GLOBAL EDITION

Principles of Managerial Finance Brief

EIGHTH EDITION

Chad J. Zutter • Scott B. Smart

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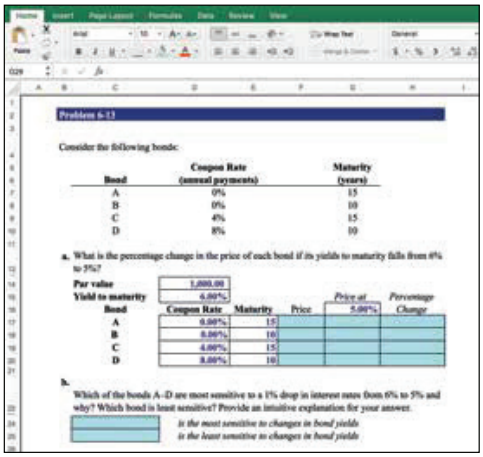

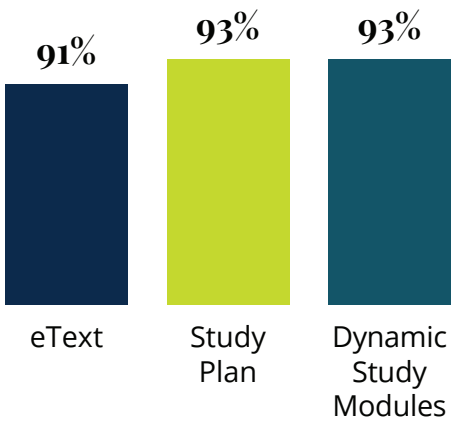

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EIGHTH EDITION
GLOBAL EDITION

Principles of Managerial Finance

BRIEF

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Dedicated to our good friend and mentor,
Dr. Lawrence J. Gitman,
who trusted us as coauthors and successors
of Principles of Managerial Finance, Brief Edition.
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Brief Contents

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Contents

PART 2 Financial Tools 113

PART 3 Valuation of Securities 285

PART 6 Long-Term Financial Decisions 547

PART 7 Short-Term Financial Decisions 635

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Chad J. Zutter is a finance professor and the Dean's Excellence Faculty Fellow at the Katz Graduate School of Business at the University of Pittsburgh. Dr. Zutter received his B.B.A. from the University of Texas at Arlington and his Ph.D. from Indiana University. His research has a practical, applied focus and has been the subject of feature stories in, among other prominent outlets, *The Economist* and *CFO Magazine*. His papers have been cited in arguments before the U.S. Supreme Court and in consultation with companies such as Google and Intel. Dr. Zutter won the prestigious Jensen Prize for the best paper published in the *Journal of Financial Economics* and a best paper award from the *Journal of Corporate Finance*, where he was recently named Associate Editor. He has won teaching awards at the Kelley School of Business at Indiana University and the Katz Graduate School of Business at the University of Pittsburgh. Prior to his career in academics, Dr. Zutter was a submariner in the U.S. Navy. Dr. Zutter and his wife have four children and live in Pittsburgh, Pennsylvania. In his free time he enjoys horseback riding and downhill skiing.

Scott B. Smart is a finance professor and the Whirlpool Finance Faculty Fellow at the Kelley School of Business at Indiana University. Dr. Smart received his B.B.A. from Baylor University and his M.A. and Ph.D. from Stanford University. His research focuses primarily on applied corporate finance topics and has been published in journals such as the *Journal of Finance*, the *Journal of Financial Economics*, the *Journal of Corporate Finance*, *Financial Management,* and others. His articles have been cited by business publications including *The Wall Street Journal*, *The Economist*, and *Business Week*. Winner of more than a dozen teaching awards, Dr. Smart has been listed multiple times as a top business school teacher by *Business Week*. He has held Visiting Professor positions at the University of Otago and Stanford University, and he worked as a Visiting Scholar for Intel Corporation, focusing on that company's mergers and acquisitions activity during the "Dot-com" boom in the late 1990s. As a volunteer, Dr. Smart currently serves on the boards of the Indiana University Credit Union and Habitat for Humanity. In his spare time he enjoys outdoor pursuits such as hiking and fly fishing.

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Preface

NEW TO THIS EDITION

Finance is a dynamic discipline, as illustrated on this book's cover by the evolution of payment methods from coins and paper currency to bitcoin. As we made plans to publish the eighth edition, we were mindful of feedback from users of the seventh edition and of changes in managerial finance practices that have taken hold in recent years. For example, in the United States of America, the Tax Cuts and Jobs Act of 2017 made sweeping changes to the corporate and personal tax codes. The new tax law changes the corporate tax from a progressive structure to one with a flat 21% tax rate. It also allows firms to immediately expense many types of capital assets while imposing limits on interest deductibility. This edition incorporates these changes and highlights how tax changes may alter firms' incentives in a variety of ways.

In every chapter, our changes were designed to make the material more up to date and more relevant for students. A number of new topics have been added at appropriate places, and new features appear in each chapter:

- We have rewritten all of the *Focus on Ethics* boxes, using new examples to highlight situations in which businesses or individuals have engaged in unethical behavior. The boxes explore the consequences of ethical lapses and the ways in which markets and governments play a role in enforcing ethical standards.
- New in this edition are Chapter Introduction Videos and animations. In the introduction videos the authors explain the importance of the chapter content within the context of managerial finance. The animations for select in-chapter figures and examples allow students to manipulate inputs to determine outputs in order to illustrate concepts and reinforce learning. MyLab Finance also offers new and updated Solution Videos that allow students to watch a video of the author discussing or solving in-chapter examples. We have also updated the financial calculator images that appear in the book to better match the financial calculator available on MyLab Finance.
- The chapter-ending Spreadsheet Exercises as well as select end-of-chapter problems in the text are now offered in MyLab Finance as auto-graded Excel Projects. Using proven, field-tested technology, auto-graded Excel Projects allow instructors to seamlessly integrate Microsoft Excel content into their course without having to manually grade spreadsheets. Students have the opportunity to practice important finance skills in Excel, helping them to master key concepts and gain proficiency with the program.
- We added new problems to each chapter, many of which require students to use real-world data and features of the new tax code to reach a solution.

The chapter sequence is essentially unchanged from the prior edition, but there are some noteworthy changes within each chapter. This edition contains fifteen chapters divided into seven parts. Each part is introduced by a brief overview, which is intended to give students an advance sense for the collective value of the chapters included in the part.

Part 1 contains two chapters. Chapter 1 provides an overview of the role of managerial finance in a business enterprise. It contains new, expanded content focusing on the goal of the firm and the broad principles that financial managers use in their pursuit of that goal. Chapter 2 describes the financial market context in which firms operate, with new coverage focusing on the transactions costs investors face when trading in secondary markets.

Part 2 contains three chapters focused on basic financial skills such as financial statement analysis, cash flow analysis, and time-value-of-money calculations. Chapter 3 provides an in-depth ratio analysis using real data from Whole Foods just prior to its acquisition by Amazon. The ratios provide opportunities for interesting discussion about some of the possible motives for that acquisition. We reorganized the flow of material in Chapter 4 to emphasize first the broad goals of strategic and operational financial planning and then the importance of cash flow within any financial plan. In Chapter 5, we rewrote much of the discussion to make time-value-of-money concepts simpler and more intuitive. We also added new coverage of growing perpetuities.

Part 3 focuses on bond and stock valuation. We placed these two chapters just ahead of the risk and return chapter to provide students with exposure to basic material on bonds and stocks that is easier to grasp than some of the more theoretical concepts in the next part. New in Chapter 6 is a discussion of the negative interest rates prevailing on government bonds in Japan and some European countries, as well as an expanded discussion of the tendency of the yield curve to invert prior to a recession. Chapter 7 offers new coverage of the use of price-to-earnings multiples to value stocks.

Part 4 contains the risk and return chapter as well as the chapter on the cost of capital. We believe that following the risk and return chapter with the cost of capital material helps students understand the important principle that the expectations of a firm's investors shape how the firm should approach major investment decisions (which are covered in Part 5). In other words, Part 4 is designed to help students understand where a project "hurdle rate" comes from before they start using hurdle rates in capital budgeting problems. Updates to Chapter 8 include new historical data on stocks, bonds, and Treasury bills, as well as examples and problems featuring real data on companies such as Apple, Google, Coca-Cola, and Wal-Mart. Chapter 9 contains new material on the use of market-value-based weights in the cost of capital calculation featuring actual data on the capital structure of Netflix. Throughout the chapter we have revised examples and problems to reflect today's low interest rate environment and the correspondingly low after-tax cost of debt faced by most public companies.

Part 5 contains two chapters on various capital budgeting topics. The first chapter focuses on capital budgeting methods such as payback and net present value analysis. A new feature of this chapter is an updated discussion of economic value added using data from Exxon Mobil Corp. The second chapter in this part explains how financial analysts construct cash flow projections, which are a required component of net present value analysis. It also describes how firms analyze the risks associated with capital investments.

Part 6 deals with the topics of capital structure and payout policy. These two chapters contain updated material on trends in firms' use of leverage and their payout practices. Chapter 12 provides a new *Focus on Practice* box discussing how Qualcomm's highly skilled labor force turns what often is thought of as a variable cost into a fixed cost and thereby creates operating leverage.

The chapter also contains new expanded coverage of the role that expected bankruptcy costs play in capital structure decisions. A new discussion in Chapter 13 highlights how and why companies have shifted their payout policies away from dividends and toward share repurchases over time.

Part 7 contains two chapters centered on working capital issues. A major development in business has been the extent to which firms have found new ways to economize on working capital investments. The first chapter in Part 7 explains why and how firms work hard to squeeze resources from their investments in current assets such as cash and inventory. The second chapter in this part focuses more on management of current liabilities.

Although the text content is sequential, instructors can assign almost any chapter as a self-contained unit, enabling instructors to customize the text to various teaching strategies and course lengths.

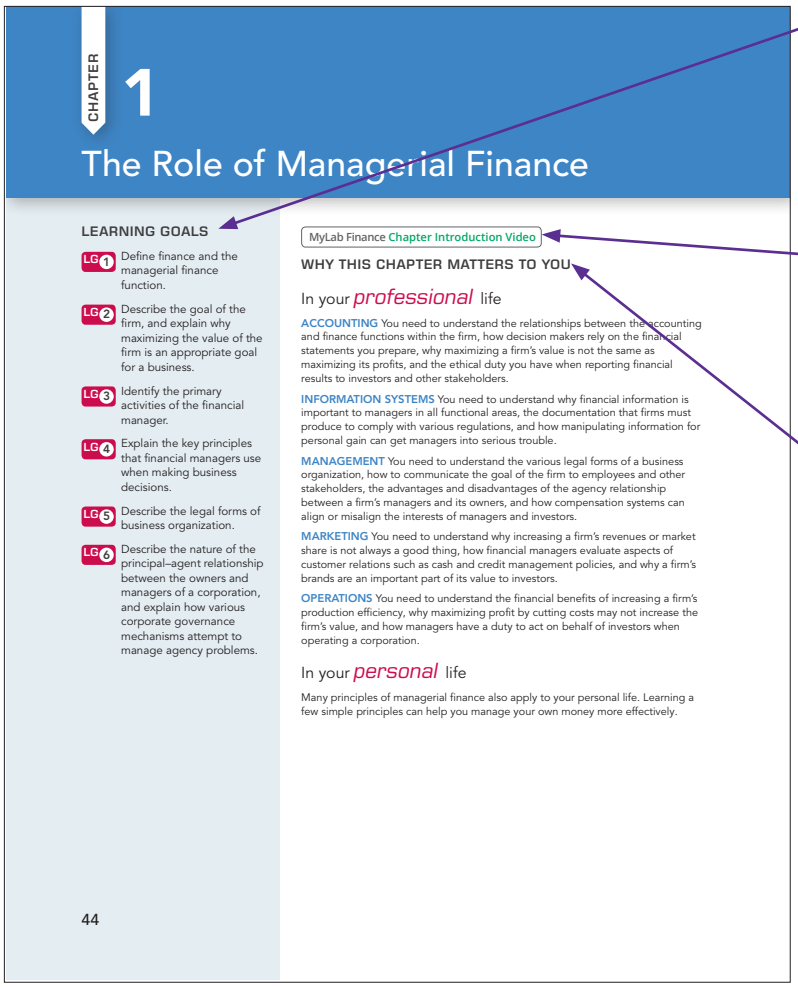
Like the previous editions, the eighth edition incorporates a proven learning system, which integrates pedagogy with concepts and practical applications. It concentrates on the knowledge that is needed to make keen financial decisions in an increasingly competitive business environment. The strong pedagogy and generous use of examples—many of which use real data from markets or companies—make the text an easily accessible resource for in-class learning or out-of-class learning, such as online courses and self-study programs.

SOLVING TEACHING AND LEARNING CHALLENGES

The desire to write *Principles of Managerial Finance, Brief Edition* came from the experience of teaching the introductory managerial finance course. Those who have taught the introductory course many times can appreciate the difficulties that some students have absorbing and applying financial concepts. Students want a book that speaks to them in plain English and explains how to apply financial concepts to solve real-world problems. These students want more than just description; they also want demonstration of concepts, tools, and techniques. This book is written with the needs of students in mind, and it effectively delivers the resources that students need to succeed in the introductory finance course.

Courses and students have changed since the first edition of this book, but the goals of the text have not changed. The conversational tone and wide use of examples set off in the text still characterize *Principles of Managerial Finance, Brief Edition*. Building on those strengths, eight editions, numerous translations, and well over half a million users, *Principles* has evolved based on feedback from both instructors and students, from adopters, nonadopters, and practitioners. In this edition, we have worked to ensure that the book reflects contemporary thinking and pedagogy to further strengthen the delivery of the classic topics that our users have come to expect. Below are descriptions of the most important resources in *Principles* that help meet teaching and learning challenges.

Users of *Principles of Managerial Finance, Brief Edition* have praised the effectiveness of the book's **Teaching and Learning System**, which they hail as one of its hallmarks. The system, driven by a set of carefully developed learning goals, has been retained and polished in this eighth edition. The "walkthrough" on the pages that follow illustrates and describes the key elements of the Teaching and Learning System. We encourage both students and instructors to acquaint themselves at the start of the semester with the many useful features the book offers.



CHAPTER 1

The Role of Managerial Finance

LEARNING GOALS

- LG1 Define finance and the managerial finance function.
- LG2 Describe the goal of the firm, and explain why maximizing the value of the firm is an appropriate goal for a business.
- LG3 Identify the primary activities of the financial manager.
- LG4 Explain the key principles that financial managers use when making business decisions.
- LG5 Describe the legal forms of business organization.
- LG6 Describe the nature of the principal–agent relationship between the owners and managers of a corporation, and explain how various corporate governance mechanisms attempt to manage agency problems.

MyLab Finance Chapter Introduction Video

WHY THIS CHAPTER MATTERS TO YOU

In your *professional* life

ACCOUNTING You need to understand the relationships between the accounting and finance functions within the firm, how decision makers rely on the financial statements you prepare, why maximizing a firm's value is not the same as maximizing its profits, and the ethical duty you have when reporting financial results to investors and other stakeholders.

INFORMATION SYSTEMS You need to understand why financial information is important to managers in all functional areas, the documentation that firms must produce to comply with various regulations, and how manipulating information for personal gain can get managers into serious trouble.

MANAGEMENT You need to understand the various legal forms of a business organization, how to communicate the goal of the firm to employees and other stakeholders, the advantages and disadvantages of the agency relationship between a firm's managers and its owners, and how compensation systems can align or misalign the interests of managers and investors.

MARKETING You need to understand why increasing a firm's revenues or market share is not always a good thing, how financial managers evaluate aspects of customer relations such as cash and credit management policies, and why a firm's brands are an important part of its value to investors.

OPERATIONS You need to understand the financial benefits of increasing a firm's production efficiency, why maximizing profit by cutting costs may not increase the firm's value, and how managers have a duty to act on behalf of investors when operating a corporation.

In your *personal* life

Many principles of managerial finance also apply to your personal life. Learning a few simple principles can help you manage your own money more effectively.

44

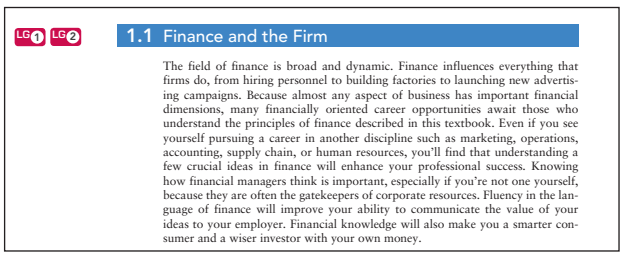
Six **Learning Goals** at the start of the chapter highlight the most important concepts and techniques in the chapter. Students are reminded to think about the learning goals while working through the chapter by strategically placed **learning goal icons**.

To help students understand the relevance of a chapter within the overarching framework of managerial finance, every chapter has available in **MyLab Finance** a short chapter introduction video by an author.

Every chapter opens with a feature, titled **Why This Chapter Matters to You**, that helps motivate student interest by highlighting both professional and personal benefits from achieving the chapter learning goals.

Its first part, **In Your Professional Life**, discusses the intersection of the finance topics covered in the chapter with the concerns of other major business disciplines. It encourages students majoring in accounting, information systems, management, marketing, and operations to appreciate how financial acumen will help them achieve their professional goals.

The second part, **In Your Personal Life**, identifies topics in the chapter that will have particular application to personal finance. This feature also helps students appreciate the tasks performed in a business setting by pointing out that the tasks are not necessarily different from those that are relevant in their personal lives.



LG1 LG2

1.1 Finance and the Firm

The field of finance is broad and dynamic. Finance influences everything that firms do, from hiring personnel to building factories to launching new advertising campaigns. Because almost any aspect of business has important financial dimensions, many financially oriented career opportunities await those who understand the principles of finance described in this textbook. Even if you see yourself pursuing a career in another discipline such as marketing, operations, accounting, supply chain, or human resources, you'll find that understanding a few crucial ideas in finance will enhance your professional success. Knowing how financial managers think is important, especially if you're not one yourself, because they are often the gatekeepers of corporate resources. Fluency in the language of finance will improve your ability to communicate the value of your ideas to your employer. Financial knowledge will also make you a smarter consumer and a wiser investor with your own money.

Learning goal icons tie chapter content to the learning goals and appear next to related text sections and again in the chapter-end summary, end-of-chapter problems and exercises, and supplements such as the *Test Bank* and MyLab.

THE ROLE OF BUSINESS ETHICS

business ethics
Standards of conduct or moral judgment that apply to persons engaged in commerce.

Business ethics are the standards of conduct or moral judgment that apply to persons engaged in commerce. Violations of these standards involve a variety of actions: "creative accounting," earnings management, misleading financial forecasts, insider trading, fraud, excessive executive compensation, options backdating, bribery, and kickbacks. The financial press has reported many such violations in recent years, involving such well-known companies as Wells Fargo, where employees opened new accounts without authorization from customers, and Volkswagen, where engineers set up elaborate deceptions to get around pollution controls. In these and similar cases, the offending companies suffered various penalties, including fines levied by government agencies, damages paid to plaintiffs in lawsuits, or lost revenues from customers who abandoned the firms because of their errant behavior. Most companies have adopted formal

For help in study and review, boldfaced **key terms** and their definitions appear in the margin where they are first introduced. These terms are also boldfaced in the book's index and appear in the end-of-book glossary.

MATTER OF FACT

Finance Professors Aren't Like Everyone Else

Professionals who advise individual investors know that many people are more willing to invest in the stock market if it has been rising in the recent past and are less willing to do so if it has been falling. Such "trend-chasing" behavior often leaves investors worse off than if they had invested consistently over time. Classical finance theory suggests that past performance of the stock market is a very poor predictor of future performance, and therefore individuals should not base investment decisions on the market's recent history. A survey found that at least one group of investors did not fall prey to trend chasing in the stock market. When deciding whether to invest in stocks, finance professors were not influenced by the market's recent trend, presumably because they know that past performance does not predict the future. That's just one of the lessons in this book that can help you make better choices with your own money.

Source: Hibbert, Lawrence, and Prakash, 2012, "Do finance professors invest like everyone else?" *Financial Analysts Journal.*

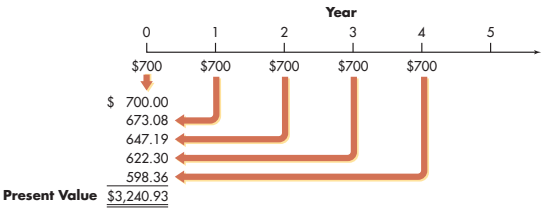
Matter of Fact boxes provide interesting empirical facts, usually featuring recent data, that add background and depth to the material covered in the chapter.

IRF EXAMPLE 5.10

MyLab Finance Animation

In Example 5.8 involving Braden Company, we found the present value of Braden's $700, 5-year ordinary annuity discounted at 4% to be $3,116.28. We now assume that Braden's $700 annual cash in flow occurs at the *start* of each year and is thereby an annuity due. The following timeline illustrates the new situation.

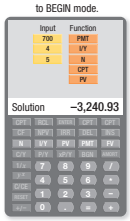
Timeline for present value of an annuity due ($700 beginning-of-year cash flows, discounted at 4%, over 5 years)



We can calculate its present value using a calculator or a spreadsheet.

MyLab Finance Financial Calculator

Note: Switch calculator to BEGIN mode.



Calculator use Before using your calculator to find the present value of an annuity due, you must either switch it to BEGIN mode or use the DUE key, depending on the specifics of your calculator. Then, using the inputs shown at the left, you will find the present value of the annuity due to be $3,240.93 (*Note:* Because we nearly always assume end-of-period cash flows, be sure to switch your calculator back to END mode when you have completed your annuity-due calculations.)

Spreadsheet use The following spreadsheet shows how to calculate the present value of the annuity due.

MyLab

	A	B
1	PRESENT VALUE OF AN ANNUITY DUE	
2	Annual annuity payment	$700
3	Annual rate of interest	4%
4	Number of years	5
5	Present value	–$3,240.93

Entry in Cell B5 is =PV(B3,B4,B2,0,1).
The minus sign appears before the $3,240.93 in B5 because the annuity's present value is a cost and therefore a cash outflow.

Examples are an important component of the book's learning system. Numbered and clearly set off from the text, they provide an immediate and concrete demonstration of how to apply financial concepts, tools, and techniques. Many of these feature real-world data.

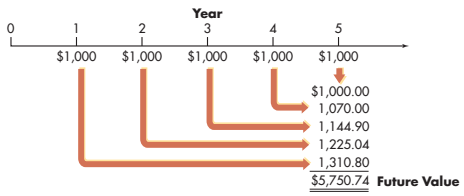
Examples illustrating time-value-of-money techniques often show the use of time lines, equations, financial calculators, and spreadsheets (with cell formulas). For instructors who prefer to use tables with interest rate factors, an IRF icon appearing with some examples indicates that the example can be solved using the interest rate factors. The reader can access the *Interest Rate Factor Supplement* in MyLab Finance. The *Interest Rate Factor Supplement* is a self-contained supplement that explains how the reader should use the interest rate factors and documents how the in-chapter examples can be solved by using them.

MyLab Finance contains additional resources to demonstrate the examples. The MyLab Financial Calculator reference indicates that the reader can use the finance calculator tool in MyLab Finance to find the solution for an example by inputting the keystrokes shown in the calculator screenshot. The MyLab Finance Solution Video reference indicates that the reader can go to MyLab Finance to watch a video of the author discussing or solving the example. The MyLab Finance Video reference indicates that the reader can watch a video on related core topical areas.

IRF PERSONAL FINANCE EXAMPLE 5.7 Fran Abrams wishes to determine how much money she will have after 5 years if she chooses annuity A, the ordinary annuity. She will deposit the $1,000 annual payments that the annuity provides at the end of each of the next 5 years into a savings account paying 7% annual interest. This situation is depicted on the following timeline.

MyLab Finance Animation

Timeline for future value of an ordinary annuity ($1,000 end-of-year deposit, earning 7%, after 5 years)



MyLab Finance Financial Calculator

As the figure shows, after 5 years, Fran will have $5,750.74 in her account. Note that because she makes deposits at the end of the year, the first deposit will earn

Personal Finance Examples demonstrate how students can apply managerial finance concepts, tools, and techniques to their personal financial decisions.

$$PV_0 = CF_1 \div r \quad (5.7)$$

Key Equations appear in green boxes throughout the text to help readers identify the most important mathematical relationships.

→ REVIEW QUESTIONS MyLab Finance Solutions

5–10 What is the difference between an ordinary annuity and an annuity due? Which is more valuable? Why?

5–11 What are the most efficient ways to calculate the present value of an ordinary annuity?

5–12 How can the formula for the future value of an annuity be modified to find the future value of an annuity due?

5–13 How can the formula for the present value of an ordinary annuity be modified to find the present value of an annuity due?

5–14 What is a perpetuity? Why is the present value of a perpetuity equal to the annual cash payment divided by the interest rate? Why doesn't this chapter provide an equation showing you how to calculate the future value of a perpetuity?

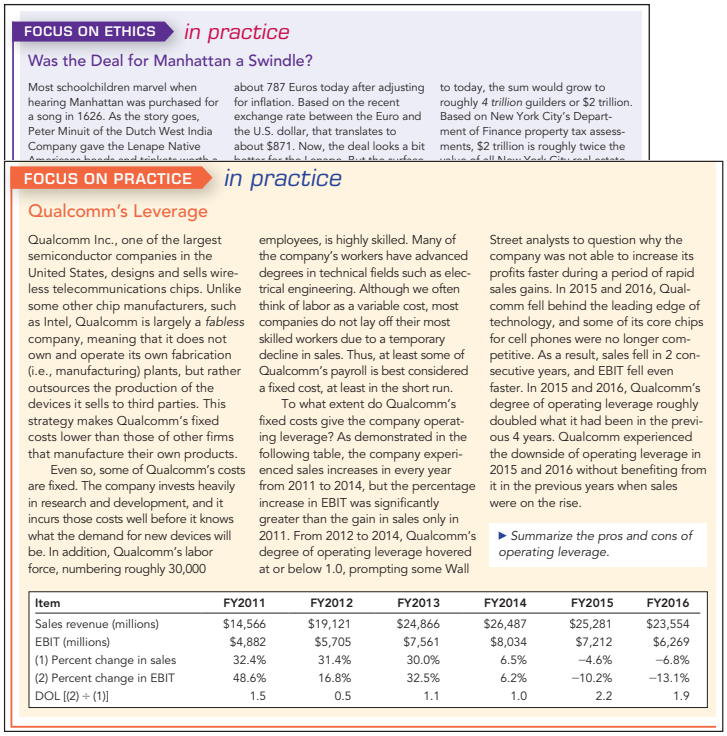
Review Questions appear at the end of each major text section. These questions challenge readers to stop and test their understanding of key concepts, tools, techniques, and practices before moving on to the next section.

→ EXCEL REVIEW QUESTIONS MyLab Finance Solutions

5–15 Because tax time comes around every year, you smartly decide to make equal contributions to your IRA at the end of every year. Using the information provided at MyLab Finance, calculate the future value of your IRA contributions when you retire.

5–16 You have just graduated from college and begun your new career, and now it is time to buy your first home. Using the information provided at MyLab Finance, determine how much you can spend for your new dream home.

NEW! Some sections have dedicated **Excel Review Questions** that ask students to demonstrate their ability to solve a financial problem using Excel.



FOCUS ON ETHICS *in practice*

Was the Deal for Manhattan a Swindle?

Most schoolchildren marvel when hearing Manhattan was purchased for a song in 1626. As the story goes, Peter Minuit of the Dutch West India Company gave the Lenape Native

about 787 Euros today after adjusting for inflation. Based on the recent exchange rate between the Euro and the U.S. dollar, that translates to about $871. Now, the deal looks a bit

to today, the sum would grow to roughly *4 trillion* guilders or $2 trillion. Based on New York City's Department of Finance property tax assessments, $2 trillion is roughly twice the

FOCUS ON PRACTICE *in practice*

Qualcomm's Leverage

Qualcomm Inc., one of the largest semiconductor companies in the United States, designs and sells wireless telecommunications chips. Unlike some other chip manufacturers, such as Intel, Qualcomm is largely a *fabless* company, meaning that it does not own and operate its own fabrication (i.e., manufacturing) plants, but rather outsources the production of the devices it sells to third parties. This strategy makes Qualcomm's fixed costs lower than those of other firms that manufacture their own products.

Even so, some of Qualcomm's costs are fixed. The company invests heavily in research and development, and it incurs those costs well before it knows what the demand for new devices will be. In addition, Qualcomm's labor force, numbering roughly 30,000 employees, is highly skilled. Many of the company's workers have advanced degrees in technical fields such as electrical engineering. Although we often think of labor as a variable cost, most companies do not lay off their most skilled workers due to a temporary decline in sales. Thus, at least some of Qualcomm's payroll is best considered a fixed cost, at least in the short run.

To what extent do Qualcomm's fixed costs give the company operating leverage? As demonstrated in the following table, the company experienced sales increases in every year from 2011 to 2014, but the percentage increase in EBIT was significantly greater than the gain in sales only in 2011. From 2012 to 2014, Qualcomm's degree of operating leverage hovered at or below 1.0, prompting some Wall Street analysts to question why the company was not able to increase its profits faster during a period of rapid sales gains. In 2015 and 2016, Qualcomm fell behind the leading edge of technology, and some of its core chips for cell phones were no longer competitive. As a result, sales fell in 2 consecutive years, and EBIT fell even faster. In 2015 and 2016, Qualcomm's degree of operating leverage roughly doubled what it had been in the previous 4 years. Qualcomm experienced the downside of operating leverage in 2015 and 2016 without benefiting from it in the previous years when sales were on the rise.

▶ *Summarize the pros and cons of operating leverage.*

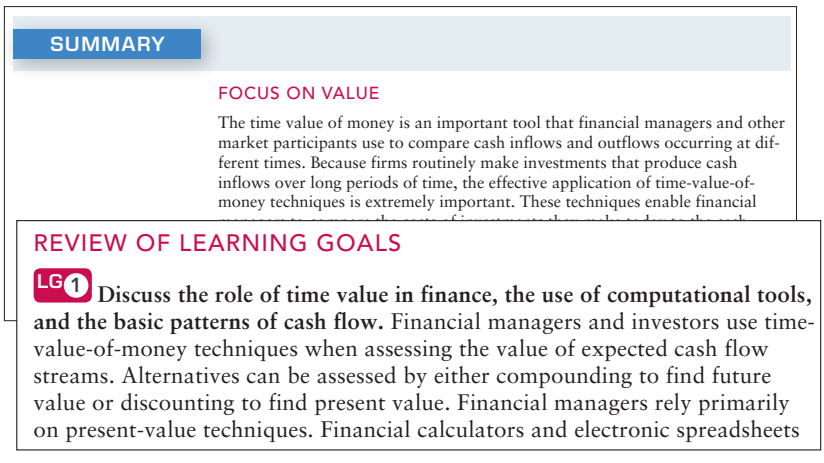
Item	FY2011	FY2012	FY2013	FY2014	FY2015	FY2016
Sales revenue (millions)	$14,566	$19,121	$24,866	$26,487	$25,281	$23,554
EBIT (millions)	$4,882	$5,705	$7,561	$8,034	$7,212	$6,269
(1) Percent change in sales	32.4%	31.4%	30.0%	6.5%	−4.6%	−6.8%
(2) Percent change in EBIT	48.6%	16.8%	32.5%	6.2%	−10.2%	−13.1%
DOL [(2) ÷ (1)]	1.5	0.5	1.1	1.0	2.2	1.9

In Practice boxes offer insights into important topics in managerial finance through the experiences of real companies, both large and small. There are two categories of In Practice boxes:

Focus on Ethics boxes help readers understand and appreciate important ethical issues and problems related to managerial finance. Nearly all of these boxes are brand new in this edition, and those that are not brand new have been substantially revised.

Focus on Practice boxes take a corporate focus that relates a business event or situation to a specific financial concept or technique.

Both types of In Practice boxes end with one or more *critical thinking questions* to help readers broaden the lesson from the content of the box.



SUMMARY

FOCUS ON VALUE

The time value of money is an important tool that financial managers and other market participants use to compare cash inflows and outflows occurring at different times. Because firms routinely make investments that produce cash inflows over long periods of time, the effective application of time-value-of-money techniques is extremely important. These techniques enable financial

REVIEW OF LEARNING GOALS

LG1 **Discuss the role of time value in finance, the use of computational tools, and the basic patterns of cash flow.** Financial managers and investors use time-value-of-money techniques when assessing the value of expected cash flow streams. Alternatives can be assessed by either compounding to find future value or discounting to find present value. Financial managers rely primarily on present-value techniques. Financial calculators and electronic spreadsheets

The end-of-chapter **Summary** consists of two sections. The first section, **Focus on Value**, explains how the chapter's content relates to the firm's goal of maximizing owner wealth. This feature helps reinforce understanding of the link between the financial manager's actions and share value.

The second part of the Summary, the **Review of Learning Goals**, restates each learning goal and summarizes the key material that was presented to support mastery of the goal. This review provides students with an opportunity to reconcile what they have learned with the learning goal and to confirm their understanding before moving forward.

SELF-TEST PROBLEMS (Solutions in Appendix)

LG2 LG5 IRF

ST5–1 **Future values for various compounding frequencies** Delia Martin has $10,000 that she can deposit in any of three savings accounts for a 3-year period. Bank A compounds interest on an annual basis, bank B compounds interest twice each year, and bank C compounds interest each quarter. All three banks have a stated annual interest rate of 4%.

a. What amount would Ms. Martin have after 3 years, leaving all interest paid on deposit, in each bank?
b. What effective annual rate (EAR) would she earn in each of the banks?
c. On the basis of your findings in parts **a** and **b**, which bank should Ms. Martin deal with? Why?
d. If a fourth bank (bank D), also with a 4% stated interest rate, compounds interest continuously, how much would Ms. Martin have after 3 years? Does this alternative change your recommendation in part **c**? Explain why or why not.

Self-Test Problems, keyed to the learning goals, give readers an opportunity to strengthen their understanding of topics by doing a sample problem. For reinforcement, solutions to the Self-Test Problems appear in the appendix at the back of the book. An IRF icon indicates that the Self-Test Problem can be solved using the interest rate factors. The reader can access the Interest Rate Factor Supplement in MyLab Finance.

WARM-UP EXERCISES Select problems are available in MyLab Finance.

LG2 **E5–1** Assume that Amaya Chidori makes a ¥40,000 deposit into an investment account in a bank in Sendai, Japan. If this account is currently paying 0.5% per annum, what will the account balance be after 2 years?

LG2 LG5 **E5–2** Paul Jackson saved £6,200 over last 2 years and decided to invest in an individual savings account (ISA), which is a type of savings account that offers tax exemptions to residents of the United Kingdom. If the ISA pays 3% annual interest, what will the account balance be after 3 years?

Warm-Up Exercises follow the Self-Test Problems. These short, numerical exercises give students practice in applying tools and techniques presented in the chapter.

PROBLEMS Select problems are available in MyLab Finance. The MyLab icon indicates problems in Excel format available in MyLab Finance.

LG2 **P4–1** **Depreciation** On March 20, 2019, Norton Systems acquired two new assets. Asset A was research equipment costing $17,000 and having a 3-year recovery period. Asset B was duplicating equipment with an installed cost of $45,000 and a 5-year recovery period. Using the MACRS depreciation percentages in Table 4.2, prepare a depreciation schedule for each of these assets.

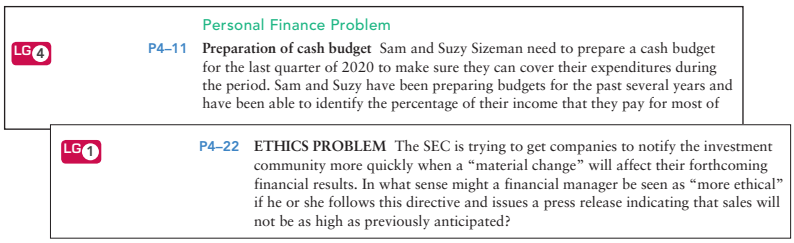
LG2 **P4–2** **Depreciation** Early this year, Rubber Incorporated purchased a new machine for $12,000 to shape rubber. It is estimated that the new machine will have a recovery period of 3 years with an expected salvage value of $2,500. Use the MACRS depreciation percentages in Table 4.2 to develop a depreciation schedule for the new machine.

LG5 **P4–20** **Integrative: Pro forma statements** Abru Industries has decided to prepare financial plans. Use the financial statements and other information provided below to prepare the financial plans.

Comprehensive Problems, keyed to the learning goals, are longer and more complex than the Warm-Up Exercises. In this section, instructors will find multiple problems that address the important concepts, tools, and techniques in the chapter.

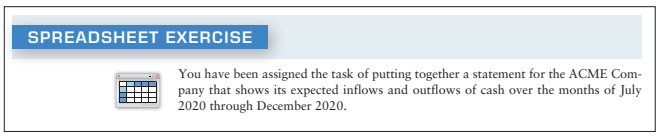
New! Excel templates for many end-of-chapter problems are available in MyLab Finance. These templates do not solve problems for students, but rather help students reach a solution faster by inputting data for them or by organizing facts presented in problems in a logical way.

A short descriptor identifies the essential concept or technique of the problem. Problems labeled as **Integrative** tie together related topics.



Personal Finance Problems specifically relate to personal finance situations and Personal Finance Examples in each chapter. These problems will help students see how they can apply the tools and techniques of managerial finance in managing their own finances.

Select exercises and problems are available in MyLab Finance.



Every chapter includes a **Spreadsheet Exercise**. This exercise gives students an opportunity to use Excel software to create one or more spreadsheets with which to analyze a financial problem. The spreadsheet to be created is often modeled on a table or Excel screenshot located in the chapter.

MyLab FINANCE

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MyLab opens the door to a powerful Web-based tutorial, testing, and diagnostic learning system designed specifically for the Zutter/Smart, *Principles of Managerial Finance, Brief Edition*. With MyLab, instructors can select an adaptable preconfigured course or create their own. Both options allow instructors to create, edit, and assign online homework, quizzes, and tests and track all student progress in the downloadable online gradebook. MyLab allows students to supplement and reinforce their in-class learning by taking advantage of a progress-driven Study Plan or self-selected practice problems, quizzes, and tests. For example, select end-of-chapter problems are assignable by instructors or selectable by students in MyLab, and because the problems have algorithmically generated values, no student will have the same homework as another or work the same problem twice; there is an unlimited opportunity for practice and testing. Students get the help they need, when they need it, from the robust tutorial options, including "View an Example" and "Help Me Solve This," which breaks the problem into steps and links to the relevant textbook page.

This fully integrated online system gives students the hands-on tutorial, practice, and diagnostic help they need to ensure they are effectively learning finance in the most efficient manner. Utilization of the resources available in MyLab Finance saves instructors time by enabling students to more effectively learn on their own and providing instructors with a full account of student progress, auto grading, and an online gradebook that can seamlessly link with a Learning Management System (e.g., Blackboard Learn, Brightspace by D2L, Canvas, or Moodle) or be downloaded to Excel.

The Multimedia Library in MyLab Finance provides students with access to a variety of chapter resources all intended to reinforce their learning and understanding of the textbook content. For example, students can access a Chapter Introduction Video for every chapter and dozens of Solution Videos for select in-chapter examples. Students can also access dynamic animations for select figures and examples throughout the book that provide them with the ability to control inputs and drive outputs to better understand the concepts.

The auto-graded Excel feature in MyLab Finance allows instructors to assign all Spreadsheet Exercises and select end-of-chapter problems without having to manually grade spreadsheets. Students have the opportunity to practice important finance skills in Excel and instructors have the ability to assess their learning without the hassle of time-consuming grading. Students simply download a spreadsheet, solve a finance problem in Excel, and then upload the file back to MyLab Finance. Students will receive personalized feedback on their work within minutes that allows them to pinpoint where they went wrong on any step of the problem.

Chapter Cases with automatically graded assessment are also provided in MyLab Finance. These cases have students apply the concepts they have learned to a more complex and realistic situation. These cases help strengthen practical application of financial tools and techniques.

MyLab also has Group Exercises that students can work together in the context of an ongoing company. Each group creates a company and follows it through the various managerial finance topics and business activities presented in the textbook.

MyLab Finance has an Interest Rate Factor Supplement that explains how to use the interest rate factors in time-value-of-money problems and works seamlessly with the textbook. The student can go directly to the IRF Supplement and see the in-chapter example solved using the interest rate factors. All examples that appear in the IRF Supplement are indicated in the text with an IRF icon.

Advanced reporting features in MyLab also allow you to easily report on AACSB accreditation and assessment in just a few clicks.

An online glossary, digital flashcards, financial calculator tutorials, videos, Spreadsheet Use examples from the text in Excel, and numerous other premium resources are available in MyLab.

DEVELOPING EMPLOYABILITY SKILLS

For students to succeed in a rapidly changing job market, they should be aware of their career options and how to go about developing a variety of skills. In this book and in MyLab Finance, we focus on developing these skills in a variety of ways.

Excel modeling skills—Each chapter contains a Spreadsheet Exercise that asks students to build an Excel model to help solve a business problem. Many chapters provide screenshots showing completed Excel models designed to solve in-chapter examples. Many chapters contain Excel Review Questions that prompt students to practice using Excel to solve specific types of problems. In addition, students can access the working Excel screenshots and solutions to the Excel Review Questions in MyLab Finance to further reenforce their learning and understanding. Also, in MyLab students will find dozens of Excel templates, marked in the text with a special icon, that help them model select end-of-chapter problems so they can reach a solution faster and with a deeper understanding of the underlying concepts. Finally, as mentioned above, every Excel Spreadsheet Exercise and select end-of-chapter problems can be assigned and auto graded.

	A	B
1	FUTURE VALUE OF AN ORDINARY ANNUITY	
2	Annual annuity payment	–$1,000
3	Annual rate of interest	7%
4	Number of years	5
5	Future value	$5,750.74

Entry in Cell B5 is =FV(B3,B4,B2,0,0).
The minus sign appears before the $1,000
in B2 because the annuity's payments
are cash outflows.

Ethical reasoning skills—The *Focus on Ethics* boxes describe situations in which business professionals have violated ethical (and in some cases even legal) standards and have suffered consequences as a result. These boxes will help students recognize the ethical temptations they are likely to face while pursuing a finance career and the consequences that they may suffer if they behave unethically. Each chapter ends with an Ethics Problem that asks students to consider the ethical dimensions of some business decision.

Critical thinking skills—Nearly every significant financial decision requires critical thinking because making optimal decisions means weighing the marginal benefits and costs of alternative plans. To weigh those benefits and costs, one must first identify and quantify them. Nearly every chapter in this textbook discusses how financial analysts place a value on the net benefits associated with a particular decision. Students who master this material will be prepared to ask the tough questions necessary to assess whether a particular course of action creates value for shareholders.

Data analysis skills—Financial work is about data. Financial analysts have to identify the data that are relevant for a particular business problem, and they must know how to process that data in a way that leads to good decision making. In-chapter examples and end-of-chapter problems require students to sort out relevant from irrelevant data and to use the data that they have to make a clear recommendation about what course of action a firm should take.

TABLE OF CONTENTS OVERVIEW

The text's organization conceptually links the firm's actions and its value as determined in the financial market. We discuss every significant financial problem or decision in terms of both risk and return to assess the potential impact on owners' wealth. A Focus on Value element in each chapter's Summary helps reinforce the student's understanding of the link between the financial manager's actions and the firm's share value.

In organizing each chapter, we have adhered to a managerial decision-making perspective, relating decisions to the firm's overall goal of wealth maximization. Once a particular concept has been developed, its application is illustrated by an example, which is a hallmark feature of this book. These examples demonstrate, and solidify in the student's thought, financial decision-making considerations and their consequences.

INSTRUCTOR TEACHING RESOURCES

Supplements available to instructors at www.pearsonglobaleditions.com/Zutter	Features of the Supplement
Instructor's Manual	• Overview of key topics • Detailed answers and solutions to all Opener-In-Review Questions, Warm-Up Exercises, end-of-chapter Problems, and Chapter Cases • Suggested answers to all critical thinking questions in chapter boxes, Ethics Problems, and Group Exercises • Spreadsheet Exercises • Group Exercises • Integrative Cases
Test Bank	More than 2,700 multiple-choice, true/false, short-answer, and graphing questions with these annotations: • Difficulty level (1 for straight recall, 2 for some analysis, 3 for complex analysis) • Type (Multiple-choice, true/false, short-answer, essay) • Topic (The term or concept the question supports) • Learning outcome • AACSB learning standard (Ethical Understanding and Reasoning; Analytical Thinking Skills; Information Technology; Diverse and Multicultural Work; Reflective Thinking; Application of Knowledge)

Computerized TestGen	TestGen allows instructors to: • Customize, save, and generate classroom tests • Edit, add, or delete questions from the Test Item Files • Analyze test results • Organize a database of tests and student results
PowerPoints	Slides include all the figures and tables from the textbook.

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PART ONE

Introduction to Managerial Finance

CHAPTERS IN THIS PART

Part 1 of *Principles of Managerial Finance* discusses the role of financial managers in businesses and the financial market environment in which firms operate. We argue that managers should aim to maximize the value of the firm and thereby maximize the wealth of its owners. Financial managers act on behalf of the firm's owners by making operating and investment decisions whose benefits exceed their costs. Such decisions create wealth for shareholders. Maximizing wealth is important because firms operate in a highly competitive financial market environment that offers shareholders many alternatives for investing. To raise the financial resources necessary to fund the firm's ongoing operations and future investment opportunities, managers must deliver value to the firm's investors. Without smart financial managers and access to financial markets, firms are unlikely to survive, let alone achieve the long-term goal of maximizing their value.

CHAPTER 1

The Role of Managerial Finance

LEARNING GOALS

- LG1 Define finance and the managerial finance function.
- LG2 Describe the goal of the firm, and explain why maximizing the value of the firm is an appropriate goal for a business.
- LG3 Identify the primary activities of the financial manager.
- LG4 Explain the key principles that financial managers use when making business decisions.
- LG5 Describe the legal forms of business organization.
- LG6 Describe the nature of the principal–agent relationship between the owners and managers of a corporation, and explain how various corporate governance mechanisms attempt to manage agency problems.

MyLab Finance Chapter Introduction Video

WHY THIS CHAPTER MATTERS TO YOU

In your *professional* life

ACCOUNTING You need to understand the relationships between the accounting and finance functions within the firm, how decision makers rely on the financial statements you prepare, why maximizing a firm's value is not the same as maximizing its profits, and the ethical duty you have when reporting financial results to investors and other stakeholders.

INFORMATION SYSTEMS You need to understand why financial information is important to managers in all functional areas, the documentation that firms must produce to comply with various regulations, and how manipulating information for personal gain can get managers into serious trouble.

MANAGEMENT You need to understand the various legal forms of a business organization, how to communicate the goal of the firm to employees and other stakeholders, the advantages and disadvantages of the agency relationship between a firm's managers and its owners, and how compensation systems can align or misalign the interests of managers and investors.

MARKETING You need to understand why increasing a firm's revenues or market share is not always a good thing, how financial managers evaluate aspects of customer relations such as cash and credit management policies, and why a firm's brands are an important part of its value to investors.

OPERATIONS You need to understand the financial benefits of increasing a firm's production efficiency, why maximizing profit by cutting costs may not increase the firm's value, and how managers have a duty to act on behalf of investors when operating a corporation.

In your *personal* life

Many principles of managerial finance also apply to your personal life. Learning a few simple principles can help you manage your own money more effectively.

LG1 LG2

1.1 Finance and the Firm

The field of finance is broad and dynamic. Finance influences everything that firms do, from hiring personnel to building factories to launching new advertising campaigns. Because almost any aspect of business has important financial dimensions, many financially oriented career opportunities await those who understand the principles of finance described in this textbook. Even if you see yourself pursuing a career in another discipline such as marketing, operations, accounting, supply chain, or human resources, you'll find that understanding a few crucial ideas in finance will enhance your professional success. Knowing how financial managers think is important, especially if you're not one yourself, because they are often the gatekeepers of corporate resources. Fluency in the language of finance will improve your ability to communicate the value of your ideas to your employer. Financial knowledge will also make you a smarter consumer and a wiser investor with your own money.

WHAT IS FINANCE?

finance
The science and art of how individuals and firms raise, allocate, and invest money.

managerial finance
Concerns the duties of the financial manager in a business.

Finance is the science and art of how individuals and firms raise, allocate, and invest money. The science of finance utilizes financial theories and concepts to establish general rules that can guide managers in their decisions. The art of finance involves adapting theory to particular business situations with their own unique circumstances. **Managerial finance** is concerned with the responsibilities of a financial manager working in a business. Though business finance is the primary focus of this book, the principles of finance apply to both personal and professional decision making. At the personal level, for instance, finance helps individuals decide how much of their earnings to spend, how much to save, and how to invest their savings. Financial thinking helps consumers decide when borrowing money is appropriate and enables them to critically evaluate loan offers with different terms. In a business context, finance involves the same types of decisions: how firms raise money from investors, how firms invest money in attempting to create value for their investors, and how firms decide whether to reinvest earnings in the business or distribute

MATTER OF FACT

Finance Professors Aren't Like Everyone Else

Professionals who advise individual investors know that many people are more willing to invest in the stock market if it has been rising in the recent past and are less willing to do so if it has been falling. Such "trend-chasing" behavior often leaves investors worse off than if they had invested consistently over time. Classical finance theory suggests that past performance of the stock market is a very poor predictor of future performance, and therefore individuals should not base investment decisions on the market's recent history. A survey found that at least one group of investors did not fall prey to trend chasing in the stock market. When deciding whether to invest in stocks, finance professors were not influenced by the market's recent trend, presumably because they know that past performance does not predict the future. That's just one of the lessons in this book that can help you make better choices with your own money.

Source: Hibbert, Lawrence, and Prakash, 2012, "Do finance professors invest like everyone else?" *Financial Analysts Journal.*

earnings back to investors. The keys to good financial decisions are much the same for businesses and individuals, which is why most students will benefit from an understanding of finance regardless of their profession. Learning the techniques of good financial analysis will not only help you make better financial decisions as a consumer but will also assist you in understanding the financial consequences of important business decisions, no matter what career path you follow.

WHAT IS A FIRM?

What is a firm? Put simply, a firm is a business organization that sells goods or services. However, a more complete answer attempts to explain why firms exist. They exist because investors want access to risky investment opportunities. In other words, firms are risky business organizations that, if not for investors' willingness to bear risk, would have difficulty generating the necessary investment capital to operate. For example, most investors do not have the expertise or wealth required to start a personal computer company, so instead they invest in a company like Apple. Even when a few individuals, such as Steve Jobs, Steve Wozniak, and Ronald Wayne, had the requisite expertise and wealth to start Apple Computer in a garage in 1976, vast amounts of additional money (i.e., investment capital) from investors were necessary for the firm to grow into what Apple is today. So, ultimately, firms are intermediaries that bring together investors and risky investment opportunities. Firms pool investment capital, make risky investment decisions, and manage risky investments all on behalf of investors who would otherwise not be able to do so effectively or efficiently on their own.

WHAT IS THE GOAL OF THE FIRM?

What goal should managers pursue? This question has no shortage of possible answers. Some might argue that managers should focus entirely on satisfying customers. Firms pursuing this goal could measure their products' market shares to gauge progress. Others suggest that managers must first inspire and motivate employees; in that case, employee turnover might be the key success metric to watch. Clearly, the goal or goals that managers select will affect many of the decisions they make, so choosing an objective is a critical determinant of how businesses operate.

Maximize Shareholder Wealth

Finance teaches that the primary goal of managers should be to maximize the wealth of the firm's owners—the stockholders or shareholders. Through the years, that recommendation has generated a lot of controversy. *The Economist* magazine once referred to shareholder value maximization as "the most powerful idea in business," but Jack Welch, the long-time Chief Executive Officer (CEO) of General Electric and a man *Fortune* magazine named "Manager of the Century," once called maximizing shareholder value "the dumbest idea in the world." Welch's assessment is particularly ironic because during his leadership, almost no company generated more wealth for its shareholders than General Electric. A $1,000 investment in GE stock made in 1981 when Welch took the reigns as CEO would have grown to roughly $67,000 by the time he retired in 2001. The simplest and best measure of stockholder wealth is the share price, so most finance textbooks (including ours) instruct managers to take actions that increase the firm's share price.

A common misconception is that when firms strive to make their shareholders happy, they do so at the expense of other constituencies such as customers, employees, or suppliers. This line of thinking ignores that in most cases, enriching shareholders requires managers to first satisfy the demands of these other interest groups, at least to some degree. Dividends ultimately received by stockholders come from the firm's profits. It is unlikely, then, that a firm whose customers are unhappy with its products, whose employees are looking for jobs at other firms, or whose suppliers are reluctant to ship raw materials will make shareholders rich because such a firm will likely be less profitable in the long run than one that better manages its relations with these stakeholder groups.

Therefore, we argue that the goal of the firm, as well as of managers, should be *to maximize the wealth of the owners for whom it is being operated*, which in most instances is equivalent to *maximizing the stock price*. This goal translates into a straightforward decision rule for managers: *Managers should take only actions that they expect will increase the shareholders' wealth*. Although that objective sounds simple, its implementation is not always easy. To determine whether a particular course of action will increase or decrease shareholders' wealth, managers have to assess what return (i.e., cash inflows net of cash outflows) and risk (i.e., the uncertainty of the net cash flows) the action will bring. How managers do that is the focus of this book.

MATTER OF FACT

Firms Accelerate Dividends So That Shareholders Save on Taxes

One way that firms can maximize the wealth of shareholders is by thinking carefully about the taxes their shareholders must pay on dividends. Tax cuts enacted by Congress in 2003 lowered the tax rate on most dividends received by shareholders to a modest 15%. However, the legislation contained a provision by which the tax cuts would expire in 2013 unless Congress specifically acted to renew them. With a political compromise to renew the tax cuts looking unlikely in the 2012 election year, many firms announced plans to accelerate dividend payments they had planned to make in early 2013 to late 2012. The Washington Post Company, for example, announced that on December 27, 2012, it would pay out the entire $9.80 per share dividend that it had planned to distribute in 2013. What was the stock market's reaction to that announcement? Washington Post shares rose $5. By accelerating their dividend payments, companies such as Washington Post, Expedia, Inc., and luxury goods producer Coach, Inc., were increasing the wealth of their shareholders by helping them save taxes.

Maximize Profit?

earnings per share (EPS)
The amount earned during the period on behalf of each outstanding share of stock, calculated by dividing the period's total earnings available for the firm's stockholders by the number of shares of stock outstanding.

It might seem intuitive that maximizing a firm's share price is equivalent to maximizing its profits. That thought is not always correct, however.

Corporations commonly measure profits in terms of **earnings per share (EPS)**, which represent the amount earned during the period on behalf of each outstanding share of stock. Accountants calculate EPS by dividing the period's total earnings available for the firm's stockholders by the number of shares of stock outstanding.

EXAMPLE 1.1

MyLab Finance Solution Video

Nick Dukakis, the financial manager of Neptune Manufacturing, a producer of marine engine components, is choosing between two investments, Rotor and Valve. The following table shows the EPS Dukakis expects each investment to earn over its 3-year life.

	Earnings per share (EPS)			
Investment	Year 1	Year 2	Year 3	Total for years 1, 2, and 3
Rotor	$1.40	$1.00	$0.40	$2.80
Valve	0.60	1.00	1.40	3.00

If Dukakis thought he should make decisions to maximize profits, he would recommend that Neptune invest in Valve rather than Rotor because it results in higher total earnings per share over the 3-year period ($3.00 EPS compared with $2.80 EPS).

Does profit maximization lead to the highest possible share price? For at least three reasons, the answer is often no. First, timing is important. An investment that provides a small profit quickly may be preferable to one that produces a larger profit if that profit comes in the distant future. Second, profits and cash flows are not identical. The profit reported by a firm is simply an estimate of how it is doing, an estimate influenced by many different accounting choices made by firms when assembling their financial reports. Cash flow is a more straightforward measure of the money flowing into and out of the company than is profit. Companies must pay their bills with cash, not profits, so cash flow matters most to financial managers and investors. Third, risk is a major consideration. A firm that earns a low but reliable profit might be more valuable than another firm with profits that fluctuate a great deal (and therefore can be very high or very low at different times).

Timing Because a firm can earn a return on funds it receives, *the receipt of funds sooner rather than later is preferred*. In our example, even though the total earnings from Rotor are smaller than those from Valve, Rotor provides much greater earnings per share in the first year. It's possible that by investing in Rotor, Neptune Manufacturing can reinvest the earnings that it receives in year 1 to generate higher profits overall than if it had invested in project Valve. If the rate of return Neptune can earn on reinvested earnings is high enough, managers may do better to invest in project Rotor even though project Valve generates higher profits over the 3 years.

Cash Flows Profits do not necessarily result in cash flows available to stockholders. The accounting assumptions and techniques that a firm adopts can sometimes allow it to show a positive profit even when its cash outflows exceed cash inflows. For instance, suppose a retail electronics store buys a laptop from a supplier in December for $1,000 and sells it a few days later for $1,500. The profit on this transaction for the month of December is $500, but what is the cash flow? If the retailer pays its supplier $1,000 in December but allows its

customer to pay for the laptop a month later in January, then the retailer actually has a net cash outflow in December.

For these and other reasons, higher earnings do not necessarily translate into a higher stock price. Earnings increases accompanied by increases in future cash flows are what produce higher stock prices. For example, a firm could increase its earnings by significantly reducing its equipment maintenance expenditures. If the reduced spending on maintenance results in lower product quality, however, the firm may impair its competitive position, and its stock price could drop as investors anticipate lower future cash flows and sell the stock. In this case, the earnings increase was accompanied by lower future cash flows and therefore a lower stock price.

risk
The chance that actual outcomes may differ from those expected.

risk averse
Requiring compensation to bear risk.

Risk Profit maximization also fails to account for **risk,** the chance that actual outcomes may differ from those expected. A basic premise in finance is that a tradeoff exists between return (cash flow) and risk. In general, stockholders are **risk averse,** which means they are willing to bear risk only if they expect compensation for doing so. In other words, investors demand higher returns on riskier investments, and they will accept lower returns on relatively safe investments. What this signifies in terms of the goal of the firm is that maximizing profits may not maximize the stock price. Suppose one firm is slightly more profitable than another, but investing in the firm with marginally higher profits also entails greater risk. Investors may well be willing to pay a higher price for the stock of the firm that produces lower but more predictable profits.

As another way to express this idea, we can say that cash flow and risk affect share price differently. Holding risk fixed, investors will pay more for the stock of a firm that generates higher cash flows and profits. In contrast, holding cash flow fixed, investors will pay more for shares that are less risky because they do not like risk. The key point, explored in more depth later, is that differences in risk can significantly affect the value of different investments. *Return and risk are, in fact, the key determinants of share price, which represents the wealth of the firm's owners.*

Maximize Stakeholders' Welfare?

stakeholders
Groups such as employees, customers, suppliers, creditors, and others who have a direct economic link to the firm but are not owners.

Critics of the view that managers should maximize the wealth of shareholders have advanced an alternative goal advocating a balanced consideration of the welfare of shareholders and other firm stakeholders. **Stakeholders** are individuals who are not owners of the firm but who nevertheless have some economic interest in it. Stakeholders include employees, suppliers, customers, and even members of the local community where a firm is located. Those who argue that firms should focus on stakeholders' interests maintain that shareholder value maximization as a business objective is far too narrow. This stakeholder view is widely held and indeed is reflected in the corporate law of countries such as Germany, France, and Japan, whereas the shareholder value maximization perspective is more common in the United States and the United Kingdom.

We see a number of flaws in recommending that firms neglect shareholder wealth maximization in favor of a broader stakeholder perspective. First, as we have already pointed out, maximizing shareholder wealth does not in any way imply that managers should ignore the interests of everyone connected to a firm who is not a shareholder. Managers cannot maximize the value of a firm if their employees, customers, and suppliers are constantly dissatisfied—all those stakeholders are free to do business with other firms. A recent study found that when

firms were added to *Fortune* magazine's list of the best companies to work for (presumably a sign of labor-friendly practices), their stock prices jumped.[1] This evidence led the study's authors to conclude that the benefits of labor-friendly practices outweigh the costs. Apparently, what is good for employees is also good for shareholders.

Second, proponents of the stakeholder perspective often argue that in pursuit of maximizing shareholder value, managers take actions that push up the stock price in the short run to the detriment of the firm's long-run performance. In fact, to maximize shareholder value, managers must necessarily assess the long-term consequences of their actions because investors will certainly do so. To illustrate, consider that in March 2017, the online retailing giant Amazon reported that it earned a profit of $4.90 per share over the previous 12 months. Another company, Clorox, reported almost identical earnings per share of $4.92. Yet the stock prices of these two companies could not have been more different. Amazon was trading for $850 per share, whereas Clorox stock was selling for just $137. In other words, investors were willing to pay 6 times more for shares of Amazon even though it reported virtually the same EPS as Clorox. Why? Several factors may contribute, but the most plausible answer is that investors envision rosier long-term prospects for Amazon. If the only matter of concern to investors was short-term profits, then the prices of Amazon and Clorox should have been much closer because their profits, at least in the short term, were nearly identical.

Third, the stakeholder perspective is intrinsically difficult to implement, and advocates of the idea that managers should consider all stakeholders' interests along with those of shareholders do not typically indicate how managers should carry it out. For example, how much emphasis should managers place on the interests of different stakeholder groups? Are the interests of employees more or less important than the desires of customers? Should members of the local community who do no business with the firm have an equal say with the firm's suppliers? When different stakeholder groups disagree on the action a firm should take, how should managers make important decisions? In contrast, the goal of shareholder maximization clarifies what actions managers should take.

Fourth, many people misinterpret the statement that managers should maximize shareholder wealth as implying that managers should take any action, including illegal or unethical actions, that increases the stock price. Even the most ardent supporters of shareholder value maximization as the firm's primary goal acknowledge that managers must act within ethical and legal boundaries.

THE ROLE OF BUSINESS ETHICS

business ethics
Standards of conduct or moral judgment that apply to persons engaged in commerce.

Business ethics are the standards of conduct or moral judgment that apply to persons engaged in commerce. Violations of these standards involve a variety of actions: "creative accounting," earnings management, misleading financial forecasts, insider trading, fraud, excessive executive compensation, options backdating, bribery, and kickbacks. The financial press has reported many such violations in recent years, involving such well-known companies as Wells Fargo, where employees opened new accounts without authorization from customers, and Volkswagen, where engineers set up elaborate deceptions to get around pollution controls. In these and

1. Olubunmi Faleye and Emery Trahan, "Labor-friendly corporate practices: Is what is good for employees good for shareholders?" *Journal of Investing*, June 2011.

similar cases, the offending companies suffered various penalties, including fines levied by government agencies, damages paid to plaintiffs in lawsuits, or lost revenues from customers who abandoned the firms because of their errant behavior. Most companies have adopted formal ethical standards, although clearly adherence to and enforcement of those standards vary. The goal of such standards is to motivate business and market participants to adhere to both the letter and the spirit of laws and regulations concerned with business and professional practice. Most business leaders believe that businesses actually strengthen their competitive positions by maintaining high ethical standards.

Ethical Guidelines

Robert A. Cooke, a noted ethicist, suggests that the following questions be used to assess the ethical viability of a proposed action.[2]

1. Is the action arbitrary or capricious? Does it unfairly single out an individual or group?
2. Does the action violate the moral or legal rights of any individual or group?
3. Does the action conform to accepted moral standards?
4. Are there alternative courses of action that are less likely to cause actual or potential harm?

Clearly, considering such questions before taking an action can help ensure its ethical viability.

Today, many firms are addressing the issue of ethics by establishing corporate ethics policies that outline a set of fundamental principles guiding what their employees must or must not do. Some firms go further and make their ethical standards the centerpiece of their corporate image. For example, Google famously adopted the motto "Don't be evil." Even for Google, however, ethical dilemmas are unavoidable in business. The *Focus on Practice* box provides an example of ethical concerns confronting Google in the wake of the 2016 U.S. presidential election.

A major impetus toward the development of ethics policies has been the Sarbanes-Oxley Act of 2002. The act requires firms to disclose whether they have a code of ethics in place, and firms must report any waivers of those codes for senior management. Companies that do not have a code of ethics must explain why they have not adopted one. Many firms require their employees to sign a formal pledge to uphold the firm's ethics policies. Such policies typically apply to employee actions in dealing with all corporate stakeholders, including the public.

Ethics and Share Price

An effective ethics program can enhance corporate value by producing positive benefits. It can reduce potential litigation and judgment costs; maintain a positive corporate image; build shareholder confidence; and gain the loyalty, commitment, and respect of the firm's stakeholders. By maintaining and enhancing cash flow and reducing perceived risk, such actions can positively affect the firm's share price. Ethical behavior is therefore necessary for achieving the firm's goal of owner wealth maximization.

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2. Robert A. Cooke, "Business Ethics: A Perspective," in *Arthur Andersen Cases on Business Ethics* (Chicago: Arthur Andersen, September 1991), pp. 2 and 5.

FOCUS ON PRACTICE *in practice*

Must Search Engines Screen Out Fake News?

During his January 11, 2017, press conference, President-elect Donald Trump berated reporter Jim Acosta and his employer, CNN, saying, "You are fake news." For news organizations to question the validity of facts cited by politicians was nothing unusual, especially during an election year, but throughout the 2016 presidential election cycle, Trump turned that dynamic on its head through his confrontations with CNN and other news organizations. These exchanges sparked a debate about the responsibility of Google, Facebook, and other Internet-based companies to identify websites spreading fake news.

Google offers an interesting case study on value maximization and corporate ethics. In 2004, Google's founders provided "An Owner's Manual" for shareholders, which stated that "Google is not a conventional company" and that the company's ultimate goal "is to develop services that significantly improve the lives of as many people as possible." The founders stressed that running a successful business is not enough; they also want Google to make the world a better place. In light of that objective, what responsibility did Google have in helping voters distinguish real news from fake news? Just 1 month before the election, Google introduced a new "fact-check tag," to help readers assess the validity of news stories they were reading online. In subsequent months, Google introduced the fact-check tag to markets in other countries where elections were taking place, and it began new initiatives such as "Cross-Check," an effort to combine the work of human fact checkers with computer algorithms to identify fake news stories in France during its election cycle.

Google's famous corporate motto, "Don't Be Evil," is intended to convey a willingness to do the right thing even at the cost of sacrifice in the short run. Google's approach does not appear to be limiting its ability to maximize value, as the company's share price increased almost 1200% from 2004 to 2017!

▶ *Is the goal of maximizing shareholder wealth necessarily ethical or unethical?*

▶ *What responsibility, if any, does Google have in helping users assess the veracity of content they read online?*

Sources: "Labeling fact-check articles in Google News," by Richard Gingras, October 13, 2016, https://blog.google/topics/journalism-news/labeling-fact-check-articles-google-news/; "Google and Facebook combat fake news in France," BI Intelligence, February 7, 2017, businessinsider.com.

→ REVIEW QUESTIONS MyLab Finance Solutions

1–1 What is the goal of the firm and, therefore, of managers and employees? Discuss how one measures achievement of this goal.

1–2 For what three main reasons is profit maximization potentially inconsistent with wealth maximization?

1–3 What is risk? Why must financial managers consider risk as well as return when they evaluate a decision alternative or action?

1–4 Is maximizing shareholder wealth inconsistent with having concern for the welfare of a firm's other stakeholders?

LG3 LG4

1.2 Managing the Firm

This book is about how managers running a firm can create value for the firm's investors through sound financial decision making. Responsibility for creating value does not rest solely or even primarily on the finance function. Marketers create value by identifying the unmet needs of customers, by making customers aware that their firm can meet those needs, and by establishing a solid brand. Employees working in the operations and supply chain functions contribute to a firm's value by streamlining manufacturing processes and securing reliable raw

materials sources at reasonable cost. Human resources professionals help acquire and retain the talent firms need to achieve success. Accountants track the performance of the firm, help create financial plans and budgets, and ensure compliance with a host of regulatory requirements. And of course, financial managers advise all their peers in other functions on the financial consequences of their decisions.

The point is that nearly every employee, regardless of how his or her work helps enhance the firm's value, will interact with financial managers and will benefit from a basic working knowledge of financial principles. Every firm has limited resources, and employees in each part of a firm need some of those resources to function. Inside a firm, resource allocation is partly a matter of negotiation. Those who can make a better case that their work adds value will be more successful in acquiring the needed resources. Often the key to negotiating successfully in that environment is understanding the language of finance. To be a successful marketer or supply chain analyst or human resources professional, you must be able to explain how your work adds value in financial terms. This book will help you do just that.

Naturally our primary focus here is on what financial managers do. Therefore, we now turn to an overview of the managerial finance function.

THE MANAGERIAL FINANCE FUNCTION

Financial managers touch every part of a firm because everything that a firm does has some kind of financial impact. Employees in a firm's finance department help control costs on the factory floor. They analyze the market potential of new products and services. They quantify the costs and benefits of hiring additional workers. They assist in mitigating risks associated with unexpected movements in interest rates, commodity prices, and exchange rates. How do they accomplish all these things? The answer is that they rely on an essential set of principles and tools that are transferable to many different business applications. The managerial finance function is therefore not just about what financial managers do but also (and more importantly) about the methods they rely on daily.

Financial Managers' Key Decisions

Broadly speaking, most decisions that financial managers make, or help their colleagues in other functions make, fall into three broad categories: investment decisions, financing decisions, and working capital decisions. Some specialized areas of managerial finance do not fit neatly into any of these three categories, but the vast majority of decisions by financial managers relate to these broad areas.

investment decisions
Decisions that focus on how a company will spend its financial resources on long-term projects that ultimately determine whether the firm successfully creates value for its owners.

Investment decisions focus on how a company will spend its financial resources on long-term projects that ultimately determine whether the firm successfully creates value for its owners. For a semiconductor company like Intel, investment decisions revolve around how much money the firm should spend on new factories (each of which cost $5 billion to build), how much it should devote to research and development (Intel spends more than $12 billion annually), and how much the company should invest in its traditional microprocessors versus chips for newer wearable devices and products related to the Internet of Things. These are the most important decisions made by firms because they largely dictate whether a company succeeds or fails in the long run. Financial managers contribute to these decisions by performing a type of financial analysis known as

capital budgeting
A technique that helps managers decide which projects create the most value for shareholders.

capital budgeting, which we will discuss at length in subsequent chapters. Briefly, **capital budgeting** is a technique that helps managers decide which projects create the most value for shareholders. Essentially, capital budgeting identifies investment opportunities for which benefits exceed costs. Because value maximization requires managers to take actions only when benefits exceed costs, capital budgeting gives managers a tool for guiding investment decisions in a way that is directly linked to the goal of the firm.

financing decisions
Decisions that determine how companies raise the money they need to pursue investment opportunities.

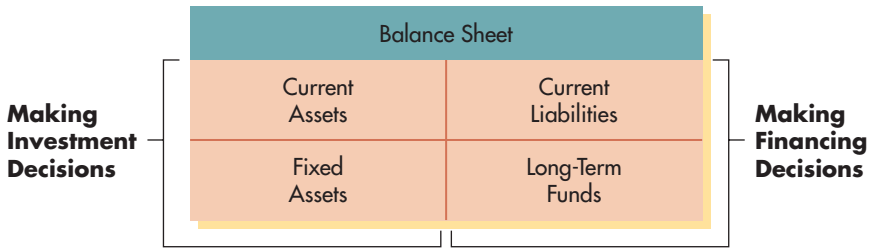
capital
The money that firms raise to finance their activities.

Once firms know how they want to invest resources, the next critical decision is where to obtain funding for those investments. **Financing decisions** determine how companies raise the money needed for investment opportunities. When firms are just getting started and as they continue to grow, they require capital from investors. **Capital** is the money raised by firms to finance their activities. For this reason, the financing decision may also be called the *capital structure decision*. Firms may raise capital by borrowing money from banks or other investors, or they may receive money from investors who want an ownership stake. Firms that are profitable can reinvest their earnings and thereby gain access to another form of capital. Although a firm's financing (or capital structure) decisions are almost certainly less important than its investment decisions, the mix of funding sources that a company uses has a number of important implications. For example, if a company chooses to borrow money, it is obligated to repay that money even if business conditions deteriorate. That's what happened to General Motors (GM) when it did not have enough cash to pay its debt and went bankrupt in June 2009. GM ultimately survived with the help of $51 billion in government assistance (of which about $39 billion was eventually repaid), but not every company that borrows money and later goes bankrupt is so fortunate. In contrast, borrowing money can benefit shareholders, in part because in the United States and many other countries, the tax code provides an incentive to borrow. Specifically, the U.S. corporate tax code allows firms to treat interest payments to lenders as a deductible business expense (which lowers the after-tax cost of borrowing for the firm), whereas tax laws do not give firms a deduction for cash dividend payments made to shareholders.

To visualize the difference between a firm's investment and financing decisions, refer to the balance sheet shown in Figure 1.1. Investment decisions generally refer to the items that appear on the left-hand side of the balance sheet, and financing decisions relate to the items on the right-hand side. Keep in mind, though, that financial managers make these decisions based on how they affect the firm's value, not on the accounting principles used to construct a balance sheet.

FIGURE 1.1

Financial Activities
Primary activities of the financial manager



working capital decisions
Decisions that refer to the management of a firm's short-term resources.

Whereas the investment and financing decisions of firms often involve major strategic initiatives, on a day-to-day basis, financial managers spend more time making various types of short-term financial decisions. **Working capital decisions** refer to the management of a firm's short-term resources. These decisions involve tracking and forecasting the firm's cash position, making sure that the firm pays its bills on time and receives timely payments from customers, and calculating the optimal amount of inventory the firm should keep on hand. Collectively, the resources that a firm invests in items such as cash, inventory, accounts receivable, and accounts payable are known as the firm's *working capital*. For many firms, the funds invested in working capital are considerable. For example, in July 2017, Apple reported that it held roughly $77 billion in cash in various short-term investments.

Principles That Guide Managers' Decisions

A financial manager performs many different roles in a large company, but no matter the job title, a common set of financial principles guide that manager's decisions and the advice he or she gives to colleagues working in different functions. Specifically, we highlight five key principles of great importance in managerial finance.

The Time Value of Money As we discussed earlier, timing matters in finance. Having money today is better than having it later because firms and individuals can invest the money on hand and earn a return on that money. Stating this idea another way, a dollar today is worth more than a dollar in the future. Investing a dollar today means that the dollar will grow to more than a dollar over time. The implication of this principle for managers is that, all else being equal, investments that provide faster payoffs are preferred over investments with distant payoffs. This does not suggest that firms must necessarily have an excessive focus on short-term results. Rather, the time value of money simply means that when an investment's payoffs come in the distant future, those payoffs must be larger to justify waiting for them.

The Tradeoff between Return and Risk "Nothing ventured, nothing gained" is a famous quote attributed to Benjamin Franklin. The equivalent financial principle is that a tradeoff exists between return and risk. Investors who want to earn higher returns must be willing to accept greater risk. Or, from the perspective of a business, a firm that puts investors' funds in riskier projects must offer those investors higher returns. For financial managers tasked with advising firms on investment decisions, this tradeoff means that any analysis of alternative investment projects quantify both the returns that investments may provide and the risks that they entail.

Cash Is King In discussing the differences between maximizing shareholder value and profits, we noted that cash flow and profit are not identical concepts. In finance, cash flow matters more than profit because firms can pay investors only with cash, not with profits. Ultimately, the cash flows that investors receive or expect to receive over time determine the value of the firm. If a firm is not generating positive cash flow, it cannot pay investors, even if its financial statements show that it is earning a profit. The same is true regarding a firm's dealings with its suppliers, employees, and anyone else to whom the firm owes money—those bills must be paid with cash.

Competitive Financial Markets When we think of the term *competition* in a business context, what usually comes to mind is the competition that occurs between firms in the markets for goods and services—Coke versus Pepsi, Samsung versus Apple, and so on. But firms also compete in another sense. They compete in the financial markets for access to capital controlled by investors. From time to time, most companies must raise money to fund new investments, and to succeed in raising money, firms have to convince participants in the financial markets that their ideas are as good or better than those of other firms seeking funding. Investors diligently search for the opportunities that provide the highest returns for a given risk level, so companies that cannot convince investors that their investment ideas will generate competitive rates of return may have difficulty raising capital.

Furthermore, at least for companies that have stock actively traded on stock exchanges, the financial markets constantly send signals to managers about how they are performing. Investors trade rapidly as they learn new information about companies, so stock prices also respond rapidly to news as it emerges. When investors hear positive news about a company (e.g., when a company announces better-than-expected financial results), the company's stock price moves up. On February 28, 2017, the stock price of the biotechnology firm Kite Pharma shot up almost 25% when the company released favorable results from clinical trials of one of the company's cancer-fighting drugs. On the other hand, stock prices fall when unfavorable news becomes known. In January 2017, shares of the toy manufacturer Mattel dropped 14% in a single day after the company announced disappointing financial results from the previous holiday shopping season.

How should managers respond to signals sent by the stock market? Although the opinions of investors as revealed by movements in a company's stock price are not always correct, managers should pay close attention to what the market is telling them. Investors have very strong incentives to evaluate the information they receive about companies in an unbiased way. If a company announces plans for a major new investment (e.g., the acquisition of another company) and its stock price falls, managers should recognize that the market is skeptical about the new investment, and they should carefully reconsider their plan to invest.

Incentives Are Important We have made a case for managers to operate firms with the aim of benefiting shareholders, but do managers behave this way? In many instances and for a variety of reasons, the answer is no. In part, this results from managers' incentives not being properly aligned with the interests of shareholders. For example, suppose one company makes an offer to purchase another company. The buyer's offer is quite attractive in the sense that the price offered is well above the current market price of the target company's stock. Accepting the offer seems like the best option for shareholders. However, the CEO of the target may decline the offer, knowing that if the acquisition takes place, he is likely to lose his job and the large salary that goes with it. Similarly, senior managers of the buyer in this example may not have their shareholders' best interests in mind. CEOs and other senior executives tend to earn higher pay when they run larger organizations, so perhaps the motivation to buy another company is about increasing management's compensation. In fact, CEO bonuses sometimes depend more on completing an acquisition deal than on whether that deal creates value for shareholders.

principal–agent problem
A problem that arises because the owners of a firm and its managers are not the same people and the agent does not act in the interest of the principal.

The example above illustrates a classic problem in finance known as the **principal–agent problem.** The principal–agent problem arises when the owners of a firm and its managers are not the same people. In this instance, what is best for shareholders and what managers believe to be in their own best interests may not be aligned. The principal–agent problem is particularly important in large corporations, in which a great degree of separation exists between the owners of a firm and its managers. We will explore the principal–agent problem, with potential solutions, as we study alternative ways of organizing businesses later in this chapter.

Organization of the Finance Function

The scope of the managerial finance function depends on the size of the firm. In very small firms, this function focuses largely on accounting and control issues. As a firm grows, the finance function typically separates from the accounting department and becomes a unique organization linked directly to the company president or CEO through the chief financial officer (CFO). The lower portion of the organizational chart in Figure 1.2 shows the structure of the finance function in a typical medium to large firm.

treasurer
A key financial manager, who manages the firm's cash, oversees its pension plans, and manages key risks.

director of risk management
Works with the treasurer to manage risks that the firm faces related to movements in exchange rates, commodity prices, and interest rates.

controller
The firm's chief accountant, who is responsible for the firm's accounting activities, such as corporate accounting, tax management, financial accounting, and cost accounting.

director of investor relations
The conduit of information between the firm and the investment community.

director of internal audit
Leads a team charged with making sure that all business units follow internal policies and comply with government regulations.

Reporting to the CFO are the treasurer, the controller, the director of investor relations, and the director of internal audit. The **treasurer** manages the firm's cash, investing surplus funds when available and securing outside financing when needed. The treasurer also oversees a firm's pension plans and, together with the **director of risk management**, manages critical risks related to movements in foreign currency values, interest rates, and commodity prices. The **controller** has a role more centered on accounting, budgeting, and tracking the performance of a business unit. The **director of investor relations** is the conduit of information between the firm and the investment community. The **director of internal audit** leads a team that is charged with making sure that all units within the firm are following internal policies and complying with government regulations. Some of these jobs have a very external focus, such as the treasurer, who must keep a close eye on a wide range of financial markets, and the director of investor relations, who communicates regularly with the outside investment community. Other jobs have a more internal focus, such as the controller position.

foreign exchange manager
The manager responsible for managing and monitoring the firm's exposure to loss from currency fluctuations.

If international sales or purchases are important to a firm, it may well employ one or more finance professionals whose job is to monitor and manage the firm's exposure to loss from currency fluctuations. A trained financial manager can "hedge," or protect against such a loss, at a reasonable cost by using a variety of financial instruments. These **foreign exchange managers** typically report to the firm's treasurer.

Relationship to Economics

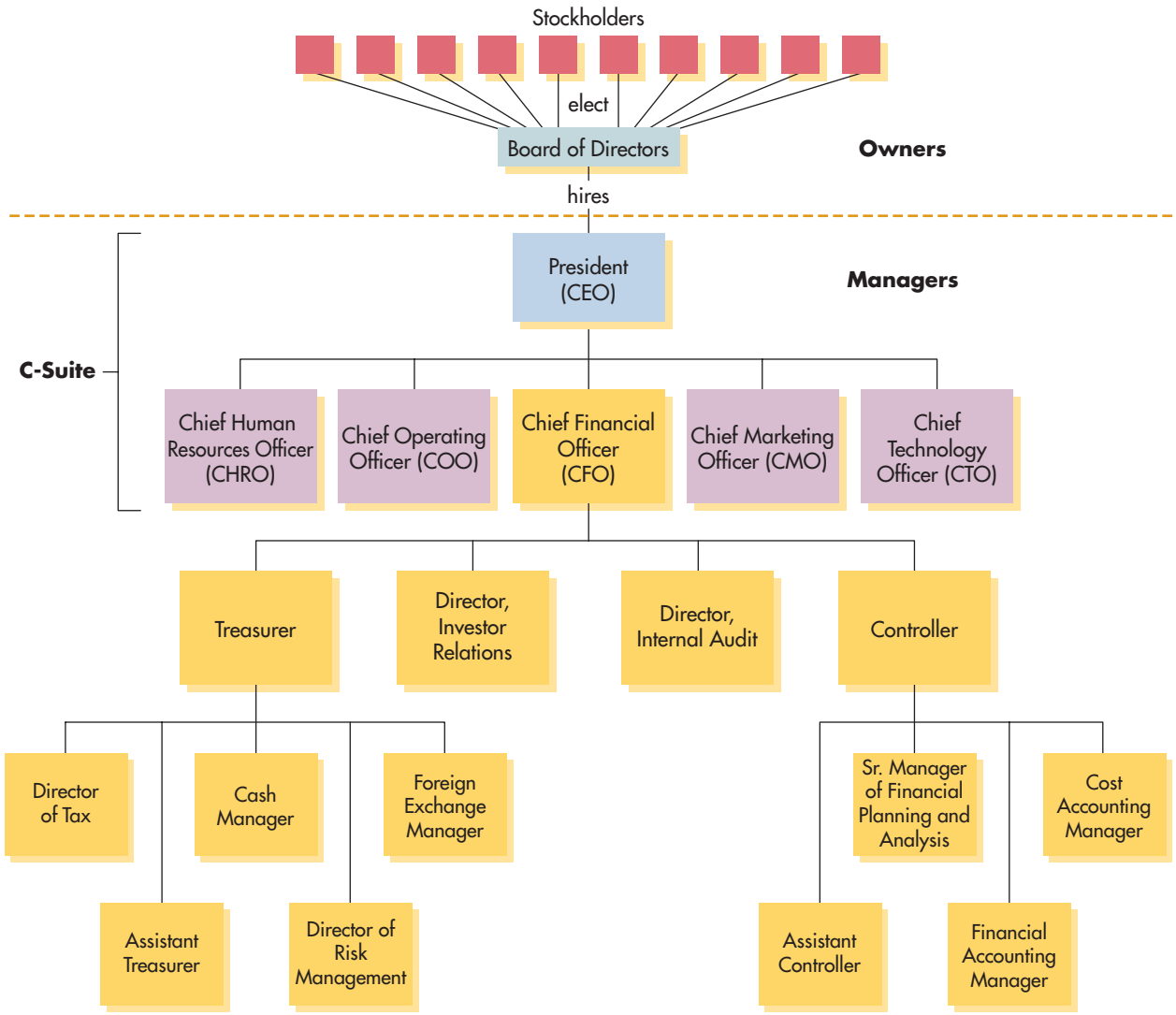
marginal cost–benefit analysis
Economic principle that states that financial decisions should be made and actions taken only when the marginal benefits exceed the marginal costs.

The field of finance is closely related to economics. Financial managers must understand the economic environment their firms operate in and must be alert to the consequences of varying levels of economic activity and changes in economic policy. They must also be able to use economic theories as guidelines for efficient business operation. Examples include supply-and-demand analysis, profit-maximizing strategies, and price theory. The primary economic principle used in managerial finance is **marginal cost–benefit analysis,** the tenet that managers should base financial decisions on the marginal benefits and costs associated with

FIGURE 1.2

Corporate Organization

The general organization of a corporation and the finance function (which is shown in yellow)



some action. That is, managers should take actions that generate higher marginal benefits than marginal costs. Nearly all financial decisions ultimately come down to an assessment of their marginal benefits and marginal costs.

EXAMPLE 1.2

Jamie Teng is a financial manager for Nord Department Stores, a large chain of upscale stores operating primarily in the western United States. She is currently trying to decide whether to replace one of the firm's computer servers with a new, more sophisticated one that would both speed processing and handle a larger

volume of transactions. The new computer server would require a cash outlay of $8,000, and the old one could be sold to net $2,000. The future benefits from faster processing would be $10,000 in today's dollars. The benefits over a similar period from the old computer (measured in today's dollars) would be $3,000. Applying marginal cost–benefit analysis, Jamie organizes the data as follows:

Benefits with new computer	$10,000
Less: Benefits with old computer	3,000
(1) Marginal benefits	$ 7,000
Cost of new computer	$ 8,000
Less: Proceeds from sale of old computer	2,000
(2) Marginal costs	$ 6,000
Net benefit [(1) – (2)]	$ 1,000

Because the marginal benefits of $7,000 exceed the marginal costs of $6,000, Jamie recommends purchasing the new computer to replace the old one. The firm will experience a net benefit of $1,000 as a result of this action.

Relationship to Accounting

The firm's finance and accounting activities are closely related and generally overlap. In small firms, accountants often carry out the finance function; in large firms, financial analysts often help compile accounting information. We can, however, note two differences between finance and accounting; one is related to the emphasis on cash flows, and the other to decision making.

Emphasis on Cash Flows The accountant's primary function is to develop and report data for measuring the performance of the firm, assess its financial position, comply with and file reports required by securities regulators, and file and pay taxes. Using generally accepted accounting principles, the accountant prepares financial statements that recognize revenue at the time of sale (whether payment has been received or not) and recognize expenses when incurred. This approach is referred to as the **accrual basis**.

accrual basis
In preparation of financial statements, recognizes revenue at the time of sale and recognizes expenses when they are incurred.

The financial manager, in contrast, places primary emphasis on *cash flows*, the intake and outgo of cash. He or she maintains solvency of the firm by planning the cash flows necessary to satisfy its obligations and to acquire assets needed to achieve its goals. The financial manager uses this **cash basis** to recognize the revenues and expenses only with respect to actual inflows and outflows of cash. Whether a firm earns a profit or experiences a loss, it must have a sufficient flow of cash to meet its obligations as they come due.

cash basis
Recognizes revenues and expenses only with respect to actual inflows and outflows of cash.

EXAMPLE 1.3

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Nassau Corporation, a small yacht dealer, sold one yacht for $1,000,000 in the calendar year just ended. Nassau originally purchased the yacht for $800,000. Although the firm paid in full for the yacht during the year, at year's end it has yet to collect the $1,000,000 from the customer. The accounting view and the

financial view of the firm's performance during the year are given by the following income and cash flow statements, respectively.

Accounting view (accrual basis)

Nassau Corporation income statement for the year ended 12/31

Sales revenue	$1,000,000
Less: Costs	800,000
Net profit	$ 200,000

Financial view (cash basis)

Nassau Corporation cash flow statement for the year ended 12/31

Cash inflow	$ 0
Less: Cash outflow	800,000
Net cash flow	−$800,000

In an accounting sense, Nassau Corporation is profitable, but in terms of actual cash flow, it has a problem. Its lack of cash flow resulted from the uncollected accounts receivable of $1,000,000. Without adequate cash inflows to meet its obligations, the firm will not survive, regardless of its level of profits.

As the example shows, accrual accounting data do not fully represent the circumstances of a firm. Thus, the financial manager must look beyond financial statements to gain insight into existing or developing problems. Of course, accountants are well aware of the importance of cash flows, and financial managers use and understand accrual-based financial statements. Nevertheless, the financial manager, by concentrating on cash flows, should be able to avoid insolvency and achieve the firm's financial goals.

PERSONAL FINANCE EXAMPLE 1.4 Individuals rarely use accrual concepts. Rather, they rely mainly on cash flows to measure their financial outcomes. Generally, individuals plan, monitor, and assess their financial activities using cash flows over a given period, typically a month or a year. Ann Bach projects her cash flows during October 2018 as follows:

	Amount	
Item	**Inflow**	**Outflow**
Net pay received	$4,400	
Rent		−$1,200
Car payment		−450
Utilities		−300
Groceries		−800
Clothes		−750
Dining out		−650
Gasoline		−260
Interest income	220	
Misc. expense		−425
Totals	$4,620	−$4,835

Ann subtracts her total outflows of $4,835 from her total inflows of $4,620 and finds that her net cash flow for October will be –$215. To cover the $215 shortfall, Ann will have to either borrow $215 (putting it on a credit card is a form of borrowing) or withdraw $215 from her savings. Alternatively, she may decide to reduce her outflows in areas of discretionary spending such as clothing purchases, dining out, or those items that make up the $425 of miscellaneous expense.

Decision Making The second major difference between finance and accounting involves decision making. Accountants devote most of their attention to the collection and presentation of financial data. Financial managers evaluate the accounting statements, develop additional data, and make decisions based on their assessment of the associated returns and risks. Of course, this does not mean that accountants never make decisions or that financial managers never gather data but rather that the primary emphases of accounting and finance are different.

→ REVIEW QUESTIONS MyLab Finance Solutions

1–5 What are the main types of decisions that financial managers make?
1–6 Why is it important that managers recognize that a tradeoff exists between risk and return? Why does that tradeoff exist?
1–7 What is the primary economic principle used in managerial finance?
1–8 What are the major differences between accounting and finance with respect to emphasis on cash flows and decision making?
1–9 If managers do not act in the best interests of shareholders, what role might incentives play in explaining that behavior?

LG5 LG6

1.3 Organizational Forms, Taxation, and the Principal–Agent Relationship

From a legal perspective, businesses can organize themselves in a variety of ways. Different organizational forms involve various tradeoffs related to ownership, control, taxation, liability, and other factors. In this section, we examine the pros and cons of alternative legal forms for businesses.

LEGAL FORMS OF BUSINESS ORGANIZATION

One of the most important decisions all businesses confront is how to choose a legal form of organization. This decision has very important financial implications. How a business is legally organized influences the risks borne by the firm's owners, how the firm can raise money, and how the firm's profits will be taxed. The three most common legal forms of business organization are the *sole proprietorship,* the *partnership,* and the *corporation.* Most businesses are organized as sole proprietorships, but the largest businesses are almost always organized as corporations. Even so, each type of organization has its advantages and disadvantages.

Sole Proprietorships

sole proprietorship
A business owned by one person and operated for his or her own profit.

A **sole proprietorship** is a for-profit business owned by one person. More than 70% of all U.S. businesses are sole proprietorships. The typical sole proprietorship is small, and the majority of sole proprietorships operate in the wholesale, retail, service, and construction industries.

Typically, the owner (proprietor) and a few employees operate the proprietorship. The proprietor raises capital from personal resources or by borrowing. The owner is responsible for all business decisions, so this form of organization appeals to entrepreneurs who enjoy working independently. Sole proprietorships do not pay taxes on their income as separate entities. Rather, income from sole proprietorships "passes through" to the owner and is taxed at the personal level.

unlimited liability
The condition of a sole proprietorship (or general partnership), giving creditors the right to make claims against the owner's personal assets to recover debts owed by the business.

A major drawback to the sole proprietorship is **unlimited liability,** which means that liabilities of the business are the entrepreneur's responsibility and that creditors can make claims against the entrepreneur's personal assets if the business fails to pay its debts.

Partnerships

partnership
A business owned by two or more people and operated for profit.

articles of partnership
The written contract used to formally establish a business partnership.

A **partnership** consists of two or more owners doing business together for profit. Partnerships account for about 10% of all businesses, and they are typically larger than sole proprietorships. Partnerships are common in the accounting, law, finance, insurance, and real estate industries.

Most partnerships are established by a written contract known as **articles of partnership**. In a *general* (or *regular*) *partnership,* all partners have unlimited liability, and each partner is legally liable for all debts of the partnership. Like a sole proprietorship, a partnership is a pass-through business, meaning that partnerships do not pay income tax directly. Instead, income from the partnership flows through to the partners and is taxed at the individual level. Table 1.1 summarizes the strengths and weaknesses of proprietorships and partnerships.

TABLE 1.1 Strengths and Weaknesses of the Common Legal Forms of Business Organization

	Sole proprietorship	Partnership	Corporation
Strengths	• Owner receives all profits (and sustains all losses) • Low organizational costs • Income included and taxed on proprietor's personal tax return • Independence • Secrecy • Ease of dissolution	• Can raise more funds than sole proprietorships • Borrowing power enhanced by more owners • More available brain power and managerial skill • Income included and taxed on partner's personal tax return	• Owners have *limited liability,* which guarantees that they cannot lose more than they invested • Can achieve large size via sale of ownership (stock) • Ownership (stock) is readily transferable • Long life of firm • Can hire professional managers • Has better access to financing
Weaknesses	• Owner has *unlimited liability* in that total wealth can be taken to satisfy debts • Limited fund-raising power tends to inhibit growth • Proprietor must be jack-of-all-trades • Difficult to give employees long-run career opportunities • Lacks continuity when proprietor dies	• Owners have *unlimited liability* and may have to cover debts of other partners • Partnership is dissolved when a partner dies • Difficult to liquidate or transfer partnership	• Taxes are generally higher because corporate income is taxed, and dividends paid to owners are also taxed at a maximum 15% rate • More expensive to organize than other business forms • Subject to greater government regulation • Lacks secrecy because regulations require firms to disclose financial results

MATTER OF FACT

Number of Businesses and Income Earned by Type of U.S. Firm

Although sole proprietorships greatly outnumber partnerships and corporations combined, they generate the lowest level of income. In total, sole proprietorships accounted for almost three-quarters of the number of business establishments in operation, but they earned just 10% of all business income. Corporations, on the other hand, accounted for just 17% of the number of businesses, but they earned almost two-thirds of all business income.

	Sole proprietorships	Partnerships	Corporations
Number of firms (millions)	25.3	3.4	5.8
Percentage of all firms	73%	10%	17%
Percentage of all business income	10%	26%	64%

Source: Overview of Approaches to Corporate Integration, Joint Committee on Taxation, United States Congress, May 17, 2016.

Corporations

corporation
A legal business entity with rights and duties similar to those of individuals but with a legal identity distinct from its owners.

A **corporation** is a business entity owned by individuals, but the corporation itself is a legal entity distinct from its owners. A corporation has the legal powers of an individual. It can sue and be sued, make and be party to contracts, and acquire property in its own name. Although fewer than 20% of all U.S. businesses are incorporated, the largest businesses nearly always are; corporations account for roughly two-thirds of total business income.

stockholders
The owners of a corporation, whose ownership, or *equity*, takes the form of common stock or, less frequently, preferred stock.

limited liability
A legal provision that limits stockholders' liability for a corporation's debt to the amount they initially invested in the firm by purchasing stock.

stock
A security that represents an ownership interest in a corporation.

dividends
Periodic distributions of cash to the stockholders of a firm.

One advantage of the corporate form is that corporations can raise money to expand by selling new stock to investors. Another advantage is that the owners of a corporation, its **stockholders** (whose ownership, or *equity*, takes the form of common or preferred stock), enjoy **limited liability,** meaning they are not personally liable for the firm's debts as are sole proprietors and partners. Their losses are limited to the amount they invested in the firm when they purchased shares of stock. In Chapter 7 you will learn more about stock, but for now we will simply say that **stock** is a security that represents an ownership interest in a corporation. Stockholders expect to earn a return by receiving **dividends**—periodic distributions of cash—or by realizing gains through increases in share price. Because the money to pay dividends generally comes from the profits that a firm earns, we refer to stockholders as *residual claimants*. They are paid last, after the corporation pays employees, suppliers, tax authorities, and lenders and anyone else to whom it owes money. Over time, if the firm does not generate enough cash to pay everyone else, there is no residual cash flow and nothing is available for stockholders. Table 1.1 lists the key strengths and weaknesses of corporations.

board of directors
Group elected by the firm's stockholders and typically responsible for approving strategic goals and plans, setting general policy, guiding corporate affairs, and approving major expenditures.

As noted in the upper portion of Figure 1.2, control of the corporation functions a little like a democracy. The stockholders vote periodically to elect members of the **board of directors,** which is typically responsible for approving strategic goals and plans, setting general policy, guiding corporate affairs, and approving major expenditures. Most importantly, the board decides when to hire or fire top managers and establishes compensation packages for the most senior executives. The board consists of "inside" directors, such as key

TABLE 1.2 2018 Tax Rate Schedule for Single Taxpayer

Taxable income brackets			Tax calculation: Base tax	+	(Marginal rate × amount over bracket lower limit)	
$ 0	to	$ 9,525	$ 0	+	(10% × amount over	$ 0)
9,525	to	38,700	$ 953	+	(12% × amount over	$ 9,525)
38,700	to	82,500	$ 4,454	+	(22% × amount over	$ 38,700)
82,500	to	157,500	$ 14,090	+	(24% × amount over	$ 82,500)
157,500	to	200,000	$ 32,090	+	(32% × amount over	$157,500)
200,000	to	500,000	$ 45,690	+	(35% × amount over	$200,000)
Over 500,000			$150,690	+	(37% × amount over	$500,000)

corporate executives, and "outside" or "independent" directors, such as executives from other companies, major shareholders, and national or community leaders. Outside directors for major corporations receive compensation in the form of cash, stock, and stock options. This compensation often totals $250,000 per year or more.

president or chief executive officer (CEO)
Corporate official responsible for managing the firm's day-to-day operations and carrying out the policies established by the board of directors.

The **president or chief executive officer** (CEO) is responsible for managing day-to-day operations and carrying out the policies established by the board of directors. The CEO reports periodically to the firm's directors.

It is important to note the division between owners and managers in a large corporation, as shown by the dashed horizontal line in Figure 1.2. This separation is the source of the principal–agent problem mentioned earlier.

Business Organizational Forms and Taxation

Owners of pass-through businesses such as proprietorships and partnerships pay tax at the individual level, not at the business level. For individuals, income tax rates are progressive, meaning that the tax rate rises with income. Taxes also depend on the individual's filing status (e.g., whether they are single or married). Table 1.2 shows the tax rates applicable in 2018 for a single taxpayer.

EXAMPLE 1.5

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Dan Webster is the sole proprietor of Webster Manufacturing. This year Webster earned $80,000 before taxes from his business. Assuming that Dan has no other income, the taxes he will owe on his business income are as follows:

$$\begin{aligned}\text{Total taxes due} &= (0.10 \times \$9{,}525) + [0.12 \times (\$38{,}700 - \$9{,}525)] \\ &\quad + [0.22 \times (\$80{,}000 - \$38{,}700)] \\ &= \$953 + \$3{,}501 + \$9{,}086 \\ &= \$13{,}540\end{aligned}$$

Notice that Webster's tax liability has two components. The first $4,454 in tax, denoted in Table 1.2 as the base tax, is calculated by multiplying 10% times Webster's first $9,525 in income and then multiplying 12% times Webster's next $29,175 in income. The sum of those two calculations is the $4,454 base tax

from line 3 in Table 1.2. On top of that, Webster must pay an additional 22% in taxes on income above $38,700.

marginal tax rate
The tax rate that applies to the next dollar of income earned.

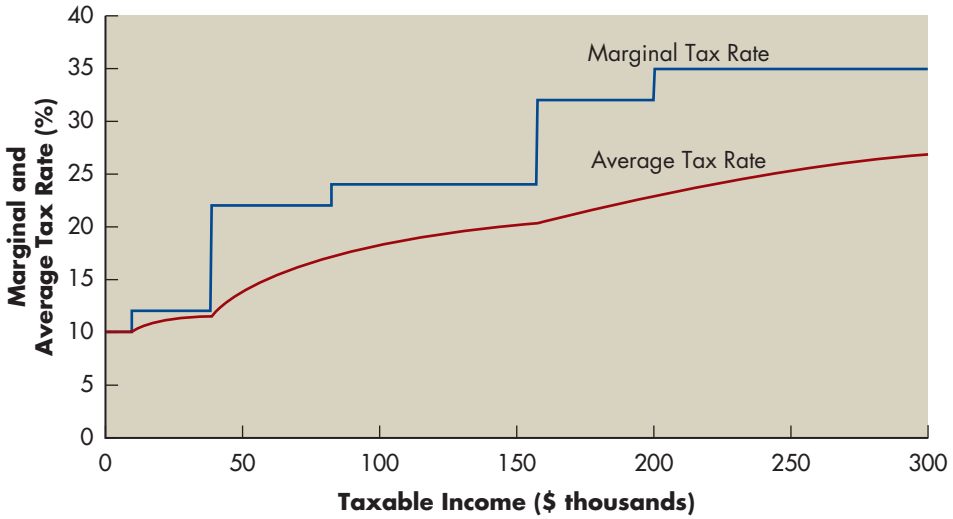
In a progressive tax rate structure like that shown in Table 1.2, there is a difference between the marginal tax rate and the average tax rate. The **marginal tax rate** represents the rate at which the next dollar of income is taxed. In Table 1.2, the marginal tax rate is 10% if the taxpayer earns less than $9,525. If income is more than $9,525 but less than $38,700, the marginal tax rate is 12%. As income rises, the marginal tax rate rises. In the example above, if Webster Manufacturing's earnings increase to $82,501, the last $1 in income would be taxed at the marginal rate of 24%.

average tax rate
Calculated by dividing taxes paid by taxable income.

The **average tax rate** equals taxes paid divided by taxable income. For many taxpayers, the average tax rate does not equal the marginal tax rate because tax rates change with income levels. In the example above, Webster Manufacturing's marginal tax rate is 22%, but its average tax rate is 16.9% ($13,540 ÷ $80,000). In most business decisions that managers make, it's the marginal tax rate that really matters. Remember that managers create value for shareholders by taking actions for which the marginal benefits exceed the marginal costs. Thus, managers should focus on the marginal tax rate because that determines the marginal taxes they will pay or avoid as a consequence of taking some action.

Figure 1.3 shows how marginal and average tax rates vary as an individual's taxable income rises. The blue line shows how the marginal tax rate increases in "steps" as income moves into each higher tax bracket (note: the graph omits the final 37% bracket for incomes above $500,000). The red line shows that the average tax increases with income too, but the average rate is generally less than the marginal rate. For example, a business owner with income of $300,000 faces a 35% marginal tax rate but pays an average tax rate of roughly 27% as illustrated in the following example.

FIGURE 1.3
Marginal and Average Tax Rates at Different Income Levels for a Single Taxpayer



EXAMPLE 1.6

Peter Strong is a partner in Argaiv Software, and from that business he earned taxable income of $300,000. Assuming that this is Peter's only source of income, from Table 1.2 we can see that based on Peter's tax bracket, he faces a marginal tax rate of 35%. How much in tax does Peter owe, and what is his average tax rate? Table 1.2 shows a base tax of $45,690 for individuals with income above $200,000 but below $500,000. Here's where that base tax comes from:

$$\begin{aligned}\text{Base tax} &= (0.10 \times \$9{,}525) + (0.12 \times \$29{,}175) + (0.22 \times \$43{,}800) \\ &\quad + (0.24 \times \$75{,}000) + (0.32 \times \$42{,}500) \\ &= \$953 + \$3{,}501 + \$9{,}636 + \$18{,}000 + \$13{,}600 \\ &= \$45{,}690\end{aligned}$$

In other words, based on his first $200,000 in partnership earnings, Peter owes $45,690 in taxes. In addition to that base tax, Peter must pay 35% tax on the last $100,000 that he earns, so his total tax bill is

$$\text{Total taxes due} = \$45{,}690 + (0.35 \times \$100{,}000) = \$80{,}690$$

Given Peter's total tax bill, we can calculate the average tax rate by dividing taxes due by taxable income, as follows:

$$\text{Average tax rate} = \$80{,}690 \div \$300{,}000 = 0.269 = 26.9\%$$

Again we stress that in many cases the marginal tax rate and the average tax rate are not equal, and in such cases, managers should focus on the marginal tax rate when they make decisions about how to invest the firm's money.

double taxation
A situation facing corporations in which income from the business is taxed twice—once at the business level and once at the individual level when cash is distributed to shareholders.

Taxation of corporations is quite different. A major disadvantage of the corporate form of organization is that a corporation itself pays taxes, and then when income from the corporation is distributed to shareholders, they pay tax again on their individual tax returns. Thus, corporations suffer from the problem of **double taxation**—corporate income is taxed twice, first at the company level and then at the shareholder level. In tax years before 2017, corporations faced a progressive structure similar to the one that determined individuals' taxes, and the top marginal rate in that structure was 35%. That marginal rate applied to any business with taxable income over $18.3 million, so large corporations generally fell under the 35% marginal tax rate. The Tax Cuts and Jobs Act of 2017 replaced the old, progressive corporate tax with a flat tax of 21%. By replacing the top marginal rate of 35% with a flat 21% tax rate, Congress reduced, but did not eliminate the double-taxation burden associated with the corporate organization form and created an incentive for corporations to invest (we'll say more about that in subsequent chapters).

EXAMPLE 1.7

Suppose that Argaiv Software (from Example 1.6) is organized as a corporation rather than as a partnership, and suppose also that Argaiv paid $300,000 in dividends to shareholders. For individuals, the tax code applies a different marginal rate to dividends than to ordinary income, with the top marginal tax rate on dividends equal to 23.8%. On the $300,000 in corporate taxable income, Argaiv will pay taxes of $63,000 ($0.21 \times \$300{,}000$), and its shareholders could pay as much as $71,400 ($0.238 \times \$300{,}000$) in taxes on the dividends that they receive. Therefore, the total tax burden faced by Argaiv and its shareholders is as high as

$134,400, compared to the total tax bill of $80,690 that would be owed if Argaiv were organized as a partnership as in the previous example. The taxes paid on Argaiv dividends by its shareholders could be less than shown here if shareholders are not in the highest individual tax bracket.

ordinary income
Income earned by a business through the sale of goods or services.

capital gain
Income earned by selling an asset for more than it cost.

Regardless of their legal form, all businesses can earn ordinary income and capital gains. A corporation earns **ordinary income** through the sale of goods or services. A **capital gain** occurs if a firm sells an asset for more than its cost. Current law treats these two types of income differently in the taxation of individuals, but not for corporations. The law requires corporations to simply add capital gains to ordinary income when calculating taxes.

The law treats interest received by corporations as ordinary income (just like capital gains), but dividends received get a special tax break that moderates the effect of double taxation. Dividends the firm receives on common and preferred stock held in other corporations are usually subject to a 50% exclusion for tax purposes. The dividend exclusion in effect eliminates half of the potential tax liability from dividends received by the second and any subsequent corporations.

In calculating their taxes, corporations can deduct operating expenses, as well as interest expenses they pay to lenders. The tax deductibility of these expenses reduces their after-tax cost. The following example illustrates the benefit of tax deductibility.

EXAMPLE 1.8

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Two corporations, Debt Co. and No-Debt Co., earned $200,000 before interest and taxes this year. During the year, Debt Co. paid $30,000 in interest. No-Debt Co. had no debt and no interest expense. How do the after-tax earnings of these firms compare?

	Debt Co.	No-Debt Co.
Earnings before interest and taxes	$200,000	$200,000
Less: Interest expense	30,000	0
Earnings before taxes	$170,000	$200,000
Less: Taxes (21%)	35,700	42,000
Earnings after taxes	$134,300	$158,000
Difference in earnings after taxes	$23,700	

Both firms face a 21% flat tax rate. Debt Co. had $30,000 more interest expense than No-Debt Co., but Debt Co.'s earnings after taxes are only $23,700 less than those of No-Debt Co. This difference is attributable to Debt Co.'s $30,000 interest expense deduction, which provides a tax savings of $6,300 (the tax bill is $35,700 for Debt Co. versus $42,000 for No-Debt Co.). The tax savings can be calculated directly by multiplying the 21% tax rate by the interest expense ($0.21 \times \$30{,}000 = \$6{,}300$). Similarly, the $23,700 after-tax interest expense can be calculated directly by multiplying 1 minus the tax rate by the interest expense $[(1 - 0.21) \times \$30{,}000 = \$23{,}700]$.

The tax deductibility of expenses reduces their actual (after-tax) cost to the firm as long as the firm is profitable. If a firm experiences a net loss in a given year, its tax liability is already zero. Even in this case, firms can deduct losses in one year from income earned in subsequent years (prior losses cannot offset more than 80% of taxable income in any subsequent year). Note that for both accounting and tax purposes interest is a tax-deductible expense, whereas dividends are not. Because dividends are not tax deductible, their after-tax cost is equal to the amount of the dividend.

Other Limited Liability Organizations

A number of other organizational forms provide owners with limited liability. The most popular are *limited partnership (LP), S corporation (S corp), limited liability company (LLC), and limited liability partnership (LLP)*. Each represents a specialized form or blending of the characteristics of the organizational forms described previously. What they have in common is that their owners enjoy limited liability, and they typically have fewer than 100 owners.

AGENCY PROBLEMS AND AGENCY COSTS

Large corporations have tens of thousands of different shareholders, and the vast majority of them have no direct managerial responsibility. The professional managers who run corporations are the *agents* of the shareholders, and they are entrusted to take actions or make decisions that are in the shareholders' best interests. As we have already noted, in many situations, managers may act in accordance with their own interests rather than on behalf of the shareholders. In most cases, if managers fail to do what shareholders want them to do, they will also fail to achieve the goal of maximizing shareholder wealth. The unavoidable conflict between a firm's principals (shareholders) and their agents (managers) gives rise to a variety of costs that owners must shoulder. **Agency costs** represent those costs that shareholders bear (or, equivalently, the loss in value that they endure) because managers pursue their own interests. Agency costs may include such things as an expensive private jet used by the CEO or the cost of hiring outside auditors to verify the accuracy of the financial reports produced by managers. Another type of agency cost arises when managers make suboptimal investment decisions, that is, making investments that decrease shareholder value or failing to make investments that would increase the firm's stock price. Of course, shareholders are generally sophisticated people, and they are aware of the consequences of delegating managerial responsibility to agents. So, to help ensure that managers act in ways consistent with the interests of shareholders, and therefore to mitigate agency costs, shareholders aim to establish a range of corporate governance practices. Society at large also influences corporate governance through the laws and regulations that governments establish and with which firms must comply.

agency costs
The costs that shareholders bear due to managers' pursuit of their own interests.

CORPORATE GOVERNANCE

Corporate governance refers to the rules, processes, and laws by which companies are operated, controlled, and regulated. It defines the rights and responsibilities of the corporate participants, such as the shareholders, board of directors, officers and managers, and other stakeholders, as well as the rules and procedures for making corporate decisions. A well-defined corporate governance structure is intended to benefit all corporate stakeholders by ensuring that the

corporate governance
The rules, processes, and laws by which companies are operated, controlled, and regulated.

firm is run in a lawful and ethical fashion, in full compliance with all corporate regulations.

Both internal and external forces influence firms' corporate governance practices. In terms of internal influences, clearly shareholders, through the board of directors, exert influence on how a firm is governed. But when internal corporate governance mechanisms fail, external forces may step in. Many of the most important laws and regulations affecting U.S. corporations were passed in the wake of some kind of scandal, brought about in part because of corporate governance failures on a wide scale.

Internal Corporate Governance Mechanisms

Primary responsibility for establishing a firm's corporate governance policies rests with the board of directors. The board is responsible for hiring and firing the firm's CEO and for setting the terms of compensation for senior managers. One of the primary ways in which boards try to align the interests of managers and shareholders is through the structure of management compensation. Specifically, at most large companies, the pay of senior employees consists of a fixed base salary combined with a variable component that is tied to the firm's performance in some manner. For example, senior managers might receive an extra cash bonus if the firm meets particular revenue or earnings targets. A more direct way to create incentives for managers to act in shareholders' interests is through awards of stock options, restricted stock, and other forms of equity compensation. **Stock options** allow managers to buy shares of the company's stock at a fixed price. For example, suppose that a company's stock is worth $45 per share at the beginning of the year. The board might include 100,000 stock options in the CEO's compensation package. Suppose that each of those options allows the CEO to buy one share of stock for $45 at any time over the next few years. That gives the CEO a tremendous incentive to take actions that increase the stock price. If the stock price rises to $55, then the CEO can buy 100,000 shares for $45 each and then immediately resell them at the $55 market price, pocketing a profit of $1 million. The higher the stock price goes, the more the CEO benefits (and the more shareholders benefit, too). However, if the CEO takes actions that reduce the stock price below $45, then those stock options have little value.

stock options
Securities that allow managers to buy shares of stock at a fixed price.

Companies may link the pay of senior managers to the performance of the company's stock price in other ways. Firms often reward senior managers by giving them **restricted stock**, which are shares of stock that do not fully transfer from the company to the employee until certain conditions are met. These conditions might relate to the length of an employee's service or to meeting performance targets. When restricted stock is *fully vested*, ownership of the shares formally transfers to the employee. Obviously, the value of restricted shares is directly tied to the company's stock price. Often employees must wait several years (known as the *vesting period*) before their restricted stock is fully vested, and even then, companies may impose *minimum holding requirements*, meaning that an employee cannot immediately sell all their restricted shares, even if they are fully vested, as long as the employee remains at the firm. Vesting requirements and minimum holding requirements ensure that the compensation of a firm's senior manager is always at least partially tied to the performance of the company's stock.

restricted stock
Shares of stock paid out as part of a compensation package that do not fully transfer from the company to the employee until certain conditions are met.

MATTER OF FACT

CEO Pay Around the World

Both the amount that CEOs receive in compensation and the form their compensation takes vary greatly around the world. A 2016 report noted that median pay for CEOs in the United States was $14.9 million, nearly 3 times more than the median pay for CEOs from non-U.S. companies. British CEOs earned the second highest median pay at $10.5 million. On the European continent, German and French CEOs earned roughly half of what their British counterparts make, at $5.4 million and $4.0 million, respectively. Japanese CEOs received even less, with median pay at $1.5 million.

Given these large differences in total compensation, the base salaries of CEOs were surprisingly similar. For instance, the median base salary for a U.S. CEO was $5.1 million, compared with $4.1 million for a German CEO. What, then, caused the variations in total CEO pay? These were driven mostly by differences in the use of equity-based compensation. As an example, the portion of CEO pay coming in the form of stock or stock options was 60% for U.S. and U.K. firms, but in Germany and France, the fraction paid in equity totaled less than 24%. Japan was an even more dramatic outlier, with equity-based compensation accounting for just 10% of total CEO pay. Recall that the U.S. and U.K. legal systems emphasize the duty of managers to shareholders, whereas legal systems elsewhere place more emphasis on stakeholders. Those differences are reflected in equity-based CEO compensation around the world.

Source: "How CEO pay differs around the globe," Equilar.com press release, August 17, 2016.

Corporate compensation plans have been closely scrutinized by stockholders, the Securities and Exchange Commission (SEC), and other government entities. The total compensation in 2016 for the chief executive officers of the 500 largest U.S. companies is considerable. For example, in 2016 Expedia's CEO, Dara Khosrowshahi, earned $94.6 million.

External Corporate Governance Mechanisms

If the board of directors does not effectively monitor senior management and establish sound governance practices, several external influences may emerge to fill the void. First, the firms' own investors may exert an effect on senior managers. Second, if investors cannot bring about change in an underperforming firm, an outside company may offer to take over the firm, in which case the senior management team would most likely be removed. Third, government regulations impose at least some minimal level of corporate governance standards with which firms must comply even if other internal and external governance mechanisms prove ineffective.

Individual versus Institutional Investors To better understand the role of shareholders in shaping a firm's corporate governance, it is helpful to differentiate between the two broad classes of owners: individuals and institutions. Generally, **individual investors** own relatively few shares and as a result do not typically have sufficient means to influence a firm's corporate governance. To pressure a firm, individual investors would have to vote collectively on matters such as electing directors. Coordinating the votes of thousands of individuals is difficult, so individual investors rarely exert much influence on corporations.

individual investors
Investors who own relatively small quantities of shares to meet personal investment goals.

institutional investors
Investment professionals such as banks, insurance companies, mutual funds, and pension funds that are paid to manage and hold large quantities of securities on behalf of others.

Institutional investors have advantages over individual investors when it comes to influencing the corporate governance of a firm. **Institutional investors** are investment professionals paid to manage and hold large quantities of securities on behalf of individuals, businesses, and governments. Such investors include banks, insurance companies, mutual funds, and pension funds. Unlike individual investors, institutional investors often monitor and directly influence a firm's corporate governance by exerting pressure on management to perform, communicating their concerns to the firm's board, or even pressing for the election of their own slate of directors to the board. These large investors can also threaten to exercise their voting rights or liquidate their holdings if the board does not respond positively to their concerns. Because individual and institutional investors share the same goal, individual investors benefit from the monitoring activities of institutional investors.

activist investors
Investors who specialize in influencing management.

Activist investors, who may be wealthy individuals or institutional investors controlling a large pool of capital, specialize in influencing management. Activist shareholders may quickly assemble a significant ownership position in a firm to persuade senior managers to take specific actions, such as replacing existing board members with new ones favored by the activist. Activist investors typically emerge when a company has been underperforming, and their objective is to force managers to make changes to improve the firm's performance. To illustrate, in January 2017, the activist investing firm, Jana Partners, revealed that it had acquired a stake in the pharmaceutical giant Bristol-Myers Squibb. At the time, Bristol-Myers stock was trading for 20% less than it had just 1 year earlier, due in part to disappointing results from a clinical trial of a key drug. Just 1 month later, Bristol-Myers agreed to add three new directors to its board and to distribute $2 billion in cash to shareholders. No sooner had the company announced these changes than another activist, Carl Icahn, announced that he, too, had acquired a large block of Bristol-Myers stock. This fueled speculation that the company could become a takeover target because Icahn had previously pushed for the acquisition of underperforming companies by larger companies.

The Threat of Takeover When a firm's internal corporate governance structure is unable to keep agency problems in check, it is likely that rival managers will try to gain control of the firm. Because agency problems represent a misuse of the firm's resources and impose agency costs on the firm's shareholders, the firm's stock is generally depressed, making the firm an attractive takeover target. The threat of takeover by another firm that believes it can enhance the troubled firm's value by restructuring its management, operations, and financing can provide a strong source of external corporate governance. The constant threat of a takeover tends to motivate management to act in the best interests of the firm's owners.

Government Regulation

Government regulation shapes the corporate governance of all firms. During the past decade, corporate governance has received increased attention because of several high-profile corporate scandals involving abuse of corporate power and, in some cases, alleged criminal activity by corporate officers. The misdeeds derived from two main types of issues: (1) false disclosures in financial reporting and other material information releases and (2) undisclosed conflicts of interest between corporations and their analysts, auditors, and attorneys and between corporate directors, officers, and shareholders.

Sarbanes-Oxley Act of 2002 (SOX)
An act aimed at eliminating corporate disclosure and conflict of interest problems. Contains provisions concerning corporate financial disclosures and the relationships among corporations, analysts, auditors, attorneys, directors, officers, and shareholders.

Asserting that an integral part of an effective corporate governance system is the provision for civil or criminal prosecution of individuals who conduct unethical or illegal acts in the name of the firm, in July 2002 the U.S. Congress passed the **Sarbanes-Oxley Act of 2002** (commonly called **SOX**). Sarbanes-Oxley was intended to eliminate many of the disclosure and conflict of interest problems that can arise when corporate managers are not held personally accountable for their firm's financial decisions and disclosures. SOX accomplished the following: established an oversight board to monitor the accounting industry, tightened audit regulations and controls, toughened penalties against executives who commit corporate fraud, strengthened accounting disclosure requirements and ethical guidelines for corporate officers, established corporate board structure and membership guidelines, established guidelines with regard to analyst conflicts of interest, mandated instant disclosure of stock sales by corporate executives, and increased securities regulation authority and budgets for auditors and investigators.

→ REVIEW QUESTIONS MyLab Finance Solutions

1–10 Which legal form of business organization is most common? Which form do the largest businesses typically take and why?

1–11 Describe the roles of, and the relationships among, the major parties in a corporation: stockholders, board of directors, and managers. How are corporate owners rewarded for the risks they take?

1–12 Explain why corporations face a double taxation problem? For corporations, how are the marginal and average tax rates related?

1–13 Define agency problems, and describe how they give rise to agency costs. Explain how a firm's corporate governance structure can help avoid agency problems.

1–14 How can the firm structure management compensation to minimize agency problems?

1–15 How do market forces—both shareholder activism and the threat of takeover—prevent or minimize the agency problem? What role do institutional investors play in shareholder activism?

1.4 Developing Skills for Your Career

We began this chapter by arguing that regardless of your major, an understanding of finance would greatly enhance your career prospects. All business disciplines have a responsibility to contribute to the firm's goal of creating value, so understanding how to determine which actions create value and having the ability to explain the wisdom behind a particular course of action can help you succeed no matter what career path you've chosen. Below we highlight skills you can develop while working through this book.

CRITICAL THINKING

For many people working in a business, it is not obvious how the business creates value for its owners. In this text, we emphasize that value creation balances risk and return, so a critical evaluation of any proposed course of action requires

an analysis of the risks of that action as well as its potential rewards. Virtually every chapter in this text provides guidance about how to make critical judgments regarding either the risks or the rewards (or both) tied to corporate decisions. By mastering those chapters will you learn how to apply criteria that lead to value-creating business decisions. You will learn the assumptions behind and the key relationships driving financial models, so even if your job does not involve building those models, you can help shape them by providing the data and analysis that the financial analysts at your firm use to provide financial justifications for key decisions. Your understanding of financial principles will also help you to identify weaknesses in financial analysis which, left uncorrected, might lead to suboptimal decisions.

COMMUNICATION AND COLLABORATION

In most large businesses today, employees work in cross-functional teams. If your aim is to work in marketing or supply chain or even general management, rest assured that working with a colleague from the finance department will be part of your regular routine. Thus, you need to understand how financial people think and the vocabulary they use to communicate with them effectively and persuasively. Developing a basic financial proficiency will help you gather and organize the information that the financial analyst on your team needs to demonstrate the value of your team's work to the larger organization.

FINANCIAL COMPUTING SKILLS

Though an in-depth discussion of using Excel or other computer programs to build complex financial models is beyond the scope of this text, we do provide an introduction to some of the Excel tools that see widespread practice in financial modeling. Even if your job does not involve building models in Excel, financial analysts in your firm will routinely present their analysis in that form, and your ability to respond and contribute to that analysis hinges upon your understanding of at least the basics of those models. Remember that finance is often the gatekeeper of corporate funds, so gaining support from the finance department may be an important step in marshaling the resources you need to do your job effectively. It's easier to gain that support if you are conversant in the basics of financial modeling in Excel.

SUMMARY

FOCUS ON VALUE

This chapter established the primary goal of the firm: **to maximize the wealth of the owners for whom the firm is being operated.** For public companies, this objective means that managers should act only on those opportunities that they expect will create value for owners by increasing the stock price. Doing so requires management to consider the returns and the risks of each proposed action and their combined effect on the value of the firm's stock.

REVIEW OF LEARNING GOALS

LG1 **Define finance and the managerial finance function.** Finance is the science and art of how individuals and firms raise, allocate, and invest money. It affects virtually all aspects of business. Managerial finance is concerned with the duties of the financial manager working in a business. Financial managers administer the financial affairs of all types of businesses: private and public, large and small, profit seeking and not for profit. They perform such varied tasks as developing a financial plan or budget, extending credit to customers, evaluating proposed large expenditures, and raising money to fund the firm's operations.

LG2 **Describe the goal of the firm, and explain why maximizing the value of the firm is an appropriate goal for a business.** The goal of the firm is to maximize its value and therefore the wealth of its shareholders. Maximizing the value of the firm means running the business in the interest of those who own it, the shareholders. Because shareholders are paid after other stakeholders, it is also generally necessary to satisfy the interests of other stakeholders to enrich shareholders.

LG3 **Identify the primary activities of the financial manager.** Financial managers are primarily involved in three types of decisions. Investment decisions relate to how a company invests its capital to generate wealth for shareholders. Financing decisions relate to how a company raises the capital it needs to invest. Working capital decisions refer to the day-to-day management of a firm's short-term resources such as cash, receivables, inventory, and payables.

LG4 **Explain the key principles that financial managers use when making business decisions.** The time value of money means that money is more valuable today than in the future because of the opportunity to earn a return on money that is on hand now. Because a tradeoff exists between risk and return, managers have to consider both factors for any investment they make. Managers should also focus more on cash flow than on accounting profit. Furthermore, managers need to recognize that market prices reflect information gathered by many different investors, so the price of a company's stock is an important signal of how the company is doing. Finally, although managers should act in shareholders' interest, they do not always do so, which requires various kinds of incentives to be in place so that the interests of managers and shareholders align to the greatest extent possible.

LG5 **Describe the legal forms of business organization.** These are the sole proprietorship, the partnership, and the corporation. The corporation is dominant in the sense that most large companies are corporations, and a corporation's owners are its stockholders. Stockholders expect to earn a return by receiving dividends or by realizing gains through increases in share price.

LG6 **Describe the nature of the principal–agent relationship between the owners and managers of a corporation, and explain how various corporate governance mechanisms attempt to manage agency problems.** The separation of owners and

managers in a corporation gives rise to the classic principal–agent relationship, in which shareholders are the principals and managers are the agents. This arrangement works well when the agent makes decisions in the principal's best interest, but it can lead to agency problems when the interests of the principal and agent differ. A firm's corporate governance structure is intended to help ensure that managers act in the best interests of the firm's shareholders and other stakeholders, and it is usually influenced by both internal and external factors.

SELF-TEST PROBLEM (Solution in Appendix)

LG 4

ST1–1 Emphasis on Cash Flows Worldwide Rugs is a rug importer located in the United States that resells its import products to local retailers. Last year, Worldwide Rugs imported $2.5 million worth of rugs from around the world, all of which were paid for prior to shipping. On receipt of the rugs, the importer immediately resold them to local retailers for $3 million. To allow its retail clients time to resell the rugs, Worldwide Rugs sells to retailers on credit. Prior to the end of its business year, Worldwide Rugs collected 85% of its outstanding accounts receivable.

a. What is the accounting profit that Worldwide Rugs generated for the year?
b. Did Worldwide Rugs have a successful year from an accounting perspective?
c. What is the financial cash flow that Worldwide Rugs generated for the year?
d. Did Worldwide Rugs have a successful year from a financial perspective?
e. If the current pattern persists, what is your expectation for the future success of Worldwide Rugs?

WARM-UP EXERCISES Select problems are available in MyLab Finance

LG 5

E1–1 You are the chief financial officer (CFO) of Morb lights, a manufacturer of lighting components for cars. The board of directors have decided that there is a need to divert investments toward LED-based lighting solutions instead of traditional light bulbs. You are currently evaluating two alternative projects. The first is to integrate new technology in the existing factory, where the cash flows for the first 4 years will be below average as the production will be affected due to refitting of facilities. However, from year 5 it will increase to above-average levels once full capacity is achieved. The second project is to take over an existing small business with the required production facility. This is expected to increase cash flows to above-average levels immediately for the next 4 years, but decrease to lower-average cash flows from year 5, when the factory's technology becomes outdated.

How do you choose from the two available options? Given the strategy of the firm, what other factors need to be taken into consideration for this decision?

LG 4

E1–2 As chief financial officer, you are responsible for weighing the financial pros and cons of the many investment opportunities developed by your company's research

and development division. You are currently evaluating two competing 15-year projects that differ in several ways. Relative to your firm's current EPS, the first project is expected to generate above-average EPS during the first 5 years, average EPS during the second 5 years, and then below-average EPS during the last 5 years. The second project is expected to generate below-average EPS during the first 5 years, average EPS during the second 5 years, and then well-above-average EPS during the last 5 years.

Is the choice obvious if you expect the second investment to result in a larger overall earnings increase? Given the goal of the firm, what issues will you consider before making a final decision?

LG 4

E1–3 The Quickclick Media Ltd. announced that the profit for the previous year is twice the amount earned in the previous year, an improvement from the projected numbers. The chief human resources officer (CHRO) suggested that the employees need to be rewarded for their efforts. To keep them motivated, she insisted on giving them a significant cash bonus in the following month. The chief financial officer (CFO), however, contended that there was insufficient cash and that they should wait till the next quarter before paying each employee a cash bonus.

How can the company, which is a profitable one, have insufficient cash flows? Explain your answer.

LG 5

E1–4 The chief financial officer (CFO) of New Age Fashion Ltd. has just received a request from a project manager to authorize an expenditure in the amount of £45,000. The manager states that this expenditure is necessary for the last stage development of a space navigation system, which is based on a programming language called Xtor. As a space engineer and financial manager, you know that Xtor is almost obsolete and is being replaced by alternatives that provide better cross-platform compatibility. However, the project manager insists that they should continue with the last tranche of payment because over £1.5 million has already been spent on developing this navigation system. It would be a shame to waste all the time and resources that have been invested.

Advise the CFO regarding whether she should authorize the £45,000 proposed expenditure. Use marginal cost–benefit analysis to explain your reasoning.

LG 6

E1–5 Premier Baking Ltd. has recently appointed a new CEO to run its bakery business, which supplies to supermarkets and restaurants. The new CEO has instituted a new compensation policy and dropped the earlier incentive scheme, which was based on overall production achieved within the targeted time limits and quality standards. The quality control manager has now reported that there is a significant increase in production delays and delivery mix-up leading to an increasing number of customer complaints.

Explain how the delays and delivery errors could represent a case of agency costs. How could Premier Bakery counter these agency costs?

LG 5

E1–6 Eastern Trading Company has a pretax trading profit of €250,000. Britain has a flat corporation tax rate of 19% on trading profits while Ireland has a flat rate of 12.5% on trading profits. As Britain is still in Eurozone, the company can register its business in either country and follow their respective tax laws. What will be the tax liability for Eastern Trading if they are registered in Britain and what will it be if they are registered in Ireland?

PROBLEMS

Select problems are available in MyLab Finance. The MyLab icon indicates problems in Excel format available in MyLab Finance.

LG 5

P1–1 Liability comparisons John Bailey invested $50,000 in The Entertainment Company seven years ago. He is concerned about the future of the firm, as the profits have plummeted over the last four years. The firm has $120,000 in outstanding debt and is considering declaring bankruptcy.

a. If John is the sole proprietor, describe the financial implication of the firm going bankrupt.

b. If John and his brother, Peter, are partners with an equal partnership distribution, describe the financial implication of the firm going bankrupt.

c. If the firm is a corporation, describe the financial implication of the firm going bankrupt.

LG 4

P1–2 Accrual income versus cash flow for a period The Motor Corporation sold vehicles for $500,000 to one specific dealer during the year. At the end of the financial year, the dealer still owed The Motor Corporation $350,000. The cost of the vehicles sold was $400,000, and this cost was incurred and paid by The Motor Corporation.

a. Determine the firm's net profit for the past year using the accrual basis of accounting.

b. Determine the firm's net cash flow for the past year using the cash basis of accounting.

c. The accountant and financial manager need to present the results to the CEO of The Motor Corporation. What will be their message regarding the performance of the corporation?

Personal Finance Problem

LG 4

P1–3 Cash flows Sheldon Smith spends many hours monitoring his personal cash flows every month. Sheldon earns 5% on his short-term investments while paying prime plus 2% (prime is 9%) on the mortgage. The cash inflows and outflows for the month of March are as follows:

Item	Cash inflow	Cash outflow
Interest received	$ 500	
Mortgage		$1,550
Salary	5,500	
Groceries bill		850
Gas bill		200
Utility bills		310

a. Determine Sheldon's total cash inflows and cash outflows for the month of March.

b. What is Sheldon's net cash flow for the month of March? Explain the meaning of the term "net cash flow."

c. What advice would you give Sheldon if there is a surplus of funds?

d. What advice would you give Sheldon if there is a shortage of funds?

LG 2 LG 4

P1–4 **Marginal cost–benefit analysis and the goal of the firm** Wendy Winter needs to determine whether the current warehouse system should be upgraded to a new system. The new system would require an initial cash outlay of $250,000. The current system could be sold for $55,000. The monetary benefit of the new system over the next five years is $325,000, while the monetary benefit of the current system over the same period is $125,000. Furthermore, it is expected that the firm's stock price will increase if the new system is implemented because it will make the firm more cost efficient and cost effective in the long run.

a. Identify and describe the analysis Wendy should use to make the decision.
b. Calculate the marginal benefit of the proposed new warehouse system.
c. Calculate the marginal cost of the proposed new warehouse system.
d. What should Wendy's recommendation be to the firm regarding the new warehouse system? Explain your answer.
e. If the new system is implemented, will the firm achieve the primary financial goal of managers?

LG 6

P1–5 **Identifying agency problems, costs, and resolutions** You are the CEO of Nelson Corporation, and the current stock price is $27.80. Pollack Enterprises announced today that it intends to buy Nelson Corporation. To obtain all the stock of Nelson Corporation, Pollack Enterprises is willing to pay $38.60 per share. At a meeting with your management, you realize that the management is not happy with the offer, and is against the takeover. Therefore, with the full support of your management team, you are fighting to prevent the takeover from Pollack Enterprises.

Is the management of Nelson Corporation acting in the best interest of the Nelson Corporation stockholders? Explain your reasoning.

LG 5

P1–6 **Corporate taxes** Southern Textile Ltd. is a manufacturer of sportswear that supplies to a number of European retail stores. Its registered office is in Singapore. During 2017, the firm earned SGD 112,000 before taxes. Singapore's corporate tax rate is 20%. Firms are eligible for a tax rebate of 50% of the tax amount, capped to a maximum amount of SGD 10,000 every year on their tax liability.

a. Calculate the firm's tax liability using Singapore's corporate tax rates.
b. How much are Southern Textile's 2017 after-tax earnings?
c. Calculate the firm's average tax rate.

LG 6

P1–7 **Average corporate tax rates** Ordinary income in 2017 was taxed subject to the rates shown in the accompanying table. Using the data in the table, perform the following:

a. Calculate a firm's tax liability, after-tax earnings, and average tax rate for the following levels of corporate earnings before taxes: $20,000; $70,000; $300,000; $700,000; $1.2 million; $16 million; and $22 million.
b. Plot the average tax rate (measured on the *y*-axis) and the pretax income levels (measured on the *x*-axis). Explain the relationship between average tax rate and pretax income level.

Corporate Tax Rate Schedule

					Tax calculation					
Taxable income brackets				Base tax	+	(Marginal rate × amount over bracket lower limit)				
$ 0	to	$ 50,000	$	0	+	(15%	×	amount over	$	0)
50,000	to	75,000		7,500	+	(25	×	amount over		50,000)
75,000	to	100,000		13,750	+	(34	×	amount over		75,000)
100,000	to	335,000		22,250	+	(39	×	amount over		100,000)
335,000	to	10,000,000		113,900	+	(34	×	amount over		335,000)
10,000,000	to	15,000,000		3,400,000	+	(35	×	amount over		10,000,000)
15,000,000	to	18,333,333		5,150,000	+	(38	×	amount over		15,000,000)
Over 18,333,333				6,416,667	+	(35	×	amount over		18,333,333)

LG 6

P1–8 **Marginal corporate tax rates** Using the corporate tax rate schedule given in the previous problem, perform the following:

a. Find the marginal tax rate for the following levels of corporate earnings before taxes: $12,000; $40,000; $70,000; $90,000; $300,000; $550,000; $1.3 million; and $22 million.

b. Plot the marginal tax rate (measured on the *y*-axis) against the pretax income levels (measured on the *x*-axis). Explain the relationship between the marginal tax rate and pretax income levels.

LG 6

P1–9 **Interest versus dividend income** Depot Logistics Inc. has declared pretax income from its operations for the year of $560,000. In addition, it also received interest payment of $40,000 on bond stock held in Warehouse PLC. During the year, they also received $40,000 in income from dividends on its 20% common stock holding in Zephir PLC. Depot Logistics is in the 30% tax bracket and is eligible for a 70% dividend exclusion on its Zephir PLC stock.

a. Calculate the tax liability for Depot Logistics on its operating income.

b. Calculate the tax and after-tax income attributable to the interest income received on account of bond stock, from Warehouse PLC.

c. Find the tax and after-tax income owing to the dividend income received on account of common stock, from Zephir PLC.

d. Compare and comment on the after-tax amounts resulting from the interest income and dividend income calculated in parts **b** and **c**.

e. What is the firm's total tax liability for the year?

LG 6

P1–10 **Interest versus dividend expense** Derwent Ltd. has announced that the earnings before income and taxes is going to be £300,000 for the current year. Assuming corporate tax rate for Derwent Ltd. is a flat 30%, compute the firm's profit after taxes and earnings available for common stockholders (earnings after taxes and preferred stock dividends, if any) under following conditions:

a. The firm pays £70,000 in interest.

b. The firm pays £70,000 in preferred stock dividends.

LG 5

P1–11 Hemingway Corporation is considering expanding its operations to boost its income, but before making a final decision, it has asked you to calculate the corporate tax consequences of such a decision. Currently, Hemingway generates

before-tax yearly income of $200,000 and has no debt outstanding. Expanding operations would allow Hemingway to increase before-tax yearly income to $350,000. Hemingway can use either cash reserves or debt to finance its expansion. If Hemingway uses debt, it will have a yearly interest expense of $70,000.

Create a spreadsheet to conduct a tax analysis (assume a 21% flat tax rate) for Hemingway Corporation and determine the following:

a. What is Hemingway's current annual corporate tax liability?
b. What is Hemingway's current average tax rate?
c. If Hemingway finances its expansion using cash reserves, what will be its new corporate tax liability and average tax rate?
d. If Hemingway finances its expansion using debt, what will be its new corporate tax liability and average tax rate?
e. What would you recommend the firm do? Why?

LG 2

P1–12 **ETHICS PROBLEM** One of the key risk areas that corporates need to manage is "ethical risks." Do you think that management of ethical risks is as important for businesses as management of financial risks? Explain how ethical problems may affect a firm's profits and stock price.

SPREADSHEET EXERCISE

Assume that Monsanto Corporation is considering the replacement of some of its older and outdated carpet-manufacturing equipment. Its objective is to improve the efficiency of operations in terms of both speed and reduction in the number of defects. The company's finance department has compiled pertinent data to conduct a marginal cost–benefit analysis for the proposed equipment replacement.

The cash outlay for new equipment would be approximately $600,000. The net book value of the old equipment and its potential net selling price add up to $250,000. The total benefits over the life of the new equipment (measured in today's dollars) would be $900,000. The sum of benefits from the remaining life of the old equipment (measured in today's dollars) would be $300,000.

TO DO

Create a spreadsheet to conduct a marginal cost–benefit analysis for Monsanto Corporation, and determine the following:

a. The marginal benefits of the proposed new equipment.
b. The marginal costs of the proposed new equipment.
c. The net benefit of the proposed new equipment.
d. What would you recommend the firm do? Why?

CHAPTER 2

The Financial Market Environment

LEARNING GOALS

- LG1 Understand the role that financial institutions play in managerial finance.
- LG2 Understand the role that financial markets play in managerial finance.
- LG3 Describe the differences between the money market and the capital market.
- LG4 Understand the major regulations and regulatory bodies that affect financial institutions and markets.
- LG5 Describe the process of issuing common stock, including venture capital, going public, and the role of the investment bank.
- LG6 Understand what is meant by financial markets in crisis, and describe some of the root causes of the Great Recession.

MyLab Finance **Chapter Introduction Video**

WHY THIS CHAPTER MATTERS TO YOU

In your *professional* life

ACCOUNTING You need to understand how the firm raises external financing with the assistance of financial institutions in the financial markets.

INFORMATION SYSTEMS You need to understand how information flows between the firm and financial markets.

MANAGEMENT You need to understand why healthy financial institutions and markets are an integral part of a healthy economy and how a crisis in the financial sector can spread and affect almost any type of business.

MARKETING You need to understand why it is important for firms to communicate results to investors and how these communications lead to more favorable external financing terms for the firm in the financial markets.

OPERATIONS You need to understand why external financing is, for most firms, an essential aspect of ongoing operations.

In your *personal* life

Making financial transactions will be a regular occurrence throughout your life. These transactions may be as simple as depositing your paycheck in a bank or as complex as deciding how to allocate the money you save for retirement among different investment options. The content in this chapter will help you make better decisions when you conduct business in the financial markets.

LG 1

2.1 Financial Institutions

financial institution
An intermediary that channels the savings of individuals, businesses, and governments into loans or investments.

Most successful firms have ongoing needs for funds. **Financial institutions** serve as intermediaries by channeling the savings of individuals, businesses, and governments into loans or investments. Many financial institutions directly or indirectly pay savers interest on deposited funds; others provide services for a fee (e.g., checking accounts for which customers pay service charges). Some financial institutions accept customers' savings deposits and lend this money to other customers such as firms, others invest customers' savings in earning assets such as real estate or stocks and bonds, and still others do both. The government requires financial institutions to operate within established regulatory guidelines.

For financial institutions, the key suppliers of funds and the key demanders of funds are individuals, businesses, and governments. The savings that individual consumers place in financial institutions provide these institutions with a large portion of their funds. Individuals not only supply funds to financial institutions but also demand funds from them in the form of loans. However, individuals as a group are *net suppliers* for financial institutions: They save more money than they borrow.

Business firms also deposit some of their funds in financial institutions, primarily in checking accounts with various commercial banks. Like individuals, firms borrow funds from these institutions, but, unlike individuals, firms are *net demanders* of funds: They borrow more money than they save.

Governments maintain deposits of temporarily idle funds, certain tax payments, and Social Security payments in commercial banks. They do not borrow funds directly from financial institutions, although by selling their debt securities to various institutions, governments indirectly borrow from them. The government, like business firms, is typically a *net demander* of funds: It typically borrows more than it saves. We've all heard about the U.S. federal budget deficit.

Major types of financial institutions include commercial banks, investment banks, investment funds, insurance companies, and pension funds. Financial institutions offer a wide range of products and services for individual, business, and government clients.

COMMERCIAL BANKS, INVESTMENT BANKS, AND THE SHADOW BANKING SYSTEM

Commercial Banks

commercial banks
Institutions that provide savers with a secure place to invest their funds and that offer loans to individual and business borrowers.

Commercial banks are financial institutions that provide savers with a secure place to deposit or save funds for future use. Deposited funds generally earn a small rate of return, are available on demand, and are insured against loss. The largest commercial banks in the United States include JPMorgan Chase, Wells Fargo, Bank of America, Citibank, U.S. Bancorp, and PNC Bank. Commercial banks are among the most important financial institutions because they provide loans to both individuals and businesses to finance investments, such as the purchase of a new home or the expansion of a business.

The traditional business model of a commercial bank—taking in and paying interest on savings deposits and investing or lending those funds back out at higher interest rates—works to the extent that depositors trust their savings are

safe. In the United States, most savings accounts at commercial banks are insured by the U.S. Federal Deposit Insurance Corporation (FDIC). The first $250,000 of deposits in an account at an FDIC-insured depository institution is covered dollar-for-dollar, principal plus any interest accrued or due the depositor. In the 1930s, FDIC insurance was put in place in response to the banking runs that occurred during the Great Depression. The same 1933 act of Congress that introduced deposit insurance, the **Glass-Steagall Act**, also created a separation between commercial banks and investment banks, meaning that an institution engaged in taking in deposits could not also engage in the somewhat riskier activities of securities underwriting and trading.

Glass-Steagall Act
An act of Congress in 1933 that created the Federal Deposit Insurance Corporation (FDIC) and separated the activities of commercial and investment banks.

Investment Banks

Investment banks are financial institutions that (1) assist companies in raising capital, (2) advise firms on major transactions such as mergers or financial restructurings, and (3) engage in trading and market-making activities. Some typical clients of investment banks include individuals with very high net worth, businesses, governments, pension funds, and other financial institutions. Size and reputation matter for investment banks. Large banks like Goldman Sachs, Morgan Stanley, Barclays, Credit Suisse, and Deutsche Bank have better connections, provide more services, and have greater capability of facilitating the unique transactions of their clients.

investment banks
Institutions that assist companies in raising capital, advise firms on major transactions such as mergers or financial restructurings, and engage in trading and market-making activities.

Commercial and investment banks remained essentially separate for more than 50 years, but Congress, with the approval of President Clinton, repealed Glass-Steagall in 1999. Companies that had formerly engaged only in the traditional activities of a commercial bank began competing with investment banks for underwriting and other services. Some of the largest commingled banks are JPMorgan Chase, Bank of America Merrill Lynch, and Citigroup.

Shadow Banking System

The past 25 years have witnessed tremendous growth in what has come to be known as the shadow banking system. The **shadow banking system** describes a group of financial institutions that engage in lending activities, much like traditional banks, but that do not accept deposits and are therefore not subject to the same regulations with which traditional depository institutions must comply. For example, financial institutions such as mutual funds, insurance companies, or pension funds might have excess cash to invest, and a large corporation might need short-term financing to cover seasonal cash flow needs. Investment banks can act as an intermediary between these two parties and help facilitate a loan and thereby become part of the shadow banking system. The Financial Stability

shadow banking system
A group of institutions that engage in lending activities, much like traditional banks, but that do not accept deposits and therefore are not subject to the same regulations as traditional banks.

MATTER OF FACT

Consolidation in the U.S. Banking Industry

The U.S. banking industry has been going through a long period of consolidation. According to the Federal Deposit Insurance Corporation (FDIC), the number of commercial banks in the United States declined from 14,400 in early 1984 to 4,964 by October 2017, a decline of more than 65%. The decline is concentrated among small community banks, which larger institutions have been acquiring at a rapid pace.

Board's *Global Shadow Banking Monitoring Report 2016* indicates that the shadow banking system financed $34 trillion in assets in 27 countries, and in the United States alone it financed $13.8 trillion in assets.

→ REVIEW QUESTIONS MyLab Finance Solutions

2–1 What are financial institutions? Describe the role they play within the financial market environment.

2–2 Who are the key customers of financial institutions? Who are net suppliers, and who are net demanders of funds?

2–3 Describe the role of commercial banks, investment banks, and the shadow banking system within the financial market environment.

LG2 LG3

2.2 Financial Markets

financial markets
Forums in which suppliers of funds and demanders of funds can transact business directly.

Whereas savers who deposit funds into financial institutions have no direct knowledge of how those funds are lent, suppliers of funds in the financial markets know where their money goes. **Financial markets** are forums in which suppliers and demanders of funds can transact business directly. The two key financial markets are the money market and the capital market. Short-term debt instruments, or marketable securities, trade in the *money market*. Long-term securities—bonds and stocks—trade in the *capital market*.

private placement
The sale of a new security directly to an investor or group of investors.

public offering
The sale of either bonds or stocks to the general public.

To raise money, firms can use either private placements or public offerings. A **private placement** involves the sale of a new security directly to an investor or group of investors, such as an insurance company or a pension fund. When firms need to raise large sums of money by selling securities, they usually do so through a **public offering**, which is the sale of either bonds or stocks to the general public.

primary market
Financial market in which securities are initially issued; the only market in which the issuer is directly involved in the transaction.

secondary market
Financial market in which preowned securities (those that are not new issues) are traded.

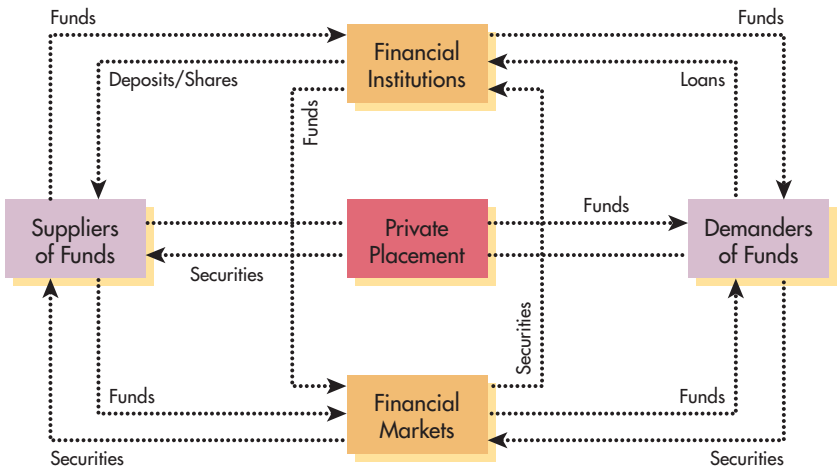
When a company or government entity sells stocks or bonds to investors and receives cash in return, it issues securities in the **primary market**. After the primary market transaction occurs, any further trading in the security does not involve the issuer directly, and the issuer receives no additional money from subsequent transactions. Once the securities begin to trade between investors, they become part of the **secondary market**. On large stock exchanges, billions of shares may trade between buyers and sellers on a single day, and these trades are all secondary market transactions. Money flows from the investors buying stocks to the investors selling them, and the company whose stock investors are trading remains largely unaffected by the transactions. Thus, we can say that the secondary market is where investors trade securities that were originally issued in the primary market.

THE RELATIONSHIP BETWEEN INSTITUTIONS AND MARKETS

Financial institutions actively participate in the financial markets as both suppliers and demanders of funds. Figure 2.1 depicts the general flow of funds through and between financial institutions and financial markets as well as the mechanics of private placement transactions. Domestic or foreign individuals, businesses, and governments may supply and demand funds. We next briefly discuss the

FIGURE 2.1

Flow of Funds
Flow of funds for financial institutions and markets



money market, including its international equivalent, the *Eurocurrency market*. We then end this section with a look at the capital market, which is the market where firms issue long-term securities such as stocks and bonds.

THE MONEY MARKET

money market
A market where investors trade highly liquid securities with maturities of 1 year or less.

The **money market** is a market where investors trade highly liquid securities with maturities of 1 year or less. The money market exists because some individuals, businesses, governments, and financial institutions have temporarily idle funds they wish to invest in a relatively safe, interest-bearing asset. At the same time, other individuals, businesses, governments, and financial institutions find themselves in need of seasonal or temporary financing. The money market brings together these suppliers and demanders of short-term funds.

marketable securities
Short-term debt instruments, such as U.S. Treasury bills, commercial paper, and negotiable certificates of deposit issued by government, business, and financial institutions, respectively.

In the money market, buyers and sellers trade **marketable securities**, which are short-term debt instruments such as U.S. Treasury bills, commercial paper, and negotiable certificates of deposit issued by government, business, and financial institutions, respectively. Investors generally consider marketable securities to be among the least risky investments available.

Eurocurrency market
International equivalent of the domestic money market.

The international equivalent of the domestic money market is the **Eurocurrency market**. This market for short-term bank deposits is denominated in U.S. dollars or other major currencies. Eurocurrency deposits arise when a corporation or individual makes a bank deposit in a currency other than the local currency of the country where the bank is located. For example, if a multinational corporation were to deposit U.S. dollars in a London bank, this action would create a Eurodollar deposit (a dollar deposit at a bank in Europe). Nearly all Eurodollar deposits are *time deposits,* which means the bank would promise to repay the deposit, with interest, at a fixed date in the future—in 6 months, for example. During the interim, the bank is free to lend this dollar deposit to creditworthy corporate or government borrowers. If the bank cannot find a borrower on its own, it may lend the deposit to another international bank.

THE CAPITAL MARKET

capital market
A market that enables suppliers and demanders of long-term funds to make transactions.

The **capital market** enables suppliers and demanders of long-term funds to make transactions. Businesses and governmental entities are the major issuers of securities in the capital market. The broker and dealer markets that provide a forum for bond and stock transactions form the backbone of the capital market. Although the United States has the world's largest and most active capital markets, in recent decades capital markets have experienced tremendous growth in countries all over the world.

Key Securities Traded: Bonds and Stocks

Securities traded in the capital market fall into two broad categories: *debt* and *equity*. The term debt refers to a loan that a borrower must repay. Equity, in contrast, refers to a security issued by a business that provides the security holder with an ownership stake in the firm. The main type of debt security is a *bond,* whereas the main equity security is *common stock*. *Preferred stock* has features of both debt and equity, and for that reason we refer to preferred stock as a hybrid security.

bond
Long-term debt instrument used by business and government to raise large sums of money, generally from a diverse group of lenders.

Bonds are long-term debt instruments used by business and government to raise large sums of money, generally from a diverse group of lenders. Bonds typically pay periodic interest at a *stated interest rate*. The borrower pays interest on the bond's *principal* until the bond's *maturity date*, at which point the borrower repays the principal to the bondholders. Bond issuers have a legal commitment to make interest and principal payments to investors, and failure to do so may result in the borrower going bankrupt.

common stock
A unit of ownership, or equity, in a corporation.

Shares of **common stock** are units of ownership, or equity, in a corporation. Common stockholders earn a return by receiving dividends—periodic distributions of cash—or by realizing increases in share price. Firms have no obligation to pay dividends on common stock, and in fact most young firms tend to reinvest their earnings rather than pay them out as dividends. Eventually, as they grow and mature, most firms do pay dividends and raise them over time.

preferred stock
A special form of ownership having a fixed periodic dividend that must be paid prior to payment of any dividends to common stockholders.

Preferred stock is a hybrid form of ownership that has features of both a bond and a common stock. Firms promise to pay preferred stockholders a fixed periodic dividend, much like the fixed interest payments that bonds offer. Firms must also pay dividends to preferred stockholders before they pay dividends to common stockholders. In other words, like bonds, preferred stock has "preference" over common stock. However, if a firm cannot pay dividends, preferred stockholders cannot force it into bankruptcy as bondholders can when a firm does not make interest and principal payments.

The market prices of both common and preferred stocks can fluctuate, but because preferred dividends are fixed, whereas firms may increase or decrease dividends on common shares without limit, common stock prices tend to fluctuate more.

Broker Markets and Dealer Markets

liquidity
The ability to quickly buy or sell a security without having an impact on the security's price.

The vast majority of trades made by investors take place in the secondary market. Print media sources like the *Wall Street Journal* and online resources like Yahoo! Finance (finance.yahoo.com) report information on secondary market transactions. A desirable feature of secondary markets for traders is **liquidity**, which refers to the ability to quickly buy or sell a security without having an

market order
An order to either buy or sell a security at the prevailing market prices.

bid price
The highest price a buyer in the market is willing to pay for a security.

ask price
The lowest price a seller in the market is willing to accept for a security.

impact on the security's price. If a security trades in an illiquid market, selling or buying that security quickly may prove difficult and may require a price concession by the investor to facilitate the trade.

The typical secondary market trade requires an investor to submit an order to a brokerage service, for which the brokerage charges the investor a fee called a commission. The simplest type of trade involves a **market order**, which is an order to either sell or buy a security at the prevailing *bid* or *ask* price, respectively. The **bid price** is the highest price a buyer in the market is willing to pay for a security, and the **ask price** is the lowest price a seller in the market is willing to accept for a security. In effect, an investor pays the ask price when buying securities and receives the bid price when selling them. An example will help illustrate this concept.

EXAMPLE 2.1

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Mark instructs his broker to submit a market order to buy 100 shares of Facebook common stock. At the time, the ask price for Facebook is $138.79, and the bid price is $138.71. Remember, the ask price is the lowest price offered in the market to sell Facebook to a potential buyer. Since Mark is trying to buy Facebook stock, and he wants to buy at the lowest possible price, he will pay $138.79, plus whatever commissions his broker charges. If, however, Mark already owned Facebook stock and wanted to sell it, he would be looking for the market's best offer to buy, the bid price. In that case, Mark would sell his shares for $138.71, less commissions charged by the broker.

bid/ask spread
The difference between the bid and ask prices.

The difference between the bid and ask prices is the **bid/ask spread**.

$$\text{Bid/Ask Spread} = \text{Ask Price} - \text{Bid Price} \tag{2.1}$$

market makers
Securities dealers who "make markets" by offering to buy or sell certain securities at stated prices.

The bid/ask spread is a kind of trading cost that investors may pay when they trade through a market maker. A **market maker** is a securities dealer who makes a market in one or more securities by offering to buy or sell them at stated bid/ask prices. The bid/ask spread represents income to the market maker in much the same way that commission is income for the broker who submits the order. When an investor submits an order through a broker, the brokerage service sends the order, usually electronically, to a market maker to execute the trade. How the market maker executes the order depends on whether the secondary market where the trade takes place is a broker market or a dealer market.

The essential difference between broker and dealer markets is a technical point that deals with the way trades are executed. When a trade occurs in a **broker market**, the market maker brings the buyer's order and the seller's order together to execute the trade at the midpoint of the bid/ask spread. In other words, Party A sells his or her securities directly to the buyer, Party B. Note that this kind of market will have a high degree of liquidity if many investors want to buy and many want to sell. In this case the market maker acts as a broker and by doing so forgoes collecting the bid/ask spread. This means that the only transaction cost for each trader is their brokerage commission.

broker market
The securities exchanges on which the two sides of a transaction, the buyer and seller, are brought together to trade securities.

dealer market
The market in which the buyer and seller are not brought together directly but instead have their orders executed by securities dealers who "make markets" in the given security.

In contrast, when trades occur in a **dealer market** the buyer's and the seller's orders are not brought directly together. Instead, market makers execute the buy/sell market orders they receive using their own inventory of securities. Essentially, two separate trades take place: Party A sells her securities (say, IBM stock) to a dealer at the bid price, and Party B buys his securities (IBM stock) from

another, or possibly even the same, dealer at the ask price. This type of market will have good liquidity if dealers are willing to buy and sell quickly in response to the orders they receive. In this case, the market maker acts as a dealer and by doing so collects one-half of the bid/ask spread for each side of the trade. If the same dealer executes both sides of the trade, she collects the full bid/ask spread. In a dealer market, the total transaction cost for each of the traders is one-half the bid/ask spread plus the brokerage commission. You can see that the key difference between broker and dealer markets is whether other traders provide liquidity or whether dealers perform that function. In broker markets the orders from investors provide liquidity, and in dealer markets the dealers provide liquidity.

PERSONAL FINANCE EXAMPLE 2.2

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Assume that the current bid price for Merck & Co. stock is $63.25 and the ask price is $63.45. Suppose you have an E*TRADE brokerage account that charges a $6.95 commission for online equity trades. What is the current bid/ask spread for Merck?

$$\text{Bid/Ask Spread} = \$63.45 - \$63.25 = \$0.20$$

Inserting the current bid and ask prices into Equation 2.1, you find that the bid/ask spread for Merck is $0.20. What would your total transaction costs be if you purchased 100 shares of Merck by submitting a market order via your E*TRADE account? Assume the trade is sent to a broker market for execution, and the market maker matches your order with a 100-share sell order for Merck from another investor. In this case your order will be executed at the midpoint of the bid/ask spread ($63.35), so you will pay only the brokerage commission.

$$\text{Total Transaction Costs} = \text{Brokerage Commission} = \$6.95$$

Now what would your total transaction costs be if you purchased 100 shares of Merck by submitting a market order via your E*TRADE account, and it is routed to a dealer market for execution?

$$\begin{aligned}\text{Total Transaction Costs} &= (\text{Number of Shares} \times 1/2 \text{ the Bid/Ask Spread}) \\ &\quad + \text{Brokerage Commission} \\ &= (100 \times 1/2 \times \$0.20) + \$6.95 \\ &= \$10 + \$6.95 = \$16.95\end{aligned}$$

Depending on where your brokerage routes your order, you find that your total transaction costs are either $6.95 in a broker market or $16.95 in a dealer market.

Because any stock that trades in the secondary market has a bid price and an ask price, it may seem difficult to answer the question, what is the market value of the stock? In the previous example, is the market value of Merck $63.45 or $63.25? A fairly common convention is to refer to the midpoint of the bid/ask spread as the stock's market value. In this case, we could say that Merck's market value is $63.35, which is halfway between the bid and ask prices.

$$\text{Midpoint of the Bid/Ask Spread} = (\$63.45 + \$63.25) \div 2 = \$63.35$$

securities exchanges
Organizations that provide the marketplace in which firms can raise funds through the sale of new securities and purchasers can resell securities.

Broker Markets Most broker markets consist of national or regional **securities exchanges**, which are organizations that provide a physical marketplace where traders can buy and sell securities. Note that most broker markets are actually broker/dealer markets in the sense that when executing trades the market maker must act as a broker first, when public orders are available to provide the necessary liquidity, and as a dealer second, when there are no public orders to provide the requisite liquidity.

If you are like most people, the first name that comes to mind in association with the "stock market" is the New York Stock Exchange, known as the NYSE. In fact, the NYSE is the dominant broker market, accounting for a little more than 25% of the total dollar volume of all trades in the U.S. stock market in 2016. Internet-based brokerage systems enable investors to place their buy and sell orders electronically, and those orders execute on the NYSE in seconds, thanks to sophisticated telecommunication devices.

For a firm to list its securities for trading on a stock exchange, it must file an application for listing and meet a number of requirements. For example, to be eligible for listing on the NYSE, a firm must have aggregate pretax earnings of at least $10 million over the previous 3 years, with at least $2 million in each of the previous 2 years, and greater than zero in each of the previous 3 years; at least 400 stockholders owning 100 or more shares; at least 1.1 million shares of publicly held stock outstanding; a market value of publicly held shares of at least $40 million; and a public share price of at least $4. Firms that earn listing status on the NYSE are among the largest public companies, and their shares often trade in multiple venues in addition to the NYSE. Accordingly, trading in NYSE-listed stocks accounted for more than 47% of all U.S. stock trades in 2016.

Dealer Markets A key feature of the dealer market is that it has no centralized trading floors. Instead, it is composed of a large number of market makers linked together via a mass-telecommunications network.

Of note, most dealer markets are technically dealer/broker markets in the sense that when executing trades the market maker can act as dealer first, whenever it suits her to provide liquidity, and as broker second, whenever it doesn't suit her to provide liquidity. If a market maker in a dealer market receives an order she does not want to execute, she can simply route the order along to another market maker for execution. For example, she might route the order to a broker market. The two most recognizable dealer markets are the **Nasdaq market**, an all-electronic trading platform used to execute securities trades, and the **over-the-counter (OTC) market**, where investors trade smaller, unlisted securities. Together these two dealer markets account for about 25% of all shares traded in the United States, with the Nasdaq accounting for the overwhelming majority of those trades. (As an aside, the primary market is also a dealer market because all new issues are sold to the investing public by securities dealers, acting on behalf of the investment bank.)

Nasdaq market
An all-electronic trading platform used to execute securities trades.

over-the-counter (OTC) market
Market where smaller, unlisted securities are traded.

Founded in 1971, the *National Association of Securities Dealers Automated Quotation System,* or simply *Nasdaq*, had its origins in the OTC market but today is a totally separate entity that's no longer part of the OTC market. In fact, in 2006 the Securities and Exchange Commission (SEC) formally recognized the Nasdaq as a "listed exchange," essentially giving it the same stature and prestige as the NYSE.

MATTER OF FACT

NYSE Is the World's Largest Stock Exchange

According to The Money Project, in 2016 the world boasted 60 major stock exchanges with a combined total market value of $69 trillion. The largest stock market in the world, as measured by the total market value of securities listed on that market, is the NYSE, with listed securities worth more than $18.5 trillion, or about 27% of the total market value for all major exchanges globally. The NYSE's total market capitalization is larger than the total market capitalizations of the world's 50 smallest major exchanges combined. The next largest is the Nasdaq at $7.5 trillion, with exchanges in Tokyo and Shanghai not far behind at $4.9 trillion and $4.5 trillion, respectively.

In recent years, the distinctions between broker and dealer markets have blurred. Electronic trading platforms, using sophisticated algorithms, place buy and sell orders very rapidly (so-called high-frequency trading), often without any human intervention. These algorithms may allow trading firms to speculate on a stock's price movements, or they may be used to take a single, large buy or sell order and break it into many smaller orders in an effort to minimize the price impact of buying or selling a large quantity of shares. An increasing amount of trading takes place today "off exchange," often in private trading venues known as "dark pools." Roughly one-third of secondary market trading occurs in these off-exchange environments.

International Capital Markets

Eurobond market
The market in which corporations and governments typically issue bonds denominated in dollars and sell them to investors located outside the United States.

Although U.S. capital markets are by far the world's largest, important debt and equity markets exist outside the United States. In the **Eurobond market,** corporations and governments typically issue bonds denominated in dollars and sell them to investors located outside the United States. A U.S. corporation might, for example, issue dollar-denominated bonds that investors in Belgium, Germany, or Switzerland would purchase. Through the Eurobond market, issuing firms and governments can tap a much larger pool of investors than would be generally available in the local market.

foreign bond
A bond that is issued by a foreign corporation or government and is denominated in the investor's home currency and sold in the investor's home market.

The *foreign bond market* is an international market for long-term debt securities. A **foreign bond** is a bond issued by a foreign corporation or government that is denominated in the investor's home currency and sold in the investor's home market. A bond issued by a U.S. company that is denominated in Swiss francs and sold in Switzerland is a foreign bond. Although the foreign bond market is smaller than the Eurobond market, many issuers have found it useful in tapping debt markets around the world.

international equity market
A market that allows corporations to sell blocks of shares to investors in a number of different countries simultaneously.

Finally, the **international equity market** allows corporations to sell blocks of shares to investors in a number of different countries simultaneously. This market enables corporations to raise far larger amounts of capital than they could in any single market. International equity sales have been indispensable to governments that have sold state-owned companies to private investors.

THE ROLE OF CAPITAL MARKETS

efficient market
A market that establishes correct prices for the securities that firms sell and allocates funds to their most productive uses.

From a firm's perspective, a capital market should be a liquid market where firms can interact with investors to obtain valuable external financing resources. From investors' perspectives, a capital market should be an **efficient market** that

establishes correct prices for the securities that firms sell and allocates funds to their most productive uses. This role is especially true for securities actively traded in broker or dealer markets, where intense competition among investors determines the prices of securities.

The Efficient-Market Hypothesis

Active stock markets, such as the NYSE and the Nasdaq market, may be *efficient* if they are made up of many rational competitive investors who react quickly and objectively to new information. The **efficient market hypothesis** (**EMH**), which is the basic theory describing the behavior of such a market, specifically states the following:

efficient market hypothesis (EMH)
Theory describing the behavior of a market in which (1) securities are in equilibrium, (2) security prices fully reflect all available information and react swiftly to new information, and (3) because stocks are fully and fairly priced, investors need not waste time looking for mispriced securities.

1. Securities are typically in equilibrium, which means they are fairly priced and their expected returns equal their required returns.
2. At any point in time, security prices fully reflect all information available about the firm and its securities, and these prices react swiftly to new information.
3. Because stocks are fully and fairly priced, investors need not waste their time trying to find mispriced (undervalued or overvalued) securities.

The price of an individual security is determined by the interaction between buyers and sellers in the market. If the market is efficient, the price of a stock is an unbiased estimate of its true value. In this context, the term *unbiased* means that stock prices are neither systematically overpriced nor underpriced. Investors compete with one another for information about a stock's true value, so at any given time, a stock's price reflects all the information known about the stock. Changes in the price reflect new information that investors learn about and act on. For example, suppose that a certain company's stock currently trades at $40 per share. If this company announces that sales of a new product have been higher than expected, and if investors have not already anticipated that announcement, investors will raise their estimate of what the stock is truly worth. At $40, the stock is a relative bargain, so temporarily more buyers than sellers will want to trade the stock, and its price will have to rise to restore equilibrium in the market. The more efficient the market is, the more rapidly this whole process works. In theory, even information known only to insiders may become incorporated in stock prices, as the *Focus on Ethics* box on page 92 explains.

New information is, almost by definition, unpredictable. For example, it is well known that retail companies in the United States have a spike in sales near the end of the calendar year as the holiday season approaches. When a firm reports higher sales near the end of the year, it is not new information because investors in the market are aware of the seasonal pattern and anticipate that sales will be higher in the fourth quarter than at any other time of year. To the market, new information would be a report from a retailer that its sales were higher (or lower) in the fourth quarter than investors had already expected. Because it is unanticipated, new information has a random quality (i.e., sometimes firms announce better-than-expected results, and sometimes they announce worse-than-expected results). As new information arrives, stock prices quickly respond, and those price movements will appear to occur at random. Therefore, one sign of stock market efficiency is that changes in stock prices are nearly impossible to predict, even by professional investors.

Not everyone agrees that prices in financial markets are as efficient as described in the preceding paragraph. Advocates of *behavioral finance,* an emerging

FOCUS ON ETHICS *in practice*

Should Insider Trading Be Legal?

In May 2017, a federal jury convicted Doug DeCinces of insider trading for scoring nearly $1.3 million from a stock tip about a pending corporate acquisition. The tip came from a close friend who happened to be CEO of the target firm. DeCinces has already agreed to pay $2.5 million to settle the civil complaint with the Securities and Exchange Commission (SEC) and now faces up to 280 years in prison. This story is common; between 2002 and 2016, the SEC pursued 740 insider-trading cases against 1,572 defendants/respondents. What is unusual is this defendant's prior career—DeCinces spent 15 years playing third base for the Baltimore Orioles and California Angels.

Congress created the modern legal framework for regulating securities markets in 1933 and 1934. The SEC defines insider trading as trading a security, in breach of a fiduciary duty or other relationship of trust and confidence, while in possession of material, nonpublic information about the security. The integrity of securities markets is important to the overall economy because growth in income and jobs depends on scarce investor funds flowing to those firms with the best prospects. When securities markets are efficient, prices send clear signals about the best place to invest. The SEC prosecutes insider trading to ensure a fair, level playing field for all investors. Were the public to see securities markets as profitable only to insiders, they might shy away. And without large numbers of active buyers and sellers, markets would send distorted price signals, and economic growth would suffer.

Interestingly, many finance and law professors believe insider trading should be legal. Perhaps the most famous proponent is Henry Manne, who has argued that SEC efforts to stop insider trading have proved as ineffective as Prohibition in deterring bootlegging. Manne and others have also emphasized efficient allocation of investor funds depends on securities prices reflecting all relevant information, not just what happens to be public. Finally, they express skepticism at the idea that insider trading will drive the public away from securities—noting many markets (such as the ones for professional athletes, real estate, and used cars) function well despite unequal distributions of information. However, the scholar most closely associated with the idea of efficient markets, Nobel Prize winner Eugene Fama, does not believe that insider trading should be allowed, based on concerns that doing so would create an incentive for managers to hold back information about the firms they manage for reasons of personal gain.

In the end, the question of whether to decriminalize insider trading comes down to a tradeoff—the social cost of security price signals potentially distorted by fewer buyers/sellers against the social benefit of signals reflecting all relevant information. SEC enforcement policies may unintentionally acknowledge this tradeoff—prosecutions are comparatively rare, but convictions lead to severe punishment. The 740 insider-trading cases since 2002 translate into an average of just 49 per year, compared with billions of U.S. securities transactions. But, as Doug DeCinces found out, when caught, the SEC can be a stern umpire.

▶ *Suppose insider trading were legal. Would it still present an ethical issue for insiders wishing to trade on non-public information?*

Sources: "Former Angels star Doug DeCinces found guilty in insider trading deal that netted him $1 million-plus," *The Orange County Register,* May 12, 2017 (accessed online: http://www.ocregister.com/2017/05/12/forrmer-angels-star-doug-decinces-found-guilty-in-insider-trading-deal-that-netted-him-1-million-plus/). "Busting Insider Trading: As Pointless as Prohibition." *Wall Street Journal*, April 28, 2014 (accessed online: https://www.wsj.com/articles/henry-g-mannebusting-insider-trading-as-pointless-as-prohibition-1398720501).

field that blends ideas from finance and psychology, argue that stock prices and prices of other securities can deviate from their true values for extended periods and that these deviations may lead to predictable patterns in stock prices. One of the most widely recognized proponents of behavioral finance, Richard Thaler, won the 2017 Nobel Prize in Economics for his work challenging the efficient markets hypothesis. Thaler's early research provided evidence that stocks that had performed poorly in the past displayed a predictable tendency to rebound, giving investors aware of that pattern a profit opportunity.

Just how efficient are prices in financial markets? One sign that markets are quite efficient is that very few professional investors, such as mutual fund and pension fund managers, earn returns that beat the average return in the market. In 2016, fewer than 40% of mutual funds earned a return that beat the return on the S&P500 stock index. Fewer than 18% beat the S&P500 over the 15-year period from 2002 to 2016. Moreover, the funds that do beat the S&P500 return change over time, meaning that funds that perform well in the past are not particularly likely to repeat that performance. A 2017 study identified mutual funds that had outperformed the S&P500 for a 3-year period and then studied the performance of those funds over the subsequent 3 years. Only 5% of fund managers who beat the S&P500 for 3 years managed to repeat that feat.[1] That relatively few professional managers outperform the overall market consistently is exactly what the efficient markets hypothesis predicts.

The extent to which stock markets are efficient will be debated for a long time. Clearly, prices do move in response to new information, and for most investors and corporate managers, the best advice is probably to use caution when betting against the market. Identifying securities over- or undervalued by the market is extremely difficult, and very few people have demonstrated an ability to bet against the market correctly for an extended period.

→ REVIEW QUESTIONS MyLab Finance Solutions

2–4 What role do financial markets play in our economy? What are primary and secondary markets? What relationship exists between financial institutions and financial markets?

2–5 What is a private placement versus a public offering?

2–6 What is the money market? What is the Eurocurrency market?

2–7 What is the capital market? What are broker markets? What are dealer markets? How do they differ?

2–8 Describe the role of capital markets from the firm's and investors' perspectives. What is the efficient market hypothesis?

LG 4

2.3 Regulation of Financial Markets and Institutions

With the hope of fostering fair, efficient, and stable financial markets, governments regulate financial institutions and markets, usually as much or more than almost any other sector in the economy. This section provides an overview of the financial regulatory landscape in the United States.

REGULATIONS GOVERNING FINANCIAL INSTITUTIONS

As mentioned in Section 2.1, Congress passed the Glass-Steagall Act in 1933 during the depths of the Great Depression. The early 1930s witnessed a series of banking panics that caused almost one-third of the nation's banks to fail. Troubles within the banking sector and other factors contributed to the worst

1. "Fleeting Alpha: Evidence From the SPIVA Persistence Scorecards," by Ryan Poirier and Aye M. Soe, S&P Dow Jones Indices, February 2017.

economic contraction in U.S. history, in which industrial production fell by more than 50%, the unemployment rate peaked at almost 25%, and stock prices dropped roughly 86%. The Glass-Steagall Act attempted to calm the public's fears about the banking industry by establishing the **Federal Deposit Insurance Corporation** (**FDIC**), which provided deposit insurance, effectively guaranteeing that individuals would not lose their money if they held it in a bank that failed. The FDIC was also charged with examining banks on a regular basis to ensure they were "safe and sound." The Glass-Steagall Act also prohibited institutions that took deposits from engaging in activities such as securities underwriting and trading, thereby effectively separating commercial banks from investment banks.

Federal Deposit Insurance Corporation (FDIC)
An agency created by the Glass-Steagall Act that provides insurance for deposits at banks and monitors banks to ensure their safety and soundness.

Over time, U.S. financial institutions faced competitive pressures from both domestic and foreign businesses that engaged in facilitating loans or making loans directly. Because these competitors either did not accept deposits or were located outside the United States, they were not subject to the same regulations as domestic banks. As a result, domestic banks began to lose market share in their core businesses. Pressure mounted to repeal the Glass-Steagall Act so that U.S. banks could compete more effectively, and in 1999 Congress enacted and President Clinton signed the **Gramm-Leach-Bliley Act**, which allows commercial banks, investment banks, and insurance companies to consolidate and compete for business in a wider range of activities.

Gramm-Leach-Bliley Act
An act that allows business combinations (i.e., mergers) between commercial banks, investment banks, and insurance companies and thus permits these institutions to compete in markets that prior regulations prohibited them from entering.

In the aftermath of the recent financial crisis and recession, Congress passed the Dodd-Frank Wall Street Reform and Consumer Protection Act in July 2010. In print, the new law runs for hundreds of pages and calls for the creation of several new agencies, including the Financial Stability Oversight Council, the Office of Financial Research, and the Bureau of Consumer Financial Protection. The act also realigns the duties of several existing agencies and requires existing and new agencies to report to Congress regularly. Nearly a decade after Dodd-Frank became law, the various agencies affected or created by the new law were still writing rules specifying how the new law's provisions would be implemented. Exactly how the new legislation will affect financial institutions and markets, or whether it will even survive with the new administration of President Trump in the White House, remains unclear.

REGULATIONS GOVERNING FINANCIAL MARKETS

During the Great Depression, Congress passed two other pieces of legislation that had an enormous effect on the regulation of financial markets. The **Securities Act of 1933** imposed new regulations governing the sale of new securities. The 1933 act was intended to regulate activity in the primary market in which securities are initially issued to the public. The act was designed to ensure that the sellers of new securities provided extensive disclosures to the potential buyers of those securities.

Securities Act of 1933
An act that regulates the sale of securities to the public via the primary market.

Securities Exchange Act of 1934
An act that regulates the trading of securities such as stocks and bonds in the secondary market.

Securities and Exchange Commission (SEC)
The primary government agency responsible for enforcing federal securities laws.

The **Securities Exchange Act of 1934** regulates the secondary trading of securities such as stocks and bonds. The Securities Exchange Act of 1934 also created the **Securities and Exchange Commission** (**SEC**), which is the primary agency responsible for enforcing federal securities laws. In addition to the one-time disclosures required of security issuers by the Securities Act of 1933, the Securities Exchange Act of 1934 requires ongoing disclosure by companies whose securities trade in secondary markets. Companies must make a 10-Q filing every quarter

and a 10-K filing annually. The 10-Q and 10-K forms contain detailed information about the financial performance of the firm during the relevant period. Today, these forms are available online through EDGAR (Electronic Data Gathering, Analysis, and Retrieval) on the SEC's website. The 1934 act also imposes limits on the extent to which corporate "insiders," such as senior managers, can trade in their firm's securities.

How much regulation of financial institutions and markets is appropriate? The debate surrounding that question may never end, but most countries do regulate the financial sectors of their economies to some degree. Trust is essential to the development of financial markets—without it, savers would be reluctant to supply funds to firms that need money to finance investment. To the extent that regulations enhance trust, they may encourage broader participation in financial markets, which in turn contributes to a growing economy.

→ REVIEW QUESTIONS MyLab Finance Solutions

2–9 Why do you think that so many pieces of important legislation related to financial markets and institutions were passed during the Great Depression?

2–10 What different aspects of financial markets do the Securities Act of 1933 and the Securities Exchange Act of 1934 regulate?

LG 5

2.4 The Securities Issuing Process

As net demanders of funds, businesses sometimes find it necessary to access the capital market to raise external financing by selling new securities to investors. Companies use the new financing to fund operations or strategic investments that maximize the value of the firm. Most businesses will issue a mix of debt and equity securities over time, and they can issue both security types through a private placement or a public offering. The process for issuing debt and that for issuing equity are more similar than not, so for brevity the remainder of this section discusses the procedure for issuing common stock.

Because of the high risk associated with a business startup, a firm's initial financing typically comes from its founders in the form of a common stock investment. Until the founders have made an equity investment, it is highly unlikely that others will contribute either equity or debt capital. Early-stage outside investors in the firm's equity, as well as lenders who provide debt capital, want assurance they are taking no more risk than the founders. In addition, they want confirmation that the founders are confident enough in their vision for the firm that they are willing to risk their own money.

ISSUING COMMON STOCK

Typically, the initial rounds of external financing for business startups with attractive growth prospects come from private investors via a private equity placement. Then, as the firm establishes the market potential of its product or service and begins to generate revenues, cash flow, and profits, it will often "go public" by issuing shares of common stock to a much broader group of investors.

private equity
External equity financing that is raised via a private placement, typically by private early-stage firms with attractive growth prospects.

angel financing
Private equity financing provided to a young firm by a wealthy individual investing his or her own money.

venture capital
Equity financing provided by a firm that specializes in financing young, rapidly growing firms. Venture capital firms raise pools of money from outside investors which they then use to purchase equity stakes in small private companies.

angel investors (angels)
Wealthy individual investors who make their own investment decisions and are willing to invest in promising startups in exchange for a portion of the firm's equity.

venture capitalists (VCs)
Formal business entities that take in private equity capital from many individual investors, often institutional investors such as endowments and pension funds or individuals of high net worth, and make private equity investment decisions on their behalf.

Before we consider the initial public sale of equity, let's discuss some key aspects of early-stage equity financing.

Private Equity

Private equity is equity financing that is raised via a private placement, typically by early-stage firms with attractive growth prospects. Rapidly growing firms will usually require multiple rounds of private equity financing as they make early investments and develop operational capabilities. When the private equity financing comes from angel investors or venture capitalists, we refer to it as **angel financing** or **venture capital**, respectively. **Angel investors** (or **angels**) tend to be wealthy individual investors who make their own investment decisions and are willing to invest in promising startups in exchange for a portion of the firm's equity. In contrast, **venture capitalist** (**VC**) firms are businesses that take in money from many individual investors, often institutional investors such as endowments and pension funds or individuals of high net worth, and make investment decisions on their behalf. VCs typically maintain strong oversight in the firms they finance. They ordinarily take a seat on the firm's board of directors and have clearly defined exit strategies, often divesting their investment in the firm when it goes public or shortly thereafter. In 2016, VCs provided almost $50 billion in financing to U.S. businesses.

Organization and Investment Stages Venture capital investors tend to be organized in one of four basic ways, as described in Table 2.1. The *VC limited partnership* is the most common structure. The primary objective of these funds is to earn high returns.

VCs can invest in early-stage companies, later-stage companies, or buyouts and acquisitions. Generally, VCs invest about 40% to 50% of their resources in early-stage companies (for startup funding and expansion), and they invest a similar percentage in later-stage companies (for marketing, production expansion, and preparation for public offering). VCs invest just 5% to 10% of their funds in transactions involving the buyout or acquisition of other companies. Generally, VCs

TABLE 2.1 Organization of Venture Capital Investors

Organization	Description
Small business investment companies (SBICs)	Corporations chartered by the federal government that can borrow at attractive rates from the U.S. Treasury and use the funds to make venture capital investments in private companies.
Financial VC funds	Subsidiaries of financial institutions, particularly banks, set up to help young firms grow and, it is hoped, become major customers of the institution.
Corporate VC funds	Firms, sometimes subsidiaries, established by nonfinancial firms, typically to gain access to new technologies that the corporation can access to further its own growth.
VC limited partnerships	Limited partnerships organized by professional VC firms, which serve as the general partner and organize, invest, and manage the partnership using the limited partners' funds; the professional VCs ultimately liquidate the partnership and distribute the proceeds to all partners.

look for annual rates of return ranging from 20% to 50% or more, depending on both the development stage and the attributes of each company. VCs require higher returns on their riskier, early-stage investments than on later-stage investments.

Deal Structure and Pricing Regardless of the development stage, when VCs invest they do so under a legal agreement that clearly defines the deal structure and pricing. The deal structure allocates responsibilities and ownership interests between the existing owners (typically the founders) and the venture capitalist, and its terms depend on numerous factors related to the founders; the business structure, stage of development, and outlook; and other market and timing issues. The deal pricing is a function of the value of the business, the amount of funding provided, and the perceived risk of business operations. To control the VC's risk exposure and to help ensure the firm's success, the agreement will typically contain covenants or provisions that subject the firm to constraints or stipulations, such as tying the actual funding amount to the achievement of measurable milestones. The agreement will also have an explicit exit strategy for the VC that defines when and how the venture capital must be repaid. For example, VCs often tie their exit strategy to the firm's initial public offering of equity.

Venture capitalists will require more equity ownership and pay less for it the riskier and less developed the business. For this reason, financial managers strive to maximize the firm's earnings and minimize the risk of the firm's cash flows. Doing so will maximize the firm's value and minimize the cost of venture capital financing.

Going Public

When a firm wishes to sell its stock in the primary market, it has three alternatives. It can make (1) a *private placement,* in which the firm sells new securities directly to an investor or group of investors; (2) a *rights offering,* in which the firm sells new shares to existing stockholders; or (3) a *public offering,* in which it offers its shares for sale to the general public. Here we focus on public offerings, particularly the **initial public offering (IPO)**, which is the first public sale of a firm's stock. IPOs are typically made by small, rapidly growing companies that either require additional capital to continue growing or have met a milestone for going public that was established in an earlier agreement to obtain VC funding.

initial public offering (IPO)
The first public sale of a firm's stock.

To go public, the firm must first obtain approval from its current shareholders, the investors who own its privately issued stock. Next, the company's auditors and lawyers must certify that all the company's financial documents are as accurate as possible. The company then hires an investment bank willing to facilitate the offering. This investment bank provides the issuer with advice about important aspects of the issuing process. We'll discuss the role of the investment bank in more detail in the next section.

prospectus
A portion of a security registration statement that describes the key aspects of the issue, the issuer, and its management and financial position.

red herring
A preliminary prospectus made available to prospective investors during the waiting period between the registration statement's filing with the SEC and its approval.

Next, with the help of the investment bank, the company files a registration statement with the SEC. One portion of this statement is called the **prospectus**. It describes the crucial aspects of the company issuing stock and the terms of the stock offering. During the waiting period between the statement's filing and its approval, prospective investors can receive a preliminary prospectus. This preliminary version is called a **red herring** because a notice printed in red on the front cover indicates the tentative nature of the document. The cover page of the preliminary prospectus describing the 2017 stock issue of Snap Inc., the parent company of Snapchat, appears in Figure 2.2. Although the preliminary

FIGURE 2.2

Cover of a Preliminary Prospectus for a Stock Issue

Some of the key factors related to the 2017 Class A common stock issue by Snap Inc. are summarized on the cover of the preliminary prospectus. The disclaimer printed in red across the top of the page is what gives the preliminary prospectus its "red herring" name.

Source: From SEC filing Form S-1/A, Copyright © U.S. Securities and Exchange Commission.

The information in this preliminary prospectus is not complete and may be changed. These securities may not be sold until the registration statement filed with the Securities and Exchange Commission is effective. This preliminary prospectus is not an offer to sell nor does it seek an offer to buy these securities in any jurisdiction where the offer or sale is not permitted.

PROSPECTUS (Subject to Completion)
Dated February 24, 2017

200,000,000 Shares

Snap Inc.

Class A Common Stock

This is an initial public offering of shares of non-voting Class A common stock of Snap Inc.

Snap Inc. is offering to sell 145,000,000 shares of Class A common stock in this offering. The selling stockholders identified in this prospectus are offering an additional 55,000,000 shares of Class A common stock. We will not receive any of the proceeds from the sale of the shares being sold by the selling stockholders.

We have three classes of common stock: Class A common stock, Class B common stock, and Class C common stock. The rights of the holders of Class A common stock, Class B common stock, and Class C common stock are identical, except with respect to voting, conversion, and transfer rights. Class A common stock is non-voting. Anyone purchasing Class A common stock in this offering will therefore not be entitled to any votes. Each share of Class B common stock is entitled to one vote and is convertible into one share of Class A common stock. Each share of Class C common stock is entitled to ten votes and is convertible into one share of Class B common stock. The Class C common stock, which is held by our founders, each of whom is an executive officer and a director of the company, will represent approximately 88.5% of the voting power of our outstanding capital stock following this offering.

Before this offering, there has been no public market for our Class A common stock. It is currently estimated that the initial public offering price will be between $14.00 and $16.00 per share. Our Class A common stock has been approved for listing on the New York Stock Exchange under the symbol "SNAP."

We are an "emerging growth company" under the Jumpstart Our Business Startups Act of 2012, have elected to comply with reduced public company reporting requirements, and may elect to comply with reduced public company reporting requirements in future filings.

See "Risk Factors" beginning on page 15 to read about factors you should consider before buying our Class A common stock.

	Price to Public	Underwriting Discounts and Commissions (1)	Proceeds to Snap Inc.	Proceeds to Selling Stockholders
Per share	$	$	$	$
Total	$	$	$	$

(1) See "Underwriting" for a description of the compensation payable to the underwriters.

At our request, the underwriters have reserved up to 7.0% of the shares of Class A common stock offered by this prospectus for sale, at the initial public offering price, to certain institutions as well as individuals associated with us. See "Underwriting—Directed Share Program."

To the extent that the underwriters sell more than 200,000,000 shares of Class A common stock, the underwriters have the option to purchase up to an additional 30,000,000 shares of Class A common stock from us and certain of the selling stockholders at the initial public offering price less the underwriting discount.

The Securities and Exchange Commission and state securities regulators have not approved or disapproved of these securities or determined if this prospectus is truthful or complete. Any representation to the contrary is a criminal offense.

The underwriters expect to deliver the shares against payment in New York, New York on , 2017.

Morgan Stanley *Goldman, Sachs & Co.* *J. P. Morgan* *Deutsche Bank Securities*

Barclays *Credit Suisse* *Allen & Company LLC*

Prospectus dated , 2017

document is incomplete, it still conveys considerable information to prospective investors. For example, Snap's IPO is selling 200,000,000 shares of non-voting Class A Common Stock in its IPO. Notice that Snap has three classes of common stock. The Class B shares have one vote per share and are convertible into one share of Class A. The Class C shares have 10 votes per share and are convertible into one share of Class B, and the founders are the exclusive owners of the super-voting Class C common stock. Thus, they have total voting control even after going public.

After the SEC approves the registration statement, the investment community can begin analyzing the company's prospects. However, from the time it files until at least 1 month after the IPO is complete, the company must observe a *quiet period* during which the law places restrictions on what company officials may say about the company. The purpose of the quiet period is to make sure that all potential investors have access to the same information about the company—the information presented in the preliminary prospectus—and that no one is privy to any unpublished data that might confer an unfair advantage.

The investment banks and company executives promote the company's stock offering through a *roadshow,* a series of presentations to potential investors around the country and sometimes overseas. In addition to providing investors with information about the new issue, roadshow sessions help investment banks gauge demand for the offering and set a preliminary offer price range. Figure 2.2 shows that the preliminary offer price range for Snap is between $14 and $16. After the investment bank sets terms and prices the issue, the SEC must approve the offering.

investment bank
Financial intermediary that specializes in selling new security issues and advising firms with regard to major financial transactions.

underwriting
The role of the investment bank in bearing the risk of reselling, at a profit, the securities purchased from an issuing corporation at an agreed-on price.

IPO offer price
The price at which the issuing firm sells its securities.

originating investment bank
The investment bank initially hired by the issuing firm, it brings other investment banks in as partners to form an underwriting syndicate.

underwriting syndicate
A group of other banks formed by the originating investment bank to share the financial risk associated with underwriting new securities.

tombstone
The list of underwriting syndicate banks, presented in such a way to indicate a syndicate member's level of involvement, located at the bottom of the IPO prospectus cover page.

The Investment Bank's Role

An **investment bank** (such as Morgan Stanley or Goldman Sachs) is a financial intermediary that specializes in selling new security issues and advising firms with regard to major financial transactions. The investment bank is responsible for promoting the stock and facilitating the sale of the company's IPO shares. The main activity of the investment bank is **underwriting**, and this is why investment banks that assist with a security offering are called *underwriters*. The underwriting process requires the investment bank to guarantee the issuer a price for its securities, called the *IPO offer price*. In so doing, the bank effectively purchases the securities from the issuing firm and bears the risk of reselling them to the public. The **IPO offer price** is the price at which the issuing firm sells the securities to the primary market investors, and it represents the actual proceeds received by the company for each security that it issues, before subtracting fees charged by the investment banker.

In most security offerings, the investment bank hired by the issuing firm, often called the **originating investment bank**, brings in other investment banks as partners to form an **underwriting syndicate**. The syndicate banks share the financial risk associated with buying the entire issue from the issuer and reselling the new securities to the public. The cover page of the IPO prospectus, known as the **tombstone**, lists the syndicate banks; the names of the originating bank and other banks responsible for selling a large percentage of the offering appear in a larger font than the names of other banks in the syndicate. The preliminary prospectus for Snap's IPO in Figure 2.2 shows that the underwriting syndicate comprised seven investment banks (Morgan Stanley, Goldman Sachs, JPMorgan, Deutsche

selling group
A large number of brokerage firms that join the originating investment bank(s); each accepts responsibility for selling a certain portion of a new security issue on a commission basis.

Bank, Barclays, Credit Suisse, and Allen & Company). Of these seven banks, Morgan Stanley was the originating bank and had the largest involvement in the offer, with responsibility for selling 30% of the shares. In many cases, the underwriting syndicate may form a **selling group**, which is composed of other financial institutions that help sell IPO shares but have no underwriting responsibility and therefore bear no risk if they are unable to sell the shares they are allocated. Members of the selling group earn a fee known as the *selling concession*.

To facilitate selling the shares, the underwriting syndicate and members of the selling group solicit buying interest from potential primary market investors. The primary market investors are the initial purchasers of the securities and generally consist of various institutional investors such as pension funds, mutual funds, and hedge funds. Once a sufficient number of primary market investors are identified, the originating investment bank and the issuing firm agree on a final IPO offer price and the shares are sold to primary market investors. Figure 2.3 depicts the selling process for a security issue.

Compensation for underwriting and selling services comes via underwriting fees that the investment banks collect in the form of a discounted price when they purchase the shares from the issuing firm. For example, the final prospectus for Snap's IPO, shown in Figure 2.4, provides all final information pertaining to the offering. You can see that the final IPO offer price, indicated as *Price to Public*, is $17 and the *Proceeds to Snap Inc.* and *Proceeds to Selling Stockholders* is only $16.575; therefore, the underwriting discount or commission is $0.425 per share. This underwriting discount or commission represents a 2.5% underwriting fee paid to the underwriters by the issuing firm. The $0.425 per share fee may not seem very large, but when you consider that the underwriting syndicate underwrote 200 million shares for Snap, it translates to a total underwriting fee

FIGURE 2.3

The Selling Process for a Large Security Issue
The investment banker hired by the issuing corporation may form an underwriting syndicate. The underwriting syndicate buys the entire security issue from the issuing corporation at an agreed-on price. The underwriters then have the opportunity (and bear the risk) of reselling the issue to the public at a profit. Both the originating investment banker and the other syndicate members put together a selling group to sell the issue on a commission basis to investors.

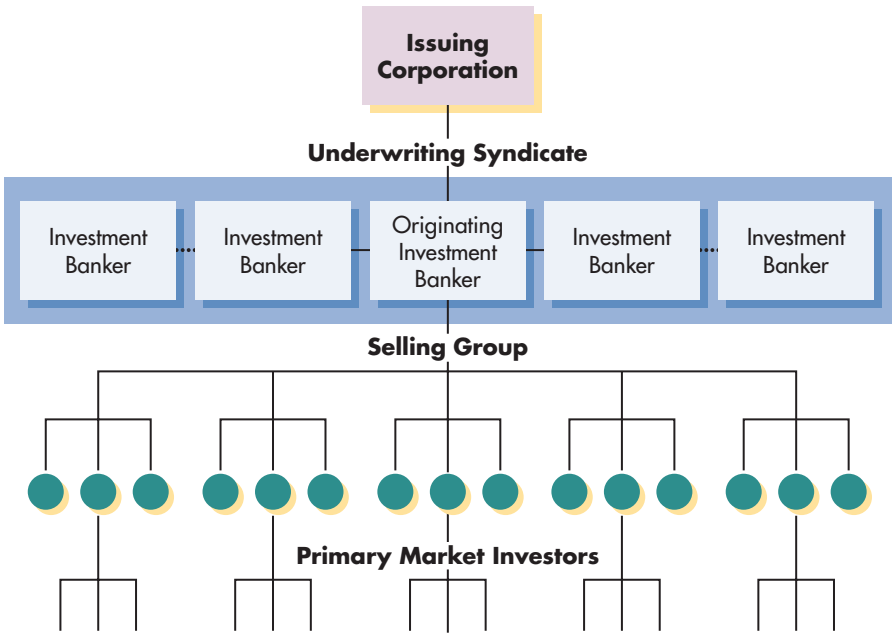

FIGURE 2.4

Cover of a Final Prospectus for a Stock Issue

The final key factors related to the 2017 Class A common stock issue by Snap Inc. are summarized on the cover of the final prospectus.

Source: From SEC filing Form 424B4. Copyright © U.S. Securities and Exchange Commission.

Filed Pursuant to Rule 424(b)(4)
Registration No. 333-215866

PROSPECTUS

200,000,000 Shares

Snap Inc.

Class A Common Stock

This is an initial public offering of shares of non-voting Class A common stock of Snap Inc.

Snap Inc. is offering to sell 145,000,000 shares of Class A common stock in this offering. The selling stockholders identified in this prospectus are offering an additional 55,000,000 shares of Class A common stock. We will not receive any of the proceeds from the sale of the shares being sold by the selling stockholders.

We have three classes of common stock: Class A common stock, Class B common stock, and Class C common stock. The rights of the holders of Class A common stock, Class B common stock, and Class C common stock are identical, except with respect to voting, conversion, and transfer rights. Class A common stock is non-voting. Anyone purchasing Class A common stock in this offering will therefore not be entitled to any votes. Each share of Class B common stock is entitled to one vote and is convertible into one share of Class A common stock. Each share of Class C common stock is entitled to ten votes and is convertible into one share of Class B common stock. The Class C common stock, which is held by our founders, each of whom is an executive officer and a director of the company, will represent approximately 88.5% of the voting power of our outstanding capital stock following this offering.

Before this offering, there has been no public market for our Class A common stock. The initial public offering price is $17.00 per share. Our Class A common stock has been approved for listing on the New York Stock Exchange under the symbol "SNAP."

We are an "emerging growth company" under the Jumpstart Our Business Startups Act of 2012, have elected to comply with reduced public company reporting requirements, and may elect to comply with reduced public company reporting requirements in future filings.

See "Risk Factors" beginning on page 15 to read about factors you should consider before buying our Class A common stock.

	Price to Public	*Underwriting Discounts and Commissions (1)*	*Proceeds to Snap Inc.*	*Proceeds to Selling Stockholders*
Per share	*$17.00*	*$0.425*	*$16.575*	*$16.575*
Total	*$3,400,000,000.00*	*$85,000,000.00*	*$2,403,375,000.00*	*$911,625,000.00*

(1) See "Underwriting" for a description of the compensation payable to the underwriters.

At our request, the underwriters have reserved up to 7.0% of the shares of Class A common stock offered by this prospectus for sale, at the initial public offering price, to certain institutions as well as individuals associated with us. See "Underwriting—Directed Share Program."

To the extent that the underwriters sell more than 200,000,000 shares of Class A common stock, the underwriters have the option to purchase up to an additional 30,000,000 shares of Class A common stock from us and certain of the selling stockholders at the initial public offering price less the underwriting discount.

The Securities and Exchange Commission and state securities regulators have not approved or disapproved of these securities or determined if this prospectus is truthful or complete. Any representation to the contrary is a criminal offense.

The underwriters expect to deliver the shares against payment in New York, New York on March 7, 2017.

Morgan Stanley *Goldman, Sachs & Co.* *J. P. Morgan* *Deutsche Bank Securities*

Barclays *Credit Suisse* *Allen & Company LLC*

total proceeds
The total amount of proceeds for all shares sold in the IPO. Calculated as the IPO offer price times the number of IPO shares issued.

of $85,000,000 on **total proceeds** of $17 × 200,000,000 = $3.4 billion, where total proceeds equal the offer price times the number of shares sold in the IPO.

$$\text{Total Proceeds} = (\text{IPO Offer Price} \times \#\text{ of IPO Shares Issued}) \quad (2.2)$$

Recall that Morgan Stanley, the originating bank, was responsible for 30% of the shares offered, so that means Morgan Stanley alone collected $25,500,000. The 2.5% underwriting fee that Snap negotiated was actually low by industry standards, because most firms going public pay a 7% fee. After subtracting the underwriting fee, Snap and its selling shareholders realized net proceeds of $2,403,375,000 and $911,625,000, respectively.

market price
The price of the firm's shares as determined by the interaction of buyers and sellers in the secondary market.

market capitalization
The total market value of a publicly traded firm's outstanding stock. Calculated as the market price times the number of shares of stock outstanding.

Though the investment banker together with the company going public set the IPO offer price, once trading begins in the secondary market, the interaction of buyers and sellers determines the **market price** of the firm's shares. The market price fluctuates as the balance of buyers and sellers shifts. Trading in the secondary market also establishes the newly public firm's **market capitalization**, which is the total market value of the firm's outstanding stock. A firm's market capitalization equals the market price of the firm's shares times the number of shares outstanding.

$$\text{Market Capitalization} = (\text{Market Price of Stock} \times \#\text{ of Shares of Stock Outstanding}) \quad (2.3)$$

The market price of Snap's stock was $24.48 per share after its first day of secondary market trading, and Snap had 661,834,416 shares of stock outstanding following its IPO. Inserting these values into equation 2.3, we find that Snap's market capitalization is about $16 billion.

The primary market investors who purchase shares in an IPO often earn a substantial profit once the shares start trading in the secondary market. For most IPOs, the offer price at which primary market investors purchase shares is well below what investors in the secondary market are willing to pay for the shares. For Snap's IPO the offer price was $17 per share, as shown in Figure 2.4, and its stock finished trading on its first day in the secondary market at $24.48 a share. For investors who purchased Snap shares from the underwriting syndicate (or the selling group), that's a one-day gain of $7.48 ($24.48 − $17). To put that number in focus, investors who purchased Snap stock at the $17 offer price earned a return on their investment of 44% in just one day. This represents a profit of almost $1.5 billion for those investors who had the opportunity to buy Snap shares at the offer price. However, it represents a substantial cost to Snap. To put this differently, had Snap and its selling stockholders sold their stock for what the market was willing to pay, they could have generated an additional $1.5 billion in total proceeds, but instead they "left the money on the table" for investors.

IPO market price
The final trading price on the first day in the secondary market.

IPO underpricing
The percentage change from the final IPO offer price to the IPO market price, which is the final trading price on the first day in the secondary market; this is also called the IPO initial return.

The percentage change from the final IPO offer price to the **IPO market price**, which is the final trading price on the first day in the secondary market, is called the **IPO underpricing**.

$$\text{IPO Underpricing} = (\text{Market Price} - \text{Offer Price}) \div \text{Offer Price} \quad (2.4)$$

The term *underpricing* applies because the offer price is usually set below what secondary market investors are willing to pay. Selling shares at what appears to be

a below-market price might seem unusual, but surprisingly IPOs are underpriced more often than not in virtually every country around the world. In the United States the average IPO that took place between 1980 and 2016 was underpriced by 17.9%. You might wonder, and you would not be alone, why issuers don't insist that investment banks sell their shares at the price the secondary market is willing to pay to generate the maximum IPO proceeds. Many theories and empirical studies aim to answer this question, and the best answers recognize that the IPO process is full of uncertainty for all parties involved. Neither the firm issuing shares in the deal, nor its investment bankers, nor even the primary market investors who bid for shares during the IPO roadshow know what the eventual market price of the stock will be. By underpricing their shares and leaving some money on the table for the primary market investors, IPO firms create incentives for all necessary parties to participate in the IPO process.

EXAMPLE 2.3

MyLab Finance Solution Video

With baby boomers retiring and hitting the open roads of America in droves, the largest U.S. recreational vehicle dealer, Camping World, decided it was time to go public. Its IPO took place on October 7, 2016, at which time the company sold 11.4 million shares at an IPO offer price of $22 per share. Checking prices for Camping World on Yahoo! Finance, you can find that the IPO market price at the close of secondary market trading on October 7 was $22.50. With this information you can calculate the IPO underpricing using Equation 2.4.

$$\text{IPO Underpricing} = (\text{Market Price} - \text{Offer Price}) \div \text{Offer Price}$$
$$= (\$22.50 - \$22) \div \$22 = 0.0227 \text{ or } 2.27\%$$

Camping World's IPO underpricing of 2.27% is considerably less than the 44% underpricing for Snap Inc. This demonstrates another interesting fact about IPOs, specifically, that the degree to which IPOs are underpriced varies tremendously from one deal to another and one time to another. Usually, smaller IPOs are underpriced more than larger ones, but that was not the case here. Camping World raised $250.8 million in its offering, which is a small fraction of the $3.4 billion raised in Snap's IPO.

→ REVIEW QUESTIONS MyLab Finance Solutions

2–11 What is the difference between an angel investor (angel) and a venture capitalist (VC)?

2–12 What four ways do VCs use to organize their businesses? How do they structure and price their deals?

2–13 What general procedures must a private firm follow to go public via an initial public offering (IPO)?

2–14 What role does an investment bank play in a public offering? Describe an underwriting syndicate.

LG6

2.5 Financial Markets in Crisis

Modern economies are vulnerable when financial markets are in a state of crisis. For example, in 2008, the U.S. financial system, as well as financial systems around the world, appeared to be on the verge of collapse. Troubles in the

financial sector spread to other industries, and a severe global recession ensued. In this section, we outline some of the main causes and consequences of the financial market crises that led to the Great Recession.

FINANCIAL INSTITUTIONS AND REAL ESTATE FINANCE

In the classic film, *It's a Wonderful Life,* the central character is George Bailey, who runs a financial institution called the Bailey Building and Loan Association. In a key scene in that movie, a bank run is about to occur, and depositors demand that George return the money they had invested in the Building and Loan. George pleads with one man to keep his funds at the bank, saying:

> You're thinking of this place all wrong, as if I have the money back in a safe. The money's not here. Your money is in Joe's house. That's right next to yours—and then the Kennedy house, and Mrs. Maklin's house, and a hundred others. You're lending them the money to build, and then they're going to pay it back to you as best they can. What are you going to do, foreclose on them?*

This scene offers a realistic portrayal of the role that financial institutions played in allocating credit for investments in residential real estate for many years. Local banks took deposits and made loans to local borrowers. However, since the 1970s, neighbors no longer hold each others' mortgages—securitization has changed the way that mortgage finance works. **Securitization** refers to the process of pooling mortgages or other types of loans and then selling claims or securities against that pool in a secondary market. These securities, called **mortgage-backed securities**, can be purchased by individual investors, mutual funds, or virtually any other investor. As homeowners repay their loans, those payments eventually make their way into the hands of investors who hold the mortgage-backed securities. Therefore, a primary risk associated with mortgage-backed securities is that homeowners may not be able to, or may choose not to, repay their loans. Banks today still lend money to individuals who want to build or purchase new homes, but they typically bundle those loans together and sell them to organizations that securitize them and pass them on to investors all over the world.

securitization
The process of pooling mortgages or other types of loans and then selling claims or securities against that pool in the secondary market.

mortgage-backed securities
Securities that represent claims on the cash flows generated by a pool of mortgages.

Falling Home Prices and Delinquent Mortgages

Prior to the 2008 financial crisis, most investors viewed mortgage-backed securities as relatively safe investments. Figure 2.5 illustrates one of the main reasons for this view. The figure shows the behavior of the Standard & Poor's Case-Shiller Index, a barometer of home prices in 10 major U.S. cities, in each month from January 1987 to January 2017. Historically, declines in the index were relatively infrequent, and between July 1995 and April 2006 the index rose continuously without posting even a single monthly decline. When house prices are rising, the gap between what homes are worth and what borrowers owe on their mortgages widens. Lenders will allow borrowers who have difficulty making payments on their mortgages to tap this built-up home equity to refinance their loans and lower their payments. Therefore, rising home prices helped keep mortgage default rates low from the mid-1990s through early 2006. Investing in real estate and mortgage-backed securities seemed to involve very little risk during this period.

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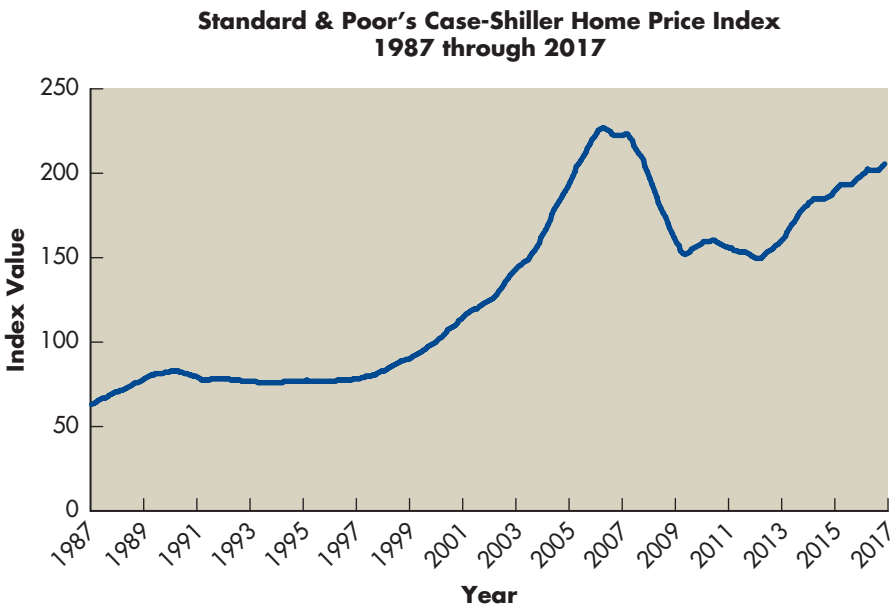
*"It's a Wonderful Life." Dir. Frank Capra. Perf. James Stewart, Donna Reed, Lionel Barrymore, and Thomas Mitchell. RKO Radio Pictures, 1946.

FIGURE 2.5

House Prices Soar and Then Crash

The figure shows the Standard & Poor's Case-Shiller Home Price Index from January 1987 through January 2017 and illustrates that home prices rose almost without interruption for nearly a decade before experiencing a sharp collapse starting in May 2006.



subprime mortgages

Mortgage loans made to borrowers with lower incomes and poorer credit histories as compared to "prime" borrowers.

In part because real estate investments seemed relatively safe, lenders began relaxing their standards for borrowers. This change led to tremendous growth in a category of loans called subprime mortgages. **Subprime mortgages** are mortgage loans made to borrowers with lower incomes and poorer credit histories as compared to "prime" borrowers. Loans granted to subprime borrowers often have adjustable, rather than fixed, interest rates, which makes subprime borrowers particularly vulnerable if interest rates rise. Many of these borrowers (and lenders) assumed that rising home prices would allow refinancing of their loans if they had difficulties making payments. Partly through the growth of subprime mortgages, banks and other financial institutions gradually increased their investments in real estate loans. In 2000, real estate loans accounted for less than 40% of the total loan portfolios of large banks. By 2007, real estate loans grew to more than half of all loans made by large banks, and the fraction of these loans in the subprime category increased as well.

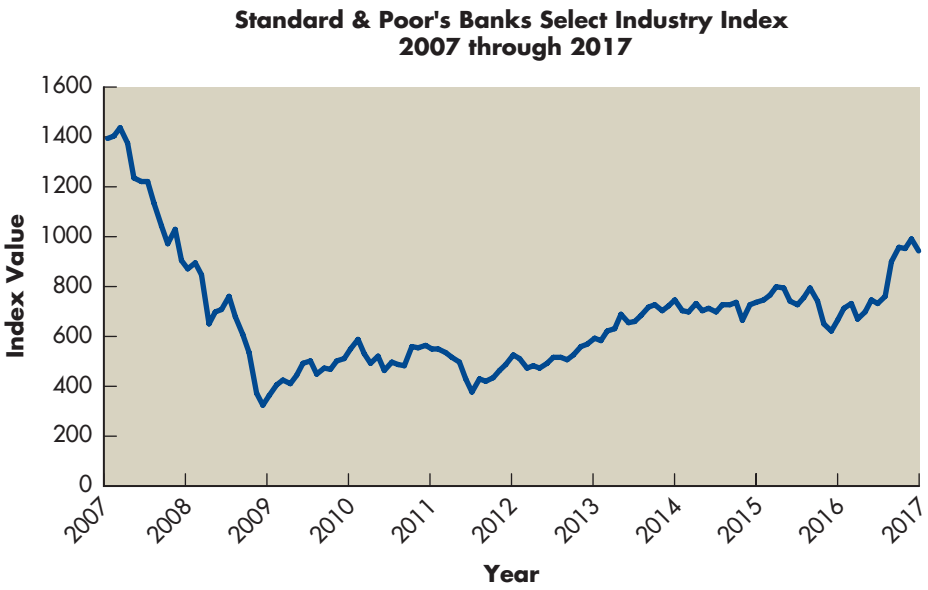
Unfortunately, as Figure 2.5 shows, home prices fell almost without interruption from May 2006 through May 2009. Over that 3-year period, home prices fell on average by more than 30%. Not surprisingly, when homeowners struggled to make mortgage payments, refinancing was no longer an option, and delinquency rates and foreclosures began to climb. By 2009, nearly 25% of subprime borrowers were behind schedule on their mortgage payments. Some borrowers, recognizing that the value of their homes was far less than the amount they owed on their mortgages, simply walked away and let lenders repossess their homes.

Crisis of Confidence in Banks

With delinquency rates rising, the value of mortgage-backed securities began to fall and so did the fortunes of financial institutions that had invested heavily in real estate assets. In March 2008, the Federal Reserve provided financing for the

FIGURE 2.6

Bank Stocks Plummet During Financial Crisis
The graph shows the Standard and Poor's Banks Select Industry Index from March 2007 to March 2017. Concerns about the health of U.S. financial institutions drove bank stocks down by 77% between May 2007 and March 2009.



acquisition (i.e., the rescue) of Bear Stearns by JPMorgan Chase. Later that year, Lehman Brothers filed for bankruptcy. Throughout 2008 and 2009, the Federal Reserve, President Bush, and finally President Obama took unprecedented steps to try to shore up the banking sector and stimulate the economy, but these measures could not completely avert the crisis.

Figure 2.6 shows the behavior of the Standard & Poor's Banks Select Industry Index, which tracks bank stocks. According to the index, bank stocks fell 77% between May 2007 and March 2009, and the number of bank failures skyrocketed. According to the FDIC, only three banks failed in 2007. In 2008, that number rose by a factor of 8 to 25 failed banks, and the number increased nearly 6 times to 140 failures in 2009. Although the economy began to recover in 2010, bank failures continued at a rapid pace, with 157 institutions failing that year, followed by 92 more failures in 2011. It was not until 2015 that bank failures fell back into the single digits.

SPILLOVER EFFECTS AND RECOVERY FROM THE GREAT RECESSION

As banks came under intense financial pressure in 2008, they began to tighten their lending standards and dramatically reduce the quantity of loans they made. In the aftermath of the Lehman Brothers bankruptcy, lending in the money market contracted very sharply. Corporations that had relied on the money market as a source of short-term funding found they could no longer raise money in this market or could do so only at extraordinarily high rates.

As a consequence, businesses began to hoard cash and cut back on expenditures, and economic activity contracted. Gross domestic product (GDP) declined in five out of six quarters starting in the first quarter of 2008, and the economy shed more than 8 million jobs in 2008–2009 as the unemployment rate reached 10%.

In response to the Great Recession, Congress passed an $862 billion stimulus package in an attempt to revive the economy, and the Federal Reserve pushed short-term interest rates close to 0%. Although the economy began to recover in 2009, the recovery was very slow. Not until May 2014 did total employment equal what it had been prior to the start of the recession, and not until September 2015 did the unemployment rate once again achieve pre-recession levels of 5% or less.

As the recession subsided and financial institutions eased credit constraints, positive economic indicators started to emerge. Figure 2.5 shows that housing prices began to recover in earnest, and mortgage default rates subsided to pre-crisis levels in March 2012. The average home price increased 42% from March 2012 to May 2017, and as of May 2017 the Case-Shiller Home Price Index was within 7% of its all-time high in April 2006. Figure 2.6 shows that the Standard & Poor's Banks Select Industry Index rose 136% from the end of December 2011 to February 2017, and according to the FDIC, bank failures steadily decreased from 51 in 2012 to only 5 in 2016.

The experience of the financial crisis and the recession that followed illustrates the importance of financial markets to the functioning of a market economy. By some measures, the 2008–2009 recession was the worst experienced in the United States since the Great Depression. Indeed, many parallels exist between those two economic contractions. Both were preceded by a period of rapid economic growth, rising stock prices, and movements by banks into new lines of business, and both involved a major crisis in the financial sector. Financial markets help transfer funds from savers to borrowers, and the smooth flow of credit is vital to the health of the economy. When that flow is interrupted and firms are denied access to credit, they invest less and hire fewer people.

→ REVIEW QUESTIONS MyLab Finance Solutions

2–15 What is securitization, and how does it facilitate investment in real estate assets?

2–16 What is a mortgage-backed security? What basic risk is associated with mortgage-backed securities?

2–17 How do rising home prices contribute to low mortgage delinquencies?

2–18 Why do falling home prices create an incentive for homeowners to default on their mortgages even if they can afford to make the monthly payments?

2–19 Why does a crisis in the financial sector spill over into other industries?

SUMMARY

THE ROLE OF FINANCIAL INSTITUTIONS AND MARKETS

This chapter described why financial institutions and markets are an integral part of managerial finance. Companies cannot get started or survive without raising capital, and financial institutions and markets give firms access to the financing necessary for growth. As we have seen in recent years, however,

financial markets can be quite turbulent, and when large financial institutions get into trouble, access to capital is reduced and firms throughout the economy suffer as a result.

REVIEW OF LEARNING GOALS

LG1 **Understand the role that financial institutions play in managerial finance.** Financial institutions bring net suppliers of funds and net demanders together to help translate the savings of individuals, businesses, and governments into loans and other types of investments. The net suppliers of funds are generally individuals or households who save more money than they borrow. Businesses and governments are generally net demanders of funds, meaning they borrow more money than they save.

LG2 **Understand the role that financial markets play in managerial finance.** Like financial institutions, financial markets help businesses raise the external financing they need to fund new investments for growth. Financial markets provide a forum in which savers and borrowers can transact business directly. Businesses and governments issue debt and equity securities directly to the public in the primary market. Subsequent trading of these securities between investors occurs in the secondary market.

LG3 **Describe the differences between the money market and the capital market.** In the money market, savers who want a temporary place to deposit funds where they can earn interest interact with borrowers who have a short-term need for funds. Marketable securities, including Treasury bills, commercial paper, and other instruments, are the main securities traded in the money market. The Eurocurrency market is the international equivalent of the domestic money market.

In contrast, the capital market is the forum in which savers and borrowers interact on a long-term basis. Firms issue either debt (bonds) or equity (stock) securities in the capital market. Once issued, these securities trade on secondary markets that are either broker markets or dealer markets. An important function of the capital market is to determine the underlying value of the securities issued by businesses. In an efficient market, the price of a security is an unbiased estimate of its true value.

LG4 **Understand the major regulations and regulatory bodies that affect financial institutions and markets.** The Glass-Steagall Act created the FDIC and imposed a separation between commercial and investment banks. The act was designed to limit the risks that banks could take and to protect depositors. More recently, the Gramm-Leach-Bliley Act essentially repealed the elements of Glass-Steagall pertaining to the separation of commercial and investment banks. After the recent financial crisis, much debate has occurred regarding the proper regulation of large financial institutions. The Dodd-Frank Act was passed in 2010 and contained a host of new regulatory requirements, the effects of which are yet to be determined.

The Securities Act of 1933 and the Securities Exchange Act of 1934 are the major pieces of legislation shaping the regulation of financial markets. The 1933

act focuses on regulating the sale of securities in the primary market, whereas the 1934 act deals with regulations governing transactions in the secondary market. The 1934 act also created the Securities and Exchange Commission, the primary body responsible for enforcing federal securities laws.

LG5 **Describe the process of issuing common stock, including venture capital, going public, and the investment bank.** The initial external financing for business startups with attractive growth prospects typically comes in the form of private equity raised via a private equity placement. These investors can be either angel investors or venture capitalists (VCs). VCs usually invest in both early-stage and later-stage companies that they hope to take public to cash out their investments.

The first public issue of a firm's stock is called an initial public offering (IPO). The company selects an investment bank to advise it and to sell the securities. The lead investment bank may form a selling syndicate with other investment banks. The IPO process includes getting SEC approval, promoting the offering to investors, and pricing the issue.

LG6 **Understand what is meant by financial markets in crisis, and describe some of the root causes of the Great Recession.** The financial crisis was caused by several factors related to investments in real estate. Financial institutions lowered their standards for lending to prospective homeowners, and institutions also invested heavily in mortgage-backed securities. When home prices fell and mortgage delinquencies rose, the value of the mortgage-backed securities held by banks plummeted, causing some banks to fail and many others to restrict the flow of credit to business. That, in turn, contributed to a severe recession in the United States that became known as the Great Recession.

SELF-TEST PROBLEM (Solution in Appendix)

LG3

ST2–1 **Transaction costs** Assume that you use a TD Ameritrade brokerage account and place your stock trades through the Interactive Voice Response (IVR) Phone System, which charges a $34.99 commission per stock trade. You would like to sell 1,500 shares of Microsoft Corporation, which is listed on the Nasdaq stock exchange, so you check the real-time quotes through TD Ameritrade and see a bid price of $57.31 and an ask price of $57.33.

a. What is the current bid/ask spread for Microsoft?

b. If you place the sell order and TD Ameritrade routes the order to Microsoft's listing exchange, what are your likely total transaction costs? (*Hint:* Nasdaq is a dealer market.)

c. What are your total transaction costs if the Nasdaq dealer who receives your order decides to act as broker and allows a public order to buy 1,500 shares of Microsoft to satisfy your order?

d. Regardless of how your trade is executed, based on the bid/ask spread what is the market value of your trade?

WARM-UP EXERCISES

Select problems are available in MyLab Finance

LG 1

E2–1 What does it mean when we say that individuals as a group are net suppliers of funds for financial institutions? What do you think the consequences might be for financial markets if individuals consumed more of their incomes and thereby reduced the supply of funds available to financial institutions?

LG 2

E2–2 FastFood Ltd. manufactures vending machines for schools. To meet the increasing demand, FastFood decides to build a new factory. The company requires £5 million to expand production. How do you think the process of raising this money will differ if FastFood borrows it from financial institutions versus raising it directly?

LG 3

E2–3 What are the sources of short-term funding available to large corporations? Differentiate these sources from those needed to raise funds for a long-term capital investment.

LG 4

E2–4 There is a renewed interest in the extent to which government regulations can be incorporated in corporate governance and financial markets and institutions. There are various arguments both in favor of and against increasing the level of government regulation. What do you think is the most important argument in support of increased government regulation?

LG 5

E2–5 Dean Drones Ltd., based in Hong Kong, has 1 million shares outstanding. The firm is planning on issuing an additional 100,000 shares at an offer price of $5 by way of crowdfunding. They have engaged a crowdfunding company which has agreed to a commission of 4% of the amount raised. Dean Drones has also planned to sell another 25,000 shares to a venture capitalist, who will only invest if the crowdfunding is successful. However, he will pay 75% of the offer price. How much cash will Dean Drones raise from these share sales?

LG 6

E2–6 Three of your former classmates from the University of London have started a business—supplying custom-made construction materials (like pre-fabricated bathroom units) to construction companies and student housing properties. They have offered you a chance to invest in their company as a shareholder. What type of questions would you need to ask them to help assess the risk of this investment opportunity?

PROBLEMS

Select problems are available in MyLab Finance. The MyLab icon indicates problems in Excel format available in MyLab Finance.

LG 3

P2–1 **Transaction costs** You would like to purchase one Class A share of Berkshire Hathaway through your Scottrade brokerage account. Scottrade charges a $7 commission for online trades. You log into your account, check the real-time quotes for Berkshire Hathaway (you see a bid price of $262,850 and an ask price of $263,770) and submit your order.

a. What is the current bid/ask spread for Berkshire Hathaway Class A shares?

b. If Scottrade routes your buy order to the NYSE, where Berkshire Hathaway is listed, what's the potential minimum your total transaction costs will be?

c. If, instead, Scottrade routes your buy order to the Nasdaq, where Berkshire Hathaway is not listed, what's the potential maximum your total transaction costs will be?
d. Regardless of how your trade is executed, based on the bid/ask spread what is the market value of your trade?

LG 3

P2–2 **Transaction costs** In late December you decide, for tax purposes, to sell a losing position that you hold in Twitter, which is listed on the NYSE, so that you can capture the loss and use it to offset some capital gains, thus reducing your taxes for the current year. However, since you still believe that Twitter is a good long-term investment, you wish to buy back your position in February the following year. To get this done you call your Charles Schwab brokerage account manager and request that he immediately sell your 1,200 shares of Twitter and then in early February buy them back. Charles Schwab charges a commission of $4.95 for online stock trades and for broker-assisted trades there is an additional $25.00 service charge, so the total commission is $29.95.

a. Suppose that your total transaction costs for selling the 1,200 shares of Twitter in December were $59.95. What was the bid/ask spread for Twitter at the time your trade was executed?
b. Given that Twitter is listed on the NYSE, do your total transaction costs for December seem reasonable? Explain why or why not.
c. When your February statement arrives in the mail, you see that your total transaction costs for buying the 1,200 shares of Twitter were $47.95. What was the bid/ask spread for Twitter at the time your trade was executed?
d. What are your total round-trip transaction costs for both selling and buying the shares, and what could you have done differently to reduce the total costs?

LG 5 MyLab

P2–3 **Initial public offering** On April 13, 2017, Yext Inc. completed its IPO on the NYSE. Yext sold 10,500,000 shares of stock at an offer price of $11 with an underwriting discount of $0.77 per share. Yext's closing stock price on the first day of trading on the secondary market was $13.41, and 85,489,470 shares were outstanding.

a. Calculate the total proceeds for Yext's IPO.
b. Calculate the percentage underwriter discount.
c. Calculate the dollar amount of the underwriting fee for Yext's IPO.
d. Calculate the net proceeds for Yext's IPO.
e. Calculate Yext's IPO underpricing.
f. Calculate Yext's market capitalization.

LG 5

P2–4 **Initial public offering** A Brazilian company called Netshoes completed its IPO on April 12, 2017, and listed on the NYSE. Netshoes sold 8,250,000 shares of stock to primary market investors at an IPO offer price of $18, with an underwriting discount of 6.5%. Secondary market investors, however, were paying only $16.10 per share for Netshoes' 31,025,936 shares of stock outstanding.

a. Calculate the total proceeds for Netshoes' IPO.
b. Calculate the dollar amount of the underwriting fee for Netshoes' IPO.
c. Calculate the net proceeds for Netshoes' IPO.
d. Calculate market capitalization for Netshoes' outstanding stock.
e. Calculate IPO underpricing for Netshoes' IPO.
f. Explain the IPO underpricing for Netshoes.

P2–5 **ETHICS PROBLEM** The Securities Exchange Act of 1934 limits, but does not prohibit, corporate insiders from trading in their own firm's shares. What ethical issues might arise when a corporate insider wants to buy or sell shares in the firm where he or she works?

SPREADSHEET EXERCISE

MuleSoft, Inc. conducted its IPO on March 17, 2017 for the principal purposes of increasing its capitalization and financial flexibility, creating a public market for its Class A common stock, and enabling access to the public equity markets for it and its stockholders. MuleSoft sold 13 million shares for an IPO offer price of $17 per share. The underwriting discount was $1.19 per share. MuleSoft intends to use the net proceeds from the offering to the firm for general corporate purposes, such as working capital, operating expenses, and capital expenditures, and to possibly acquire complementary businesses, products, services or technologies. MuleSoft's closing stock price was $24.75 after the first day of trading on the NYSE and there were 125,991,577 shares of stock outstanding.

TO DO

Create a spreadsheet to conduct an analysis of MuleSoft's IPO, and determine the following:

a. Calculate the total proceeds for MuleSoft's IPO.
b. Calculate the percentage underwriter discount for MuleSoft's IPO.
c. Calculate the dollar amount of the underwriting fee for MuleSoft's IPO.
d. Calculate the net proceeds for MuleSoft's IPO.
e. Calculate the percentage IPO underpricing for MuleSoft's IPO.
f. Calculate the market capitalization for MuleSoft's IPO after the first day of trading in the secondary market.

PART TWO

Financial Tools

CHAPTERS IN THIS PART

In Part Two, you will learn about some of the basic analytical tools that financial managers use almost every day. Chapter 3 reviews the main financial statements used as a firm's primary means of communication with investors, analysts, and the rest of the business community. The chapter also demonstrates some simple tools for analyzing the information contained in financial statements; these tools will help managers to identify and diagnose financial problems.

Firms create financial statements using the accrual principles of accounting; in finance, though, cash flow is what really matters. Chapter 4 shows how to use financial statements in determining the amount of cash flow a firm is generating and the ways in which it is spending that cash flow. It also explains how firms develop short-term and long-term financial plans.

Managers must decide whether the cash flows that investments produce over time justify their up-front costs. Chapter 5 illustrates techniques for making these sorts of judgments.

CHAPTER 3

Financial Statements and Ratio Analysis

LEARNING GOALS

- LG1 Review the contents of the stockholders' report and the procedures for consolidating international financial statements.
- LG2 Understand who uses financial ratios and how.
- LG3 Use ratios to analyze a firm's liquidity and activity.
- LG4 Discuss the relationship between debt and financial leverage, as well as the ratios used to analyze a firm's debt.
- LG5 Use ratios to analyze a firm's profitability and its market value.
- LG6 Use a summary of financial ratios and the DuPont system of analysis to perform a complete ratio analysis.

MyLab Finance Chapter Introduction Video

WHY THIS CHAPTER MATTERS TO YOU

In your *professional* life

ACCOUNTING You need to understand how your colleagues in the finance field function as well as how outside investors analyze the four essential financial statements that the accounting department compiles. You especially need to understand how analysts use key financial ratios to assess a firm's health.

INFORMATION SYSTEMS You need to understand what data are included in the firm's financial statements so you can design systems that will supply such data to those who prepare the statements and to those who use the data for ratio calculations.

MANAGEMENT You need to understand why different firm stakeholders will have an interest in the firm's financial statements and how those stakeholders will analyze the statements to assess the firm's performance—and yours.

MARKETING You need to understand the effects your decisions will have on the financial statements, particularly the income statement and the statement of cash flows, and how analysis of ratios, especially those involving sales figures, will affect the firm's decisions about inventory, credit policies, and pricing decisions.

OPERATIONS You need to understand how the costs of operations are reflected in the firm's financial statements and how analysis of ratios—particularly those involving assets, cost of goods sold, or inventory—may affect requests for new equipment or facilities.

In your *personal* life

A routine step in personal financial planning is to prepare and analyze personal financial statements so that you can monitor progress toward your financial goals. Also, to build and monitor your investment portfolio, you need to understand and analyze corporate financial statements.

LG 1

3.1 The Stockholders' Report

generally accepted accounting principles (GAAP)
The practice and procedure guidelines used to prepare and maintain financial records and reports; authorized by the Financial Accounting Standards Board (FASB).

Financial Accounting Standards Board (FASB)
The accounting profession's rule-setting body, which authorizes generally accepted accounting principles (GAAP).

Public Company Accounting Oversight Board (PCAOB)
A not-for-profit corporation established by the Sarbanes-Oxley Act of 2002 to protect the interests of investors and further the public interest in the preparation of informative, fair, and independent audit reports.

stockholders' report
Annual report that publicly owned corporations must provide to stockholders; it summarizes and documents the firm's financial activities during the past year.

letter to stockholders
Typically, the first element of the annual stockholders' report and the primary communication from management.

Every corporation has many uses for the standardized reports of its financial activities. Periodically, companies prepare reports for regulators, creditors (lenders), owners, and management. The guidelines they use to prepare and maintain financial records are known as **generally accepted accounting principles (GAAP).** The accounting profession's rule-setting body, the **Financial Accounting Standards Board (FASB)**, authorizes these accounting principles.

In addition, the *Sarbanes-Oxley Act of 2002,* enacted in an effort to eliminate many disclosure and conflict of interest problems of corporations, established the **Public Company Accounting Oversight Board (PCAOB),** a not-for-profit corporation that oversees auditors of public corporations. Congress charged the PCAOB with protecting the interests of investors and furthering the public interest in the preparation of informative, fair, and independent audit reports. Legislators hoped that the PCAOB would instill confidence in investors with regard to the accuracy of public corporations' audited financial statements.

The U.S. Securities and Exchange Commission (SEC)—the federal regulatory body that governs the sale and listing of securities—requires publicly owned corporations with more than $5 million in assets and 500 or more stockholders to provide their stockholders with an annual **stockholders' report.** The stockholders' report summarizes and documents the firm's financial activities during the past year. It begins with a letter to the stockholders from the firm's chief executive officer or chairman of the board.

THE LETTER TO STOCKHOLDERS

The **letter to stockholders** is the primary communication from management in the annual report. It describes the events that managers believe had the greatest effect on the firm during the year. It also typically discusses management philosophy, corporate governance issues, strategies, and plans for the coming year.

THE FOUR KEY FINANCIAL STATEMENTS

The four key financial statements required by the SEC for reporting to shareholders are (1) the income statement, (2) the balance sheet, (3) the statement of stockholders' equity, and (4) the statement of cash flows. The financial statements from the 2019 stockholders' report of Bartlett Company, a manufacturer of metal fasteners, are presented and briefly discussed in this section. Most likely, you have studied these four financial statements in an accounting course, so the purpose here is to refresh your memory of the basics rather than provide an exhaustive review.

Income Statement

income statement
Provides a financial summary of the firm's operating results during a specified period.

The **income statement** provides a financial summary of the firm's operating results during a specified period, usually one quarter or one year. Companies produce and release to the public quarterly and annual income statements based

FOCUS ON ETHICS *in practice*

Earnings Shenanigans

Near the end of each quarter, many publicly traded companies unveil performance numbers in a Wall Street ritual known as "earnings season." Interest is high as media outlets race to report the announcements, analysts pore over the figures, and investors trade on the implications. The most anticipated metric is normally earnings per share (EPS), which for each firm is compared to the consensus forecast of market analysts. Firms beating the forecast tend to enjoy jumps in share prices while those falling short, by even a small amount, tend to suffer price declines.

Pressure to meet or beat market expectations can push executives to unethical, and sometimes illegal, acts of financial misrepresentation. In April 2016, Logitech International S.A., a leading producer of peripherals for computers (like its famous mouse) and other electronics, agreed to a $7.5 million penalty to settle with the U.S. Securities and Exchange Commission (SEC) for fraudulently underreporting losses on a new product in 2011 and, more generally, understating likely expenses on product warranties in 2012/2013—all just to meet earnings expectations.

In October 2010, Logitech launched "Revue"—a device for streaming online media on a television. Demand fell far short of expectations, resulting in well over 100,000 unsold units by fourth quarter 2011. Generally Accepted Accounting Principles (GAAP) require valuing such inventory at market value if the firm foresees slashing the sales price below cost. Yet Logitech failed to fully mark down unsold Revues, thereby seriously overstating 2011 operating income. On a broader scale, Logitech also artificially boosted income in 2012 and 2013 by understating the number of its products covered by warranties as well as the size of likely claims on defective devices.

In his 2002 letter to shareholders, Berkshire Hathaway President, CEO, and Board Chairman Warren Buffett shared three enduring nuggets of wisdom to keep in mind when looking at financials: (i) weak accounting practices typically signify bigger problems, (ii) unintelligible information usually indicates shifty management, and (iii) earnings often fall short of rosy forecasts because firms seldom operate in predictable environments. The Sage of Omaha closed the newsletter on a prophetic note: "Managers that always promise to 'make the numbers' will at some point be tempted to make up the numbers."

▶ *Logitech understated potential warranty expenses by assuming customers would submit defective-product claims within one quarter—even though warranties extended for many years. Suppose instinct tells you the assumption is reasonable and ethical because problems with electronic devices occur soon after purchase or not at all. What evidence might you compile to challenge your instincts and satisfy auditors?*

"SEC Announced Financial Fraud Cases," U.S. Securities and Exchange Press Release 2016-74 (April 19, 2016). Two executives also lost their jobs and agreed to pay five-figure fines. Link: https://www.sec.gov/news/pressrelease/2016-74.html.

on their fiscal year, which may or may not align with a calendar year. Kroger's fiscal year, for example, ends on or near January 31, so the company would report earnings for the fiscal year 2017 in January 2018. About 70% of U.S. public companies align their fiscal year with the calendar year. Most large companies produce income statements at least monthly, but they use these statements internally and do not publicly release them.

Table 3.1 presents Bartlett Company's income statements for the years ended December 31, 2019 and 2018. The 2019 statement begins with sales revenue, which is the total dollar amount of sales during the period. Next we subtract the cost of goods sold to obtain Bartlett's gross profit of $986,000, which represents the amount remaining to pay operating, financial, and tax costs. Then we deduct operating expenses—which include selling expense, general and administrative expense, lease expense, and depreciation expense—to arrive at *operating profits* of $418,000. Operating profits represent what the company earned from producing and selling products before deducting any costs related to debt financing

(i.e., interest expense) and taxes. For this reason, operating profit is often called *earnings before interest and taxes,* or *EBIT*. Finally we deduct the cost of any debt financing—interest expense—to find *net profits* (or *earnings*) *before taxes*. After subtracting $93,000 in 2019 interest, Bartlett Company had $325,000 of net profits before taxes.

Once we have the before-tax profit, we can calculate taxes due based on the appropriate tax rates. Deducting taxes leaves us with *net profits* (or *earnings*) *after taxes,* also referred to as *net income*. Bartlett Company's net profits after taxes for 2019 were $231,000. We must subtract preferred stock dividends (if the firm has preferred stock) from net profits after taxes to arrive at *earnings available for common stockholders,* which is the amount earned by the firm on behalf of its common stockholders.

Dividing earnings available for common stockholders by the number of shares of common stock outstanding results in *earnings per share (EPS)*. EPS represent the number of dollars earned during the period on behalf of each outstanding share of common stock. In 2019, Bartlett Company earned $221,000, and it had 76,262 common shares outstanding. Dividing earnings available for common stockholders by shares outstanding results in earnings per share of $2.90.

TABLE 3.1 Bartlett Company Income Statements ($000)

	For the years ended December 31	
	2019	2018
Sales revenue	$3,074	$2,567
Less: Cost of goods sold	2,088	1,711
Gross profits	$ 986	$ 856
Less: Operating expenses		
Selling expense	$ 100	$ 108
General and administrative expenses	194	187
Other operating expenses	35	35
Depreciation expense	239	223
Total operating expense	$ 568	$ 553
Operating profits	$ 418	$ 303
Less: Interest expense	93	91
Net profits before taxes	$ 325	$ 212
Less: Taxes	94	64
Net profits after taxes	$ 231	$ 148
Less: Preferred stock dividends	10	10
Earnings available for common stockholders	$ 221	$ 138
Earnings per share (EPS)[a]	$2.90	$1.81
Dividend per share (DPS)[b]	$1.29	$0.75

[a]Calculated by dividing the earnings available for common stockholders by the number of shares of common stock outstanding: 76,262 in 2019 and 76,244 in 2018. Earnings per share in 2019: $221,000 ÷ 76,262 = $2.90; in 2018: $138,000 ÷ 76,244 = $1.81.

[b]Calculated by dividing the dollar amount of dividends paid to common stockholders by the number of shares of common stock outstanding. Dividends per share in 2019: $98,000 ÷ 76,262 = $1.29; in 2018: $57,183 ÷ 76,244 = $0.75.

dividend per share (DPS)
The dollar amount of cash distributed during the period on behalf of each outstanding share of common stock.

Companies are not legally required to pay dividends to shareholders, and in fact many firms do not pay dividends, preferring to reinvest their earnings in new assets to finance growth. However, many companies do pay dividends, and management (along with the board of directors) determines the size of the payments. In 2019, Bartlett decided to pay $98,000 in dividends to shareholders, which translates into a **dividend per share** of $1.29. Because Bartlett pays cash dividends to its shareholders, the income statement shows how much cash the company paid to each share in 2019.

PERSONAL FINANCE EXAMPLE 3.1

Jan and Jon Smith, a mid-30s married couple with no children, prepared a personal income and expense statement, which is similar to a corporate income statement. A condensed version of their income and expense statement follows.

Jan and Jon Smith's Income and Expense Statement for the Year Ended December 31, 2019

Income	
Salaries	$91,500
Interest received	195
Dividends received	120
(1) Total income	$91,815
Expenses	
Mortgage payments	$11,500
Auto loan payments	4,280
Utilities	3,180
Home repairs and maintenance	1,050
Food	8,235
Car expense	5,450
Health care and insurance	3,150
Clothes, shoes, accessories	2,745
Insurance	1,380
Taxes	36,600
Appliance and furniture payments	1,250
Recreation and entertainment	4,575
Tuition and books for Jan	3,830
Personal care and other items	915
(2) Total expenses	$88,140
(3) Cash surplus (or deficit) [(1) − (2)]	$ 3,675

During the year, the Smiths had total income of $91,815 and total expenses of $88,140, which left them with a cash surplus of $3,675. They can save and invest the surplus. Notice that the $3,675 represents just about 4% of the Smiths' total income. Most financial advisors would suggest a much higher savings rate, so Jan and Jon may want to take a hard look at their budget to see where they can cut expenses.

Balance Sheet

balance sheet
Summary statement of the firm's financial position at a given point in time.

current assets
Short-term assets, expected to be converted into cash within 1 year.

current liabilities
Short-term liabilities, expected to be paid within 1 year.

The **balance sheet** presents a summary statement of the firm's financial position at a given time. The statement balances the firm's assets (what it owns) against its financing, which can be either debt (what it owes) or equity (what owners provided). Bartlett Company's balance sheets as of December 31 of 2019 and 2018 appear in Table 3.2. They show a variety of asset, liability (debt), and equity accounts.

The balance sheet makes a clear distinction between short-term and long-term assets and liabilities. The **current assets** and **current liabilities** are short-term assets and liabilities, which means that the firm will convert them into cash

TABLE 3.2 Bartlett Company Balance Sheets ($000)

	December 31	
Assets	**2019**	**2018**
Cash	$ 363	$ 288
Marketable securities	68	51
Accounts receivable	503	365
Inventories	289	300
Total current assets	$1,223	$1,004
Land and buildings	$2,072	$1,903
Machinery and equipment	1,866	1,693
Furniture and fixtures	358	316
Vehicles	275	314
Other (includes financial leases)	98	96
Total gross fixed assets (at cost)	$4,669	$4,322
Less: Accumulated depreciation	2,295	2,056
Net fixed assets	$2,374	$2,266
Total assets	$3,597	$3,270
Liabilities and Stockholders' Equity		
Accounts payable	$ 382	$ 270
Notes payable	79	99
Accruals	159	114
Total current liabilities	$ 620	$ 483
Long-term debt (includes financial leases)	1,023	967
Total liabilities	$1,643	$1,450
Preferred stock: cumulative 5%, $100 par, 2,000 shares authorized and issued	$ 200	$ 200
Common stock: $2.50 par, 100,000 shares authorized, shares issued and outstanding in 2019: 76,262; in 2018: 76,244	191	191
Paid-in capital in excess of par on common stock	428	417
Retained earnings	1,135	1,012
Total stockholders' equity	$1,954	$1,820
Total liabilities and stockholders' equity	$3,597	$3,270

(current assets) or pay them (current liabilities) within 1 year. The balance sheet classifies all other assets and liabilities, along with stockholders' equity, as long-term, or fixed, because they will likely remain on the firm's books for more than 1 year.

Accountants refer to an item on the balance sheet as being *liquid* if the item is easy to convert into cash quickly without much loss in value. The balance sheet lists assets from the most liquid—cash—down to the least liquid. Marketable securities are very liquid short-term investments, such as U.S. Treasury bills or certificates of deposit, held by the firm. Most financial analysts view marketable securities as almost perfect substitutes for cash because they are so easy to sell quickly. Accounts receivable represent the total monies owed the firm by its customers on credit sales. They are not as liquid as cash and marketable securities because some uncertainty always exists regarding whether a firm's customers will pay their bills. Inventories include raw materials, work in process (partially finished goods), and finished goods held by the firm. Inventories are even less liquid because the firm must first sell the finished product and then collect on the sale. The entry for gross fixed assets is the original cost of all fixed (long-term) assets owned by the firm. Net fixed assets represent the difference between gross fixed assets and accumulated depreciation, the total expense recorded for the depreciation of fixed assets. The value of any item listed on the balance sheet is called its *book value*.

Similarly, the balance sheet lists the liabilities and equity accounts from short-term to long-term. Current liabilities include accounts payable, amounts owed for credit purchases by the firm; notes payable, outstanding short-term loans, typically from commercial banks; and accruals, amounts owed for services for which a bill may not or will not be received. Examples of accruals include taxes due the government and wages due employees. **Long-term debt** represents debt for which payment is not due in the current year. Stockholders' equity refers to the owners' claims on the firm. The preferred stock entry shows the historical proceeds from the sale of preferred stock ($200,000 for Bartlett Company).

long-term debt
Debt for which payment is not due in the current year.

Next, the amount paid by the original purchasers of common stock appears in two separate entries—common stock and paid-in capital in excess of par on common stock. The common stock entry is the *par value* of common stock. Par value is an arbitrary number assigned to shares of stock when they are first created. The par value is not related to the price investors pay for the stock that a company issues. **Paid-in capital in excess of par** represents the amount of proceeds in excess of the par value received from the original sale of common stock. The sum of the common stock and paid-in capital accounts divided by the number of shares outstanding represents the original price per share received by the firm on a single issue of common stock. Bartlett Company therefore received about $8.12 per share [($191,000 par + $428,000 paid-in capital in excess of par) ÷ 76,262 shares] from the sale of its common stock.

paid-in capital in excess of par
The amount of proceeds in excess of the par value received from the original sale of common stock.

Finally, **retained earnings** represent the cumulative total of all earnings, net of dividends, that the company has retained and reinvested in the firm since its inception. It is important to recognize that retained earnings do not represent a pool of cash that the firm can draw upon. Rather, they are funds already reinvested in the business.

retained earnings
The cumulative total of all earnings, net of dividends, that have been retained and reinvested in the firm since its inception.

Bartlett Company's balance sheets in Table 3.2 show that the firm's total assets increased from $3,270,000 in 2018 to $3,597,000 in 2019. The $327,000 increase was due to increases of $219,000 in current assets and $108,000 in net fixed assets. The asset increase, in turn, appears to have been financed mainly by increases of $123,000 in retained earnings and $193,000 in total liabilities. Better insight into these changes can be derived from the statement of cash flows, which we will discuss shortly.

PERSONAL FINANCE EXAMPLE 3.2 The following personal balance sheet for Jan and Jon Smith—the couple introduced earlier, who are married, in their mid-30s, and have no children—is similar to a corporate balance sheet.

Jan and Jon Smith's Balance Sheet: December 31, 2019

Assets		Liabilities and Net Worth	
Cash on hand	$ 90	Credit card balances	$ 665
Checking accounts	575	Utility bills	265
Savings accounts	760	Medical bills	75
Money market funds	800	Other current liabilities	45
Total liquid assets	$ 2,225	Total current liabilities	$ 1,050
Stocks and bonds	$ 2,250	Real estate mortgage	$120,000
Mutual funds	1,500	Auto loans	14,250
Retirement funds, IRA	2,000	Education loan	13,800
Total investments	$ 5,750	Personal loan	4,000
Real estate	$180,000	Furniture loan	800
Cars	34,000	Total long-term liabilities	$152,850
Household furnishings	3,700	Total liabilities	$153,900
Jewelry and artwork	1,500	Net worth (N/W)	73,275
Total personal property	$219,200		
Total assets	$227,175	Total liabilities and net worth	$227,175

The Smiths have total assets of $227,175 and total liabilities of $153,900. Personal net worth (N/W) is a "plug figure"—the difference between total assets and total liabilities—which in the case of Jan and Jon Smith is $73,275.

statement of stockholders' equity
Shows all equity account transactions that occurred during a given year.

statement of retained earnings
Reconciles the net income earned during a given year, and any cash dividends paid, with the change in retained earnings between the start and the end of that year. An abbreviated form of the *statement of stockholders' equity.*

Statement of Retained Earnings

The statement of retained earnings is an abbreviated form of the statement of stockholders' equity. Unlike the **statement of stockholders' equity,** which shows all equity account transactions that occurred during a given year, the **statement of retained earnings** reconciles the net income earned during a given year, and any cash dividends paid, with the change in retained earnings between the start and the end of that year. Table 3.3 presents this statement for Bartlett Company for the year ended December 31, 2019. The statement shows that the company began the year with $1,012,000 in retained earnings and had net profits

TABLE 3.3 Bartlett Company Statement of Retained Earnings ($000) for the Year Ended December 31, 2019

Retained earnings balance (January 1, 2019)	$1,012
Plus: Net profits after taxes (for 2019)	231
Less: Cash dividends (paid during 2019)	
Preferred stock	10
Common stock	98
Total dividends paid	$ 108
Retained earnings balance (December 31, 2019)	$1,135

after taxes of $231,000, from which it paid a total of $108,000 in dividends, resulting in year-end retained earnings of $1,135,000. Thus, the net increase for Bartlett Company was $123,000 ($231,000 net profits after taxes minus $108,000 in dividends) during 2019.

Statement of Cash Flows

statement of cash flows
Provides a summary of the firm's operating, investment, and financing cash flows and reconciles them with changes in its cash and marketable securities during the period.

The **statement of cash flows** is a summary of the cash flows over the period. The statement provides insight into the firm's operating, investment, and financing cash flows and reconciles them with changes in its cash and marketable securities during the period. Bartlett Company's statement of cash flows for the year ended December 31, 2019, appears in Table 3.4. We provide further insight into this statement in our discussion of cash flow later in this text.

NOTES TO THE FINANCIAL STATEMENTS

notes to the financial statements
Explanatory notes keyed to relevant accounts in the statements; they provide detailed information on the accounting policies, procedures, calculations, and transactions underlying entries in the financial statements.

Included with published financial statements are explanatory notes keyed to the relevant accounts in the statements. These **notes to the financial statements** provide detailed information on the accounting policies, procedures, calculations, and transactions underlying entries in the financial statements. Common issues addressed by these notes include revenue recognition, income taxes, breakdowns of fixed asset accounts, debt and lease terms, and contingencies. Since passage of Sarbanes-Oxley, notes to the financial statements have also included some details about compliance with that law. Professional securities analysts use the data in the statements and notes to develop estimates of the value of securities that the firm issues, and these estimates influence the actions of investors and therefore the firm's share value.

CONSOLIDATING INTERNATIONAL FINANCIAL STATEMENTS

Financial Accounting Standards Board (FASB) Standard No. 52
Mandates that U.S.–based companies translate their foreign-currency-denominated assets and liabilities into U.S. dollars, for consolidation with the parent company's financial statements. This process is done by using the *current rate (translation) method.*

So far, we've discussed financial statements involving only one currency, the U.S. dollar. The issue of how to consolidate a company's foreign and domestic financial statements has bedeviled the accounting profession for many years. The current policy is described in **Financial Accounting Standards Board (FASB) Standard No. 52,**

TABLE 3.4 Bartlett Company Statement of Cash Flows ($000) for the Year Ended December 31, 2019

Cash Flow from Operating Activities	
Net profits after taxes	$ 231
Depreciation	239
Increase in accounts receivable	−138[a]
Decrease in inventories	11
Increase in accounts payable	112
Increase in accruals	45
Cash provided by operating activities	$ 500
Cash Flow from Investment Activities	
Increase in gross fixed assets	−347
Change in equity investments in other firms	0
Cash provided by investment activities	−$ 347
Cash Flow from Financing Activities	
Decrease in notes payable	−20
Increase in long-term debts	56
Changes in stockholders' equity[b]	11
Dividends paid	−108
Cash provided by financing activities	−$ 61
Net increase in cash and marketable securities	$ 92

[a]As is customary, parentheses are used to denote a negative number, which in this case is a cash outflow.

[b]Retained earnings are excluded here because their change is actually reflected in the combination of the "net profits after taxes" and "dividends paid" entries.

current rate (translation) method
Technique used by U.S.–based companies to translate their foreign-currency-denominated assets and liabilities into U.S. dollars, for consolidation with the parent company's financial statements, using the year-end (current) exchange rate.

which mandates that U.S. companies translate their foreign-currency-denominated assets and liabilities into U.S. dollars for consolidation with the parent company's financial statements. This process is done with a technique called the **current rate (translation) method,** under which all of a U.S. parent company's foreign-currency-denominated assets and liabilities are converted into dollar values using the exchange rate prevailing at the fiscal year ending date (the current rate). Income statement items are treated similarly. Equity accounts, in contrast, are translated into dollars by using the exchange rate that prevailed when the parent's equity investment was made (the historical rate). Retained earnings are adjusted to reflect each year's operating profits or losses.

→ REVIEW QUESTIONS MyLab Finance Solutions

3–1 What roles do GAAP, the FASB, and the PCAOB play in the financial reporting activities of public companies?

3–2 Describe the purpose of each of the four major financial statements.

3–3 Why are the notes to the financial statements important to professional securities analysts?

3–4 How is the current rate (translation) method used to consolidate a firm's foreign and domestic financial statements?

LG2

3.2 Using Financial Ratios

ratio analysis
Involves methods of calculating and interpreting financial ratios to analyze and monitor the firm's performance.

The information contained in the four basic financial statements has major significance to a variety of interested parties who regularly need to have relative measures of the company's performance. *Relative* is the key word here, because the analysis of financial statements is based on the use of *ratios* or *relative values*. **Ratio analysis** involves methods of calculating and interpreting financial ratios to analyze and monitor the firm's performance. The basic inputs required to conduct ratio analysis are the firm's income statement and balance sheet.

INTERESTED PARTIES

Ratio analysis of a firm's financial statements is of interest to shareholders, creditors, and the firm's own management. Both present and prospective shareholders are interested in the firm's current and future level of risk and return, which directly affect share price. The firm's creditors concern themselves primarily with the short-term liquidity of the company and its ability to make interest and principal payments. A secondary concern of creditors is the firm's profitability; they want assurance that the business is healthy. Management, like stockholders, focuses on all aspects of the firm's financial situation, and it uses ratios to monitor the firm's performance from period to period.

TYPES OF RATIO COMPARISONS

Ratio analysis is not merely the calculation of a given ratio. More important is the *interpretation* of the ratio value. Usually, the value of a particular ratio is less important than how it changes over time or how it compares to the same ratios for competing firms. Looking at ratios over time or in comparison to other firms in the same industry allows users of financial ratios to make more refined judgments about a company's performance.

Cross-Sectional Analysis

cross-sectional analysis
Comparison of different firms' financial ratios at the same point in time; involves comparing the firm's ratios with those of other firms in its industry or with industry averages.

benchmarking
A type of *cross-sectional analysis* in which the firm's ratio values are compared with those of a key competitor or with a group of competitors that it wishes to emulate.

Cross-sectional analysis involves the comparison of different firms' financial ratios at the same point in time. Analysts are often interested in how well a firm has performed in relation to other firms in its industry. Frequently, a firm will compare its ratio values with those of a key competitor, a group of competitors, or even top-performing firms from other industries that it wishes to emulate. Nearly all users of financial ratios employ this type of cross-sectional analysis, called **benchmarking**.

One simple type of benchmarking compares a particular company's financial ratios to the industry averages. Several sources publish industry average ratios, including the *Almanac of Business and Industrial Financial Ratios, Dun & Bradstreet's Industry Norms and Key Business Ratios, RMA Annual Statement Studies, Value Line,* and various online sources. Table 3.5 illustrates a brief cross-sectional ratio analysis by comparing several ratios for pairs of firms that compete with each other as well as for the industry average value.

Analysts have to exercise great care when drawing conclusions from ratio comparisons. It's tempting to assume that if one ratio for a particular firm is

TABLE 3.5 Financial Ratios for Select Firms and Their Industry Average Values

	Current ratio	Quick ratio	Inventory turnover	Average collection period (days)	Total asset turnover	Debt ratio	Net profit margin	Return on total assets	Return on common equity	Price to earnings ratio
Apple	1.4	1.3	61.6	49.6	0.7	0.6	21.2%	14.2%	35.6%	16.9
Hewlett-Packard	1.0	0.7	8.8	31.1	1.7	0.7	5.2	8.6	16.4	10.7
Computers	1.5	0.6	21.0	57.0	0.8	0.4	15.6	11.9	32.3	16.0
Home Depot	1.3	0.4	4.3	5.3	1.6	0.5	4.0	6.5	13.7	22.7
Lowe's	1.3	0.2	3.7	0.0	1.4	0.4	3.7	5.4	9.3	20.6
Building materials	2.8	0.8	3.7	5.3	1.6	0.3	4.0	6.5	13.7	26.2
Kroger	0.8	0.2	11.5	5.8	3.2	0.8	1.9	6.0	30.0	13.6
Whole Foods Market	1.5	1.1	19.9	5.6	2.5	0.5	3.2	8.0	15.7	18.0
Grocery stores	1.3	0.7	11.1	7.5	2.4	0.6	2.1	3.1	9.8	20.8
Target	0.9	0.3	5.9	3.9	1.8	0.7	3.8	7.1	24.4	10.7
Walmart	0.9	0.3	9.0	3.7	2.4	0.6	3.5	8.4	20.3	16.3
Merchandise stores	1.7	0.6	4.1	3.7	2.3	0.5	1.5	4.9	10.8	37.1

The data used to calculate these ratios are drawn from the Compustat North American database.

above the industry norm, it signifies that the firm is performing well, at least along the dimension measured by that ratio. However, ratios may be above or below the industry norm for both positive and negative reasons, and it is necessary to determine why a firm's performance differs from that of its industry peers. *Thus, ratio analysis on its own is probably most useful in highlighting areas for further investigation.*

EXAMPLE 3.3

MyLab Finance Solution Video

In early 2019, Mary Boyle, the chief financial analyst at Caldwell Manufacturing, a producer of heat exchangers, gathered data on the firm's financial performance during 2018, the year just ended. She calculated a variety of ratios and obtained industry averages. She was especially interested in inventory turnover, which reflects the speed with which the firm moves its inventory from raw materials through production into finished goods and to the customer as a completed sale. Generally, analysts like to see higher values of this ratio because they indicate a quicker turnover of inventory and more efficient inventory management. Caldwell Manufacturing's inventory turnover for 2018 and the industry average inventory turnover were as follows:

	Inventory Turnover, 2018
Caldwell Manufacturing	14.8
Industry average	9.7

Initially, Mary believed these data showed that the firm had managed its inventory much better than the average firm in the industry. The turnover was nearly 53% faster than the industry average. On reflection, however, she realized that

a very high inventory turnover could be a sign that the firm is not holding enough inventories. The consequence of low inventory could be excessive stockouts (insufficient inventory to meet customer needs). Discussions with people in the manufacturing and marketing departments did, in fact, uncover such a problem. Inventories of raw materials during the year were extremely low, resulting in numerous production delays that hindered the firm's ability to meet demand and resulted in disgruntled customers and lost sales. A ratio that initially appeared to reflect extremely efficient inventory management was actually the symptom of a major problem.

Time-Series Analysis

time-series analysis
Evaluation of the firm's financial performance over time using financial ratio analysis.

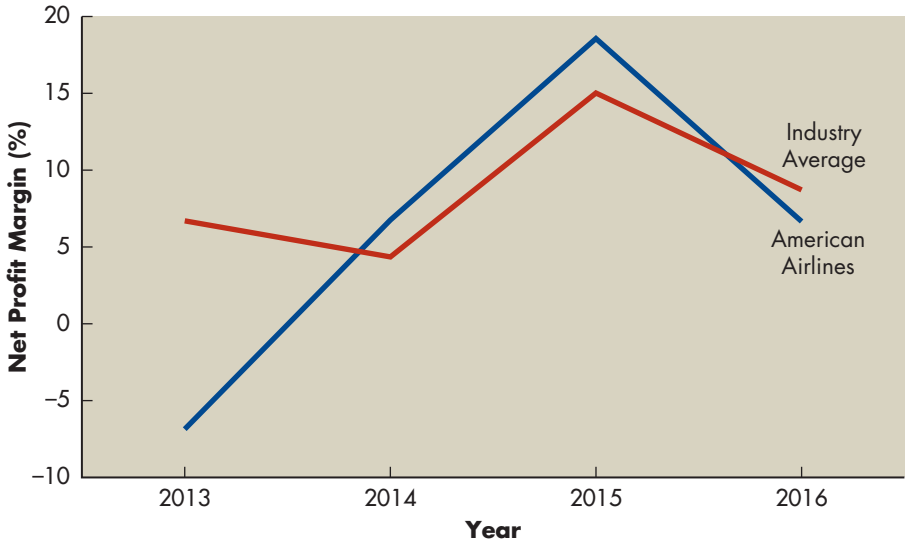
Time-series analysis evaluates performance over time. Comparison of current to past performance, using ratios, enables analysts to assess the firm's progress and to spot trends. Any significant year-to-year changes may indicate a problem, especially if the same trend is not an industry-wide phenomenon.

Combined Analysis

The most informative approach to ratio analysis combines cross-sectional and time-series analyses. A combined view makes it possible to assess the trend in the behavior of the ratio in relation to the trend for the industry. Figure 3.1 depicts this type of approach. The figure shows the net profit margin for American Airlines as well as the U.S. airline industry from 2013 to 2016. A glance at the figure reveals several interesting patterns. First, American Airlines was more profitable than the industry in 2014 and 2015, but it lagged the industry in 2013 and 2016. In other words, relative to industry profitability, American's net profit margin shows no discernible trend. Second, the airline industry seems quite volatile, with

FIGURE 3.1

Combined Analysis
Combined cross-sectional and time-series view of American Airlines' net profit margin, 2013–2016



industry net profit margins fluctuating from a low of 4.4% in 2014 to a high of 15.0% in 2015. Like American, the airline industry's profitability does not exhibit any particular trend over this period. Third, American Airlines' profits are even more volatile than the industry's, ranging from −6.9% to 18.6% during this 4-year period. Of course, it makes sense that the financial results of one company would fluctuate more than the industry average, because grouping firms together and taking an average smooths out some of the ups and downs that individual firms experience.

CAUTIONS ABOUT USING RATIO ANALYSIS

Before discussing specific ratios, we should consider the following cautions about their use:

1. Ratios that reveal large deviations from the norm merely indicate the possibility of a problem. Analysts must do additional work to determine whether a problem exists and to isolate the causes of the problem.
2. A single ratio does not generally provide sufficient information on which to judge the overall performance of the firm. However, if an analysis focuses only on certain specific aspects of a firm's financial position, one or two ratios may suffice.
3. Analysts should take care to use financial statements dated at the same point in the year before calculating ratios for different companies. Otherwise, the effects of seasonality may produce erroneous conclusions and decisions.
4. It is preferable to use audited financial statements for ratio analysis. If statements have not been audited, the data in them may not reflect the firm's true financial condition.
5. The financial data being compared should have been constructed using the same set of accounting principles, such as GAAP. The use of differing accounting treatments can distort the results of ratio comparisons.
6. Results can be distorted by high inflation, which can cause the book values of inventory and depreciable assets to differ greatly from their replacement values. Additionally, inventory costs and depreciation write-offs can differ from their true values, thereby distorting profits. Without adjustment, inflation tends to make older firms (older assets) appear more efficient and profitable than newer firms (newer assets). Clearly, in using ratios, you must be careful when comparing older with newer firms or comparing a firm to itself over a long period.

As noted above, no single financial ratio can reveal much about a firm's financial health, which has many different facets. Consequently, financial experts typically analyze a firm using many different ratios.

Financial ratios fall into five general categories based upon the specific attributes of performance they are designed to assess: liquidity, activity, debt, profitability, and market ratios. Calculating these ratios requires, at a minimum, a firm's income statement and balance sheet. In the next section we will begin a thorough ratio analysis of Whole Foods Market Inc. (prior to its acquisition by Amazon) by using data from their balance sheets and income statements, which appear in Table 3.6 and Table 3.7, respectively. We have condensed the actual statements and simplified them slightly for presentation here. Note, however,

TABLE 3.6 Whole Foods Market Inc. Balance Sheets for 2016 and 2015 ($ millions)

Assets	2016	2015	Liabilities and Equity	2016	2015
Cash	$ 852	$ 519	Accounts payable	$ 307	$ 295
Accounts receivable	242	218	Other current liabilities	1,034	957
Inventory	517	500	Total current liabilities	$1,341	$1,252
Other current assets	364	307	Long-term debt	1,776	720
Total current assets	$1,975	$1,544	Total liabilities	$3,117	$1,972
Property, plant, and equipment (net)	3,442	3,163	Common stock	907	1,780
Other long-term assets	924	1,034	Retained earnings	2,317	1,989
Total fixed assets	$4,366	$4,197	Total equity	$3,224	$3,769
Total assets	$6,341	$5,741	Total liabilities plus equity	$6,341	$5,741

Note: The company had 318.3 million and 348.9 million shares outstanding in 2016 and 2015, respectively.

TABLE 3.7 Whole Foods Market Inc. Income Statements for 2016 and 2015 ($ millions)

	2016	2015
Sales	$15,724	$15,389
Less: Cost of goods sold	10,313	9,973
Gross profit	$ 5,411	$ 5,416
Less: Selling, general, and administrative expenses	4,477	4,472
Other operating expenses	77	83
Operating profit (EBIT)	$ 857	$ 861
Less: Interest expense	41	0
Plus: Other income	11	17
Pre-tax income	$ 827	$ 878
Less: Taxes	320	342
Net income	$ 507	$ 536
Dividends paid	$ 177	$ 186

that you could analyze almost any company using the ratios presented in the remainder of this chapter. Of course, many companies in different industries use ratios that focus on aspects particular to their industry.

→ REVIEW QUESTIONS MyLab Finance Solutions

3–5 With regard to financial ratio analysis, how do the viewpoints held by the firm's present and prospective shareholders, creditors, and management differ?

3–6 What is the difference between cross-sectional and time-series ratio analysis? What is benchmarking?

3–7 When performing cross-sectional ratio analysis, the analyst should pay primary attention to what types of deviations from the norm? Why?

3–8 Why is it preferable to compare ratios calculated using financial statements that are dated at the same point in time during the year?

LG 3

3.3 Liquidity Ratios

liquidity
A firm's ability to satisfy its short-term obligations *as they come due.*

The **liquidity** of a firm reflects its ability to satisfy its short-term obligations as they come due. Generally speaking, a firm with greater liquidity will have an easier time paying its bills and is less likely to become insolvent. Because a common precursor to financial distress and bankruptcy is low or declining liquidity, these ratios can provide early warning signs that a company has cash flow problems that could cause the business to fail. Clearly, the ability of a firm to pay its bills is desirable, so having enough liquidity for day-to-day operations is important. However, liquid assets, like cash held at banks and marketable securities, do not earn a particularly high rate of return, so shareholders will not want a firm to overinvest in liquidity.

How much liquidity is enough? The liquidity needed depends on a variety of factors, including the firm's size, its access to short-term financing sources like bank credit lines, and the volatility of its business. Larger firms with access to bank credit need less liquidity than smaller firms that may not be able to borrow in a crisis. All firms have to balance the need for safety that liquidity provides against the low returns that liquid assets generate for investors. Beyond safety, liquidity provides other benefits. For example, a firm with large cash reserves will be able to make strategic investments quickly rather than going through the process of raising additional funds to invest.

We can make some general statements about the optimal liquidity position for a firm, though quantifying that precisely is probably impossible. To the extent that a firm needs liquidity for safety, then a firm in an industry that is volatile (like airlines, as we saw in Figure 3.1) needs more liquidity than one in a more stable industry. Within a single industry, a firm that is itself riskier than others in the industry (e.g., a firm that has more long-term debt) probably requires more liquidity. From the strategic investment perspective, a firm in an industry where the competitive dynamics are changing rapidly or consolidation is taking place may need the ability to make sudden strategic investments, and that need could justify a higher investment in liquid assets.

Though determining exactly how much liquidity a firm needs represents a challenge, measuring a firm's liquidity is relatively straightforward. The two most common measures of liquidity are the current ratio and the quick (acid-test) ratio.

CURRENT RATIO

current ratio
A measure of liquidity calculated by dividing the firm's current assets by its current liabilities.

The **current ratio** measures liquidity by comparing a firm's current assets to its current liabilities. The mathematical expression for the current ratio is

$$\text{Current ratio} = \text{Current assets} \div \text{Current liabilities} \quad (3.1)$$

The data required to calculate the current ratios for Whole Foods in 2016 and 2015 appear in Table 3.6. The current ratios for Whole Foods in those 2 years are

$$\text{2016: } \$1{,}975 \div \$1{,}341 = 1.47$$
$$\text{2015: } \$1{,}544 \div \$1{,}252 = 1.23$$

MATTER OF FACT

Determinants of Liquidity Needs

Glance back at the first column of data in Table 3.5, which shows the current ratio for a variety of companies and industries. Notice that the industry with the highest current ratio (i.e., most liquidity) is building materials, an industry notoriously sensitive to business cycle swings. The current ratio for that industry is 2.8, indicating that the typical firm in that business has almost 3 times as much in current assets as in current liabilities. Two of the largest competitors in that industry, The Home Depot and Lowe's, operate with a current ratio of 1.3, less than half the industry average. Does this ratio mean that these firms have a liquidity problem? Not necessarily. Large enterprises generally have well-established relationships with banks that can provide lines of credit and other short-term loan products in the event that the firm needs liquidity. Smaller firms may not have the same access to credit and therefore tend to operate with more liquidity.

Whole Foods increased its liquidity position in 2016 to a level slightly above the industry average, as shown in Table 3.5. The grocery industry is one in which cash flows are relatively stable and predictable—people have to eat whether the economy is booming or in recession. Ordinarily, we would therefore expect grocers to maintain less liquidity than firms in most other industries. Indeed, Table 3.5 shows that the average current ratio in the grocery industry (1.3) is less than that in industries such as computers (1.5), building materials (2.8), and retail merchandise stores (1.7). However, prior to its acquisition by Amazon, Whole Foods occupied a unique position in the grocery industry, one that catered to upscale consumers by offering gourmet, organic food products at higher prices compared to traditional grocers such as Kroger. Imagine what might happen to Whole Foods in a recession. Customers cut back spending on luxury items first, which might mean a switch from Whole Foods to a grocery provider with lower prices. Thus, we expect Whole Foods to be riskier than the average grocery company, and that in turn may justify their relatively high current ratio.

PERSONAL FINANCE EXAMPLE 3.4

MyLab Finance Solution Video

Individuals, like corporations, can use financial ratios to analyze and monitor their performance. Typically, personal finance ratios are calculated using the personal income and expense statement and personal balance sheet for the period of concern. Here we use these statements, presented in the preceding personal finance examples, to demonstrate calculation of Jan and Jon Smith's liquidity ratio for calendar year 2019.

The personal *liquidity ratio* is calculated by dividing total liquid assets by total current debt. It indicates the percentage of annual debt obligations that an individual can meet using current liquid assets. The Smiths' total liquid assets were $2,225. Their total current debts are $18,080 (total current liabilities of $1,050 + mortgage payments of $11,500 + auto loan payments of $4,280 + appliance and furniture payments of $1,250). Substituting these values into the ratio formula, we get

$$\text{Liquidity ratio} = \frac{\text{Total liquid assets}}{\text{Total current debts}} = \frac{\$2{,}225}{\$18{,}880} = 0.123, \text{ or } 12.3\%$$

The ratio indicates that the Smiths can cover only about 12% of their existing 1-year debt obligations with their current liquid assets. Clearly, the Smiths plan to

meet these debt obligations from their income, but this ratio suggests that their liquid funds do not provide a large cushion. As one of their goals, they should probably build up a larger fund of liquid assets to meet unexpected expenses.

QUICK (ACID-TEST) RATIO

quick (acid-test) ratio
A measure of liquidity calculated by dividing the firm's current assets less inventory by its current liabilities.

The **quick (acid-test) ratio** is similar to the current ratio except that it excludes inventory, which is generally the least liquid current asset. The generally low liquidity of inventory results from two primary factors: (1) Many types of inventory cannot be easily sold because they are partially completed items, special-purpose items, and the like; and (2) inventory is typically sold on credit, which means that it becomes an account receivable before being converted into cash. An additional problem with inventory as a liquid asset is that the times when companies face a dire need for liquidity, when business is bad, are precisely the times when it is most difficult to convert inventory into cash by selling it. The quick ratio is calculated as

$$\text{Quick ratio} = \frac{\text{Current assets} - \text{Inventory}}{\text{Current liabilities}} \tag{3.2}$$

The quick ratio calculations for Whole Foods show that the company increased its most liquid assets significantly in 2016. A glance back at the balance sheet makes it clear that Whole Foods dramatically increased its cash holdings in 2016, whereas most other current asset and liability accounts did not change as much. The consequence was a jump in the quick ratio, as shown below:

$$2016: \frac{\$1{,}975 - \$517}{\$1{,}341} = \frac{\$1{,}458}{\$1{,}341} = 1.09$$

$$2015: \frac{\$1{,}544 - \$500}{\$1{,}252} = \frac{\$1{,}044}{\$1{,}252} = 0.83$$

The important question arising from these calculations is whether Whole Foods was building up cash because it perceived a need for greater financial safety, because it was planning to use the cash for a major investment, or for some other reason.

MATTER OF FACT

The Importance of Inventories

Turn again to Table 3.5 and examine the columns listing current and quick ratios for different firms and industries. Notice that Apple has a current ratio of 1.4, almost identical to current ratios for Home Depot and Lowe's, which are both 1.3. The quick ratios for Home Depot and Lowe's are much lower than their current ratios, but for Apple that is not true—that firm's current and quick ratios are nearly equal. Why? First, Apple relies primarily on contract manufacturers to make its products, so it holds little or no inventory while its devices are being made. Second, the popularity of Apple's products means that inventory does not sit on retail store shelves very long. In contrast, all it takes is a trip to your local Home Depot or Lowe's store to see that the business model in this industry requires a massive investment in inventory, which implies that the quick ratio will be much less than the current ratio for building materials firms.

As with the current ratio, the quick ratio level that a firm should strive to achieve depends largely on the nature of the business in which it operates. The quick ratio provides a better measure of overall liquidity only when a firm's inventory cannot be easily converted into cash. If inventory is liquid, the current ratio is a preferred measure of overall liquidity.

→ REVIEW QUESTIONS MyLab Finance Solutions

3–9 Under what circumstances would the current ratio be the preferred measure of overall firm liquidity? Under what circumstances would the quick ratio be preferred?

3–10 In Table 3.5, most of the specific firms listed have current ratios that fall below the industry average. Why? One exception to this general pattern is Whole Foods Market, which competes at the very high end of the retail grocery market. Why might Whole Foods Market operate with greater-than-average liquidity?

LG 3

3.4 Activity Ratios

activity ratios
Measure the speed with which various accounts are converted into sales or cash, or inflows or outflows.

Activity ratios measure the speed with which various asset and liability accounts are converted into sales or cash. Activity ratios measure how efficiently a firm operates along a variety of dimensions, such as inventory management, disbursements, and collections. A number of ratios measure the activity of the most important current accounts, which include inventory, accounts receivable, and accounts payable. We can use ratios to assess the efficiency with which a firm manages its total assets as well.

INVENTORY TURNOVER

inventory turnover ratio
Measures the activity, or liquidity, of a firm's inventory.

For firms whose business involves holding significant inventory balances, the **inventory turnover ratio** is a metric used by analysts to judge the effectiveness of inventory management practices. Here again, the value of the inventory ratio that represents good management depends on the nature of the business. As you would expect (and as you will soon see), grocery stores turn their inventory over quite rapidly. After all, many items in a grocer's inventory spoil quickly. In contrast, a firm that manufactures heavy equipment will turn its inventory over much more slowly, partly because the manufacturing process itself takes a long time, requiring a large investment in raw materials and work-in-process inventory. The formula for calculating inventory is

$$\text{Inventory turnover} = \text{Cost of goods sold} \div \text{Inventory} \quad (3.3)$$

Remember that cost of goods sold represents the cost of all items sold by the firm in a year, whereas inventory refers to the goods on hand at any moment. Thus, when calculating this ratio, we arrive at a figure that represents the number of times per year the company "turns over," or sells, its inventory balance. To calculate inventory turnover for Whole Foods, we need information from

their income statement and balance sheet. Calculations show that Whole Foods turned its inventory 19.9 times in both 2015 and 2016.

$$2016: \$10{,}313 \div \$517 = 19.9$$
$$2015: \$9{,}973 \div \$500 = 19.9$$

average age of inventory
Average number of days' sales in inventory.

Another inventory activity ratio measures how many days of inventory the firm has on hand. You can easily convert inventory turnover into an **average age of inventory** by dividing the turnover ratio into 365. For example, if Whole Foods sells its inventory 19.9 times within a single year, then that means its inventory balance lasts, on average, about 18.3 days ($365 \div 19.9 = 18.3$). Obviously, some items in inventory turn every day or two, such as freshly baked bread or ready-to-eat food cooked in the store. If these items do not sell rapidly, they spoil and go to waste. Other items, like canned goods or cleaning supplies, do not sell as rapidly. On average, though, the typical item in a Whole Foods store sells in about 18 days, and that figure didn't change in 2016.

To illustrate how much financial ratios can vary across industries, consider the Oregon-based company Willamette Valley Vineyards. Wine producers age most varieties of wine they make before selling them to customers. In its recent financial statements, Willamette reported that it held $10.63 million in inventory and its cost of goods sold for the year was $7.1 million. Plugging those numbers into Equation 3.3 reveals that Willamette's inventory turnover ratio was just 0.67 times per year. Dividing that number into 365 tells us that the average product made by Willamette stays in inventory for 544 days!

AVERAGE COLLECTION PERIOD

average collection period
The average amount of time needed to collect accounts receivable.

The **average collection period,** or average age of accounts receivable, is useful in evaluating credit and collection policies. It equals the accounts receivable balance divided by average daily sales:[1]

$$\text{Average collection period} = \frac{\text{Accounts receivable}}{\text{Average sales per day}} = \frac{\text{Accounts receivable}}{\frac{\text{Annual sales}}{365}} \quad (3.4)$$

Applying data from Whole Foods' income statement and balance sheet to Equation 3.4, we find that the company's collection period is exceedingly short at just over 5 days.

$$2016: \frac{\$242}{\frac{\$15{,}724}{365}} = 5.6 \text{ days}$$
$$2015: \frac{\$218}{\frac{\$15{,}389}{365}} = 5.2 \text{ days}$$

1. The formula as presented assumes, for simplicity, that all sales are made on a credit basis. If that is not the case, *average credit sales per day* should be substituted for average sales per day.

A result like this for a grocery store company isn't particularly surprising. Most customers pay with cash, a check, or a credit card. Accounting practices treat all those payment forms as cash sales. That is, when a customer pays Whole Foods with a credit card (as long as the card is a Visa, MasterCard, or any card not issued by Whole Foods), the transaction goes to cash on the firm's balance sheet, not to accounts receivable. The low collection period for Whole Foods really reflects that they make very few sales on credit—not that they collect quickly when they do sell on credit.

To get a different perspective on the average collection period, let's examine financial data from Whirlpool Corp. Whirlpool manufactures consumer durable goods like ovens, refrigerators, washers, and dryers. It sells very little directly to consumers. Instead, Whirlpool sells to appliance retailers like Best Buy, Lowe's, Home Depot and others. Nearly all these sales occur on credit, with Whirlpool giving its retail partners some time to sell the appliances before they have to submit payment back to Whirlpool.

In 2016 Whirlpool's receivables balance was $2.7 billion, with sales of $20.7 billion. Plugging those numbers into Equation 3.4 shows that Whirlpool's average collection period was just less than 48 days. The year before, the company's collection period numbered about 44 days, so collections appear to have slowed a little in 2016. A slowdown in collections would not be unusual in an economy that was losing steam as customers struggled to pay their bills on time. However, the U.S. economy performed relatively well in 2016, so does the slowing collection period indicate an internal problem with Whirlpool's collection efforts?

Although the overall economy performed well in 2016, many parts of the brick-and-mortar retail segment struggled, largely (though not entirely) due to competition from Amazon. Two of Whirlpool's biggest U.S. customers, Sears and Best Buy, reported declining or flat sales that year, and managers at Sears took the unusual step of publicly announcing that they were not sure the company could survive in the long term. The situation was better at Home Depot, where sales increased, but their payables rose even faster, suggesting that Home Depot was taking more time to pay its suppliers. The increase in Whirlpool's collection period from 44 to 48 days may not seem like a major change, but it represents hundreds of millions of additional dollars tied up in the company's accounts receivable.

The average collection period is meaningful only in relation to the firm's credit terms. If Whirlpool had extended its credit terms slightly in 2016, then that alone could explain the increase in its collection period. If Whirlpool implemented no change in credit terms in 2016, then the rising collection period could easily

MATTER OF FACT

Who Gets Credit?

Notice in Table 3.5 the vast differences across industries in the average collection periods. Companies in the building materials, grocery, and merchandise store industries collect in just a few days, whereas firms in the computer industry take a month or two to collect on their sales. This difference exists primarily because these industries serve very different customers. Grocery and retail stores serve individuals who pay cash or use credit cards (which, to the store, are essentially the same as cash). Computer manufacturers sell to retail chains, businesses, and other large organizations that negotiate agreements allowing them to pay well after the sale is made.

indicate either deteriorating financial conditions among Whirlpool's customers or perhaps even problems with its collections department. Either situation would require further attention from the company's financial management team.

AVERAGE PAYMENT PERIOD

average payment period
The average amount of time needed to pay accounts payable.

The **average payment period,** or average age of accounts payable, is calculated in the same manner as the average collection period:

$$\text{Average payment period} = \frac{\text{Accounts payable}}{\text{Average purchases per day}} = \frac{\text{Accounts payable}}{\frac{\text{Annual purchases}}{365}} \quad (3.5)$$

The difficulty in calculating this ratio stems from the need to find annual purchases,[2] a value not available in published financial statements. Ordinarily, purchases are estimated as a given percentage of cost of goods sold. If we assume that Whole Foods' purchases equaled 70% of its cost of goods sold, its average payment period is

$$2016: \frac{\$307}{\frac{0.70 \times \$10{,}313}{365}} = 15.5 \text{ days}$$

$$2015: \frac{\$295}{\frac{0.70 \times \$9{,}973}{365}} = 15.4 \text{ days}$$

Whole Foods pays for purchases in about 15 days, a figure that barely moved in 2016. As was true with the average collection period, we can make judgments about Whole Foods' 15-day average payment period only if we know the credit terms offered by their suppliers. If Whole Foods' suppliers have extended, on average, 15-day credit terms, an analyst would conclude that the company is doing a good job of paying its bills on time. Although we have no information about the credit terms granted to Whole Foods, there are likely no issues of concern here because the payment period remained virtually fixed for 2 years.

TOTAL ASSET TURNOVER

total asset turnover
Indicates the efficiency with which the firm uses its assets to generate sales.

The **total asset turnover** is a measure of the efficiency with which the firm uses its assets to generate sales. This ratio simply indicates how many dollars of sales a firm produces for each dollar of assets that it has invested in the business. The formula for total asset turnover is

$$\text{Total asset turnover} = \text{Sales} \div \text{Total assets} \quad (3.6)$$

2. Technically, we should use annual *credit* purchases—rather than annual purchases—in calculating this ratio. For simplicity, we ignore this refinement here.

MATTER OF FACT

Sell It Fast

Observe in Table 3.5 that the grocery business has more rapid total asset turnover than any other industry. That makes sense because inventory is among the most valuable assets held by these firms, and grocery stores must sell baked goods, dairy products, and produce quickly or throw such items away when they spoil. It's true that some items in a grocery store have a shelf life longer than anyone really wants to know (think Twinkies), but on average a grocery store has to replace its entire inventory in just a few days or weeks, and that practice contributes to the rapid turnover of the firm's total assets.

For Whole Foods, the total asset turnover figures for 2015 and 2016 are

$$2016: \$15{,}724 \div \$6{,}341 = 2.48$$
$$2015: \$15{,}389 \div \$5{,}741 = 2.68$$

Whole Foods' asset turnover slowed a bit in 2016, and that would concern managers if it was part of a long-term trend for the company. Looking back at Table 3.5, we see that the average asset turnover ratio for the grocery industry is 2.4, so Whole Foods' performance is in line with the industry norm.

Generally, the higher a firm's total asset turnover, the more efficiently its assets have been used. This measure is probably of greatest interest to management because it indicates whether the firm's operations have been financially efficient.

→ REVIEW QUESTION MyLab Finance Solutions

3–11 To assess the firm's average collection period and average payment period ratios, what additional information is needed, and why?

LG 4

3.5 Debt Ratios

The debt position of a firm indicates the amount of money the firm uses that does not come from shareholders, but rather from lenders. In general, analysts center most on long-term debts that commit the firm to a stream of contractual payments over many years. The greater the debt, the greater is the firm's risk of being unable to meet its contractual debt payments. Because firms must satisfy creditors' claims before they can pay shareholders, current and prospective shareholders pay close attention to the firm's ability to repay debts. Lenders are also concerned about the firm's indebtedness, because holding everything else constant, a firm with more debt has a greater risk of failing to repay its lenders.

financial leverage
The magnification of risk and return through the use of fixed-cost financing, such as debt and preferred stock.

In general, the more debt a firm uses in relation to its total assets, the greater is its financial leverage. The term **financial leverage** refers to the degree to which a firm uses debt financing (or other types of fixed-cost financing, such as preferred stock) and to the effects of debt financing. When a firm finances more of its investment by borrowing money, the expected return on the investment increases, but so does the risk.

EXAMPLE 3.5

Patty Akers is incorporating her new business. After much analysis, she determined that an initial investment of $50,000—$20,000 in current assets and $30,000 in fixed assets—is necessary. These funds can be obtained in one of two ways. The first is the *no-debt plan,* under which she would invest the full $50,000 without borrowing. The other alternative, the *debt plan,* involves investing $25,000 and borrowing the balance of $25,000 at 6% annual interest.

Patty expects $30,000 in sales, $18,000 in operating expenses, and a 21% tax rate. Projected balance sheets and income statements associated with the two plans appear below in Table 3.8. The no-debt plan results in after-tax profits of $9,480, which represent a 19% rate of return on Patty's $50,000 investment. The debt plan results in $8,295 of after-tax profits, which represent a 33.2% rate of return on Patty's investment of $25,000. The debt plan provides Patty with a higher rate of return, but also has a greater risk because the annual $1,500 of interest must be paid whether Patty's business is profitable or not.

The previous example demonstrates that *with increased debt comes greater risk as well as higher potential return.* Therefore, the greater the financial leverage, the greater the potential risk and return. A detailed discussion of the effect of debt on the firm's risk, return, and value appears later in this text. For now we will focus on how analysts use financial leverage ratios to assess a firm's debt position.

degree of indebtedness
Ratios that measure the amount of debt relative to other significant balance sheet amounts.

Leverage measures are of two general types: measures of the degree of indebtedness and measures of the ability to repay debts. The **degree of indebtedness** ratios measure the amount of debt relative to other significant balance sheet amounts. Two common measures of the degree of indebtedness are the debt ratio and the debt-to-equity ratio.

TABLE 3.8 Financial Statements Associated with Patty's Alternatives

Balance sheets	No-debt plan	Debt plan
Current assets	$20,000	$20,000
Fixed assets	30,000	30,000
Total assets	$50,000	$50,000
Debt (6% interest)	$ 0	$25,000
(1) Equity	50,000	25,000
Total liabilities and equity	$50,000	$50,000
Income Statements		
Sales	$30,000	$30,000
Less: Operating expenses	18,000	18,000
Operating profits	$12,000	$12,000
Less: Interest expense	0	0.06 × $25,000 = $ 1,500
Net profits before taxes	$12,000	$10,500
Less: Taxes (rate = 21%)	2,520	2,205
(2) Net profits after taxes	$ 9,480	$ 8,295
Return on equity [(2) ÷ (1)]	$\frac{\$9,480}{\$50,000} = 19\%$	$\frac{\$8,295}{\$25,000} = 33.2\%$

ability to repay debt coverage ratios
Ratios that measure a firm's ability to make required debt payments and to pay other fixed charges such as lease payments.

The second type of leverage measures focuses on a firm's **ability to repay debt.** These ratios compare the income that a firm earns to the fixed payments (for debts and obligations such as leases) that it is obliged to make. These ratios are also called **coverage ratios,** and they help analysts assess whether a company can *service their debts* (i.e., make payments on time). Typically, lenders prefer higher coverage ratios, but a very high ratio might indicate that the firm's management is too conservative and could earn higher returns by borrowing more. In general, lower coverage ratios mean that a firm is less likely to repay its debt in full and on time. If a firm is unable to pay these obligations, its creditors may seek immediate repayment, which in most instances would force a firm into bankruptcy. Two popular coverage ratios are the times interest earned ratio and the fixed-payment coverage ratio.

DEBT RATIO

debt ratio
Measures the proportion of total assets financed by the firm's creditors.

The **debt ratio** measures the proportion of total assets financed by the firm's creditors. A higher debt ratio means that a firm is using a larger amount of other people's money to finance its operations, or equivalently, the firm is using greater financial leverage. The formula for debt ratio is

$$\text{Debt ratio} = \text{Total liabilities} \div \text{Total assets} \tag{3.7}$$

Plugging values from Whole Foods' balance sheet into Equation 3.7, we find that the company's debt ratios are

$$2016: \$3{,}117 \div \$6{,}341 = 0.49 = 49\%$$
$$2015: \$1{,}972 \div \$5{,}741 = 0.34 = 34\%$$

This value indicates that the company has financed close to half its assets with debt as of 2016 and that the company dramatically increased its debt ratio that year. An increase in the debt ratio could reflect a strategic financial decision by Whole Foods' management to position the company in a way that would allow it to earn higher returns while taking greater risk. In fact, a reading of management's commentary that accompanies the financial statements in the annual report indicates that in the past year the firm issued new long-term notes (i.e., it borrowed money) and used some of the proceeds from that borrowing to repurchase shares, thus shifting its financing mix away from equity toward debt.

DEBT-TO-EQUITY RATIO

debt-to-equity ratio
Measures the relative proportion of total liabilities and common stock equity used to finance the firm's total assets.

The **debt-to-equity ratio** measures the relative proportion of total liabilities to common stock equity used to finance the firm's assets. As with debt ratio, a higher debt-to-equity ratio means that the firm uses more financial leverage. The debt-to-equity ratio is calculated as

$$\text{Debt-to-equity ratio} = \text{Total liabilities} \div \text{Common stock equity} \tag{3.8}$$

The debt-to-equity ratios for Whole Foods look like this

$$2016: \$3{,}117 \div \$3{,}224 = 0.97$$
$$2015: \$1{,}972 \div \$3{,}769 = 0.52$$

This result tells us that in 2016, for every $1.00 common stockholders have invested in Whole Foods, the company owes about 97¢ to creditors. These ratios show even more dramatically the shift in the company's financing mix away from equity toward debt. Of note, several methods exist for calculating the debt-to-equity ratio. A common alternative uses only long-term debt in the numerator. In that case, the ratios for Whole Foods are

$$2016: \$1{,}776 \div \$3{,}224 = 0.55$$
$$2015: \$720 \div \$3{,}769 = 0.19$$

When conducting ratio analyses, some financial analysts choose to consider all stockholders, including both preferred and common stockholders, rather than only common stockholders, in which case they use values relevant to all stockholders, such as net profits after taxes (instead of earnings available for common stockholders) and total stockholders' equity (instead of common stock equity). Clearly, different methods can lead to very different results, although in this case the two methods produce the same results because Whole Foods has only common stock outstanding. Here again we note that high versus low debt ratios reflect a tradeoff, specifically that higher debt leads to both higher return and risk. Making blanket statements that a firm clearly has too much or too little debt is difficult, except perhaps when the firm's debts are so high that it can't repay them. Assessing a firm's ability to repay debts is the focus of the coverage ratios that we turn to next.

TIMES INTEREST EARNED RATIO

times interest earned ratio
Measures the firm's ability to make contractual interest payments; sometimes called the *interest coverage ratio.*

The **times interest earned ratio,** sometimes called the *interest coverage ratio,* measures the firm's ability to make contractual interest payments. The higher its value, the better able the firm is to fulfill its interest obligations. The times interest earned ratio is calculated as

$$\text{Times interest earned ratio} = \text{Earnings before interest and taxes} \div \text{Interest} \quad (3.9)$$

The figure for earnings before interest and taxes (EBIT) is the same as that for operating profits shown in the income statement. The income statement for Whole Foods in 2015 shows interest expense of $0, so we cannot use Equation 3.9 in that year. The times interest earned ratio in 2016 is

$$\text{Time interest earned ratio} = \$857 \div \$41 = 20.9$$

At first glance, this ratio seems to indicate that Whole Foods has EBIT more than 20 times what it needs to cover the interest charges on its debt. If that were true, it would indicate that the company should have no problem meeting its long-term obligations. However, the figure may be somewhat misleading because Whole Foods leases many of its properties. Lease payments are very similar to interest payments in the sense that the payments are fixed and the firm must make those payments whether business is good or bad. In other words, lease expenses influence a firm's risk and return profile in much the same way that borrowing money does.

FIXED-PAYMENT COVERAGE RATIO

fixed-payment coverage ratio
Measures the firm's ability to meet all fixed-payment obligations.

The **fixed-payment coverage ratio** measures the firm's ability to meet all fixed-payment obligations such as loan interest and principal, lease payments, and preferred stock dividends. As is true of the times interest earned ratio, the higher this value, the better. The formula for the fixed-payment coverage ratio is

$$\text{Fixed-payment coverage ratio} = \frac{\text{Earnings before interest and taxes} + \text{Lease payments}}{\text{Interest} + \text{Lease payments} + \{(\text{Principal payments} + \text{Preferred stock dividends}) \times [1/(1-T)]\}} \quad (3.10)$$

where T is the corporate tax rate applicable to the firm's income. The term $1/(1 - T)$ is included to adjust the after-tax principal and preferred stock dividend payments back to a before-tax equivalent that is consistent with the before-tax values of all other terms. Unfortunately, from the abbreviated financial statements in Tables 3.6 and 3.7, we cannot calculate this ratio for Whole Foods.

Like the times interest earned ratio, the fixed-payment coverage ratio measures risk. The lower this ratio, the greater is the risk to both lenders and owners; the greater this ratio, the lower is the risk. This ratio allows interested parties to assess the firm's ability to meet additional fixed-payment obligations without being driven into bankruptcy.

→ REVIEW QUESTIONS MyLab Finance Solutions

3–12 What is financial leverage?

3–13 What ratio measures the firm's degree of indebtedness? What ratios assess the firm's ability to service debts?

LG5

3.6 Profitability Ratios

There are many measures of profitability. As a group, these measures enable analysts to evaluate the firm's profits with respect to its sales, assets, or the owners' investment. Owners, creditors, and managers pay close attention to boosting profits because of the great importance the market places on them.

COMMON-SIZE INCOME STATEMENTS

common-size income statement
An income statement in which each item is expressed as a percentage of sales.

A useful tool for evaluating profitability in relation to sales is the **common-size income statement.** Each item on this statement is expressed as a percentage of sales. Common-size income statements prove especially useful when comparing performance across years because it is easy to see if certain categories of expenses are trending up or down as a percentage of the total volume of business that the company transacts. Three frequently cited ratios of profitability that come directly from the common-size income statement are (1) the gross profit margin, (2) the operating profit margin, and (3) the net profit margin.

TABLE 3.9 Whole Foods Common-Size Income Statements

	2016	2015	Evaluation[a] 2015–2016
Sales revenue	100.0%	100.0%	
Less: Cost of goods sold	65.6	64.8	Worse
(1) Gross profit margin	34.4%	35.2%	Worse
Less: Operating expenses			
Less: Selling, general, and administrative expenses	28.5%	29.1%	Better
Other operating expenses	0.5	0.5	Same
(2) Operating profit margin	5.4%	5.6%	Worse
Less: Interest expense	0.3	0.0	
Plus: Other income	0.1%	0.1%	
Pre-tax income	5.2%	5.7%	Worse
Less: Taxes	2.0	2.2	Better
(3) Net profit margin	3.2%	3.5%	Worse

[a]Subjective assessments based on data provided.

Table 3.9 shows common-size income statements for 2016 and 2015 for Whole Foods. These statements reveal that the firm's cost of goods sold increased from 64.8% of sales in 2015 to 65.6% in 2016, resulting in a worsening gross profit margin. Operating income and net income fell as well, but a decline in operating expenses helped to moderate the company's decline in income.

GROSS PROFIT MARGIN

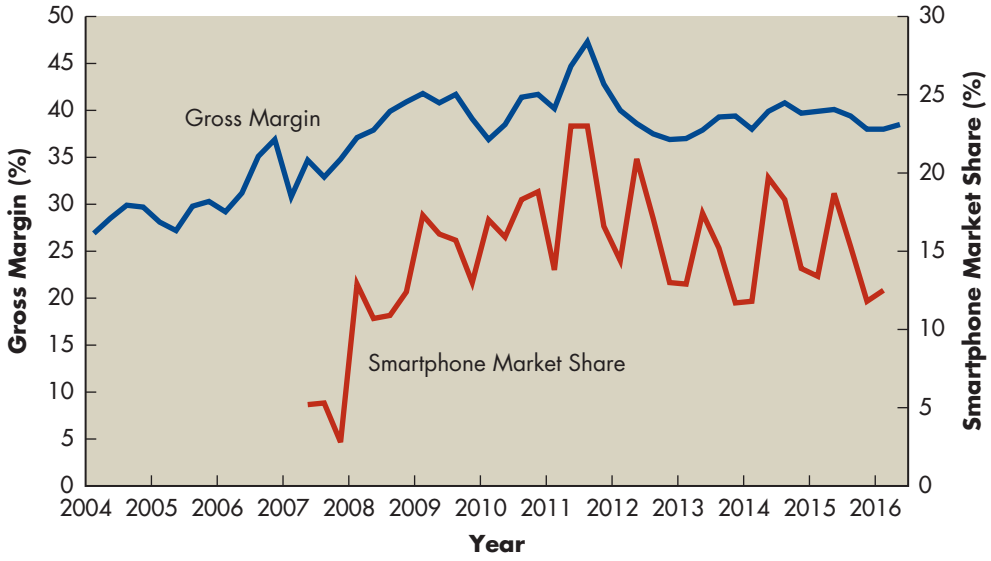
gross profit margin
Measures the percentage of each sales dollar remaining after the firm has paid for its goods.

The **gross profit margin** measures the percentage of each sales dollar remaining after the firm has paid for its cost of goods sold. The higher the gross profit margin, the better. Analysts pay close attention to changes in a company's gross profit margin, particularly when a company's profits depend on its intellectual property (like high technology) or its brand value. The reason why the gross profit margin is so important is simple. You can loosely think of the gross profit margin as a measure of the "markup" on a firm's products. A company with a high gross profit margin is able to charge a high price relative to what it spends to make a product, and that is an indicator of a strong competitive position in the market. Conversely, a thin gross profit margin suggests that the company cannot charge a great deal more than the production costs of the product, which is a sign that the company operates in a highly competitive environment or has noncompetitive manufacturing costs. When analysts see a dip in a company's gross profit margin, they may interpret it as a sign of a weakening competitive position.

To understand this point, look at Figure 3.2, which shows how Apple's introduction of the iPhone changed that company's gross margin. Apple sold its first iPhone in the fourth quarter of its 2007 fiscal year, and the company quickly increased its share of the smartphone market from nothing to 17% by the third quarter of 2009. Over that same period, Apple's gross margin improved from

FIGURE 3.2

Apple Gross Margin and Share of Smartphone Market 2004–2016



34.7% to 41.8%. That increased gross profit margin meant that for every dollar of revenue Apple generated, it earned roughly an additional 7¢ in gross profit. For several years, Apple's competitive position strengthened as the share of the firm's total revenues coming from smartphones increased. By the middle of 2012, Apple's gross margin and its share of the smartphone market peaked at 47% and 23%, respectively. Since then, competition has reduced Apple's share of smartphone sales and its gross margin, although Apple is still much more profitable than it was before it launched the iPhone.

The formula for the gross profit margin is

$$\text{Gross profit margin} = \frac{\text{Sales} - \text{Cost of goods sold}}{\text{Sales}} = \frac{\text{Gross profits}}{\text{Sales}} \tag{3.11}$$

Returning to our running ratio analysis of Whole Foods' financial performance, we see that their gross profit margin for 2016 and 2015 is

$$2016: \frac{\$15{,}724 - \$10{,}313}{\$15{,}724} = 0.344 = 34.4\%$$

$$2015: \frac{\$15{,}389 - \$9{,}973}{\$15{,}389} = 0.352 = 35.2\%$$

We can also see that the gross profit margin is labeled (1) on the common-size income statement in Table 3.9. Whole Foods' gross profit margin slipped a bit in 2016, which is a worrisome sign that managers would want to watch carefully.

OPERATING PROFIT MARGIN

operating profit margin
Measures the percentage of each sales dollar remaining after all costs and expenses *other than* interest, taxes, and preferred stock dividends are deducted; the "pure profits" earned on each sales dollar.

The **operating profit margin** measures the percentage of each sales dollar remaining after deducting all costs and expenses other than interest, taxes, and preferred stock dividends. It represents the "pure profits" earned on each sales dollar. Operating profits are "pure" because they measure only the profits earned on operations and ignore interest, taxes, and preferred stock dividends. The operating profit margin is calculated as

$$\text{Operating profit margin} = \text{Operating profits} \div \text{Sales} \quad (3.12)$$

The operating margin for Whole Foods looks like this:

$$2016: \$857 \div \$15{,}724 = 0.054 = 5.4\%$$
$$2015: \$861 \div \$15{,}389 = 0.056 = 5.6\%$$

This value is labeled (2) on the common-size income statement in Table 3.9. As was the case with the company's gross margin, Whole Foods' operating margin declined a bit in 2016.

NET PROFIT MARGIN

net profit margin
Measures the percentage of each sales dollar remaining after all costs and expenses, *including* interest, taxes, and preferred stock dividends, have been deducted.

The **net profit margin** measures the percentage of each sales dollar remaining after all costs and expenses, including interest, taxes, and preferred stock dividends, have been deducted. Naturally, managers and analysts view a high net profit margin in a positive light. The higher the firm's net profit margin, the better. The net profit margin is calculated as

$$\text{Net profit margin} = \text{Earnings available for common stockholders} \div \text{Sales} \quad (3.13)$$

Applying Equation 3.13 to the numbers in Whole Foods' income statements, we find that their net profit margin is

$$2016: \$507 \div \$15{,}724 = 0.032 = 3.2\%$$
$$2015: \$536 \div \$15{,}389 = 0.034 = 3.4\%$$

This value is labeled (3) on the common-size income statement in Table 3.9. Does it surprise you that Whole Foods makes just a little more than 3¢ of net profit for each dollar of groceries that it sells? The grocery industry earns notoriously thin net profit margins, largely because food products are undifferentiated. An apple you buy at one grocery store looks and tastes pretty much like an apple you buy anywhere else, so grocery pricing tends to be very competitive. Notice in Table 3.5, however, that Whole Foods' net profit margin is a little higher than Kroger's, which is consistent with Whole Foods' strategy to sell more unique food items to upscale customers.

The net profit margin is a commonly cited measure of the firm's success with respect to earnings on sales. "Good" net profit margins differ considerably across industries. A net profit margin of 2% or less would not be unusual for a grocery store, whereas a net profit margin of 10% would be low for a retail jewelry store.

EARNINGS PER SHARE (EPS)

The firm's earnings per share (EPS) is generally of interest to present or prospective stockholders and management. As we noted earlier, EPS represents the number of dollars earned during the period on behalf of each outstanding share of common stock. Unlike most of the ratios we've studied so far, EPS is not a figure that analysts can compare across companies in a meaningful way. That's because every company has a different number of common shares outstanding. If we observe that Whole Foods has EPS that are roughly 3 times greater than Kroger's EPS, we cannot conclude that managers at Whole Foods are doing a better job. The difference in EPS is a function of both the profits earned by each company and the number of outstanding shares. Therefore, analysts look closely at how EPS change over time for a particular company and at how a firm's EPS compare to its stock price (as we will see shortly). Earnings per share is calculated as

$$\text{Earnings per share} = \frac{\text{Earnings available for common stockholders}}{\text{Number of shares of common stock outstanding}} \quad (3.14)$$

The note to Whole Foods' balance sheet in Table 3.6 tells us how many shares of stock the company had outstanding in 2015 and 2016, so combining that information with the net income figures from Table 3.7 we have

$$2016: \$507 \div 318.3 = \$1.59$$
$$2015: \$536 \div 348.9 = \$1.54$$

Notice an interesting pattern here. Whole Foods earned a smaller net profit in 2016 ($507 versus $536 in 2015) and a smaller net profit margin (3.2% versus 3.4% in 2015), but it reported higher earnings per share in 2016 ($1.59 versus $1.54). How did the company earn less money overall and at the same time earn more per share? The answer is that Whole Foods repurchased shares in 2016, so the total number of outstanding shares declined. Firms repurchase shares for many reasons. One reason is to put excess cash held by a company into the hands of shareholders, but another may be to increase the EPS figure. We will return to the motivations for and consequences of share repurchases later in this book.

Besides repurchasing shares, firms can return cash to shareholders by paying dividends. The dollar amount of cash actually distributed to each share is the *dividend per share (DPS)*. Table 3.7 shows that Whole Foods paid $177 million and $186 million in dividends in 2016 and 2015, respectively. Dividing those figures by the number of outstanding shares in each year, we see that the company paid DPS of about $0.56 in 2016 and $0.53 in 2015. Thus, although Whole Foods decreased its total dividend payments in 2016, the DPS increased because the company decreased the number of outstanding shares that year. Notice that Whole Foods' DPS are quite a bit less than its EPS. Most firms that pay dividends do not pay out all earnings as dividends. Instead, they reinvest some of their earnings to help finance future investment and growth.

RETURN ON TOTAL ASSETS (ROA)

return on total assets (ROA)
Measures the overall effectiveness of management in generating profits with its available assets; also called the *return on investment (ROI)*.

The **return on total assets (ROA),** one of several ratios that are sometimes called the *return on investment (ROI),* measures the overall effectiveness of management in generating profits with its available assets. The return on total assets is calculated as

$$\text{ROA} = \text{Earnings available for common stockholders} \div \text{Total assets} \quad (3.15)$$

For Whole Foods, the ROA results for 2016 and 2015 are

$$2016: \$507 \div \$6{,}341 = 0.080 = 8.0\%$$
$$2015: \$536 \div \$5{,}741 = 0.093 = 9.3\%$$

The numbers here tell us that Whole Foods earned about 9.3¢ for each dollar of assets in 2015, but it earned just 8¢ in 2016.

The decline in Whole Foods' ROA in 2016 is one of the more alarming changes we've identified in this ratio analysis of the firm's performance. This drop occurred because net income fell about 5.4% in 2016, while total assets increased by 10.4%. Whole Foods invested more assets in its business and simultaneously earned less income—clearly not an outcome desired by the company or its investors. Financial analysts working at Whole Foods or at outside firms that might invest in Whole Foods' stock would surely investigate this result in more depth, and in so doing they would explore several questions. First, the analysis here examines just 2 years of data. Analysts could easily calculate the company's ROA going back several more years to see if Whole Foods' ROA in 2015 was unusually good. In that case, the 2016 ROA of 8.0% might be more in line with the company's long-term performance and would therefore not be a cause for alarm. Second, if analysts look at a longer time series of Whole Foods' financial numbers and find that 8% is, in fact, a poor outcome by historical standards, they would want to know if 2016 was also a bad year for the industry as a whole. If the industry performed well in 2016, that would make Whole Foods' dip more worrisome. Third, one reason the ROA might decline in a particular year is that the firm made a large investment that takes time to pay off. That hypothesis seems consistent with the 10.4% increase in Whole Foods' assets in 2016, but analysts would comb Whole Foods' public disclosures carefully to learn how the company invested its additional assets in 2016 and whether it is reasonable to expect those investments to generate positive earnings and cash flows in 2017 and beyond.

RETURN ON EQUITY (ROE)

return on equity (ROE)
Measures the return earned on the common stockholders' investment in the firm.

The **return on equity (ROE)** ratio is similar to ROA, except that it focuses on the earnings that a company generates relative to the equity invested in the firm rather than the assets invested. The equation for ROE is

$$\text{ROE} = \text{Earnings available for common stockholders} \div \text{Common stock equity} \quad (3.16)$$

Before checking the ROE numbers for Whole Foods, take a moment to compare the equations for ROA (Equation 3.15) and ROE (Equation 3.16). The two equations share the same numerator, earnings available for common stockholders.

They differ only because the denominator for ROE is common stock equity, whereas the denominator for ROA is total assets. From the basic equation in accounting, we know that on a balance sheet, the firm's total assets equal the sum of liabilities and equity (A = L + E). This means that as long as a firm has at least some liabilities on its balance sheet, its common stock equity will always be less than its assets. If equity is less than assets, then the denominator of the ROE calculation will always be less than the denominator for ROA. Given that the two ratios share the same numerator, we can make the following general statements about the relation between ROA and ROE.

- When a firm has positive earnings available for common stockholders, its ROE will be greater than its ROA (ROE > ROA if earnings are positive).
- When a firm does not have positive earnings available for common stockholders (e.g., when the firm experiences a loss), its ROE will be more negative than its ROA (ROE < ROA if earnings are negative).

A simplified way of stating this relationship is that in good times, the return on a firm's equity is even better than the return on its assets, but in bad times, the return on a firm's equity is worse than the return on its assets. Now let's look at the ROE results for Whole Foods, which are

$$2016: \$507 \div \$3{,}224 = 0.157 = 15.7\%$$
$$2015: \$536 \div \$3{,}769 = 0.142 = 14.2\%$$

Two observations are important here. First, in both years Whole Foods' ROE exceeds its ROA. Second, although the firm's ROA fell in 2016 (from 9.3% to 8.0%), its ROE actually went up that year (from 14.2% to 15.7%). At first glance this seems quite odd. These two ratios are both designed to measure a company's profitability, but for the same company in the same year, one ratio fell while the other rose. Why did this happen, and what are we to make of this apparent contradiction?

As we noted above, the difference between ROE and ROA arises because a firm's assets typically exceed its common stock equity, with the difference being the firm's liabilities. The more a firm borrows, the larger is the gap between its assets and its equity. Likewise, if a firm uses debt financing to a great extent, then the ROA and ROE ratios can tell very different stories. In 2016, Whole Foods increased its total assets by 10.4%, but the firm's common stock equity actually fell by 14.5%. The only way to make both of those things happen at the same time is to borrow more, and Whole Foods' balance sheet shows that the company did just that. Total liabilities increased in 2016 from $1,972 to $3,117, a 58% jump! In 2016, Whole Foods made some major changes to the right-hand side of its balance sheet. It accomplished this primarily by borrowing money and using that money to retire some of its outstanding common stock. The bottom of Table 3.6 indicates that Whole Foods reduced common stock shares outstanding by 30.6 million in 2016.

The ROA and ROE ratios reflect this dramatic shift in Whole Foods' mix of debt and equity financing in two ways. First, it is the change in financing mix that creates a situation in which the ROA falls and the ROE rises in the same year. The ROA fell in 2016 because the company's earnings fell at the same time its assets increased. However, the ROE actually rose because Whole Foods' equity fell even faster than its earnings. In other words, the company earned

a lower profit in 2016, but many fewer shareholders had a claim on those profits. The second way the change in financing mix influences the ROA and ROE ratios is that the gap between those two ratios widens with more debt and less equity financing. Below we repeat the ROA and ROE values for 2015 and 2016 and highlight the differences between them.

	2016	2015
ROE	15.7%	14.2%
ROA	8.0	9.3
Difference (ROE − ROA)	7.7	4.9

As we stated earlier, when a company finances its activities, at least in part, by borrowing money, we say that the firm employs *financial leverage*. You can understand why we use that term if you look at the differences in ROA and ROE above. In 2016, Whole Foods used much more debt (i.e., more leverage), and that resulted in an ROE almost twice as large as the ROA. In other words, by borrowing money Whole Foods magnified or levered up the return that shareholders earned relative to the underlying return on the firm's overall asset base. In 2015 the ROE was also higher than the ROA, but not to the same degree because Whole Foods did not rely as heavily on borrowed funds that year. Of course, the favorable ROE outcome in 2016 might have been quite different if Whole Foods had earned a loss that year. In that case, the ROE would have been substantially worse than the ROA.

The general lesson here is one that we will return to repeatedly in this text. When firms borrow money, they magnify the returns that shareholders earn in good times, but they also magnify the losses that shareholders endure in bad times. The earnings of a company with more debt will experience higher highs and lower lows compared to a company with less debt. The more a firm borrows, the greater will be the volatility of its earnings.

→ REVIEW QUESTIONS MyLab Finance Solutions

3–14 What three ratios of profitability appear on a common-size income statement?

3–15 What would explain a firm having a high gross profit margin and a low net profit margin?

3–16 A firm's ROE is typically not equal to its ROA. Why? When would a firm's ROA equal its ROE?

LG 5

3.7 Market Ratios

market ratios
Relate a firm's market value, as measured by its current share price, to certain accounting values.

Market ratios relate the firm's market value, as measured by its current share price, to certain accounting values. These ratios give insight into how investors in the marketplace believe the firm is doing in terms of risk and return. An interesting aspect of these ratios is that they combine backward-looking and forward-looking perspectives. A firm's stock price is intrinsically forward looking because

what investors are willing to pay for a stock is based much more on how they think a company will perform in the future than on how it has performed in the past. Accounting values, in contrast, have an inherently historical perspective. Here we consider two widely quoted market ratios, one that focuses on earnings and another that emphasizes book value.

PRICE/EARNINGS (P/E) RATIO

price/earnings (P/E) ratio
Measures the amount that investors are willing to pay for each dollar of a firm's earnings; the higher the P/E ratio, the greater the investor confidence.

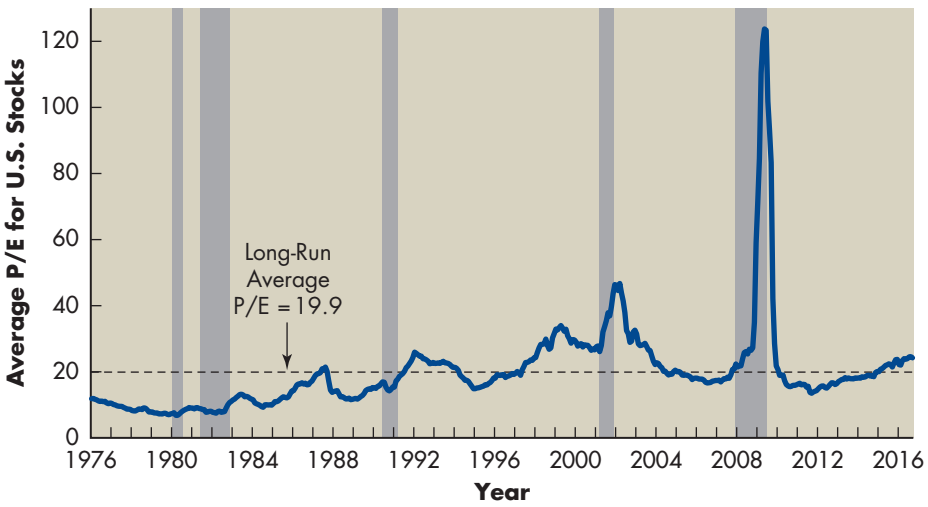
The **price/earnings (P/E) ratio** is one of the most widely quoted financial ratios in the investments community. The P/E ratio measures the amount that investors are willing to pay for each dollar of a firm's earnings. A variety of factors can influence whether a firm's P/E ratio is high or low, but one of the primary determinants of the P/E ratio is the rate of growth that investors believe a firm will achieve. Other things being equal, investors will pay a higher price for the shares of a firm they expect to grow rapidly, so fast-growing firms tend to have higher P/E ratios than more stable companies. Another factor that influences this ratio is risk. Holding everything else constant, investors will pay a higher price for a firm they believe is less risky. Therefore, the P/E ratio may be high if a firm's growth prospects are good, if its risk is low, or (as we will soon see) for other reasons. The P/E ratio is calculated as

$$\text{P/E ratio} = \text{Market price per share of common stock} \div \text{Earnings per share} \quad (3.17)$$

Before examining the P/E ratio for Whole Foods, let's take a look at the long-term behavior of P/E ratios in the broad stock market. The blue line in Figure 3.3 shows the average P/E ratio for all U.S. stocks on a monthly basis from January 1976 to September 2016, and the vertical grey bars show periods in which the U.S. economy was in recession. The horizontal line in the figure indicates that from 1976 to 2016, the average stock had a P/E ratio of about 19.9. However,

FIGURE 3.3

Average P/E Ratio for U.S. Stocks
Average P/E ratio for all U.S. stocks on a monthly basis from January 1976 to September 2016



Source: Authors' calculations using data obtained from Robert Shiller's website

P/E ratios fluctuated dramatically, ranging from a low of 6.8 in April 1980 to a high of 123.7 in May 2009.

We can plausibly link some of the fluctuations in P/E ratios to changes in investors' expectations about growth. The average P/E ratio fell in the late 1970s and into the early 1980s, which is consistent with the view that investors had low growth expectations. Indeed, two recessions occurred in the early 1980s, and economic growth was slow by historical standards until the second recession ended. Generally speaking, the mid-1980s through the decade of the 1990s was a period of above-average economic growth, and the average P/E ratio in the U.S. stock market trended up throughout that period. In contrast, economic growth was tepid by historical standards in the 2000s, and the average P/E ratio fell again during that time, with one very obvious and very large exception.

Notice in Figure 3.3 the extremely high P/E ratios that prevailed in the stock market during much of 2008 and 2009. Those unusually high numbers reveal an important lesson about the difficulties of interpreting P/E ratios. We know that the U.S. economy experienced a deep recession in 2008 and 2009. If a high P/E ratio is a sign that investors expect rapid earnings growth, then a recession seems like a strange time to observe high P/E ratios in the stock market. In fact, the market's average P/E ratio was high at this time not because investors expected very rapid earnings growth in the future, but because total corporate earnings during the recession were extremely low. In inflation-adjusted terms, corporate earnings were lower in 2009 than they had been since 1922! In other words, the "E" in the denominator of the P/E ratio fell dramatically in the recession, and that caused an unusual spike in the P/E ratio. To put it differently, although the recession probably caused investors to revise downward their expectations about future earnings growth, the actual earnings that companies generated during the recession fell even faster, so the net result was a huge jump in the market's average P/E ratio.

With the stock market's historical P/E ratios providing some perspective, let's examine Whole Foods' P/E ratio. At the end of the 2016 fiscal year, the price of Whole Foods' common stock was $28.35, and a year earlier the price was $31.65. Using these values and the EPS figures provided earlier, we can calculate Whole Foods' P/E ratios as follows:

$$2016: \$28.35 \div \$1.59 = 17.83$$
$$2015: \$31.65 \div \$1.53 = 20.69$$

The P/E ratio indicates that investors were paying $17.83 for each $1.00 of earnings in 2016, and that figure was down significantly from the 2015 P/E ratio of 20.69. Does the drop in Whole Foods' P/E ratio signal that investors are less optimistic about the company's growth prospects? To answer that question, it is wise to examine how P/E ratios changed at other firms during this period. We could compare Whole Foods' P/E ratio to the P/E ratios of other grocery chains, other retail stores, or some other comparison group. For example, using Figure 3.3 we can compare the P/E ratio for Whole Foods to the average P/E ratio in the stock market. In September 2016, when Figure 3.3 ends, Whole Foods' P/E ratio was 17.8, whereas the average U.S. stock had a P/E ratio of 24.2. The year before, in September 2015, Whole Foods' P/E ratio was 20.7, whereas the average stock's P/E was 21.4. For 2 years in a row, Whole Foods' P/E was below the average value for all U.S. stocks, but perhaps more worrisome

for Whole Foods' managers and investors, the company's P/E ratio fell in 2016 while the P/E ratio of the average U.S. stock actually rose.

MARKET/BOOK (M/B) RATIO

market/book (M/B) ratio
Provides an assessment of how investors view the firm's performance. Firms expected to earn high returns relative to their risk typically sell at higher M/B multiples.

The **market/book (M/B) ratio** provides an assessment of how investors view the firm's performance by comparing the market price of the firm's common stock (i.e., what investors are willing to pay for the stock) to the book value of common stock (i.e., the value shown on the balance sheet). For most companies, the M/B ratio will be greater than 1, and often it is much greater than that. Remember that the values shown on a company's balance sheet are based largely on historical costs, whereas the market value of a company's stock is inherently based on how investors believe the company will perform in the future. Furthermore, recall that the objective of managers is to create value for shareholders. One way to demonstrate that managers are creating value is to show that the value investors are willing to pay for the stock is greater than the historical-cost-based book value of the firm's shares. In other words, when the firm's market value exceeds its book value, then managers have created value that exceeds the costs of the assets they have invested in.

To calculate the firm's M/B ratio, we first need to find the *book value per share of common stock:*

$$\text{Book value per share of common stock} = \frac{\text{Total common stock equity}}{\text{Number of shares of common stock outstanding}} \quad (3.18)$$

For Whole Foods, we see in Table 3.6 that the company reported a total equity balance of $3,224 million in 2016, and it had 318.3 million shares of common stock outstanding.[3] This results in a book value per share of

$$\text{Book value per share of common stock} = \frac{\$3{,}224}{318.3} = \$10.13$$

In 2015, the company reported equity of $3,769 and 348.9 million outstanding shares, so book value per share that year was $10.80. With this information in hand, we can calculate the market/book ratio. The formula for the market/book ratio is

$$\text{Market/book (M/B) ratio} = \frac{\text{Market price per share of common stock}}{\text{Book value per share of common stock}} \quad (3.19)$$

Previously, we noted that Whole Foods' stock price was trading at $28.35 at the end of its 2016 fiscal year and at $31.65 at the end of 2015. Using those numbers and the book value per share figures above, we find that Whole Foods' M/B ratios look like this:

$$\text{2016: } \$28.35 \div \$10.13 = 2.80$$
$$\text{2015: } \$31.65 \div \$10.80 = 2.93$$

3. Whole Foods has no preferred stock, so total equity equals common stock equity. For firms with outstanding preferred shares, we would subtract the book value of preferred shares from total equity to obtain common stock equity.

Just as Whole Foods' P/E ratio fell in 2016, so did its M/B ratio. In 2015, investors were willing to pay $2.93 for each $1 of book value, but in 2016 they paid only $2.80 per $1 of book value.

The stocks of firms that investors expect to perform well—firms that improve profits, increase their market share, or launch successful products—typically sell at higher M/B ratios than the stocks of firms with less attractive outlooks. For Whole Foods, the M/B ratio provides a mixed signal. On the one hand, the market value of the firm's shares is close to 3 times greater than the book value. On the other hand, investors seem to have cooled a bit on the company in 2016.

→ REVIEW QUESTION MyLab Finance Solutions

3–17 What do the price/earnings (P/E) ratio and the market/book (M/B) ratio reveal about how investors assess a firm's performance? What caveats must investors keep in mind when evaluating these ratios?

LG 6

3.8 A Complete Ratio Analysis

In this section we summarize the ratio analysis that we've performed for Whole Foods, and we introduce another approach for using ratios to diagnose problems with a firm's profitability—the DuPont method.

SUMMARY OF WHOLE FOODS' FINANCIAL CONDITION

Table 3.10 summarizes many of the ratios we've calculated for Whole Foods. The table shows ratio values for 2015 and 2016, the industry average ratio (where available), and the formula for each ratio. Using these data, we can discuss the five key aspects of the firm's performance: liquidity, activity, debt, profitability, and market.

Liquidity

The overall liquidity of the firm increased significantly in 2016, rising above the industry norm. The company should therefore encounter no difficulties in paying short-term liabilities, but investors may develop concerns that the company is overinvesting in liquidity if this trend continues.

Activity

Whole Foods' inventory turnover has been steady for 2 consecutive years and is well above the industry average. Although the grocery chain's receivables collection period increased slightly in 2016, the company does not sell a great deal on credit, and its collections still seem to be better than average for the industry. The speed with which the company pays its bills has not changed materially in the past 2 years. Overall, then, we conclude that Whole Foods is managing its current assets and liabilities reasonably well.

Whole Foods' total asset turnover slowed to a significant degree in 2016, and the company is just about at the industry average on this metric. Recall

that Whole Foods made a significant investment in new assets in 2016, and no asset category increased faster than cash, which jumped 64%. Holding more cash is not likely to help the company generate more revenue, so until Whole Foods puts its cash to use by investing in revenue-generating assets, its total asset turnover is not likely to return to the 2015 level the company achieved. Firms that hold too much cash sometimes become the target of a takeover attempt as the acquiring firm views the target's excess cash as an under-performing asset.

Debt

Whole Foods' indebtedness increased sharply in 2016, though the company still uses less debt than does the average grocery company. Given that the company is generating more than enough cash flow to cover its interest payments, the increase in debt is not likely to be a major source of concern, even though it will increase the company's risk profile.

Profitability

Whole Foods was more profitable than the average grocery firm in 2016 by all measures. The company's net profit margin, ROA, and ROE all exceeded the industry average. Even so, managers and investors will not want to see a continuation of the decline in net margin and ROA that occurred in 2016. As we have discussed above, although the company increased its ROE, it did so primarily by replacing equity with debt on its balance sheet, not by making the business intrinsically more profitable. A look at the market ratios also suggests that investors do not view everything about the company's performance in a positive light.

Market

Both the P/E and M/B ratios fell in 2016, suggesting that investors have a little less confidence in the firm in 2016. However, both of these ratios are above the industry average. The declines in these ratios may reflect investors' concerns about deteriorating fundamental profitability in the business, reduced growth prospects, or other factors such as increased risk arising from greater financial leverage.

Overall, the ratio analysis for Whole Foods told a mixed story at the end of 2016. The company was profitable and growing. It showed no signs of difficulty in paying its debts. However, there were some indications that the firm's profits were coming under pressure. Furthermore, the market value ratios indicate that investors were not quite as optimistic about Whole Foods as they were in 2015.

Another sign of investor discontent emerged in April 2017, when the activist hedge fund, Jana Partners, announced that it had accumulated a block of 9% of the company's common stock, making it the company's largest shareholder. Jana publicly challenged the board and senior management of Whole Foods and proposed its own slate of 4 candidates for the board of directors. Whole Foods responded by offering to appoint 2 of Jana's 4 candidates to the board if the hedge fund agreed to refrain from publicly criticizing the company for 2 years. Jana refused, but as this book was going to press, Amazon announced that it was buying Whole Foods for $13.7 billion in cash. That price tag represented a 27% premium over the then-current market price of Whole Foods stock and a major win for Jana Partners.

TABLE 3.10 Summary of Whole Foods' Ratios (2015–2016, Including 2016 Industry Averages)

Ratio	Formula	Year		Industry average	Evaluation		
		2015	2016	2016	Cross-sectional 2016	Time-series 2015–2016	Overall
Liquidity							
Current ratio	$\frac{\text{Current assets}}{\text{Current liabilities}}$	1.23	1.47	1.32	OK	OK	OK
Quick (acid-test) ratio	$\frac{\text{Current assets} - \text{Inventory}}{\text{Current liabilities}}$	0.83	1.09	0.76	OK	OK	OK
Activity							
Inventory turnover	$\frac{\text{Cost of goods sold}}{\text{Inventory}}$	19.9	19.9	11.1	OK	OK	OK
Average collection period	$\frac{\text{Accounts receivable}}{\text{Average sales per day}}$	5.2 days	5.6 days	7.5 days	OK	OK	OK
Average payment period	$\frac{\text{Accounts payable}}{\text{Average purchases per day}}$	15.4 days	15.5 days	17.1 days	OK	OK	OK
Total assets turnover	$\frac{\text{Sales}}{\text{Total assets}}$	2.68	2.48	2.4	OK	Watch	OK
Debt							
Debt ratio	$\frac{\text{Total liabilities}}{\text{Total assets}}$	34%	49%	60.0%	OK	Watch	OK
Debt/equity ratio	$\frac{\text{Total liabilities}}{\text{Common stock equity}}$	0.52	0.97	1.50	OK	Watch	OK
Times interest earned ratio	$\frac{\text{Earnings before interest and taxes}}{\text{Interest}}$	NA	20.9	4.3	OK	OK	OK

Ratio	Formula	Year 2015	Year 2016	Industry average 2016	Evaluation: Cross-sectional 2016	Evaluation: Time-series 2015–2016	Evaluation: Overall
Profitability							
Gross profit margin	$\frac{\text{Gross profits}}{\text{Sales}}$	35.2%	34.4%	30.0%	OK	OK	OK
Operating profit margin	$\frac{\text{Operating profits}}{\text{Sales}}$	5.6%	5.4%	6.1%	Watch	Watch	Watch
Net profit margin	$\frac{\text{Earnings available for common stockholders}}{\text{Sales}}$	3.4%	3.2%	2.1%	OK	Watch	OK
Earnings per share (EPS)	$\frac{\text{Earnings available for common stockholders}}{\text{Number of shares of common stock outstanding}}$	$1.54	$1.59	NA	NA	OK	OK
Return on total assets (ROA)	$\frac{\text{Earnings available for common stockholders}}{\text{Total assets}}$	9.3%	8.0%	3.1%	OK	Watch	Watch
Return on equity (ROE)	$\frac{\text{Earnings available for common stockholders}}{\text{Common stock equity}}$	14.2%	15.7%	13.8%	Good	OK	Good
Market							
Price/earnings (P/E) ratio	$\frac{\text{Market price per share of common stock}}{\text{Earnings per share}}$	20.69	17.83	15.2	OK	Watch	OK
Market/book (M/B) ratio	$\frac{\text{Market price per share of common stock}}{\text{Book value per share of common stock}}$	2.93	2.80	2.60	OK	Watch	OK

DUPONT SYSTEM OF ANALYSIS

DuPont system of analysis
System used to dissect the firm's financial statements and to assess its financial condition.

Analysts use the **DuPont system of analysis** to dissect the firm's financial statements and to assess its financial condition. It merges information from the income statement and the balance sheet into two summary measures of profitability, return on total assets (ROA) and return on common equity (ROE), and then decomposes those measures to identify underlying drivers of the firm's performance. Figure 3.4 depicts the basic DuPont system with 2016 financial information from Whole Foods. The upper portion of the chart summarizes the income statement activities, and the lower portion summarizes the balance sheet activities.

DuPont Formula

DuPont formula
Multiplies the firm's *net profit margin* by its *total asset turnover* to calculate the firm's *return on total assets (ROA).*

The DuPont system first brings together the net profit margin, which measures the firm's profitability on sales, with its total asset turnover, which indicates how efficiently the firm has used its assets to generate sales. In the **DuPont formula,** the product of these two ratios results in the return on total assets (ROA):

$$\text{ROA} = \text{Net profit margin} \times \text{Total asset turnover}$$

Substituting the appropriate formulas for net profit margin and total asset turnover into the equation and simplifying results in the formula for ROA given earlier,

$$\text{ROA} = \frac{\text{Earnings available for common stockholders}}{\text{Sales}} \times \frac{\text{Sales}}{\text{Total assets}} = \frac{\text{Earnings available for common stockholders}}{\text{Total assets}}$$

When we substitute the 2016 values of the net profit margin and total asset turnover for Whole Foods, calculated earlier, into the DuPont formula, the result is

$$\text{ROA} = 3.2\% \times 2.48 = 7.9\%$$

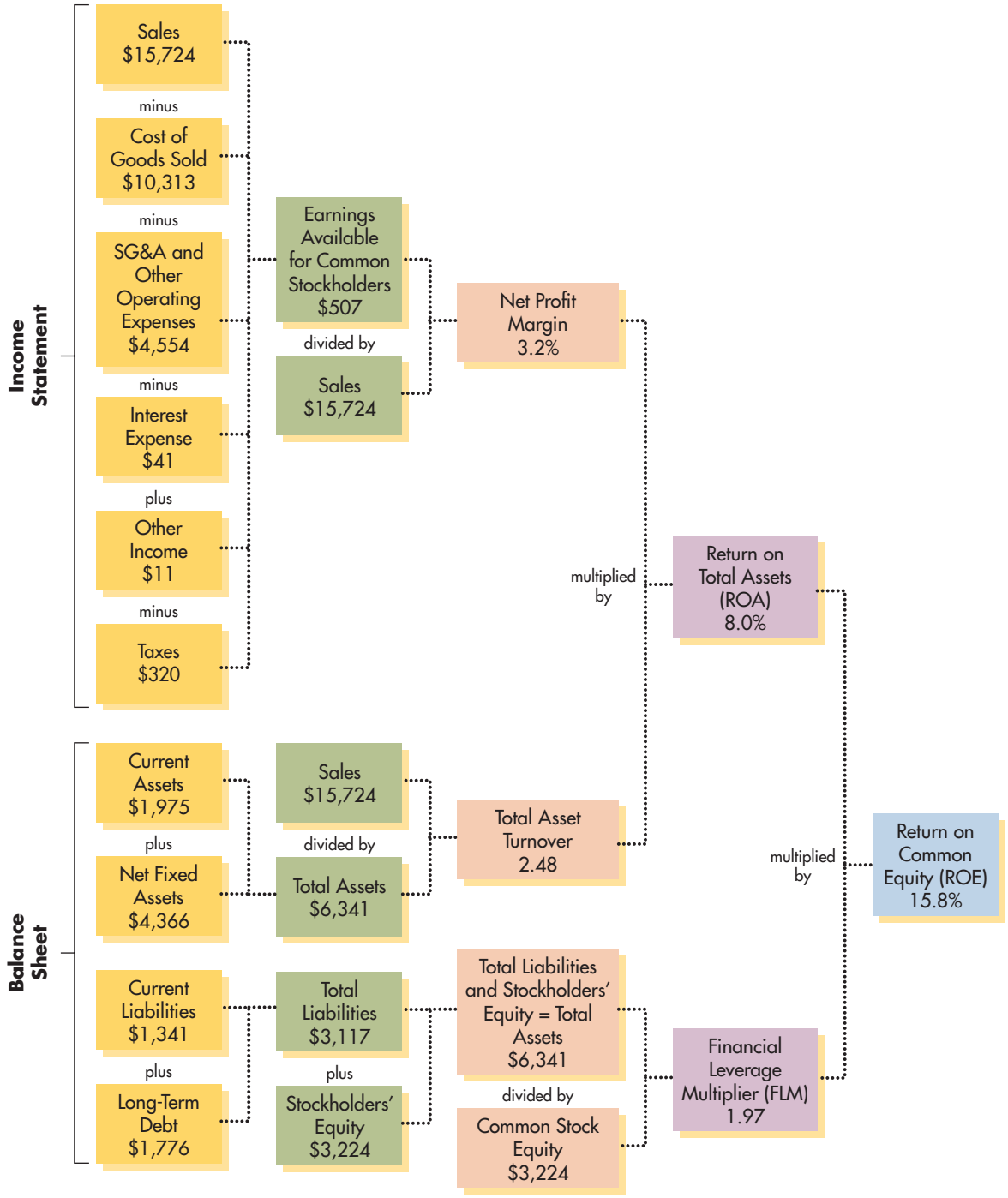
Except for a small difference in rounding, this value is the same as that calculated directly in Section 3.6 (page 145). The DuPont formula enables the firm to break down its return into profit-on-sales and efficiency-of-asset-use components. One way to think about this type of analysis is that it demonstrates two "channels" through which a firm may achieve a given level of ROA. A firm may achieve its target ROA either by having a strong net profit margin or by turning over its assets rapidly. Firms can adopt strategies that emphasize either of these channels to achieve an acceptable ROA.

To illustrate this idea, return to Table 3.5 and focus your attention on the ratios for Target and Walmart. Clearly, these two companies compete against each other, yet they have adopted different strategies. Target stores typically have a more open layout with better lighting compared to Walmart stores, and Target's prices are a bit higher. Walmart typically charges lower prices, but it crams its stores with items that turn over rapidly. In Table 3.5, observe that these two companies earned fairly similar ROAs—7.1% for Target and 8.4% for Walmart. They achieved these results in different ways. Target had a higher net profit margin (3.8% versus 3.5% at Walmart) mostly because it charged higher prices. But Walmart turned its assets much faster (2.4 times per year versus 1.8 times for Target). Strategically, Target has decided to compete by attracting a more upscale consumer who wants a more relaxed shopping experience and is willing to pay more than the typical Walmart customer. If Target decided to cut its prices to compete on that dimension with Walmart, it would need to increase its asset turnover; otherwise, its ROA would fall.

FIGURE 3.4

DuPont System of Analysis

The DuPont system of analysis with application to Whole Foods (2016)



MATTER OF FACT

Dissecting ROA

Return to Table 3.5, and examine the ROA figures for Home Depot and Kroger. Those two firms have very similar ROAs, with Home Depot earning 6.5% and Kroger earning 6.0%. Now look at their net profit margins. By that measure, Home Depot is more than twice as profitable as Kroger (net margin of 4.0% versus 1.9% for Kroger). If Home Depot's net profit margin is so much bigger than Kroger's, why do the two firms earn very similar ROAs? The answer lies in total asset turnover. Kroger turns its assets 3.2 times per year, which is much faster than Home Depot's asset turnover of 1.6 times. Simply put, Kroger uses its assets twice as efficiently as Home Depot, but Home Depot's net profit margin is about twice as large as Kroger's; the end result is that both firms earn close to a 6% ROA.

Modified DuPont Formula

modified DuPont formula
Relates the firm's *return on total assets (ROA)* to its *return on equity (ROE)* using the *financial leverage multiplier (FLM).*

financial leverage multiplier (FLM)
The ratio of the firm's total assets to its common stock equity.

The second step in the DuPont system employs the **modified DuPont formula.** This formula relates the firm's return on total assets (ROA) to its return on equity (ROE). The key ratio linking ROA to ROE is the **financial leverage multiplier (FLM),** which is the ratio of total assets to common stock equity:

$$\text{Financial leverage multiplier (FLM)} = \text{Total assets} \div \text{Common stock equity} \quad (3.20)$$

Next, it's easy to see that the product of ROA and FLM equals the firm's ROE.

$$\text{ROE} = \text{ROA} \times \text{FLM}$$

Substituting the appropriate formulas for ROA and FLM into the equation and simplifying results in the formula for ROE given earlier:

$$\text{ROE} = \frac{\text{Earnings available for common stockholders}}{\text{Total assets}} \times \frac{\text{Total assets}}{\text{Common stock equity}} = \frac{\text{Earnings available for common stockholders}}{\text{Common stock equity}}$$

Using this expression to calculate ROE clearly shows the effect that financial leverage has in magnifying a firm's ROA because the FLM is almost always a number greater than 1.0. Substituting the 2016 values for Whole Foods' ROA of 8.0%, calculated earlier, and the company's FLM of 1.97 ($6,341 total assets ÷ $3,224 common stock equity) into the modified DuPont formula yields

$$\text{ROE} = 8.0\% \times 1.97 = 15.8\%$$

The 15.8% ROE calculated by using the modified DuPont formula is the same as that calculated directly (page 146), again except for a minor difference in rounding.

The FLM is also often referred to as the *equity multiplier,* and it is sometimes calculated using total stockholders' equity in the denominator. Recognize that these three ratios—the multiplier, the debt ratio, and debt-to-equity ratio—are all related such that any one of them can be directly calculated from the other two. For example, if we divide the debt-to-equity ratio (Equation 3.8) by the debt ratio (Equation 3.7), we obtain the FLM. Using the relevant 2016 numbers for Whole Foods, we have

$$\text{Equity multiplier} = (\text{Debt-to-equity ratio})/(\text{Debt ratio}) = 0.97/0.49 = 1.98$$

This number matches the figure we obtained above, subject to a small difference in rounding.

Applying the DuPont System

The advantage of the DuPont system is that it allows the firm to break its return on equity into a profit-on-sales component (net profit margin), an efficiency-of-asset-use component (total asset turnover), and a use-of-financial-leverage component (financial leverage multiplier). Analysts can decompose the total return to owners into these important components.

The use of the DuPont system of analysis as a diagnostic tool is best explained using Figure 3.4. Beginning with the rightmost value—the ROE—the financial analyst moves to the left, dissecting and analyzing the inputs to the formula to isolate the probable cause of the resulting above-average (or below-average) value.

EXAMPLE 3.6

MyLab Finance Solution Video

In Table 3.8 we saw that Whole Foods' 2016 ROE was 15.7%, above the 13.8% industry average. What are the drivers of this difference? Start at the far right of Figure 3.4 and move left. Whole Foods' ROA was 8.0%, well above the industry average of 3.1%. Whole Foods' FLM was just under 2.0, whereas the industry average was 2.5.[4] Therefore, Whole Foods' shareholders enjoyed a higher-than-average ROE because the firm's underlying profitability, its ROA, was much higher than that of the typical grocery chain. Continuing to move left in Figure 3.4, we see that the ROA figure resulted from Whole Foods' above-average net profit margin of 3.2% and its asset turnover of 2.48, which just barely rose above the industry average.

→ REVIEW QUESTIONS MyLab Finance Solutions

3–18 Financial ratio analysis is often divided into five areas: liquidity, activity, debt, profitability, and market ratios. Differentiate each of these areas of analysis from the others. Which is of greatest concern to creditors?

3–19 Describe how you would use a large number of ratios to perform a complete ratio analysis of the firm.

3–20 What three areas of analysis are combined in the modified DuPont formula? Explain how the manager uses the DuPont system of analysis to dissect the firm's results and isolate their causes.

SUMMARY

FOCUS ON VALUE

Financial managers review and analyze the firm's financial statements periodically, both to uncover developing problems and to assess the firm's progress toward achieving its goals. These actions are aimed at **preserving and creating**

4. We estimate the industry average FLM by dividing the industry average debt-to-equity ratio of 1.5 in Table 3.8 by the industry average debt ratio of 0.6.

value for the firm's owners. Financial ratios enable financial managers to monitor the pulse of the firm and its progress toward its strategic goals. Although financial statements and financial ratios rely on accrual concepts, they can provide useful insights into important aspects of risk and return (cash flow) that affect share price.

REVIEW OF LEARNING GOALS

LG1 **Review the contents of the stockholders' report and the procedures for consolidating international financial statements.** The annual stockholders' report, which publicly owned corporations must provide to stockholders, documents the firm's financial activities of the past year. It includes the letter to stockholders and other information about the firm's activities and strategies. It also contains four key financial statements: the income statement, the balance sheet, the statement of stockholders' equity (or its abbreviated form, the statement of retained earnings), and the statement of cash flows. Notes describing the technical aspects of the financial statements follow. Financial statements of companies that have operations whose cash flows are denominated in one or more foreign currencies must be translated into U.S. dollars in accordance with *FASB Standard No. 52*.

LG2 **Understand who uses financial ratios and how.** Ratio analysis enables stockholders, lenders, and the firm's managers to evaluate the firm's financial performance. It can be performed on a cross-sectional or a time-series basis. Benchmarking is a popular type of cross-sectional analysis. Users of ratios should understand the cautions that apply to their use.

LG3 **Use ratios to analyze a firm's liquidity and activity.** Analysts can assess a firm's liquidity, or the ability of the firm to pay its bills as they come due, by calculating the current ratio and the quick (acid-test) ratio. Activity ratios measure the speed with which accounts are converted into sales or cash. Analysts use the inventory turnover ratio, the accounts receivable collection period, and the average payment period (for accounts payable) to assess the activity of those current assets and liabilities. Total asset turnover measures the efficiency with which the firm uses its assets to generate sales.

LG4 **Discuss the relationship between debt and financial leverage, as well as the ratios used to analyze a firm's debt.** The more debt a firm uses, the greater its financial leverage, which magnifies both risk and return. Financial debt ratios measure both the degree of indebtedness and the ability to service debts. A common measure of indebtedness is the debt ratio. The ability to pay fixed charges can be measured by times interest earned and fixed-payment coverage ratios.

LG5 **Use ratios to analyze a firm's profitability and its market value.** The common-size income statement, which shows each item as a percentage of sales, can be used to determine gross profit margin, operating profit margin, and net profit margin. Other measures of profitability include earnings per share, return on total assets, and return on common equity. Market ratios include the price/earnings ratio and the market/book ratio.

LG6 **Use a summary of financial ratios and the DuPont system of analysis to perform a complete ratio analysis.** A summary of all ratios can be used to perform a complete ratio analysis using cross-sectional and time-series analysis. The DuPont system of analysis is a diagnostic tool used to find the key areas responsible for the firm's financial performance. It enables the firm to break the return on common equity into three components: profit on sales, efficiency of asset use, and use of financial leverage.

SELF-TEST PROBLEMS (Solutions in Appendix)

LG3 LG4 LG5

ST3–1 Ratio formulas and interpretations Without referring to the text, indicate for each of the following ratios the formula for calculating it and the kinds of problems, if any, the firm may have if that ratio is too high relative to the industry average. What if the ratio is too low relative to the industry average? Create a table similar to the one that follows and fill in the empty blocks.

Ratio	Too high	Too low
Current ratio =		
Inventory turnover =		
Times interest earned =		
Gross profit margin =		
Return on total assets =		
Price/earnings (P/E) ratio =		

LG3 LG4 LG5

ST3–2 Balance sheet completion using ratios Complete the 2019 balance sheet for O'Keefe Industries, using the information that follows it.

O'Keefe Industries Balance Sheet December 31, 2019

Assets		Liabilities and Stockholders' Equity	
Cash	$32,720	Accounts payable	$120,000
Marketable securities	25,000	Notes payable	_____
Accounts receivable	_____	Accruals	$ 20,000
Inventories	_____	Total current liabilities	_____
Total current assets	_____	Long-term debt	_____
Net fixed assets	_____	Stockholders' equity	$600,000
Total assets	$_____	Total liabilities and stockholders' equity	$_____

The following financial data for 2019 are also available:

1. Sales totaled $1,800,000.
2. The gross profit margin was 25%.
3. Inventory turnover was 6.0.
4. There are 365 days in the year.
5. The average collection period was 40 days.
6. The current ratio was 1.60.
7. The total asset turnover ratio was 1.20.
8. The debt ratio was 60%.

WARM-UP EXERCISES

Select problems are available in MyLab Finance

LG 1

E3–1 You are a summer intern at the office of a local tax preparer. To test your basic knowledge of financial statements, your manager gives you the following list of accounts and asks you to prepare a simple income statement using those accounts.

Accounts	($000,000)
Depreciation	$ 25
General and administrative expenses	22
Sales	345
Sales expenses	18
Cost of goods sold	255
Lease expense	4
Interest expense	3

a. Arrange the accounts into a well-labeled income statement. Make sure you label and solve for gross profit, operating profit, and net profit before taxes.
b. Using a 21% tax rate, calculate taxes paid and net profit after taxes.
c. Assuming a dividend of $1.10 per share with 4.25 million shares outstanding, calculate EPS and additions to retained earnings.

LG 1

E3–2 Explain why the income statement can also be called a "profit-and-loss statement." What exactly does the word *balance* mean in the title of the balance sheet? Why do we balance the two halves?

LG 1

E3–3 Ocean Terminal Company Ltd. started its business in 2019 with retained earnings of $68.45 million. It paid two semiannual dividends of $0.23 per share to 3.25 million preferred stockholders during the year. Common stockholders, holding 9.8 million common shares, were paid four quarterly dividends of $0.25 per share. The company had a net profit after taxes of $6.34 million. Prepare the statement of retained earnings for the year ended December 31, 2019.

LG 3

E3–4 Crane Housing PLC has a current ratio of 2.5 and total current assets worth £5 million. Crane housing also has some long-term borrowings where the bank has stipulated that the current ratio of the firm should not drop below 1.5. The management has planned to take on a new housing project in Birmingham which will increase the inventory by £3 million. The firms plan to fund this inventory by increasing accounts payable.

Explain whether they will be able to follow this plan. Suggest any alternative sources to fund this increase in inventory without affecting the current ratio.

LG 6

E3–5 Geotherm Energy Ltd. has a net profit margin of 6%, a financial leverage multiplier of 1.5, and a total asset turnover of 1.2. What is the ROE? What is the advantage of using the DuPont system to calculate ROE over the direct calculation of earnings available for common stockholders divided by common stock equity?

PROBLEMS

Select problems are available in MyLab Finance. The MyLab icon indicates problems in Excel format available in MyLab Finance.

P3–1 **Financial statement account identification** Mark each of the accounts listed in the following table as follows:

a. In column (1), indicate in which statement—income statement (IS) or balance sheet (BS)—the account belongs.

b. In column (2), indicate whether the account is a current asset (CA), current liability (CL), expense (E), fixed asset (FA), long-term debt (LTD), revenue (R), or stockholders' equity (SE).

	(1)	(2)
Account name	**Statement**	**Type of account**
Accounts payable	_____	_____
Accounts receivable	_____	_____
Accruals	_____	_____
Accumulated depreciation	_____	_____
Administrative expense	_____	_____
Buildings	_____	_____
Cash	_____	_____
Common stock (at par)	_____	_____
Cost of goods sold	_____	_____
Depreciation	_____	_____
Equipment	_____	_____
General expense	_____	_____
Interest expense	_____	_____
Inventories	_____	_____
Land	_____	_____
Long-term debts	_____	_____
Machinery	_____	_____
Marketable securities	_____	_____
Notes payable	_____	_____
Operating expense	_____	_____
Paid-in capital in excess of par	_____	_____
Preferred stock	_____	_____
Preferred stock dividends	_____	_____
Retained earnings	_____	_____
Sales revenue	_____	_____
Selling expense	_____	_____
Taxes	_____	_____
Vehicles	_____	_____

LG 1

P3–2 Income statement preparation On January 1, 2019, Belle Florist opened a store in an upmarket area of Soho, London. The business is owned by Boris Kimmel, the sole proprietor. During the year, Boris has kept a record of all transactions. On December 31, 2019, his records show that he has sold goods worth £280,000, which were purchased for £80,000 from vendors in Rotterdam, the Netherlands. He has withdrawn £42,000 as his *annual* salary. The business has paid £15,000 toward gas, electricity, and council taxes for the year. Lease payments for the office space rented were £24,000, including a refundable deposit of £4,000. Belle Florist employed two full-time shop assistants, each receiving *annual* salaries of £24,000 before tax. Depreciation expense on the office furniture and fixtures was £1,000 *per month*. They also have paid £2,200 toward interest and charges on an overdraft facility they have from their bankers. The business is supposed to pay an average tax rate of 25% during 2019.

a. Prepare an income statement for Belle Florist for the year ended December 31, 2019.

b. Evaluate the financial performance of the business for 2019.

Personal Finance Problem

LG 1

P3–3 Income statement preparation Adam and Arin Adams have collected their personal income and expense information and have asked you to put together an income and expense statement for the year ended December 31, 2019. You have received the following information from the Adams family.

Adam's salary	$45,000	Utilities	$ 3,200
Arin's salary	30,000	Groceries	2,200
Interest received	500	Medical	1,500
Dividends received	150	Property taxes	1,659
Auto insurance	600	Income tax, Social Security	13,000
Home insurance	750	Clothes and accessories	2,000
Auto loan payment	3,300	Gas and auto repair	2,100
Mortgage payment	14,000	Entertainment	2,000

a. Create a personal *income and expense statement* for the period ended December 31, 2019. It should be similar to a corporate income statement.

b. Did the Adams family have a cash surplus or cash deficit?

c. If the result is a surplus, how can the Adams family use that surplus?

LG 1

P3–4 Calculation of EPS and retained earnings Parsons Electronics Inc. ended 2017 with a net profit *before* taxes of €560,000. The company is subject to a 20% tax rate and must pay €50,000 in preferred stock dividends. The balance sheet shows Parsons has an ordinary share capital of €25,000 in 25 preference shares.

a. Calculate Parsons' 2017 earnings per share (EPS).

b. If the firm paid common stock dividends of €1.20 per share, how many euros would go to retained earnings?

LG 1

P3–5 Balance sheet preparation Use the appropriate items from the following list to prepare Mellark's Baked Goods balance sheet at December 31, 2019.

Item	Value ($000) at December 31, 2019	Item	Value ($000) at December 31, 2019
Accounts payable	$ 220	Inventories	$ 375
Accounts receivable	450	Land	100
Accruals	55	Long-term debts	420
Accumulated depreciation	265	Machinery	420
Buildings	225	Marketable securities	75
Cash	215	Notes payable	475
Common stock (at par)	90	Paid-in capital in excess of par	360
Cost of goods sold	2,500	Preferred stock	100
Depreciation expense	45	Retained earnings	210
Equipment	140	Sales revenue	3,600
Furniture and fixtures	170	Vehicles	25
General expense	320		

P3–6 Effect of net income on a firm's balance sheet Conrad Air Inc. reported net income of $1,365,000 for the year ended December 31, 2020. Show how Conrad's balance sheet would change from 2019 to 2020 depending on how Conrad "spent" those earnings as described in the scenarios that appear below.

Conrad Air Inc. Balance Sheet as of December 31, 2019

Assets		Liabilities and Stockholders' Equity	
Cash	$ 120,000	Accounts payable	$ 70,000
Marketable securities	35,000	Short-term notes	55,000
Accounts receivable	45,000	Current liabilities	$ 125,000
Inventories	$ 130,000	Long-term debt	2,700,000
Current assets	$ 330,000	Total liabilities	$2,825,000
Equipment	$2,970,000	Common stock	$ 500,000
Buildings	1,600,000	Retained earnings	1,575,000
Fixed assets	$4,570,000	Stockholders' equity	$2,075,000
Total assets	$4,900,000	Total liabilities and equity	$4,900,000

a. Conrad paid no dividends during the year and invested the funds in marketable securities.
b. Conrad paid dividends totaling $500,000 and used the balance of the net income to retire (pay off) long-term debt.
c. Conrad paid dividends totaling $500,000 and invested the balance of the net income in building a new hangar.
d. Conrad paid out all $1,365,000 as dividends to its stockholders.

LG 1

P3–7 Initial sale price of common stock Borris & Jarvis (B&J) Dental Group has one issue of preferred stock and one issue of common stock outstanding. Given B&J's stockholders' equity account that follows, determine the original price per share at which the firm sold its single issue of common stock.

Stockholders' Equity ($000)	
Preferred stock	$ 375
Common stock ($0.50 par, 500,000 shares outstanding)	250
Paid-in capital in excess of par on common stock	2,376
Retained earnings	950
Total stockholder's equity	$3,951

LG 1

P3–8 Statement of retained earnings Hayes Enterprises began 2015 with a retained earnings balance of $1,151,000. During 2015, the firm earned $528,000 after taxes. From this amount, preferred stockholders were paid $98,000 in dividends. At year-end 2015, the firm's retained earnings totaled $1,324,000. The firm had 100,000 shares of common stock outstanding during 2015.

a. Prepare a statement of retained earnings for the year ended December 31, 2015, for Hayes Enterprises. (*Note:* Be sure to calculate and include the amount of cash dividends paid in 2015.)

b. Calculate the firm's 2015 earnings per share (EPS).

c. How large a per-share cash dividend did the firm pay on common stock during 2015?

LG 1

P3–9 Changes in stockholders' equity Listed are the equity sections of balance sheets for the years 2017 and 2018 as reported by Taylor Construction PLC. The overall value of stockholder's equity has increased from £2,000,000 to £3,400,000. Use the statements provided below to answer the following questions.

Taylor Construction PLC		
Stockholder's Equity	**2017**	**2018**
Authorized capital in 10p shares	5,000,000	5,000,000
Issued and paid up ordinary share capital	1,000,000	1,200,000
Share premium	400,000	1,000,000
Retained earnings	600,000	1,200,000
Total stockholders' equity	2,000,000	3,400,000

Taylor Construction PLC paid total dividends of £300,000 to their stockholders in 2018.

a. What was the corporation's profit after taxes?

b. How many new shares were issued by Taylor Constructions during the year?

c. At what price per share did the new stock, issued in 2018, sell?

d. Assume that the share capital and share premium for 2017 relates to the original share issue in 2015 and there has not been any changes since. What was the price per share for stock sold in 2015?

LG 2 LG 3 LG 4 LG 5

P3–10 Ratio comparisons Eddie Greer recently inherited a large amount of money from his grandfather. His financial advisor has suggested to invest equally in four companies to create a stock portfolio. Wishing to learn more about the companies in which he will invest, Eddie performs a ratio analysis on each company and decides to compare them. Some of his ratios are listed below.

Ratio	Dove Apartments	Apex Manufacturers	Beth Software	Kingsley Restaurants
Current ratio	1.3	4.2	7.4	1.8
Quick ratio	1.2	3.5	5.4	0.8
Debt to equity ratio	0.74	0.35	0.0	0.42
Net profit margin	5.60%	8.50%	26%	16%

Dove Apartments owns a residential complex in the city center and rents the apartments to students and professionals; Apex Manufacturers produce PVC frames for windows and doors for the construction industry; Beth software provides online security services; and Kingsley Restaurants is a chain of pubs and restaurants.

Assuming that Eddie's financial advisor has selected the portfolio with care, Eddie finds the differences in the ratios of the four companies confusing. Help him out.

a. What fundamental problem might Eddie encounter in comparing these companies on the basis of their ratios?

b. Why might the current and quick ratios for Dove Apartments be much lower than the same ratios for Apex Manufacturers?

c. Why is it acceptable for the Dove Apartments to carry a large debt, but not Beth Software?

d. Why should Eddie invest in Dove Apartments and Apex Manufacturers, which are earning a lower net margin than the other two companies? Will he be better off investing all his money in Beth Software instead of in less profitable companies?

LG 3

P3–11 Liquidity management Bauman Company's total current assets, total current liabilities, and inventory for each of the past 4 years follow:

Item	2016	2017	2018	2019
Total current assets	$16,950	$21,900	$22,500	$27,000
Total current liabilities	9,000	12,600	12,600	17,400
Inventory	6,000	6,900	6,900	7,200

a. Calculate the firm's current and quick ratios for each year. Compare the resulting time series for these measures of liquidity.

b. Comment on the firm's liquidity over the 2016–2019 period.

c. If you were told that Bauman Company's inventory turnover for each year in the 2016–2019 period and the industry averages were as follows, would this information support or conflict with your evaluation in part **b**? Why?

Inventory turnover	2016	2017	2018	2019
Bauman Company	6.3	6.8	7.0	6.4
Industry average	10.6	11.2	10.8	11.0

Personal Finance Problem

LG 3

P3–12 **Liquidity ratio** Jamie Anderson has compiled some of his personal financial data to determine his liquidity position. The data are as follows.

Account	Amount
Cash	£3,200
Marketable Securities	2,200
Savings Account	1,400
Credit Card Payables	1,650
Repayment due to a friend	980

a. Calculate Jamie's liquidity ratio.
b. Jamie knows that on average his friends have liquidity ratios of about 1.75. How would you analyze Jamie's liquidity relative to his friends?

LG 3

P3–13 **Inventory management** Three companies that compete in Scotland's home furniture industry are Loch Furnishing, Highland Furnishing, and Fell Furniture. The table below shows cost of goods sold and average inventory levels for 2015, 2016, and 2017 fiscal years. Calculate the inventory turnover ratio for each company in each year and present your conclusions. All values are in £ thousands.

Loch	2017	2016	2015
Cost of goods sold	5,100	4,826	4,652
Inventory	1,326	1,284	1,213
Highland			
Cost of goods sold	1,406	1,315	1,245
Inventory	577	552	521
Fell			
Cost of goods sold	2,100	1,842	1,648
Inventory	512	480	427

LG 3

P3–14 **Accounts receivable management** Speedy Manufacturing Company's end-of-year accounts receivable balance consists of amounts originating in the months indicated in the following table. The company had annual sales of $3.2 million. The company extends 30-day credit terms.

Month of origin	Accounts receivable
July	$ 2,500
August	3,600
September	63,250
October	21,100
November	54,000
December	298,000
Year-end accounts receivable	$442,450

a. Use the year-end total to evaluate the company's collection system.
b. If 75% of the company's sales occur between July and December, would this information affect the validity of your conclusion in part **a**? Explain.

LG 3

P3–15 Interpreting liquidity and activity ratios The table below shows key financial data for three supermarket chains that compete in the grocery retail industry: Almi, Pemco, and Harrison. All euro values are in thousands.

	Almi	Pemco	Harrison
Sales	€120,451	€30,258	€11,654
Cost of goods sold	62,523	13,100	8,482
Receivables	8,927	2,872	1,864
Inventory	8,652	2,351	1,022
Total current assets	48,963	8,724	3,046
Total current liabilities	54,620	6,721	4,065
Total assets	228,124	24,256	9,162

a. Calculate each of the following ratios for all three companies: current ratio, quick ratio, inventory turnover, average collection period, and total asset turnover.
b. Which company has the best liquidity position?
c. Would you say that the three companies are managing their debtors on a comparative basis? Which one has the best performance in terms of collecting its receivables? Which is the worst?
d. Which company has the most rapid inventory turnover? Which has the lowest asset turnover? Compare your results and explain why a company may have the best inventory turnover but the worst asset turnover.

LG 4

P3–16 Debt analysis Springfield Bank is evaluating Creek Enterprises, which has requested a $4,000,000 loan, to assess the firm's financial leverage and financial risk. On the basis of the debt ratios for Creek, along with the industry average and Creek's recent financial statements (following), evaluate and recommend appropriate action on the loan request.

Creek Enterprises Income Statement for the Year Ended December 31, 2019

Sales revenue	$30,000,000
Less: Cost of goods sold	21,000,000
Gross profits	$ 9,000,000
Less: Operating expenses	
Selling expense	$ 3,000,000
General and administrative expenses	1,800,000
Lease expense	200,000
Depreciation expense	1,000,000
Total operating expense	$ 6,000,000
Operating profits	$ 3,000,000
Less: Interest expense	1,000,000
Net profits before taxes	$ 2,000,000
Less: Taxes (rate = 21%)	420,000
Net profits after taxes	$ 1,580,000
Less: Preferred stock dividends	100,000
Earnings available for common stockholders	$ 1,480,000

Creek Enterprises Balance Sheet December 31, 2019

Assets		Liabilities and Stockholders' Equity	
Cash	$ 1,000,000	Accounts payable	$ 8,000,000
Marketable securities	3,000,000	Notes payable	8,000,000
Accounts receivable	12,000,000	Accruals	500,000
Inventories	7,500,000	Total current liabilities	$16,500,000
Total current assets	$23,500,000	Long-term debt (includes financial leases)[b]	$20,000,000
Land and buildings	$11,000,000		
Machinery and equipment	20,500,000	Preferred stock (25,000 shares, $4 dividend)	$ 2,500,000
Furniture and fixtures	8,000,000		
Gross fixed assets (at cost)[a]	$39,500,000	Common stock (1 million shares at $5 par)	5,000,000
Less: Accumulated depreciation	13,000,000		
Net fixed assets	$26,500,000	Paid-in capital in excess of par value	4,000,000
Total assets	$50,000,000	Retained earnings	2,000,000
		Total stockholders' equity	$13,500,000
		Total liabilities and stockholders' equity	$50,000,000

[a]The firm has a 4-year financial lease requiring annual beginning-of-year payments of $200,000. Three years of the lease have yet to run.

[b]Required annual principal payments are $800,000.

Industry averages	
Debt ratio	0.51
Times interest earned ratio	7.30
Fixed-payment coverage ratio	1.85

LG4 LG5

P3–17 **Profitability analysis** The table below shows 2017 total revenues, cost of goods sold, earnings available for common stockholders, total assets, and stockholders' equity for three companies competing in the local beverages market in Thailand—Gold Drinks, Tropical Fresh, and Sun Supplies. All the values are in Thai Baht (THB) thousands.

	Gold Drinks	Tropical Fresh	Sun Supplies
Revenues	125,577	188,385	19,308
Cost of goods sold	49,377	84,615	7,734
Earnings	16,869	18,975	2,529
Total assets	261,798	222,375	29,361
Shareholders equity	69,174	33,726	6,390

a. Use the information given to calculate each firm's profitability in as many different ways as you can. Which firm is most profitable? Explain why it might be difficult to pick one as the most profitable.

b. For each firm, ROE is greater than ROA. Explain why this is the case. Compare the ROE and ROA for each firm. Can you determine which one has the least proportion of debt in its capital structure?

LG2 LG3 LG4

P3-18 Using Tables 3.1, 3.2, and 3.3, conduct a complete ratio analysis of the Bartlett Company for the years 2018 and 2019. You should assess the firm's liquidity, activity, debt, and profitability ratios. Highlight any particularly positive or negative developments that you uncover when comparing ratios from 2018 and 2019.

LG5

P3–19 Common-size statement analysis A common-size income statement for Santa Enterprises' 2017 operations follows. Using the firm's 2017 income statement, develop the 2017 common-size income statement and compare it with the 2016 statement. Which areas require further analysis and investigation?

Santa Enterprises Common-Size Income Statement for the Year Ended December 31, 2016	
Sales revenue ($7,100,000)	100.0%
Less: Cost of goods sold	58.5
Gross profits	41.5%
Less: Operating expenses	
Sales and marketing expenses	14.1%
Lease payments	5.5
Depreciation expense	3.4
Total operating expense	23.0%
Operating profits	18.5%
Less: Interest expense	3.5
Net profit before taxes	15.0%
Less: Taxes (Rate = 30%)	3.0
Net profit after taxes	12.0%
Less: Preferred stock dividends	2.8
Retained profits	9.2%

Santa Enterprises Income Statement for the Year Ended December 31, 2017	
Sales revenue	6,200,000
Less: Cost of goods sold	3,900,000
Gross profits	2,300,000
Less: Operating expenses	
Sales and marketing expenses	590,000
Lease payments	210,000
Depreciation expense	1,000,000
Total operating expense	1,800,000
Operating profits	500,000
Less: Interest expense	240,000
Net profit before taxes	260,000
Less: Taxes (Rate = 30%)	52,000
Net profit after taxes	208,000
Less: Preferred stock dividends	92,000
Retained profits	116,000

LG4 LG5 MyLab

P3–20 The relationship between financial leverage and profitability Pelican Paper Inc. and Timberland Forest Inc. are rivals in the manufacture of craft papers. Some financial statement values for each company follow. Use them in a ratio analysis that compares the firms' financial leverage and profitability.

Item	Pelican Paper	Timberland Forest
Total assets	$10,000,000	$10,000,000
Total equity (all common)	9,000,000	5,000,000
Total debt	1,000,000	5,000,000
Annual interest	100,000	500,000
Total sales	25,000,000	25,000,000
EBIT	6,250,000	6,250,000
Earnings available for common stockholders	3,690,000	3,450,000

a. Calculate the following debt and coverage ratios for the two companies. Discuss their financial risk and ability to cover the costs in relation to each other.
1. Debt ratio
2. Times interest earned ratio

b. Calculate the following profitability ratios for the two companies. Discuss their profitability relative to one another.
1. Operating profit margin
2. Net profit margin
3. Return on total assets
4. Return on common equity

c. In what way has the larger debt of Timberland Forest made it more profitable than Pelican Paper? What are the risks that Timberland's investors undertake when they choose to purchase its stock instead of Pelican's?

LG 4

P3-21 **Analysis of debt ratios** Financial information from fiscal year 2017 for two companies Carson Sportswear and Boswell Dresses, competing businesses in sportswear market in Utah, appears in the table below. All dollar values are in thousands.

	Carson	Boswell
Total assets	$27,668,200	$1,242,487
Total liabilities	16,906,300	819,901
EBIT	4,876,000	76,585
Interest expense	210,400	47,149

a. Calculate the debt ratio and times interest earned ratio for each company. Identify the similarities and differences in terms of their debt usage.

b. Calculate the ratio of interest expense to total liabilities for each company. What do you think this ratio is trying to measure on theoretical basis? Explain why the values for this ratio are very different for the two companies.

LG 6

P3–22 **Ratio proficiency** McDougal Printing Inc. had sales totaling $40,000,000 in fiscal year 2019. Some ratios for the company are listed below. Use this information to determine the dollar values of various income statement and balance sheet accounts as requested.

McDougal Printing Inc. Year Ended December 31, 2019	
Sales	**$40,000,000**
Gross profit margin	80%
Operating profit margin	35%
Net profit margin	8%
Return on total assets	16%
Return on common equity	20%
Total asset turnover	2
Average collection period	62.2 days

Calculate values for the following:

a. Gross profits

b. Cost of goods sold

c. Operating profits
d. Operating expenses
e. Earnings available for common stockholders
f. Total assets
g. Total common stock equity
h. Accounts receivable

LG 6

P3–23 Cross-sectional ratio analysis Use the accompanying financial statements for Fox Manufacturing Company for the year ended December 31, 2019, along with the industry average ratios below, to do the following:

a. Prepare and interpret a complete ratio analysis of the firm's 2019 operations.
b. Summarize your findings and make recommendations.

Fox Manufacturing Company Income Statement for the Year Ended December 31, 2019

Sales revenue	$600,000
Less: Cost of goods sold	460,000
Gross profits	$140,000
Less: Operating expenses	
General and administrative expenses	$ 30,000
Depreciation expense	30,000
Total operating expense	$ 60,000
Operating profits	$ 80,000
Less: Interest expense	10,000
Net profits before taxes	$ 70,000
Less: Taxes	27,100
Net profits after taxes (*Hint:* Earnings available for common stockholders as there are no preferred stockholders)	$ 42,900
Earnings per share (EPS)	$2.15

Ratio	Industry average, 2019
Current ratio	2.35
Quick ratio	0.87
Inventory turnover[a]	4.55
Average collection period[a]	35.8 days
Total asset turnover	1.09
Debt ratio	0.300
Times interest earned ratio	12.3
Gross profit margin	0.202
Operating profit margin	0.135
Net profit margin	0.091
Return on total assets (ROA)	0.099
Return on common equity (ROE)	0.167
Earnings per share (EPS)	$3.10

[a]Based on a 365-day year and on end-of-year figures.

Fox Manufacturing Company Balance Sheet
December 31, 2019

Assets	
Cash	$ 15,000
Marketable securities	7,200
Accounts receivable	34,100
Inventories	82,000
Total current assets	$138,300
Net fixed assets	270,000
Total assets	$408,300
Liabilities and Stockholders' Equity	
Accounts payable	$ 57,000
Notes payable	13,000
Accruals	5,000
Total current liabilities	$ 75,000
Long-term debt	$150,000
Common stock equity (20,000 shares outstanding)	$110,200
Retained earnings	73,100
Total stockholders' equity	$183,300
Total liabilities and stockholders' equity	$408,300

LG6 MyLab

P3–24 Financial statement analysis The financial statements of Zach Industries for the year ended December 31, 2019, follow.

Zach Industries Income Statement
for the Year Ended December 31, 2019

Sales revenue	$160,000
Less: Cost of goods sold	106,000
Gross profits	$ 54,000
Less: Operating expenses	
Selling expense	$ 16,000
General and administrative expenses	10,000
Lease expense	1,000
Depreciation expense	10,000
Total operating expense	$ 37,000
Operating profits	$ 17,000
Less: Interest expense	6,100
Net profits before taxes	$ 10,900
Less: Taxes	4,360
Net profits after taxes	$ 6,540

Zach Industries Balance Sheet December 31, 2019	
Assets	
Cash	$ 500
Marketable securities	1,000
Accounts receivable	25,000
Inventories	45,500
Total current assets	$ 72,000
Land	$ 26,000
Buildings and equipment	90,000
Less: Accumulated depreciation	38,000
Net fixed assets	$ 78,000
Total assets	$150,000
Liabilities and Stockholders' Equity	
Accounts payable	$ 22,000
Notes payable	47,000
Total current liabilities	$ 69,000
Long-term debt	22,950
Common stock[a]	31,500
Retained earnings	26,550
Total liabilities and stockholders' equity	$150,000

[a]The firm's 3,000 outstanding shares of common stock closed 2019 at a price of $25 per share.

a. Use the preceding financial statements to complete the following table. Assume that the industry averages given in the table are applicable for both 2018 and 2019.

Ratio	Industry average	Actual 2018	Actual 2019
Current ratio	1.80	1.84	_____
Quick ratio	0.70	0.78	_____
Inventory turnover[a]	2.50	2.59	_____
Average collection period[a]	37.5 days	36.5 days	_____
Debt ratio	65%	67%	_____
Times interest earned ratio	3.8	4.0	_____
Gross profit margin	38%	40%	_____
Net profit margin	3.5%	3.6%	_____
Return on total assets	4.0%	4.0%	_____
Return on common equity	9.5%	8.0%	_____
Market/book ratio	1.1	1.2	_____

[a]Based on a 365-day year and on end-of-year figures.

b. Analyze Zach Industries' financial condition as it is related to (1) liquidity, (2) activity, (3) debt, (4) profitability, and (5) market. Summarize the company's overall financial condition.

LG 6

P3–25 Integrative: Complete ratio analysis Given the following financial statements, historical ratios, and industry averages, calculate Sterling Company's financial ratios for the most recent year. (Assume a 365-day year.)

Sterling Company Income Statement for the Year Ended December 31, 2019

Sales revenue	$10,000,000
Less: Cost of goods sold	7,500,000
Gross profits	$ 2,500,000
Less: Operating expenses	
Selling expense	$ 300,000
General and administrative expenses	650,000
Lease expense	50,000
Depreciation expense	200,000
Total operating expense	$ 1,200,000
Operating profits	$ 1,300,000
Less: Interest expense	200,000
Net profits before taxes	$ 1,100,000
Less: Taxes (rate = 21%)	231,000
Net profits after taxes	$ 869,000
Less: Preferred stock dividends	50,000
Earnings available for common stockholders	$ 819,000
Earnings per share (EPS)	$4.10

Sterling Company Balance Sheet December 31, 2019

Assets		Liabilities and Stockholders' Equity	
Cash	$ 200,000	Accounts payable[a]	$ 900,000
Marketable securities	50,000	Notes payable	200,000
Accounts receivable	800,000	Accruals	100,000
Inventories	950,000	Total current liabilities	$ 1,200,000
Total current assets	$ 2,000,000	Long-term debt (includes financial leases)	$ 3,000,000
Gross fixed assets (at cost)	$12,000,000	Preferred stock (25,000 shares, $2 dividend)	$ 1,000,000
Less: Accumulated depreciation	3,000,000	Common stock (200,000 shares at $3 par)[b]	600,000
Net fixed assets	$ 9,000,000	Paid-in capital in excess of par value	5,200,000
Other assets	1,000,000	Retained earnings	1,000,000
Total assets	$12,000,000	Total stockholders' equity	$ 7,800,000
		Total liabilities and stockholders' equity	$12,000,000

[a]Annual credit purchases of $6,200,000 were made during the year.

[b]On December 31, 2019, the firm's common stock closed at $39.50 per share.

Analyze its overall financial situation from both a cross-sectional and a time-series viewpoint. Break your analysis into evaluations of the firm's liquidity, activity, debt, profitability, and market.

Historical and Industry Average Ratios for Sterling Company

Ratio	Actual 2017	Actual 2018	Industry average, 2019
Current ratio	1.40	1.55	1.85
Quick ratio	1.00	0.92	1.05
Inventory turnover	9.52	9.21	8.60
Average collection period	45.6 days	36.9 days	35.5 days
Average payment period	59.3 days	61.6 days	46.4 days
Total asset turnover	0.74	0.80	0.74
Debt ratio	0.20	0.20	0.30
Times interest earned ratio	8.2	7.3	8.0
Fixed-payment coverage ratio	4.5	4.2	4.2
Gross profit margin	0.30	0.27	0.25
Operating profit margin	0.12	0.12	0.10
Net profit margin	0.062	0.062	0.053
Return on total assets (ROA)	0.045	0.050	0.040
Return on common equity (ROE)	0.061	0.067	0.066
Earnings per share (EPS)	$1.75	$2.20	$1.50
Price/earnings (P/E) ratio	12.0	10.5	11.2
Market/book (M/B) ratio	1.20	1.05	1.10

LG 6

P3–26 **DuPont system of analysis** Steve Steaks Ltd. and Barry Sizzle Ltd. are two restaurant chains that are competing across Europe. Use the following 2016 financial information to conduct a DuPont system of analysis for each company.

	Steve Steaks	Barry Sizzle
Sales	2,129,195	1,637,717
Earnings available for common stockholders	173,306	176,881
Total assets	5,249,650	3,174,317
Stockholders' equity	1,613,407	312,393

a. Which company has the higher net profit margin? Higher asset turnover?
b. Which company has the lower ROA? Lower ROE?

LG 6

P3–27 **Complete ratio analysis, recognizing significant differences** The CEO of Dinnington Glass Company has approached Anne Hersch, the company's accountant, for an annual financial checkup. As the first step, Anne and her team have prepared a complete set of ratios for fiscal years 2017 and 2018. She intends to use them to look for significant changes in the company's situation from one year to the next.

Dinnington Glass Company, Financial Ratios

Ratio	2017	2018
Current ratio	4.45	3.8
Quick ratio	3.52	3.22
Inventory turnover	15.4	13.6
Average collection period	35.4 days	30.15 days
Total asset turnover	1.8	2.2
Debt ratio	0.38	0.54
Times interest earned ratio	5	3.5
Gross profit margin	52%	48%
Operating profit margin	15%	18%

Dinnington Glass Company, Financial Ratios (Continued)

Ratio	2018	2019
Net profit margin	11.20%	11.50%
Return on total assets	15.60%	20.21%
Return on common equity	22%	40%
Price/earnings ratio	10.2	9.4
Market/book ratio	2.75	2.43

a. To examine the degree of change, calculate the year-to-year proportional change by subtracting the 2017 ratio from the 2018 ratio and then dividing the difference by the year 2017 ratio. Multiply the result by 100 to get percentage change in the given ratio. Preserve the positive or negative sign to indicate the direction of change. Calculate the proportional change for all the ratios provided in the table.

b. For any ratio that shows a year-to-year difference of more than 10% in any direction (positive or negative), state whether the difference is in the company's favor or not.

c. For the most significant changes (25% or more), identify the movement in other ratios that might provide a logical explanation for the change in the ratio you are discussing.

LG 1

P3–28 ETHICS PROBLEM Do some reading in periodicals or on the Internet to find out more about the Sarbanes-Oxley Act's provisions for companies. Select one of those provisions, and indicate why you think financial statements will be more trustworthy if company financial executives implement this provision of SOX.

SPREADSHEET EXERCISE

The income statement and balance sheet are the primary reports that a firm constructs for use by management and for distribution to stockholders, regulatory bodies, and the general public. They are the primary sources of historical financial information about the firm. Dayton Products Inc. is a moderate-sized manufacturer. The company's management has asked you to perform a detailed financial statement analysis of the firm.

The income statements for the years ending December 31, 2019 and 2018, respectively, are presented in the following table.

Annual Income Statements (Values in Millions)

	For the year ended	
	December 31, 2019	December 31, 2018
Sales	$178,909	$187,510
Cost of goods sold	109,701	111,631
Selling, general, and administrative expenses	12,356	12,900
Other tax expense	33,572	33,377
Depreciation and amortization	12,103	7,944
Other income (add to EBIT to arrive at EBT)	3,147	3,323
Interest expense	398	293
Income tax rate	21%	21%
Dividends paid per share	$1.15	$0.91
Basic EPS from total operations	$1.64	$2.87

You also have the following balance sheet information as of December 31, 2019 and 2018, respectively.

Annual Balance Sheets (Values in Millions)

	December 31, 2019	December 31, 2018
Cash	$ 9,090	$ 6,547
Receivables	21,163	19,549
Inventories	8,068	7,904
Other current assets	1,831	1,681
Property, plant, and equipment, gross	204,960	187,519
Accumulated depreciation and depletion	110,020	97,917
Other noncurrent assets	19,413	17,891
Accounts payable	13,792	22,862
Short-term debt payable	4,093	3,703
Other current liabilities	15,290	3,549
Long-term debt payable	6,655	7,099
Deferred income taxes	16,484	16,359
Other noncurrent liabilities	21,733	16,441
Retained earnings	76,458	73,161
Total common shares outstanding	6.7 billion	6.8 billion

TO DO

a. Create a spreadsheet similar to Table 3.1 to model the following:
- (1) A multiple-step comparative income statement for Dayton Inc. for the periods ending December 31, 2019 and 2018. You must calculate the cost of goods sold for the year 2019.
- (2) A common-size income statement for Dayton Inc. covering the years 2019 and 2018.

b. Create a spreadsheet similar to Table 3.2 to model the following:
- (1) A detailed, comparative balance sheet for Dayton Inc. for the years ended December 31, 2019 and 2018.
- (2) A common-size balance sheet for Dayton Inc. covering the years 2019 and 2018.

c. Create a spreadsheet similar to Table 3.10 to perform the following analysis:
- (1) Create a table that reflects both 2019 and 2018 operating ratios for Dayton Inc., segmented into (a) liquidity, (b) activity, (c) debt, (d) profitability, and (e) market. Assume that the current market price for the stock is $90.
- (2) Compare the 2019 ratios to the 2018 ratios. Indicate whether the results "outperformed the prior year" or "underperformed relative to the prior year."

CHAPTER 4

Long- and Short-Term Financial Planning

LEARNING GOALS

- **LG1** Understand the financial planning process, including long-term (strategic) financial plans and short-term (operating) financial plans.
- **LG2** Understand tax depreciation procedures and the effect of depreciation on the firm's cash flows.
- **LG3** Discuss the firm's statement of cash flows, operating cash flow, and free cash flow.
- **LG4** Discuss the cash-planning process and the preparation, evaluation, and use of the cash budget.
- **LG5** Explain the procedures used to prepare and evaluate the pro forma income statement and the pro forma balance sheet.
- **LG6** Evaluate the approaches to pro forma financial statement preparation and the common uses of pro forma statements.

MyLab Finance Chapter Introduction Video

WHY THIS CHAPTER MATTERS TO YOU

In your *professional* life

ACCOUNTING You need to understand how depreciation is used for both tax and financial reporting purposes; how to develop the statement of cash flows; the primary focus on cash flows, rather than accruals, in financial decision making; and how pro forma financial statements are used within the firm.

INFORMATION SYSTEMS You need to understand the data that must be kept to record depreciation for tax and financial reporting, the information required for strategic and operating plans, and what data are necessary as inputs for preparing cash plans and profit plans.

MANAGEMENT You need to understand the difference between strategic and operating plans, and the role of each; the importance of focusing on the firm's cash flows; and how use of pro forma statements can head off trouble for the firm.

MARKETING You need to understand the central role that marketing plays in formulating the firm's long-term strategic plans and the importance of the sales forecast as the key input for both cash planning and profit planning.

OPERATIONS You need to understand how depreciation affects the value of the firm's plant assets, how the results of operations are captured in the statement of cash flows, that operations provide key inputs into the firm's short-term financial plans, and the distinction between fixed and variable operating costs.

In your *personal* life

Individuals, like corporations, should focus on cash flow when planning and monitoring finances. You should establish short- and long-term financial goals (destinations) and develop personal financial plans (road maps) that will guide their achievement. Cash flows and financial plans are as important for individuals as for corporations.

LG1

4.1 The Financial Planning Process

Financial planning is an important aspect of the firm's operations because it provides road maps for guiding, coordinating, and controlling actions to achieve the firm's objective of creating value for shareholders. The financial planning process is highly collaborative across functions because the inputs required to build a financial plan come from every part of the firm. Two key aspects of the financial planning process are *cash planning* and *profit planning*. Cash planning involves preparation of the firm's cash budget, a tool that managers use to ensure they put excess cash to work or have outside financing lined up when the firm is not generating enough internal cash to cover expenses. Profit planning involves preparation of pro forma statements, which project what a firm's balance sheet and income statement will look like in future years. Both the cash budget and the pro forma statements are useful for internal financial planning, and sometimes lenders want to see a firm's financial projections before they approve loans.

financial planning process
Planning that begins with long-term, or strategic, financial plans that in turn guide the formulation of short-term, or operating, plans and budgets.

The **financial planning process** begins with long-term, or *strategic*, financial plans. These plans, in turn, guide the formulation of short-term, or *operating*, plans and budgets. Generally, the short-term plans and budgets implement the firm's long-term strategic objectives. Although the remainder of this chapter places primary emphasis on short-term financial plans and budgets, a few preliminary comments on long-term financial plans are in order.

LONG-TERM (STRATEGIC) FINANCIAL PLANS

long-term (strategic) financial plans
Plans that lay out a company's financial actions and the anticipated impact of those actions over periods ranging from 2 to 10 years.

Long-term (strategic) financial plans lay out a company's financial actions and the anticipated effect of those actions over periods ranging from 2 to 10 years. These plans reflect the company's strategies for how it will compete in its markets to create value for shareholders. Integrated across functional areas, the plans require input from all areas of the firm, including research and development, marketing, operations, human resources, accounting, and, of course, finance. The plans specify the magnitude and timing of major investments the firm must make (as well as former investments the firm will abandon), and they forecast when and how those investments will pay off. Long-term financial plans describe how a firm will develop and execute marketing plans to promote its products and services, and these plans make projections for how many employees the firm will need to achieve its goals. Many firms adopt a 5-year strategic planning process in which managers revise the 5-year plan at least annually as significant new information becomes available. Firms subject to high degrees of operating uncertainty, relatively short production cycles, or both, tend to use shorter planning horizons.

From a financial perspective, long-term plans have two main objectives. First, long-term plans describe how a firm will build value for shareholders by creating new products and services that customers want. Second, long-term plans help managers determine whether they will need to raise additional external capital by selling stock or borrowing money, or whether the firm will generate sufficient cash flow to retire debt, pay dividends, or repurchase shares. In other words, long-term plans influence both of the main types of decisions that financial managers face: investment decisions and financing decisions. A series of annual budgets support the long-term plans by providing intermediate goals for managers.

SHORT-TERM (OPERATING) FINANCIAL PLANS

short-term (operating) financial plans
Plans that specify short-term financial actions and the anticipated impact of those actions.

Short-term (operating) financial plans specify short-term financial actions and the anticipated effect of those actions. These plans most often cover a 1- to 2-year period. Key inputs include the sales forecast and various forms of operating and financial data. Key outputs include a number of operating budgets, the cash budget, and pro forma financial statements. The entire short-term financial planning process is outlined in Figure 4.1. Here we focus solely on cash and profit planning from the financial manager's perspective.

Short-term financial planning begins with the sales forecast. From that forecast, companies develop production plans that take into account lead (preparation) times and include estimates of the resources required to achieve the sales forecast, such as raw materials for manufacturing firms or new personnel for services firms. Once managers estimate the costs of acquiring and deploying those resources, the firm can prepare a pro forma income statement and cash budget. With these basic inputs, the firm can finally develop a pro forma balance sheet.

PERSONAL FINANCE EXAMPLE 4.1

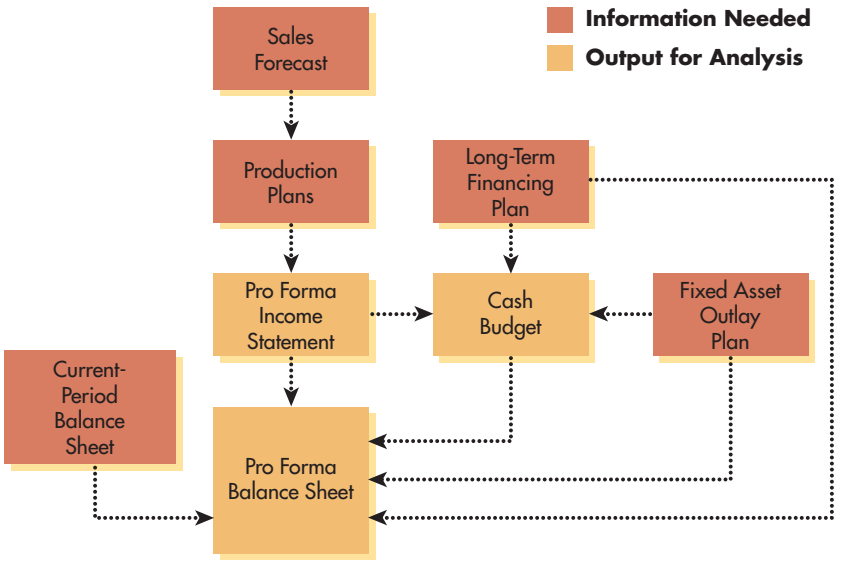
The first step in personal financial planning requires you to define your goals. Whereas in a corporation the goal is to maximize shareholder wealth, individuals typically have several different financial goals. These might have short-, medium-, or long-term horizons, and they depend on your age, income, family status, and other factors.

Set your personal financial goals carefully and realistically. Each goal should be clearly defined and have a priority, time frame, and cost estimate. For example, a college senior's intermediate-term goal in 2019 might include earning a master's degree at a cost of $60,000 by 2021, and his or her long-term goal might be to buy a condominium at a cost of $250,000 by 2025.

Throughout the remainder of this chapter, we will concentrate on the key outputs of the short-term financial planning process: the cash budget, the pro

FIGURE 4.1

Short-Term Financial Planning
The short-term (operating) financial planning process



forma income statement, and the pro forma balance sheet. First, however, we turn our attention to the subject of cash flow, focusing on why cash flow differs from profit and on different cash flow measures that may be important to managers and investors.

→ REVIEW QUESTIONS MyLab Finance Solutions

4–1 What is the financial planning process? Contrast long-term (strategic) financial plans with short-term (operating) financial plans.

4–2 Which three statements result as part of the short-term (operating) financial planning process?

LG2 LG3

4.2 Measuring the Firm's Cash Flow

"Cash is king" is an old saying in finance. Cash flow is the primary ingredient in any financial valuation model. If an analyst wants to put a value on an investment that a firm is considering, estimating cash flow is central to the valuation process. This chapter explains where the cash flow numbers used in valuations come from.

Though a company's earnings deservedly receive much attention from outside investors, earnings and cash flows are not equal. When companies calculate their earnings, they do so using accrual-based generally accepted accounting principles (GAAP), and those principles are designed to achieve objectives other than simply reporting cash inflows and outflows. For example, if a company pays cash today for an asset that it will use for many years, like a piece of equipment, GAAP does not permit firms to deduct the entire cost of that asset as an expense against earnings in the current year. Rather, firms must spread out the cost of the asset over several years, recognizing that the asset's useful life is more than 1 year. Accounting principles reflect the view that charging smaller expenses over an asset's useful life more fairly represents the firm's financial performance than does deducting an asset's entire cost from earnings in the year the firm purchases the asset. This allocation of historical cost over time is called **depreciation**. In finance, we want to know exactly when a firm spends and receives cash, so to calculate how much cash flow a firm generates, financial analysts must "unwind" some of the effects of accounting principles, starting with the effects of depreciation expenses.

depreciation
A portion of the costs of fixed assets charged against annual revenues over time.

DEPRECIATION

U.S. law allows firms to use different depreciation methods in their tax returns and their public financial statements, and for this reason many firms keep two separate sets of financial "books"—one for taxes and one for public financial reporting. When calculating taxes, depreciation expenses reduce taxable income, and thereby also reduce taxes due. Because of the time value of money, firms would rather save taxes today than save taxes tomorrow, so businesses favor methods that allow them to depreciate assets as rapidly as possible on their tax books. Prior to the Tax Cuts and Jobs Act of 2017, firms were required to depreciate most types of assets using the **modified accelerated cost recovery system** (**MACRS**). The new law allows firms to immediately deduct

modified accelerated cost recovery system (MACRS)
System used to determine the depreciation of assets for tax purposes.

100% of the cost of many (but not all) types of new assets. However, these "bonus depreciation" deductions will be phased out gradually over several years without further Congressional action. For financial reporting purposes, firms can choose from several different methods for calculating depreciation expenses. All of those methods use a formula that relies on an asset's depreciable value and its depreciable life.

Depreciable Value of an Asset

Under the MACRS procedures and the new law, the depreciable value of an asset (the amount to be depreciated) is its full cost, including outlays for installation. Even if the asset will have some salvage value at the end of its useful life, the firm can still take depreciation deductions equal to the asset's full initial cost.

EXAMPLE 4.2

MyLab Finance Solution Video

Baker Corporation acquired a new machine at a cost of $38,000, with installation costs of $2,000. When the machine is retired from service, Baker expects to sell it for scrap metal and receive $1,000. Regardless of its expected salvage value, the depreciable value of the machine is $40,000: $38,000 cost + $2,000 installation cost.

Depreciable Life of an Asset

depreciable life
Time period over which an asset is depreciated.

The period over which an asset is depreciated is called its **depreciable life**. For any particular asset, the shorter the depreciable life, the larger the annual depreciation deductions will be, and the larger will be the tax savings associated with those deductions, all other things being equal. Accordingly, the Tax Cuts and Jobs Act of 2017 makes investments in many types of new assets more attractive by accelerating the depreciation deductions (and hence the tax savings) associated with those investments. The new law allows firms to depreciate 100% of an asset's cost in the year it is purchased, though some types of assets are not eligible for this bonus depreciation.

MACRS recovery period
The appropriate depreciable life of a particular asset as determined by MACRS.

Because firms must still gradually depreciate the cost of some assets, and because the MACRS provisions will once again be the norm for most assets in a few years, we describe the basic MACRS system here. There are six **MACRS recovery periods**—3, 5, 7, 10, 15, and 20 years—with longer recovery periods for some types of property investments. Corresponding to each of these recovery periods is a property class that includes specific assets defined by the tax law. For instance, under MACRS, office furniture, such as desks and filing cabinets, falls into the 7-year recovery period class. Table 4.1 lists some of the assets in each of the first four property classes.

DEPRECIATION METHODS

For financial reporting purposes, companies can use a variety of depreciation methods (straight-line, double-declining balance, and sum-of-the-years'-digits). For tax purposes, when using MACRS, firms usually depreciate assets in the first four MACRS property classes by the double-declining balance method, using a half-year convention (meaning that a half-year's depreciation is taken in the year the asset is purchased) and switching to straight-line when advantageous. Table 4.2

TABLE 4.1 First Four Property Classes under MACRS

Property class (recovery period)	Definition
3 years	Research equipment and certain special tools
5 years	Computers, printers, copiers, duplicating equipment, cars, light-duty trucks, qualified technological equipment, and similar assets
7 years	Office furniture, fixtures, most manufacturing equipment, railroad track, and single-purpose agricultural and horticultural structures
10 years	Equipment used in petroleum refining or in the manufacture of tobacco products and certain food products

TABLE 4.2 Rounded Depreciation Percentages by Recovery Year Using MACRS for First Four Property Classes

	Percentage by recovery year[a]			
Recovery year	3 years	5 years	7 years	10 years
1	33%	20%	14%	10%
2	45	32	25	18
3	15	19	18	14
4	7	12	12	12
5		12	9	9
6		5	9	8
7			9	7
8			4	6
9				6
10				6
11				4
Totals	100%	100%	100%	100%

[a]These percentages have been rounded to the nearest whole percent.

shows the approximate percentages (rounded to the nearest whole percent) written off each year for the first four property classes.

For assets depreciated under MACRS, the half-year convention assumes that, on average, firms acquire assets in the middle of the year, so the allowable depreciation deduction in the first year is smaller than it would be if firms could take a full year's worth of depreciation in the year they purchase an asset. Because firms can take only a half-year's worth of depreciation in the first year, they can take an extra half-year in the year after the asset's useful life officially ends. To illustrate, observe that in Table 4.2 an asset falling in the 3-year recovery class is depreciated over 4 years, an asset in the 5-year recovery class is depreciated over 6 years, and so on. The first and last year's depreciation charges represent a half-year's worth of depreciation.

EXAMPLE 4.3

Baker Corporation acquired, for an installed cost of $40,000, a machine having a recovery period of 5 years. Using the applicable percentages from Table 4.2, Baker calculates the depreciation in each year as follows:

Year	Cost	Percentages (from Table 4.2)	Depreciation
1	$40,000	20%	$40,000 × 20% = $ 8,000
2	40,000	32	$40,000 × 32% = $12,800
3	40,000	19	$40,000 × 19% = $ 7,600
4	40,000	12	$40,000 × 12% = $ 4,800
5	40,000	12	$40,000 × 12% = $ 4,800
6	40,000	5	$40,000 × 5% = $ 2,000
Totals		100%	$40,000

Column 3 shows that the full cost of the asset is written off over 6 recovery years.

DEVELOPING THE STATEMENT OF CASH FLOWS

The statement of cash flows, introduced in Chapter 3, summarizes the firm's cash flow over a given period. Keep in mind that analysts typically lump cash and marketable securities together when assessing the firm's liquidity because both cash and marketable securities represent a reservoir of liquidity. That reservoir is increased by cash inflows and decreased by cash outflows.

Notice how the three sections of the statement of cash flows reflect the three fundamental functions of firms. Firms take in money from investors, they invest that money in risky assets, and they operate those assets to generate cash flows for a return to investors. Accordingly, the statement of cash flows shows that a firm's cash flows fall into three categories: (1) cash flow from operating activities, (2) cash flow from investment activities, and (3) cash flow from financing activities. **Cash flow from operating activities** includes the cash inflows and outflows directly related to the sale and production of the firm's products and services. **Cash flow from investment activities** includes the cash flows associated with the purchase and sale of both fixed assets and equity investments in other firms. Clearly, purchase transactions would result in cash outflows, whereas sales transactions would generate cash inflows. **Cash flow from financing activities** results from debt and equity financing transactions. Borrowing on either a short-term or long-term basis would result in a corresponding cash inflow; repaying debt would result in an outflow. Similarly, the sale of the company's stock would result in a cash inflow; the repurchase of stock or payment of cash dividends would result in an outflow.

cash flow from operating activities
Cash flows directly related to sale and production of the firm's products and services.

cash flow from investment activities
Cash flows associated with purchase and sale of both fixed assets and equity investments in other firms.

cash flow from financing activities
Cash flows that result from debt and equity financing transactions; includes incurrence and repayment of debt, cash inflows from the sale of stock, and cash outflows to repurchase stock or pay cash dividends.

Classifying Inflows and Outflows of Cash

The statement of cash flows groups the inflows and outflows of cash into these three categories and summarizes the firm's overall cash position. The information required to construct the statement of cash flows comes from the income statement and the balance sheet. But which items on those statements represent cash inflows and which represent outflows? In some cases, the answers are quite intuitive. When a firm earns positive net income, for example, that counts as a

cash inflow. Perhaps less intuitively, when a firm's income statement shows a deduction for depreciation expense, that too is a cash inflow. Remember that depreciation expense is just an accounting entry designed to smooth out the reported cost of an asset over time. When a firm deducts depreciation on its income statement, there is no cash outlay directly tied to that deduction. That fact alone would mean that the firm's net income is less than its cash flow, so we add depreciation expense back to net income to get a clearer picture of the cash flow a company earns.

Similarly, changes in accounts on a firm's balance sheet reflect inflows and outflows of cash. In general, increases in asset accounts on the balance sheet are associated with cash outflows tied to investments that a firm has made in new assets. If we see that a firm reports higher fixed assets from one year to the next, that means cash outflow is tied to the acquisition of those new assets. The same is true if current assets such as inventory and receivables increase on the balance sheet. In contrast, decreases in asset balances point toward cash inflows. If this year's balance sheet shows lower gross fixed asset balances, then the firm generated cash by selling fixed assets. If inventory or receivables balances are lower this year, the firm generated cash by selling inventories or collecting accounts receivable.

Conversely, increases in items on the right-hand side of the balance sheet (i.e., liabilities and equity) reflect cash inflows. If a firm borrows more, it receives a cash inflow and the value of debt on the balance sheet increases. If a firm sells more stock, it receives a cash inflow and the value of common stock equity on the balance sheet increases. The opposite is true when liabilities and equity accounts fall. A reduction in debts signals that a firm spent cash paying back money that it previously borrowed. A reduction in common stock equity suggests that the firm repurchased outstanding shares of stock. Table 4.3 classifies the basic inflows (sources) and outflows (uses) of cash.

We can make a few additional points about the classification scheme in Table 4.3:

1. A *decrease* in an asset, such as the firm's cash balance, is an *inflow of cash*. Why? It is because cash that has been tied up in the asset is released and can be used for some other purpose, such as repaying a loan. In contrast, an *increase* in the firm's cash balance is an *outflow of cash* because additional cash is being tied up in the firm's cash balance.

   The classification of decreases and increases in a firm's cash balance is difficult for many to grasp. To clarify, imagine that you store all your cash in a bucket. Your cash balance is represented by the amount of cash in the bucket. When you need cash, you withdraw it from the bucket, which decreases your cash balance and provides an inflow of cash to you. Conversely, when you have excess cash, you deposit it in the bucket, which

MATTER OF FACT

Apple's Cash Flows

In its 2016 annual report, Apple reported more than $65 billion in cash from its operating activities. It used much of that cash flow on investment activities, spending roughly $31 billion to increase its holdings of marketable securities (i.e., to build up cash reserves). With plans to open a new headquarters building the next year, Apple spent almost $13 billion to acquire new property, plant, and equipment. By contrast, the cash flow from financing activities was relatively minor. The company spent almost $30 billion on share repurchases in 2016, but that was largely offset by the $22 billion Apple raised by issuing new debt.

TABLE 4.3 Inflows and Outflows of Cash

Inflows (sources)	Outflows (uses)
Decrease in any asset	Increase in any asset
Increase in any liability	Decrease in any liability
Net profits after taxes	Net loss after taxes
Depreciation and other noncash charges	Dividends paid
Sale of stock	Repurchase or retirement of stock

increases your cash balance and represents an outflow of cash from you. Focus on the movement of funds in and out of your pocket. A decrease in cash (from the bucket) is an inflow (to your pocket); an increase in cash (in the bucket) is an outflow (from your pocket).

noncash charge
An expense that is deducted on the income statement but does not involve the actual outlay of cash during the period; includes depreciation, amortization, and depletion.

2. Depreciation (like amortization and depletion) is an example of a **noncash charge**, an expense that is deducted on the income statement but does not involve an actual outlay of cash. Therefore, when measuring the amount of cash flow generated by a firm, we have to add depreciation and any other noncash expenses back to net income; if we don't, we will understate the cash truly generated by the firm. For this reason, depreciation appears as a source of cash in Table 4.3.
3. Because depreciation is treated as a separate cash inflow, only changes in gross rather than net fixed assets appear on the statement of cash flows. The change in net fixed assets is equal to the change in gross fixed assets minus the depreciation charge. Therefore, if we treated depreciation as a cash inflow as well as the reduction in net (rather than gross) fixed assets, we would be double counting depreciation.
4. Direct entries of changes in retained earnings are not included on the statement of cash flows. Instead, entries for items that affect retained earnings appear as net profits or losses after taxes and dividends are paid.

Preparing the Statement of Cash Flows

The statement of cash flows uses data from the income statement, along with the beginning- and end-of-period balance sheets. Tables 4.4 and 4.5 show the income statement for the year ended December 31, 2019 and the December 31 balance

TABLE 4.4 Baker Corporation 2019 Income Statement ($000)

Sales revenue	$1,700
Less: Cost of goods sold	1,000
Gross profits	$ 700
Less: Operating expenses	
Selling, general, and administrative expense	$ 230
Depreciation expense	100
Total operating expense	$ 330
Earnings before interest and taxes (EBIT)	$ 370
Less: Interest expense	70
Net profits before taxes	$ 300
Less: Taxes (rate = 21%)	63
Net profits after taxes	$ 237
Less: Preferred stock dividends	10
Earnings available for common stockholders	$ 227
Earnings per share (EPS)[a]	$ 2.27
Common stock dividends per share (DPS)[b]	$ 0.70

[a]Calculated by dividing the earnings available for common stockholders by the number of shares of common stock outstanding ($170,000 ÷ 100,000 shares = $1.70 per share).

[b]The firm's board decided to pay $70,000 in dividends to common shareholders, so dividends per share are $0.70 ($70,000 ÷ 100,000 shares = $0.70 per share).

TABLE 4.5 Baker Corporation Balance Sheets ($000)

	December 31	
Assets	**2019**	**2018**
Cash and marketable securities	$1,057	$ 500
Accounts receivable	400	500
Inventories	600	900
Total current assets	$2,000	$1,900
Land and buildings	$1,200	$1,050
Machinery and equipment, furniture and fixtures, vehicles, and other	1,300	1,150
Total gross fixed assets (at cost)	$2,500	$2,200
Less: Accumulated depreciation	1,300	1,200
Net fixed assets	$1,200	$1,000
Total assets	$3,257	$2,900
Liabilities and stockholders' equity		
Accounts payable	$ 700	$ 500
Notes payable	600	700
Accruals	100	200
Total current liabilities	$1,400	$1,400
Long-term debt	600	400
Total liabilities	$2,000	$1,800
Preferred stock	$ 100	$ 100
Common stock: $1.20 par, 100,000 shares outstanding in 2019 and 2018	120	120
Paid-in capital in excess of par on common stock	380	380
Retained earnings	657	500
Total stockholders' equity	$1,257	$1,100
Total liabilities and stockholders' equity	$3,257	$2,900

sheets for 2018 and 2019 for Baker Corporation. Table 4.6 presents the statement of cash flows for the year ended December 31, 2019, for Baker Corporation. Note that all cash inflows as well as net profits after taxes and depreciation are treated as positive values. All cash outflows, any losses, and dividends paid are treated as negative values. The items in each category—operating, investment, and financing—are totaled, and the three totals are added to get the "Net increase (decrease) in cash and marketable securities" for the period. As a check, this value should reconcile with the actual change in cash and marketable securities for the year, which is obtained from the beginning- and end-of-period balance sheets.

Interpreting the Statement

The statement of cash flows allows the financial manager and other interested parties to analyze the firm's cash flow. The manager should pay special attention both to the major categories of cash flow and to the individual items of cash inflow and outflow, to look for any developments that are contrary to the company's financial policies. In addition, analysts can use the statement to evaluate progress toward projected goals or to isolate inefficiencies. The financial manager

TABLE 4.6 Baker Corporation Statement of Cash Flows ($000) for the Year Ended December 31, 2019

Cash flow from operating activities	
Net profits after taxes	$237
Depreciation	100
Decrease in accounts receivable	100
Decrease in inventories	300
Increase in accounts payable	200
Decrease in accruals	−100
Cash provided by operating activities	$837
Cash flow from investment activities	
Increase in gross fixed assets	−$300
Changes in equity investments in other firms	0
Cash provided by investment activities	−$300
Cash flow from financing activities	
Decrease in notes payable	−$100
Increase in long-term debt	200
Changes in stockholders' equity[a]	0
Dividends paid (common and preferred)	−80
Cash provided by financing activities	$ 20
Net increase in cash and marketable securities	$557

[a]Retained earnings are excluded here because their change is actually reflected in the combination of the "Net profits after taxes" and "Dividends paid" entries.

also can prepare a statement of cash flows developed from projected financial statements to determine whether planned actions are desirable in view of the resulting cash flows.

operating cash flow (OCF)
The cash flow a firm generates from its normal operations; calculated as net operating profits after taxes (NOPAT) plus depreciation.

net operating profits after taxes (NOPAT)
A firm's earnings before interest and after taxes, EBIT × (1 − *T*).

Operating Cash Flow A firm generates its **operating cash flow** (**OCF**) from its normal operations: producing and selling its output of goods or services. Various definitions of OCF appear in the financial literature. The definition introduced here excludes interest expense. We exclude interest expense because we want a measure that captures the cash flow generated by the firm's operations, not by how those operations are financed. The first step is to calculate **net operating profits after taxes** (**NOPAT**), which represent the firm's earnings before interest and after taxes. Letting T equal the applicable corporate tax rate, we calculate NOPAT as

$$\text{NOPAT} = \text{EBIT} \times (1 - T) \tag{4.1}$$

To convert NOPAT to operating cash flow (OCF), we merely add back depreciation:

$$\text{OCF} = \text{NOPAT} + \text{Depreciation} \tag{4.2}$$

We can substitute the expression for NOPAT from Equation 4.1 into Equation 4.2 to get a single equation for OCF:

$$\text{OCF} = [\text{EBIT} \times (1 - T)] + \text{Depreciation} \quad (4.3)$$

EXAMPLE 4.4

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Substituting the values for Baker Corporation from its income statement (Table 4.4) into Equation 4.3, we get

$$\text{OCF} = [\$370 \times (1.00 - 0.21)] + \$100 = \$292.3 + \$100 = \$392.3$$

During 2019, Baker Corporation generated $392,300 of cash flow from producing and selling its output. Therefore, we can conclude that Baker's operations are generating positive cash flows.

FREE CASH FLOW

free cash flow (FCF)
The amount of cash flow available to investors (creditors and owners) after the firm has met all operating needs and paid for investments in net fixed assets and net current assets.

The firm's **free cash flow (FCF)** represents the cash available to investors—the providers of debt (creditors) and equity (owners)—after the firm has met all operating needs and paid for net investments in fixed assets and current assets. Conceptually, free cash flow is the cash flow that firms can distribute to investors, but as the *Focus on Ethics* box explains, sometimes an unexpected flood of free cash flows tempts managers to waste those funds rather than putting them in investors' hands.

Free cash flow can be defined as

$$\begin{aligned}\text{FCF} = \text{OCF} &- \text{Net fixed asset investment (NFAI)} \\ &- \text{Net current asset investment (NCAI)}\end{aligned} \quad (4.4)$$

The *net fixed asset investment (NFAI)* is the net investment the firm makes in fixed assets and refers to purchases minus sales of fixed assets. You can calculate the NFAI using

$$\text{NFAI} = \text{Change in net fixed assets} + \text{Depreciation} \quad (4.5)$$

The NFAI is also equal to the change in gross fixed assets from one year to the next.

EXAMPLE 4.5

Using the Baker Corporation's balance sheets in Table 4.5, we see that its change in net fixed assets between 2018 and 2019 was $200 ($1,200 in 2019 − $1,000 in 2018). Substituting this value and the $100 of depreciation for 2019 into Equation 4.5, we get Baker's net fixed asset investment (NFAI) for 2019:

$$\text{NFAI} = \$200 + \$100 = \$300$$

Baker Corporation therefore invested a net $300,000 in fixed assets during 2019. This amount would, of course, represent a cash outflow to acquire fixed assets during 2019.

FOCUS ON ETHICS *in practice*

Is Excess Cash Always a Good Thing?

In Shakespeare's *As You Like It,* Rosalind—the lovesick heroine—wonders, "Can one desire too much of a good thing?" By "thing," she specifically meant love, but the implied answer has transformed the question into a common expression—you can't get enough of a good thing. As the chapter notes, free cash flow is a good thing because a firm blessed with it has already met all operating needs and paid for all investments in net current and net fixed assets. But once a firm has covered these, is more cash always better?

Paradoxically, Harvard finance professor Michael Jensen replied, "not always," in a classic 1986 paper. To argue the point, Jensen returned to the potential conflict between shareholders (principals) and management (their agents). Shareholders want management to focus on share price. But sometimes the CEO has a different agenda—such as boosting company size, perhaps to raise his profile and trigger lucrative employment offers from other firms. The weaker the shareholders' control, the more likely management will pursue its own interests. And free cash flow, according to Jensen, gives management resources to play with.

Imagine a mature firm with healthy cash flows but an uncertain future. In the original article, Jensen pointed to the oil industry, which remains a good example. Between 1973 and 1980, supply disruptions from Middle Eastern conflict and the Iranian Revolution produced an 11-fold increase in crude-oil prices. Because it is tough to reduce commutes or trade in gas-guzzlers overnight, oil companies reaped a short-term bonanza, pumping out billions in free cash flow. In the long run, however, consumers can move and buy new cars; firms can also build more energy-efficient factories. They did and by 1986 oil prices were 71% below the 1980 peak. In the meantime, however, oil companies spent that mountain of cash on exploration and acquisitions of firms outside the oil business—neither of which did more for shareholders than they could have done for themselves had oil-company management simply paid out the surplus cash as dividends.

This is not to imply more free cash flow is always bad. Often, small, younger firms find themselves in the exact opposite position of early 1980s oil companies—they are flush with great projects but cash poor. Because of their short track record and thin collateral, such firms often must fund investment projects with internal funds because borrowing is too expensive or impossible. In this case, excess cash is great because it allows management to exploit opportunities that might otherwise go by the wayside.

The bottom line for management is—the best way to keep shareholders happy is to focus on what is best for them. Or, as the Bard more poetically put it in *King Lear,* "How, in one house, should many people under two commands hold amity? 'Tis hard; almost impossible."

▶ *Suppose unexpected events in the market for your product leave you with significant free cash flow. What benchmark should you use in determining the best (and most ethical) use of those funds?*

Source: Michael C. Jensen, "Agency Costs of Free Cash Flow, Corporate Finance, and Takeovers," *American Economic Review* 76 (1986): 323–329.

Looking at Equation 4.5, we see that if net fixed assets decline by an amount exceeding the depreciation for the period, the NFAI would be negative. A negative NFAI represents a net cash inflow attributable to the firm selling more assets than it acquired during the year.

The *net current asset investment (NCAI)* represents the net investment made by the firm in its current (operating) assets. "Net" refers to the difference between current assets and the sum of accounts payable and accruals. Notes payable are not included in the NCAI calculation because they represent a negotiated creditor claim on the firm's free cash flow. The NCAI calculation is

$$\text{NCAI} = \text{Change in current assets} - \text{Change in (accounts payable} + \text{accruals)} \tag{4.6}$$

EXAMPLE 4.6

Looking at the Baker Corporation's balance sheets for 2018 and 2019 in Table 4.5, we see that the change in current assets between 2018 and 2019 is $157 ($2,057 in 2019 − $1,900 in 2018). The difference between Baker's accounts payable plus accruals of $800 in 2019 ($700 in accounts payable + $100 in accruals) and of $700 in 2018 ($500 in accounts payable + $200 in accruals) is $100 ($800 in 2019 − $700 in 2018). Substituting into Equation 4.6 the change in current assets and the change in the sum of accounts payable plus accruals for Baker Corporation, we get its 2019 NCAI:

$$\text{NCAI} = \$157 - \$100 = \$57$$

So, during 2019 Baker Corporation made a $57 investment in its current assets net of accounts payable and accruals.

Now we can substitute Baker Corporation's 2019 operating cash flow (OCF) of $392.3, its net fixed asset investment (NFAI) of $300, and its net current asset investment (NCAI) of $57 into Equation 4.4 to find its free cash flow (FCF):

$$\text{FCF} = \$392.3 - \$300 - \$57 = \$35.3$$

We can see that during 2019 Baker generated $35,300 of free cash flow, which it can use to pay its investors: creditors (payment of interest) and owners (payment of dividends). Thus, the firm generated adequate cash flow to cover all its operating costs and investments and had free cash flow available to pay investors. However, Baker's interest expense in 2019 was $70,000, so the firm is not generating enough FCF to provide a sufficient return to its investors.

By generating more cash flow than it needs to pay bills and invest in new current and fixed assets, a firm creates value for shareholders. In the next section, we consider various aspects of financial planning for cash flow and profit.

→ REVIEW QUESTIONS MyLab Finance Solutions

- **4–3** Briefly describe the first four modified accelerated cost recovery system (MACRS) property classes and recovery periods. Explain how the depreciation percentages are determined by using the MACRS recovery periods.
- **4–4** Describe the overall cash flow through the firm in terms of cash flow from operating activities, cash flow from investment activities, and cash flow from financing activities.
- **4–5** Explain why a decrease in cash is classified as a cash inflow (source) and why an increase in cash is classified as a cash outflow (use) in preparing the statement of cash flows.
- **4–6** Why is depreciation (as well as amortization and depletion) considered a noncash charge?
- **4–7** Describe the general format of the statement of cash flows. How are cash inflows differentiated from cash outflows on this statement?
- **4–8** Why do we exclude interest expense from operating cash flow?
- **4–9** Define and differentiate between a firm's operating cash flow (OCF) and its free cash flow (FCF).

LG4

4.3 Cash Planning: Cash Budgets

cash budget (cash forecast)
A statement of the firm's planned inflows and outflows of cash that managers use to estimate its short-term cash requirements.

The **cash budget**, or **cash forecast**, is a statement of the firm's planned inflows and outflows of cash. Managers use the cash budget to estimate the firm's short-term cash requirements, with particular attention to planning for surplus cash and for cash shortages.

Typically, the cash budget covers 1 year, divided into smaller time intervals. The number of intervals depends on the nature of the business. The more seasonal and uncertain a firm's cash flows, the greater the number of intervals. Because many firms are confronted with a seasonal cash flow pattern, the cash budget is quite often presented on a monthly basis. Firms with stable patterns of cash flow may use quarterly or annual time intervals.

THE SALES FORECAST

sales forecast
The prediction of the firm's sales over a given period, based on external and/or internal data; used as the key input to the short-term financial planning process.

The key input to the short-term financial planning process is the firm's **sales forecast**. The marketing department often plays the major role in putting together this projection of sales over the coming year. On the basis of the sales forecast, the financial manager estimates the monthly cash flows that will result from projected sales and from outlays related to production, inventory, and sales. The manager also determines the level of fixed assets required and the amount of financing, if any, needed to support the firm's activities during the year. In practice, obtaining good data proves the most difficult aspect of forecasting. The sales forecast may be based on an analysis of external data, internal data, or a combination of the two.

external forecast
A sales forecast based on the relationships observed between the firm's sales and certain key external economic indicators.

An **external forecast** is based on the relationships observed between the firm's sales and certain key external economic indicators such as the gross domestic product (GDP), new housing starts, consumer confidence, and disposable personal income. Constructing an external forecast calls for a *top-down approach,* which means that the company first looks at the big picture, such as how fast GDP will be growing. From there, the company identifies the markets it will compete in and makes projections for the share of each market it can capture. These high-level factors eventually lead to an overall sales forecast for the firm.

internal forecast
A sales forecast based on a buildup, or consensus, of sales forecasts through the firm's own sales channels.

Internal forecasts are based on a consensus of sales forecasts through the firm's own sales channels, using a *bottom-up approach*. Managers charged with creating an internal forecast ask the firm's salespeople to estimate how many units of each type of product they expect to sell in the coming year. The sales manager collects and aggregates these forecasts and then makes adjustments to them based on a range of factors to arrive at the firm's overall sales forecast.

Firms generally use a combination of external and internal forecast data to make the final sales forecast. The internal data provide insight into sales expectations, and the external data provide a means of adjusting these expectations to take into account general economic factors. The nature of the firm's product also often affects the mix and types of forecasting methods used.

PREPARING THE CASH BUDGET

Table 4.7 illustrates the general format of a cash budget. The budget begins by calculating total cash receipts and disbursements to arrive at the net cash inflow or outflow, which is then added to the beginning cash balance. The resulting

TABLE 4.7 The General Format of the Cash Budget

	Jan.	Feb.	…	Nov.	Dec.
Total cash receipts	$XXA	$XXH		$XXN	$XXU
Less: Total cash disbursements	XXB	XXI	…	XXO	XXV
Net cash flow	$XXC	$XXJ		$XXP	$XXW
Add: Beginning cash	XXD	XXE	XXK	XXQ	XXR
Ending cash	$XXE	$XXK		$XXR	$XXX
Less: Minimum cash balance	XXF	XXL	…	XXS	XXY
Required total financing		$XXM		$XXT	
Excess cash balance	$XXG				$XXZ

ending cash balance shows how much cash the firm would have on hand without seeking additional financing. Most firms have a minimum cash balance they want to keep on hand at all times, so the cash budget compares the ending cash balance to the minimum desired balance. If the ending cash balance exceeds the minimum, the firm has excess cash it can invest in marketable securities or other assets. If the ending cash balance falls short of the minimum balance requirement, then the firm will seek additional financing, most likely in the form of short-term borrowing.

The following discussion, along with Tables 4.8 and 4.9, illustrates each of the cash budget's components individually. Table 4.10 presents the completed cash budget for Coulson Industries.

Total Cash Receipts

total cash receipts
All of a firm's inflows of cash during a given financial period.

Total cash receipts include all inflows of cash during a given period. The most common components of cash receipts are cash sales, collections of accounts receivable, and other cash receipts. Note that to estimate cash receipts, analysts have to gather information from a variety of sources within the firm, including people from marketing and sales as well as those employees who oversee collections.

EXAMPLE 4.7

Coulson Industries, a defense contractor, is developing a cash budget for October, November, and December. Coulson's sales in August and September were $100,000 and $200,000, respectively. Sales of $400,000, $300,000, and $200,000 have been forecast for October, November, and December, respectively. Historically, 20% of the firm's sales have been for cash, 50% have generated accounts receivable collected after 1 month, and the remaining 30% have generated accounts receivable collected after 2 months. Bad-debt expenses (uncollectible accounts) have been negligible. In December, the firm will receive a $30,000 dividend from stock in a subsidiary. The schedule of expected cash receipts for the company appears in Table 4.8. It contains the following:

Forecast sales Coulson expects sales to rise from August to October before falling slightly in November and December.

Cash sales The cash sales shown for each month represent 20% of the total sales forecast for that month.

TABLE 4.8 A Schedule of Projected Cash Receipts for Coulson Industries ($000)

Sales forecast	Aug. $100	Sept. $200	Oct. $400	Nov. $300	Dec. $200
Cash sales (0.20)	$20	$40	$ 80	$ 60	$ 40
Collections of A/R:					
Lagged 1 month (0.50)		50	100	200	150
Lagged 2 months (0.30)			30	60	120
Other cash receipts					30
Total cash receipts	$20	$90	$210	$320	$340

Collections of A/R These entries represent the collection of accounts receivable (A/R) resulting from sales in earlier months.

Lagged 1 month These figures represent sales made in the preceding month that generated accounts receivable collected in the current month. Because 50% of the current month's sales are collected 1 month later, the collections of A/R with a 1-month lag shown for September represent 50% of the sales in August, collections for October represent 50% of September sales, and so on.

Lagged 2 months These figures represent sales made 2 months earlier that generated accounts receivable collected in the current month. Because 30% of sales are collected 2 months later, the collections with a 2-month lag shown for October represent 30% of the sales in August, and so on.

Other cash receipts These are cash receipts expected from sources other than sales. Interest received, dividends received, proceeds from the sale of equipment, stock and bond sale proceeds, and lease receipts may show up here. For Coulson Industries, the only other cash receipt is the $30,000 dividend due in December.

Total cash receipts This figure represents the total of all the cash receipts listed for each month. For Coulson Industries, the figures for August and September represent actual cash inflows, whereas the figures for October, November, and December are forecasts based on expected sales and collections patterns.

Total Cash Disbursements

total cash disbursements
All outlays of cash by the firm during a given financial period.

Total cash disbursements include all outlays of cash by the firm during a given period. The most common cash disbursements are

- Cash purchases
- Payments of accounts payable
- Rent (and lease) payments
- Wages and salaries
- Tax payments
- Fixed-asset outlays
- Interest payments
- Cash dividend payments
- Principal payments (loans)
- Repurchases or retirements of stock

Here, too, note that the information required to estimate total cash disbursements comes from a wide range of sources. The human resources department would have the best access to information about disbursements for employee salaries, wages, and benefits. The operations department would be in the best position to provide data on purchases of raw materials and purchases of new fixed assets. The accounting department would have responsibility for the firm's tax payments. In short, for financial managers to put together a cash budget, they must be engaged with practically every part of a firm.

It is important to recognize that *depreciation and other noncash charges are NOT included in the cash budget* because they merely represent a scheduled write-off of an earlier cash outflow. The impact of depreciation, as we noted earlier, is reflected in the reduced cash outflow for tax payments.

EXAMPLE 4.8

Coulson Industries has gathered the following data needed for preparing a cash disbursements schedule for October, November, and December.

Purchases The firm's purchases represent 70% of sales. Of this amount, Coulson pays 10% in cash up front. It pays 70% in the month immediately following the month of purchase, as highlighted in Table 4.9 by the row labeled *lagged 1 month*. The company pays the remaining 20% 2 months following the month of purchase, as Table 4.9 shows in the row labeled *lagged 2 months*.

Rent payments Coulson will pay rent of $5,000 each month.

Wages and salaries Fixed salaries for the year are $96,000, or $8,000 per month. In addition, Coulson's financial managers estimate that wages equal 10% of monthly sales.

TABLE 4.9 A Schedule of Projected Cash Disbursements for Coulson Industries ($000)

Purchases (0.70 × sales)	Aug. $70	Sept. $140	Oct. $280	Nov. $210	Dec. $140
Cash purchases (0.10)	$7	$14	$ 28	$ 21	$ 14
Payments of A/P:					
Lagged 1 month (0.70)		49	98	196	147
Lagged 2 months (0.20)			14	28	56
Rent payments			5	5	5
Wages and salaries			48	38	28
Tax payments					25
Fixed-asset outlays				130	
Interest payments					10
Cash dividend payments			20		
Principal payments					20
Total cash disbursements	$7	$63	$213	$418	$305

Tax payments Coulson must pay taxes of $25,000 in December.

Fixed-asset outlays The company will pay cash for new machinery costing $130,000 in November.

Interest payments An interest payment of $10,000 is due in December.

Cash dividend payments Coulson will pay cash dividends of $20,000 in October.

Principal payments (loans) A $20,000 principal payment is due in December.

Repurchases or retirements of stock No repurchase or retirement of stock is expected between October and December.

Table 4.9 presents the firm's cash disbursements schedule, using the preceding data.

net cash flow
The mathematical difference between the firm's cash receipts and its cash disbursements in each period.

ending cash
The sum of the firm's beginning cash and its net cash flow for the period.

required total financing
Amount of funds needed by the firm if the ending cash for the period is less than the desired minimum cash balance; typically represented by notes payable.

excess cash balance
The (excess) amount available for investment by the firm if the period's ending cash is greater than the desired minimum cash balance; assumed to be invested in marketable securities.

Net Cash Flow, Ending Cash, Financing, and Excess Cash

Look back at the general-format cash budget in Table 4.7. We have inputs for the first two entries, and we now continue calculating the firm's cash needs. We find the firm's **net cash flow** by subtracting the cash disbursements from cash receipts in each period. Then we add beginning cash to the firm's net cash flow to determine the **ending cash** for each period.

Finally, we subtract the desired minimum cash balance from ending cash to find the **required total financing** or the **excess cash balance**. If the ending cash is less than the minimum cash balance, financing is required. Most managers view such financing as short term, so we will assume that any short-term borrowing the firm does will appear on the balance sheet as notes payable. If the ending cash is greater than the minimum cash balance, *excess cash* exists. Managers usually invest any excess cash in liquid, short-term, interest-paying marketable securities.

EXAMPLE 4.9

Table 4.10 presents Coulson Industries' cash budget. The company wishes to maintain, as a reserve for unexpected needs, a minimum cash balance of $25,000. For Coulson Industries to keep this ending cash balance, it will need total borrowing of $76,000 in November and $41,000 in December. In October, the firm will have an excess cash balance of $22,000, which it can invest in an interest-earning marketable security. The required total financing figures in the cash budget refer to how much Coulson will owe at the end of the month; they do not represent the monthly changes in borrowing.

We can easily find the monthly changes in borrowing and in excess cash by further analyzing the cash budget. In October, the $50,000 beginning cash, which becomes $47,000 after the $3,000 net cash outflow, results in a $22,000 excess cash balance (i.e., Coulson has $22,000 in cash above the $25,000 minimum). In November, Coulson has a net cash outflow of $98,000. From that we subtract the existing cash and marketable securities balance of $47,000 and find that the firm has a cash deficit of $51,000. Because Coulson wants a minimum of $25,000 of cash on hand at all times,

TABLE 4.10 A Cash Budget for Coulson Industries ($000)

	Oct.	Nov.	Dec.
Total cash receipts[a]	$210	$320	$340
Less: Total cash disbursements[b]	213	418	305
Net cash flow	−$ 3	−$ 98	$ 35
Add: Beginning cash	50	47	−51
Ending cash	$ 47	−$ 51	−$ 16
Less: Minimum cash balance	25	25	25
Required total financing (notes payable)[c]		$ 76	$ 41
Excess cash balance (marketable securities)[d]	$ 22		

[a]From Table 4.8.

[b]From Table 4.9.

[c]Values are placed in this line when the ending cash is less than the desired minimum cash balance. These amounts are typically financed short term and therefore are represented by notes payable.

[d]Values are placed in this line when the ending cash is greater than the desired minimum cash balance. These amounts are typically assumed to be invested short term and therefore are represented by marketable securities.

in November the firm must borrow $76,000, enough to cover the cash deficit and replenish the cash balance to the desired minimum. In December, Coulson earns net cash inflows of $35,000, which it uses to repay some of its short-term borrowings, reducing the outstanding short-term debt from $76,000 to $41,000. In summary, the financial activities for each month would be as follows:

October: **Invest the $22,000** excess cash balance in marketable securities.

November: Liquidate the $22,000 of marketable securities and **borrow $76,000** (notes payable).

December: **Repay $35,000** of notes payable to leave $41,000 of outstanding required total financing.

At the end of each of the 3 months, Coulson expects the following balances in cash, marketable securities, and notes payable:

	End-of-month balance ($000)		
Account	Oct.	Nov.	Dec.
Cash	$25	$25	$25
Marketable securities	22	0	0
Notes payable	0	76	41

EVALUATING THE CASH BUDGET

The cash budget indicates whether managers should expect a cash shortage or surplus in each of the months covered by the forecast. It is a critical planning tool because it helps managers secure borrowing arrangements, such as

bank lines of credit, before the firm actually needs the money. As time passes, managers refer back to the cash budget to compare projections to the firm's actual performance. Such a comparison allows managers to identify problems in which actual cash inflows and outflows vary from the budget's forecast.

Cash budgets are just as important to individuals. Nearly all financial advisors tell their clients that they should have money saved in liquid assets sufficient to cover a few months of expenses in the event of an emergency. Individuals following this advice know how much money they need in their emergency fund only if they have a good idea of what their monthly cash expenses (i.e., disbursements) will be. Similarly, individuals can use cash budgets to identify periods when they will have excess funds to invest or when they will need to borrow money.

PERSONAL FINANCE EXAMPLE 4.10 Individuals need to prepare budgets to make sure they can cover their current expenses (cash outflows) and save for the future. The personal budget is a short-term financial planning report that helps individuals or families achieve short-term financial goals. Personal budgets typically cover a 1-year period, broken into months.

A condensed version of a personal budget for the first quarter (3 months) is shown below.

	Jan.	Feb.	Mar.
Income			
Take-home pay	$4,775	$4,775	$4,775
Investment income			90
(1) Total income	$4,775	$4,775	$4,865
Expenses			
(2) Total expenses	$4,026	$5,291	$7,396
Cash surplus or deficit [(1) − (2)]	$ 749	−$ 516	−$2,531
Cumulative cash surplus or deficit	$ 749	$ 233	−$2,298

The personal budget shows a cash surplus of $749 in January, followed by monthly deficits in February and March of $516 and $2,531, resulting in a cumulative deficit of $2,298 through March. Clearly, to cover the deficit, some action—such as increasing income, reducing expenses, drawing down savings, or borrowing—will be necessary to bring the budget into balance. Borrowing by using credit can offset a deficit in the short term but can lead to financial trouble if done repeatedly.

COPING WITH UNCERTAINTY IN THE CASH BUDGET

Forecasts are almost inevitably wrong, at least to some degree. That doesn't mean that putting together a cash budget is pointless. Instead, it indicates that managers need to understand that a firm's actual experience will not

match the projections included in the cash budget exactly and that plans to invest surplus cash or to borrow money have to be flexible enough to adjust to actual outcomes. Of course, the best way to deal with uncertainty in the cash budget is to incorporate the most careful and accurate forecasts possible. Aside from careful estimation of cash budget inputs, there are two ways of coping with uncertainty in the cash budget. One is to conduct a *scenario analysis,* in which analysts prepare several cash budgets, based on pessimistic, most likely, and optimistic forecasts. From this range of cash flows, the financial manager can determine the amount of financing necessary to cover the most adverse situation. The use of several cash budgets, based on differing scenarios, also should give the financial manager a sense of the riskiness of various alternatives.

EXAMPLE 4.11

Table 4.11 presents the summary of Coulson Industries' cash budget prepared for each month, using pessimistic, most likely, and optimistic estimates of total cash receipts and disbursements. The most likely estimate is based on the expected outcomes presented earlier.

During October, Coulson will, at worst, need $15,000 of financing and, at best, will have a $62,000 excess cash balance. During November, its financing requirement could be as high as $185,000, or it could experience an excess cash balance of $5,000. The December projections show maximum borrowing of $190,000, with a possible excess cash balance of $107,000. By considering extreme values in the pessimistic and optimistic outcomes, Coulson Industries should be better able to plan its cash requirements. For the 3-month period, the peak borrowing requirement under the worst circumstances would be $190,000, which happens to be considerably greater than the most likely estimate of $76,000.

TABLE 4.11 A Scenario Analysis of Coulson Industries' Cash Budget ($000)

	October			November			December		
	Pessimistic	Most likely	Optimistic	Pessimistic	Most likely	Optimistic	Pessimistic	Most likely	Optimistic
Total cash receipts	$ 160	$210	$285	$ 210	$320	$410	$275	$340	$422
Less: Total cash disbursements	200	213	248	380	418	467	280	305	320
Net cash flow	–$ 40	–$ 3	$ 37	–$170	–$ 98	–$ 57	–$ 5	$ 35	$102
Add: Beginning cash	50	50	50	10	47	87	– 160	–51	30
Ending cash	$ 10	$ 47	$ 87	–$160	–$ 51	$ 30	–$165	–$ 16	$132
Less: Minimum cash balance	25	25	25	25	25	25	25	25	25
Required total financing	$ 15			$ 185	$ 76		$190	$ 41	
Excess cash balance		$ 22	$ 62			$ 5			$107

A second and much more sophisticated way of coping with uncertainty in the cash budget is *simulation*. By simulating the occurrence of sales and other uncertain events, the firm can develop a probability distribution of its ending cash flows for each month. The financial decision maker can then use the probability distribution to determine the amount of financing needed to protect the firm adequately against a cash shortage.

CASH FLOW WITHIN THE MONTH

Because the cash budget shows cash flows only on a monthly basis, the information provided by the cash budget is not necessarily adequate for ensuring solvency. A firm must look more closely at its pattern of daily cash receipts and cash disbursements to ensure that adequate cash is available for paying bills as they come due.

The synchronization of cash flows in the cash budget at month's end does not ensure that the firm will be able to meet its daily cash requirements. Because a firm's cash flows are generally quite variable when viewed daily, effective cash planning requires a look beyond the cash budget. The financial manager must therefore plan and monitor cash flow more frequently than on a monthly basis. The greater the variability of cash flows from day to day, the greater the amount of attention required.

→ REVIEW QUESTIONS MyLab Finance Solutions

- **4–10** What is the purpose of the cash budget? What role does the sales forecast play in its preparation?
- **4–11** Briefly describe the basic format of the cash budget.
- **4–12** How can the two "bottom lines" of the cash budget be used to determine the firm's short-term borrowing and investment requirements?
- **4–13** What is the cause of uncertainty in the cash budget, and what two techniques can be used to cope with this uncertainty?

LG 5

4.4 Profit Planning: Pro Forma Statements

pro forma statements
Projected, or forecast, income statements and balance sheets.

Whereas cash planning focuses on forecasting cash flows, *profit planning* has a broader emphasis that encapsulates the firm's overall financial position. Shareholders, creditors, and the firm's management pay close attention to **pro forma statements**, which are projected income statements and balance sheets. Firms construct pro forma financial statements by studying past relationships between key accounts on the income statement and balance sheet and making judgments about whether those relationships will continue in the near future. Many of the financial ratios introduced earlier in this text play an important role in the creation of pro forma financial statements.

Managers require two main inputs to prepare pro forma statements: (1) financial statements for at least the preceding year and (2) the sales forecast for the coming year. Given those inputs, managers make a variety of assumptions based on historical financial relationships to construct projected income statements and balance sheets. To illustrate this process, we will focus on the company Fair Traders Inc., which works with artists in developing countries to produce and sell handmade dinner plates and mugs.

PRECEDING YEAR'S FINANCIAL STATEMENTS

The income statement for the firm's 2019 operations is given in Table 4.12. It indicates that Fair Traders had sales of $100,000, total cost of goods sold of $80,000, net profits before taxes of $9,000, and net profits after taxes of $7,650. The firm paid $4,000 in cash dividends, leaving $3,650 to be transferred to retained earnings. The firm's balance sheet for 2019 is given in Table 4.13.

SALES FORECAST

As with the cash budget, the key input for pro forma statements is the sales forecast. Fair Traders' sales forecast for the coming year (2020), based on both external and internal data, appears in Table 4.14. The unit sale prices of the products reflect an increase from $20 to $25 for mugs and from $40 to $50 for plates. These increases are necessary to cover anticipated rises in costs.

TABLE 4.12 Fair Traders Income Statement for the Year Ended December 31, 2019

Sales revenue	
Mugs (1,000 units at $20/unit)	$ 20,000
Plates (2,000 units at $40/unit)	80,000
Total sales	$100,000
Less: Cost of goods sold	
Labor	$ 28,500
Materials	13,500
Overhead	38,000
Total cost of goods sold	$ 80,000
Gross profits	$ 20,000
Less: Operating expenses	10,000
Operating profits	$ 10,000
Less: Interest expense	1,000
Net profits before taxes	$ 9,000
Less: Taxes (assumed rate = 15%)	1,350
Net profits after taxes	$ 7,650
Less: Common stock dividends	4,000
To retained earnings	$ 3,650

TABLE 4.13 Fair Traders Balance Sheet, December 31, 2019

Assets		Liabilities and stockholders' equity	
Cash	$ 6,000	Accounts payable	$ 7,000
Marketable securities	4,000	Taxes payable	300
Accounts receivable	13,000	Notes payable	8,300
Inventories	16,000	Other current liabilities	3,400
Total current assets	$39,000	Total current liabilities	$19,000
Net fixed assets	51,000	Long-term debt	18,000
Total assets	$90,000	Total liabilities	$37,000
		Common stock	30,000
		Retained earnings	23,000
		Total liabilities and stockholders' equity	$90,000

TABLE 4.14 2020 Sales Forecast for Fair Traders

Unit sales		Dollar sales	
Mugs	1,500	Mugs ($25/unit)	$ 37,500
Plates	1,950	Plates ($50/unit)	97,500
		Total	$135,000

→ REVIEW QUESTION MyLab Finance Solutions

4–14 What is the purpose of pro forma statements? What inputs are required for preparing them using the simplified approaches?

LG5

4.5 Preparing the Pro Forma Income Statement

percent-of-sales method
A simple method for developing the pro forma income statement; it forecasts sales and then expresses the various income statement items as percentages of projected sales.

A simple method for developing a pro forma income statement is the **percent-of-sales method.** It forecasts sales and then expresses the various income statement items as percentages of projected sales. The percentages used are likely to be the percentages of sales for those items in the previous year. By using dollar values taken from Fair Traders' 2019 income statement (Table 4.12), we find that these percentages are

$$\frac{\text{Cost of goods sold}}{\text{Sales}} = \frac{\$80{,}000}{\$100{,}000} = 0.800 = 80.0\%$$

$$\frac{\text{Operating expenses}}{\text{Sales}} = \frac{\$10{,}000}{\$100{,}000} = 0.100 = 10.0\%$$

$$\frac{\text{Interest expense}}{\text{Sales}} = \frac{\$1{,}000}{\$100{,}000} = 0.010 = 1.0\%$$

TABLE 4.15 A Pro Forma Income Statement, Using the Percent-of-Sales Method, for Fair Traders for the Year Ended December 31, 2020

Sales revenue	$135,000
Less: Cost of goods sold (0.80)	108,000
Gross profits	$ 27,000
Less: Operating expenses (0.10)	13,500
Operating profits	$ 13,500
Less: Interest expense (0.01)	1,350
Net profits before taxes	$ 12,150
Less: Taxes (assumed rate = 15%)	1,823
Net profits after taxes	$ 10,327
Less: Common stock dividends	4,000
To retained earnings	$ 6,327

Applying these percentages to the firm's forecast sales of $135,000 (developed in Table 4.14), we get the 2020 pro forma income statement shown in Table 4.15. We have assumed that Fair Traders will pay $4,000 in common stock dividends, so the expected contribution to retained earnings is $6,327. This represents a considerable increase over $3,650 in the preceding year (see Table 4.12).

CONSIDERING TYPES OF COSTS AND EXPENSES

The technique used to prepare the pro forma income statement in Table 4.15 assumes that all the firm's costs and expenses are variable. That is, for a given percentage increase in sales, the same percentage increase in cost of goods sold, operating expenses, and interest expense would result. For example, as Fair Traders' sales increased by 35%, we assumed that its costs of goods sold also increased by 35%. On the basis of this assumption, the firm's net profits before taxes also increased by 35%.

Because this approach assumes that all costs are variable, it may understate the increase in profits that will occur when sales increase if some of the firm's costs are fixed. Similarly, if sales decline, the percentage-of-sales method may overstate profits if some costs are fixed and do not fall when revenues decline. Therefore, a pro forma income statement constructed using the percentage-of-sales method generally tends to understate profits when sales are increasing and overstate profits when sales are decreasing. The best way to adjust for the presence of fixed costs when preparing a pro forma income statement is to break the firm's historical costs and expenses into fixed and variable components. We discuss the potential returns as well as risks resulting from use of fixed (operating and financial) costs to create "leverage" elsewhere in this text. The main point is to recognize that fixed costs make a firm's profits more volatile than its revenues. That is, when both profits and sales are rising, profits tend to increase at a faster rate, but when profits and sales are in decline, the percentage drop in profits is often greater than the rate of decline in sales.

EXAMPLE 4.12

MyLab Finance Solution Video

Fair Traders' 2019 actual and 2020 pro forma income statements, broken into fixed and variable cost and expense components, follow:

Fair Traders Income Statements

	2019 Actual	2020 pro forma
Sales revenue	$100,000	$135,000
Less: Cost of goods sold		
Fixed cost	40,000	40,000
Variable cost (0.40 × sales)	40,000	54,000
Gross profits	$ 20,000	$ 41,000
Less: Operating expenses		
Fixed expense	$ 5,000	$ 5,000
Variable expense (0.05 × sales)	5,000	6,750
Operating profits	$ 10,000	$ 29,250
Less: Interest expense (all fixed)	1,000	1,000
Net profits before taxes	$ 9,000	$ 28,250
Less: Taxes (assumed rate = 15%)	1,350	4,238
Net profits after taxes	$ 7,650	$ 24,012

Breaking Fair Traders' costs and expenses into fixed and variable components provides a more accurate projection of its pro forma profit. By assuming that *all* costs are variable (as shown in Table 4.15), we find that projected net profits before taxes would continue to equal 9% of sales (in 2019, $9,000 net profits before taxes ÷ $100,000 sales). Therefore, the 2020 net profits before taxes would have been $12,150 (0.09 × $135,000 projected sales) instead of the $28,250 obtained by using the firm's fixed-cost–variable-cost breakdown.

When using a simplified approach to prepare a pro forma income statement, analysts should break down costs and expenses into fixed and variable components.

→ REVIEW QUESTIONS MyLab Finance Solutions

4–15 How is the percent-of-sales method used to prepare pro forma income statements?

4–16 Why does the presence of fixed costs lead to errors in a pro forma income statement constructed using the percent-of-sales method? What is a better method?

LG 5

4.6 Preparing the Pro Forma Balance Sheet

A number of simplified approaches are available for preparing the pro forma balance sheet. One involves estimating each balance sheet account as a fixed percentage of sales. A better and more common approach is the **judgmental approach**, under which the firm estimates the values of certain balance sheet accounts and

judgmental approach
A simplified approach for preparing the pro forma balance sheet under which the firm estimates the values of certain balance sheet accounts and uses its external financing as a balancing, or "plug," figure.

uses its external financing as a balancing, or "plug," figure. The judgmental approach represents an improved version of the percent-of-sales approach to pro forma balance sheet preparation. The judgmental approach requires only slightly more information and should yield better estimates than the somewhat naive percent-of-sales approach.

To apply the judgmental approach in preparing Fair Traders' 2020 pro forma balance sheet, we make a number of assumptions about levels of various balance sheet accounts:

1. A minimum cash balance of $6,000 is desired.
2. Marketable securities will remain unchanged from their current level of $4,000.
3. Accounts receivable on average represent about 45 days of sales (about 1/8 of a year). Because Fair Traders' annual sales are projected to be $135,000, accounts receivable should average $16,875 (1/8 × $135,000).
4. The ending inventory should remain at a level of about $16,000, of which 25% (approximately $4,000) should be raw materials and the remaining 75% (approximately $12,000) should consist of finished goods.
5. A new machine costing $20,000 will be purchased. Total depreciation for the year is $8,000. Adding the $20,000 acquisition to the existing net fixed assets of $51,000 and subtracting the depreciation of $8,000 yields net fixed assets of $63,000.
6. Purchases will represent approximately 30% of annual sales, which in this case is approximately $40,500 (0.30 × $135,000). The firm estimates that it can take 73 days on average to satisfy its accounts payable. Thus accounts payable should equal one-fifth (73 days ÷ 365 days) of the firm's purchases, or $8,100 (1/5 × $40,500).
7. Taxes payable will equal one-fourth of the current year's tax liability, which equals $455 (one-fourth of the tax liability of $1,823 shown in the pro forma income statement in Table 4.15).
8. Notes payable will remain unchanged from their current level of $8,300.
9. No change in other current liabilities is expected. They remain at the level of the previous year: $3,400.
10. The firm's long-term debt and its common stock will remain unchanged at $18,000 and $30,000, respectively; no issues, retirements, or repurchases of bonds or stocks are planned.
11. Retained earnings will increase from the beginning level of $23,000 (from the balance sheet dated December 31, 2019, in Table 4.13) to $29,327. The increase of $6,327 represents the amount of retained earnings calculated in the year-end 2020 pro forma income statement in Table 4.15.

external financing required ("plug" figure)
Under the judgmental approach for developing a pro forma balance sheet, the amount of external financing needed to bring the statement into balance. It can be either a positive or a negative value.

A 2020 pro forma balance sheet for Fair Traders based on these assumptions is presented in Table 4.16. A **"plug" figure—**called the **external financing required—**of $8,293 is needed to bring the statement into balance. This means that the firm will have to obtain about $8,300 of additional external financing to support the increased sales level of $135,000 for 2020.

A positive value for "external financing required," like that shown in Table 4.16, means that, based on its plans, the firm will not generate enough internal financing to support its forecast growth in assets. To support the forecast level of operation, the firm must raise funds externally by using debt and/or equity financing or by reducing dividends. Once managers decide what form of

TABLE 4.16 A Pro Forma Balance Sheet, Using the Judgmental Approach, for Fair Traders (December 31, 2020)

Assets			Liabilities and stockholders' equity	
Cash		$ 6,000	Accounts payable	$ 8,100
Marketable securities		4,000	Taxes payable	455
Accounts receivable		16,875	Notes payable	8,300
Inventories			Other current liabilities	3,400
Raw materials	$ 4,000		Total current liabilities	$ 20,255
Finished goods	12,000		Long-term debt	18,000
Total inventory		16,000	Total liabilities	$ 38,255
Total current assets		$ 42,875	Common stock	30,000
Net fixed assets		63,000	Retained earnings	29,327
Total assets		$105,875	Total	$ 97,582
			External financing required[a]	8,293
			Total liabilities and stockholders' equity	$105,875

[a]The amount of external financing needed to force the firm's balance sheet to balance. Because of the nature of the judgmental approach, the balance sheet is not expected to balance without some type of adjustment.

financing the firm will employ, they modify the pro forma balance sheet to replace "external financing required" with the planned increases in the debt and/or equity accounts.

A negative value for "external financing required" indicates that, based on its plans, the firm will generate more financing internally than it needs to support its forecast growth in assets. In this case, funds are available for use in repaying debt, repurchasing stock, increasing dividends, or investing in new assets. Once managers decide what they will do with the additional cash flow that the firm will generate, they replace the "external financing required" line item in the pro forma balance sheet with the planned changes to other accounts.

→ REVIEW QUESTIONS MyLab Finance Solutions

4–17 Describe the judgmental approach for simplified preparation of the pro forma balance sheet.

4–18 What is the significance of the "plug" figure, external financing required? Differentiate between strategies associated with positive values and with negative values for external financing required.

LG6

4.7 Evaluation of Pro Forma Statements

It is difficult to forecast the many variables involved in preparing pro forma statements. As a result, investors, lenders, and managers frequently use the techniques presented in this chapter to make rough estimates of pro forma

financial statements. It is nonetheless important to recognize the weaknesses of these simplified approaches. The weaknesses lie in two assumptions: (1) that the firm's past financial condition is an accurate indicator of its future and (2) that managers can force certain accounts to take on "desired" values. Despite their weaknesses, pro forma financial statements remain useful to managers.

However pro forma statements are prepared, analysts must understand how to use them in making financial decisions. Both financial managers and lenders can use pro forma statements to analyze the firm's inflows and outflows of cash, as well as its liquidity, activity, debt, profitability, and market value. They can calculate various ratios from the pro forma income statement and balance sheet to evaluate performance. They can even construct a pro forma statement of cash flows from the pro forma balance sheet and income statement. After analyzing the pro forma statements, the financial manager can take steps to adjust planned operations to achieve short-term financial goals. For example, if projected profits on the pro forma income statement are too low, a variety of pricing and/or cost-cutting actions might be initiated. If the projected level of accounts receivable on the pro forma balance sheet is too high, changes in credit or collection policy may be called for. Pro forma statements are therefore of great importance in solidifying the firm's financial plans for the coming year. Pro forma forecast statements also provide a "baseline" for managers to evaluate ongoing performance as the year begins. They enable questions such as "Why are our actuals above (or below) our prior expectations?" and "What has changed in our operations?"

→ REVIEW QUESTIONS MyLab Finance Solutions

4–19 What are the two basic weaknesses of the simplified approaches to preparing pro forma statements?

4–20 What is the financial manager's objective in evaluating pro forma statements?

SUMMARY

FOCUS ON VALUE

Cash flow, the lifeblood of the firm, is a key determinant of the value of the firm. The financial manager must plan and manage the firm's cash flow. The goal is to ensure the firm's solvency and to generate positive cash flow for the firm's owners. Both the magnitude and the risk of the cash flows generated on behalf of the owners determine the firm's value.

To carry out the responsibility **to create value for owners,** the financial manager uses tools such as cash budgets and pro forma financial statements as part of the process of generating positive cash flow. Good financial plans should result in positive free cash flows. Clearly, the financial manager must deliberately

and carefully plan and manage the firm's cash flows to achieve the firm's goal of maximizing share price.

REVIEW OF LEARNING GOALS

LG1 **Understand the financial planning process, including long-term (strategic) financial plans and short-term (operating) financial plans.** The two key aspects of the financial planning process are cash planning and profit planning. Cash planning involves the cash budget or cash forecast. Profit planning relies on the pro forma income statement and balance sheet. Long-term (strategic) financial plans act as a guide for preparing short-term (operating) financial plans. Long-term plans tend to cover periods ranging from 2 to 10 years; short-term plans most often cover a 1- to 2-year period.

LG2 **Understand tax depreciation procedures and the effect of depreciation on the firm's cash flows.** Depreciation is an important factor affecting a firm's cash flow. An asset's depreciable value and depreciable life are determined by using the MACRS standards in the federal tax code. MACRS groups assets (excluding real estate) into six property classes based on length of recovery period.

LG3 **Discuss the firm's statement of cash flows, operating cash flow, and free cash flow.** The statement of cash flows is divided into cash flow from operating, investment, and financing activities. It reconciles changes in the firm's cash flows with changes in cash and marketable securities for the period. Interpreting the statement of cash flows involves both the major categories of cash flow and the individual items of cash inflow and outflow. Free cash flow, which analysts use to value companies, is the amount of cash flow available to creditors and owners.

LG4 **Discuss the cash-planning process and the preparation, evaluation, and use of the cash budget.** The cash-planning process uses the cash budget, based on a sales forecast, to estimate short-term cash surpluses and shortages. The cash budget is typically prepared for a 1-year period divided into months. It nets cash receipts and disbursements for each period to calculate net cash flow. Ending cash is estimated by adding beginning cash to the net cash flow. By subtracting the desired minimum cash balance from the ending cash, the firm can determine required total financing or the excess cash balance. To cope with uncertainty in the cash budget, scenario analysis or simulation can be used. A firm must also consider its pattern of daily cash receipts and cash disbursements.

LG5 **Explain the procedures used to prepare and evaluate the pro forma income statement and the pro forma balance sheet.** A pro forma income statement can be developed by calculating past percentage relationships between certain cost and expense items and the firm's sales and then applying these percentages to forecasts. Because this approach implies that all costs and expenses are variable, it tends to understate profits when sales are increasing and to overstate profits when sales are decreasing. This problem can be avoided by breaking down costs and expenses into fixed and variable

components. In this case, the fixed components remain unchanged from the most recent year, and the variable costs and expenses are forecast on a percent-of-sales basis.

Under the judgmental approach, the values of certain balance sheet accounts are estimated and the firm's external financing is used as a balancing, or "plug," figure. A positive value for "external financing required" means that the firm will not generate enough internal financing to support its forecast growth in assets and will have to raise funds externally or reduce dividends. A negative value for "external financing required" indicates that the firm will generate more financing internally than it needs to support its forecast growth in assets and funds will be available for use in repaying debt, repurchasing stock, or increasing dividends.

LG6 **Evaluate the approaches to pro forma financial statement preparation and the common uses of pro forma statements.** Simple approaches for preparing pro forma statements assume that the firm's past financial condition is an accurate indicator of the future. Pro forma statements are commonly used to forecast and analyze the firm's profitability and overall financial performance so that managers can make adjustments to operations to achieve short-term financial goals.

SELF-TEST PROBLEMS (Solutions in Appendix)

LG2 LG3 **ST4–1** **Depreciation and cash flow** A firm expects to have earnings before interest and taxes (EBIT) of $160,000 in each of the next 6 years. It pays annual interest of $15,000. The firm is considering the purchase of an asset that costs $140,000, requires $10,000 in installation cost, and has a recovery period of 5 years. It will be the firm's only asset, and the asset's depreciation is already reflected in its EBIT estimates.

a. Calculate the annual depreciation for the asset purchase using the MACRS depreciation percentages in Table 4.2.

b. Calculate the firm's operating cash flows for each of the 6 years, using Equation 4.3. Assume that the firm is subject to a 21% tax rate on all the profit that it earns.

c. Suppose that the firm's net fixed assets, current assets, accounts payable, and accruals had the following values at the start and end of the final year (year 6). Calculate the firm's free cash flow (FCF) for that year.

Account	Year 6 start	Year 6 end
Net fixed assets	$ 7,500	$ 0
Current assets	90,000	110,000
Accounts payable	40,000	45,000
Accruals	8,000	7,000

d. Compare and discuss the significance of each value calculated in parts **b** and **c**.

LG4 LG5

ST4–2 Cash budget and pro forma balance sheet inputs Jane McDonald, a financial analyst for Carroll Company, has prepared the following sales and cash disbursement estimates for the period February–June of the current year.

Month	Sales	Cash disbursements
February	$500	$400
March	600	300
April	400	600
May	200	500
June	200	200

McDonald notes that, historically, 30% of sales have been for cash. Of *credit sales,* the firm collects 70% 1 month after the sale, and it collects the remaining 30% 2 months after the sale. The firm wishes to maintain a minimum ending balance in its cash account of $25. The firm will invest balances above this amount in short-term government securities (marketable securities), whereas any deficits would be financed through short-term bank borrowing (notes payable). The beginning cash balance at April 1 is $115.

a. Prepare cash budgets for April, May, and June.

b. How much financing, if any, at a maximum would Carroll Company require to meet its obligations during this 3-month period?

c. A pro forma balance sheet dated at the end of June is to be prepared from the information presented. Give the size of each of the following: cash, notes payable, marketable securities, and accounts receivable.

LG5

ST4–3 Pro forma income statement Euro Designs Inc. expects sales during 2020 to rise from the 2019 level of $3.5 million to $3.9 million. Because of a scheduled large loan payment, the interest expense in 2020 is expected to drop to $325,000. The firm plans to increase its cash dividend payments during 2020 to $320,000. The company's year-end 2019 income statement follows.

Euro Designs Inc. Income Statement for the Year Ended December 31, 2019

Sales revenue	$3,500,000
Less: Cost of goods sold	1,925,000
Gross profits	$1,575,000
Less: Operating expenses	420,000
Operating profits	$1,155,000
Less: Interest expense	400,000
Net profits before taxes	$ 755,000
Less: Taxes (rate = 21%)	158,550
Net profits after taxes	$ 596,450
Less: Cash dividends	250,000
To retained earnings	$ 346,450

a. Use the percent-of-sales method to prepare a 2020 pro forma income statement for Euro Designs Inc.

b. Explain why the statement may underestimate the company's actual 2020 pro forma income.

WARM-UP EXERCISES

Select problems are available in MyLab Finance

LG2 **E4–1** The installed cost of a new computerized controller was $65,000. Calculate the depreciation schedule by year assuming a recovery period of 5 years and using the appropriate MACRS depreciation percentages given in Table 4.2.

LG3 **E4–2** Classify the following changes in each of the accounts as either an inflow or an outflow of cash. During the year (a) marketable securities increased, (b) land and buildings decreased, (c) accounts payable increased, (d) vehicles decreased, (e) accounts receivable increased, and (f) dividends were paid.

LG3 **E4–3** Star Industries has published its annual account. It indicates that during the year the firm had sales of $3,500,000, cost of goods sold totaled $2,300,000, operating expenses were $420,000, and depreciation expenses were $240,000. The firm is in 30% tax bracket. Determine the firm's operating cash flow (OCF).

LG3 **E4–4** Plato PLC is a supplier to large construction companies. During 2017, Plato experienced an increase in net fixed assets of £1,500,000 and had depreciation of £1,000,000. It also experienced an increase in current assets of £750,000 and accounts payable of £375,000. If operating cash flow (OCF) for the year was £3,500,000, calculate the firm's free cash flow (FCF) for the year.

LG5 **E4–5** York Engineering Ltd. forecasts sales of €1,250,000 for 2022. Assume that the firm has fixed costs of €320,000 and variable costs amount to 30% of sales. Operating expenses are estimated to include fixed costs of €37,000 and a variable portion equal to 10% of sales. Interest expenses for 2022 are estimated to be €25,000. Estimate York's net profit before taxes for 2022.

PROBLEMS

Select problems are available in MyLab Finance. The MyLab icon indicates problems in Excel format available in MyLab Finance.

LG2 **P4–1** **Depreciation** On March 20, 2019, Norton Systems acquired two new assets. Asset A was research equipment costing $17,000 and having a 3-year recovery period. Asset B was duplicating equipment with an installed cost of $45,000 and a 5-year recovery period. Using the MACRS depreciation percentages in Table 4.2, prepare a depreciation schedule for each of these assets.

LG2 **P4–2** **Depreciation** Early this year, Rubber Incorporated purchased a new machine for $12,000 to shape rubber. It is estimated that the new machine will have a recovery period of 3 years with an expected salvage value of $2,500. Use the MACRS depreciation percentages in Table 4.2 to develop a depreciation schedule for the new machine.

LG2 LG3 **P4–3** **MACRS depreciation expense and accounting cash flow** Pavlovich Instruments Inc., a maker of precision telescopes, expects to report pretax income of $430,000 this year. The company's financial manager is considering the timing of a purchase of new computerized lens grinders. The grinders will have an installed cost of $80,000 and a cost recovery period of 5 years. They will be depreciated using the MACRS schedule.

a. If the firm purchases the grinders before year's end, what depreciation expense will it be able to claim this year? (Use Table 4.2.)
b. If the firm reduces its reported income by the amount of the depreciation expense calculated in part **a,** what tax savings will result?

LG2 LG3

P4–4 Depreciation and accounting cash flow A firm has gathered the following data for its current year's operations. The firm has only one asset, which has a 3-year recovery period. The cost of the asset a year ago was $165,000. The depreciation rate is 45%.

Accruals	$ 12,500
Current assets	135,000
Interest expense	13,550
Sales revenue	420,000
Inventory	82,300
Total costs before depreciation, interest, and taxes	295,000
Tax rate on ordinary income	40%

a. Calculate the firm's operating cash flow for the current year (see Equation 4.2).
b. Why is it important to add back noncash items such as depreciation when calculating cash flows?

LG3

P4–5 Classifying inflows and outflows of cash Classify each of the following items as an inflow (I) or an outflow (O) of cash.

Item	Change ($)	Item	Change ($)
Cash	+150	Cash dividends	+540
Accounts payable	+1,100	Accounts receivable	−460
Notes payable	−530	Inventory	−160
Fixed assets	+550	Repurchase of stock	+475
Sale of stock	+950	Long-term debt	−1,890
Depreciation	+110	Net profit	+380

LG3 MyLab

P4–6 Finding operating and free cash flows Consider the following balance sheets and selected data from the income statement of Keith Corporation.

Keith Corporation Balance Sheets

	December 31	
Assets	**2019**	**2018**
Cash	$ 1,500	$ 1,000
Marketable securities	1,800	1,200
Accounts receivable	2,000	1,800
Inventories	2,900	2,800
Total current assets	$ 8,200	$ 6,800
Gross fixed assets	$29,500	$28,100
Less: Accumulated depreciation	14,700	13,100
Net fixed assets	$14,800	$15,000
Total assets	$23,000	$21,800

(continued)

Keith Corporation Balance Sheets *(continued)*

Liabilities and stockholders' equity	December 31 2019	2018
Accounts payable	$ 1,600	$ 1,500
Notes payable	2,800	2,200
Accruals	200	300
Total current liabilities	$ 4,600	$ 4,000
Long-term debt	5,000	5,000
Total liabilities	$ 9,600	$ 9,000
Common stock	$10,000	$10,000
Retained earnings	3,400	2,800
Total stockholders' equity	$13,400	$12,800
Total liabilities and stockholders' equity	$23,000	$21,800

Keith Corporation Income Statement Data (2019)

Depreciation expense	$1,600
Earnings before interest and taxes (EBIT)	2,700
Interest expense	367
Net profits after taxes	1,400
Tax rate	21%

a. Calculate the firm's net operating profit after taxes (NOPAT) for the year ended December 31, 2019, using Equation 4.1.
b. Calculate the firm's operating cash flow (OCF) for the year ended December 31, 2019, using Equation 4.3.
c. Calculate the firm's free cash flow (FCF) for the year ended December 31, 2019, using Equation 4.4.
d. Interpret, compare, and contrast your cash flow estimates in parts **b** and **c**.

P4-7 **Statement of cash flows** The following is an extract from the 2017 and 2018 financial statements of Garmen Ltd. All figures are in thousands (£).

Account	2017	2018
Preferred stock	300	300
Common stock par	600	600
Share premium	800	800
Retained earnings	450	575
Total stockholders' equity	2,150	2,275

a. Garmen's statement of cash flows for 2018 shows £0 cash inflow resulting from changes in stockholders' equity, yet the balance sheet shows that stockholders' equity increased by £125,000 in 2019. Can you explain this apparent contradiction?
b. Will the statement of cash flows for Garmen Ltd. show £0 cash inflow resulting from the change in stockholders' equity every year, or are other values possible? Explain the possible situations when the cash flows from the change in stockholders' equity could be positive or negative in some future year.

LG 4

P4–8 **Cash receipts** A firm reported actual sales of $65,000 in the month of June and $70,000 in July. The sales forecasts indicate that sales are expected to be $85,000, $92,000, and $95,750 for the months of August, September, and October, respectively. Sales are 60% cash and 40% credit, and credit sales are collected evenly over the following 2 months. No other cash receipts are received. What are the firm's expected cash receipts for the months of August, September, and October?

LG 4

P4–9 **Cash disbursements schedule** The Coffee Specialist Corporation has approached you to compile a cash disbursement schedule for the months of March, April, and May. Use the following information and Table 4.9 as a guide to prepare this schedule.

Sales: January = $520,000; February = $540,000; March = $550,000; April = $600,000; May = $660,000; June = $670,000

Purchases: Purchases are calculated as 70% of the following month's sales, 50% of purchases are made in cash, 30% of purchases are settled 1 month after purchase, and the remaining 20% of purchases are settled 2 months after purchase.

Rent: The firm pays rent of $9,500 per month.

Wages and salaries: The fixed wage and salary costs are $7,500 per month plus a variable cost of 6.5% of the current month's sales.

Taxes: The tax bill to be paid in May amounts to $57,500.

Fixed asset outlays: New equipment will be acquired during March at a cost of $85,000.

Interest payments: An amount of $32,000 for interest is due in March.

Cash dividends: Dividends of $15,000 will be paid in April.

LG 4

P4–10 **Cash budget: Basic** Farmers Delight Corporation reported sales of $350,000 in June, $380,000 in July, and $390,000 in August. The forecasts for September, October, and November are $385,000, $418,000, and $429,000, respectively. The initial cash balance on September 1 is $150,000, and a minimum of $8,000 should be kept. Use the given information to compile a cash budget for the months of September, October, and November.

(1) Farmers Delight predicts that 5% of its sales will never be collected, 30% of its sales will be cash sales, and the remaining 65% will be collected in the following month.
(2) Farmers Delight receives other monthly income of $3,000.
(3) The actual or expected purchases are $150,000, $120,000, and $115,000 for the months of September to November, respectively, and 50% are paid in cash while the remainder is paid in the following month. The purchases for August were $120,000.
(4) Monthly rent is $3,500 chargeable only in October and November.
(5) Wages and salaries are 12% of the previous month's sales.
(6) Cash dividends of $4,600 are declared and will be paid in September.
(7) Long-term loan repayment of principal and interest of $4,700 is due in October.
(8) Additional equipment costing $8,500 is ordered and scheduled to be paid for in cash in November.
(9) Taxes of $8,250 are due in November.

Personal Finance Problem

LG 4

P4–11 **Preparation of cash budget** Sam and Suzy Sizeman need to prepare a cash budget for the last quarter of 2020 to make sure they can cover their expenditures during the period. Sam and Suzy have been preparing budgets for the past several years and have been able to identify the percentage of their income that they pay for most of

their cash outflows. These percentages are based on their take-home pay (e.g., monthly utilities normally run 5% of monthly take-home pay). The information in the following table can be used to create their fourth-quarter budget for 2020.

Income	
Monthly take-home pay	$4,900
Expenses	
Housing	30.0%
Utilities	5.0%
Food	10.0%
Transportation	7.0%
Medical/dental	0.5%
Clothing for October and November	3.0%
Clothing for December	$ 440
Property taxes (November only)	11.5%
Appliances	1.0%
Personal care	2.0%
Entertainment for October and November	6.0%
Entertainment for December	$1,500
Savings	7.5%
Other	5.0%
Excess cash	4.5%

a. Prepare a quarterly cash budget for Sam and Suzy covering the months October through December 2020.
b. Are there individual months that incur a deficit?
c. What is the cumulative cash surplus or deficit by the end of December 2020?

LG4

P4–12 Cash budget: Advanced The Green PLC has projected following unit sales for January 2019 to August 2019. The sales of Green PLC are 30% in cash and the remainder is on a credit for 1 month. It also expects cash receipts from its subsidiaries worth £40,000 in March, £26,000 in April, and £27,000 in June.

The firm pays 20% in cash for all its purchases. The remaining 40% is paid in the following month and the last 40% is paid 2 months later.

Month	Sales	Purchases
January	600,000	400,000
February	500,000	350,000
March	600,000	450,000
April	500,000	475,000
May	700,000	300,000
June	800,000	450,000
July	750,000	300,000
August	800,000	350,000

Wages and salaries amount to 25% of the sales in the preceding month. They also need to pay rent of £15,000 every month. The payment for a new machinery will be due in March for £45,000 and will be paid in cash. They have to pay interim tax of £45,000 in May.

The firm also expects to pay dividend of £26,000 in March and receive a cash subsidy of £37,000 from government in June.

a. Assuming that the firm has a cash balance of £32,000 at the beginning of January, estimate the end-of-month closing cash balances for each month, March to August.

b. The directors decide that the cash balance should be maintained at £20,000 at any given point of time. Determine the required total financing or excess cash balance for each month, March to August.

c. Do you think that the Green PLC will need an overdraft facility for the period from March to August? What overdraft limit should they ask for while requesting a line of credit from banks?

LG 4

P4–13 Cash flow concepts The following represent financial transactions that Johnsfield & Co. will be undertaking in the next planning period. For each transaction, check the statement or statements that will be affected immediately.

	Statement		
Transaction	Cash budget	Pro forma income statement	Pro forma balance sheet
Cash sale			
Credit sale			
Accounts receivable are collected			
Asset with 5-year life is purchased			
Depreciation is taken			
Amortization of goodwill is taken			
Sale of common stock			
Retirement of outstanding bonds			
Fire insurance premium is paid for the next 3 years			

LG 4

P4–14 Cash budget: Scenario analysis Markham Enterprises has gathered the following data to plan for its cash requirements and short-term investment opportunities for June, July, and August. All amounts are shown in thousands of dollars.

	June			July			August		
	Pessi-mistic	Most likely	Opti-mistic	Pessi-mistic	Most likely	Opti-mistic	Pessi-mistic	Most likely	Opti-mistic
Total cash receipts	$250	$370	$430	$245	$305	$395	$265	$335	$412
Total cash disbursements	260	310	405	255	285	375	280	300	396

a. Prepare a scenario analysis of Markham Enterprises. The beginning balance is −$28,000 for June and the minimum required cash balance is $30,000.

b. Use the analysis prepared in part **a** to identify Markham's financing needs or surplus over the three scenarios. If needed, where could the funds be obtained? What should be done with a surplus of cash?

LG 4

P4–15 Multiple cash budgets: Scenario analysis Brownstein Inc. expects sales of $100,000 during each of the next 3 months. It will make monthly purchases of $60,000 during this time. Wages and salaries are $10,000 per month plus 5% of sales. Brownstein expects to make a tax payment of $20,000 in the next month and a $15,000 purchase of fixed assets in the second month and to receive $8,000 in cash from the sale of an asset in the third month. All sales and purchases are for cash. Beginning cash and the minimum cash balance are assumed to be zero.

a. Construct a cash budget for the next 3 months.

b. Brownstein is unsure of the sales levels, but all other figures are certain. If the most pessimistic sales figure is $80,000 per month and the most optimistic is $120,000 per month, what are the monthly minimum and maximum ending cash balances that the firm can expect for each of the 1-month periods?

c. Briefly discuss how the financial manager can use the data in parts **a** and **b** to plan for financing needs.

LG 5

P4–16 Pro forma income statement Bells Manufacturing estimates that the sales for the 2016 financial year will be $2.25 million. No new borrowing was obtained and, therefore, the interest expense remained unchanged at $24,500. Bells Manufacturing is planning on paying cash dividends of $85,000 during 2016. Refer to the financial data for the year ended December 31, 2015, while answering the following:

a. Compile the pro forma income statement for the year ended December 31, 2016, using the percentage-of-sales method.

b. Compile the pro forma income statement for the year ended December 31, 2016, using the fixed and variable cost data.

c. As the financial manager, which of the two pro forma statements would you regard as more accurate? Explain.

Bells Manufacturing Income Statement for the Year Ended December 31, 2015

Sales revenue	$1,800,000
Less: Cost of goods sold	1,100,000
Gross profits	$ 700,000
Less: Operating expenses	450,000
Operating profits	$ 250,000
Less: Interest expense	24,500
Net profits before taxes	$ 225,500
Less: Taxes (rate = 40%)	90,200
Net profits after taxes	$ 135,300
Less: Cash dividends	85,000
To retained earnings	$ 50,300

Bell Manufacturing Breakdown of Costs and Expenses into Fixed and Variable Components for the Year Ended December 31, 2015

Cost of goods sold	
Fixed cost	$ 750,000
Variable cost	350,000
Total costs	$1,100,000
Operating expenses	
Fixed expenses	$ 155,000
Variable expenses	295,000
Total expenses	$ 450,000

LG 5

P4–17 **Pro forma income statement: Scenario analysis** Smyth Inc. has decided to do a scenario analysis for the year 2018. Their pessimistic prediction for sales is $360,000, the most likley amount of sale is $450,000, and the optimistic sales prediction is $520,000. Smyth's income statement for the latest year follows.

Smyth Inc. Income Statement for the Year Ended December 31, 2017

Sales revenue	$370,000
Less: Cost of goods sold	168,000
Gross profits	$202,000
Less: Operating expenses	92,000
Operating profits	$110,000
Less: Interest expense	12,500
Net profits before taxes	$ 97,500
Less: Taxes (rate = 30%)	29,250
Net profits after taxes	$ 68,250

a. Refer the income statement for December 31, 2017, and using the percent-of-sales method, develop the pessimistic, most likely, and optimistic pro forma income statement for the coming year ending on December 31, 2018.

b. The percent-of-sales method may result in an overstatement of profits for the pessimistic case and an understatement of profit for the most likely and optimistic cases. Explain why.

c. Restate the pro forma income statement in part to accommodate the following information about the 2018 costs:

$75,000 of the cost of goods sold is fixed, rest is variable.
$40,000 of operating expenses is fixed, rest is variable.
All the interest expense is fixed

d. Compare your results in part **a** to the results in part **c**. Do your observations confirm your explanation in part **b**?

LG 5

P4–18 **Pro forma balance sheet: Basic** Leonard Industries wishes to prepare a pro forma balance sheet for December 31, 2020. The firm expects 2020 sales to total $3,000,000. The following information has been gathered:

(1) A minimum cash balance of $50,000 is desired.
(2) Marketable securities are expected to remain unchanged.
(3) Accounts receivable represent 10% of sales.
(4) Inventories represent 12% of sales.
(5) A new machine costing $90,000 will be acquired during 2020. Total depreciation for the year will be $32,000.
(6) Accounts payable represent 14% of sales.
(7) Accruals, other current liabilities, long-term debt, and common stock are expected to remain unchanged.
(8) The firm's net profit margin is 4%, and it expects to pay out $70,000 in cash dividends during 2020.
(9) The December 31, 2019, balance sheet follows.

Leonard Industries Balance Sheet December 31, 2019

Assets		Liabilities and stockholders' equity	
Cash	$ 45,000	Accounts payable	$ 395,000
Marketable securities	15,000	Accruals	60,000
Accounts receivable	255,000	Other current liabilities	30,000
Inventories	340,000	Total current liabilities	$ 485,000
Total current assets	$ 655,000	Long-term debt	350,000
Net fixed assets	600,000	Total liabilities	$ 835,000
Total assets	$1,255,000	Common stock	200,000
		Retained earnings	220,000
		Total liabilities and stockholders' equity	$1,255,000

a. Use the judgmental approach to prepare a pro forma balance sheet dated December 31, 2020, for Leonard Industries.

b. How much, if any, additional financing will Leonard Industries require in 2020? Discuss.

c. Could Leonard Industries adjust its planned 2020 dividend to avoid the situation described in part **b**? Explain how.

LG 5

P4–19 Pro forma balance sheet Randy & Wiskers Enterprises has 2018 sales of $15.5 million. It wishes to analyze expected performance and financing needs for 2019. You are requested to compile a pro forma balance sheet. Given the following information, respond to parts **a** and **b**.

(1) The balance sheet items vary directly with sales: accounts receivable (10%), inventory (15%), accounts payable (10%), and net profit margin (2%).
(2) Marketable securities and other current liabilities are expected to remain unchanged.
(3) A minimum cash balance of $520,000 is desired.
(4) A new equipment costing $20,000 will be purchased during 2019, and a total depreciation in 2019 is forecast as $5,000.
(5) Accruals are expected to rise to $660,000.
(6) No sale or retirement of long-term debt is expected, and no common stock will be repurchased.
(7) The dividend payout of 50% of net profits is expected to continue.
(8) Sales are expected to decrease to $15,000,000.
(9) The December 31, 2018, balance sheet follows.

Randy & Wiskers Enterprises Balance Sheet December 31, 2018 ($000)

Assets		Liabilities and stockholders' equity	
Cash	$ 500	Accounts payable	$1,550
Marketable securities	350	Accruals	600
Accounts receivable	1,550	Other current liabilities	150
Inventories	2,325	Total current liabilities	$2,300
Total current assets	$3,725	Long-term debt	2,000
Net fixed assets	5,800	Total liabilities	$4,300
Total assets	$9,525	Common equity	5,225
		Total liabilities and stockholders' equity	$9,525

Based on the information provided, answer the following:

a. Prepare a pro forma balance sheet dated December 31, 2019.

b. Discuss the financing changes suggested by the statement prepared in part **a**.

LG 5

P4–20 **Integrative: Pro forma statements** Abru Industries has decided to prepare financial plans. Use the financial statements and other information provided below to prepare the financial plans.

(1) The firm has estimated that its sales for 2020 will be €2.7 million.
(2) The firm expects to pay €110,000 in cash dividend in 2020.
(3) Accounts receivable represent approximately 20% of annual sales.
(4) The firm wishes to maintain a minimum cash balance of €25,000.
(5) The closing inventory is expected to change directly in line with the changes in sales in 2020.
(6) The firm will invest in a new production unit costing €120,000. The depreciation chargeable for 2020 will be €40,000.
(7) Accounts payable will change directly with change in sales in 2020.

Abru Industries Income Statement for Year Ended December 31, 2019

Sales revenue	€3,200,000
Less: Cost of goods sold	2,400,000
Gross profits	€ 800,000
Less: Operating expenses	400,000
Operating profits	€ 400,000
Less: Interest expenses	20,000
Net profit before taxes	€ 380,000
Less: Taxes (rate = 30%)	114,000
Net profit after taxes	€ 266,000
Less: Cash dividends	60000
To retained earnings	€ 206,000

Abru Industries Balance Sheet December 31, 2019			
Assets		**Liabilities and stockholders' equity**	
Cash	€ 127,000	Accounts payable	€ 380,000
Marketable securities	75,000	Taxes payable	75,000
Accounts receivable	580,000	Other current liabilities	22,000
Inventories	410,000	Total current liabilities	€ 477,000
Total current assets	€1,192,000	Long-term debt	750,000
Net fixed assets	1,450,000	Total liabilities	€1,227,000
Total assets	€2,642,000	Common stock	600,000
		Retained earnings	815,000
		Total liabilities and stockholders' equity	€2,642,000

Other items in financial statements including interest expense and tax rate will remain unchanged.

a. Prepare a pro forma income statement for year ended December 31, 2020, using percent-of-sales method.

b. Prepare a pro forma balance sheet dated December 31, 2020, using the judgmental approach.

c. Analyze these statements and discuss if any external financing is required.

LG 5 MyLab

P4–21 Integrative: Pro forma statements Morten Metal Limited has assembled past (2019) financial statements (income statement and balance sheet follows) and financial projections for use in preparing financial plans for the coming year (2020).

Morten Metal Ltd. Income Statement for Year Ended December 31, 2019	
Sales revenue	$350,000
Less: Cost of goods sold	192,500
Gross profits	$157,500
Less: Operating expenses	59,500
Operating profits	$ 98,000
Less: Interest expense	14,000
Net profits before taxes	$ 84,000
Less: Taxes (rate = 25%)	21,000
Net profits after taxes	$ 63,000
Less: Cash dividends	20,000
To retained earnings	$ 43,000

Morten Metal Limited Balance Sheet on December 31, 2019

Assets		Liabilities and stockholders' equity	
Cash	$ 16,200	Accounts payable	$ 50,000
Marketable securities	15,500	Tax payable	6,600
Accounts receivables	43,700	Other current liabilities	13,800
Inventories	35,000	Total current liabilities	$ 70,400
Total current assets	$110,400	Long Term debt	36,000
Net fixed assets	112,000	Total liabilities	$106,400
Total assets	$222,400	Common stock	52,000
		Retained earnings	64,000
		Total liabilities and equity	$222,400

Information related to financial projections for the year 2020 follows.

(1) Projected sales are $420,000.
(2) Cost of goods sold in 2019 includes $72,000 in fixed costs.
(3) Operating expense in 2019 includes $17,500 in fixed costs.
(4) Interest expense will be $18,000 in 2020.
(5) The firm will pay cash dividend amounting to 25% of net profit after taxes.
(6) Cash and inventories are expected to double.
(7) Marketable securities, long-term debt, and common stock will remain unchanged.
(8) Accounts receivable, accounts payable, and other current liabilities will change in direct response to the change in sales.
(9) During the year, the firm will purchase a delivery vehicle costing $25,000. The depreciation expense on the new vehicle for 2020 will be $7,000.
(10) The tax rate will remain at 25%.

a. Prepare a pro forma income statement for the year ended December 31, 2020, using the fixed cost data given to improve the accuracy of percent-of-sales method.
b. Prepare a pro forma balance sheet as of December 31, 2020, using the information provided and the judgmental approach. Include a reconciliation of retained earnings account.
c. Analyze these statements, and discuss the resulting external financing required.

LG 1

P4–22 ETHICS PROBLEM The SEC is trying to get companies to notify the investment community more quickly when a "material change" will affect their forthcoming financial results. In what sense might a financial manager be seen as "more ethical" if he or she follows this directive and issues a press release indicating that sales will not be as high as previously anticipated?

SPREADSHEET EXERCISE

You have been assigned the task of putting together a statement for the ACME Company that shows its expected inflows and outflows of cash over the months of July 2020 through December 2020.

You have been given the following data for ACME Company:

(1) Expected gross sales for May through December, respectively, are $300,000, $290,000, $425,000, $500,000, $600,000, $625,000, $650,000, and $700,000.
(2) 12% of the sales in any given month are collected during that month. However, the firm has a credit policy of 3/10 net 30, so factor a 3% discount into the current month's sales collection.
(3) 75% of the sales in any given month are collected during the following month after the sale.
(4) 13% of the sales in any given month are collected during the second month following the sale.
(5) The expected purchases of raw materials in any given month are based on 60% of the expected sales during the following month.
(6) The firm pays 100% of its current month's raw materials purchases in the following month.
(7) Wages and salaries are paid on a monthly basis and are based on 6% of the current month's expected sales.
(8) Monthly lease payments are 2% of the current month's expected sales.
(9) The monthly advertising expense amounts to 3% of sales.
(10) R&D expenditures are expected to be allocated to August, September, and October at the rate of 12% of sales in those months.
(11) During December a prepayment of insurance for the following year will be made in the amount of $24,000.
(12) During the months of July through December, the firm expects to have miscellaneous expenditures of $15,000, $20,000, $25,000, $30,000, $35,000, and $40,000, respectively.
(13) Taxes will be paid in September in the amount of $40,000 and in December in the amount of $45,000.
(14) The beginning cash balance in July is $15,000.
(15) The target cash balance is $15,000.

TO DO

a. Prepare a cash budget for July 2020 through December 2020 by creating a combined spreadsheet that incorporates spreadsheets similar to those in Tables 4.8, 4.9, and 4.10. Divide your spreadsheet into three sections:
   (1) Total cash receipts
   (2) Total cash disbursements
   (3) Cash budget covering the period of July through December

   The cash budget should reflect the following:
   (1) Beginning and ending monthly cash balances
   (2) The required total financing in each month required
   (3) The excess cash balance in each month with excess

b. Based on your analysis, briefly describe the outlook for this company over the next 6 months. Discuss its specific obligations and the funds available to meet them. What could the firm do in the case of a cash deficit? (Where could it get the money?) What should the firm do if it has a cash surplus?

CHAPTER 5

Time Value of Money

LEARNING GOALS

- **LG1** Discuss the role of time value in finance, the use of computational tools, and the basic patterns of cash flow.
- **LG2** Understand the concepts of future value and present value, their calculation for single cash flow amounts, and the relationship between them.
- **LG3** Find the future value and the present value of both an ordinary annuity and an annuity due, and find the present value of a perpetuity.
- **LG4** Calculate both the future value and the present value of a mixed stream of cash flows.
- **LG5** Understand the effect that compounding interest more frequently than annually has on future value and on the effective annual rate of interest.
- **LG6** Describe the procedures involved in (1) determining deposits needed to accumulate a future sum, (2) loan amortization, (3) finding interest or growth rates, and (4) finding an unknown number of periods.

MyLab Finance **Chapter Introduction Video**

WHY THIS CHAPTER MATTERS TO YOU

In your *professional* life

ACCOUNTING You need to understand time-value-of-money calculations to account for certain transactions such as loan amortization, lease payments, and bond interest rates.

INFORMATION SYSTEMS You need to understand time-value-of-money calculations to design systems that accurately measure and value the firm's cash flows.

MANAGEMENT You need to understand time-value-of-money calculations so that your management of cash receipts and disbursements enables the firm to receive the greatest value from its cash flows.

MARKETING You need to understand time value of money because funding for new programs and products must be justified financially using time-value-of-money techniques.

OPERATIONS You need to understand time value of money because it affects the value of investments in new equipment, in new processes, and in inventory.

In your *personal* life

Time-value-of-money techniques are widely used in personal financial planning. With them, you can calculate how much wealth you can accumulate by saving and investing money over time. You can determine how much money you need to set aside now to reach a particular savings target in the future. You can compare the values of lump-sum payments to streams of cash flows such as annuities. You can calculate payments for consumer loans such as auto loans and home mortgages, or given those payments, you can determine the interest rate that a lender is charging you. Time-value-of-money techniques can help you with almost any major financial decision that you face over your lifetime.

LG 1

5.1 The Role of Time Value in Finance

The *time value of money* refers to the observation that it is better to receive money sooner than later. You can invest money you have in hand today to earn a positive rate of return, producing more money tomorrow. For that reason, a dollar today is worth more than a dollar in the future. In business situations, managers constantly face tradeoffs when actions that require cash outflows today may produce cash inflows later. Because cash that comes in the future is worth less than cash that firms spend up front, managers need a set of tools for comparing cash inflows and outflows that occur at different times. Individuals can use those tools also when making decisions about investing or borrowing money. This chapter introduces you to those tools.

FUTURE VALUE VERSUS PRESENT VALUE

Suppose that a firm has an opportunity to spend $15,000 today on some investment that will produce $17,000 spread out over the next 5 years as follows:

Year 1	$3,000
Year 2	5,000
Year 3	4,000
Year 4	3,000
Year 5	2,000

Is this investment a wise one? It might seem that the obvious answer is yes because the firm spends $15,000 and receives $17,000. Remember, though, that the value of the dollars the firm receives in the future is less than the value of the dollars they spend today. Therefore, it is not clear whether the $17,000 inflows are enough to justify the initial investment.

Time-value-of-money analysis helps managers answer questions like this one. The idea is that managers need a way to compare cash today versus cash in the future. There are two equivalent ways of doing so. One way is to ask the question, what amount of money in the future is equivalent to $15,000 today? In other words, what is the *future value* of $15,000? The other approach asks, what amount today is equivalent to $17,000 paid out over the next 5 years as outlined above? In other words, what is the *present value* of the stream of cash flows coming in the next 5 years?

timeline
A horizontal line on which time zero appears at the leftmost end and future periods are marked from left to right; can be used to depict investment cash flows.

A **timeline** depicts the cash flows associated with a given investment. It is a horizontal line on which time zero appears at the leftmost end and future periods are marked from left to right. A timeline illustrating our hypothetical investment problem appears in Figure 5.1. The cash flows occurring at time zero

FIGURE 5.1

Timeline
Timeline depicting an investment's cash flows

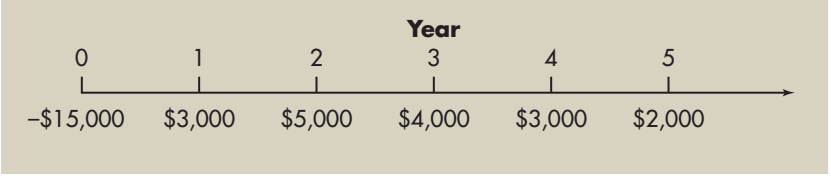
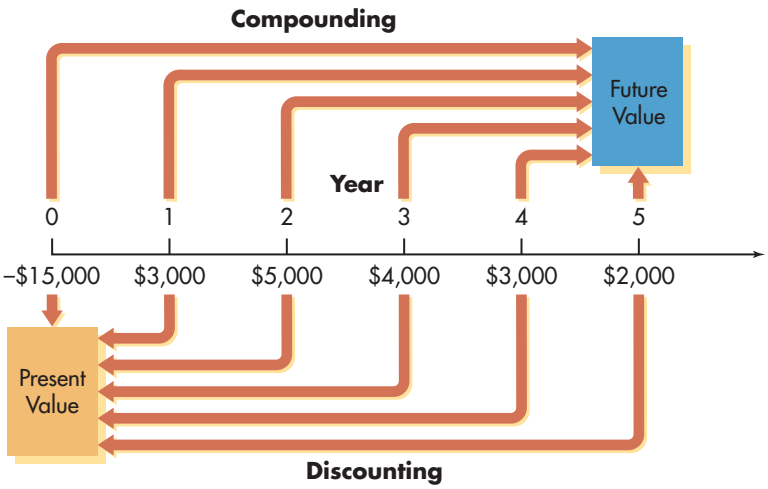


FIGURE 5.2

Compounding and Discounting
Timeline showing compounding to find future value and discounting to find present value



(today) and at subsequent 1-year intervals are below the line; the negative values represent *cash outflows* ($15,000 invested today at time zero), and the positive values represent *cash inflows* ($3,000 inflow in 1 year, $5,000 inflow in 2 years, and so on).

To make the correct investment decision, managers must compare the cash flows depicted in Figure 5.1 at a single point in time. Typically, that point is either the end or the beginning of the investment's life. The future value technique uses *compounding* to find the *future value* of each cash flow at the end of the investment's life and then sums these values to find the investment's future value. This approach is depicted above the timeline in Figure 5.2. The figure shows that the future value of each cash flow is measured at the end of the investment's 5-year life. Alternatively, the present value technique uses *discounting* to find the *present value* of each cash flow at time zero and then sums these values to find the investment's value today. Application of this approach is depicted below the timeline in Figure 5.2. In practice, when making investment decisions, managers usually adopt the present value approach.

COMPUTATIONAL TOOLS

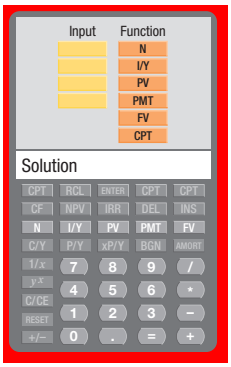
Finding present and future values can involve time-consuming calculations. Although you should understand the concepts and mathematics underlying these calculations, financial calculators and spreadsheets streamline the application of time value techniques.

Financial Calculators

Financial calculators include numerous preprogrammed financial routines. Learning how to use these routines can make present and future value calculations a breeze.

FIGURE 5.3

Calculator Keys
Important financial keys on the typical calculator



N — Number of periods
I/Y — Interest rate per period
PV — Present value
PMT — Payment amount per period
FV — Future value
CPT — Compute key used to initiate financial calculation once all input values have been entered

We focus primarily on the keys highlighted in Figure 5.3. We typically use four of the five keys shown in third row on the calculator, along with the compute (**CPT**) key to calculate the value of a fifth key. That is, one of the five keys in the third row represents the unknown value we want to calculate. There are also more sophisticated menu-driven functions such as the CF, NPV, and IRR keystrokes: After you select the appropriate routine, the calculator prompts you to enter the appropriate input value. Throughout this book our examples provide the typical keystrokes for the time-value-of-money calculations. It may be necessary for you to refer to your specific calculator's reference guide for complete instructions about how to use your financial calculator.

Once you understand the underlying concepts, you probably will want to use a calculator to streamline calculations. With a little practice, you can increase both the speed and the accuracy of your financial computations. Remember that conceptual understanding of the material is the objective. An ability to solve problems with the aid of a calculator does not necessarily reflect such an understanding, so don't just settle for answers. Work with the material until you are sure that you also understand the concepts.

Electronic Spreadsheets

Like financial calculators, electronic spreadsheets have built-in routines that simplify time-value calculations. We provide in the text a number of spreadsheet solutions that identify the cell entries for calculating time values. The value for each variable is entered in a cell in the spreadsheet, and the calculation is programmed using an equation that links the individual cells. Changing any input variable automatically changes the solution as a result of the equation linking the cells.

Cash Flow Signs

To provide a correct answer, financial calculators and electronic spreadsheets require that users designate whether a cash flow represents an inflow or an outflow. Entering positive numbers designates cash inflows, while entering negative numbers designates cash outflows. By entering the cash flows correctly, you are providing the financial calculator or electronic spreadsheet the calculation's timeline. With accurate cash flows entered, answers provided by financial calculators or electronic spreadsheets will indicate the proper result.

BASIC PATTERNS OF CASH FLOW

Applications of time-value-of-money calculations to financial problems are almost infinite in variety. One way to place those applications into different categories is based on the general patterns of cash inflows and outflows. Some financial problems involve comparing a single cash inflow to a single cash outflow. Others involve comparing streams of cash inflows and outflows. Here are the basic cash flow patterns that we will study in this chapter.

Single amount: A lump sum amount either currently held or expected at some future date. For example, we might want to know how much a $1,000 investment made today might be worth in 5 years. Or we might wish to know how much money we have to set aside today to cover some specific one-time payment we'll have to make in the future.

Annuity: A level periodic stream of cash flow. Many financial arrangements involve making or receiving a fixed payment each month or each year for several years. The classic example from consumer finance is the home mortgage. Time-value-of-money techniques help us determine what the monthly mortgage payment will be given the size of the loan required to buy a home.

Mixed stream: A stream of cash flow that is not an annuity; a stream of unequal periodic cash flows that reflect no particular pattern. Most business investment decisions fall into this category. Two examples appear below. Mixed stream A involves an immediate cash outflow of $4,400, followed by cash inflows of varying amounts for the next 6 years. Mixed stream B has a cash outflow of $50 up front, followed by alternating cash inflows and outflows.

	Mixed cash flow stream	
Year	A	B
0	−$4,400	−$ 50
1	100	50
2	800	−100
3	1,200	280
4	1,200	−60
5	1,400	
6	300	

Regardless of whether a specific financial problem involves a lump sum, an annuity, or a mixed stream, the tools and concepts required to make valid comparisons of cash flows across time are similar, as we will see in the rest of this chapter.

→ REVIEW QUESTIONS MyLab Finance Solutions

5–1 What is the difference between future value and present value? Which approach is generally preferred by financial managers?

5–2 Define and differentiate among the three basic patterns of cash flow: (1) a single amount, (2) an annuity, and (3) a mixed stream.

LG2

5.2 Single Amounts

Although most real-world financial problems require managers to make comparisons between streams of cash flow over time, some problems are simpler and involve lump sums or single cash flows at a particular point in time. Furthermore, understanding how to apply time-value-of-money methods to lump sum problems is key to knowing how to handle more complex decisions, so we will begin by studying the comparison of lump sums at different times.

FUTURE VALUE OF A SINGLE AMOUNT

The most basic time-value-of-money concepts and computations concern single payments or receipts that occur in the present or in the future. We begin by considering problems that involve finding the future value of cash that is on hand immediately. Then we will use the underlying concepts to solve problems that determine the value today of cash that will be received or paid in the future.

We often need to know to what extent the money we invest now will grow in the future. For example, if you deposit $500 today into an account that pays 2% annual interest, how much would you have in the account in 10 years? **Future value** is the value on some future date of money that you invest today. The future value depends on how much money you invest now, how long it remains invested, and the interest rate earned by the investment.

future value
The value on some future date of money that you invest today.

The Concept of Future Value

Perhaps the most powerful of all time-value-of-money concepts is that of compound interest. **Compound interest** is interest paid on an investment's original principal and on interest that has accumulated over previous periods. The term **principal** may refer to the original amount of money placed into an investment or to the balance on which an investment pays interest. Compound interest works by adding the interest earned from one period to the original principal, to create a new principal value for the next period. Thus, an investor receives (or a borrower pays) interest not only on the original principal but also on interest that has been earned in previous periods and added to the original principal balance. The process of adding interest to an investment's principal and paying interest on the new, higher balance is called *compounding*. Compounding may occur daily, monthly, annually, or at almost any time interval. Annual compounding is the simplest type, so we will begin with examples of annual compounding.

compound interest
Interest that is earned on a given deposit and has become part of the principal at the end of a specified period.

principal
The amount of money on which interest is paid.

To calculate the future value of a sum of money that we have on hand today, we will apply compound interest over time. To compute the future value, we must know the present value, or the amount of money we have today; the interest rate; the number of periods that the investment will earn interest; and the compounding interval, that is, the number of times per year that interest compounds. A simple example illustrates the concept of future value with annual compounding.

PERSONAL FINANCE EXAMPLE 5.1

MyLab Finance Solution Video

If Fred Moreno places $100 in an account paying 8% interest compounded annually (i.e., interest is added to the $100 principal 1 time per year), after 1 year he will have $108 in the account. That's just the initial principal of $100 plus 8% ($8) in interest. The future value at the end of the first year is

$$\text{Future value at end of year 1} = \$100 \times (1 + 0.08) = \$108$$

If Fred were to leave this money in the account for another year, he would be paid interest at the rate of 8% on the new principal of $108. After 2 years there would be $116.64 in the account. This amount would represent the principal after the first year ($108) plus 8% of the $108 ($8.64) in interest. The future value after 2 years is

$$\begin{aligned}\text{Future value after 2 years} &= \$108 \times (1 + 0.08)\\ &= \$116.64\end{aligned}$$

Substituting the expression $100 × (1 + 0.08) from the first-year calculation for the $108 value in the second-year calculation gives us

$$\begin{aligned}\text{Future value after 2 years} &= \$100 \times (1 + 0.08) \times (1 + 0.08)\\ &= \$100 \times (1 + 0.08)^2\\ &= \$116.64\end{aligned}$$

The equations in the preceding example lead to a general formula for calculating future value.

The Equation for Future Value

We can generalize the basic relationship illustrated in Example 5.1 to find the future value of a lump sum in any situation. We use the following notation for the various inputs:

FV_n = future value after n periods
PV_0 = initial principal, or present value when time = 0
r = annual rate of interest (*Note:* Financial calculators often use **I/Y** to represent the interest rate.)
n = number of periods (typically years) that the money remains invested

The general equation for the future value after n periods is

$$FV_n = PV_0 \times (1 + r)^n \tag{5.1}$$

The following example shows how to apply Equation 5.1.

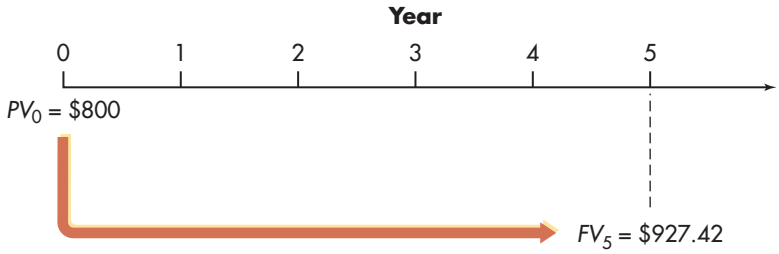
IRF PERSONAL FINANCE EXAMPLE 5.2

Jane Farber places $800 in a savings account paying 3% interest compounded annually. She wants to know how much money will be in the account after 5 years. Substituting $PV_0 = \$800$, $r = 0.03$, and $n = 5$ into Equation 5.1 gives the future value after 5 years:

$$FV_5 = \$800 \times (1 + 0.03)^5 = \$800 \times (1.15927) = \$927.42$$

We can depict this situation on a timeline as follows:

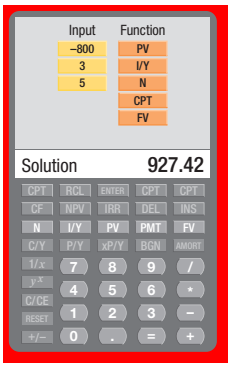
Timeline for future value of a single amount ($800 initial principal, earning 3%, after 5 years)



Although solving the equation in the preceding example is not particularly difficult, using a financial calculator or electronic spreadsheet simplifies the calculation.

PERSONAL FINANCE EXAMPLE 5.3 In Personal Finance Example 5.2, Jane Farber places $800 in her savings account at 3% interest compounded annually and wishes to find out how much will be in the account after 5 years.

MyLab Finance Financial Calculator



Calculator use[1] We can use a financial calculator to find the future value directly. First enter –800 and depress **PV;** next enter 5 and depress **N;** then enter 3 and depress **I/Y** (which is equivalent to "*r*" in our notation); finally, to calculate the future value, depress **CPT** and then **FV.** The future value of $927.42 should appear on the calculator display as shown at the left. Remember that the calculator differentiates inflows from outflows by preceding the outflows with a negative sign. For example, in the problem just demonstrated, the $800 present value (PV), because we entered it as a negative number, is considered an outflow. Therefore, the calculator shows the future value (FV) of $927.42 as a positive number to indicate that it is the resulting inflow. Had we entered $800 present value as a positive number, the calculator would show the future value of $927.42 as a negative number. Simply stated, *the cash flows—present value (PV) and future value (FV)—will have opposite signs.* (*Note:* In future examples of calculator use, we will use only a display similar to that shown here. If you need a reminder of the procedures involved, review this paragraph.)

Spreadsheet use Excel offers a mathematical function that makes the calculation of future values easy. The format of that function is FV(rate,nper,pmt,pv,type). The terms inside the parentheses are inputs that Excel requires to calculate the future value. The terms *rate* and *nper* refer to the interest rate and the number of time periods, respectively. The term *pv* represents the lump sum (or present value) that you are investing today. For now, we will ignore the other two inputs, *pmt* and *type,* and enter a value of zero for each. The following Excel spreadsheet shows how to use this function to calculate the future value.

1. Many calculators allow the user to set the number of payments per year. Most of these calculators are preset for monthly payments, or 12 payments per year. Because we work primarily with annual payments—one payment per year—it is important to be sure that your calculator is set for one payment per year. Although most calculators are preset to recognize that all payments occur at the end of the period, it is also important to make sure that your calculator is correctly set on the END mode. To avoid including previous data in current calculations, always clear all registers of your calculator before inputting values and making each computation. You can punch the known values into the calculator in any order; the order specified in this as well as other demonstrations of calculator use included in this text merely reflects convenience and personal preference.

MyLab

	A	B
1	FUTURE VALUE OF A SINGLE AMOUNT	
2	Present value	–$800
3	Annual rate of interest	3%
4	Number of years	5
5	Future value	$927.42

Entry in Cell B5 is =FV(B3,B4,0,B2,0).
The minus sign appears before the $800 in B2 because the cost of the investment is treated as a cash outflow.

Changing any of the values in cells B2, B3, or B4 automatically changes the result shown in cell B5 because the formula in that cell links back to the others. As with the calculator, Excel reports cash inflows as positive numbers and cash outflows as negative numbers. In the example here, we have entered the $800 present value as a negative number, which causes Excel to report the future value as a positive number. Logically, Excel treats the $800 present value as a cash outflow, as if you are paying for the investment you are making, and it treats the future value as a cash inflow when you reap the benefits of your investment 5 years later.

A Graphical View of Future Value

Figure 5.4 illustrates how the future value of $1 depends on the interest rate and the number of periods that money is invested. It shows that (1) the higher the interest rate, the higher the future value, and (2) the longer the money remains invested, the higher the future value. Note that for an interest rate of 0%, the future value always equals the present value ($1.00). For any interest rate greater than zero, however, the future value is greater than the present value of $1.00.

simple interest
Interest that is earned only on an investment's original principal and not on interest that accumulates over time.

Compound Interest versus Simple Interest

Before turning our attention to the concept of present value, we should make a distinction between compound interest, a concept that we have applied in all of our examples so far, and simple interest. **Simple interest** is interest earned only

FIGURE 5.4

Future Value Relationship
Interest rates, time periods, and the future value of one dollar

MyLab Finance Animation

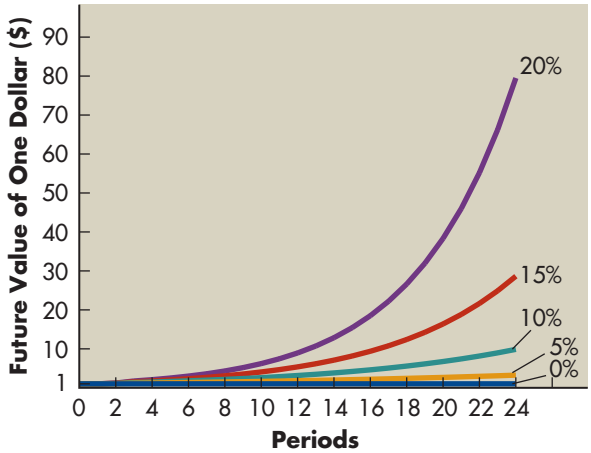


TABLE 5.1 Simple Interest versus Compound Interest

	Account Balance	
Time (year)	Simple Interest	Compound Interest
0 (initial deposit)	$1,000	$1,000.00
1	1,050	1,050.00
2	1,100	1,102.50
3	1,150	1,157.62
4	1,200	1,215.51
5	1,250	1,276.28
10	1,500	1,628.89

on an investment's original principal and not on accumulated interest. Naturally money accumulates faster when an investment earns compound interest rather than simple interest. When the interest rate is very low and the time that money remains invested is very short, the difference between earning compound interest and simple interest is small. But at higher interest rates and for longer investment horizons, the differences can be quite substantial. Table 5.1 illustrates this concept by showing how much money accumulates over time if an investor places $1,000 into an account earning 5% interest. If the account pays simple interest, then the investor receives exactly $50 in interest every period, so after 1 year the account balance is $1,050, after 2 years the balance is $1,100, and so on. If the account pays compound interest, the balance grows much faster because the investor earns more than $50 in interest every period after the first one. After 10 years, the account paying 5% simple interest is worth $1,500, but the account paying compound interest is worth $1,628.89.

Our focus thus far has been on determining how fast money will grow over time. In many business and personal finance problems, the relevant question is not what the future value of an investment will be, but rather how much a future cash flow (or stream of cash flows) is worth today.

PRESENT VALUE OF A SINGLE AMOUNT

Most investments made by businesses and individuals involve an exchange of money today for money in the future. For example, a company must spend money today to build a plant, but over time the products made in that plant will generate cash inflows for the firm. Therefore, the firm must decide whether those future cash inflows are worth the cost of building the plant. In much the same way, an individual investor buys a stock because it will pay dividends and may sell in the future at a higher price than it sells for today. The investor must decide if the price required to buy the stock today is worth the future dividends and capital gains the stock may provide in the future. Thus, both businesses and individuals need a way to determine the *present value* of cash flows that come in the future.

present value
The value in today's dollars of some future cash flow.

The **present value** is the value in today's dollars of some future cash flow. An equivalent definition is that the present value is the amount that one would have to invest today such that the investment would grow to a particular value in the future. For example, suppose an individual is presented with an investment opportunity that will pay $5,000 three years from now. The present value represents the amount of money the investor would pay today for the right to receive

that $5,000 cash inflow in 3 years. Like future value, present value depends on the interest rate and the timing of cash flows.

The Concept of Present Value

discounting cash flows
The process of finding present values; the inverse of compounding interest.

The process of finding present values is often referred to as **discounting cash flows.** Present value calculations answer the following question: If you can earn r percent on your money, what is the most you would be willing to pay now for an opportunity to receive FV_n dollars n periods from today?

This process is actually the inverse of compounding interest. Instead of finding the future value of present dollars invested at a given rate, discounting determines the present value of a future amount, assuming an opportunity to earn a certain return on the money. This annual rate of return is variously referred to as the *discount rate, required return, cost of capital,* and *opportunity cost*. We use these terms interchangeably in this text.

PERSONAL FINANCE EXAMPLE 5.4 Paul Shorter has an opportunity to receive $300 one year from now. What is the most that Paul should pay now for this opportunity? The answer depends in part on what Paul's current investment opportunities are (i.e., what his opportunity cost is). Suppose Paul can earn a return of 2% on money that he has on hand today. To determine how much he'd be willing to pay for the right to receive $300 one year from now, Paul can think about how much of his own money he'd have to set aside right now to earn $300 by next year. Letting PV_0 equal this unknown amount and using the same notation as in the future value discussion, we have

$$PV_0 \times (1 + 0.02) = \$300$$

Solving for PV_0 gives us

$$PV_0 = \frac{\$300}{(1 + 0.02)} = \$294.12$$

The value today ("present value") of $300 received 1 year from today, given an interest rate of 2%, is $294.12. That is, investing $294.12 today at 2% would result in $300 in 1 year. Given his opportunity cost (or his required return) of 2%, Paul should not pay more than $294.12 for this investment. Doing so would mean that he would earn a return of less than 2% on this investment. That's unwise if he has other similar investment opportunities that pay 2%. However, if Paul could buy this investment for less than $294.12, he would earn a return greater than his 2% opportunity cost.

The Equation for Present Value

We can find the present value of a future amount mathematically by solving Equation 5.1 for PV_0. In other words, the present value, PV_0, of some future amount, FV_n, to be received n periods from now, assuming an interest rate (or opportunity cost) of r, equals

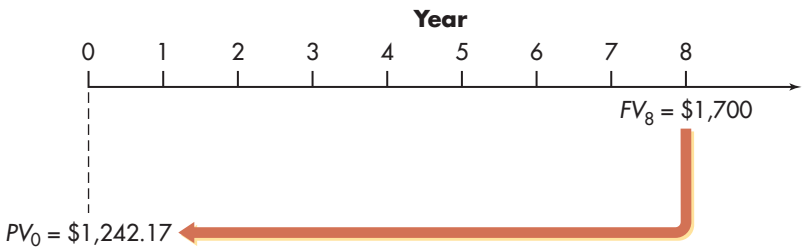
$$PV_0 = \frac{FV_n}{(1 + r)^n} \tag{5.2}$$

IRF PERSONAL FINANCE EXAMPLE 5.5 Pam Valenti has been offered an investment opportunity that will pay her $1,700 eight years from now. Pam has other investment opportunities available to her that pay 4%, so she will require a 4% return on this opportunity. How much should Pam pay for this opportunity? In other words, what is the present value of $1,700 that comes in 8 years if the opportunity cost is 4%? Substituting $FV_8 = \$1{,}700$, $n = 8$, and $r = 0.04$ into Equation 5.2 yields

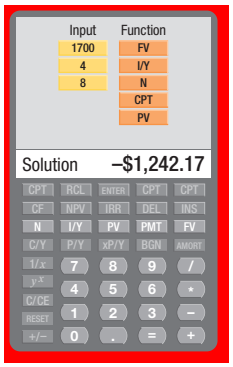
$$PV_0 = \frac{\$1{,}700}{(1 + 0.04)^8} = \frac{\$1{,}700}{1.36857} = \$1{,}242.17$$

The following timeline shows this analysis.

Timeline for present value of a single amount ($1,700 future amount, discounted at 4%, for 8 years)



MyLab Finance Financial Calculator



Calculator use Using the calculator's financial functions and the inputs shown at the left, you should find the present value to be $1,242.17. Notice that the calculator result is represented as a negative value to indicate that the present value is a cash outflow (i.e., the investment's cost).

Spreadsheet use The format of Excel's present value function is very similar to the future value function covered earlier. The appropriate syntax is PV(rate,nper,pmt,fv,type). The input list inside the parentheses is the same as in Excel's future value function with one exception. The present value function contains the term *fv*, which represents the future lump sum payment (or receipt) whose present value you are trying to calculate. The following Excel spreadsheet illustrates how to use this function to calculate the present value.

MyLab

	A	B
1	PRESENT VALUE OF A SINGLE AMOUNT	
2	Future value	$1,700
3	Annual rate of interest	4%
4	Number of years	8
5	Present value	–$1,242.17

Entry in Cell B5 is =PV(B3,B4,0,B2,0).
The minus sign appears before the $1,242.17 in B5 because the cost of the investment is treated as a cash outflow.

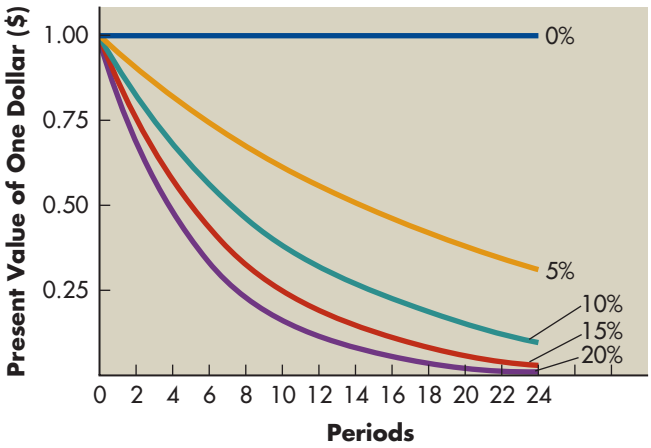
A Graphical View of Present Value

Figure 5.5 illustrates how the present value of $1 depends on the interest rate (or discount rate) and the number of periods an investor must wait to receive $1. The figure shows that, everything else being equal, (1) the higher the discount

FIGURE 5.5

Present Value Relationship
Discount rates, time periods, and present value of one dollar

MyLab Finance Animation



rate, the lower the present value; and (2) the longer the waiting period, the lower the present value. Also note that if the discount rate is 0%, the present value of $1 always equals $1 no matter when that dollar arrives. But for any discount rate greater than zero, the present value is less than $1.

→ REVIEW QUESTIONS MyLab Finance Solutions

5–3 How is the compounding process related to the payment of interest on savings? What is the general equation for future value?

5–4 What effect would a decrease in the interest rate have on the future value of a deposit? What effect would an increase in the holding period have on future value?

5–5 What is meant by "the present value of a future amount"? What is the general equation for present value?

5–6 What effect does increasing the required return have on the present value of a future amount? Why?

5–7 How are present value and future value calculations related?

→ EXCEL REVIEW QUESTIONS MyLab Finance Solutions

5–8 It is tax time and you would like to make a tax-deductible contribution to an individual retirement account (IRA). Using the information provided at MyLab Finance, find the future value of an IRA contribution that grows until you retire.

5–9 It is never too soon to begin investing for a child's college education. Using the information provided at MyLab Finance, determine the present value you would need to invest today to ensure that your child receives the college education she deserves.

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5.3 Annuities

annuity
A stream of equal periodic cash flows over a specified time period. These cash flows can be inflows or outflows of funds.

ordinary annuity
An annuity for which the cash flow occurs at the end of each period.

annuity due
An annuity for which the cash flow occurs at the beginning of each period.

How much would you pay today for an investment that pays $3,000 at the end of each of the next 20 years, given that you can earn 7% on other investments? How much will you have after 5 years if your employer withholds and invests $1,000 of your bonus at the end of each of the next 5 years, guaranteeing you a 9% annual rate of return? To answer these questions, you need to understand the application of time value of money to *annuities*.

An **annuity** is a stream of equal periodic cash flows over a specified time. These cash flows may arrive at annual intervals, but they can also occur at other intervals, such as monthly rent or car payments. The cash flows in an annuity can be inflows (the $3,000 received at the end of each of the next 20 years) or outflows (the $1,000 invested at the end of each of the next 5 years).

TYPES OF ANNUITIES

Annuities are of two general types. For an **ordinary annuity**, the cash flow occurs at the *end* of each period. For an **annuity due**, the cash flow occurs at the *beginning* of each period.

PERSONAL FINANCE EXAMPLE 5.6 Fran Abrams is evaluating two annuities. Both annuities pay $1,000 per year, but annuity A is an ordinary annuity, while annuity B is an annuity due. To better understand the difference between these annuities, she has listed their cash flows in Table 5.2. The two annuities differ only in the timing of their cash flows: The cash flows occur sooner with the annuity due than with the ordinary annuity.

Although the cash flows of both annuities in Table 5.2 total $5,000, the annuity due would have a higher future value than the ordinary annuity because each of its five annual cash flows can earn interest for 1 year more than each of the ordinary annuity's cash flows. In general, as we will demonstrate later in this chapter, *the value (present or future) of an annuity due is always greater than the value of an otherwise identical ordinary annuity.*

TABLE 5.2 Comparison of Ordinary Annuity and Annuity Due Cash Flows ($1,000, 5 Years)

	Annual cash flows	
Year	Annuity A (*ordinary*)	Annuity B (*annuity due*)
0	$ 0	$1,000
1	1,000	1,000
2	1,000	1,000
3	1,000	1,000
4	1,000	1,000
5	1,000	0
Totals	$5,000	$5,000

FINDING THE FUTURE VALUE OF AN ORDINARY ANNUITY

One way to find the future value of an ordinary annuity is to calculate the future value of each cash flow and then add up those figures. Fortunately, several shortcuts lead to the answer. You can calculate the future value after n years of an ordinary annuity that makes n annual cash payments equal to CF_1 by using Equation 5.3:

$$FV_n = CF_1 \times \left\{ \frac{[(1 + r)^n - 1]}{r} \right\} \quad (5.3)$$

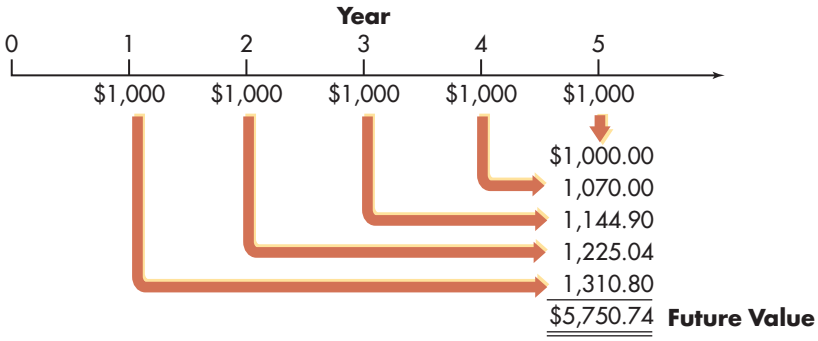
As before, in this equation r represents the interest rate, and n represents the number of payments in the annuity (or, equivalently, the number of years over which the annuity is spread). The subscript 1 on the term CF_1 highlights that with an ordinary annuity, the first payment comes after 1 year (or, more generally, after 1 *period*). The calculations required to find the future value of an ordinary annuity are illustrated in the following example.

IRF PERSONAL FINANCE EXAMPLE 5.7

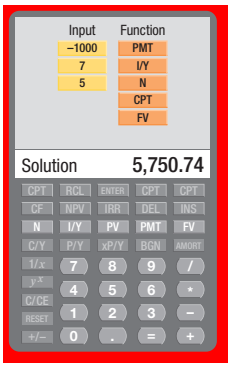
MyLab Finance Animation

Fran Abrams wishes to determine how much money she will have after 5 years if she chooses annuity A, the ordinary annuity. She will deposit the $1,000 annual payments that the annuity provides at the end of each of the next 5 years into a savings account paying 7% annual interest. This situation is depicted on the following timeline.

Timeline for future value of an ordinary annuity ($1,000 end-of-year deposit, earning 7%, after 5 years)



MyLab Finance Financial Calculator



As the figure shows, after 5 years, Fran will have $5,750.74 in her account. Note that because she makes deposits at the end of the year, the first deposit will earn interest for 4 years, the second for 3 years, and so on. Plugging the relevant values into Equation 5.3, we have

$$FV_5 = \$1{,}000 \times \left\{ \frac{[(1 + 0.07)^5 - 1]}{0.07} \right\} = \$5{,}750.74$$

Calculator use Using the calculator inputs shown at the left, you can confirm that the future value of the ordinary annuity equals $5,750.74. In this example, we enter the $1,000 annuity payment as a negative value, which in turn causes the calculator to report the resulting future value as a positive value. You can think of each $1,000 deposit that Fran makes into her investment account as

a payment into the account or a cash outflow, and after 5 years the future value is the balance in the account, or the cash inflow that Fran receives as a reward for investing.

Spreadsheet use To calculate the future value of an annuity in Excel, we will use the same future value function that we used to calculate the future value of a lump sum, but we will add two new input values. Recall that the future value function's syntax is FV(rate,nper,pmt,pv,type). We have already explained the terms *rate, nper,* and *pv* in this function. The term *pmt* refers to the annual payment the annuity offers. The term *type* is an input that lets Excel know whether the annuity being valued is an ordinary annuity (in which case the input value for *type* is 0 or omitted) or an annuity due (in which case the correct input value for *type* is 1). In this particular problem, the input value for *pv* is 0 because there is no up-front money received that is separate from the annuity. The only cash flows are those that are part of the annuity stream. The following Excel spreadsheet demonstrates how to calculate the future value of the ordinary annuity.

MyLab

	A	B
1	FUTURE VALUE OF AN ORDINARY ANNUITY	
2	Annual annuity payment	–$1,000
3	Annual rate of interest	7%
4	Number of years	5
5	Future value	$5,750.74

Entry in Cell B5 is =FV(B3,B4,B2,0,0). The minus sign appears before the $1,000 in B2 because the annuity's payments are cash outflows.

FINDING THE PRESENT VALUE OF AN ORDINARY ANNUITY

Quite often in finance, we need to find the present value of a stream of cash flows spread over several future periods. An annuity is, of course, a stream of equal periodic cash flows. The method for finding the present value of an ordinary annuity is similar to the method just discussed. One approach is to calculate the present value of each cash flow in the annuity and then add up those present values. Alternatively, the algebraic shortcut for finding the present value of an ordinary annuity that makes an annual payment of CF_1 for n years looks like

$$PV_0 = \left(\frac{CF_1}{r}\right) \times \left[1 - \frac{1}{(1 + r)^n}\right] \tag{5.4}$$

Of course, the simplest approach is to solve problems like this one with a financial calculator or spreadsheet program.

IRF EXAMPLE 5.8

MyLab Finance Solution Video

MyLab Finance Animation

Braden Company, a small producer of plastic toys, wants to determine the most it should pay for a particular ordinary annuity. The annuity consists of cash inflows of $700 at the end of each year for 5 years. The firm requires the annuity to provide a minimum return of 4%. The following timeline depicts this situation.

Timeline for present value of an ordinary annuity ($700 end-of-year cash flows, discounted at 4%, over 5 years)

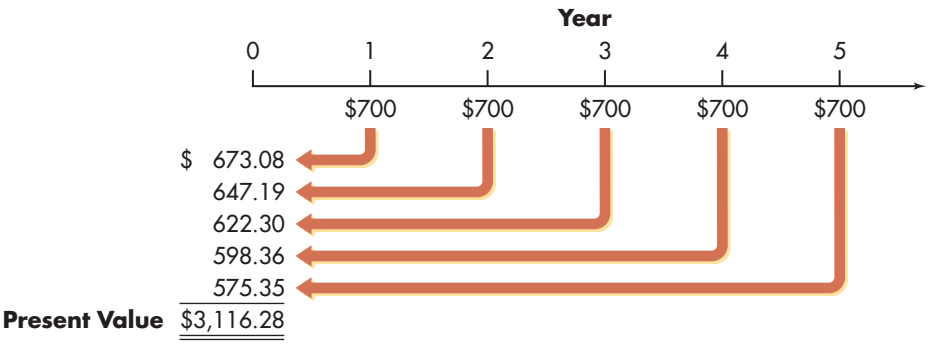
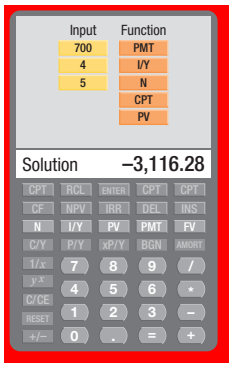


Table 5.3 shows that one way to find the present value of the annuity is to simply calculate the present values of all the cash payments using the present value equation (Equation 5.2) and sum them. This procedure yields a present value of $3,116.28. Calculators and spreadsheets offer streamlined methods for arriving at this figure.

TABLE 5.3 Long Method for Finding the Present Value of an Ordinary Annuity

Year (n)	Cash flow	Present value calculation	Present value
1	$700	$\frac{\$700}{(1 + 0.04)^1} =$	$ 673.08
2	700	$\frac{\$700}{(1 + 0.04)^2} =$	$ 647.19
3	700	$\frac{\$700}{(1 + 0.04)^3} =$	$ 622.30
4	700	$\frac{\$700}{(1 + 0.04)^4} =$	$ 598.36
5	700	$\frac{\$700}{(1 + 0.04)^5} =$	$ 575.35
		Present value of annuity	$3,116.28

MyLab Finance Financial Calculator



Calculator use Using the calculator's inputs shown at the left, you will find the present value of the ordinary annuity to be $3,116.28. Because the present value in this example is a cash outflow representing what Braden Company is willing to pay for the annuity, we show it as a negative value in the calculator display.

Spreadsheet use The following spreadsheet shows how to calculate present value of the ordinary annuity.

MyLab

	A	B
1	PRESENT VALUE OF AN ORDINARY ANNUITY	
2	Annual annuity payment	$700
3	Annual rate of interest	4%
4	Number of years	5
5	Present value	–$3,116.28

Entry in Cell B5 is =PV(B3,B4,B2,0,0). The minus sign appears before the $3,116.28 in B5 because the annuity's present value is a cost and therefore a cash outflow.

FINDING THE FUTURE VALUE OF AN ANNUITY DUE

We now turn our attention to annuities due. Remember that the cash flows of an annuity due occur at the *start of the period*. In other words, if we are dealing with annual payments, each payment in an annuity due comes 1 year earlier than it would in an ordinary annuity, which in turn means that each payment can earn an extra year of interest. That is why the future value of an annuity due exceeds the future value of an otherwise identical ordinary annuity.

The algebraic shortcut for the future value after n years of an annuity due that makes n annual payments of CF_0 is

$$FV_n = CF_0 \times \left\{ \frac{[(1 + r)^n - 1]}{r} \right\} \times (1 + r) \tag{5.5}$$

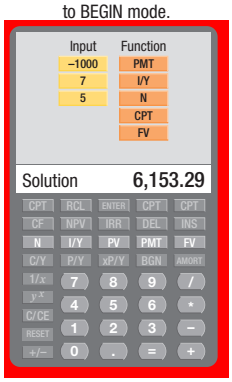
Compare this equation with Equation 5.3, which shows how to calculate the future value of an ordinary annuity. The two equations are nearly identical but do show two differences. In Equation 5.5 we use the term CF_0 rather than CF_1 to highlight that for an annuity due, the first payment comes right away (at the beginning of the first year when time = 0). In addition, Equation 5.5 has an added term, $(1 + r)$, at the end. In other words, the value obtained from Equation 5.5 will be $(1 + r)$ times greater than the value in Equation 5.3 if the other inputs (the annual cash flow and the number of payments) are the same. That makes sense because all the payments in the annuity due earn 1 more year of interest than do payments in the ordinary annuity.

IRF PERSONAL FINANCE EXAMPLE 5.9

MyLab Finance Animation

MyLab Finance Financial Calculator

Note: Switch calculator to BEGIN mode.

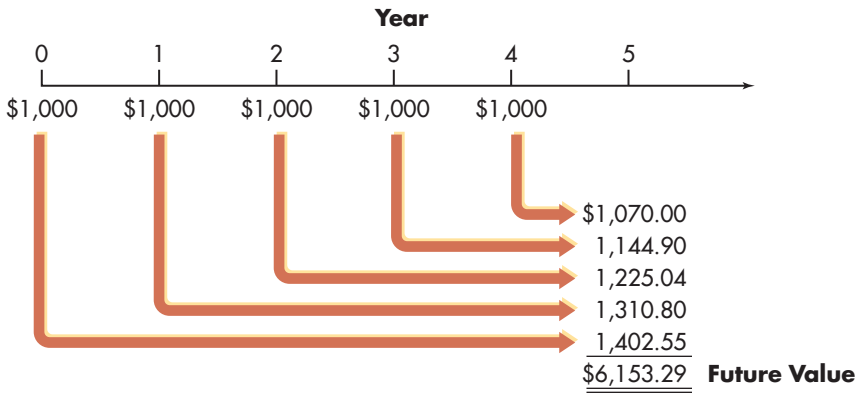


Recall from an earlier example, illustrated in Table 5.2, that Fran Abrams wanted to choose between an ordinary annuity and an annuity due, both offering similar terms except for the timing of cash flows. We calculated the future value of the ordinary annuity in Example 5.7, but we now want to calculate the future value of the annuity due. The timeline on the next page depicts this situation. Take care to notice on the timeline that when we use Equation 5.5 (or any of the shortcuts that follow) we are calculating the future value of Fran's annuity due after 5 years even though the fifth and final payment in the annuity due comes after 4 years (which is equivalent to the beginning of year 5). We can calculate the future value of an annuity due using a calculator or a spreadsheet.

Calculator use Before using your calculator to find the future value of an annuity due, you must either switch it to BEGIN mode or use the DUE key, depending on the specific calculator. Then, using the inputs shown at the left, you will find the future value of the annuity due to be $6,153.29. (*Note:* Because we nearly always assume end-of-period cash flows, be sure to switch your calculator back to END mode when you have completed your annuity-due calculations.)

Spreadsheet use The following Excel spreadsheet illustrates how to calculate the future value of the annuity due. Remember that for an annuity due the *type* input

Timeline for future value of an annuity due ($1,000 beginning-of-year deposit, earning 7%, after 5 years)



value must be set to 1, and we must also specify the *pv* input value as 0 because there is no upfront cash other than what is part of the annuity stream.

MyLab

	A	B
1	FUTURE VALUE OF AN ANNUITY DUE	
2	Annual annuity payment	–$1,000
3	Annual rate of interest	7%
4	Number of years	5
5	Future value	$6,153.29

Entry in Cell B5 is =FV(B3,B4,B2,0,1).
The minus sign appears before the $1,000 in B2 because the annuity's payments are cash outflows.

Comparison of an Annuity Due with an Ordinary Annuity Future Value

The future value of an annuity due is always greater than the future value of an otherwise identical ordinary annuity. We can see that by comparing the future values after 5 years of Fran Abrams's two annuities:

$$\text{Ordinary annuity} = \$5{,}750.74 \quad \text{versus} \quad \text{Annuity due} = \$6{,}153.29$$

Because the cash flow of the annuity due occurs at the beginning of the period rather than at the end (i.e., each payment comes 1 year sooner in the annuity due), its future value is greater. How much greater? It is interesting to calculate the percentage difference between the value of the annuity and the value of the annuity due:

$$(\$6{,}153.29 - \$5{,}750.74) \div \$5{,}750.74 = 0.07 = 7\%$$

Recall that the interest rate in this example is 7%. It is no coincidence that the annuity due is 7% more valuable than the annuity. An extra year of interest on each of the annuity due's payments makes the annuity due 7% more valuable than the annuity.

FINDING THE PRESENT VALUE OF AN ANNUITY DUE

We can also find the present value of an annuity due. By adjusting the ordinary annuity present value calculation, we can easily perform this calculation. Because the cash flows of an annuity due occur at the beginning rather than end of the

period, we discount each annuity due cash flow 1 fewer period than an ordinary annuity. The algebraic formula for the present value of an annuity due is

$$PV_0 = \left(\frac{CF_0}{r}\right) \times \left[1 - \frac{1}{(1 + r)^n}\right] \times (1 + r) \quad (5.6)$$

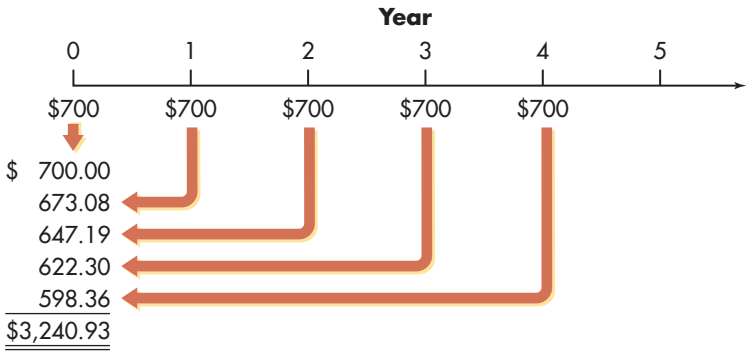
Notice the similarity between this equation and Equation 5.4. The two equations are identical except that Equation 5.6 uses CF_0 to indicate that the first cash flow arrives immediately in an annuity due, and Equation 5.6 has an extra term at the end, $(1 + r)$. The reason for this extra term is the same as when we calculated the future value of the annuity due. In the annuity due, each payment arrives 1 year earlier (compared to the ordinary annuity), so each payment has a higher present value. To be specific, each payment of the annuity due is discounted one less period so it's worth r% more than each ordinary annuity payment.

IRF EXAMPLE 5.10

MyLab Finance Animation

In Example 5.8 involving Braden Company, we found the present value of Braden's \$700, 5-year ordinary annuity discounted at 4% to be \$3,116.28. We now assume that Braden's \$700 annual cash in flow occurs at the *start* of each year and is thereby an annuity due. The following timeline illustrates the new situation.

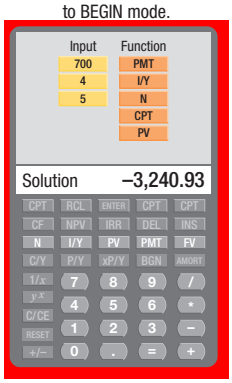
Timeline for present value of an annuity due (\$700 beginning-of-year cash flows, discounted at 4%, over 5 years)



We can calculate its present value using a calculator or a spreadsheet.

MyLab Finance Financial Calculator

Note: Switch calculator to BEGIN mode.



Calculator use Before using your calculator to find the present value of an annuity due, you must either switch it to BEGIN mode or use the DUE key, depending on the specifics of your calculator. Then, using the inputs shown at the left, you will find the present value of the annuity due to be \$3,240.93 (*Note:* Because we nearly always assume end-of-period cash flows, be sure to switch your calculator back to END mode when you have completed your annuity-due calculations.)

Spreadsheet use The following spreadsheet shows how to calculate the present value of the annuity due.

MyLab

	A	B
1	PRESENT VALUE OF AN ANNUITY DUE	
2	Annual annuity payment	\$700
3	Annual rate of interest	4%
4	Number of years	5
5	Present value	–\$3,240.93

Entry in Cell B5 is =PV(B3,B4,B2,0,1).
The minus sign appears before the \$3,240.93 in B5 because the annuity's present value is a cost and therefore a cash outflow.

Comparison of an Annuity Due with an Ordinary Annuity Present Value

The present value of an annuity due is always greater than the present value of an otherwise identical ordinary annuity. We can verify this statement by comparing the present values of the Braden Company's two annuities:

$$\text{Ordinary annuity} = \$3{,}116.28 \quad \text{versus} \quad \text{Annuity due} = \$3{,}240.93$$

Because the cash flows of the annuity due occur at the beginning of each period rather than at the end, their present values are greater. If we calculate the percentage difference in the values of these two annuities, we will find that the annuity due is 4% more valuable than the annuity (remember that 4% is the discount rate that Braden uses):

$$(\$3{,}240.93 - \$3{,}116.28) \div \$3{,}116.28 = 0.04 = 4\%$$

FINDING THE PRESENT VALUE OF A PERPETUITY

perpetuity
An annuity with an infinite life, providing continual annual cash flow.

A **perpetuity** is an annuity with an infinite life. In other words, it is an annuity that never stops providing a cash flow at the end of each year.

A number of business and personal investment decisions involve payouts that occur indefinitely into the future and are therefore excellent applications of the idea of a perpetuity. Fortunately, the calculation for the present value of a perpetuity is one of the easiest in finance. If a perpetuity pays an annual cash flow of CF_1, starting 1 year from now, the present value of the cash flow stream is

$$PV_0 = CF_1 \div r \tag{5.7}$$

PERSONAL FINANCE EXAMPLE 5.11

Ross Clark wishes to endow a chair in finance at his alma mater. In other words, Ross wants to make a lump sum donation today that will provide an annual stream of cash flows to the university forever. The university indicated that the annual cash flow required to support an endowed chair is $400,000 and that it will invest money Ross donates today in assets earning a 5% return. If Ross wants to give money today so that the university will begin receiving annual cash flows next year, how large must his contribution be? To determine the amount Ross must give the university to fund the chair, we must calculate the present value of a $400,000 perpetuity discounted at 5%. Using Equation 5.7, we can determine that this present value is $8 million when the interest rate is 5%:

$$PV_0 = \$400{,}000 \div 0.05 = \$8{,}000{,}000$$

In other words, to generate $400,000 every year for an indefinite period requires $8,000,000 today if Ross Clark's alma mater can earn 5% on its investments. If the university earns 5% interest annually on the $8,000,000, it can withdraw $400,000 per year indefinitely without ever touching the original $800,000 donation.

Many financial applications require analysts to calculate the present value of a cash flow stream that continues forever (i.e., a perpetuity) and grows at a steady rate. Calculating the present value of a growing perpetuity is not much more complicated than finding the present value of a level perpetuity. For a cash flow stream

that begins next year, pays an initial cash flow of CF_1, and grows after next year at a constant rate g forever, the present value of the growing perpetuity is

$$PV_0 = \left(\frac{CF_1}{r - g}\right) \quad (5.8)$$

Equation 5.8 applies only when the discount rate is greater than the growth rate in cash flows (i.e., $r > g$). If the interest rate is less than or equal to the growth rate, cash flows grow so fast that the present value of the stream is infinite.

PERSONAL FINANCE EXAMPLE 5.12 Suppose, after consulting with his alma mater, Ross Clark learns that the university requires the endowment to provide a $400,000 cash flow next year, but subsequent annual cash flows must grow by 2% per year to keep up with inflation. How much does Ross need to donate today to cover this requirement? Plugging the relevant values into Equation 5.8, we have:

$$PV_0 = \frac{\$400{,}000}{0.05 - 0.02} = \$13{,}333{,}333$$

Compared to the level perpetuity providing $400,000 per year, the growing perpetuity requires Ross to make a much larger initial donation, $13.3 million versus $8 million.

→ REVIEW QUESTIONS MyLab Finance Solutions

5–10 What is the difference between an ordinary annuity and an annuity due? Which is more valuable? Why?

5–11 What are the most efficient ways to calculate the present value of an ordinary annuity?

5–12 How can the formula for the future value of an annuity be modified to find the future value of an annuity due?

5–13 How can the formula for the present value of an ordinary annuity be modified to find the present value of an annuity due?

5–14 What is a perpetuity? Why is the present value of a perpetuity equal to the annual cash payment divided by the interest rate? Why doesn't this chapter provide an equation showing you how to calculate the future value of a perpetuity?

→ EXCEL REVIEW QUESTIONS MyLab Finance Solutions

5–15 Because tax time comes around every year, you smartly decide to make equal contributions to your IRA at the end of every year. Using the information provided at MyLab Finance, calculate the future value of your IRA contributions when you retire.

5–16 You have just graduated from college and begun your new career, and now it is time to buy your first home. Using the information provided at MyLab Finance, determine how much you can spend for your new dream home.

5–17 Rather than making contributions to an IRA at the end of each year, you decide to make equal contributions at the beginning of each year. Using the information provided at MyLab Finance, solve for the future value of your IRA contributions when you retire.

LG 4

5.4 Mixed Streams

mixed stream
A stream of unequal periodic cash flows that reflect no particular pattern.

Two types of cash flow streams are possible, the annuity and the mixed stream. Whereas an annuity is a pattern of equal periodic cash flows, a **mixed stream** consists of unequal periodic cash flows that reflect no particular pattern. Financial managers frequently need to evaluate opportunities that they expect to provide mixed streams of future cash flows. Here we consider both the future value and the present value of mixed streams.

FUTURE VALUE OF A MIXED STREAM

Determining the future value of a mixed stream of cash flows is straightforward. We compute the future value of each cash flow at the specified future date and then add all the individual future values to find the total future value.

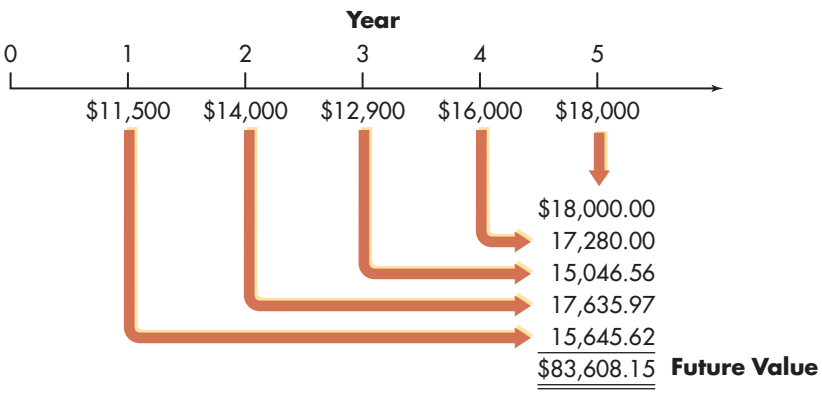
IRF **EXAMPLE 5.13**

Shrell Industries, a cabinet manufacturer, expects to receive the following mixed stream of cash flows over the next 5 years from one of its small customers.

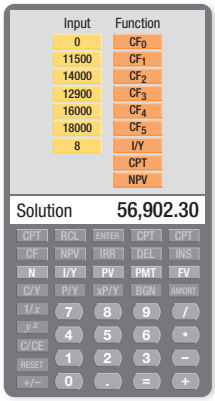
Time	Cash flow
0	$ 0
1	11,500
2	14,000
3	12,900
4	16,000
5	18,000

If Shrell expects to earn 8% on its investments, how much will it accumulate after 5 years if it immediately invests these cash flows when they are received? This situation is depicted on the following timeline.

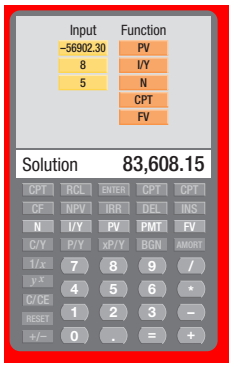
Timeline for future value of a mixed stream (end-of-year cash flows, compounded at 8% to the end of year 5)



MyLab Finance Financial Calculator



MyLab Finance Financial Calculator



Calculator use Most financial calculators do not have a built-in function for finding the future value of a mixed stream of cash flows, but most of them have a function for finding the present value. Once you have the present value of the mixed stream, you can move it forward in time to find the future value. To accomplish this task you must first enter the mixed stream of cash flows into your financial calculator's cash flow register, usually denoted by the CF key, starting with the cash flow at time zero. Be sure to enter cash flows correctly as either cash inflows or outflows. Once you enter the cash flows, you will need to use the calculator's net present value (NPV) function to find the present value of the cash flows. For Shrell, enter the following into your calculator's cash flow register: $CF_0 = 0$, $CF_1 = 11{,}500$, $CF_2 = 14{,}000$, $CF_3 = 12{,}900$, $CF_4 = 16{,}000$, $CF_5 = 18{,}000$. Next enter the interest rate of 8% and then solve for the NPV, which is the present value of the mixed stream of cash flows at time zero. The present value of the mixed stream of cash flows is $56,902.30, so you need to move this amount forward to the end of year 5 to find the future of the mixed stream. Enter −56,902.30 as the PV, 5 for N, 8 for I/Y, and then compute FV.

You will find that the future value at the end of year 5 of Shrell's mixed cash flows is $83,608.15. An alternative approach to using the calculator's cash flow register and NPV function is to find the future value at time 5 of each cash flow and then sum the individual future values to find the future value of Shrell's mixed stream. Finding the future value of a single cash flow was demonstrated earlier (in Personal Finance Example 5.3). As you have already discovered, summing the individual future values of Shrell Industries' mixed cash flow stream results in a future value of $83,608.15 after 5 years.

Spreadsheet use A relatively simple way to use Excel to calculate the future value of a mixed stream is to use the Excel net present value (NPV) function combined with the future value (FV) function discussed on page 232. The syntax of the NPV function is NPV(rate, value1, value2, value 3, . . .). The rate argument is the interest rate, and value1, value2, value3, . . . represent a stream of cash flows. The NPV function assumes that the first payment in the stream arrives 1 year in the future and that all subsequent payments arrive at 1-year intervals.

To find the future value of a mixed stream, the trick is to use the NPV function to first find the present value of the mixed stream and then find the future of this present value lump sum amount. The Excel spreadsheet below illustrates this approach (notice that the NPV appears as an outflow because it represents the net present value of the stream of investment costs).

MyLab

	A	B
1	FUTURE VALUE OF A MIXED STREAM	
2	Year	Cash Flow
3	1	$11,500
4	2	$14,000
5	3	$12,900
6	4	$16,000
7	5	$18,000
8	Annual rate of interest	8%
9	NPV	$56,902.30
10	Number of years	5
11	Future value	$83,608.15
	Entry in Cell B9 is =NPV(B8,B3:B7). Entry in Cell B11 is =–FV(B8,B10,0,B9,0).	

PRESENT VALUE OF A MIXED STREAM

Finding the present value of a mixed stream of cash flows is similar to finding the future value of a mixed stream. We determine the present value of each future cash flow and then add all the individual present values together to find the total present value.

IRF EXAMPLE 5.14

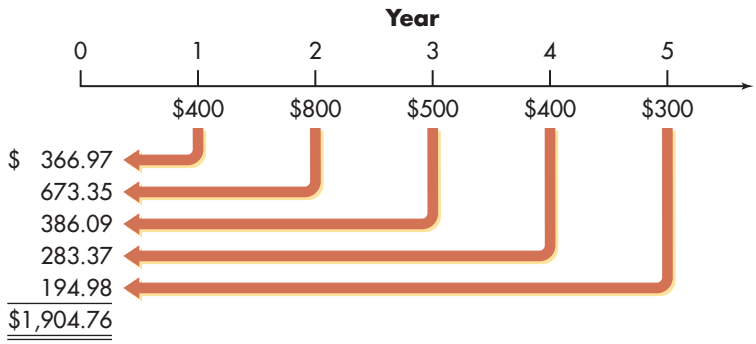
MyLab Finance Solution Video

Frey Company, a shoe manufacturer, has the opportunity to receive the following mixed stream of cash flows over the next 5 years.

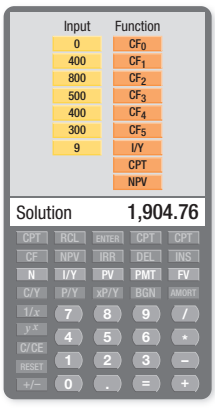
Time	Cash flow
0	$ 0
1	400
2	800
3	500
4	400
5	300

If the firm must earn at least 9% on its investments, what is the most it should pay for this opportunity? This situation is depicted on the following timeline.

Timeline for present value of a mixed stream (end-of-year cash flows, discounted at 9% over the corresponding number of years)



MyLab Finance Financial Calculator



Calculator use You can use the NPV function on your financial calculator to find the present value of the mixed cash flow stream. Recall that to accomplish this task you must first enter the mixed stream of cash flows into your financial calculator's cash flow register by using the CF key. For Frey enter the following into your calculator's cash flow register: $CF_0 = 0$, $CF_1 = 400$, $CF_2 = 800$, $CF_3 = 500$, $CF_4 = 400$, $CF_5 = 300$. Next enter the interest rate of 9% and then solve for the NPV. The present value of Frey Company's mixed cash flow stream found using a calculator is $1,904.76.

Spreadsheet use To calculate the present value of a mixed stream in Excel, we will use the NPV function. The present value of the mixed stream of future cash flows can be calculated as shown on the following Excel spreadsheet.

MyLab

	A	B
1	PRESENT VALUE OF A MIXED STREAM	
2	Year	Cash Flow
3	1	$400
4	2	$800
5	3	$500
6	4	$400
7	5	$300
8	Annual rate of interest	9%
9	Present value	$1,904.76
Entry in Cell B9 is =NPV(B8,B3:B7).		

→ REVIEW QUESTION MyLab Finance Solutions

5–18 How do you calculate the future value of a mixed stream of cash flows? How do you calculate the present value of a mixed stream?

→ EXCEL REVIEW QUESTION MyLab Finance Solutions

5–19 To give yourself a financial head start after college, you have decided to work summer jobs and invest the money you earn until after graduation. You expect that your earnings each summer will vary depending on the job you get. Using the information provided at MyLab Finance, find the value of your financial head start after graduation.

LG 5

5.5 Compounding Interest More Frequently Than Annually

Interest often compounds more frequently than once a year. Savings institutions compound interest semiannually, quarterly, monthly, weekly, daily, or even continuously. This section discusses various issues and techniques related to these more frequent compounding intervals.

SEMIANNUAL COMPOUNDING

semiannual compounding
Compounding of interest over two periods within the year.

Semiannual compounding of interest involves an investment with two compounding periods within the year. Rather than paying the stated interest rate once a year, the investment pays one-half of the stated interest rate twice a year.

IRF **PERSONAL FINANCE EXAMPLE 5.15** Fred Moreno has decided to invest $100 in a savings account paying 8% interest compounded semiannually. If he leaves his money in the account for 24 months (2 years), he will receive 4% interest compounded over four periods, each of which is 6 months long. Table 5.4 shows that after 12 months (1 year) with 8% semiannual compounding, Fred will have $108.16; after 24 months (2 years), he will have $116.99.

TABLE 5.4 Future Value from Investing $100 at 8% Interest Compounded Semiannually over 24 Months (2 Years)

Period	Beginning principal	Future value calculation	Future value at end of period
6 months	$100.00	$100.00 × (1 + 0.04) =	$104.00
12 months	104.00	$104.00 × (1 + 0.04) =	$108.16
18 months	108.16	$108.16 × (1 + 0.04) =	$112.49
24 months	112.49	$112.49 × (1 + 0.04) =	$116.99

QUARTERLY COMPOUNDING

quarterly compounding
Compounding of interest over four periods within the year.

Quarterly compounding of interest involves four compounding periods within the year. One-fourth of the stated interest rate is paid four times a year.

IRF PERSONAL FINANCE EXAMPLE 5.16 Fred Moreno has found an institution that will pay him 8% interest compounded quarterly. If he leaves his money in this account for 24 months (2 years), he will receive 2% interest compounded over eight periods, each of which is 3 months long. Table 5.5 shows the amount Fred will have at the end of each period. After 12 months (1 year), with 8% quarterly compounding, Fred will have $108.24; after 24 months (2 years), he will have $117.17.

TABLE 5.5 Future Value from Investing $100 at 8% Interest Compounded Quarterly over 24 Months (2 Years)

Period	Beginning principal	Future value calculation	Future value at end of period
3 months	$100.00	$100.00 × (1 + 0.02) =	$102.00
6 months	102.00	$102.00 × (1 + 0.02) =	$104.04
9 months	104.04	$104.04 × (1 + 0.02) =	$106.12
12 months	106.12	$106.12 × (1 + 0.02) =	$108.24
15 months	108.24	$108.24 × (1 + 0.02) =	$110.41
18 months	110.41	$110.41 × (1 + 0.02) =	$112.62
21 months	112.62	$112.62 × (1 + 0.02) =	$114.87
24 months	114.87	$114.87 × (1 + 0.02) =	$117.17

Table 5.6 compares values for Fred Moreno's $100 at the end of years 1 and 2, given annual, semiannual, and quarterly compounding periods at the 8% rate. The table shows that *the more frequently interest compounds, the greater the amount of money that accumulates*. This statement is true for any interest rate above zero for any period of time.

TABLE 5.6 Future Value at the End of Years 1 and 2 from Investing $100 at 8% Interest, Given Various Compounding Periods

	Compounding period		
End of year	Annual	Semiannual	Quarterly
1	$108.00	$108.16	$108.24
2	116.64	116.99	117.17

A GENERAL EQUATION FOR COMPOUNDING

We can rewrite the future value formula (Equation 5.1) for situations when compounding takes place more than once per year. If m equals the number of times per year interest is compounded, the formula for the future value of a lump sum becomes

$$FV_n = PV_0 \times \left(1 + \frac{r}{m}\right)^{m \times n} \tag{5.9}$$

If $m = 1$, Equation 5.9 reduces to Equation 5.1. Thus, if interest compounds annually, Equation 5.9 will provide the same result as Equation 5.1. We illustrate the application of Equation 5.9 with a simple example.

PERSONAL FINANCE EXAMPLE 5.17 The preceding examples calculated the amount that Fred Moreno would have after 2 years if he deposited $100 at 8% interest compounded semiannually or quarterly. For semiannual compounding, m would equal 2 in Equation 5.9; for quarterly compounding, m would equal 4. Substituting the appropriate values for semiannual and quarterly compounding into Equation 5.9, we find that

1. *For semiannual compounding:*

$$FV_2 = \$100 \times \left(1 + \frac{0.08}{2}\right)^{2 \times 2} = \$100 \times (1 + 0.04)^4 = \$116.99$$

2. *For quarterly compounding:*

$$FV_2 = \$100 \times \left(1 + \frac{0.08}{4}\right)^{4 \times 2} = \$100 \times (1 + 0.02)^8 = \$117.17$$

These results agree with the values for FV_2 in Tables 5.4 and 5.5.

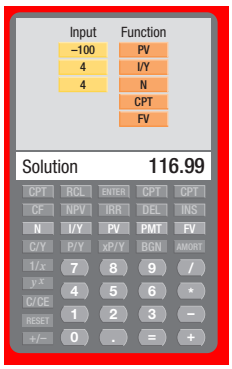
If the interest were compounded monthly, weekly, or daily, m would equal 12, 52, or 365, respectively.

USING COMPUTATIONAL TOOLS FOR COMPOUNDING

As before, we can simplify the computation process by using a calculator or spreadsheet program.

PERSONAL FINANCE EXAMPLE 5.18 Fred Moreno wished to find the future value of $100 invested at 8% interest compounded both semiannually and quarterly for 2 years.

MyLab Finance Financial Calculator

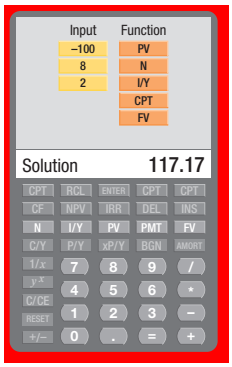


Calculator use If the calculator were used for the semiannual compounding calculation, the number of periods would be 4, and the interest rate would be 4%. The future value of $116.99 will appear on the calculator display as shown to the left.

For the quarterly compounding case, the number of periods would be 8 and the interest rate would be 2%. The future value of $117.17 will appear on the calculator display as shown on the next page.

Spreadsheet use The future value of the single amount with semiannual and quarterly compounding also can be calculated as shown on the following Excel spreadsheet.

MyLab Finance Financial Calculator



MyLab

	A	B
1	FUTURE VALUE OF A SINGLE AMOUNT WITH SEMIANNUAL AND QUARTERLY COMPOUNDING	
2	Present value	–$100
3	Annual rate of interest	8%
4	Compounding frequency - semiannual	2
5	Number of years	2
6	Future value with semiannual compounding	$116.99
7	Present value	–$100
8	Annual rate of interest	8%
9	Compounding frequency - quarterly	4
10	Number of years	2
11	Future value with quarterly compounding	$117.17

Entry in Cell B6 is =FV(B3/B4,B5*B4,0,B2,0).
Entry in Cell B11 is =FV(B8/B9,B10*B9,0,B7,0).
The minus sign appears before the $100 in B2 and B7 because the cost of the investment is treated as a cash outflow.

CONTINUOUS COMPOUNDING

continuous compounding
Compounding of interest, literally, all the time. Equivalent to compounding interest an infinite number of times per year.

As the number of compounding periods per year gets very large, we approach a situation in which we compound interest continuously. In this case interest compounds every second (or even every nanosecond)—literally, interest compounds all the time. In this case, m in Equation 5.9 would approach infinity, and as m approaches infinity, Equation 5.9 converges to

$$FV_n = PV_0 \times e^{r \times n} \tag{5.10}$$

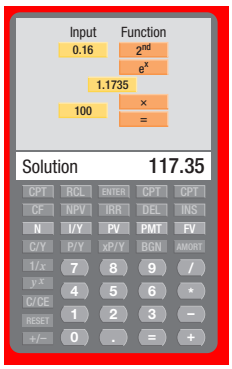
where e is the exponential function,[2] which has a value of approximately 2.7183.

IRF PERSONAL FINANCE EXAMPLE 5.19

To find the value after 2 years ($n = 2$) of Fred Moreno's $100 deposit ($PV_0 = \$100$) in an account paying 8% annual interest ($r = 0.08$) compounded continuously, we can substitute into Equation 5.10:

$$\begin{aligned} FV_2 \text{ (continuous compounding)} &= \$100 \times e^{0.08 \times 2} \\ &= \$100 \times 2.7183^{0.16} \\ &= \$100 \times 1.1735 = \$117.35 \end{aligned}$$

MyLab Finance Financial Calculator



Calculator use To find this value using the calculator, you must first find the value of $e^{0.16}$ by punching in 0.16 and then pressing 2nd and then e^x to get 1.1735. Next multiply this value by $100 to obtain the future value of $117.35, as shown at the left. (*Note:* On some calculators, you may not have to press 2nd before pressing e^x.)

Spreadsheet use The following Excel spreadsheet shows how to calculate the future value of Fred's deposit with continuous compounding.

2. Most calculators have the exponential function, typically noted by e^x. The use of this key is especially helpful in calculating future value when interest is compounded continuously.

MyLab

	A	B
1	FUTURE VALUE OF A SINGLE AMOUNT WITH CONTINUOUS COMPOUNDING	
2	Present value	$100
3	Annual rate of interest, compounded continuously	8%
4	Number of years	2
5	Future value with continuous compounding	$117.35
Entry in Cell B5 is =B3*EXP(B3*B4).		

As expected, Fred's deposit grows more with continuous compounding than it does with semiannual ($116.99) or quarterly ($117.17) compounding. In fact, continuous compounding produces a greater future value than any other compounding frequency.

NOMINAL AND EFFECTIVE ANNUAL RATES OF INTEREST

nominal (stated) annual rate
Contractual annual rate of interest charged by a lender or promised by a borrower.

effective (true) annual rate (EAR)
The annual rate of interest actually paid or earned.

Both businesses and investors need to make objective comparisons of loan costs or investment returns over different compounding periods. To put interest rates on a common basis for comparison, we distinguish between nominal and effective annual rates. The **nominal, or stated, annual rate** is the contractual annual rate of interest charged by a lender or promised by a borrower. The **effective, or true, annual rate (EAR)** is the annual rate of interest actually paid or earned. The effective annual rate reflects the effects of compounding frequency, whereas the nominal annual rate does not.

Using the notation introduced earlier, we can calculate the effective annual rate, EAR, by substituting values for the nominal annual rate, r, and the compounding frequency, m, into the equation

$$EAR = \left(1 + \frac{r}{m}\right)^m - 1 \tag{5.11}$$

We can apply Equation 5.11 using data from preceding examples.

PERSONAL FINANCE EXAMPLE 5.20 Fred Moreno wishes to find the effective annual rate associated with an 8% nominal annual rate ($r = 0.08$) when interest is compounded (1) annually ($m = 1$), (2) semiannually ($m = 2$), and (3) quarterly ($m = 4$). Substituting these values into Equation 5.11, we get

1. *For annual compounding:*

$$EAR = \left(1 + \frac{0.08}{1}\right)^1 - 1 = (1 + 0.08)^1 - 1 = 1 + 0.08 - 1 = 0.08 = 8\%$$

2. *For semiannual compounding:*

$$EAR = \left(1 + \frac{0.08}{2}\right)^2 - 1 = (1 + 0.04)^2 - 1 = 1.0816 - 1 = 0.0816 = 8.16\%$$

3. *For quarterly compounding:*

$$EAR = \left(1 + \frac{0.08}{4}\right)^4 - 1 = (1 + 0.02)^4 - 1 = 1.0824 - 1 = 0.0824 = 8.24\%$$

Calculator use To find the *EAR* using the calculator, you first need to enter the nominal annual rate and the compounding frequency per year. Most financial calculators have a NOM key for entering the nominal rate and either a P/Y or C/Y key for entering the compounding frequency per year. Once you enter these inputs, depress the EFF or CPT key to display the corresponding effective annual rate.

Spreadsheet use You can convert nominal interest rates to effective rates (or vice versa) using Excel's EFFECT and NOMINAL functions. To find the *EAR*, the EFFECT function asks you to input the nominal annual rate and the compounding frequency. If you input an *EAR* and the compounding frequency, the NOMINAL function provides the nominal annual rate or the annual percentage rate (APR). Interest rate conversions from the 8% *APR* to the semiannual *EAR* and from the quarterly *EAR* back to the 8% *APR* are shown on the following Excel spreadsheet.

MyLab

	A	B
1	INTEREST RATE CONVERSION NOMINAL VS. EFFECTIVE ANNUAL RATE	
2	Nominal annual rate of interest	8%
3	Compounding frequency - semiannual	2
4	Effective annual rate of interest	8.16%
5	Nominal annual rate of interest	8%
6	Compounding frequency - quarterly	4
7	Effective annual rate of interest	8.24%
	Entry in Cell B4 is =EFFECT(B2,B3). Entry in Cell B5 is =NOMINAL(B7,B6).	

These examples demonstrate two important points. First, the nominal rate equals the effective rate if compounding occurs annually. Second, the effective annual rate increases with increasing compounding frequency, up to a limit that occurs with continuous compounding.[3]

annual percentage rate (APR)
The nominal annual rate of interest, found by multiplying the periodic rate by the number of periods in one year, that must be disclosed to consumers on credit cards and loans as a result of "truth-in-lending laws."

annual percentage yield (APY)
The effective annual rate of interest that must be disclosed to consumers by banks on their savings products as a result of "truth-in-savings laws."

At the consumer level, "truth-in-lending laws" require disclosure on credit card and loan agreements of the **annual percentage rate (APR).** The APR is the nominal annual rate, which is found by multiplying the periodic rate by the number of periods in 1 year. For example, a bank credit card that charges 1.5% per month (the periodic rate) would have an APR of 18% (1.5% per month $\times$ 12 months per year).

"Truth-in-savings laws," in contrast, require banks to quote the **annual percentage yield (APY)** on their savings products. The APY is the effective annual rate a savings product pays. For example, a savings account that pays 0.75% per month would have an APY of 9.38% $[(1.0075)^{12} - 1]$.

Quoting loan interest rates at their lower nominal annual rate (the APR) and savings interest rates at the higher effective annual rate (the APY) offers two advantages. First, it tends to standardize disclosure to consumers. Second, it enables financial institutions to quote the most attractive interest rates: low loan rates and high savings rates.

3. The effective annual rate for this extreme case can be found by using the equation

$$EAR \text{ (continuous compounding)} = e^r - 1 \qquad (5.11a)$$

For the 8% nominal annual rate ($r = 0.08$), substitution into Equation 5.10a results in an effective annual rate of

$$e^{0.08} - 1 = 1.0833 - 1 = 0.0833 = 8.33\%$$

in the case of continuous compounding. This result is the highest effective annual rate attainable with an 8% nominal rate.

→ REVIEW QUESTIONS MyLab Finance Solutions

5–20 What effect does compounding interest more frequently than annually have on (**a**) future value and (**b**) the effective annual rate (EAR)? Why?

5–21 How does the future value of a deposit subject to continuous compounding compare to the value obtained by annual compounding?

5–22 Differentiate between a nominal annual rate and an effective annual rate (EAR). Define annual percentage rate (APR) and annual percentage yield (APY).

FOCUS ON ETHICS *in practice*

Was the Deal for Manhattan a Swindle?

Most schoolchildren marvel when hearing Manhattan was purchased for a song in 1626. As the story goes, Peter Minuit of the Dutch West India Company gave the Lenape Native Americans beads and trinkets worth a mere $24 for the island.

But wait. A letter written by Dutch merchant, Pieter Schage, on November 5, 1626 to the directors of the Dutch West India Company confirmed the transaction but valued the goods (which more likely were kettles, muskets, powder, and axes) at 60 Dutch guilders. According to the *International Institute of Social History*, 60 Dutch guilders in 1626 are worth about 787 Euros today after adjusting for inflation. Based on the recent exchange rate between the Euro and the U.S. dollar, that translates to about $871. Now, the deal looks a bit better for the Lenape. But the surface area of Manhattan comprises 636,000 square feet, and condos there sell for an average of $1,700 *per square foot*. So even after adjusting for price changes since 1626, Minuit still looks pretty sly.

Before closing the case, consider one more factor. The average annualized return on U.S. stocks over the last 200 years was 6.6%. If 60 Dutch guilders were invested at 6.6% from 1626 to today, the sum would grow to roughly *4 trillion* guilders or $2 trillion. Based on New York City's Department of Finance property tax assessments, $2 trillion is roughly twice the value of all New York City real estate today!

Of course, when the deal for Manhattan was struck, the first asset trading of any kind on a street called Wall lay over 80 years in the future, so the Lenape could not salt the receipts away in stocks. Still, the illustration makes the larger point—compounding is a magical thing! And given this magic, it is less clear who fleeced whom.

▶ *People without finance training often fail to appreciate the power of compound interest. Consider the following data for a typical credit card:*

Outstanding Balance:	$5,000
Annual Percentage Rate (APR):	12%
Minimum Payment:	Larger of [(1% + APR/12) × balance] or $25

	Minimum Payment Only	$100 Payment Each Month
Monthly Payments to Zero Balance	208	71
Total Interest Paid	$4,242	$1,993

The first minimum payment is $100, but that minimum will decline each month as the outstanding balance shrinks. Making the minimum payment every month means that the borrower takes 17 years to pay off the card, paying more than $4,000 in interest along the way. By paying $100 each month, however, the borrower repays the debt in one-third the time and at less than half the interest cost.

How much responsibility do lenders have to educate borrowers? Does the fact that the government requires disclosure statements with a few standardized examples illustrating the time value of money change your answer?

→ EXCEL REVIEW QUESTIONS MyLab Finance Solutions

5–23 You are responsible for managing your company's short-term investments and you know that the compounding frequency of investment opportunities is quite important. Using the information provided at MyLab Finance, calculate the future value of an investment opportunity based on various compounding frequencies.

5–24 What if your short-term investments provide continuous compounding? Using the information provided at MyLab Finance, determine the future value of an investment opportunity based on continuous compounding.

5–25 Rather than comparing future values, you often compare the effective annual rates of various investment opportunities with differing compounding frequencies. Using the information provided at MyLab Finance, solve for the effective annual rates of several investment opportunities with different compounding frequencies.

LG 6

5.6 Special Applications of Time Value

Future-value and present-value techniques have a number of important applications in finance. We'll study four of them in this section: (1) determining deposits needed to accumulate a future sum, (2) loan amortization, (3) finding interest or growth rates, and (4) finding an unknown number of periods.

DETERMINING DEPOSITS NEEDED TO ACCUMULATE A FUTURE SUM

Suppose that you want to buy a house 5 years from now, and you estimate that an initial down payment of $30,000 will be required at that time. To accumulate the $30,000, you will wish to make equal annual end-of-year deposits into an account paying annual interest of 6%. The solution to this problem is closely related to the process of finding the future value of an annuity. You must determine what size annuity will have a future value of $30,000 after 5 years.

Earlier in the chapter we used Equation 5.3 to find the future value of an ordinary annuity that made a payment, CF_1, each year. In the current problem, we know the future value we want to achieve, $30,000, but we want to solve for the annual cash payment that we'd have to save to achieve that goal. Solving Equation 5.3 for CF_1 gives

$$CF_1 = FV_n \div \left\{ \frac{[(1 + r)^n - 1]}{r} \right\} \tag{5.12}$$

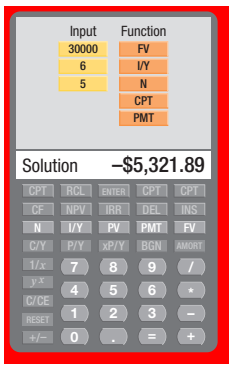
Plugging the relevant values into Equation 5.12, we find that the annual deposit required is $5,321.89.

$$CF_1 = \$30{,}000 \div \left\{ \frac{[(1 + 0.06)^5 - 1]}{0.06} \right\} = \$30{,}000 \div \left\{ \frac{0.3382256}{0.06} \right\} = \$5{,}321.89$$

As a practical matter, to solve problems like this one, analysts nearly always use a calculator or Excel as demonstrated in the following example.

PERSONAL FINANCE EXAMPLE 5.21 As just stated, you want to determine the equal annual end-of-year deposits required to accumulate $30,000 after 5 years, given an interest rate of 6%.

MyLab Finance Financial Calculator



Calculator use Using the calculator inputs shown at the left, you will find the annual deposit amount to be $5,321.89. Thus, if $5,321.89 is deposited at the end of each year for 5 years at 6% interest, there will be $30,000 in the account after 5 years.

Spreadsheet use In Excel, solving for the annual cash flow that helps you reach the $30,000 means using the payment function. Its syntax is PMT (rate,nper,pv, fv,type). We have previously discussed all the inputs in this function. The following Excel spreadsheet illustrates how to use this function to find the annual payment required to save $30,000.

MyLab

	A	B
1	ANNUAL DEPOSITS AMOUNT TO ACCUMULATE A FUTURE SUM	
2	Future value	$30,000
3	Annual rate of interest	6%
4	Number of years	5
5	Annual annuity payment	–$5,321.89

Entry in Cell B5 is =PMT(B3,B4,0,B2,0). The minus sign appears before the annuity payment in B5 because deposit amounts are cash outflows for the investor.

LOAN AMORTIZATION

loan amortization
The determination of the equal periodic loan payments necessary to provide a lender with a specified interest return and to repay the loan principal over a specified period.

loan amortization schedule
A schedule of equal payments to repay a loan. It shows the allocation of each loan payment to interest and principal.

The term **loan amortization** refers to a situation in which the borrower makes fixed periodic payments and gradually pays down the loan principal over time. A **loan amortization schedule** is a record of the payments that a borrower makes, including the interest and principal components of each payment, and the schedule shows the remaining loan balance after each payment. Many consumer loans such as home mortgages and car loans are typically structured as amortizing loans. In terms of time-value-of-money-concepts, the stream of fixed payments in an amortizing loan has the same present value as the original principal. In other words, given the principal, the interest rate, and the term (i.e., the length of time that the borrower makes payments) of the loan, we can calculate the periodic loan payment by finding an annuity that has the same present value as the loan principal.

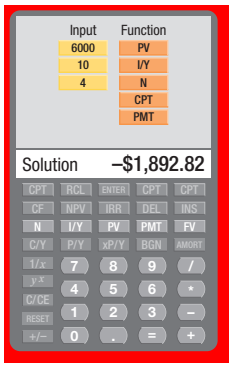
Earlier in the chapter, Equation 5.4 demonstrated how to find the present value of an ordinary annuity given information about the number of time periods, the interest rate, and the annuity's periodic payment. We can rearrange that equation to solve for the payment, our objective in this problem:

$$CF_1 = (PV_0 \times r) \div \left[1 - \frac{1}{(1 + r)^n}\right] \tag{5.13}$$

PERSONAL FINANCE EXAMPLE 5.22 Alex May borrows $6,000 from a bank. The bank requires Alex to repay the loan fully in 4 years by making four end-of-year payments. The interest rate on the loan is 10%. What is the loan payment that Alex will have to make each year? Plugging the appropriate values into Equation 5.13, we have

$$CF_1 = (\$6{,}000 \times 0.10) \div \left[1 - \frac{1}{(1 + 0.10)^4}\right] = \$600 \div 0.316987 = \$1{,}892.82$$

MyLab Finance Financial Calculator



Calculator use Using the calculator inputs shown at the left, you verify that Alex's annual payment will be $1,892.82. Thus, to repay the interest and principal on a $6,000, 10%, 4-year loan, equal annual end-of-year payments of $1,892.82 are necessary.

Table 5.7 provides a loan amortization schedule that shows the principal and interest components of each payment. The portion of each payment that represents interest (column 3) declines over time, and the portion going to principal repayment (column 4) increases. Every amortizing loan displays this pattern; as each payment reduces the principal, the interest component declines, leaving a larger portion of each subsequent loan payment to repay principal. Notice that after Alex makes the fourth payment, the remaining loan balance is zero.

Spreadsheet use The first spreadsheet below shows how to calculate the annual loan payment, and the second spreadsheet illustrates the construction of an amortization schedule.

MyLab

	A	B
1	ANNUAL PAYMENT AMOUNT TO REPAY A LOAN	
2	Present value	$6,000
3	Annual rate of interest	10%
4	Number of years	4
5	Annual loan payment	–$1,892.82

Entry in Cell B5 is =PMT(B3,B4,B2,0,0). The minus sign appears before the loan payment in B5 because loan payments are cash outflows for the borrower.

TABLE 5.7 Loan Amortization Schedule ($6,000 Principal, 10% Interest, 4-Year Repayment Period)

End-of-year	Beginning-of-year principal (1)	Loan payment (2)	Payments: Interest [0.10 × (1)] (3)	Payments: Principal [(2) − (3)] (4)	End-of-year principal [(1) − (4)] (5)
1	$6,000.00	$1,892.82	$600.00	$1,292.82	$4,707.18
2	4,707.18	1,892.82	470.72	1,422.10	3,285.08
3	3,285.08	1,892.82	328.51	1,564.31	1,720.77
4	1,720.77	1,892.82	172.08	1,720.74	—[a]

[a]Because of rounding, a slight difference ($0.03) exists between the beginning-of-year-4 principal (in column 1) and the year-4 principal payment (in column 4).

	A	B	C	D	E
1	LOAN AMORTIZATION SCHEDULE				
2		Loan principal		$6,000	
3		Annual rate of interest		10%	
4		Number of years		4	
5		Annual annuity payments			
6	Year	Total	To Interest	To Principal	Year-End Principal
7	0				$6,000.00
8	1	–$1,892.82	–$600.00	–$1,292.82	$4,707.18
9	2	–$1,892.82	–$470.72	–$1,422.11	$3,285.07
10	3	–$1,892.82	–$328.51	–$1,564.32	$1,720.75
11	4	–$1,892.82	–$172.07	–$1,720.75	$0.00

Key Cell Entries

Cell B8 is =PMT(D3,D4,D2,0,0), copy to B9:B11
Cell C8 is =-D3*E7, copy to C9:C11
Cell D8 is =B8-C8, copy to D9:D11
Cell E8 is =E7+D8, copy to E9:E11
The minus sign appears before the loan payments because these are cash outflows for the borrower.

FINDING INTEREST OR GROWTH RATES

One of the performance measures that investors and corporate managers focus on most is growth. How fast a firm can grow its sales, earnings, or cash flows is an important signal about its competitive position in the market. Similarly, people who want to judge their own performance as investors look at the growth rate in the value of their investment portfolio or in the prices of particular stocks they own. Finding a growth rate involves the same mathematics as finding an interest rate, because the interest rate determines how fast money grows over time. To calculate a growth rate, we again make use of Equation 5.1, but in this case we want to solve for the interest rate (or growth rate) representing the increase in value of some investment between two time periods. Solving Equation 5.1 for r, we have

$$r = \left(\frac{FV_n}{PV_0}\right)^{1/n} - 1 \tag{5.14}$$

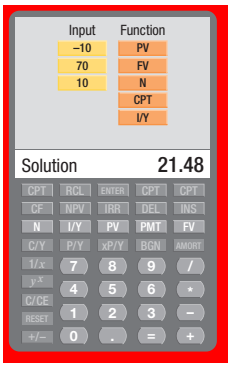
The simplest situation is one in which an investment's value has changed over time, and you want to know what compound annual rate of growth (or interest) is consistent with the change in value that occurred over time.

PERSONAL FINANCE EXAMPLE 5.23 Consumers across the United States are familiar with Dollar Tree stores, which offer a vast array of items that cost just $1. Most shoppers at Dollar Tree probably do not know that the company's stock was one of the best-performing stocks during the decade that ended in 2016. An investor who purchased a $10 share of Dollar Tree stock at the end of 2006 saw the firm's stock price grow to $70 by 2016's close. What compound annual growth rate does that increase represent? Or, equivalently, what average annual rate of interest did shareholders earn over that period? Let the

initial $10 price represent the stock's present value in 2006, and let $70 represent the stock's future value 10 years later. Plugging the appropriate values into Equation 5.13, we find that Dollar Tree stock increased almost 21.5% per year over this decade.

$$r = (\$70 \div \$10)^{(1/10)} - 1 = 0.2148 = 21.48\%$$

MyLab Finance Financial Calculator



Calculator use Using the calculator to find the interest or growth rate, we treat the earliest value as a present value, *PV,* and the latest value as a future value, *FV*. (*Note:* Most calculators require either the *PV* or the *FV* value to be input as a negative value to calculate an unknown interest or growth rate.) If we think of an investor buying Dollar Tree stock for $10 at the end of 2016, we treat that $10 payment as a cash outflow. Then the $70 future value represents a cash inflow, as if the investor sold the stock in 2016 and received cash. The calculator screenshot confirms that the growth rate in Dollar Tree stock over this period was 21.48%.

Spreadsheet use The following spreadsheet shows how to find Dollar Tree's growth rate using Excel's RATE function. The syntax of that function is RATE(nper,pmt,pv,fv,type,guess). We have encountered the function's arguments *nper*, *pmt*, *pv*, *fv*, and *type* previously. In this problem, $10 is the present value, and $70 is the future value. We set the arguments *pmt* and *type* to zero because those arguments are needed to work with annuities, but we are calculating the growth rate by comparing two lump sums. The new argument in this function is *guess*, which in nearly all applications you can set to zero.

MyLab

	A	B
1	SOLVING FOR INTEREST OR GROWTH RATE OF A SINGLE AMOUNT INVESTMENT	
2	Present value	–$10
3	Future value	$70
4	Number of years	10
5	Annual rate of interest	21.48%
	Entry in Cell B5 is =RATE(B4,0,B2,B3,0,0). The minus sign appears before the $10 in B2 because we treat the investment's cost as a cash outflow.	

Sometimes individuals want to know the interest rate that is associated with a stream of cash flows rather than two lump sums. For example, if you pay a lump sum today in exchange for a stream of cash flows over several years, what rate of return is implicit in this arrangement? The most straightforward problem of this type involves solving for the interest rate embedded in an annuity.

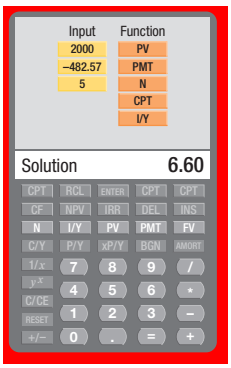
PERSONAL FINANCE EXAMPLE 5.24 Jan Jacobs can borrow $2,000 today, and she must repay the loan in equal end-of-year payments of $482.57 over 5 years. Notice that Jan's payments will total $2,412.85 (i.e., $482.57 per year × 5 years). That's more than she borrowed, so she is clearly paying interest on this loan, as

we'd expect. The question is, what annual interest rate is Jan paying? You could calculate the percentage difference between what Jan borrowed and what she repaid as follows:

$$\frac{\$2{,}412.85 - \$2{,}000}{\$2{,}000} = 0.206 = 20.6\%$$

Unfortunately, for two reasons this calculation does not tell us what interest rate Jan is paying. First, this calculation sums Jan's payments over 5 years, so it does not reveal the interest rate on her loan *per year*. Second, because each of Jan's payments comes at a different time, it is not valid to simply add them up. Time-value-of-money principles tell us that even though each payment is for $482.57, the payments have different values because they occur at different times. The key idea in this problem is that there is some interest rate at which the present value of the loan payments is equal to the loan principal. It's this interest rate that equates the loan principal to the present value of payments that we want to find. Solving for that algebraically is very difficult, so we rely on a calculator or spreadsheet to find the solution.

MyLab Finance Financial Calculator



Calculator use (*Note:* Most calculators require you to input either the *PMT* or the *PV* value as a negative number to calculate an unknown interest rate on an equal-payment loan. We take the approach of treating PMT as a cash outflow with a negative number.) Using the inputs shown at the left, you will find that the interest rate on this loan is 6.6%.

Spreadsheet use You can also calculate the interest on this loan as shown on the following Excel spreadsheet.

MyLab

	A	B
1	SOLVING FOR INTEREST OR GROWTH RATE OF AN ORDINARY ANNUITY	
2	Present value	$2,000
3	Annual annuity amount	–$482.57
4	Number of years	5
5	Annual rate of interest	6.60%

Entry in Cell B5 is =RATE(B4,B3,B2,0,0). The minus sign appears before the $482.57 in B3 because we treat the loan payment as a cash outflow.

FINDING AN UNKNOWN NUMBER OF PERIODS

Sometimes individuals want to know how long it will take them to reach a particular savings goal if they set aside a lump sum today or if they make fixed deposits into an investment account each year. The simplest situation is when a person wishes to determine the number of periods, n, it will take for an initial deposit, PV_0, to grow to a specified future amount, FV_n, given a stated interest rate, r. To solve this problem, we will once again rely on the basic future value relationship described in Equation 5.1, except that here we want to solve for n rather than FV_n.

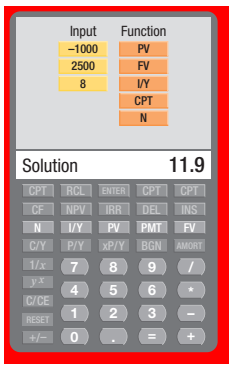
If we solve Equation 5.1 for n, we obtain the following equation

$$n = \frac{\log\left(\frac{FV_n}{PV_0}\right)}{\log\,(1 + r)} \tag{5.15}$$

In other words, to find the number of periods it takes to accumulate FV_n dollars starting with PV_0 dollars and earning rate r, we first take the logarithm of the ratio of the future value to the present value. Then we divide that by the logarithm of 1 plus the interest rate.

PERSONAL FINANCE EXAMPLE 5.25 Ann Bates wishes to determine how long it will take for her initial $1,000 deposit, earning 8% annual interest, to grow to $2,500. Applying Equation 5.15, at an 8% annual rate of interest, how many years, n, will it take for Ann's $1,000, PV_0, to grow to $2,500, FV_n?

MyLab Finance Financial Calculator



$$n = \frac{\log\left(\frac{\$2{,}500}{\$1{,}000}\right)}{\log\,(1.08)} = \frac{0.39794}{0.03342} = 11.9$$

Ann will have to wait almost 12 years to reach her savings goal of $2,500.

Calculator use Using the calculator, we treat the initial value as the present value, PV, and the latest value as the future value, FV. (*Note:* Most calculators require either the PV or the FV value to be input as a negative number to calculate an unknown number of periods. We treat Ann's $1,000 initial deposit as a cash flow and give it a negative number.) Using the inputs shown at the left, we verify that it will take Ann 11.9 years to reach her $2,500 goal.

Spreadsheet use You can calculate the number of years for the present value to grow to a specified future value using Excel's NPER function, as shown below.

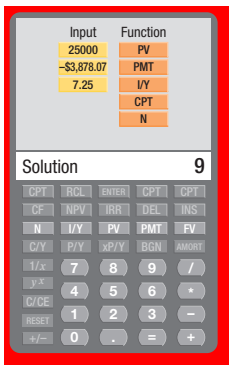
MyLab

	A	B
1	SOLVING FOR THE YEARS OF A SINGLE AMOUNT INVESTMENT	
2	Present value	–$1,000
3	Future value	$2,500
4	Annual rate of interest	8%
5	Number of years	11.9
	Entry in Cell B5 is =NPER(B4,0,B2,B3,0). The minus sign appears before the $1,000 in B2 because we treat the initial deposit as a cash outflow.	

A similar type of problem involves finding the number of level payments required to pay off a loan. That is, suppose we know the loan principal, the loan payment, and the interest rate. With that information we can determine how many payments will be required to completely repay the loan. Here again the loan principal is the present value, and we want a stream of annuity payments that have the same present value. We know the interest rate, but we do not know how many loan payments are required.

PERSONAL FINANCE EXAMPLE 5.26 Bill Smart can borrow $25,000 at a 7.25% annual interest rate. The lender requires Bill to make equal, end-of-year payments of $3,878.07. Bill wishes to determine how long it will take to fully repay the loan. The algebraic solution to this problem is a bit tedious, so we will find the answer with a calculator or spreadsheet.

MyLab Finance Financial Calculator



Calculator use (*Note:* Most calculators require either the *PV* or the *PMT* value to be input as a negative number to calculate an unknown number of periods. We treat the loan payments as cash outflows here and show them with a negative number.) Using the inputs at the left, you will find the number of periods to be 9 years. So, after making 9 payments of $3,878.07, Bill will have a zero outstanding balance.

Spreadsheet use The number of years to pay off the loan also can be calculated as shown on the following Excel spreadsheet.

MyLab

	A	B
1	SOLVING FOR THE YEARS TO REPAY A SINGLE LOAN AMOUNT	
2	Present value	$25,000
3	Annual payment amount	–$3,878.07
4	Annual rate of interest	7.25%
5	Number of years	9.0

Entry in Cell B5 is =NPER(B4,B3,B2,0,0). The minus sign appears before the $3,878.07 in B3 because we treat the loan payments as cash outflows.

→ REVIEW QUESTIONS MyLab Finance Solutions

5–26 How can you determine the size of the equal, end-of-year deposits necessary to accumulate a certain future sum at the end of a specified future period at a given annual interest rate?

5–27 Describe the procedure used to amortize a loan into a series of equal periodic payments.

5–28 How can you determine the unknown number of periods when you know the present and future values—single amount or annuity—and the applicable rate of interest?

→ EXCEL REVIEW QUESTIONS MyLab Finance Solutions

5–29 You want to buy a new car as a graduation present for yourself, but before finalizing a purchase you need to consider the monthly payment amount. Using the information provided at MyLab Finance, find the monthly payment amount for the car you are considering.

5–30 As a finance major, you realize that you can quickly estimate your retirement age by knowing how much you need to retire, how much you can contribute each month to your retirement account, and what rate of return you can earn on your retirement investments. With that information, you can solve for the number of years it will take to save the money you need to retire. Using the information provided at MyLab Finance, estimate the age at which you will be able to retire.

SUMMARY

FOCUS ON VALUE

The time value of money is an important tool that financial managers and other market participants use to compare cash inflows and outflows occurring at different times. Because firms routinely make investments that produce cash inflows over long periods of time, the effective application of time-value-of-money techniques is extremely important. These techniques enable financial managers to compare the costs of investments they make today to the cash inflows those investments will generate in future years. Such comparisons help managers achieve the firm's overall goal of share price maximization. It will become clear later in this text that the application of time-value techniques is a key part of the valuation process needed to make wealth-maximizing decisions.

REVIEW OF LEARNING GOALS

LG1 **Discuss the role of time value in finance, the use of computational tools, and the basic patterns of cash flow.** Financial managers and investors use time-value-of-money techniques when assessing the value of expected cash flow streams. Alternatives can be assessed by either compounding to find future value or discounting to find present value. Financial managers rely primarily on present-value techniques. Financial calculators and electronic spreadsheets streamline the application of time-value techniques. Cash flow patterns are of three types: a single amount or lump sum, an annuity, or a mixed stream.

LG2 **Understand the concepts of future value and present value, their calculation for single amounts, and the relationship between them.** Future value (FV) relies on compound interest to translate current dollars into future dollars. The initial principal or deposit in one period, along with the interest earned on it, becomes the beginning principal of the following period.

The present value (PV) of a future amount is the amount of money today that is equivalent to the given future amount, considering the return that can be earned. Present value is the inverse of future value.

LG3 **Find the future value and the present value of both an ordinary annuity and an annuity due, and find the present value of a perpetuity.** An annuity is a pattern of equal periodic cash flows. For an ordinary annuity, the cash flows occur at the end of the period. For an annuity due, cash flows occur at the beginning of the period.

The future or present value of an ordinary annuity can be found by using algebraic equations, a financial calculator, or a spreadsheet program. The value of an annuity due is always r% greater than the value of an identical annuity. The present value of a perpetuity—an infinite-lived annuity—equals the annual cash payment divided by the discount rate. The present value of a growing perpetuity equals the initial cash payment divided by the difference between the discount rate and the growth rate.

LG4 **Calculate both the future value and the present value of a mixed stream of cash flows.** A mixed stream of cash flows consists of unequal periodic cash flows that reflect no particular pattern. The future value of a mixed stream of cash flows is the sum of the future values of each cash flow. Similarly, the present value of a mixed stream of cash flows is the sum of the present values of the individual cash flows.

LG5 **Understand the effect that compounding interest more frequently than annually has on future value and on the effective annual rate of interest.** Interest can compound at intervals ranging from annually to daily and even continuously. The more often interest compounds, the larger the future amount that will be accumulated, and the higher the effective, or true, annual rate (EAR).

The annual percentage rate (APR)—a nominal annual rate—is quoted on credit cards and loans. The annual percentage yield (APY)—an effective annual rate—is quoted on savings products.

LG6 **Describe the procedures involved in (1) determining deposits needed to accumulate a future sum, (2) loan amortization, (3) finding interest or growth rates, and (4) finding an unknown number of periods.** (1) The periodic deposit to accumulate a given future sum can be found by solving the equation for the future value of an annuity for the annual payment. (2) A loan can be amortized into equal periodic payments by solving the equation for the present value of an annuity for the periodic payment. (3) Interest or growth rates can be estimated by finding the unknown interest rate in the equation for the present value of a single amount or an annuity. (4) The number of periods can be estimated by finding the unknown number of periods in the equation for the present value of a single amount or an annuity.

SELF-TEST PROBLEMS (Solutions in Appendix)

LG2 LG5 IRF

ST5–1 Future values for various compounding frequencies Delia Martin has $10,000 that she can deposit in any of three savings accounts for a 3-year period. Bank A compounds interest on an annual basis, bank B compounds interest twice each year, and bank C compounds interest each quarter. All three banks have a stated annual interest rate of 4%.

a. What amount would Ms. Martin have after 3 years, leaving all interest paid on deposit, in each bank?

b. What effective annual rate (EAR) would she earn in each of the banks?

c. On the basis of your findings in parts **a** and **b**, which bank should Ms. Martin deal with? Why?

d. If a fourth bank (bank D), also with a 4% stated interest rate, compounds interest continuously, how much would Ms. Martin have after 3 years? Does this alternative change your recommendation in part **c**? Explain why or why not.

LG3 IRF

ST5–2 Future values of annuities Ramesh Abdul has the opportunity to invest in either of two annuities, each of which will cost $38,000 today. Annuity X is an annuity due

that makes 6 cash payments of $9,000. Annuity Y is an ordinary annuity that makes 6 cash payments of $10,000. Assume that Ramesh can earn 15% on his investments.

a. On a purely intuitive basis (i.e., without doing any math), which annuity do you think is more attractive? Why?

b. Find the future value after 6 years for both annuities.

c. Use your finding in part **b** to indicate which annuity is more attractive. Why? Compare your finding to your intuitive response in part **a.**

LG 2 LG 3 LG 4 IRF

ST5–3 **Present values of single amounts and streams** You have a choice of accepting either of two 5-year cash flow streams or single amounts. One cash flow stream is an ordinary annuity, and the other is a mixed stream. You may accept alternative A or B, either as a cash flow stream or as a single amount. Given the cash flow stream and single amounts associated with each (see the following table), and assuming a 9% opportunity cost, which alternative (A or B) and in which form (cash flow stream or single amount) would you prefer?

	Cash flow stream	
Year	Alternative A	Alternative B
1	$700	$1,100
2	700	900
3	700	700
4	700	500
5	700	300
	Single amount	
At time zero	$2,825	$2,800

LG 6 IRF

ST5–4 **Deposits needed to accumulate a future sum** Judi Janson wishes to accumulate $8,000 by making equal, end-of-year deposits over the next 5 years. If Judi can earn 7% on her investments, how much must she deposit at the end of each year to meet this goal?

WARM-UP EXERCISES

Select problems are available in MyLab Finance.

LG 2

E5–1 Assume that Amaya Chidori makes a ¥40,000 deposit into an investment account in a bank in Sendai, Japan. If this account is currently paying 0.5% per annum, what will the account balance be after 2 years?

LG 2 LG 5

E5–2 Paul Jackson saved £6,200 over last 2 years and decided to invest in an individual savings account (ISA), which is a type of savings account that offers tax exemptions to residents of the United Kingdom. If the ISA pays 3% annual interest, what will the account balance be after 3 years?

LG 3

E5–3 Lisi Ji just won $12 million in the Hong Kong mega lottery. She is given the option of receiving a lump sum immediately, or she can elect to receive an annual payment of $1 million at the end of each year for the next 15 years. If Lisi can earn 8% annually on her investments, which option should she take?

LG 4

E5–4 Yassir Ismail is planning to install a new machine for his metal fabrication business in Dubai. The machine will cost AED240,000 (United Arab Emirates dirham). He estimates that the new machine will generate cash inflows shown in the following table, over its 5-year life.

Year	Cash flow (in AED)
1	42,000
2	50,000
3	62,000
4	48,000
5	40,000

Should Yassir purchase and install the new machinery if he expects a minimum annual return of 12% on his investment?

LG 5

E5–5 First Choice Bank wants to earn an effective interest rate of 18% per year. In order to suit different potential borrowers' needs, the bank offers two options. The first calculates interest on a weekly compounding basis while the second calculates interest compounded monthly. What interest rate is the bank required to report for the two options? Give one reason why a borrower might prefer an interest rate compounded monthly over one that is compounded weekly.

LG 6

E5–6 Jack and Jill have just had their first child. If they expect that college will cost $150,000 per year in 18 years, how much should the couple begin depositing annually at the end of each of the next 18 years to accumulate enough funds to pay 1 year of tuition 18 years from now? Assume they can earn a 6% annual rate of return on their investment.

PROBLEMS

Select problems are available in MyLab Finance. The MyLab icon indicates problems in Excel format available in MyLab Finance.

LG 1

P5–1 **Using a timeline** Barnaby PLC is considering starting a new branch of their business in Northern Ireland that requires an initial outlay of £280,000 and is expected to produce cash inflows of £80,000 at the end of years 1, 2, and 3; £70,000 at the end of years 4 and 5; and £90,000 at the end of year 6.

a. Draw and label a timeline depicting the cash flows associated with Barnaby's proposed investment.

b. Use arrows to demonstrate, on the timeline in part **a,** how compounding to find future value can be used to measure all cash flows at the end of year 6.

c. Use arrows to demonstrate, on the timeline in part **a,** how discounting to find present value can be used to measure all cash flows at the beginning of the period (time zero).

d. Which of the approaches—future value or present value—do you think financial managers rely on most often for decision making?

LG 2

P5–2 **Future value calculation** Without referring to the preprogrammed function on your financial calculator, use the basic formula for future value along with the given interest rate, r, and the number of periods, n, to calculate the future value of £1 in each of the cases shown in the following table.

Case	Interest rate, r	Number of periods, n
A	11%	4
B	8	5
C	10	2
D	7	3
E	4	6

LG 1 MyLab

P5–3 **Future value** You have $100 to invest. If you put the money into an account earning 5% interest compounded annually, how much money will you have in 10 years? How much money will you have in 10 years if the account pays 5% simple interest?

LG 2 MyLab

P5–4 **Future values** For each of the cases shown in the following table, calculate the future value of the single cash flow deposited today and held until the end of the deposit period if the interest is compounded annually at the rate specified.

Case	Single cash flow	Interest rate	Deposit period (years)
A	$ 200	5%	20
B	4,500	8	7
C	10,000	9	10
D	25,000	10	12
E	37,000	11	5
F	40,000	12	9

Personal Finance Problem

LG 2

P5–5 **Time value** James has €4,000 to invest in a savings account at 5% interest compounded annually.

a. Find out the compound value in the account after (1) 2 years, (2) 6 years, and (3) 10 years.

b. Use your findings in part **a** to calculate the amount of interest earned in (1) the first 2 years (years 1 to 2), (2) the next 4 years (years 3 to 6), and (3) the last 4 years (years 7 to 10)

c. Compare your findings in part **b.** Why does the amount of interest earned increase in each succeeding period?

Personal Finance Problem

LG 2

P5–6 **Time value** Isabella wishes to purchase a Nissan GTR. The car costs £85,000 today and, after completing her graduation, she has secured a well-paying job and is able to save for the car. The price trend indicates that its price will increase by 3% to 6% every year. Isabella wants to save enough to buy the car in 5 years from today.

a. Estimate the price of the car in 5 years if the price increases by (1) 3% per year and (2) 6% per year.

b. How much more expensive will the car be if the price increases by 6% rather than 3%?

Personal Finance Problem

LG2 MyLab

P5–7 **Time value** You can deposit $10,000 into an account paying 9% annual interest either today or exactly 10 years from today. How much better off will you be 40 years from now if you decide to make the initial deposit today rather than 10 years from today?

Personal Finance Problem

LG2

P5–8 **Time value** Peter just got his driver's license, and he wants to buy a new sports car for $70,000. He has $3,000 to invest as a lump sum today. Peter is a conservative investor and he only invests in safe products. After approaching different banks, he is offered the following investment opportunities:

a. River Bank's savings account with an interest rate of 10.8% compounded monthly.
b. First State Bank's savings account with an interest rate of 11.5% compounded annually.
c. Union Bank's saving account with an interest rate of 9.3% compounded weekly.

How long will it take for Peter to accumulate enough money to buy the car in each of the three cases?

Personal Finance Problem

LG2

P5–9 **Single-payment loan repayment** Kelly borrows $30,000, to start a motor repair business in Hong Kong, that she must repay in a lump sum within the next 9 years. The interest rate is 10% annually compounded. There is no prepayment penalty.

a. What amount will be due if she decides to repay the loan after 2 years?
b. How much would she have to repay after 5 years?
c. What amount is due at the end of 8 years?

LG2

P5–10 **Present value calculation** Without referring to the preprogrammed function on your financial calculator, use the basic formula for present value, along with the given discount rate, r, and the number of periods, n, to calculate the present value of $1 in each of the cases shown in the following table.

Case	Discount rate, r	Number of periods, n
A	2%	4
B	10	2
C	5	3
D	13	2

LG2

P5–11 **Present values** For each of the cases shown in the following table, calculate the present value of the cash flow. Assume that the cash flow is received at the end of the period noted in the table.

Cash	Single cash flow	Discount rate	Periods (years)
A	€ 8,000	11%	5
B	12,000	8	12
C	60,000	13	20
D	48,000	20	7
E	6,000	5	9

LG 2

P5–12 **Present value concept** Answer each of the following questions.

a. How much money would you have to invest today to accumulate $6,000 after 6 years if the rate of return on your investment is 12%?

b. What is the present value of $6,000 that you will receive after 6 years if the discount rate is 12%?

c. What is the most you would spend today for an investment that will pay $6,000 in 6 years if your opportunity cost is 12%?

d. Compare, contrast, and discuss your findings in parts **a** through **c**.

Personal Finance Problem

LG 2

P5–13 **Time value** Aziz Hussain has been offered an investment that will pay him $6,000 three years from today.

a. If he earns 8% compounded annually in a treasury bond, what value should he place on this opportunity today?

b. What is the most he should pay to purchase this investment today?

c. If Aziz can purchase this investment for less than the amount calculated in part **a**, what does that imply about the rate of return he will earn on the investment?

LG 2

P5–14 **Time value** An Iowa state savings bond can be converted to $100 at maturity 6 years from purchase. If the state bonds are to be competitive with U.S. savings bonds, which pay 3% annual interest (compounded annually), at what price must the state sell its bonds? Assume no cash payments on savings bonds prior to redemption.

Personal Finance Problem

LG 2

P5–15 **Time value and discount rates** John Ross has received his pension statement that promises to pay him a lump sum of £150,000 when he retires exactly 10 years from today. A pension release firm has offered him an immediate cash payment in exchange for his pension.

a. What is the least amount John should accept if he can earn the following rates of return on similar-risk investments during the 10-year period?
(1) 4%
(2) 8%
(3) 12%

b. Rework part **a** under the assumption that the £150,000 payment will be received in 15 rather than 10 years.

c. Compare your findings in parts **a** and **b**, and explain the relationship indicated between future value, length of investment, and the applicable rate of return.

Personal Finance Problem

LG 2

P5–16 **Time value comparisons of single amounts** In exchange for a $23,000 payment today, a well-known company will allow you to choose one of the alternatives shown in the following table. Your opportunity cost is 9%.

Alternative	Single amount
A	$28,500 at end of 3 years
B	$54,000 at end of 9 years
C	$160,000 at end of 20 years

a. Find the value today of each alternative.
b. Are all the alternatives acceptable? That is, are they worth $23,000 today?
c. Which alternative, if any, will you take?

Personal Finance Problem

LG 2 MyLab

P5–17 **Cash flow investment decision** Tom Alexander has an opportunity to purchase any of the investments shown in the following table. The purchase price, the amount of the single cash inflow, and its year of receipt are given for each investment. Which purchase recommendations would you make, assuming that Tom can earn 10% on his investments?

Investment	Price	Single cash inflow	Year of receipt
A	$18,000	$30,000	5
B	600	3,000	20
C	3,500	10,000	10
D	1,000	15,000	40

LG 2

P5–18 **Calculating deposit needed** Peter put £6,000 in an account earning 4% annually. After 4 years, he made another deposit into the same account. At the end of 6 years, the account balance is £13,000. What was the amount deposited at the end of year 4?

LG 3 MyLab

P5–19 **Future value of an annuity** For each case in the accompanying table, answer the questions that follow.

Case	Annuity payment	Interest rate	Annuity length (years)
A	$ 2,500	8%	10
B	500	12	6
C	30,000	20	5
D	11,500	9	8
E	6,000	14	30

a. Calculate the future value of the annuity, assuming that it is
(1) An ordinary annuity.
(2) An annuity due.
b. Compare your findings in parts **a**(1) and **a**(2). All else being identical, which type of annuity—ordinary or annuity due—is preferable? Explain why.

LG 3

P5–20 **Present value of an annuity** Consider the following cases.

Case	Annuity payment	Interest rate	Annuity length (years)
A	£ 30,000	8%	3
B	24,000	12	15
C	8,000	5	20
D	160,000	9	8
E	72,000	10	12

a. Calculate the present value of the annuity, assuming that it is
(1) An ordinary annuity.
(2) An annuity due.

b. Compare your findings in parts **a**(1) and **a**(2). All else being identical, which type of annuity is preferable—ordinary or annuity due? Explain why.

Personal Finance Problem

LG 3

P5–21 **Time value: Annuities** Marian Kirk wishes to select the better of two 10-year annuities. Annuity 1 is an ordinary annuity of $2,500 per year for 10 years. Annuity 2 is an annuity due of $2,300 per year for 10 years.

a. Find the future value of both annuities 10 years from now, assuming that Marian can earn (1) 6% annual interest and (2) 10% annual interest.

b. Use your findings in part **a** to indicate which annuity has the greater future value after 10 years for both the (1) 6% and (2) 10% interest rates.

c. Find the present value of both annuities, assuming that Marian can earn (1) 6% annual interest and (2) 10% annual interest.

d. Use your findings in part **c** to indicate which annuity has the greater present value for both (1) 6% and (2) 10% interest rates.

e. Briefly compare, contrast, and explain any differences between your findings using the 6% and 10% interest rates in parts **b** and **d.**

Personal Finance Problem

LG 3

P5–22 **Retirement planning** Jill Smyth, a 22-year-old university graduate, has just landed her first job and has planned to retire at age 62. She has decided to deopsit £5,000 every year in an individual savings account (ISA), which is tax-free for British citizens and gives a 5% per annum return.

a. If Jill continues to make end-of-year $5,000 deposits into the ISA, how much will she have accumulated in 40 years when she turns 62?

b. If Jill decides to wait until age 32 to begin making deposits into the ISA, how much will she have accumulated when she retires after 30 years?

c. Using your findings in parts **a** and **b,** discuss the impact of delaying deposits into the ISA for 10 years on the amount accumulated by the end of the period?

d. Rework parts **a** and **b,** assuming that Jill makes all deposits at the beginning, rather than the end, of each year. Discuss the effect of beginning-of-year deposits on the future value accumulated by the end of Jill's sixty-second year.

Personal Finance Problem

LG 3

P5–23 **Value of a retirement annuity** Your bank manager has informed you about a new investment plan that will provide you with $5,000 at the end of each of the next 20 years. If you have an opportunity to earn a guaranteed return of 6%, what is the most you would pay for this annuity right now?

Personal Finance Problem

LG 2 LG 3

P5–24 **Funding your retirement** John Wick is 50 years old and has saved nothing for retirement. However, he has just inherited £150,000 from his great grandfather and wants to invest it in a retirement plan. He plans to put the money in an investment account earning a 10% return. He will let the money accumulate for 15 years, when he will retire at the age of 65. He would like to deposit enough money so that he can begin making withdrawals of £40,000 per year starting at age 66 and continuing for

24 additional years, when he turns 90. He wants the balance in his account after the last withdrawal to be £0. After investing in his retirement plan, John wants to spend the rest of his money on a world tour.

a. How much money must John invest to achieve his goal? Construct a timeline to help visualize the details of this investment plan.

b. John realizes that once he retires he will want to invest only in less risky assets, like government securities that will earn a slightly lower rate of return—5%. So he will earn 10% until age 65, and then 5% per annum from age 65 to 90. How much money does he need to set aside now to achieve his retirement goal?

c. Suppose John has changed his mind and invests the entire inheritance into the account earning 10%. After making his last withdrawal at age 90, he wants to leave the remaining money to his niece. How much would his niece receive when John withdraws the last annual installment of £40,000?

Personal Finance Problem

LG2 LG3

P5–25 **Value of an annuity versus a single amount** Assume that you just won the state lottery. Your prize can be taken either in the form of $40,000 at the end of each of the next 25 years (i.e., $1,000,000 over 25 years) or as a single amount of $500,000 paid immediately.

a. If you expect to earn 5% annually on your investments over the next 25 years, ignoring taxes and other considerations, which alternative should you take? Why?

b. Would your decision in part **a** change if you could earn 7% rather than 5% on your investments over the next 25 years? Why?

c. At approximately what interest rate would you be indifferent between the two options?

LG3

P5–26 **Perpetuities** Consider the data in the following table.

Perpetuity	Annual payment	Discount rate
A	€120,000	8%
B	60,000	12
C	1,500	6
D	300,000	4
E	3000	7

Determine the present value of each perpetuity.

P5–27 **Perpetuities** Suppose you have been offered an investment opportunity that will pay you $500 at the end of every year, starting one year from now and continuing forever. Assume the relevant discount rate is 6%.

a. What is the maximum amount you would pay for this investment?

b. What would you pay if the first cash flow from this investment comes immediately, and the following cash payments of £500 after one year thereafter.

c. Suppose the first cash flow from this investment is 4 years from now, i.e., the first payment will be made at the end of fourth year and will continue every year thereafter. How much is this worth to you today?

MyLab

P5–28 **Perpetuities** You are evaluating an investment that will pay $75 in 1 year, and it will continue to make payments at annual intervals thereafter, but the payments will grow by 4% forever.

a. What is the present value of the first $75 payment if the discount rate is 10%?

b. How much cash will this investment pay 100 years from now? What is the present value of the 100th payment? Again, use a 10% discount rate.

c. What is the present value of the entire growing stream of perpetual cash flows?

d. Explain why the answers to parts **a** and **b** help to explain why an infinite stream of growing cash flows has a finite present value?

Personal Finance Problem

P5–29 **Creating an endowment** On completion of her introductory finance course, Marla Lee was so pleased with the amount of useful and interesting knowledge she gained that she convinced her parents, who were wealthy alumni of the university she was attending, to create an endowment. The endowment will provide for three students from low-income families to take the introductory finance course each year in perpetuity. The cost of taking the finance course this year is $200 per student (or $600 for 3 students), but that cost will grow by 2% per year forever. Marla's parents will create the endowment by making a single payment to the university today. The university expects to earn 6% per year on these funds.

a. What will it cost 3 students to take the finance class next year?

b. How much will Marla's parents have to give the university today to fund the endowment if it starts paying out cash flow next year?

c. What amount would be needed to fund the endowment if the university could earn 9% rather than 6% per year on the funds?

LG 4

P5–30 **Value of a mixed stream** For each of the mixed streams of cash flows shown in the following table, calculate the future value at the end of the final year if deposits are made into an account paying annual intertest of 8%. Assume that no withdrawls are made during the period and that the deposits are made

a. At the *end* of each year (i.e., the first deposit occurs 1 year from now)

b. At the *beginning* of each year (i.e., the first deposit occurs immediately)

	Cash flow stream		
Year	X	Y	Z
1	$20,000	$7,000	$15,000
2	10,000	9,000	12,000
3	15,000	6,000	13,000
4		5,000	11,000
5		8,000	

Personal Finance Problem

LG 4

P5–31 **Value of a single amount versus a mixed stream** Boris Miller has contracted to sell a piece of land that he owns, which has permission for a residential development. A property developer is willing to buy the land and has proposed two methods of payment. The developer is willing to pay £150,000 now or a deferred payment over the

next 4 years paying £40,000 at the end of year 1, £30,000 at the end of year 2, £50,000 at the end of year 3, and £60,000 at the end of year 4. Boris wants to use the proceeds at the end of year 5 to start a business and is concerned about future value of his receipts at the end of year 5. He can earn 4% annual interest from his investment account. Which alternative should Boris choose?

LG4 MyLab

P5–32 **Value of mixed streams** Find the present value of the streams of cash flows shown in the following table. Assume that the opportunity cost is 12%.

A		B		C	
Year	Cash flow	Year	Cash flow	Year	Cash flow
1	−$2,000	1	$10,000	1–5	$10,000/yr
2	3,000	2–5	5,000/yr	6–10	8,000/yr
3	4,000	6	7,000		
4	6,000				
5	8,000				

LG4

P5–33 **Present value: Mixed streams** Consider the mixed streams of cash flows shown in the following table.

	Cash flow stream	
Year	A	B
0	−$50,000	$10,000
1	40,000	20,000
2	30,000	30,000
3	20,000	40,000
4	10,000	−50,000
Totals	$50,000	$50,000

a. Find the present value of each stream using a 5% discount rate.
b. Compare the calculated present values and discuss them in light of the undiscounted cash flows totaling $50,000 in each case. Is there some discount rate at which the present values of the two streams would be equal?

LG1 LG4

P5–34 **Value of a mixed stream** Neil Tyson has developed a prototype of an armored fabric that is very light, but is capable of stopping projectiles as efficiently as a traditional bullet-proof jacket. A military supplier is considering the technology and has offered to pay Neil £30,000 in years 1, 2, and 3; and £40,000 in years 4 to 6. All payments will be made at the end of each year.

a. Lay out the cash flows involved in the offer on a timeline.
b. If Neil applies a required rate of return of 10% to them, what is the present value of this series of payments?
c. Another company has made an offer of a one-time payment of £275,000 for the fabric. Which offer should Neil accept?

LG 4

P5-35 Value of a mixed stream Cook Energy Ltd. plans to build a new low-cost nuclear power plant in France. The construction will cost €30 million right now, but cash flows of €12 million will start arriving at the end of years 1 to 8. The plant will need to be decommissioned at the end of year 5 and will cost €45 million for land restoration, to be paid at the end of year 9.

a. What is the total undiscounted cash flow associated with this project over its 9-year life? Given this answer, do you think Cook should accept this project? Why?
b. Assuming an interest rate of 8%, calculate the net present value of the project. What if the interest rate is 15%? Comment on what you find.

LG 4

P5–36 Relationship between future value and present value: Mixed stream Using the information in the accompanying table, answer the questions that follow. Assume all transactions take place at the end of the year.

Year	Cash flow ($)
1	$ 3,000
2	0
3	4,000
4	8,000
5	12,000
6	6,000

a. Using a discount rate of 7%, determine the present value of the cash flows.
b. Suppose you had a lump sum equal to your answer in part **a.** You invested this sum in an account earning a 7% return each year. How much would you have after 6 years?
c. Calculate the future value of cash flows 6 years from now and compare it to your answer in part **b.**
d. How much would you be willing to pay for this, assuming that you can earn 7% on your investments?

LG 4

P5–37 Relationship between future value and present value: Mixed stream The table below shows a mixed cash flow stream starting in 1 year, except that the cash flow for year 3 is missing.

Year 1	$10,000
Year 2	5,000
Year 3	
Year 4	20,000
Year 5	3,000

Suppose you somehow know that the present value of the entire stream is $32,911.03 and that the discount rate is 4%. What is the amount of the missing cash flow in year 3?

LG5

P5–38 Changing compounding frequency Using annual, semiannual, and quarterly compounding periods for each of the following, (1) calculate the future value if £10,000 is deposited initially and (2) determine the effective annual rate (EAR).

a. At 12% annual interest for 5 years.
b. At 15% annual interest for 8 years.
c. At 18% annual interest for 11 years.

LG5 MyLab

P5–39 Compounding frequency, time value, and effective annual rates For each of the cases in the table below:

a. Calculate the future value at the end of the specified deposit period.
b. Determine the effective annual rate, EAR.
c. Compare the nominal annual rate, r, to the effective annual rate, EAR. What relationship exists between compounding frequency and the nominal and effective annual rates?

Case	Amount of initial deposit	Nominal annual rate, r	Compounding frequency, m (times/year)	Deposit period (years)
A	$ 2,500	6%	2	5
B	50,000	12	6	3
C	1,000	5	1	10
D	20,000	16	4	6

LG5

P5–40 Continuous compounding For each of the cases in the following table, find the future value at the end of the deposit period, assuming that interest is compounded continuously at the given nominal annual rate.

Case	Amount of initial deposit	Nominal annual rate, r	Deposit period (years), n
A	$1,000	9%	2
B	600	10	10
C	4,000	8	7
D	2,500	12	4

Personal Finance Problem

LG5

P5–41 Compounding frequency and time value François plans to invest $4,000 in an individual savings account (ISA) at a nominal interest rate of 6%.

a. How much will François have in the account after 10 years if interest is compounded (1) annually, (2) semiannually, and (3) daily (assuming 365-day year).
b. What is the effective annual rate (EAR) for each compounding period in part **a**?
c. How much greater will François' ISA balance be if the interest is compounded continuously rather than semiannually for the same period?
d. Consider your answers in parts **a, b,** and **c.** What does it indicate about the relationship between compounding frequency and the compound value for nominal interest rates?

Personal Finance Problem

LG3 LG5

P5–42 **Annuities and compounding** Janet Boyle intends to deposit $300 per year in a credit union for the next 10 years, and the credit union pays an annual interest rate of 8%.

a. Determine the future value that Janet will have in 10 years, given that end-of-period deposits are made and no interest is withdrawn, if
(1) $300 is deposited annually and the credit union pays interest annually.
(2) $150 is deposited semiannually and the credit union pays interest semiannually.
(3) $75 is deposited quarterly and the credit union pays interest quarterly.

b. Use your findings in part **a** to discuss the effect of more frequent deposits and compounding of interest on the future value of an annuity.

LG6 MyLab

P5–43 **Deposits to accumulate future sums** For each case shown in the following table, determine the amount of the equal, end-of-year deposits necessary to accumulate the given sum at the end of the specified period, assuming the stated annual interest rate.

Case	Sum to be accumulated	Accumulation period (years)	Interest rate
A	$ 5,000	3	12%
B	100,000	20	7
C	30,000	8	10
D	15,000	12	8

Personal Finance Problem

LG6

P5–44 **Creating a retirement fund** Harry Brolin plans to retire after 38 years and wants to accumulate €180,000 when he retires. Harry plans to make equal, end-of-year deposits into a savings account paying 8% annual interest.

a. What amount does he need to deposit every year to create €180,000 in 38 years?

b. If Josh can afford to deposit only €700 per year into the account, how much will he have accumulated in 38 years?

Personal Finance Problem

LG6

P5–45 **Accumulating a growing future sum** You have $30,000, and you are making the decision between consumption and investment. You are considering either using all of the money to buy a new car or investing the whole amount. You have two investment options: You can either put the money into a savings account with a nominal interest rate of 5% compounded monthly, or invest the money in stocks with an expected return of 6% compounded continuously.

a. If you choose to invest, how much will you have 6 years later if you invested in (1) the savings account, or (2) stocks?

b. If you invested in the savings account, how long will it take for you to double your money?

c. Suppose the price of the car inflates by 2% per year. If you choose to invest your money in stocks, how long will it take for you to be able to afford 2 cars?

Personal Finance Problem

LG2 LG3 LG6

P5–46 **Inflation, time value, and annual deposits** Sadiq Ansari wants to support his daughter's education by paying for her MBA degree from a premier university in Britain. Research indicates that the fees for a 1-year MBA course at any good British university will cost £35,000 now. His daughter is 3 years old and he expects that he will need to pay her fees in 20 years. He wishes to invest a fixed amount at the end of each of the next 20 years to fund her degree. He is also aware that, on average, the fees are likely to increase by 4% annually.

a. What is the expected fees for an MBA degree in 20 years, when Sadiq will have to pay for his daughter's course?
b. How much must Sadiq invest at the end of each of the next 20 years if his investments pay 8% every year.
c. If Sadiq invests at the beginning instead of at the end of each year, how much must he invest each year if his investments pay the same 8% per year?

LG6 MyLab

P5–47 **Loan payment** Determine the equal, end-of-year payment required each year over the life of the loans shown in the following table to repay them fully during the stated term of the loan.

Loan	Principal	Interest rate	Term of loan (years)
A	$12,000	8%	3
B	60,000	12	10
C	75,000	10	30
D	4,000	15	5

Personal Finance Problem

LG6

P5–48 **Loan amortization schedule** Han Xiao just closed a $50,000 business loan that she must repay her brother, who has agreed to lend it at 5% annual interest. Han must repay the loan over the next 5 years, in 5 equal, end-of-year payments.
a. How much does Han have to pay every year if she has to repay the loan by the fifth end-of-year installment?
b. Prepare an amortization schedule showing the interest and principal breakdown of each loan payments.
c. Explain why the interest expense of each subsequent payment declines over time.

LG6

P5–49 **Loan interest deductions** Liz Rogers just closed a $10,000 business loan that she must repay in three equal, end-of-year payments. The interest rate on the loan is 13%. As part of her firm's detailed financial planning, Liz wishes to determine the annual interest deduction attributable to the loan. (Because it is a business loan, the interest portion of each loan payment is tax-deductible to the business.)
a. Determine the firm's annual loan payment.
b. Prepare an amortization schedule for the loan.
c. How much interest expense will Liz's firm have in *each* of the next 3 years as a result of this loan?

Personal Finance Problem

LG6

P5–50 **Monthly loan payments** Tim Smith is shopping for a used luxury car. He has found one priced at $30,000. The dealer has told Tim that if he can come up with a down payment of $5,000, the dealer will finance the balance of the price at a 6% annual rate over 3 years (36 months).
a. Assuming that Tim accepts the dealer's offer, what will his *monthly* (end-of-month) payment amount be?
b. Use a financial calculator or spreadsheet to help you figure out what Tim's *monthly* payment would be if the dealer were willing to finance the balance of the car price at a 4% annual rate.

LG6

P5–51 **Growth rates** Jamie Turner bought shares of stock in three different companies on January 1, 2012. He eventually sold his shares on January 1, 2017. The

following table shows his sale and purchase price for the three stocks. Calculate the average annual growth in each of the stock Jamie held over this time.

Company	Purchase price on January 1, 2012	Sale price on January 1, 2017
A	£6.40	£21.20
B	1.20	12.20
C	3.40	9.70

Personal Finance Problem

LG 6

P5–52 **Rate of return** Rishi Singh has $1,500 to invest. His investment counselor suggests that Rishi should buy an investment that pays no interest but will be worth $2,000 after 3 years.

a. What average annual rate of return will Rishi earn with this investment?

b. Rishi is considering another investment, of equal risk, that earns an annual return of 8%. Which investment should he make, and why?

Personal Finance Problem

LG 6

P5–53 **Rate of return and investment choice** Madeline Jones has $6,000 and wants to invest it. Because she is only 20 years old, she is not worried about the length of the investment's life. Her primary concern is the return she will earn on the investment. Her financial advisor has identified 4 investments that are ideal for her per her risk preferences. All the investments require an initial $6,000 payment.

Investment	Future cash inflow	Investment life (years)
A	$15,000	15
B	8,000	4
C	13,000	12
D	10,500	6

a. Calculate the average annual rate of return on each of the 4 investments available to Madeline.

b. Which investment would you recommend to Madeline, given her goal of maximizing the annual return?

LG 6

P5–54 **Rate of return: Annuity** Amit Krishnamurthy invests in a bond that promises him $6,000 each year for the next 20 years. If he pays $75,000 for this investment, what is his annual rate of return?

Personal Finance Problem

LG 6

P5–55 **Choosing the best annuity** Raina Herzig wishes to choose the best of four annuities available to her. In each case, in exchange for paying a lump sum today, she will receive equal, end-of-year cash payments for a specified number of years. She considers the annuities equally risky and is not concerned about their differing lives.

Her decision will be based solely on the rate of return she will earn on each annuity. The following table shows the key terms of the four annuities.

Annuity	Cost of annuity today	Annual cash flow	Life (years)
A	$30,000	$3,100	20
B	25,000	3,900	10
C	40,000	4,200	15
D	35,000	4,000	12

a. Calculate, to the nearest 1%, the rate of return on each of the four annuities Raina is considering.
b. Given Raina's stated decision criterion, which annuity would you recommend?

Personal Finance Problem

LG6

P5–56 **Interest rate for an annuity** April Bartrick has just received an inheritance of $1,000,000. She plans to invest the entire sum in an annuity, paying at the end of each year for the next 20 years. Two personal bankers suggest different long-term, fixed income instruments that she can invest in. However, the annual payment from the first investment is $94,393 and $117,459 from second investment.

a. What is the rate of return offered by the two investments (rounded off to the nearest whole percent)?
b. April is willing to settle for an annuity that carries an interest rate assumption of 9% per annum. What minimum annual payment would be acceptable for her?

Personal Finance Problem

LG6

P5–57 **Loan rates of interest** You have a credit card debt amounting to $50,000. The card charges you a 32% interest rate with monthly compounding. You believe that the interest rate of the existing debt is too high, so you decide to switch cards and move the outstanding balance on the old card to the new card. After doing some research, you find Cards A, B, and C as alternatives. If you move the existing debt to Card B or Card C, there will be extra charges (handling fees). Card B will charge $500, and Card C will charge $1,000 handling fees.

Card	Interest rate	Outstanding amount
A	30%	$50,000
B	29	50,500
C	28	51,000

a. If you pay off the debt in one year with equal monthly amounts, how much in interest payments have you saved by using (1) Card A, (2) Card B, and (3) Card C rather than keeping your existing card?
b. Which card should you choose?

LG6

P5–58 **Number of years needed to acccumulate a future amount** For each of the following cases, determine the number of years it will take for the initial deposit to grow to equal the future amount at the given interest rate.

Case	Initial deposit	Future amount	Interest rate
A	$ 300	$ 1,000	7%
B	12,000	15,000	5
C	9,000	20,000	10
D	100	500	9
E	7,500	30,000	15

Personal Finance Problem

LG 6

P5–59 **Time to accumulate a given sum** Manuel Rios wishes to determine how long it will take an initial deposit of $10,000 to double.

a. If Manuel earns 10% annual interest on the deposit, how long will it take for him to double his money?

b. How long will it take if he earns only 7% annual interest?

c. How long will it take if he can earn 12% annual interest?

d. Reviewing your findings in parts **a, b,** and **c,** indicate what relationship exists between the interest rate and the amount of time it will take Manuel to double his money.

P5–60 **Number of years to provide a given return** In each of the following cases, determine the number of years that the given ordinary annuity cash flows must continue to provide the desired rate of return given the cost of the annuity.

Case	Cost of annuity	Annuity payment	Desired rate of return
A	$ 1,000	$ 250	11%
B	150,000	30,000	15
C	80,000	10,000	10
D	600	275	9
E	17,000	3,500	6

Personal Finance Problem

LG 6

P5–61 **Time to repay installment loan** Mia Salto wishes to determine how long it will take to repay a $14,000 loan given that the lender requires her to make annual end-of-year installment payments of $2,450.

a. If the interest rate on the loan is 12%, how long will it take her to repay the loan fully?

b. How long will it take if the interest rate is 9%?

c. How long will it take if she has to pay 15% annual interest?

d. Reviewing your answers in parts **a, b,** and **c,** describe the general relationship between the interest rate and the amount of time it will take Mia to repay the loan fully.

LG 6

P5–62 **ETHICS PROBLEM** The Grameen Bank of Bangladesh is considered to be a pioneer institution in developing and promoting 'micro finance'. This emerging area in banking provides opportunities to the lowest income group of a society and offers loans as small as 1000 Bangladeshi Taka (approximately $12). However, they charge an interest rate of almost 20% per annum and have been criticized for

exploiting the poor. The Grameen Bank has defended its rates saying that the lower value of each loan adds to a substantial administration cost that needs to be recovered if the venture has to be financially viable. How would you respond to this defense of micro finance practices?

SPREADSHEET EXERCISE

At the end of 2019, Uma Corporation is considering a major long-term project in an effort to remain competitive in its industry. The production and sales departments have determined the potential annual cash flow savings that could accrue to the firm if it acts soon. Specifically, they estimate that a mixed stream of future cash flow savings will occur at the end of the years 2020 through 2025. The years 2026 through 2030 will see consecutive $90,0000 cash flow savings at the end of each year. The firm estimates that its discount rate over the first 6 years will be 7%. The expected discount rate over the years 2026 through 2030 will be 11%.

The project managers will find the project acceptable if it results in present cash flow savings of at least $860,000. The following cash flow savings data are supplied to the finance department for analysis.

Year	Cash flow savings
2020	$110,000
2021	120,000
2022	130,000
2023	150,000
2024	160,000
2025	150,000
2026	90,000
2027	90,000
2028	90,000
2029	90,000
2030	90,000

TO DO

Create spreadsheets similar to Table 5.3, and then answer the following questions.

a. Determine the value (at the end of 2019) of the future cash flow savings expected to be generated by this project.

b. Based solely on the one criterion set by management, should the firm undertake this specific project? Explain.

c. What is the "interest rate risk," and how might it influence the recommendation made in part **b**? Explain.

PART THREE

Valuation of Securities

CHAPTERS IN THIS PART

In Part Two, you learned how to use time-value-of-money tools to compare cash flows at different times. In Part Three, you will put those tools to use by valuing the two most common types of securities: bonds and stocks.

Chapter 6 introduces you to the world of interest rates and bonds. Although bonds are among the safest investments available, they are not without risk. The primary risk is that market interest rates will fluctuate. Those fluctuations cause bond prices to move, and those movements affect the returns that bond investors earn. Chapter 6 explains why interest rates vary from one bond to another and the factors that cause interest rates to move over time.

Chapter 7 focuses on stock valuation. It explains the characteristics of stock that distinguish it from debt and describes the differences between common and preferred stock. You'll have another chance to practice time-value-of-money techniques as Chapter 7 illustrates how to value stocks by discounting either (1) the dividends that stockholders receive or (2) the free cash flows that the firm generates over time.

CHAPTER 6

Interest Rates and Bond Valuation

LEARNING GOALS

- LG1 Describe interest rate fundamentals, the term structure of interest rates, and risk premiums.
- LG2 Review the legal aspects of bond financing and bond cost.
- LG3 Discuss the general features, yields, prices, ratings, popular types, and international issues of corporate bonds.
- LG4 Understand the key inputs and basic model used in the bond valuation process.
- LG5 Apply the basic valuation model to bonds, and describe the impact of required return and time to maturity on bond prices.
- LG6 Explain yield to maturity (YTM), its calculation, and the procedure used to value bonds that pay interest semiannually.

MyLab Finance Chapter Introduction Video

WHY THIS CHAPTER MATTERS TO YOU

In your *professional* life

ACCOUNTING You need to understand interest rates and the various types of bonds to be able to account properly for amortization of bond premiums and discounts and for bond issues and retirements.

INFORMATION SYSTEMS You need to understand the data that are necessary to track bond valuations and bond amortization schedules.

MANAGEMENT You need to understand the behavior of interest rates and how they affect the types of funds the firm can raise and the timing and cost of bond issues and retirements.

MARKETING You need to understand how the interest rate level and the firm's ability to issue bonds may affect the availability of financing for marketing research projects and new-product development.

OPERATIONS You need to understand how the interest rate level may affect the firm's ability to raise funds to maintain and grow the firm's production capacity.

In your *personal* life

Interest rates have a direct impact on personal financial planning. Movements in interest rates occur frequently and affect the returns from and values of savings and investments. The rate of interest you are charged on credit cards and loans can have a profound effect on your personal finances. Understanding the basics of interest rates is important to your personal financial success.

LG 1

6.1 Interest Rates and Required Returns

As noted earlier in this text, financial institutions and markets create the mechanism through which funds flow between savers (suppliers of funds) and borrowers (demanders of funds). All else being equal, savers would like to earn as much interest as possible, and borrowers would like to pay as little as possible. The interest rate prevailing in the market at any given time reflects the equilibrium between savers and borrowers.

INTEREST RATE FUNDAMENTALS

interest rate
Usually applied to debt instruments such as bank loans or bonds; the compensation paid by the borrower of funds to the lender; from the borrower's point of view, the cost of borrowing funds.

required return
Usually applied to equity instruments such as common stock; the cost of funds obtained by selling an ownership interest.

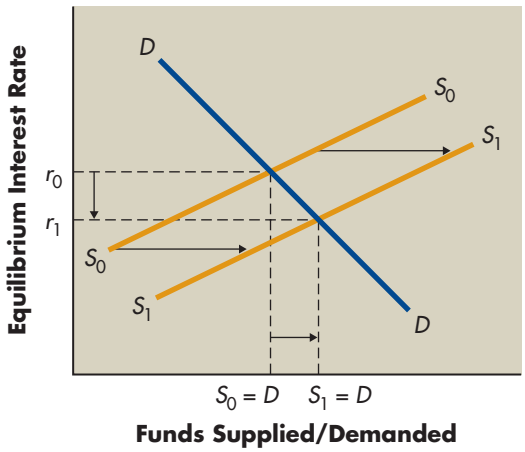
The *interest rate* or *required return* represents the cost of money. It is the compensation that a supplier of funds expects and a demander of funds must pay. Usually the term **interest rate** applies to debt instruments such as bank loans or bonds, whereas the term **required return** applies to almost any kind of investment. In fact, the meanings of these two terms are quite similar because in both cases the supplier is compensated for providing funds to the demander.

When we speak about the interest rate or the required return on an investment, we may take either a historical perspective (i.e., what return did an investment actually provide?) or a forward-looking perspective (i.e., what return should we expect the investment to provide in the future given its risk?). Both perspectives are important. Looking at historical data to measure the *actual returns* that different types of investments have provided helps managers and investors form better judgments about the *expected returns* that are the focus of the forward-looking approach. In a decision-making context, expected returns weigh more heavily than do actual returns.

Broadly speaking, interest rates are determined by the interaction of supply and demand, just as prices of other goods and services are determined. When the demand for funds is low and the supply of savings is high, interest rates are low. Figure 6.1 illustrates this supply–demand relationship. The equilibrium interest rate, r_0, occurs at the intersection of the supply function (labeled S_0) and the demand function (labeled D).

FIGURE 6.1

Supply–Demand Relationship
Supply of savings and demand for investment funds



The equilibrium interest rate changes as economic forces alter either the supply of or the demand for funds. To combat a recession, the Board of Governors of the Federal Reserve System might initiate actions to increase the supply of credit in the economy, causing the supply function in Figure 6.1 to shift down and to the right to S_1. The result would be a lower equilibrium interest rate, r_1. With a lower cost of money, firms might find that investments previously viewed as unattractive are now worth undertaking, and as firms hire more workers and spend more on plant and equipment, the economy begins to expand again.

inflation
A rising trend in the prices of most goods and services.

A variety of factors can influence the equilibrium interest rate. One factor is **inflation**, an increase in the prices of most goods and services. Typically, savers demand higher returns (i.e., higher interest rates) when inflation is high because they want their investments to outpace rising prices—they want their purchasing power to increase so they can increase their consumption in the future as a result of having saved and invested money. A second factor influencing interest rates is risk. When people perceive a particular investment as riskier, they will expect a higher return on that investment as compensation for bearing the risk. A third factor that can affect the interest rate is a **liquidity preference** among investors. The term *liquidity preference* refers to the general tendency of investors to prefer short-term securities (i.e., securities that are more liquid). If, all other things being equal, investors would prefer to buy short-term rather than long-term securities, interest rates on short-term instruments such as Treasury bills will be lower than rates on longer-term securities. Investors will hold these securities, despite the relatively low return they offer, because they meet investors' preferences for liquidity.

liquidity preference
A general tendency for investors to prefer short-term (i.e., more liquid) securities.

Negative Interest Rates

Almost as long as there have been borrowers and lenders, both parties assumed that interest rates could only be positive. That is, borrowers would have to repay lenders more money than they originally borrowed. In many parts of the world, that assumption has been turned upside down. Starting in 2014, central banks in several European economies and in Japan instituted policies that resulted in negative interest rates. When a loan carries an interest rate below zero, the lender essentially pays interest to the borrower rather than the other way around.

Central banks in Europe and Japan instituted negative interest rate policies (NIRPs) to combat weak economic growth. These policies work through linkages in the banking system and the broader financial system. Each nation's central bank requires commercial banks in that country to have accounts at the central bank, where they deposit reserves. When a central bank decides to push interest rates below zero, it starts by charging commercial banks interest on their reserves rather than paying interest to those banks. In other words, the first step in creating negative interest rates is for the central bank to essentially impose a tax on the commercial banks. That action has ripple effects throughout the financial system, and other interest rates, such as those on government bonds, may turn negative too. By the fall of 2016, outstanding government bonds paying negative interest rates accounted for more than $12 trillion globally.

A natural question is, why would anyone buy an investment if it paid an interest rate below zero? The answer is that there is no good, safe alternative offering a better return. Consumers and other investors who do not have large amounts of money to invest could hold cash at home and earn a 0% return, and indeed signs of more cash hoarding (such as an increase in demand for home safes and large-denomination bills) materialized after the NIRPs were put in

MATTER OF FACT

Fear Turns T-Bill Rates Negative

Near the height of the financial crisis in December 2008, interest rates on Treasury bills briefly turned negative, meaning that investors paid more to the Treasury than the Treasury promised to pay back. Why would people put their money into an investment they *know* will lose money? Remember that 2008 saw the demise of Lehman Brothers, and fears that other commercial banks and investments banks might fail were rampant. Evidently, some investors were willing to pay the U.S. Treasury to keep their money safe for a short time.

place. Even so, holding cash is risky because cash can be stolen or lost in a fire. For institutional investors who have millions or billions to invest, holding cash is very costly. Buying a government bond with a (slightly) negative interest rate may be the only way to keep money secure. So far, widespread negative interest rates have been confined to Europe and Japan, but interest rates on some U.S. government securities have been negative for brief periods.

Nominal and Real Interest Rates

nominal rate of interest
The actual rate of interest charged by the supplier of funds and paid by the demander.

The **nominal rate of interest** is the actual rate of interest charged by the supplier of funds and paid by the demander. Interest rates quoted online or at financial institutions are nominal interest rates. The nominal interest rate is also the rate at which an investor's money will grow over time. However, because of inflation's effect on the value of money, the nominal interest rate does not adequately capture the increase in an investor's purchasing power over time.

For example, if you put $50 into an investment that promises to pay 3% interest, at the end of the year you will have $51.50 (the initial $50 plus a $1.50 return). Your nominal return is 3%, but this does not necessarily mean that you are better off at the end of the year because the nominal return does not take into account the effects of inflation. Assume that at the beginning of the year, one bag of groceries costs $50. You can either make the $50 investment that offers a 3% nominal return or use that money to buy one bag of groceries. During the year, suppose grocery prices rise by 3%. This means that by the end of the year one bag of groceries costs $51.50. If you invest your money rather than spend it on groceries, by year's end you will have $51.50, still just enough to buy one bag of groceries. In other words, your purchasing power did not increase at all during the year. The **real interest rate** on an investment measures the increase in purchasing power that the investment provides. In the current example, the real rate of return is 0% even though the nominal rate of return is 3%. In dollar terms, by investing $50 you increased your wealth by 3% to $51.50, but in terms of purchasing power you are no better off because you can only buy the same amount of goods that you could have bought before you made the investment.

real rate of interest
The rate of return on an investment measured not in dollars but in the increase in purchasing power that the investment provides. The real rate of interest measures the rate of increase in purchasing power.

We can express the relationship between the nominal interest rate, the real interest rate, and the expected inflation rate as follows:

$$(1 + r) = (1 + r^*)(1 + i) \tag{6.1}$$

$$r^* \approx r - i \tag{6.1a}$$

where

r = nominal interest rate
r^* = real interest rate
i = expected inflation rate

Equation 6.1 shows that 1 plus the nominal interest rate equals the product of 1 plus the real interest rate and 1 plus the expected inflation rate. Equation 6.1a reveals that the real rate is *approximately* equal to the difference between the nominal rate and the expected inflation rate. This approximation is quite good when interest rates and expected inflation are low. In market environments with high interest and inflation rates, however, the approximation in Equation 6.1a becomes less accurate.

PERSONAL FINANCE EXAMPLE 6.1

MyLab Finance Solution Video

Burt Gummer is a survivalist who constantly worries that the apocalypse may happen any day now. To be prepared, Burt stores food with a long shelf life in his basement. Burt has $100 to add to his food stores, and he is considering the purchase of 100 cans of Spam for $1 each. Burt expects the inflation rate over the coming year to be 9%, so a can of Spam will cost $1.09 each in a year. Burt's wife, Heather, has heard of an investment that will pay a 21% nominal return over the next year, so she thinks Burt should invest the money rather than use it to buy Spam.

Equation 6.1a says that the approximate real return on Burt's potential investment is 12%:

$$12\% \approx 21\% - 9\%$$

On the basis of this calculation, Burt might expect that if he invests $100, he could buy 112 cans of Spam next year rather than 100 cans this year (a 12% increase in purchasing power). Suppose that Burt invests the money, earns a 21% rate of return, and 1 year later has $121. By that time, one can of Spam costs $1.09, so Burt is just barely able to purchase 111 cans (111 cans × $1.09 = $120.99). Burt's purchasing power has increased by 11%, not by the 12% that he expected. Equation 6.1 reveals that the exact real return on Burt's investment is 11%:

$$\begin{aligned}(1 + 0.21) &= (1 + r^*)(1 + 0.09)\\ \frac{1.21}{1.09} &= 1 + r^*\\ 1.110 - 1 &= 0.11 = 11\% = r^*\end{aligned}$$

Nominal Interest Rates, Inflation, and Risk

Nominal interest rates are affected not only by inflation but also by risk. Just as investors demand higher rates of return when expected inflation is high, they also demand higher returns on risky investments than on safe ones. Otherwise, investors have little incentive to bear the additional risk. Therefore, *investors will demand a higher nominal rate of return on risky investments*. The additional return that investors require as compensation for bearing risk is called the risk premium (RP).

Before discussing the impact of risk on interest rates, we find it useful to establish a benchmark rate of return in the absence of risk. Suppose some

investment offers a return that is completely free of risk. Denote this rate of return as the risk-free rate, R_F. By definition, the return on this investment is not affected by risk, but it is affected by investors' inflation expectations. The higher the inflation rate that investors expect over the investment's life, the higher the nominal return they will demand, even in the absence of risk. Therefore, the nominal rate of interest on a risk-free investment is the sum of the real return that investors require and the inflation rate that they expect.[1] We could say that the risk-free rate reflects a premium, over and above the real interest rate, based on expected inflation. Mathematically, this relationship is given by Equation 6.2:

$$R_F = r^* + i \tag{6.2}$$

The premium for expected inflation in Equation 6.2 represents the rate of inflation that investors expect over the life of an investment. The expected inflation premium changes over time in response to many factors, such as shifts in monetary and fiscal policies, currency movements, and international political events.

Although in practice no investment is completely free of risk, securities issued by the U.S. government are widely regarded as the safest investments in the world. *Treasury bills* (*T-bills*) are short-term IOUs issued by the U.S. Treasury that mature in 1 year or less. The Treasury also issues longer-term securities such as *Treasury notes*, which have maturities ranging from 2 to 10 years, and *Treasury bonds*, which mature in 30 years. These securities are as close as we can get in the real world to a risk-free investment, so the rate of return offered by Treasury bills is a common proxy for the risk-free rate in Equation 6.2. You can find nominal rates of return on T-bills on the web and from many other sources. Figure 6.2 illustrates how the rate of inflation and the risk-free interest rate moved from 1961 through 2016. The blue line in the figure plots the interest rate on a 1-year T-bill each year, and the red line plots the inflation that occurred during that calendar year. The difference between the two lines is therefore the real rate of return that investors actually earned during the year (as opposed to the real rate that they expected to earn at the start of each calendar year).

During this period, the two rates tended to move in a similar fashion. Note that T-bill rates were slightly above the inflation rate most of the time, meaning that T-bills generally offered a small positive real return (about 1.3% on average). Between 1978 and the early 1980s, inflation and interest rates were quite high, peaking at around 14% in 1980–1981. Since then, T-bill rates have gradually declined. To combat a severe recession, the Federal Reserve pushed interest rates down to almost 0% in 2009 and kept them there for several years. Even though the economy experienced a positive inflation rate in every year since 2009, the Fed kept interest rates near zero, so the real interest rate in those years was actually negative.

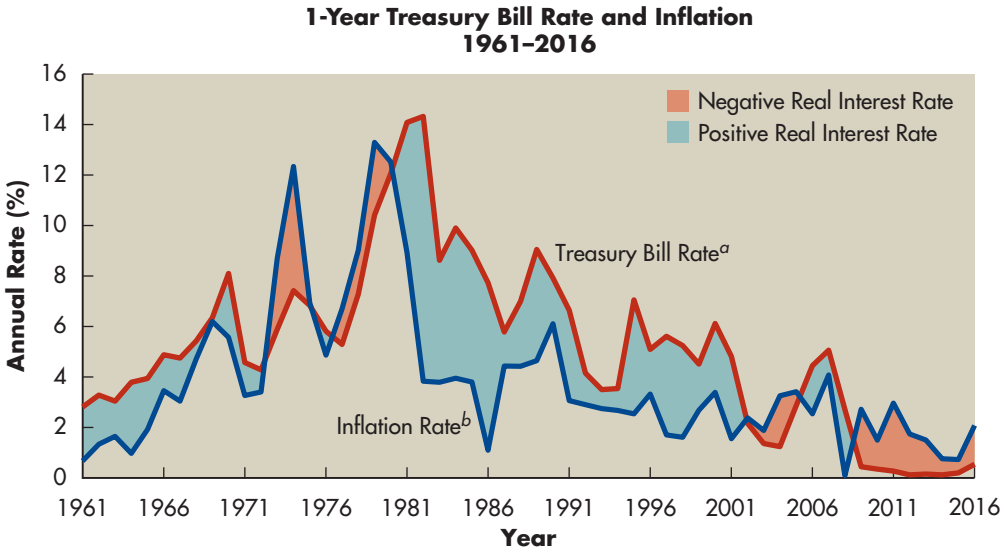
Now consider some alternative investment, j, that is not risk free. Because this investment is risky, investors will demand a risk premium, RP_j, over and above the risk-free rate. Thus, the nominal return on security j equals

$$r_j = R_F + RP_j \tag{6.3}$$

1. Here again we are making use of the approximate relationship between the nominal rate, the real rate, and inflation. By rearranging Equation 6.1a, we see that the nominal rate approximately equals the real rate plus the inflation rate.

FIGURE 6.2

Inflation and the Risk-free Interest Rates
Relationship between annual rate of inflation and 1-year U.S. Treasury bill rate, 1961–2016



[a] Interest rate on a 1-year Treasury bill issued in January of each calendar year.
[b] Change in consumer price index in each calendar year.

Sources: Data from selected *Federal Reserve Bulletins* and *U.S. Department of Labor, Bureau of Labor Statistics.*

The size of the risk premium, RP_j, depends on many factors. One factor that matters a great deal is the type of security under consideration. Investment grade bonds have lower risk premiums than junk bonds, and likewise preferred stocks usually have lower risk premiums than common stocks. In addition, attributes of the entity issuing the security affect the risk premium. Common stocks issued by large companies usually have lower risk premiums than stocks issued by small companies, for example. We will have a great deal more to say about risk premiums later in this text.

TERM STRUCTURE OF INTEREST RATES

term structure of interest rates
The relationship between the maturity and rate of return for bonds with similar levels of risk.

yield curve
A graphic depiction of the term structure of interest rates.

yield to maturity (YTM)
Compound annual rate of return earned on a debt security purchased on a given day and held to maturity. An estimate of the market's required return on a particular bond.

The **term structure of interest rates** is the relationship between the maturity and rate of return for bonds with similar levels of risk. A graph of this relationship is called the **yield curve**. A quick glance at the yield curve tells analysts how rates vary between short-, medium-, and long-term bonds, but it may also provide information on where interest rates and the economy in general are headed in the future. Usually, when analysts examine the term structure of interest rates, they focus on Treasury securities because they are free of default risk.

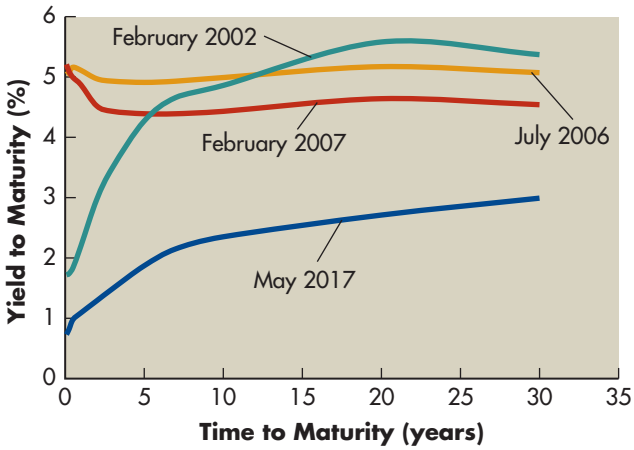
Yield Curves

A bond's **yield to maturity (YTM)** (discussed in greater detail later in this chapter) represents the compound annual rate of return that an investor earns on the bond, assuming the bond makes all promised payments and the investor holds the bond to maturity. In most cases the YTM is a reasonably good measure of the market's required return on a bond. In a yield curve, the YTM is plotted on the vertical axis and time to maturity is plotted on the horizontal axis. Most of the time,

FIGURE 6.3

Treasury Yield Curves
Yield curves for U.S. Treasury securities: February 2002; July 2006; February 2007; and May 2017

MyLab Finance **Animation**



Source: https://www.treasury.gov/resource-center/data-chart-center/interest-rates/Pages/TextView.aspx?data=yield

normal yield curve
An upward-sloping yield curve indicates that long-term interest rates are generally higher than short-term interest rates.

inverted yield curve
A downward-sloping yield curve indicates that short-term interest rates are generally higher than long-term interest rates.

flat yield curve
A yield curve that indicates that interest rates do not vary much at different maturities.

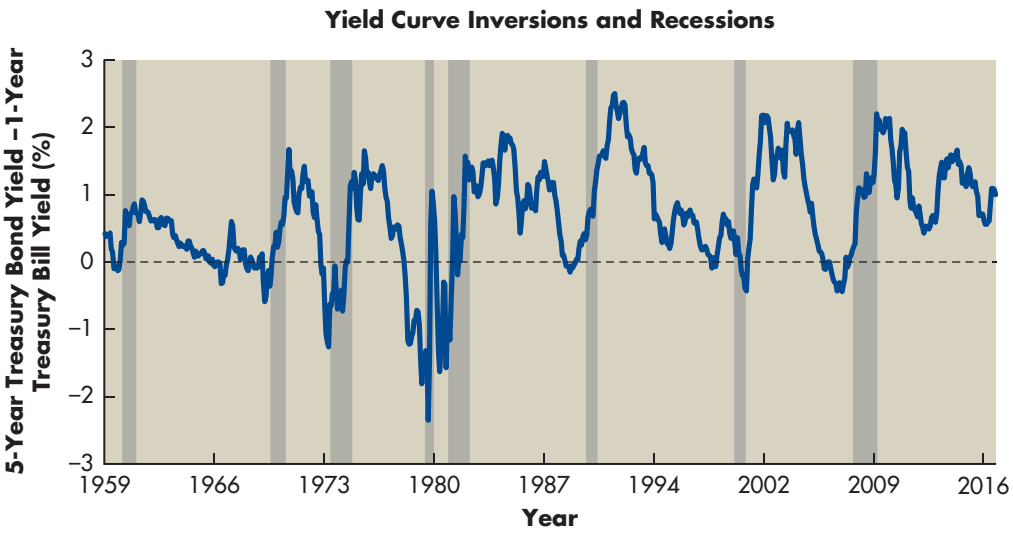
long-term interest rates are higher than short-term rates, and we have a **normal yield curve** that slopes upward. Occasionally, short-term rates are higher than long-term rates, and we have an **inverted yield curve**. Finally, at times little or no difference exists between short-term and long-term rates, and we have a **flat yield curve**. Figure 6.3 shows four historical yield curves for U.S. Treasury securities: one from February 2002, a second from July 2006, a third from February 2007, and a fourth from May 2017.

Observe that both the position and the shape of the yield curves change over time. The yield curve of February 2002 was upward sloping and relatively steep, with long-term rates well above short-term rates. The yield curve from May 2017 was also upward sloping, but it was not as steep as the yield curve in 2002, and at every maturity, rates were lower in 2017 than in 2002. The lower rates in 2017 were a function of both intervention by the Federal Reserve to keep rates low and the lower rate of inflation prevailing in the economy then compared to 2002. The yield curve from July 2006 was almost flat, with very little difference between yields on short-term and long-term Treasury securities. Finally, the yield curve from February 2007 was inverted, or downward sloping. Historically, a downward-sloping yield curve occurs infrequently and is often a sign that the economy is weakening. Most recessions in the United States have been preceded by an inverted yield curve.

Figure 6.4 demonstrates that last point. The grey bars in the figure indicate periods during which the U.S. economy was in recession. The line in the figure plots the difference between the yield to maturity on a 5-year Treasury note and the yield to maturity on a 1-year Treasury bill. Figure 6.4 shows that most of the time the 5-year note has a higher yield than the 1-year bill, but notice that when the line dips below 0% (i.e., when the yield curve is downward sloping), a recession almost always follows within a few months. In addition, notice how the difference in yields tends to be highest soon after a recession ends. This means that the slope of the yield curve is very steep as the economy pulls out of a recession and begins growing rapidly. Thus, the slope of the yield curve is a good predictor

FIGURE 6.4

The Slope of the Yield Curve and the Business Cycle
The difference in rates between 5-year and 1-year Treasury securities and its relationship to the business cycle



of overall economic activity: A negative slope foreshadows a recession, whereas a steep positive slope predicts an economic boom.

The shape of the yield curve may affect the firm's financing decisions. A financial manager who faces a downward-sloping yield curve may be tempted to rely more heavily on cheaper, long-term financing. However, a risk in following this strategy is that interest rates may fall in the future, so long-term rates that seem cheap today may be relatively expensive tomorrow. Likewise, when the yield curve is upward sloping, the manager may believe it wise to use cheaper, short-term financing. Relying on short-term financing has its own risks. Firms that borrow on a short-term basis may see their costs rise if interest rates go up. Even more serious is the risk that a firm may not be able to refinance a short-term loan when it comes due. A variety of factors influence the choice of loan maturity, but the shape of the yield curve is something that managers must consider when making decisions about short-term versus long-term borrowing.

MATTER OF FACT

Bond Yields Hit Record Lows

On July 8, 2016, the 10-year Treasury note yield reached an all-time low of 1.366%. That was good news for the housing market. Many mortgage rates are linked to rates on Treasury securities. For example, the traditional 30-year mortgage rate is typically linked to the yield on 10-year Treasury notes. With mortgage rates reaching new lows, potential buyers found they could afford more expensive homes, and existing homeowners were able to refinance their existing loans, lowering their monthly mortgage payments and leaving them with more money to spend on other things. This kind of activity is precisely what the Federal Reserve hoped to stimulate by keeping interest rates low during the economic recovery.

Theories of the Term Structure

Three theories are frequently cited to explain the general shape of the yield curve: the expectations theory, the liquidity preference theory, and the market segmentation theory.

expectations theory
The theory that the yield curve reflects investor expectations about future interest rates; an expectation of rising interest rates results in an upward-sloping yield curve, and an expectation of declining rates results in a downward-sloping yield curve.

Expectations Theory One theory of the term structure of interest rates, the **expectations theory**, suggests that the yield curve reflects investor expectations about future interest rates. The expectations theory asserts that when deciding whether to buy long-term or short-term bonds, investors seek only to maximize their expected return. As a consequence, when investors expect short-term interest rates to rise in the future (perhaps because investors believe that inflation will rise in the future), today's long-term rates will be higher than current short-term rates, and the yield curve will be upward sloping. The opposite is true when investors expect declining short-term rates: Today's short-term rates will be higher than current long-term rates, and the yield curve will be inverted.

To understand the expectations theory, consider this example. Suppose that the yield curve is upward sloping, as it usually is. The rate on a 1-year T-bill is 2%, and the rate on a 2-year Treasury note is a bit higher at 2.5%. Now, consider an investor who has $100 to place into a low-risk investment for 2 years. The investor has two options. First, he could purchase the 2-year Treasury note, and after 2 years he would accumulate $105.06, as follows:

$$\$100(1 + 0.025)^2 = \$105.06$$

Instead, the investor could buy the 1-year T-bill paying 2%, and when that investment matures, he could buy another 1-year T-bill. Today the investor does not know what return the T-bill will pay next year, but he has some expectation of what that return will be, which we will denote $E(r)$. Following this strategy, over the next 2 years the investor's money will grow to

$$\$100(1 + 0.020)(1 + E(r))$$

The expectations theory says that equilibrium occurs when investors are indifferent between these two options because both offer the same expected return. In other words, equilibrium occurs when the investor expects to accumulate the same amount of money no matter which option she chooses. If we set the return on these two strategies to be equal to each other, we see that the only way such an equilibrium can exist in this example is if the investor believes that the rate next year on a 1-year T-bill will be 3%:

$$\begin{aligned} \$100(1 + 0.025)^2 &= \$100(1 + 0.020)(1 + E(r)) \\ (1 + 0.025)^2 &= (1 + 0.020)(1 + E(r)) \\ E(r) &= 0.030 = 3.0\% \end{aligned}$$

To recap, we began the example with a yield curve that was upward sloping. According to the expectations theory, an upward-sloping yield curve must mean that investors expect interest rates to rise in the future. Only because they expect short-term rates to rise are they willing to purchase a short-term bond today that offers a lower return than today's long-term bond offers. In this example, the investor is indifferent between the two options—buying the Treasury note and earning 2.5% for 2 consecutive years or buying a T-bill today that pays 2% and

another T-bill that the investor expects will pay 3.0% next year. The table below summarizes the fact situation in this example.

Investment strategy	Rate earned this year (%)	Rate earned (or expected) next year (%)	Compound return over 2 years (%)
Buy 2-year note today	2.5	2.5	5.06
Buy 1-year T-bill, then reinvest in another T-bill next year	2.0	3.0	5.06

According to the expectations theory, an upward-sloping yield curve means that investors expect interest rates to rise, and by the same logic, a downward-sloping yield curve means that investors expect interest rates to fall.

EXAMPLE 6.2

Suppose that a 1-year T-bill currently offers a 3.5% return and a 2-year Treasury note offers a 3.0% annual return. Thus, the short-term rate is higher than the long-term rate and the yield curve slopes down. According to the expectations theory, what belief must investors hold about the rate of return that a 1-year T-bill will offer next year? First, recognize that by purchasing the 2-year note, investors can earn a return of 6.09% over 2 years:

$$(1 + 0.030)^2 = 1.0609$$

If the market is in equilibrium, then the expected return on a strategy of purchasing a sequence of two 1-year T-bills must offer the same return, so we have

$$\begin{aligned}(1 + 0.035)(1 + E(r)) &= 1.0609\\ 1 + E(r) &= 1.0609 \div 1.035\\ E(r) &= 0.025 = 2.5\%\end{aligned}$$

Investors believe the T-bill will offer a 2.5% return next year, which is lower than the 3.0% return currently offered by 1-year T-bills. In other words, investors are indifferent between earning 3.0% for 2 consecutive years on the Treasury note or earning 3.5% this year and 2.5% next year on a sequence of two 1-year T-bills. Thus, today's downward-sloping yield curve implies that investors expect falling rates.

liquidity preference theory
Theory suggesting that long-term rates are generally higher than short-term rates (hence, the yield curve is upward sloping) because investors perceive short-term investments as more liquid and less risky than long-term investments. Borrowers must offer higher rates on long-term bonds to entice investors away from their preferred short-term securities.

Liquidity Preference Theory Most of the time, yield curves are upward sloping, which, according to the expectations theory, means that investors expect interest rates to rise. An alternative explanation for the typical upward slope of the yield curve is the **liquidity preference theory**. This theory holds that, all else being equal, investors generally prefer to buy short-term securities, while issuers prefer to sell long-term securities. For investors, short-term securities are attractive because they are highly liquid and their prices are not particularly volatile.[2] Hence, investors will accept somewhat lower rates on short-term bonds because they are less risky than long-term bonds. Conversely, when firms or governments

2. Later in this chapter, we demonstrate that debt instruments with longer maturities are more sensitive to changing market interest rates. For a given change in market rates, the prices (i.e., values) of longer-term bonds will fluctuate more (up or down) than the prices of bonds with shorter maturities.

want to lock in their borrowing costs for a long period by selling long-term bonds, those bonds have to offer higher rates to entice investors away from the short-term securities they prefer. Borrowers are willing to pay somewhat higher rates because long-term debt allows them to eliminate or reduce the risk of not being able to refinance short-term debts when they come due. Borrowing on a long-term basis also reduces uncertainty about future borrowing costs.

market segmentation theory
Theory suggesting that the market for loans is segmented on the basis of maturity and that the supply of and demand for loans within each segment determine its prevailing interest rate; the slope of the yield curve is determined by the general relationship between the prevailing rates in each market segment.

Market Segmentation Theory The **market segmentation theory** suggests that the market for loans is totally segmented on the basis of maturity and that the supply of and demand for loans within each segment determine its prevailing interest rate. In other words, the equilibrium between suppliers and demanders of short-term funds, such as seasonal business loans, would determine prevailing short-term interest rates, and the equilibrium between suppliers and demanders of long-term funds, such as real estate loans, would determine prevailing long-term interest rates. The slope of the yield curve would be determined by the general relationship between the prevailing rates in each market segment. For example, an upward-sloping yield curve indicates greater borrowing demand relative to the supply of funds in the long-term segment of the debt market relative to the short-term segment.

All three term structure theories have merit, so the slope of the yield curve is affected by (1) interest rate expectations, (2) liquidity preferences, and (3) the comparative equilibrium of supply and demand in the short- and long-term market segments. Upward-sloping yield curves result from expectations of rising interest rates, lender preferences for shorter-maturity loans, and greater supply of short-term loans than of long-term loans relative to demand. The opposite conditions would result in a downward-sloping yield curve. At any time, the interaction of these three forces determines the prevailing slope of the yield curve.

RISK PREMIUMS: ISSUER AND ISSUE CHARACTERISTICS

So far, we have considered only risk-free U.S. Treasury securities. We now reintroduce the risk premium and assess it in view of risky non-Treasury issues. Recall Equations 6.2 and 6.3:

$$R_F = r^* + i$$
$$r_j = R_F + RP_j$$

In words, the nominal rate of interest for security j (r_j) is equal to the risk-free rate, consisting of the real rate of interest (r^*) plus the expected inflation rate (i), plus the risk premium (RP_j). The *risk premium* varies with specific issuer and issue characteristics.

EXAMPLE 6.3

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The nominal interest rates on a number of classes of long-term securities in May 2017 were as follows:

Security	Nominal interest rate
5-Year U.S. Treasury notes	1.81%
Corporate bonds:	
Investment grade	3.37
High-yield	7.67

Because the U.S. Treasury bond would represent the risk-free rate for a 5-year investment, we can calculate the risk premium of the other securities by subtracting the risk-free rate, 1.81%, from rates offered by each of the other corporate securities:

Security	Risk premium
Corporate bonds:	
Investment grade	3.37% − 1.81% = 1.56%
High-yield	7.67% − 1.81% = 5.86%

These risk premiums reflect differing issuer and issue risks. Junk bonds have a higher risk premium than investment grade bonds, and that higher risk premium is the compensation that investors demand for bearing the higher default risk of lower-quality bonds.

The risk premium consists of a number of issuer- and issue-related components, including business risk, financial risk, interest rate risk, liquidity risk, and tax risk, as well as the purely debt-specific risks—default risk and contractual provision risk—briefly defined in Table 6.1. In general, the highest risk premiums and therefore the highest nominal interest rates are associated with securities issued by firms with a high risk of default and from long-term maturities that have unfavorable contractual provisions.

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6–1 What is the real rate of interest? Differentiate it from the nominal rate of interest.

6–2 What is the term structure of interest rates, and how is it related to the yield curve?

6–3 For a given class of similar-risk securities, what does each of the following yield curves reflect about interest rates: (**a**) downward sloping, (**b**) upward sloping, and (**c**) flat? What is the "normal" shape of the yield curve?

TABLE 6.1 Debt-Specific Risk Premium Components

Component	Description
Default risk	The possibility that the issuer of debt will not pay the contractual interest or principal as scheduled. The greater the uncertainty as to the borrower's ability to meet these payments, the greater the risk premium. High bond ratings reflect low default risk, and low bond ratings reflect high default risk.
Contractual provision risk	Conditions that are often included in a debt agreement or a stock issue. Some of these reduce risk, whereas others may increase risk. For example, a provision allowing a bond issuer to retire its bonds prior to their maturity under favorable terms increases the bond's risk.

6–4 Briefly describe the following theories of the general shape of the yield curve: (**a**) expectations theory, (**b**) liquidity preference theory, and (**c**) market segmentation theory.

6–5 List and briefly describe the potential issuer- and issue-related risk components that are embodied in the risk premium. Which are the purely debt-specific risks?

LG2 LG3

6.2 Government and Corporate Bonds

municipal bond
A bond issued by a state or local government body.

corporate bond
A long-term debt instrument indicating that a corporation has borrowed a certain amount of money and promises to repay it in the future under clearly defined terms.

par value, face value, principal
The amount of money the borrower must repay at maturity, and the value on which periodic interest payments are based.

coupon rate
The percentage of a bond's par value that will be paid annually, typically in two equal semiannual payments, as interest.

bond indenture
A legal document that specifies both the rights of the bondholders and the duties of the issuing corporation.

standard debt provisions
Provisions in a bond indenture specifying certain record-keeping and general business practices that the bond issuer must follow; normally, they do not place a burden on a financially sound business.

restrictive covenants
Provisions in a bond indenture that place operating and financial constraints on the borrower.

When governments and corporations need to borrow money, they often do so by issuing bonds. In addition to the Treasury bills, notes, and bonds issued by the federal government, state and local governments issue bonds known as **municipal bonds**. A **corporate bond** is a long-term debt instrument indicating that a corporation has borrowed a certain amount of money and promises to repay it in the future under clearly defined terms.

The features of government and corporate bonds are similar. Most bonds are issued with maturities of 10 to 30 years and with a **par value**, **principal**, or **face value**, of $1,000. A bond's **coupon rate** represents the percentage of the bond's par value that will be paid to bondholders annually as interest. Most bonds make two interest payments per year (i.e., semiannual payments), and in that case the bond pays one-half of the coupon rate every 6 months. Bonds are sometimes called *fixed-income securities* because the coupon payments they make either do not change or change only according to a specified formula that is not linked to the issuer's financial performance.

LEGAL ASPECTS OF CORPORATE BONDS

Certain legal arrangements are required to protect purchasers of bonds. Bondholders are protected primarily through the indenture and the trustee.

Bond Indenture

A **bond indenture** is a legal document that specifies both the rights of the bondholders and the duties of the bond issuer. Included in the indenture are descriptions of the amount and timing of all interest and principal payments, as well as descriptions of specific actions that the borrower must take or must not take. Corporate borrowers commonly must (1) maintain satisfactory accounting records in accordance with generally accepted accounting principles (GAAP), (2) periodically supply audited financial statements, (3) pay taxes and other liabilities when due, and (4) maintain all facilities in good working order.

Standard Provisions The **standard debt provisions** in the bond indenture specify certain record-keeping and general business practices that the bond issuer must follow.

Restrictive Provisions Bond indentures also normally include certain **restrictive covenants**, which place operating and financial constraints on the borrower. These provisions help protect the bondholder against increases in borrower risk.

Without them, the borrower could increase the firm's risk but not have to pay increased interest to compensate for the increased risk.

The most common restrictive covenants do the following:

1. Place limits on the values of certain accounting ratios that must be maintained while the debt is outstanding. Examples of some ratios with levels constrained by debt covenants are the interest coverage ratio, the current ratio, and the debt-to-equity ratio. Many of these ratios require a minimum level of liquidity, to ensure against loan default.
2. Prohibit or limit the sale of accounts receivable or other assets to generate cash. Selling receivables could cause a long-run cash shortage if proceeds were used to meet current obligations. Violations of this type of covenant could force the borrower to repay outstanding bonds immediately.
3. Impose fixed-asset restrictions. The borrower must maintain a specified level of fixed assets to guarantee its ability to repay the bonds.
4. Constrain subsequent borrowing. Additional long-term debt may be prohibited, or additional borrowing may be subordinated to the original loan. **Subordination** means that subsequent creditors agree to wait until all claims of the *senior debt* are satisfied.
5. Limit the firm's annual cash dividend payments to a specified percentage or amount.

subordination
In a bond indenture, the stipulation that subsequent creditors agree to wait until all claims of the senior debt are satisfied.

Other restrictive covenants are sometimes included in bond indentures.

The violation of any standard or restrictive provision by the borrower may give bondholders the right to demand immediate repayment of the debt, or it may trigger some other change, such as a rating downgrade or a renegotiation of the terms of the indenture. Generally, bondholders evaluate any violation to determine whether it jeopardizes the loan. They may then decide to demand immediate repayment, continue the loan, or alter the terms of the bond indenture.

Sinking-Fund Requirements Another common restrictive provision is a **sinking-fund requirement**. Its objective is to provide for the systematic retirement of bonds prior to their maturity. To carry out this requirement, the corporation makes semiannual or annual payments that are used to retire bonds by purchasing them in the marketplace.

sinking-fund requirement
A restrictive provision often included in a bond indenture, providing for the systematic retirement of bonds prior to their maturity.

Security or Collateral The bond indenture identifies any collateral pledged against the bond and specifies how it must be maintained. **Collateral** refers to a specific asset against which bondholders have a claim in the event that the borrower defaults on the bond. The protection of bond collateral is crucial to guarantee the safety of a bond issue. A bond backed by some form of collateral is called a **secured bond**, whereas a bond backed only by the ability of the borrower to repay is called an **unsecured bond**.

collateral
A specific asset against which bondholders have a claim in the event that a borrower defaults on a bond.

secured bond
A bond backed by some form of collateral.

unsecured bond
A bond backed only by the borrower's ability to repay the debt.

Trustee

A **trustee** is a third party to a bond indenture. The trustee can be an individual, a corporation, or (most often) a commercial bank trust department. The trustee is paid to act as a "watchdog" on behalf of the bondholders and can take specified actions on behalf of the bondholders if the terms of the indenture are violated.

trustee
A paid individual, corporation, or commercial bank trust department that acts as the third party to a bond indenture and can take specified actions on behalf of the bondholders if the terms of the indenture are violated.

COST OF BONDS TO THE ISSUER

The cost of bond financing is generally greater than the issuer would have to pay for short-term borrowing. The major factors that affect the cost, which is the rate of interest paid by the bond issuer, are the bond's maturity, the size of the offering, the issuer's risk, and the basic cost of money.

Impact of Bond Maturity

Generally, as we noted earlier in Section 6.1, long-term debt pays higher interest rates than short-term debt. In a practical sense, the longer the maturity of a bond, the more sensitive the price of the bond will be to future changes in interest rates, which increases the risks of long-term bonds to investors. In addition, the longer the term, the greater the chance that the issuer might default.

Impact of Offering Size

The size of the bond offering also affects the interest cost of borrowing, but in an inverse manner: Bond flotation and administration costs per dollar borrowed are likely to decrease as offering size increases. However, the risk to the bondholders may increase, because larger offerings result in greater risk of default, all other factors held constant.

Impact of Issuer's Risk

The greater the issuer's *default risk,* the higher the interest rate. Some risk can be reduced through inclusion of appropriate restrictive provisions in the bond indenture. Clearly, bondholders must be compensated with higher returns for taking greater risk. Frequently, bond buyers rely on bond ratings (discussed later) to determine the issuer's overall risk.

Impact of the Cost of Money

The cost of money in the capital market is the basis for determining a bond's coupon rate. Generally, the rate on U.S. Treasury securities of equal maturity is used as the lowest-risk cost of money. To that basic rate is added a *risk premium* (as described earlier in this chapter) that reflects the factors mentioned above (maturity, offering size, and issuer's risk).

GENERAL FEATURES OF A BOND ISSUE

Three features sometimes included in a corporate bond issue are a conversion feature, a call feature, and stock purchase warrants. These features provide the issuer or the purchaser with certain opportunities for replacing or retiring the bond or supplementing it with some type of equity issue.

conversion feature
A feature of convertible bonds that allows bondholders to change each bond into a stated number of shares of common stock.

Convertible bonds offer a **conversion feature** that allows bondholders to convert each bond into shares of the bond issuer's common stock. Bondholders convert their bonds into stock only when the market price of the stock is such that conversion will provide a profit for the bondholder. In other words, if the market price of the bond issuer's stock rises enough, it makes sense for bondholders to convert their bonds into shares rather than to accept cash repayment of the bond principal. Because the bond conversion feature gives investors the opportunity to participate in the appreciation of the issuer's common stock, a conversion feature is desirable from the perspective of bondholders. As a result,

they will accept a lower interest rate on convertible bonds compared to bonds without the conversion feature, all other factors being equal.

call feature
A feature included in nearly all corporate bond issues that gives the issuer the opportunity to repurchase bonds at a stated call price prior to maturity.

call price
The stated price at which a bond may be repurchased, by use of a call feature, prior to maturity.

call premium
The amount by which a bond's call price exceeds its par value.

Nearly all corporate bond issues include a **call feature**. That feature gives the issuer the opportunity to repurchase bonds prior to maturity. The **call price** is the stated price at which the issuer may repurchase bonds prior to maturity. Sometimes the call feature can be exercised only during a certain period. As a rule, the call price exceeds the par value of a bond by an amount equal to 1 year's interest. For example, a $1,000 bond with a 5% coupon rate would be callable for around $1,050 [$1,000 + (0.05 × $1,000)]. The amount by which the call price exceeds the bond's par value is commonly referred to as the **call premium**. This premium compensates bondholders for having the bond called away from them; to the issuer, it represents the cost of calling the bonds.

The call feature enables an issuer to call an outstanding bond when interest rates fall and issue a new bond at a lower interest rate. When interest rates rise, the call privilege will not be exercised, except possibly to meet sinking-fund requirements. Of course, to sell a callable bond in the first place, the issuer must pay a higher interest rate than that on noncallable bonds of equal risk, to compensate bondholders for the risk of having the bonds called away from them.

stock purchase warrants
Instruments that give their holders the right to purchase a certain number of shares of the issuer's common stock at a specified price over a certain period of time.

Bonds occasionally have stock purchase warrants attached as "sweeteners" to make them more attractive to prospective buyers. **Stock purchase warrants** are instruments that give their holders the right to purchase a certain number of shares of the issuer's common stock at a specified price over a certain period of time. Their inclusion typically enables the issuer to pay a slightly lower coupon rate than would otherwise be required.

BOND YIELDS

In the bond market, we use several conventions for measuring a bond's rate of return. Unfortunately for students who are new to the field, the names of different return measures are rather similar, as all of them incorporate the word *yield*. That term has slightly different meanings in different contexts. The three most widely reported measures of a bond's return are its *current yield*, its *yield to maturity (YTM)*, and its *yield to call (YTC)*. Each of these terms defines a bond's return in a slightly different way.

current yield
A measure of a bond's cash return for the year; calculated by dividing the bond's annual interest payment by its current price.

The simplest yield measure is the **current yield**, the annual interest payment divided by the current price. For example, a $1,000 par-value bond with an 8% coupon rate that currently sells for $970 would have a current yield of 8.25% [(0.08 × $1,000) ÷ $970]. This measures how much interest a bondholder receives as a percentage of the bond's market price. However, a bond's total return depends not just on the interest payments it makes but also on the change in the bond's price that occurs. Because it focuses only on the interest that a bond pays, the current yield is not an especially accurate measure of a bond's rate of return. Both the yield to maturity and the yield to call measures provide a more complete picture of a bond's return, and we'll return to those concepts later in this chapter.

BOND PRICES

Because most corporate bonds are purchased and held by institutional investors, such as banks, insurance companies, and mutual funds, rather than individual investors, bond trading and price data are not readily available to individuals. Even so, it is important to understand market conventions for quoting bond prices and yields. Table 6.2 includes some data on the bonds of five companies. A quote for a bond issued by Verizon appears in the table's first row. The second column shows

TABLE 6.2 Data on Selected Bonds

Company	Coupon	Maturity	Price	Yield (YTM)
Verizon	4.522%	Sep. 15, 2048	91.98	5.033%
Ford	5.291	Dec. 8, 2046	101.98	5.158
Marathon	5.000	Sep. 15, 2054	91.75	5.524
Humana	3.150	Dec. 1, 2022	101.73	2.799
Kohls	4.750	Dec. 15, 2023	104.48	3.947

Bond data from http://finra-markets.morningstar.com/BondCenter/ActiveUSCorpBond.jsp, accessed on April 28, 2017.

that Verizon's bond has a coupon rate of 4.522%, and the third column indicates that the bond matures on September 15, 2048. The fourth column lists the bond's closing price *expressed as a percentage of the bond's par value.* Most corporate bonds are issued with a *par,* or *face, value* of $1,000. The Verizon bond has a $1,000 par value and is quoted at 91.98, or $919.80 (0.9198 × $1,000). The final column of Table 6.2 shows the bond's *yield to maturity (YTM),* which, as we will see, is the compound annual rate of return that would be earned on the bond if it were purchased and held to maturity. Given its 4.522% coupon rate and its price of $919.80, the Verizon bond offers a yield to maturity of 5.033%. Note that the YTM is above the coupon rate. The reason is that the Verizon bond currently sells below its $1,000 par value, so an investor who buys the bond today and holds it until it matures will receive interest payments of $45.22 each year *and* a capital gain of $81.20 ($1,000 − $919.80) when the bond matures. The capital gain component adds to the bond's total return, which boosts its YTM above its coupon rate.

BOND RATINGS

Independent agencies such as Moody's, Fitch, and Standard & Poor's assess the riskiness of publicly traded bond issues. These agencies derive their ratings by using financial ratio and cash flow analyses to assess the likely payment of bond interest and principal. Table 6.3 summarizes these ratings. For discussion of ethical issues related to the bond-rating agencies, see the *Focus on Ethics* box.

Normally, an inverse relationship exists between the quality of a bond and the rate of return that it must provide bondholders: High-quality (high-rated) bonds provide lower returns than lower-quality (low-rated) bonds, reflecting the lender's risk–return tradeoff. When considering bond financing, the financial manager must focus on the expected ratings of the bond issue because these ratings directly affect the interest rate that the issuer must pay investors.

COMMON TYPES OF BONDS

debentures
subordinated debentures
income bonds
mortgage bonds
collateral trust bonds
equipment trust certificates
See Table 6.4.

We can classify bonds in a variety of ways. Here we break them into traditional bonds (the basic types that have been around for years) and contemporary bonds (newer, more innovative types). The traditional types of bonds are summarized in terms of their key characteristics and priority of lender's claim in Table 6.4. Note that the first three types—**debentures**, **subordinated debentures**, and **income bonds**—are unsecured, whereas the last three—**mortgage bonds**, **collateral trust bonds**, and **equipment trust certificates**—are secured.

TABLE 6.3 Moody's and Standard & Poor's Bond Ratings

Moody's	Interpretation	Standard & Poor's	Interpretation
Aaa	Prime quality	AAA	Investment grade
Aa	High grade	AA	
A	Upper medium grade	A	
Baa	Medium grade	BBB	
Ba	Lower medium grade or speculative	BB	Speculative
B	Speculative	B	
Caa	From very speculative	CCC	
Ca	to near or in default	CC	
C	Lowest grade	C	Income bond
		D	In default

Note: Some ratings may be modified to show relative standing within a major rating category; for example, Moody's uses numerical modifiers (1, 2, 3), whereas Standard & Poor's uses plus (+) and minus (−) signs.

Sources: Moody's Investors Service, Inc., and Standard & Poor's Corporation.

TABLE 6.4 Characteristics and Priority of Lender's Claim of Traditional Types of Bonds

Bond type	Characteristics	Priority of lender's claim
Unsecured bonds		
Debentures	Unsecured bonds that only creditworthy firms can issue. Convertible bonds are normally debentures.	Claims are the same as those of any general creditor. May have other unsecured bonds subordinated to them.
Subordinated debentures	Claims are not satisfied until those of the creditors holding certain (senior) debts have been fully satisfied.	Claim is that of a general creditor but not as good as a senior debt claim.
Income bonds	Payment of interest is required only when earnings are available. Commonly issued in reorganization of a failing firm.	Claim is that of a general creditor. Are not in default when interest payments are missed because they are contingent only on earnings being available.
Secured Bonds		
Mortgage bonds	Secured by real estate or buildings.	Claim is on proceeds from sale of mortgaged assets; if not fully satisfied, the lender becomes a general creditor. The first-mortgage claim must be fully satisfied before distribution of proceeds to second-mortgage holders and so on. A number of mortgages can be issued against the same collateral.
Collateral trust bonds	Secured by stock and (or) bonds that are owned by the issuer. Collateral value is generally 25% to 35% greater than bond value.	Claim is on proceeds from stock and/or bond collateral; if not fully satisfied, the lender becomes a general creditor.
Equipment trust certificates	Used to finance "rolling stock," such as airplanes, trucks, boats, railroad cars. A trustee buys the asset with funds raised through the sale of trust certificates and then leases it to the firm; after making the final scheduled lease payment, the firm receives title to the asset. A type of leasing.	Claim is on proceeds from the sale of the asset; if proceeds do not satisfy outstanding debt, trust certificate lenders become general creditors.

zero- (or low-) coupon bonds

junk (high-yield) bonds

floating-rate bonds

extendible notes

putable bonds
See Table 6.5.

Table 6.5 describes the key characteristics of five contemporary types of bonds: **zero- (or low-) coupon bonds, junk (high-yield) bonds, floating-rate bonds, extendible notes,** and **putable bonds.** These bonds can be either unsecured or secured. Changing capital market conditions and investor preferences have spurred further innovations in bond financing in recent years and will probably continue to do so.

INTERNATIONAL BOND ISSUES

Companies and governments borrow internationally by issuing bonds in two principal financial markets: the Eurobond market and the foreign bond market. Both give borrowers the opportunity to obtain large amounts of long-term debt financing quickly, in the currency of their choice and with flexible repayment terms.

Eurobond
A bond issued by an international borrower and sold to investors in countries with currencies other than the currency in which the bond is denominated.

A **Eurobond** is issued by an international borrower and sold to investors in countries with currencies other than the currency in which the bond is denominated. An example is a dollar-denominated bond issued by a U.S. corporation

FOCUS ON ETHICS *in practice*

"Can Bond Ratings Be Trusted?"

Nationally Recognized Statistical Rating Organizations (NRSROs), or credit-rating agencies, provide investors with independent assessments of a debt issuer's ability to make scheduled interest and principal payments. NRSROs assess corporate bonds, government bonds, municipal bonds, and debt obligations backed by collateral, such as mortgage-backed securities (MBSs). Broadly speaking, all NRSROs use the same approach for evaluating a debt instrument—feed quantitative data and qualitative judgments into a statistical model, then use the resulting default probability to award a letter grade on a continuum from "extremely unlikely" to "almost certain." Moody's, Standard & Poor's, and Fitch dominate the credit-ratings business, accounting for nearly 95% of the market. The reputations of the Big Three—each has been in business over 100 years—make their ratings highly coveted. But the Great Recession of 2007–09 tarnished those reputations.

The pre-recession housing boom and strong demand for highly rated debt boosted the value of outstanding mortgage-backed securities to over $11 trillion by 2008, or 35% of U.S. bond market debt. This trend made the business of rating MBSs very lucrative, perhaps leading NRSROs to overlook potential flaws in their default-risk models. From 2000 to 2007, MBSs accounted for nearly half of Moody's rating revenues; in 2006 alone, Moody's awarded a "AAA" rating to an average of 30 MBSs *every day*. But when home prices across the U.S. started to tumble in 2007, the flaws in the models of default risk became apparent as home mortgage defaults soared. Ultimately, Moody's had to downgrade 83% of the $869 billion in MBSs rated AAA in 2006. The fallout from widespread MBS "ratings inflation" brought down two of the nation's largest investment banks—Bear Stearns and Lehman Brothers—and contributed to the worst recession since the Great Depression.

In the post-game analysis, many blamed fraud for the ratings inflation, as suggested by an internal December 2006 Standard & Poor's email that proclaimed "Let's hope we are all wealthy and retired by the time this house of cards falters."* Others pointed to a flawed system whereby the issuer of the debt instrument, not the investor, pays the NRSRO. But these explanations cannot tell the whole story—several large financial institutions that paid for ratings of complex MBSs were undone by their own holdings when those ratings turned out to be inflated. Moreover, ratings inflation did not extend to the traditional bread-and-butter of the business—corporate bonds—despite the fact issuers also pay for those ratings.

▶ *What ethical issues could arise because companies or governments issuing debt—not investors—pay NRSROs to rate those instruments?*

▶ *Why do you think NRSROs inflated ratings for new complex MBSs but not traditional corporate bonds in the run-up to the Great Recession?*

*From House Committee on Oversight and Government Reform

TABLE 6.5 Characteristics of Contemporary Types of Bonds

Bond type	Characteristics[a]
Zero- (or low-) coupon bonds	Issued with no (zero) or a very low coupon (stated interest) rate and sold at a large discount from par. A significant portion (or all) of the investor's return comes from gain in value (i.e., par value minus purchase price). Generally callable at par value.
Junk (high-yield) bonds	Debt rated Ba or lower by Moody's or BB or lower by Standard & Poor's. Commonly used by rapidly growing firms to obtain growth capital, most often as a way to finance mergers and takeovers. High-risk bonds with high yields, often yielding 2% to 3% more than the best-quality corporate debt.
Floating-rate bonds	Stated interest rate is adjusted periodically within stated limits in response to changes in specified money market or capital market rates. Popular when future inflation and interest rates are uncertain. Tend to sell at close to par because of the automatic adjustment to changing market conditions. Some issues provide for annual redemption at par at the option of the bondholder.
Extendible notes	Short maturities, typically 1 to 5 years, that can be renewed for a similar period at the option of holders. Similar to a floating-rate bond. An issue might be a series of 3-year renewable notes over a period of 15 years; every 3 years, the notes could be extended for another 3 years, at a new rate competitive with market interest rates at the time of renewal.
Putable bonds	Bonds that can be redeemed at par (typically, $1,000) at the option of their holder either at specific dates after the date of issue and every 1 to 5 years thereafter or when and if the firm takes specified actions, such as being acquired, acquiring another company, or issuing a large amount of additional debt. In return for its conferring the right to "put the bond" at specified times or when the firm takes certain actions, the bond's yield is lower than that of a nonputable bond.

[a] The claims of lenders (i.e., bondholders) against issuers of each of these types of bonds vary, depending on the bonds' other features. Each of these bonds can be unsecured or secured.

and sold to Belgian investors. From the founding of the Eurobond market in the 1960s until the mid-1980s, "blue chip" U.S. corporations were the largest single class of Eurobond issuers. Some of these companies were able to borrow in this market at interest rates below those the U.S. government paid on Treasury bonds. As the market matured, issuers became able to choose the currency in which they borrowed, and European and Japanese borrowers rose to prominence. In more recent years, the Eurobond market has become much more balanced in terms of the mix of borrowers, total issue volume, and currency of denomination.

foreign bond
A bond that is issued by a foreign corporation or government and is denominated in the investor's home currency and sold in the investor's home market.

In contrast, a **foreign bond** is issued by a foreign corporation or government and is denominated in the investor's home currency and sold in the investor's home market. A Swiss-franc–denominated bond issued in Switzerland by a U.S. company is an example of a foreign bond. The largest foreign bond markets include the United Kingdom, Japan, Switzerland, and the United States. Some types of foreign bonds have particularly unusual names. For example, a *bulldog bond* is a foreign bond issued in Britain and a *samurai bond* is one issued in Japan.

→ REVIEW QUESTIONS MyLab Finance Solutions

6–6 What are typical maturities, denominations, and interest payments of a corporate bond? What mechanisms protect bondholders?

6–7 Differentiate between standard debt provisions and restrictive covenants included in a bond indenture. What are the consequences if a bond issuer violates any of these covenants?

6–8 How is the cost of bond financing typically related to the cost of short-term borrowing? In addition to the maturity of a bond, what other major factors affect its cost to the issuer?

6–9 What is a conversion feature? A call feature? What are stock purchase warrants?

6–10 What is the current yield for a bond? How are bond prices quoted? How are bonds rated, and why?

6–11 Compare the basic characteristics of Eurobonds and foreign bonds.

LG 4

6.3 Valuation Fundamentals

valuation
The process that links risk and return to determine the worth of an asset.

Valuation is the process that links risk and return to determine the worth of an asset. It is a relatively simple process that investors and managers apply to *expected* streams of cash flows from bonds, stocks, income properties, oil wells, and so on. To determine an asset's value, a financial manager uses the time-value-of-money techniques presented in Chapter 5 and the concepts of risk and return that we will develop in Chapter 8.

For two major reasons, understanding the valuation process is crucial for financial managers. First, firms often issue securities such as bonds and stocks to investors, so managers must grasp how investors will value those securities. Second, financial managers must often decide whether some investment opportunity available to a firm will generate sufficient cash flows to justify its cost. To make that judgment, managers work to place a value on an investment project's cash flows and then compare that estimate of the investment's value to its cost. Making investments that are worth more than they cost is central to creating value for shareholders, which is the primary goal of financial management.

KEY INPUTS

The valuation process has three key inputs: (1) cash flows; (2) timing; and (3) a measure of risk, which determines the required return. Each input is described below.

Cash Flows

The value of any asset depends on the cash flow(s) it is *expected* to provide over time. To have value, an asset does not have to provide an annual cash flow; it can provide an intermittent cash flow or even a single cash flow over the period.

PERSONAL FINANCE EXAMPLE 6.4 Celia Sargent wishes to estimate the value of three assets she is considering investing in: common stock in Michaels Enterprises, an interest in an oil well, and an original painting by a well-known artist. Her cash flow estimates for each are as follows:

Stock in Michaels Enterprises: Expect to receive cash dividends of $300 per year indefinitely.

Oil well: Expect to receive cash flows of $2,000 after 1 year, $4,000 after 2 years, and $10,000 after 4 years, when the well will run dry.

Original painting: Expect to sell the painting in 5 years for $85,000.

With these cash flow estimates, Celia has taken the first step toward placing a value on each of the assets.

Timing

In addition to making cash flow estimates, we must know the timing of the cash flows. For example, Celia expects the cash flows of $2,000, $4,000, and $10,000 for the oil well to occur after 1, 2, and 4 years, respectively. The combination of the cash flow and its timing defines the return expected from the asset.

Risk and Required Return

The risk associated with a cash flow stream also affects its value. Holding the size of the cash flow stream constant, the more risky a cash flow stream is (i.e., the more uncertainty about the amount and timing of the cash flow stream), the less valuable the stream will be. In the valuation process, we account for greater risk by discounting cash flows at a higher rate (i.e., by requiring a higher rate of return). The higher the risk, the greater the required return, and the lower the risk, the less the required return.

PERSONAL FINANCE EXAMPLE 6.5 Let's return to Celia Sargent's task of placing a value on the original painting and consider two scenarios.

Scenario 1: Certainty A major art gallery has contracted to buy the painting for $85,000 after 5 years. Because this contract is already signed and the art gallery is well established and reliable, Celia views this asset as "money in the bank." She thus would use something close to the prevailing risk-free rate of 3% as the required return when calculating the value of the painting.

Scenario 2: High risk The values of original paintings by this artist have fluctuated widely over the past 10 years. Although Celia expects to sell the painting for $85,000, she realizes that its sale price in 5 years could range between $30,000 and $140,000. Because of the high uncertainty surrounding the painting's value, Celia believes that a 15% required return is appropriate.

These two estimates of the appropriate required return illustrate how the discount rate accounts for risk in the valuation process. Although adjusting the discount rate for risk has a subjective element, analysts use historical data and a variety of analytical methods to estimate the required return with as much precision as possible.

BASIC VALUATION MODEL

The value of an asset is *the present value of all the future cash flows it is expected to provide*. Therefore, calculating an asset's value means discounting the expected cash flows back to the present using a discount rate or required return commensurate with the asset's risk. Using the present value techniques explained in Chapter 5, we can express the value of any asset at time zero, V_0, as

$$V_0 = \frac{CF_1}{(1 + r)^1} + \frac{CF_2}{(1 + r)^2} + \ldots + \frac{CF_n}{(1 + r)^n} \tag{6.4}$$

where

V_0 = value of the asset at time zero
CF_t = cash flow *expected* in year t
r = required return (discount rate)
n = time period (investment's life or investor's holding period)

We can use the basic idea behind Equation 6.4 to determine the value of many different kinds of assets.

IRF PERSONAL FINANCE EXAMPLE 6.6 Celia Sargent values each asset by discounting its cash flows as indicated by Equation 6.4. Because Michael's stock pays a perpetual stream of $300 dividends, Equation 6.4 reduces to Equation 5.7, which says that the present value of a perpetuity equals the dividend payment divided by the required return. Celia decides that a 12% discount rate is appropriate for this investment, so her estimate of the value of Michael's Enterprises stock is

$$\$300 \div 0.12 = \$2{,}500$$

Next, Celia values the oil well investment, which she believes is the most risky of the three investments. Discounting the oil well's cash flows using a 20% required return, Celia estimates the well's value to be

$$\frac{\$2{,}000}{(1 + 0.20)^1} + \frac{\$4{,}000}{(1 + 0.20)^2} + \frac{\$10{,}000}{(1 + 0.20)^4} = \$9{,}266.98$$

Finally, Celia estimates the value of the painting by discounting the expected $85,000 cash payment in 5 years at 15%:

$$\$85{,}000 \div (1 + 0.15)^5 = \$42{,}260.02$$

Note that, regardless of the pattern of the asset's expected cash flows, Celia can use the basic valuation equation to determine the asset's value.

→ REVIEW QUESTIONS MyLab Finance Solutions

6–12 Why is it important for financial managers to understand the valuation process?
6–13 What are the three key inputs to the valuation process?
6–14 Does the valuation process apply only to assets that provide an annual cash flow? Explain.
6–15 Define and specify the general equation for the value of any asset, V_0.

LG5 LG6

6.4 Bond Valuation

Customizing the basic valuation equation to value specific securities such as bonds, preferred stock, and common stock is relatively straightforward. We describe bond valuation in this chapter, and we cover the valuation of common stock and preferred stock elsewhere in this text in Chapter 7.

BOND FUNDAMENTALS

Bonds are long-term debt instruments used by business and government to raise large sums of money, typically from a diverse group of lenders. Most corporate bonds pay interest semiannually (every 6 months) at a stated coupon rate; have an initial maturity of 10 to 30 years; and have a par value, principal, or face value, of $1,000 that the borrower must repay at maturity.

EXAMPLE 6.7

On January 1, 2018, Mills Company issued a 6% coupon rate, 10-year bond with a $1,000 par value that pays interest annually. Investors who buy this bond receive the contractual right to two types of cash flows: (1) $60 annual interest (6% coupon rate × $1,000 par value) distributed at the end of each year and (2) the $1,000 par value at the end of the tenth year.

We will use the Mills Company bond to see how the market prices bonds. We use the terms price and value (or pricing and valuation) interchangeably, reflecting a view that the participants in the bond market determine the price of a bond using the valuation principles outlined here.

BOND VALUATION

Valuing a bond is a simple application of Equation 6.4. The market price of a bond should equal the present value of the payments its issuer is contractually obligated to make. Those payments include a series of coupon (i.e., interest) payments and a final payment to return the bond's par value to the investor when the bond matures. The basic model for the value, B_0, of a bond is given by

$$B_0 = \frac{C}{(1+r)^1} + \frac{C}{(1+r)^2} + \frac{C}{(1+r)^3} + \ldots + \frac{C}{(1+r)^n} + \frac{M}{(1+r)^n}$$

$$B_0 = \left[\sum_{t=1}^{n} \frac{C}{(1+r)^t}\right] + \left[\frac{M}{(1+r)^n}\right] \tag{6.5}$$

where

B_0 = value (or price) of the bond at time zero
C = annual coupon interest payment in dollars
n = number of years to maturity
M = par value in dollars
r = required return on the bond

Notice that the stream of cash flows provided by a bond is composed of an annuity paying $\$C$ for n years plus a lump sum payment of $\$M$ when the bond matures. Determining the value of a bond today means calculating the present value of the annuity of coupon payments and adding to that the present value of the bond's par value paid at maturity. Therefore, an alternative mathematical

approach to calculating a bond's price makes use of the formulas for the present value of an annuity and the present value of a lump sum, discussed previously in this text.

$$B_0 = \left(\frac{C}{r}\right)\left[1 - \frac{1}{(1 + r)^n}\right] + \frac{M}{(1 + r)^n} \tag{6.5a}$$

The first term in Equation 6.5a is the formula for the present value of an annuity, and the second term is the present value of a lump sum. We can calculate a bond's value by using Equations 6.5 or 6.5a, or by using a financial calculator or spreadsheet.

IRF EXAMPLE 6.8

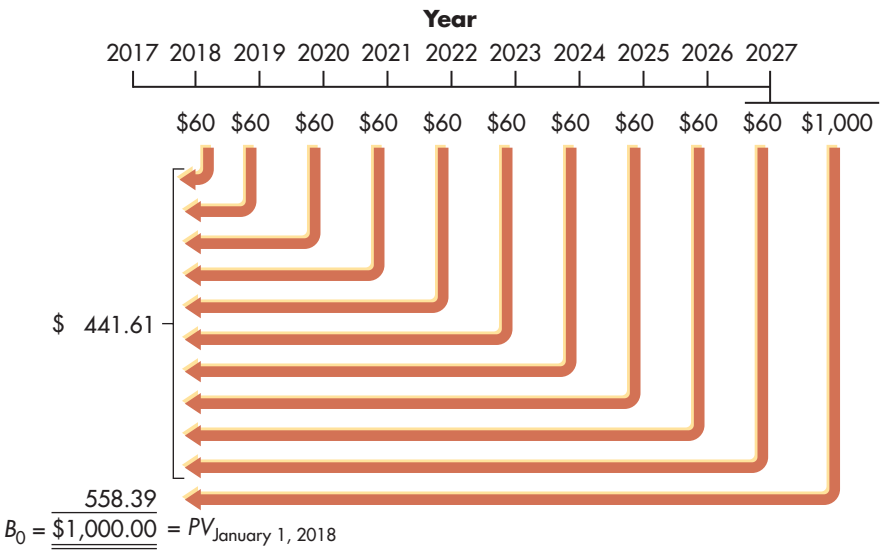
Tim Sanchez wishes to determine the current value of the Mills Company bond. If the bond pays interest annually and the required return on the bond is 6% (equal to its coupon rate), then we can calculate the bond's value using Equation 6.5a:

$$B_0 = \left(\frac{\$60}{0.06}\right)\left[1 - \frac{1}{(1 + 0.06)^{10}}\right] + \frac{\$1{,}000}{(1 + 0.06)^{10}}$$

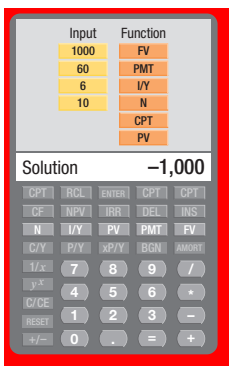
$$B_0 = \$1{,}000[0.44161] + \$558.39 = \$441.61 + \$558.39 = \$1{,}000.00$$

The timeline below depicts the computations involved in finding the bond value.

Timeline for bond valuation (Mills Company's 6% coupon rate, 10-year maturity, $1,000 par, January 1, 2018, issue date, paying annual interest, and required rate of return of 6%)



MyLab Finance Financial Calculator



Calculator use Using the Mills Company's inputs shown at the left, you should find the bond value to be exactly $1,000. If you compare the calculator keystrokes to the ones we displayed when we used a calculator to find the present value of an ordinary annuity earlier in this text, you will see that there is an additional term here, namely, the $1,000 future value (FV). We must add that to our sequence of keystrokes because the bond pays out an annuity plus a

lump sum at the end. When we add the FV keystroke, we are capturing the value of that final lump sum payment when the bond matures. Note that *the calculated bond value is equal to its par value, which will always be the case when the required return is equal to the coupon rate.*

Spreadsheet use We can also calculate the value of the Mills Company bond as shown in the following Excel spreadsheet.

	A	B
1	VALUATION FOR ANNUAL BOND	
2	Par value	$1,000
3	Coupon interest rate	6%
4	Annual Interest payment	$60
5	Required rate of return	6%
6	Number of years to maturity	10
7	Bond value	–$1,000.00

Entry in Cell B4 is =B2*B3.
Entry in Cell B7 is =PV(B5,B6,B4,B2,0).
The minus sign appears before the $1,000.00 in B7 because the bond's price is a cost for the investor.

SEMIANNUAL INTEREST RATES AND BOND VALUES

As a practical matter, most bonds make semiannual rather than annual interest payments. Continuing with the example of the Mills Company bond, we note that if it paid interest semiannually rather than annually, then investors would receive an annuity of 20 coupon payments (2 payments per year for 10 years) of $30 each (half of the annual $60 coupon paid every 6 months), and of course they will also receive $1,000 when the bond matures. Calculating the value for a bond paying semiannual interest requires three changes to the approach we've used so far:

1. Convert the annual coupon payment, C, to a semiannual payment by dividing C by 2.
2. Recognize that if the bond has n years to maturity it will make $2n$ coupon payments (i.e., in n years there are $2n$ semiannual periods).
3. Discount each payment by using the semiannual required return calculated by dividing the annual required return, r, by 2.[3]

3. As we noted in Chapter 5, the effective annual rate of interest, EAR, for stated interest rate r, when interest is paid semiannually ($m = 2$) can be found by using Equation 5.10:

$$EAR = \left(1 + \frac{r}{2}\right)^2 - 1$$

For example, a bond with a 12% required stated annual return, r_d, that pays semiannual interest would have an effective annual rate of

$$EAR = \left(1 + \frac{0.12}{2}\right)^2 - 1 = (1.06)^2 - 1 = 1.1236 - 1 = 0.1236 = 12.36\%$$

Because most bonds pay semiannual interest at semiannual rates equal to 50% of the stated annual rate, their effective annual rates are generally higher than their stated annual rates.

Substituting these three changes into Equations 6.5 and 6.5a yields

$$B_0 = \frac{\frac{C}{2}}{\left(1 + \frac{r}{2}\right)^1} + \frac{\frac{C}{2}}{\left(1 + \frac{r}{2}\right)^2} + \frac{\frac{C}{2}}{\left(1 + \frac{r}{2}\right)^3} + \ldots + \frac{\frac{C}{2}}{\left(1 + \frac{r}{2}\right)^{2n}} + \frac{M}{\left(1 + \frac{r}{2}\right)^{2n}}$$

$$B_0 = \left[\sum_{t=1}^{2n} \frac{\frac{C}{2}}{\left(1 + \frac{r}{2}\right)^t}\right] + \left[\frac{M}{\left(1 + \frac{r}{2}\right)^{2n}}\right] \quad (6.6)$$

and

$$B_0 = \left(\frac{C/2}{r/2}\right)\left[1 - \frac{1}{\left(1 + \frac{r}{2}\right)^{2n}}\right] + \frac{M}{\left(1 + \frac{r}{2}\right)^{2n}} \quad (6.6a)$$

IRF EXAMPLE 6.9

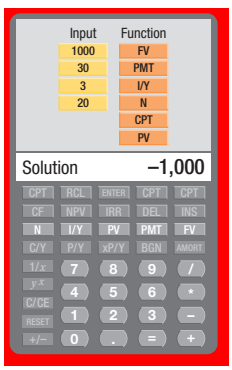
Assuming that the Mills Company bond pays interest semiannually and that the required annual return, r, is 6%, we can use Equation 6.6a to find the value of the bond:

$$B_0 = \left(\frac{\$60/2}{0.06/2}\right)\left[1 - \frac{1}{\left(1 + \frac{0.06}{2}\right)^{2(10)}}\right] + \frac{\$1{,}000}{\left(1 + \frac{0.06}{2}\right)^{2(10)}}$$

$$B_0 = \$1{,}000[0.44632] + \$553.68 = \$446.32 + \$553.68 = \$1{,}000$$

As before, because the required rate on this bond equals the coupon rate, the bond sells at par value. We will soon see that when the required return does not equal the coupon rate, the bond may sell above or below par value.

MyLab Finance Financial Calculator



Calculator use When using a calculator to find the price of a bond that pays interest semiannually, we must double the number of periods and divide both the required annual return and the annual coupon payment by 2. For the Mills Company bond, we would use 20 periods (2 × 10 years), a semiannual required return of 3% (6% ÷ 2), and an interest payment of $30 ($60 ÷ 2). Using these inputs, you should find the bond value with semiannual interest to be $1,000, as shown at the left.

Spreadsheet use The value of the Mills Company bond paying semiannual interest at an annual required return of 6% also can be calculated as shown in the following Excel spreadsheet.

MyLab

	A	B
1	VALUATION FOR SEMIANNUAL BOND	
2	Par value	$1,000
3	Coupon interest rate	6%
4	Interest payments per year	2
5	Interest payment	$30
6	Required rate of return	6%
7	Number of years to maturity	10
8	Bond value	–$1,000

Entry in Cell B5 is =B2*B3/B4.
Entry in Cell B8 is =PV(B6/B4,B7*B4,B5,B2,0).
The minus sign appears before the $1,000
in B8 because the bond's price is a cost for the investor.

CHANGES IN BOND VALUES

The price of a bond in the marketplace does not remain fixed at its par value. In Table 6.2 you saw that the prices of bonds often differ from their par values. Some bonds are valued below par (current price below 100), and others are valued above par (current price above 100). A variety of forces in the economy, as well as the passage of time, affect bond values. The most important thing to know about bond prices is that they move in the opposite direction of required returns. When the required return rises, the bond price falls, and when the required return falls, the bond price rises.

Required Returns and Bond Values

Whenever the required return on a bond differs from the bond's coupon rate, the bond's price will differ from its par value. The required return is likely to differ from the coupon rate because either (1) economic conditions have changed since the bond was issued, causing a shift in the cost of funds; or (2) the bond issuer's risk has changed. Increases in the cost of funds or in risk will raise the required return; decreases in the cost of funds or in risk will lower the required return.

discount
The amount by which a bond sells below its par value.

premium
The amount by which a bond sells above its par value.

When the required return is greater than the coupon rate, the bond's value will be less than its par value. In this case, the bond sells at a **discount**. Looking back at Table 6.2 on page 303, you can see that the Verizon and Marathon bonds sell at a discount, and these bonds have a yield to maturity that exceeds the coupon rate. When the required return falls below the coupon rate, the bond's value will be greater than par. In this situation, the bond sells at a **premium**, which is the case for the Ford, Humana, and Kohls bonds in Table 6.2.

IRF EXAMPLE 6.10

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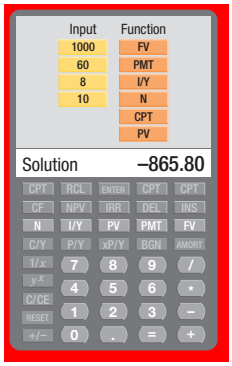
Let's reconsider the Mills Company bond paying a 6% coupon rate and maturing in 10 years (assume annual interest payments for simplicity). Initially, we assumed that the required return on this bond was 6%, and in that case the bond's value was $1,000, equal to par value. Let's see what happens to the bond's value if the required return is higher or lower than the coupon rate. Table 6.6 shows that at an 8% required return, the bond sells at a discount

MyLab Finance Financial Calculator



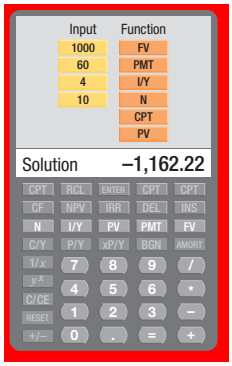


TABLE 6.6 **Bond Values for Various Required Returns (Mills Company's 6% Coupon Interest Rate, 10-Year Maturity, $1,000 Par, January 1, 2018, Issue Date, Paying Annual Interest)**

Required return, r	Bond value, B_0	Status
8%	$ 865.80	Discount
6	1,000.00	Par value
4	1,162.22	Premium

with a value of $865.80, but if the required return is 4%, the bond sells at a premium with a value of $1,162.22.

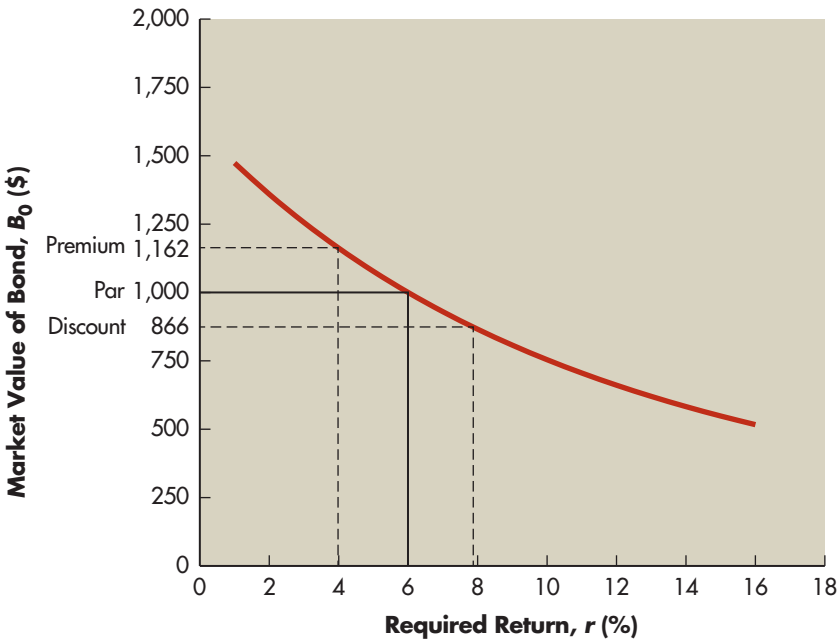
Calculator use Using the inputs shown at the left for the two different required returns, you will find the value of the bond to be below or above par. At an 8% required return, the bond would sell for $865.80, which is a discount of $134.20 below par value. At a 4% required return, the bond would sell for $1,162.22, which is a premium of $162.22 above par value. Figure 6.5 illustrates the inverse relationship between the required return and the price of the Mills Company bond.

Spreadsheet use The values for the Mills Company bond at required returns of 8% and 6% also can be calculated as shown in the following Excel spreadsheet. Once this spreadsheet has been configured, you can calculate the bond price for any required return by simply changing the input values.

FIGURE 6.5

Bond Values and Required Returns
Bond values and required returns (Mills Company's 6% coupon interest rate, 10-year maturity, $1,000 par, January 1, 2018, issue date, paying annual interest)

MyLab Finance Animation



MyLab

	A	B	C
1	VALUATION FOR ANNUAL BOND		
2	Par value	$1,000	$1,000
3	Coupon interest rate	6%	6%
4	Annual interest payment	$60	$60
5	Required rate of return	8%	4%
6	Number of years to maturity	10	10
7	Bond value	–$865.80	–$1,162.22

Entry in Cell B7 is =PV(B5,B6,B4,B2,0). Note that the bond trades at a discount (i.e., below par) because the bond's coupon rate is below investors' required rate of return.

Entry in Cell C7 is =PV(C5,C6,C4,C2,0). Note that the bond trades at a premium (i.e., above par) because the bond's coupon rate is above investors' required rate of return.

Time to Maturity and Bond Values

Whenever the required return is different from the coupon rate, the amount of time to maturity affects a bond's price. An additional factor is whether required returns are constant or change over the life of the bond.

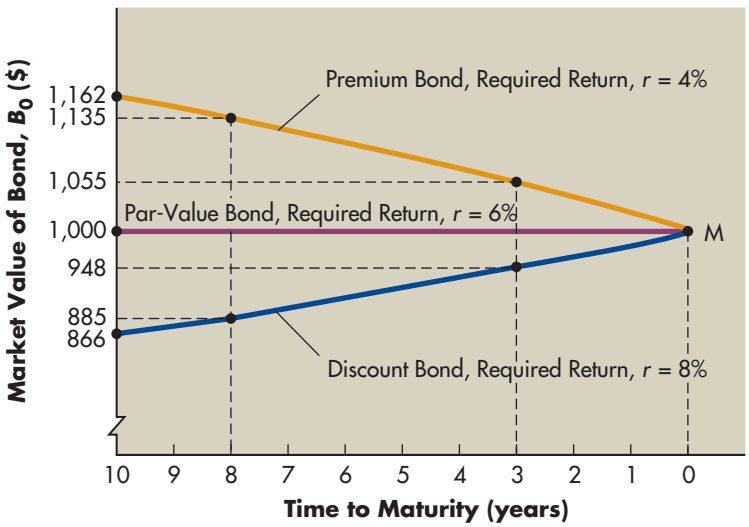
Constant Required Returns When the required return is different from the coupon rate and is constant until maturity, the value of the bond will approach its par value as the passage of time brings the bond's maturity date closer. (Of course, when the required return equals the coupon rate, the bond's value will remain at par until it matures.)

EXAMPLE 6.11

Figure 6.6 depicts the behavior of the bond values calculated earlier and presented in Table 6.6 for Mills Company's 6% coupon rate bond paying annual interest and having 10 years to maturity. Each of the three required returns—8%,

FIGURE 6.6

Time to Maturity and Bond Values
Relationship among time to maturity, required returns, and bond values (Mills Company's 6% coupon rate, 10-year maturity, $1,000 par, January 1, 2018, issue date, paying annual interest)



6%, and 4%—remains constant throughout the bond's 10-year life. The bond's value at both 8% and 4% approaches and ultimately equals the bond's $1,000 par value at its maturity, as the discount (at 8%) or premium (at 4%) declines with the passage of time.

interest rate risk
The chance that interest rates will change and thereby change the required return and bond value. Rising rates, which result in decreasing bond values, are of greatest concern.

Changing Required Returns The chance that a bond's required return will change and thereby alter the bond's price is called **interest rate risk**. Bondholders are typically more concerned with rising interest rates because an increase in a bond's required return causes a decrease in its price. The shorter the time until a bond's maturity, the less responsive is its market value to a given change in the required return. In other words, *short maturities have less interest rate risk than long maturities when all other features (coupon interest rate, par value, and interest payment frequency) are the same.* This statement proves true because of the mathematics of time value; the present values of cash flows arriving in the near future change far less than the present values of cash flows that come in the more distant future, in response to a change in the discount rate.

EXAMPLE 6.12

MyLab Finance Solution Video

The effect of changing required returns on bonds with differing maturities can be illustrated by using Mills Company's bond and Figure 6.6. If the required return rises from 6% to 8% when the bond has 8 years to maturity (see the vertical dashed line at 8 years), the bond's value decreases from $1,000 to $885.07, which is an 11.5% decrease. If the same change in required return had occurred with only 3 years to maturity (see the vertical dashed line at 3 years), the bond's value would have dropped to just $948.46, only a 5.1% decrease. Similar types of responses can be seen for the change in bond value associated with decreases in required returns. The shorter the time to maturity, the less the impact on bond value caused by a given change in the required return.

YIELD TO MATURITY (YTM)

Earlier in this chapter we discussed several different measures of a bond's return. The best of these is the bond's yield to maturity (YTM), which is the compound annual rate of return earned on a bond purchased on a given day and held to maturity. Mathematically, a bond's YTM is the discount rate that equates the bond's market price to the present value of the cash flows paid by the bond to investors. Remember that in Equations 6.5 and 6.5a we referred to the discount rate as the bond's required return, so a bond's YTM is really a measure of its required return. The YTM calculation assumes that the bond makes all scheduled interest and principal payments as promised.[4] The yield to maturity on a bond with a current price equal to its par value (i.e., $B_0 = M$) will always equal the coupon rate. When the bond value differs from par, the YTM will differ from the coupon rate.

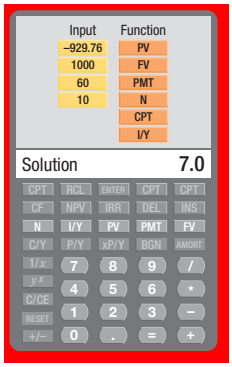
To calculate a bond's YTM, you must know its current market price, the number of years to maturity, its par value, and its coupon rate. In principle, you

4. Many bonds have a *call feature*, which means they may not reach maturity if the issuer, after a specified time, calls them back. Because the call feature typically cannot be exercised until a specific future date, investors often calculate the *yield to call (YTC)*. The yield to call represents the rate of return that investors earn if they buy a callable bond at a specific price and hold it until it is called back and they receive the *call price*, which would be set at or above the bond's par value. Here our focus is solely on the more general measure of yield to maturity.

could find the YTM for a bond making annual coupon payments by solving Equation 6.5 or 6.5a for r. Solving for r algebraically is extremely difficult, so usually we find the YTM by using a calculator or spreadsheet, or by trial and error. The calculator and spreadsheet provide accurate YTM values with minimal effort.

IRF PERSONAL FINANCE EXAMPLE 6.13 Earl Washington wishes to find the YTM on Mills Company's bond. The bond currently sells for $929.76, has a 6% coupon rate and $1,000 par value, pays interest annually, and has 10 years to maturity.

MyLab Finance Financial Calculator



Calculator use Most calculators require either the present value (B_0 in this case) or the future values (I and M in this case) to be input as negative numbers to calculate yield to maturity. We take that approach here. Using the inputs shown at the left, you should find the YTM to be 7.0%.

Spreadsheet use The yield to maturity of Mills Company's bond also can be calculated as shown in the Excel spreadsheet below. First, enter all the bond's cash flows. Note that you begin with the bond's price as an outflow (a negative number). In other words, an investor has to pay the price up front to receive the cash flows over the next 10 years. Next, use Excel's *internal rate of return* function. This function calculates the discount rate that makes the present value of a series of cash flows equal to zero. In this case, when the present value of all cash flows is zero, the present value of the inflows (coupon payments and principal) equals the present value of the outflows (the bond's initial price). In other words, the internal rate of return function is giving us the bond's YTM, the discount rate that equates the bond's price to the present value of its cash flows.

Since the typical bond's interest payments form an annuity stream, you can further reduce the work necessary to solve for a bond's yield to maturity using Excel. The second screenshot on the next page shows how to use the RATE function in Excel to determine a bond's yield to maturity.

MyLab

	A	B
1	YIELD TO MATURITY	
2	Year	Cash Flow
3	0	–$929.76
4	1	$60
5	2	$60
6	3	$60
7	4	$60
8	5	$60
9	6	$60
10	7	$60
11	8	$60
12	9	$60
13	10	$1,060
14	YTM	7.0%
	Entry in Cell B14 is =IRR(B3:B13)	

MyLab

	A	B
1	YIELD TO MATURITY	
2	Par value	$1,000
3	Coupon interest rate	6%
4	Interest payments per year	1
5	Interest payment	$60
6	Number of years to maturity	10
7	Bond current value	–$929.76
8	Bond yield to maturity	7.0%
Entry in Cell B14 is =RATE(B6*B4,B5,B7,B2,0).		

→ REVIEW QUESTIONS MyLab Finance Solutions

6–16 What procedure is used to value a bond that pays annual interest? Semiannual interest?

6–17 What relationship between the required return and the coupon rate will cause a bond to sell at a discount? At a premium? At its par value?

6–18 If the required return on a bond differs from its coupon rate, describe the behavior of the bond price over time as the bond moves toward maturity.

6–19 As a risk-averse investor, would you prefer bonds with short or long periods until maturity? Why?

6–20 What is a bond's yield to maturity (YTM)? Briefly describe the use of a financial calculator and the use of an Excel spreadsheet for finding YTM. Why is the YTM a good measure of the required return on a bond?

→ EXCEL REVIEW QUESTIONS MyLab Finance Solutions

6–21 Spreadsheet models can be used to determine the value of a bond based on its provisions and the required rate of return. Using the information provided at MyLab Finance find the value of an annual coupon bond using a spreadsheet model.

6–22 Some bonds make interest payments more than once per year. Using the information provided at MyLab Finance develop a spreadsheet capable of comparing bond values for differing payment frequencies.

6–23 As a financial manager it is often helpful to know the yield to maturity of outstanding bonds. Using the information provided at MyLab Finance use a spreadsheet to compute the yield to maturity for a bond.

SUMMARY

FOCUS ON VALUE

Interest rates and required returns embody the real cost of money, inflationary expectations, and issuer and issue risk. They reflect the return required by market participants as compensation for the risk perceived in a specific investment.

The interest rate or required return on a bond varies with the bond's maturity, and typically rates are higher on longer term bonds. The yield curve plots the relation between the required return and the maturity of bonds with similar risk profiles.

The value of an asset equals the present value of its expected cash flows, using the required return as the discount rate. Bonds are the easiest financial assets to value; both the amounts and the timing of their cash flows are contractual and therefore known with near certainty (at least for high-grade bonds). The financial manager needs to understand how to apply valuation techniques to bonds, stocks, and tangible assets (as we will demonstrate in the following chapters) to make decisions that are consistent with the firm's **share price maximization goal.**

REVIEW OF LEARNING GOALS

LG 1 **Describe interest rate fundamentals, the term structure of interest rates, and risk premiums.** Equilibrium in the flow of funds between savers and borrowers produces the interest rate or required return. Most interest rates are expressed in nominal terms. The nominal interest rate represents the rate at which money grows over time, whereas the real interest rate represents the rate at which purchasing power grows over time. The difference between the nominal rate and the real rate is (approximately) the inflation rate (or the expected inflation rate). For risky assets, the nominal interest rate is the sum of the risk-free rate and a risk premium reflecting issuer and issue characteristics. The risk-free rate is the real rate of interest plus an inflation premium.

For any class of similar-risk bonds, the term structure of interest rates reflects the relation between the interest rate or required return and the time to maturity. Yield curves plot this relation on a graph and can be downward sloping (inverted), upward sloping (normal), or flat. The expectations theory, liquidity preference theory, and market segmentation theory are cited to explain the shape of the yield curve. Risk premiums for non-Treasury debt issues result from business risk, financial risk, interest rate risk, liquidity risk, tax risk, default risk, maturity risk, and contractual provision risk.

LG 2 **Review the legal aspects of bond financing and bond cost.** Corporate bonds are long-term debt instruments indicating that a corporation has borrowed an amount that it promises to repay in the future under clearly defined terms. Most bonds are issued with maturities of 10 to 30 years and a par value of $1,000. The bond indenture, enforced by a trustee, states all conditions of the bond issue. It contains both standard debt provisions and restrictive covenants, which may include a sinking-fund requirement and/or a security interest. The cost of a bond to an issuer depends on its maturity, offering size, and issuer risk and on the basic cost of money.

LG 3 **Discuss the general features, yields, prices, ratings, popular types, and international issues of corporate bonds.** A bond issue may include a conversion feature, a call feature, or stock purchase warrants. The return on a bond

can be measured by its current yield, yield to maturity (YTM), or yield to call (YTC). Bond prices are typically reported along with their coupon, maturity date, and yield to maturity (YTM). Bond ratings by independent agencies indicate the risk of a bond issue. Various types of traditional and contemporary bonds are available. Eurobonds and foreign bonds enable established creditworthy companies and governments to borrow large amounts internationally.

LG4 **Understand the key inputs and basic model used in the bond valuation process.** Key inputs to the valuation process include cash flows, timing, risk, and the required return. The value of any asset is equal to the present value of all future cash flows it is expected to provide over the relevant time period.

LG5 **Apply the basic valuation model to bonds, and describe the impact of required return and time to maturity on bond values.** The value of a bond is the present value of its coupon payments plus the present value of its par value. The discount rate used to determine bond value is the required return, which may differ from the bond's coupon rate. A bond can sell at a discount, at par, or at a premium, depending on whether the required return is greater than, equal to, or less than its coupon rate. The amount of time to maturity affects bond prices. The price of a bond will approach its par value as the bond moves closer to maturity. The chance that interest rates will change and thereby alter the required return and bond value is called interest rate risk. The shorter the amount of time until a bond's maturity, the less responsive is its market value to a given change in the required return.

LG6 **Explain yield to maturity (YTM), its calculation, and the procedure used to value bonds that pay interest semiannually.** Yield to maturity is the rate of return investors earn if they buy a bond at a specific price and hold it until maturity. YTM can be calculated by using a financial calculator or by using an Excel spreadsheet. Bonds that pay interest semiannually are valued by using the same procedure used to value bonds paying annual interest except that the interest payments are one-half of the annual interest payments, the number of periods is twice the number of years to maturity, and the required return is one-half of the stated annual required return on similar-risk bonds.

SELF-TEST PROBLEMS (Solutions in Appendix)

LG5 LG6 IRF

ST6–1 **Bond valuation** Lahey Industries has outstanding a $1,000 par-value bond with an 8% coupon rate. The bond has 12 years remaining to its maturity date.

a. If interest is paid annually, find the value of the bond when the required return is (1) 7%, (2) 8%, and (3) 10%.

b. Indicate for each case in part **a** whether the bond is selling at a discount, at a premium, or at its par value.

c. Using the 10% required return, find the bond's value when interest is paid semiannually.

LG 3 LG 6 IRF

ST6–2 **Bond yields** Elliot Enterprises' bonds currently sell for $1,026.57, have a 6.5% coupon rate and a $1,000 par value, pay interest annually, and have 18 years to maturity.

a. Calculate the bonds' current yield.
b. Calculate the bonds' yield to maturity (YTM).
c. Compare the YTM calculated in part **b** to the bonds' coupon rate and current yield (calculated in part **a**). Use a comparison of the bonds' current price and par value to explain these differences.

WARM-UP EXERCISES

Select problems are available in MyLab Finance.

LG 1

E6–1 Suppose that the real rate of return on T-bills is 5% and the inflation rate is 2.4%. What is the nominal rate of return on T-bills?

LG 1

E6–2 The yields for Treasuries with differing maturities on a recent day are shown in the following table.

Maturity	Yield
3 months	0.50%
6 months	0.62
1 year	0.75
2 years	1.50
3 years	1.80
5 years	3.80
10 years	4.51
30 years	4.62

a. Use this information to plot a yield curve for this date.
b. If the expectations hypothesis is true, approximately what rate of return do investors expect a 5-year Treasury note to pay 5 years from now?
c. If the expectations hypothesis is true, approximately what rate of return do investors expect a 1-year Treasury security to pay starting 2 years from now?
d. Is it possible that even though the yield curve slopes up in this problem, investors will not be expecting rising interest rates? Explain.

LG 1

E6–3 The YTMs for Treasuries with differing maturities (with each rate expressed as an annual rate) on a recent day were as shown in the following table.

Maturity	YTM
3 months	1.41%
6 months	1.71
2 years	2.68
3 years	3.01
5 years	3.70
10 years	4.51
30 years	5.25

The real rate of interest is 0.8% per year. Use the information in the preceding table to calculate the approximate inflation expectation for each maturity.

LG 1

E6–4 Assume that the rate of inflation expected over the coming financial year in India is 6.5%. Explain how a 1-year T-bill could earn a negative real rate of return over the next year. How could it have a zero real rate of return? What is the minimum nominal rate of return the T-bill should offer an investor who expects a 3% real rate of return?

LG 1

E6–5 Calculate the risk premium for each of the following companies offering long-term bonds, assuming that the yield to maturity (YTM) for comparable Treasuries is 4%.

Company	Nominal interest rate
A	6%
B	9
C	5.2

LG 4

E6–6 Jennifer has invested in two schemes. The first scheme has a required return of 12% and will produce a stream of £300 at the end of each year indefinitely. The second scheme has a required return of 8% and will produce an end-of-year cash flow of £500 in the first year, £800 in the second and third years, and £250 in its fourth and final year. Calculate the present value of each investment scheme based on their payment streams and required returns.

LG 5

E6–7 A bond with 5 years to maturity and a coupon rate of 6% has a par, or face, value of $20,000. Interest is paid annually. If the required return on this bond is 8%, what is the price of the bond?

LG 5

E6–8 Assume a 5-year Treasury bond has a coupon rate of 4.5%.

a. Give examples of required rates of return that would make the bond sell at a discount, at a premium, and at par.

b. If this bond's par value is $10,000, calculate the differing values for this bond given the required rates you chose in part **a.**

PROBLEMS

Select problems are available in MyLab Finance. The MyLab icon indicates problems in Excel format available in MyLab Finance.

LG 1

P6–1 **Interest rate fundamentals: Real and nominal rates of return** Nick is a product manager at an investment banking firm. When his supervisor asks him to price an investment product, Nick conducted some research to obtain market information. According to his research, the rate of return of 3-month Treasury bills is 6% and the expected inflation rate now stands at 3%. Nick also observed that the risk

premium of an investment product with similar characteristics in the market is 5%. Based on the information, what should the nominal rate of return of Nick's investment product be?

LG 1

P6–2 **Equilibrium rate of interest** To estimate the equilibrium rate of interest, the economics division of Mountain Banks—a major bank holding company—has gathered the data summarized in the following table. Because the likelihood is high that new tax legislation will be passed in the near future, the table also includes current data as well as data reflecting the probable impact of passage of the legislation on the demand for funds. (*Note:* The proposed legislation will not affect the supply schedule of funds. Assume a perfect world in which inflation is expected to be zero, funds suppliers and demanders have no liquidity preference, and all outcomes are certain.)

	Currently		With passage of tax legislation
Amount of funds supplied/demanded ($ billion)	Interest rate required by funds suppliers	Interest rate required by funds demanders	Interest rate required by funds demanders
$ 1	2%	7%	9%
5	3	6	8
10	4	4	7
20	6	3	6
50	7	2	4
100	9	1	3

a. Draw the supply curve and the demand curve for funds using the current data. (*Note:* Unlike the functions in Figure 6.1, the functions here will not appear as straight lines.)
b. Using your graph, label and note the equilibrium rate of interest using the current data.
c. Add to the graph, drawn in part **a**, the new demand curve expected in the event that the proposed tax legislation is passed.
d. What is the new equilibrium rate of interest? Compare and analyze this finding in light of your analysis in part **b.**

Personal Finance Problem

LG 1

P6–3 **Real and nominal rates of interest** Jonathan Harper currently has £1,000 that he can spend today on novelty yarn costing £20 a bundle. Alternatively, he could invest the £1,000 in a Bank of England bond that pays 6% nominal rate of interest. The inflation forecast for the coming year is 3%.
a. How many skeins of novelty yarn can Jonathan purchase today?
b. How much money will Jonathan have at the end of 1 year if he forgoes purchasing the skeins of yarn today and invests his money instead?

c. How much would you expect a skein of yarn to cost at the end of 1 year in light of the expected inflation?

d. If Jonathan invests in the bond and then uses the proceeds at the end of 1 year to buy yarn, how many skeins (fractions are OK) can he buy? Compare your answer to the number of skeins he can buy at the beginning of the period.

e. What is Jonathan's real rate of return over the year? How is it related to the change in Jonathan's buying power found in part **d**? Explain.

LG 1

P6–4 **Yield curve** Jack Trading and Brokerage Ltd. wishes to evaluate interest rate behavior. They have gathered data from five Treasury securities issued by Deutsche Bundesbank, Germany's central bank. Each security has a different maturity and all measured at the same point in time. The summarized data follow.

Bundesbank Treasury security	Time to maturity	Yield
A	5 years	5.2%
B	10 years	6.3
C	20 years	7.5
D	1 year	3.1
E	6 months	2.3

a. Draw the yield curve associated with these data.

b. Describe the resulting yield curve in part **a,** and explain what it says about the future direction of interest rates assuming under the expectations theory.

LG 1

P6–5 **Nominal interest rates and yield curves** Economic forecasters predict that the rate of inflation in Singapore will be at 3% over the next few decades. The following table shows the nominal interest paid on Treasury securities having different maturities.

Maturity	Nominal rate of return
3 months	6%
2 years	7.5
5 years	8
10 years	10
20 years	12

a. Approximately what real rate of interest do Treasury securities offer investors at each maturity?

b. Assume that the nominal rate of interest paid by every Treasury security above suddenly dropped by 1% without any change in inflation forecast. What effect, if any, would this event have on your answers in part **a**?

c. Using your findings in part **a,** draw a yield curve for Singapore's Treasury securities. Explain the future direction of interest rates under the expectations theory.

d. What would a follower of the liquidity preference theory say about how the preferences of lenders and borrowers tend to affect the shape of the yield curve drawn in part **c**?

e. What would a follower of the market segmentation theory say about the supply and demand for long-term loans versus the supply and demand for short-term loans given the yield curve constructed for part **c** of this problem?

LG 1 MyLab

P6–6 Nominal and real rates Tyra loves to shop at her favorite store, Dollar Barrel, where she can find hundreds of items priced at exactly $1. Tyra has $200 to spend and is thinking of going on a shopping spree at Dollar Barrel, but she is also thinking of investing her money.

a. Suppose the expected rate of inflation is 1% (so next year, everything at Dollar Barrel will cost $1.01) and Tyra can earn 5% on money that she invests. Approximately what real rate of interest could Tyra earn if she invests her money? How many items can she buy at Dollar Barrel today, and how many can she buy a year from now if she invests her money and goes shopping later? What is the percentage increase in Tyra's purchasing power if she waits a year to go shopping? Compare your answer to the approximate real interest rate on Tyra's investment.

b. Now suppose that the expected inflation rate is 10% and Tyra can earn 20% on money that she invests over the year. What is the approximate real rate of interest that Tyra will earn? Calculate the number of items that Tyra could buy next year from Dollar Barrel if she invests her money. What is the percentage increase in her purchasing power if she waits a year to go shopping? Relate your answer back to Tyra's real rate of return.

LG 1

P6–7 Term structure of interest rates The following yield data for a number of highest-quality corporate bonds existed at each of the three points in time noted.

	Yield		
Time to maturity (years)	5 years ago	2 years ago	Today
1	9.1%	14.6%	9.3%
3	9.2	12.8	9.8
5	9.3	12.2	10.9
10	9.5	10.9	12.6
15	9.4	10.7	12.7
20	9.3	10.5	12.9
30	9.4	10.5	13.5

a. On the same set of axes, draw the yield curve at each of the three given times.

b. Label each curve in part **a** with its general shape (downward sloping, upward sloping, flat).

c. Describe the general interest rate expectation existing at each of the three times, assuming the expectations theory holds.

d. Examine the data from 5 years ago. According to the expectations theory, what approximate return did investors expect a 5-year bond to pay as of today?

LG 1

P6–8 **Term structure** A 2-year Treasury bond currently offers a 6% rate of return. A 3-year Treasury bond offers a 7% rate of return. Under the expectations theory, what rate of return do investors expect a 2-year Treasury bond to pay during the third year?

LG 1

P6–9 **Risk-free rate and risk premiums** Consider the following information:

Security	Time to maturity (years)	Inflationary expectation	Risk premium
A	3	6%	4%
B	5	5.5	5
C	6	5	2
D	7	4.8	3
E	10	6	6

a. Suppose the rate of return on 3-month Treasury bills is 4%, and the 3-month expected inflation rate is 2%. What is the real return?
b. Based on your result in part **a,** what is the nominal rate of return of each security?
c. Why is the inflationary expectation for each security different?

LG 2

P6–10 **Bond interest payments before and after taxes** Your company needs to raise $50 million, and you want to issue 10-year annual coupon bonds to raise this capital. Suppose the market requires the return of your company's bonds to be 6%, and you decide to issue them at par.
a. How many bonds would you need to issue?
b. What will be the total expense to your company at the time when the bonds mature in year 10?
c. Suppose your company is in the 38% tax bracket. What is your company's net after-tax interest cost associated with this bond issue at the time when the bonds mature in year 10?

LG 4

P6–11 **Current yield and yield to maturity** Assume that a $1,000-par-value bond has a coupon rate of 5% and will mature in 10 years. It has a current price quote of $810.34. Given this information, answer the following questions.
a. What is the yield to maturity of the bond?
b. What is the current yield of the bond?
c. Why does the current yield differ from the yield to maturity?
d. One year later, the market rates have increased to 8%. Assume that you have just received a coupon payment and sold the bond. If you sold your bond at its intrinsic value, what would the rate of return be on your investment?

Personal Finance Problem

LG 4 MyLab

P6–12 **Valuation fundamentals** Imagine that you are trying to evaluate the economics of purchasing a condominium to live in during college rather than renting an apartment. If you buy the condo, during each of the next 4 years you will have to pay property taxes and maintenance expenditures of about $6,000 per year, but you will avoid paying rent of $10,000 per year. When you graduate 4 years from now, you expect to sell the condo for $125,000. If you buy the condo, you will use money you have saved that is currently invested and earning a 4% annual rate of return. Assume for simplicity that all cash flows (rent, maintenance, etc.) would occur at the end of each year.
a. Draw a timeline showing the cash flows, their timing, and the required return applicable to valuing the condo.
b. What is the maximum price you would be willing to pay to acquire the condo? Explain.

LG4 MyLab

P6–13 **Valuation of assets** Using the information provided in the following table, find the value of each asset today.

Asset	Cash flow: Year	Cash flow: Amount	Appropriate required return
A	1	$ 3,000	8%
	2	3,000	
	3	3,000	
B	1 through ∞	$ 500	5%
C	1	$ 0	6%
	2	0	
	3	0	
	4	0	
	5	45,000	
D	1 through 5	$ 1,500	4%
	6	8,500	
E	1	$ 2,000	7%
	2	3,000	
	3	5,000	
	4	7,000	
	5	4,000	
	6	1,000	

Personal Finance Problem

LG4

P6–14 **Asset valuation and risk** Lothar Drake wishes to estimate the value of an asset expected to provide cash inflows of $4,000 at the end of years 1 and 2, $5,000 at the end of years 3 and 4, and $4,500 at the end of year 5. His research indicates that he must earn 4% on low-risk assets, 6% on average-risk assets, and 10% on high-risk assets.

a. Determine what is the most Lothar should pay for the asset if it is classified as (1) low-risk, (2) average-risk, and (3) high-risk.

b. Suppose that Lothar is unable to assess the risk of the asset and wants to be certain that he is making a good decision. Based on your findings in part **a,** what is the most he should pay? Why?

c. All else being the same, what effect does increasing risk have on the value of an asset? Explain your answer in light of your findings in part **a.**

LG5

P6–15 **Basic bond valuation** Motorway Development Corporation builds and maintains highways across Europe. They have an outstanding issue of €100-par-value bonds with an 8% coupon rate. The issue pays interest *annually* and has 12 years remaining to its maturity date.

a. If bonds of similar risk are currently earning a 4% rate of return, how much should the Motorway Development Corporation's bond sell for today?

b. Describe the *two* possible reasons why the rate on similar-risk bonds is below the coupon rate on the Motorway Development Corporation bonds.

c. If the required return were at 10% instead of 4%, what would the current value of Motorway Development Corporation's bonds be? Contrast this finding with your findings in part **a** and discuss.

LG5 MyLab

P6–16 **Bond valuation: Annual interest** Calculate the value of each of the bonds shown in the following table, all of which pay interest *annually*.

Bond	Par value	Coupon rate	Years to maturity	Required return
A	$1,000	11%	20	12%
B	1,000	8	16	8
C	100	9	8	7
D	500	6	13	8
E	1,000	7	10	5

LG5

P6–17 **Bond value and changing required returns** Bond X has a coupon rate of 8% and Bond Y pays a 4% annual coupon. Both bonds have 10 years to maturity. The yield to maturity for both bonds is now 8%.

a. If the interest rate rises by 2%, by what percentage will the price of the two bonds change?

b. If the interest rate drops by 2%, by what percentage will the price of the two bonds change?

c. Which bond has more interest rate risk? Why?

LG5

P6–18 **Bond value and time: Constant required returns** Pecos Manufacturing has just issued a 15-year, 12% coupon rate, $1,000-par bond that pays interest annually. The required return is currently 14%, and the company is certain it will remain at 14% until the bond matures in 15 years.

a. Assuming that the required return does remain at 14% until maturity, find the value of the bond with (1) 15 years, (2) 12 years, (3) 9 years, (4) 6 years, (5) 3 years, and (6) 1 year to maturity.

b. Plot your findings on a set of "time to maturity (x-axis)–market value of bond (y-axis)" axes constructed similarly to Figure 6.6.

c. All else remaining the same, when the required return differs from the coupon rate and is assumed to be constant to maturity, what happens to the bond value as time moves toward maturity? Explain your answer in light of the graph in part **b.**

Personal Finance Problem

LG5 MyLab

P6–19 **Bond value and time: Changing required returns** Lynn Parsons is considering investing in either of two outstanding bonds. The bonds both have $1,000 par values and 11% coupon rates and pay annual interest. Bond A has exactly 5 years to maturity, and bond B has 15 years to maturity.

a. Calculate the value of bond A if the required return is (1) 8%, (2) 11%, and (3) 14%.

b. Calculate the value of bond B if the required return is (1) 8%, (2) 11%, and (3) 14%.

c. From your findings in parts **a** and **b**, complete the following table, and discuss the relationship between time to maturity and changing required returns.

Required return	Value of bond A	Value of bond B
8%	?	?
11	?	?
14	?	?

d. If Lynn wants to minimize interest rate risk, which bond should she purchase? Why?

LG 6

P6–20 **Yield to maturity** Peter, an intern at Elite Investments, is asked by his supervisor to perform simple analysis of bonds in the bond market. He wants to calculate the theoretical values of the following six bonds. Using the information provided below, calculate the intrinsic value of each $1,000-par-value bond.

Bond	Coupon rate	Coupon frequency	Time to maturity	Yield to maturity	Price
A	5%	semiannually	5 years	5%	_____
B	5	annually	5	5	_____
C	7	semiannually	7	7	_____
D	7	annually	10	7	_____
E	12	semiannually	8	8	_____
F	10	annually	8	7	_____

LG 6

P6–21 **Yield to maturity** Three years ago, ABC Company issued 10-year bonds that pay 5% semiannually.

a. If the bond currently sells for $1,045, what is the yield to maturity (YTM) on this bond?

b. If you are expecting the interest rate to drop in the near future and you want to gain profit by speculating on a bond, will you buy or sell this bond? Explain.

LG 6

P6–22 **Yield to maturity** Each of the bonds shown in the following table pays interest *annually*.

Bond	Par value	Coupon rate	Years to maturity	Current value
A	$ 400	9%	10	$ 375
B	300	10	18	300
C	1,000	10	14	1,200
D	100	10	12	120
E	2,000	6	4	1,800

a. Calculate the yield to maturity (YTM) for each bond.

b. What relationship exists between the coupon rate and yield to maturity and the par value and market value of a bond? Explain.

Personal Finance Problem

LG 2 LG 5 LG 6

P6–23 **Bond valuation and yield to maturity** Mark Goldsmith's broker has shown him two bonds issued by different companies. Each has a maturity of 5 years, a par value of $1,000, and a yield to maturity of 7.5%. The first bond is issued by Crabbe Waste Disposal Corporation and has a coupon rate of 6.324% paid annually. The second bond, issued by Malfoy Enterprises, has a coupon rate of 8.8% paid annually.

a. Calculate the selling price for each bond.

b. Mark has $20,000 to invest. If he wants to invest only in bonds issued by Crabbe Waste Disposal, how many of those bonds could he buy? What if he wants to invest only in bonds issued by Malfoy Enterprises? Round your answers to the nearest integer.

c. What is the total interest income that Mark could earn each year if he invested only in Crabbe bonds? How much interest would he earn each year if he invested only in Malfoy bonds?

d. Assume that Mark will reinvest all the interest he receives as it is paid, and his rate of return on reinvested interest will be 10%. Calculate the total dollars that Mark will accumulate over 5 years if he invests in Crabbe bonds or Malfoy bonds. Your total dollar calculation will include the interest Mark gets, the principal he receives when the bonds mature, and all the additional interest he earns from reinvesting the coupon payments that he receives.

e. The bonds issued by Crabbe and Malfoy might appear to be equally good investments because they offer the same yield to maturity of 7.5%. Notice, however, that your answers to part **d** are not the same for each bond, suggesting that one bond is a better investment than the other. Why is that the case?

LG 6

P6–24 **Bond valuation: Semiannual interest** Heather has just bought a bond that will mature in 5 years for £300, with a £320 par value and a coupon rate of 10% paid semiannually. What should the value of this bond be if the required return on similar-risk bonds is 12% per year (6% paid semiannually)?

LG 6 MyLab

P6–25 **Bond valuation: Semiannual interest** Calculate the value of each of the bonds shown in the following table, all of which pay interest semiannually.

Bond	Par value	Coupon rate	Years to maturity	Required stated annual return
A	$1,000	10%	12	8%
B	1,000	12	20	12
C	500	12	5	14
D	1,000	14	10	10
E	100	6	4	14

LG 6

P6–26 **Bond valuation: Quarterly interest** Calculate the value of a $1,000-par-value bond paying quarterly interest at an annual coupon rate of 12% and having 8 years until maturity if the required return on similar-risk bonds is currently a 10% annual rate paid quarterly.

LG 1

P6–27 **ETHICS PROBLEM** Bond-rating agencies have invested significant sums of money in an effort to determine which quantitative and nonquantitative factors best predict

bond defaults. Furthermore, some of the raters invest time and money to meet privately with corporate personnel to get information used in assigning the issue's bond rating. To recoup those costs, some bond-rating agencies have tied their ratings to the purchase of additional services. Do you believe this is an acceptable practice? Defend your position.

SPREADSHEET EXERCISE

CSM Corporation has a bond issue outstanding that has 15 years remaining to maturity and carries a coupon rate of 6%. Interest on the bond is paid on a semiannual basis. The par value of the CSM bond is $1,000, and it is currently selling for $874.42.

TO DO

a. Create a spreadsheet similar to the Excel spreadsheet examples in the chapter to solve for the yield to maturity.
b. Create a spreadsheet similar to the Excel spreadsheet examples in the chapter to solve for the price of the bond if the yield to maturity is 2% higher.
c. Create a spreadsheet similar to the Excel spreadsheet examples in the chapter to solve for the price of the bond if the yield to maturity is 2% lower.
d. What can you summarize about the relationship between the price of the bond, the par value, the yield to maturity, and the coupon rate?

MyLab Finance Visit www.pearson.com/mylab/finance for **Chapter Case: *Evaluating Annie Hegg's Proposed Investment in Atilier Industries Bonds,*** Group Exercises, and other numerous resources.

CHAPTER 7

Stock Valuation

LEARNING GOALS

- LG1 Differentiate between debt and equity.
- LG2 Discuss the features of both common and preferred stock.
- LG3 Apply the basic valuation model to stocks, and describe the relevant cash flows and the impact of required return.
- LG4 Understand the concept of market efficiency and how to value stocks using zero-growth, constant-growth, and variable-growth dividend models.
- LG5 Discuss the free cash flow valuation model and the book value, liquidation value, and price/earnings (P/E) multiple approaches.
- LG6 Explain the relationships among financial decisions, return, risk, and the firm's value.

MyLab Finance Chapter Introduction Video

WHY THIS CHAPTER MATTERS TO YOU

In your *professional* life

ACCOUNTING You need to understand the difference between debt and equity in terms of tax treatment; the ownership claims of capital providers, including venture capitalists and stockholders; and the differences between book value per share and other market-based valuations.

INFORMATION SYSTEMS You need to understand the procedures used to issue common stock, the information needed to value stock, how to collect and process the necessary information from each functional area, and how to disseminate information to investors.

MANAGEMENT You need to understand the difference between debt and equity capital, the rights and claims of stockholders, the process of issuing common stock, and the effects each functional area has on the value of the firm's stock.

MARKETING You need to understand that the firm's ideas for products and services will greatly affect investors' beliefs regarding the likely success of the firm's projects and that projects viewed as more likely to succeed are also viewed as more valuable and therefore lead to a higher stock value.

OPERATIONS You need to understand that the evaluations of venture capitalists and other would-be investors will in part depend on the efficiency of the firm's operations and that more cost-efficient operations lead to better growth prospects and therefore higher stock valuations.

In your *personal* life

At some point, you are likely to hold stocks as an asset in your retirement program. You may want to estimate a stock's value. If the stock is selling below its estimated value, you may buy the stock; if its market price is above its value, you may sell it. Some individuals rely on financial advisors for such buy or sell recommendations. Regardless of how you approach investment decisions, it will be helpful to understand how stocks are valued.

LG 1

7.1 Differences Between Debt and Equity

debt
Includes all borrowing incurred by a firm, including bonds, and is repaid according to a fixed schedule of payments.

equity
Funds provided by the firm's owners (investors or stockholders) that are repaid subject to the firm's performance.

Although debt and equity capital are both sources of external financing used by firms, they are very different in several important respects. Most importantly, debt financing is obtained from creditors, and equity financing is obtained from stockholders whose investment makes them part owners of the firm. Creditors (lenders or debtholders) have a legal right to be repaid, whereas stockholders have only an expectation of being repaid. **Debt** includes all borrowing incurred by a firm, including bonds, and is repaid according to a fixed schedule of payments. **Equity** consists of funds provided by the firm's owners (investors or stockholders), and the stockholders earn a return that is not guaranteed but is tied to the firm's performance. A firm can obtain equity either *internally*, by retaining earnings rather than paying them out as dividends to its stockholders, or *externally*, by selling common or preferred stock. The key differences between debt and equity capital are summarized in Table 7.1 and discussed in the following pages.

VOICE IN MANAGEMENT

Unlike creditors, stockholders are owners of the firm. Stockholders generally have voting rights that permit them to select the firm's directors and vote on special issues. In contrast, debtholders do not receive voting privileges but instead rely on the firm's contractual obligations to be their voice.

CLAIMS ON INCOME AND ASSETS

Stockholders' claims on income and assets are secondary to the claims of creditors. Their claims on income cannot be paid until all the creditors' claims, including both interest and scheduled principal payments, have been satisfied. After satisfying creditor's claims, the firm's board of directors decides whether to distribute dividends to the owners.

MATTER OF FACT

How Are Assets Divided in Bankruptcy?

According to the U.S. Securities and Exchange Commission, in bankruptcy assets are divided up as follows:

1. **Secured creditors:** Secured bank loans or secured bonds are paid first.
2. **Unsecured creditors:** Unsecured bank loans or unsecured bonds, suppliers, or customers have the next claim.
3. **Equityholders:** Equityholders or the owners of the company have the last claim on assets, and they may not receive anything if the secured and unsecured creditors' claims are not fully repaid.

Stockholders' claims on assets also are secondary to the claims of creditors. If the firm fails, its assets are sold, and the proceeds are distributed in this order: secured creditors, unsecured creditors, and equityholders. Because equityholders are the last to receive any distribution of assets, their investment is relatively risky, and they expect greater returns from their investment in the firm's stock than the returns creditors require on the firm's borrowings. The greater rate of

TABLE 7.1 Key Differences Between Debt and Equity

	Type of capital	
Characteristic	Debt	Equity
Voice in management[a]	No	Yes
Claims on income and assets	Senior to equity	Subordinate to debt
Maturity	Stated	None
Tax treatment	Interest deduction	No deduction

[a]Debtholders do not have voting rights, but instead they rely on the firm's contractual obligations to them to be their voice.

return expected by stockholders means that the cost of equity financing is higher relative to the cost of debt financing for the firm.

MATURITY

Unlike debt, equity is a permanent form of financing for the firm. It does not "mature," so repayment is not required. When they purchase shares, stockholders must recognize that, although a ready market may exist for their shares, the price of the shares will fluctuate over time, and there is no way to know what the share price will be when an investor is ready to sell. This fluctuation of the market price of equity makes the overall returns to a firm's stockholders even more risky.

TAX TREATMENT

Interest payments to debtholders are treated as tax-deductible expenses by the issuing firm, whereas dividend payments to a firm's stockholders are not tax deductible. The tax deductibility of interest lowers the corporation's cost of debt financing—yet another reason the cost of debt financing is lower than that of equity financing.

→ REVIEW QUESTION MyLab Finance Solution

7–1 What are the key differences between debt and equity?

LG 2

7.2 Common and Preferred Stock

A firm can obtain equity capital by selling either common or preferred stock. All corporations initially issue common stock to raise equity capital. Some later issue either additional common stock or preferred stock to raise more equity capital. Although both common and preferred stock are forms of equity capital, preferred stock has some similarities to debt that significantly differentiate it from common stock. Here we first consider the features of both common and preferred stock and then describe the process of issuing common stock, including the use of venture capital.

COMMON STOCK

privately owned (stock)
The common stock of a firm is owned by private investors; this stock is not publicly traded.

publicly owned (stock)
The common stock of a firm is owned by public investors; this stock is publicly traded.

closely owned (stock)
The common stock of a firm is owned by an individual or a small group of investors (such as a family); they are usually privately owned companies.

widely owned (stock)
The common stock of a firm is owned by many unrelated individual and institutional investors.

par-value common stock
An arbitrary value that is established for legal purposes in the firm's corporate charter and that can be used to find the total number of shares outstanding by dividing it into the book value of common stock.

preemptive right
Allows common stockholders to maintain their proportionate ownership in the corporation when new shares are issued, thus protecting them from dilution of ownership.

dilution of ownership
A reduction in each previous shareholder's fractional ownership resulting from the sale of new common shares.

dilution of earnings
A reduction in each previous shareholder's fractional claim on the firm's earnings resulting from the sale of new common shares.

rights
Financial instruments that allow stockholders to purchase additional shares at a price below the market price, in direct proportion to their fractional ownership.

The true owners of a corporate business are the common stockholders. Common stockholders are sometimes referred to as *residual owners* because they receive what is left—the residual—after all other claims on the firm's income and assets have been satisfied. They are assured of only one thing: They cannot lose any more than they have invested in the firm. As a result of their generally uncertain position, common stockholders expect to earn relatively high returns. Those returns may come in the form of dividends, capital gains, or both.

Ownership

The common stock of a firm can be **privately owned** by private investors or **publicly owned** by public investors. Private companies are usually smaller than public companies and they are often **closely owned** by an individual investor or a small group of private investors (such as a family). Public companies are **widely owned** by many unrelated individual and institutional investors. The shares of privately owned firms generally do not trade actively in the stock market. If they do trade, the transactions are among private investors and often require the firm's consent. Large corporations, emphasized in the following discussions, are publicly owned, and their shares are generally actively traded in the stock markets described in Chapter 2.

Par Value

The market value of common stock is completely unrelated to its par value. The **par value** of common stock is an arbitrary value established for legal purposes in the firm's corporate charter and is generally set quite low, often $1 or less. Recall that when a firm sells new shares of common stock, the firm records the par value of the shares sold in the capital section of the balance sheet as part of common stock. One benefit of this recording is that at any time the total number of shares of common stock outstanding can be found by dividing the book value of common stock by the par value.

Setting a low par value is advantageous in states where certain corporate taxes are based on the par value of stock. A low par value is also beneficial in states that have laws against selling stock at a discount to par. For example, a company whose common stock has a par value of $20 per share might be unable to issue stock if investors are unwilling to pay more than $16 per share.

Preemptive Rights

The **preemptive right** allows common stockholders to purchase shares in any new stock sale that the firm undertakes, thus maintaining their proportionate ownership in the corporation. Without the preemptive right, new share issues could dilute the ownership of existing stockholders. A **dilution of ownership** is a reduction in each previous shareholder's fractional ownership resulting from the sale of new common shares. Preemptive rights allow preexisting shareholders to maintain their preissuance voting control and protects them against the **dilution of earnings**: a reduction in their fractional claim on earnings that could occur when the firm sells new shares of common stock.

In a *rights offering*, the firm grants **rights** to its shareholders. These financial instruments allow stockholders to purchase additional shares at a price below

authorized shares
Shares of common stock that a firm's corporate charter allows it to issue.

outstanding shares
Issued shares of common stock held by investors, including both private and public investors.

treasury stock
Issued shares of common stock held by the firm; often these shares have been repurchased by the firm.

issued shares
Shares of common stock that have been put into circulation; the sum of *outstanding shares* and *treasury stock*.

the market price, in direct proportion to their fractional ownership. In these situations, rights are an important financing tool that simultaneously allow the firm to raise new equity capital while providing stockholders an incentive to maintain their ownership stake by participating in the offering.

Authorized, Outstanding, and Issued Shares

The corporate charter of a firm indicates how many **authorized shares** it can issue. The firm cannot sell more shares than the charter authorizes without obtaining approval through a shareholder vote. To avoid later amendment of the charter, firms generally attempt to authorize more shares than they initially plan to issue.

Authorized shares become **outstanding shares** when they are issued or sold to investors. If the firm repurchases any of its outstanding shares, these are recorded as **treasury stock** and are no longer considered outstanding shares. **Issued shares** are the shares of common stock that have been put into circulation; they represent the sum of outstanding shares and treasury stock.

EXAMPLE 7.1

Golden Enterprises, a producer of medical pumps, has the following stockholders' equity account on December 31:

Stockholders' Equity

Common stock—$0.80 par value:	
Authorized 35,000,000 shares; issued 15,000,000 shares	$ 12,000,000
Paid-in capital in excess of par	63,000,000
Retained earnings	31,000,000
	$106,000,000
Less: Cost of treasury stock (1,000,000 shares)	4,000,000
Total stockholders' equity	$102,000,000

How many shares of additional common stock can Golden sell without gaining approval from its shareholders? The firm has 35 million authorized shares, 15 million issued shares, and 1 million shares of treasury stock. Thus, 14 million shares are outstanding (15 million issued shares minus 1 million shares of treasury stock), and Golden can issue 21 million additional shares (35 million authorized shares minus 14 million outstanding shares) without seeking shareholder approval. This total includes the treasury shares currently held, which the firm can reissue to the public without obtaining shareholder approval.

Voting Rights

Generally, each share of common stock entitles its holder to one vote in the election of directors and on special issues. Votes are generally assignable and may be cast at the annual stockholders' meeting.

proxy statement
A statement transferring the votes of a stockholder to another party.

Because most stockholders do not attend the annual meeting to vote, they may sign a **proxy statement** transferring their votes to another party. The solicitation of proxies from shareholders is closely controlled by the Securities and Exchange Commission to ensure that proxies are not being solicited on the basis

of false or misleading information. Management usually receives the stockholders' proxies because it can solicit them at company expense.

proxy battle
The attempt by a nonmanagement group to gain control of the management of a firm by soliciting a sufficient number of proxy votes.

Occasionally, when the firm is widely owned, outsiders may wage a **proxy battle** to unseat the existing management and gain control of the firm. Winning a corporate election requires votes from a majority of the shares voted. Historically, the odds of an outside group winning a proxy battle were generally slim, but that has changed in recent years. Investors such as Carl Icahn have had repeated success gaining seats on boards of directors and affecting corporate policies in other ways through proxy fights.

Rather than trying to gain control of the firm through a proxy fight, shareholders can simply make proposals that may be voted on at a shareholders meeting. Even in very large firms, these proposals can sometimes prove effective. In 2016, for instance, shareholders of the largest 250 U.S. public companies, as ranked by *Fortune* magazine, put forward 580 proposals, of which 47.1% received majority support.

In recent years, many firms, including household names like Google and Facebook, have issued two or more classes of common stock with unequal voting rights. A firm can use different classes of stock as a defense against a *hostile takeover* in which an outside group, without management support, tries to gain voting control of the firm by buying its shares in the marketplace. **Supervoting shares**, which have multiple votes per share, allow "insiders" to maintain control against an outside group whose shares have only one vote each. At other times, a class of **nonvoting common stock** is issued when the firm wishes to raise capital through the sale of common stock but does not want to give up its voting control.

supervoting shares
Stock that carries with it multiple votes per share rather than the single vote per share typically given on regular shares of common stock.

nonvoting common stock
Common stock that carries no voting rights; issued when the firm wishes to raise capital through the sale of common stock but does not want to give up its voting control.

When firms issue different classes of common stock on the basis of unequal voting rights, class A common typically—but not universally—has one vote per share, and class B common has supervoting rights. In most cases, the multiple share classes are equal with respect to all other aspects of ownership, although some exceptions do apply to this general rule. In particular, there is usually no difference in the distribution of earnings (dividends) and assets. Treasury stock, which is held within the corporation, generally *does not* have voting rights, *does not* earn dividends, and *does not* have a claim on assets in liquidation.

Dividends

The payment of dividends to the firm's shareholders is at the discretion of the company's board of directors. Most corporations that pay dividends distribute them quarterly. Dividends may be paid in cash, stock, or merchandise. Cash dividends are the most common, merchandise dividends the least.

Common stockholders are not promised a dividend, but they come to expect certain payments on the basis of the firm's dividend payment history. Before firms pay dividends to common stockholders, they must pay any past due dividends owed to preferred stockholders. The ability to pay dividends can be affected by restrictive debt covenants designed to ensure that the firm can repay its creditors.

Since passage of the *Jobs and Growth Tax Relief Reconciliation Act of 2003*, many firms now pay larger dividends to shareholders, who are subject to a maximum tax rate of 20% on dividends rather than the maximum tax rate of 39.6% on other forms of income. Chapter 13 explores the important aspects of firms' dividend decisions in greater depth.

MATTER OF FACT

Did Tax Cuts Stimulate Dividends?

A careful analysis of how firms responded to the dividend tax cuts contained in the 2003 Jobs and Growth Tax Relief Reconciliation Act found that firms dramatically increased dividends soon after that law was passed. One interesting comparison involved the tendency of firms that had never paid dividends to start paying them. In the quarters leading up to the tax cut, only about 4 firms per quarter began paying dividends, but in the quarters immediately following the passage of the new tax law, 29 firms per quarter announced they would start paying dividends. Similar increases occurred in firms already paying dividends, with nearly 50% of all dividend-paying firms announcing they would increase their dividend payments by 20% or more after the tax cut became law. An important confounding factor arose, however: Corporate earnings jumped at the same time, so whether dividends rose due to tax policy or due to improving corporate profits remains a matter of debate.

International Stock Issues

Although the international market for common stock is not as large as the international market for bonds, cross-border issuance and trading of common stock have increased dramatically in the past 30 years.

Some corporations issue stock in foreign markets. For example, the stock of General Electric trades in Frankfurt, London, Paris, and Tokyo; the stocks of Time Warner and Microsoft trade in Frankfurt and London; and the stock of McDonald's trades in Frankfurt, London, and Paris. The Frankfurt, London, and Tokyo markets are the most popular. Issuing stock internationally broadens the ownership base and helps a company integrate into the local business environment. Having locally traded stock can facilitate corporate acquisitions because firms can use their own shares as a method of payment.

American depositary shares (ADSs)
Dollar-denominated receipts for the stocks of foreign companies that are held by a U.S. financial institution overseas.

American depositary receipts (ADRs)
Securities, backed by *American depositary shares (ADSs),* that permit U.S. investors to hold shares of non-U.S. companies and trade them in U.S. markets.

Foreign corporations have also discovered the benefits of trading their stock in the United States. The disclosure and reporting requirements mandated by the U.S. Securities and Exchange Commission have historically discouraged all but the largest foreign firms from directly listing their shares on the New York Stock Exchange or the American Stock Exchange.

As an alternative, most foreign companies choose to tap the U.S. market through **American depositary shares (ADSs)**. These shares are dollar-denominated receipts for the stocks of foreign companies that are held by a U.S. financial institution overseas. They serve as backing for **American depositary receipts (ADRs)**, which are securities that permit U.S. investors to hold shares of non-U.S. companies and trade them in U.S. markets. Because ADRs are issued, in dollars, to U.S. investors, they are subject to U.S. securities laws. At the same time, they give investors the opportunity to diversify their portfolios internationally.

PREFERRED STOCK

par-value preferred stock
Preferred stock with a stated face value that is used with the specified dividend percentage to determine the annual dollar dividend.

Most corporations do not issue preferred stock, but preferred shares are common in some industries such as financial services. *Preferred stock* gives its holders privileges that make them senior to common stockholders. Preferred stockholders are promised a fixed periodic dividend, stated either as a percentage or as a dollar amount. How the dividend is specified depends on whether the preferred stock has a *par value*. **Par-value preferred stock** has a stated face value, and its

no-par preferred stock
Preferred stock with no stated face value but with a stated annual dollar dividend.

annual dividend is specified as a percentage of this value. **No-par preferred stock** has no stated face value, but its annual dividend is stated in dollars. Preferred stock is most often issued by public utilities, by financial institutions such as banks and insurance companies, by acquiring firms in merger transactions, and by young firms receiving investment funds from venture capital firms. Preferred dividends are not tax deductible for the firm that pays them.

Basic Rights of Preferred Stockholders

The basic rights of preferred stockholders are somewhat stronger than those of common stockholders. Preferred stock is often considered *quasi-debt* because, much like interest on debt, it specifies a fixed periodic payment (dividend). Unlike debt, however, preferred stock has no maturity date. Because they have a fixed claim on the firm's income that takes precedence over the claim of common stockholders, preferred stockholders are exposed to less risk.

Preferred stockholders are also given preference over common stockholders in the liquidation of assets in a legally bankrupt firm, although they must "stand in line" behind creditors. The amount of the claim of preferred stockholders in liquidation normally equals the par or stated value of the preferred stock. Preferred stockholders are not normally given a voting right, although preferred stockholders are sometimes allowed to elect one member of the board of directors.

Features of Preferred Stock

A preferred stock issue generally includes a number of features. Along with the stock's par value, the amount of dividend payments, the dividend payment dates, and any restrictive covenants, such features are specified in an agreement similar to a bond indenture.

Restrictive Covenants The restrictive covenants in a preferred stock issue focus on ensuring the firm's continued existence and regular payment of the dividend. These covenants include provisions about passing (i.e., skipping) dividends, the sale of senior securities, mergers, sales of assets, minimum liquidity requirements, and repurchases of common stock. The violation of preferred stock covenants usually permits preferred stockholders either to obtain representation on the firm's board of directors or to force the retirement of their stock at or above its par or stated value.

cumulative (preferred stock)
Preferred stock for which all passed (unpaid) dividends in arrears, along with the current dividend, must be paid before dividends can be paid to common stockholders.

noncumulative (preferred stock)
Preferred stock for which passed (unpaid) dividends do not accumulate.

Cumulation Most preferred stock is **cumulative** with respect to any dividends passed. That is, all dividends in arrears, along with the current dividend, must be paid before dividends can be paid to common stockholders. If preferred stock is **noncumulative**, passed (unpaid) dividends do not accumulate. In this case, only the current dividend must be paid before dividends can be paid to common stockholders. Because common stockholders can receive dividends only after the dividend claims of preferred stockholders have been satisfied, paying preferred dividends when they are due is in the firm's best interest.

callable feature (preferred stock)
A feature of *callable preferred stock* that allows the issuer to retire the shares within a certain period of time and at a specified price.

Other Features Preferred stock can be *callable* or *convertible*. Preferred stock with a **callable feature** allows the issuer to retire outstanding shares within a certain period of time at a specified price. The call price is normally set at or above the initial issuance price, but it may decrease as time passes. Making preferred stock callable provides the issuer with a way to bring the fixed-payment commitment of the preferred issue to an end if conditions favor it.

conversion feature (preferred stock)
A feature of *convertible preferred stock* that allows holders to change each share into a stated number of shares of common stock.

Preferred stock with a **conversion feature** allows holders to change each share into a stated number of shares of common stock, usually anytime after a predetermined date. The number of shares of common stock for which the preferred stock can be exchanged may be fixed, or it may change through time according to a predetermined formula.

→ REVIEW QUESTIONS MyLab Finance Solutions

7–2 What risks do common stockholders take that other suppliers of capital do not?

7–3 How does a rights offering protect a firm's stockholders against the dilution of ownership?

7–4 Explain the relationships among authorized shares, outstanding shares, treasury stock, and issued shares.

7–5 What are the advantages to both U.S.-based and foreign corporations of issuing stock outside their home markets? What are American depositary receipts (ADRs)? What are American depositary shares (ADSs)?

7–6 What claims do preferred stockholders have with respect to distribution of earnings (dividends) and assets?

7–7 Explain the cumulative feature of preferred stock. What is the purpose of a call feature in a preferred stock issue?

LG3 LG4 LG5

7.3 Common Stock Valuation

Common stockholders expect rewards through periodic cash flows, such as cash dividends, or an increasing share value. Some investors decide which stocks to buy and sell based on a strategy to hold a broadly diversified portfolio of stocks. Other investors have a more speculative motive for trading only specific stocks. These investors try to spot companies whose shares are *misvalued,* meaning that the true value of the shares is different from the current market price. These investors buy shares they believe to be *undervalued* (i.e., the market price is less than the true value) and sell shares they think are *overvalued* (i.e., the market price is greater than the true value). Regardless of one's motive for trading, understanding how to value common stocks is an important part of the investment process. Stock valuation is also an important tool for financial managers. How can they work to maximize the stock price without understanding the factors that determine the value of the stock? In this section, we will describe specific stock valuation techniques. First, we will consider the relationship between market efficiency and stock valuation.

MARKET EFFICIENCY AND STOCK VALUATION

Rational buyers and sellers use their assessment of an asset's risk and return to determine its value. To a buyer, the asset's value represents the maximum purchase price, and to a seller, it represents the minimum sale price. In competitive markets with many active participants, such as a stock exchange, the interactions of many buyers and sellers result in an equilibrium price—the *market value*—for each security. This price reflects the collective actions that buyers and sellers take on the basis of all available information. Buyers and sellers digest new information quickly as it becomes available and, through their purchase and sale activities, create a new

MATTER OF FACT

The Value of Speed

The University of Michigan produces a monthly survey measuring consumer confidence, and that survey routinely causes stock prices to move when it is released. In June 2013, various news organizations reported that Thomson Reuters had a contract allowing it to distribute information about the monthly consumer confidence survey to its clients, via a conference call, 5 minutes before the survey results were posted on the university's website. The contract contained another provision that allowed Thomson Reuters to distribute survey results electronically to an elite group of clients at 9:54:58 a.m., 2 seconds prior to the conference call. The 2 seconds of lead time over the rest of the market could allow these clients to trade stocks before most market participants learned about the new information in the survey.

market equilibrium price. Because the flow of new information is continual and the content of that information is unpredictable (otherwise, it would not be *new* information), stock prices fluctuate, always moving toward a new equilibrium that reflects the most recent information available. This general concept, introduced in Chapter 2, is known as *market efficiency*.

Not all market participants are believers in the efficient-market hypothesis. Some think it is worthwhile to search for undervalued or overvalued securities and then trade them to profit from market inefficiencies. Others argue that only mere luck allows market participants to anticipate new information correctly and as a result earn *abnormal returns*, that is, actual returns greater than should be expected given the risk of the investment. They believe that market participants are unlikely to earn abnormal returns over the long run. Contrary to this belief, some well-known investors such as Warren Buffett and Bill Gross have managed to earn abnormal returns on their portfolios for extended periods. It is unclear whether their success is the result of good fortune, or their superior ability to anticipate new information, or of some form of market inefficiency.

The Behavioral Finance Challenge

Although considerable evidence supports the concept of market efficiency, a growing body of academic evidence has begun to cast doubt on the validity of this notion. The research documents various *anomalies*—outcomes that are inconsistent with efficient markets—in stock returns. A number of academics and practitioners have also recognized that emotions and other subjective factors play a role in investment decisions.

behavioral finance
A growing body of research that focuses on investor behavior and its impact on investment decisions and stock prices. Advocates are commonly referred to as "behaviorists."

This focus on investor behavior has resulted in a significant body of research, collectively referred to as **behavioral finance**. Advocates of behavioral finance are commonly referred to as "behaviorists." Daniel Kahneman was awarded the 2002 Nobel Prize in economics for his work in behavioral finance, specifically for integrating insights from psychology and economics. More recently, Richard Thaler received the 2017 Nobel Prize in Economics for his work on the tendency of the stock market to overreact to trends, the economic consequences of consumers failing to exert self control, and the role of investor sentiment in the pricing of certain types of mutual funds. Ongoing research into the psychological factors that can affect investor behavior and the resulting effects on stock prices will likely result in growing acceptance of behavioral finance. The *Focus on Practice* box further explains some findings of behavioral finance.

Although challenges to the efficient-market hypothesis, such as those presented by advocates of behavioral finance, are interesting and worthy of study, in this text we generally take the position that markets are efficient. We will use the terms *expected return* and *required return* interchangeably because they should be equal in an efficient market. In other words, we will operate under the assumption that a stock's market price at any point in time is the best estimate of its value. We're now ready to look closely at the mechanics of common stock valuation.

COMMON STOCK DIVIDEND VALUATION MODEL

Like the value of a bond, discussed in Chapter 6, the value of a share of common stock is equal to the present value of all future cash flows it is expected to provide. So Equation 6.4 can be used to find the value of a share of stock by discounting the stock's expected cash flows back to their present value, using the required return commensurate with the stock's risk as the appropriate discount rate.

Although a stockholder can earn capital gains by selling stock at a price above that originally paid, what the buyer really pays for is the right to all future dividends. What about stocks that do not currently pay dividends? Such stocks have a value attributable to a future dividend stream or to the proceeds from the sale of the company.

The basic dividend valuation model for common stock is given by

$$P_0 = \frac{D_1}{(1 + r)^1} + \frac{D_2}{(1 + r)^2} + \ldots + \frac{D_\infty}{(1 + r)^\infty} \tag{7.1}$$

where

P_0 = value today of common stock
D_t = dividend *expected* at the end of year t
r = required return on common stock

The equation can be simplified somewhat by redefining each year's dividend, D_t, in terms of anticipated growth. We will consider three models here: zero growth, constant growth, and variable growth.

Zero-Growth Dividend Model

zero-growth dividend model
An approach to dividend valuation that assumes a constant, nongrowing dividend stream.

The simplest approach to dividend valuation, the **zero-growth dividend model**, assumes a constant, nongrowing dividend stream. Mature, steady-income-producing firms that have already made and cultivated their long-term strategic investments exemplify firms that pay a constant dividend over time; these firms are sometimes referred to as "cash cows." In terms of the notation already introduced,

$$D_1 = D_2 = \ldots = D_\infty$$

When we let D_1 represent the amount of the annual dividend, Equation 7.1 under zero growth reduces to

$$P_0 = D_1 \times \sum_{t=1}^{\infty} \frac{1}{(1 + r)^t} = D_1 \times \frac{1}{r} = \frac{D_1}{r} \tag{7.2}$$

FOCUS ON PRACTICE *in practice*

Understanding Human Behavior Helps Us Understand Investor Behavior

Market anomalies are patterns inconsistent with the efficient-market hypothesis. Behavioral finance has a number of theories to help explain how human emotions influence people in their investment decision-making processes.

Regret theory deals with the emotional reaction people experience after realizing they have made an error in judgment. When deciding whether to sell a stock, investors become emotionally affected by the price at which they purchased the stock. A sale at a loss would confirm that the investor miscalculated the value of the stock when it was purchased. The correct approach when considering whether to sell a stock is, "Would I buy this stock today if it were already liquidated?" If the answer is no, it is time to sell. Regret theory also holds true for investors who passed up buying a stock that now is selling at a much higher price. Again, the correct approach is to value the stock today without regard to its prior value.

Herding is another market behavior affecting investor decisions. Some investors rationalize their decision to buy certain stocks with "everyone else is doing it." Investors may feel less embarrassment about losing money on a popular stock than about losing money on an unknown or unpopular stock.

People have a tendency to place particular events into *mental accounts*, and the difference between these compartments sometimes influences behavior more than the events themselves. Researchers have asked people the following question: "Would you purchase a $20 ticket at the local theater if you realize after you get there that you have lost a $20 bill?" Roughly 88% of people would do so. Under another scenario, people were asked whether they would buy a second $20 ticket if they arrived at the theater and realized they had left at home a ticket purchased in advance for $20. Only 40% of respondents would buy another. In both scenarios, the person is out $40, but mental accounting leads to a different outcome. In investing, compartmentalization is best illustrated by the hesitation to sell an investment that once had monstrous gains and now has a modest gain. During bull markets, people get accustomed to paper gains. When a market correction deflates investors' net worth, they are hesitant to sell, causing them to wait for the return of that gain.

Other investor behaviors are prospect theory and anchoring. According to *prospect theory*, people express a different degree of emotion toward gains than losses. Individuals are stressed more by prospective losses than they are buoyed by the prospect of equal gains. *Anchoring* is the tendency of investors to place more value on recent information. People tend to give too much credence to recent market opinions and events and mistakenly extrapolate recent trends that differ from historical, long-term averages and probabilities. Anchoring is a partial explanation for the longevity of some bull markets.

Most stock valuation techniques require that all relevant information be available to properly determine a stock's value and potential for future gain. Behavioral finance may explain the connection between valuation and an investor's actions based on that valuation.

▶ *Theories of behavioral finance can apply to other areas of human behavior as well as investing. Think of a situation in which you may have demonstrated one of these behaviors. Share your situation with a classmate.*

The equation shows that with zero growth, the value of a share of common stock would equal the present value of a perpetuity of D_1 dollars discounted at a required rate of return for common stock, r. (Perpetuities were introduced in Chapter 5; see Equation 5.14 and the related discussion.)

IRF PERSONAL FINANCE EXAMPLE 7.2

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Chuck Swimmer estimates that the dividend paid on the common stock of Denham Company, an established textile producer, is expected to remain constant at $3 per share indefinitely. If his required return on its common stock is 15%, then using Equation 7.2 we find the stock's value is $20 ($3 ÷ 0.15) per share.

Preferred Stock Valuation Because preferred stock typically provides its holders with a fixed annual dividend and because it never matures, Equation 7.2 can be used to find the value of preferred stock. The value of preferred stock can be estimated by inserting the dividend on the preferred stock for D_1 and the required return for preferred stock, r, in Equation 7.2. For example, a preferred stock paying a $5 annual dividend and having a required return of 13% would have a value of $38.46 ($5 ÷ 0.13) per share.

Constant-Growth Dividend Model

constant-growth dividend model
A widely cited dividend valuation approach that assumes dividends will grow at a constant rate, but a rate less than the required return.

The **constant-growth dividend model** assumes that dividends will grow at a constant rate, but a rate less than the required return. (The assumption that the constant dividend growth rate, g, is less than the required return, r, is a necessary mathematical condition for deriving this model.[1]) Firms that are relatively mature but have not yet exhausted all of their investment opportunities may exhibit a relatively constant dividend growth rate. If the firm's policy is to pay out only a portion of earnings while reinvesting the rest, then as the firm's earnings grow from returns earned on reinvested earnings, dividends will grow, too. By letting D_0 represent the most recent dividend, we can rewrite Equation 7.1 as

$$P_0 = \frac{D_0 \times (1 + g)^1}{(1 + r)^1} + \frac{D_0 \times (1 + g)^2}{(1 + r)^2} + \ldots + \frac{D_0 \times (1 + g)^\infty}{(1 + r)^\infty} \quad (7.3)$$

If we simplify Equation 7.3 and let $D_1 = D_0 \times (1 + g)$, it can be rewritten as

Gordon growth dividend model
A common name for the *constant-growth dividend model* that is widely cited in dividend valuation.

$$P_0 = \frac{D_1}{r - g} \quad (7.4)$$

The constant-growth dividend model in Equation 7.4 is commonly called the **Gordon growth dividend model**. An example will show how it works.

IRF EXAMPLE 7.3

MyLab Finance Solution Video

Lamar Company, a small cosmetics company, from 2014 through 2019 paid the following per-share dividends on its common stock:

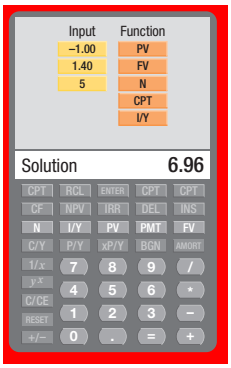
Year	Dividend per share
2019	$1.40
2018	1.29
2017	1.20
2016	1.12
2015	1.05
2014	1.00

1. Another assumption of the constant-growth dividend model as presented is that earnings and dividends grow at the same rate. This assumption is true only in cases in which a firm pays out a fixed percentage of its earnings each year (has a fixed payout ratio). In the case of a declining industry, a negative growth rate ($g < 0\%$) might exist. In such a case, the constant-growth dividend model, as well as the variable-growth dividend model presented in the next section, remains fully applicable to the valuation process.

We assume that the historical average annual growth rate of dividends is an accurate estimate of the future constant annual dividend growth rate, g. To find the historical average annual growth rate of dividends, we must solve the following for g:

$$\begin{aligned} D_{2019} &= D_{2014} \times (1 + g)^5 \\ \frac{D_{2019}}{D_{2014}} &= (1 + g)^5 \\ \frac{\$1.40}{\$1.00} &= (1 + g)^5 \\ \left(\frac{\$1.40}{\$1.00}\right)^{\frac{1}{5}} - 1 &= g \\ 0.0696 &= g \\ 7\% &= g \end{aligned}$$

MyLab Finance **Financial Calculator**



We can also use a financial calculator to quickly find that the historical average annual growth rate of Lamar Company dividends equals approximately 7%. (*Note:* Most calculators require *either* the *PV* or *FV* value to be input as a negative number to calculate an unknown interest or growth rate. That approach is used here.) We estimate that Lamar's dividend in 2020, D_1, will equal \$1.50 (about 7% more than the 2019 dividend). Assume the required return, r, is 15%. By substituting these values into Equation 7.4, we estimate the value of the stock to be

$$P_0 = \frac{\$1.50}{0.15 - 0.07} = \frac{\$1.50}{0.08} = \underline{\underline{\$18.75}} \text{ per share}$$

Given the estimated values of D_1, r, and g, Lamar Company's stock value is \$18.75 per share.

As you can see, the constant-growth model makes quick work of finding the present value of an infinite stream of dividends. However, keep in mind that the accuracy of the stock valuation found using this model largely depends on the assumed growth rate. Consider that changing the assumed dividend growth rate from 7% to 8% for Lamar causes the calculated valuation to increase by more than 15%, to \$21.57.

Variable-Growth Dividend Model

variable-growth dividend model
A dividend valuation approach that allows for a change in the dividend growth rate.

The zero- and constant-growth common stock models do not allow for any shift in expected growth rates. Because future growth rates might shift up or down as a result of changing business conditions, we find it useful to consider a **variable-growth dividend model** that allows for a change in the dividend growth rate.[2] For example, reflect on a young firm that experiences rapid growth in sales and earnings in its early years as its products take off, but after some time the rate of growth levels off, causing dividend growth to follow the same pattern. We will assume that a single shift in growth rates occurs at the end of year n, and we will use g_1 to represent the initial growth rate and g_2 for the growth rate after the

2. More than one change in the growth rate can be incorporated into the model, but to simplify the discussion we will consider only a single growth-rate change. Although this model can incorporate an unlimited number of changes in the growth rate, building in a large number of different growth rates probably does not improve the model's accuracy a great deal.

shift. To determine the value of a share of stock in the case of variable growth, we use a four-step procedure:

Step 1 Find the value of the cash dividends at the end of *each year,* D_t, during the initial growth period, years 1 through n. This step may require adjusting the most recent dividend, D_0, using the initial growth rate, g_1, to calculate the dividend amount for each year. Therefore, for the first n years,

$$D_t = D_0 \times (1 + g_1)^t$$

Step 2 Find the present value of the dividends expected during the initial growth period. Using the notation presented earlier, we can give this value as

$$\sum_{t=1}^{n} \frac{D_0(1 + g_1)^t}{(1 + r)^t} = \sum_{t=1}^{n} \frac{D_t}{(1 + r)^t}$$

Step 3 Find the value of the stock *at the end of the initial growth period,* by applying the constant-growth model (Equation 7.4) to the dividends expected from year $n + 1$ to infinity. That is, $P_n = (D_{n+1})/(r - g_2)$ is the present value in year n of all dividends expected from year $n + 1$ to infinity, assuming a constant dividend growth rate, g_2. To express this value in today's dollars (rather than in year n dollars), we need to discount P_n for an additional n periods using the required return r as follows

$$\frac{1}{(1 + r)^n} \times \frac{D_{n+1}}{r - g_2}$$

Step 4 Add the present value components found in Steps 2 and 3 to find the value of the stock, P_0, given in Equation 7.5:

$$P_0 = \underbrace{\sum_{t=1}^{n} \frac{D_0 \times (1 + g_1)^t}{(1 + r)^t}}_{\substack{\textit{Present value of}\\ \textit{dividends}\\ \textit{during initial}\\ \textit{growth period}}} + \underbrace{\left[\frac{1}{(1 + r)^n} \times \frac{D_{n+1}}{r - g_2}\right]}_{\substack{\textit{Present value of}\\ \textit{price of stock}\\ \textit{at end of initial}\\ \textit{growth period}}} \tag{7.5}$$

The following example illustrates the application of these steps to a variable-growth situation with only one change in the growth rate.

IRF PERSONAL FINANCE EXAMPLE 7.4 Victoria Robb is thinking about purchasing the common stock of Warren Industries, a rapidly growing boat manufacturer. She finds that the firm's most recent (2019) annual dividend payment was $1.50 per share. Victoria estimates that these dividends will increase at a 10% annual rate, g_1, over the next 3 years (2020, 2021, and 2022) because of the introduction of a hot new boat. Beyond 2022, she expects the firm's mature product line to result in a slowing of the dividend growth rate to 5% per year, g_2, for the foreseeable future. Victoria's required return, r, is 15%. To estimate the current value of Warren's common stock, P_0, she applies the four-step procedure to these data.

TABLE 7.2 Calculation of Present Value of Warren Industries Dividends (2020–2022)

t	Year	$D_0 = D_{2019}$ (1)	$(1 + g_1)^t$ (2)	D_t [(1) × (2)] (3)	$(1 + r)^t$ (4)	Present value of dividends [(3) ÷ (4)] (5)
1	2020	$1.50	1.100	$1.65	1.150	$1.43
2	2021	1.50	1.210	1.82	1.323	1.37
3	2022	1.50	1.331	2.00	1.521	1.32
					Sum of present value of dividends = $\sum_{t=1}^{3} \frac{D_0 \times (1 + g_1)^t}{(1 + r_s)^t}$ =	$4.12

Step 1 Columns 1, 2, and 3 of Table 7.2 calculate the value of the cash dividends in each of the next 3 years, which are $1.65, $1.82, and $2.00.

Step 2 The present value in 2019 of the next three dividends is calculated in columns 3, 4, and 5 of Table 7.2. The sum of the present values of the three dividends is $4.12.

Step 3 To find the value of the stock at the end of the initial growth period n = 2022, first calculate $D_{n+1} = D_{2023}$:

$$D_{2023} = D_{2022} \times (1 + 0.05) = \$2.00 \times (1.05) = \$2.10$$

Based on $D_{2023} = \$2.10$, a 15% required return, and a 5% dividend growth rate, the value in 2022 of all dividends paid in 2023 and beyond, or equivalently the price of the stock in 2022, is

$$P_{2022} = \frac{D_{2023}}{r - g_2} = \frac{\$2.10}{0.15 - 0.05} = \frac{\$2.10}{0.10} = \$21.00$$

Finally, convert the $21 share value in 2022 into a present (end-of-2019) value by discounting it at 15% for three years as follows

$$\frac{P_{2022}}{(1 + r)^3} = \frac{\$21}{(1 + 0.15)^3} = \$13.81$$

Step 4 As specified in Equation 7.5, add the present value of the initial dividend stream (found in Step 2) to the present value of the stock at the end of the initial growth period (found in Step 3) to obtain the current value of Warren Industries stock

$$P_0 = \$4.12 + \$13.81 = \underline{\$17.93} \text{ per share}$$

Victoria's calculations indicate that the stock is currently worth $17.93 per share.

FREE CASH FLOW STOCK VALUATION MODEL

As an alternative to the dividend valuation models presented earlier in this chapter, analysts sometimes estimate a firm's value by using projected *free cash flows (FCFs)*. This approach is appealing when valuing firms that have no dividend history or are startups, or when valuing an operating unit or division of a larger public company.

Although dividend valuation models are widely used and accepted, in these situations a more general free cash flow valuation model is preferred.

free cash flow valuation model
A model that determines the value of an entire company as the present value of its expected *free cash flows* discounted at the firm's *weighted average cost of capital,* which is its expected average future cost of funds over the long run.

The **free cash flow valuation model** is based on the same premise as dividend valuation models: The value of a share of common stock is the present value of all future cash flows it is expected to provide over an infinite time horizon. However, in the free cash flow valuation model, instead of valuing the firm's expected dividends, we value the firm's expected *free cash flows*, defined in Chapter 4 (on page 190, Equation 4.4). Free cash flow represents the amount of cash flow available to investors—the providers of debt (creditors) and equity (owners)—after the firm meets all its other obligations.

The free cash flow valuation model estimates the value of the entire company by finding the present value of its expected free cash flows discounted at its *weighted average cost of capital,* r_{WACC}, which is a blend of the firm's cost of debt and equity financing (we'll say more about this in Chapter 9), as specified in Equation 7.6:

$$V_C = \frac{FCF_1}{(1 + r_{WACC})^1} + \frac{FCF_2}{(1 + r_{WACC})^2} + \ldots + \frac{FCF_\infty}{(1 + r_{WACC})^\infty} \tag{7.6}$$

where

V_C = value of the entire company
FCF_t = free cash flow expected at the end of year t
r_{WACC} = the firm's weighted average cost of capital

Note the similarity between Equations 7.6 and 7.1, the general stock valuation equation.

Because the value of the entire company, V_C, is the market value of the entire enterprise (i.e., of all assets), to find common stock value, V_S, we must subtract the market value of all the firm's debt, V_D, and the market value of preferred stock, V_P, from V_C:

$$V_S = V_C - V_D - V_P \tag{7.7}$$

Because it is difficult to accurately forecast a firm's free cash flow far into the future, specific annual free cash flows are typically forecast for only short horizons, beyond which a constant growth rate is assumed. Here we assume that the first 5 years of free cash flows are explicitly forecast and that a constant rate of free cash flow growth occurs beyond the end of year 5 to infinity. This model is methodologically similar to the variable-growth dividend model presented earlier in this chapter. An example demonstrates how to use the model.

EXAMPLE 7.5

It is currently December 31, 2019, and Dewhurst Inc. wishes to determine the value of its common stock by using the free cash flow valuation model. To apply the model, the firm's CFO developed the free cash flow estimates and other data given in Table 7.3. We can now apply the model in four steps.

Step 1 First calculate the present value of each cash flow that Dewhurst produces in the years 2020 through 2024. The first several rows of Table 7.4

TABLE 7.3 Dewhurst Inc.'s Data for the Free Cash Flow Valuation Model

Year (t)	Free cash flow (FCF_t)	Other data
2020	$400,000	Growth rate of *FCF*, beyond 2024 to infinity, $g_{FCF} = 3\%$
2021	450,000	Weighted average cost of capital, $r_{WACC} = 9\%$
2022	520,000	Market value of all debt, $V_D = \$3{,}100{,}000$
2023	560,000	Market value of preferred stock, $V_P = \$800{,}000$
2024	600,000	Number of shares of common stock outstanding = 300,000

list those present values. For example, the present value of the $400,000 cash flow that comes in 2020 is $366,972.

Step 2 Use the constant growth model to calculate the present value, as of 2024, of all cash flows that arrive in years 2025 and beyond. Because cash flows grow at a steady 3% clip over that time horizon, the free cash flow in 2025 is $618,000 (3% more than the 2024 cash flow of $600,000). Therefore, we can calculate the present value in 2024 of all cash flows from 2025 to infinity as follows:

$$\begin{aligned} PV_{2024} &= FCF_{2025} \div (r_{WACC} - g) \\ &= \$618{,}000 \div (0.09 - 0.03) \\ &= \$10{,}300{,}000 \end{aligned}$$

Finally, since we are valuing Dewhurst in 2019, we need to discount the $10,300,000 figure an additional 5 years to calculate its present value today (not in 2024). Table 7.4 shows that the present value is $6,692,658.

Step 3 Add up the present values of the individual cash flows from 2020 to 2024 as well as the present value of cash flows that arrive in 2025 and beyond to get the total value, V_C, of Dewhurst in 2019. Table 7.4 shows that the company's total value is $8,626,426.

TABLE 7.4 Calculation of the Value of the Entire Company for Dewhurst Inc.

t	Year	FCF_t (1)	$(1 + r_{WACC})^t$ (2)	Present value of FCF_t [(1) ÷ (2)] (3)
1	2020	$ 400,000	1.090	$ 366,972
2	2021	450,000	1.188	378,788
3	2022	520,000	1.295	401,544
4	2023	560,000	1.412	396,601
5	2024	600,000	1.539	389,864
5	2024	10,300,000	1.539	6,692,658
			Value of entire company, V_C =	$8,626,426[a]

[a]This value of the entire company is based on the rounded values that appear in the table. The precise value found without rounding is $8,628,234.

Step 4 Calculate the value of the common stock using Equation 7.7. Substituting into Equation 7.7 the value of the entire company, V_C, calculated in Step 3, and the market values of debt, V_D, and preferred stock, V_P, given in Table 7.3, yields the value of the common stock, V_S:

$$V_S = \$8{,}626{,}426 - \$3{,}100{,}000 - \$800{,}000 = \underline{\underline{\$4{,}726{,}426}}$$

The value of Dewhurst's common stock is therefore estimated to be $4,726,426. By dividing this total by the 300,000 shares of common stock that the firm has outstanding, we get a common stock value of $15.75 per share ($4,726,426 ÷ 300,000).

The free cash flow valuation model is similar to the dividend valuation models presented earlier. The appeal of this approach is its focus on free cash flow estimates rather than on forecasted dividends, which are far more difficult to estimate for firms that have not yet started paying dividends. The more general nature of the free cash flow model is responsible for its growing popularity, particularly with CFOs and other financial managers.

OTHER APPROACHES TO COMMON STOCK VALUATION

Many other approaches to common stock valuation exist. Some approaches that see widespread use focus on book value, liquidation value, and some type of price/earnings multiple.

book value per share
The amount per share of common stock that would be received if all of the firm's assets were *sold for their exact book (accounting) value* and the proceeds remaining after paying all liabilities (including preferred stock) were divided among the common stockholders.

Book Value

Book value per share is simply the amount per share of common stock that would be received if all the firm's assets were sold for their exact book (accounting) value, if its liabilities (including preferred stock) were paid at book value, and if the proceeds remaining were divided among the common stockholders. This method is not particularly sophisticated because it relies on historical balance sheet data. It ignores the firm's expected earnings potential and generally falls far short of the firm's value in the marketplace. Let us look at an example.

EXAMPLE 7.6

At year-end 2019, Lamar Company's balance sheet shows total assets of $6 million, total liabilities and preferred stock of $4.5 million, and 100,000 shares of common stock outstanding. Its book value per share would therefore be

$$\frac{\$6{,}000{,}000 - \$4{,}500{,}000}{100{,}000 \text{ shares}} = \underline{\underline{\$15}} \text{ per share}$$

For many firms, the book value of assets is quite a bit less than the market value, so the book value per share is usually a conservative estimate of a stock's value. However, if investors believe that the book value of a firm's assets is overstated or the value of its liabilities is understated, the stock's market value may fall short of its book value.

liquidation value per share
The *actual amount* per share of common stock that would be received if all the firm's assets were *sold for their market value,* liabilities (including preferred stock) were paid, and any remaining money were divided among the common stockholders.

Liquidation Value

Liquidation value per share is the actual amount per share of common stock that would be received if all the firm's assets were sold for their market value, liabilities and preferred stock were paid, and any remaining money were divided among the

common stockholders. This measure is more realistic than book value—because it is based on the current market value of the firm's assets—but it still may not fully account for the earning power of those assets. An example will illustrate.

EXAMPLE 7.7

Lamar Company found on investigation that it could obtain $6.25 million if it sold its assets today. The firm's liquidation value per share would therefore be

$$\frac{\$6{,}250{,}000 - \$4{,}500{,}000}{100{,}000 \text{ shares}} = \underline{\underline{\$17.50}} \text{ per share}$$

Ignoring liquidation expenses, this amount would be the firm's minimum value.

Price/Earnings (P/E) Multiples

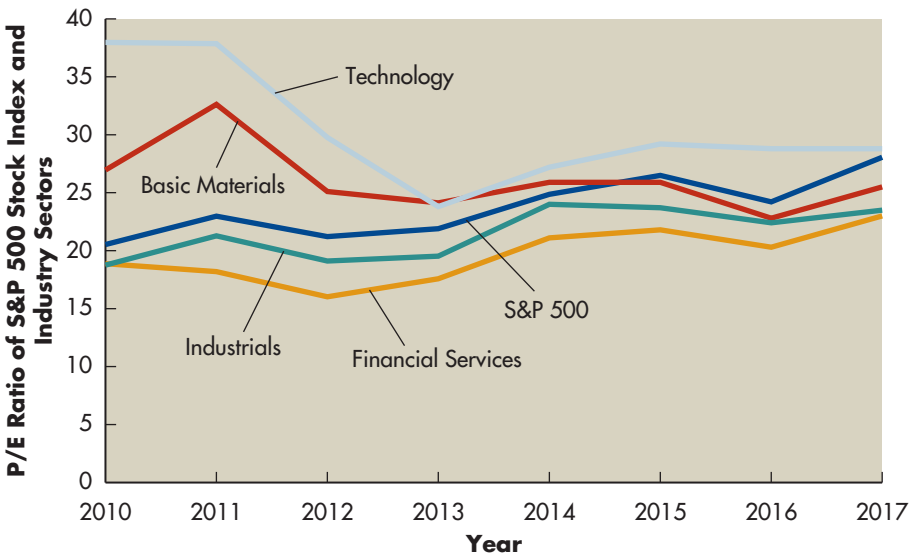
price/earnings multiple approach
A popular technique used to estimate the firm's share value; calculated by multiplying the firm's expected earnings per share (EPS) by the average price/earnings (P/E) ratio for the industry.

The *price/earnings (P/E) ratio*, introduced in Chapter 3, reflects the amount investors are willing to pay for each dollar of earnings. The average P/E ratio in a particular industry can be used as a guide to a firm's value, if we can assume that investors value the earnings of that firm in the same way they do the "average" firm in the industry. The **price/earnings multiple approach** is a popular technique used to estimate the firm's share value; it is calculated by multiplying the firm's expected earnings per share (EPS) by the average price/earnings (P/E) ratio for the industry.

Figure 7.1 plots the yearly Shiller P/E ratio for the S&P 500 Stock Index and several industry sectors, as reported by multpl.com for the years 2010 through 2017. These yearly P/E ratios are the price-to-average earnings from the preceding 10 years and are, therefore, less prone to large earnings swings that can be caused by variation of profit margins across business cycles. A useful starting point for evaluating the P/E ratio is the *market P/E ratio*. A common proxy for the market P/E ratio shown in Figure 7.1 is the average P/E ratio of all the stocks in a given market index, like the S&P 500. The market P/E ratio indicates the general state of

FIGURE 7.1

P/E Ratio of S&P 500 Stock Index and Industry Sectors
The yearly average price-to-earnings ratio for stocks in the S&P 500 fluctuated around a mean of 24 from 2010 to 2017. The yearly average price-to-earnings ratio for various industry sectors had means that ranged from 15 for the energy sector to 51 for the real estate sector.
(*Source:* Data from http://www.multpl.com)



the market and gives an idea of how aggressively investors are pricing earnings. Other things being equal, the higher the market P/E ratio, the more optimistic investors are regarding the future performance of the average stock. From 2010 to 2017, the yearly P/E ratio for the S&P 500 stock index averaged 24, and Figure 7.1 shows that it was generally rising as the United States continued to rebound from the Great Recession and businesses ramped up investing in growth opportunities. Not surprisingly, the yearly P/E ratios for individual industry sectors can differ from the market P/E ratio. Other things being equal, an industry that is less risky will have a higher P/E as will an industry with higher expected earnings growth. In Figure 7.1 you can observe that the yearly P/E ratios for both the financial services and industrial sectors are running somewhat in parallel and below that of the P/E ratio for the S&P 500, and from this you might discern that either the riskiness is higher or the growth prospects are lower for firms in these sectors relative to the average stock in the market. Historically, the former has been the case. In contrast, the technology sector generally has both faster-growing and riskier earnings than the market average. However, since the technology sector's P/E ratio is consistently above that of the market, we can conclude that in comparison to the average stock, the relative difference in earning growth is greater than the relative difference in risk. The yearly P/E ratio for the basic materials sector initially runs above the P/E ratio for the S&P 500 and then falls below that of the market in 2015. Given that this industry sector tends to be relatively riskier than the market, we might conclude from Figure 7.1 that investors had anticipated sufficiently larger earnings growth for the sector relative to the average stock in the market for the period leading up to 2015.

The P/E ratio valuation technique is a simple method of determining a stock's value. Because it is based on a firm's expected earnings, the widespread use of the P/E ratio as a valuation tool has increased the demand for more frequent announcements or "guidance" regarding future earnings. Some firms have been caught pushing ethical boundaries to boost investors' earnings expectations, while other firms avoid providing any earnings guidance at all.

The use of P/E multiples is especially helpful in valuing firms that are not publicly traded, but analysts use this approach for public companies, too. In any case, the price/earnings multiple approach is forward looking because it considers expected earnings, and it usually produces higher valuations than the book value or liquidation value approaches.

PERSONAL FINANCE EXAMPLE 7.8

MyLab Finance Solution Video

Ann Perrier plans to use the price/earnings multiple approach to estimate the value of Lamar Company's stock, which she currently holds in her retirement account. She estimates that Lamar Company will earn $1.90 per share next year (2020). This expectation is based on an analysis of the firm's historical earnings trend and on expected economic and industry conditions. She finds the price/earnings (P/E) ratio for firms in the same industry to average 14. Multiplying Lamar's expected earnings per share (EPS) of 1.90 by this ratio gives her a value for the firm's shares of $26.60, assuming that investors will continue to value the average firm at 14 times its earnings.

So how much is Lamar Company's stock really worth? That's a trick question because there's no one right answer. It is important to recognize that the answer depends on the assumptions made and the techniques used. Professional securities

MATTER OF FACT

Problems with P/E Valuation

The P/E multiple approach is a fast and easy way to estimate a stock's value. However, P/E ratios vary widely over time. In 1980, the average stock had a P/E ratio below 9, but by the year 2000, the ratio had risen above 40. Therefore, analysts using the P/E approach in the 1980s would have come up with much lower estimates of value than analysts using the model 20 years later. By 2012, the average stock had a P/E ratio of about 20, which is close to the long-run average; however, at the start of 2017 the average was back up to around 28. When using this approach to estimate stock values, the estimate will depend more on whether stock market valuations generally are high or low rather than on whether the particular company is doing well or not.

analysts typically use a variety of models and techniques to value stocks. For example, an analyst might use the constant-growth dividend model, liquidation value, and a P/E multiple to estimate the worth of a given stock. If the analyst feels comfortable with his or her estimates, the stock would be valued at no more than the largest estimate. Of course, should the firm's estimated liquidation value per share exceed its "going concern" value per share, estimated by using one of the valuation models (zero-, constant-, or variable-growth or free cash flow) or the P/E multiple approach, the firm would be viewed as "worth more dead than alive." In such an event, the firm would lack sufficient earning power to justify its existence and should probably be liquidated.

→ REVIEW QUESTIONS MyLab Finance Solutions

7–8 Describe the events that occur in an efficient market in response to new information that cause the expected return to exceed the required return. What happens to the market value?

7–9 What does the efficient-market hypothesis (EMH) say about (**a**) securities prices, (**b**) their reaction to new information, and (**c**) investor opportunities to profit? What is the behavioral finance challenge to this hypothesis?

7–10 Describe, compare, and contrast the following common stock dividend valuation models: (**a**) zero-growth, (**b**) constant-growth, and (**c**) variable-growth.

7–11 Describe the free cash flow valuation model, and explain how it differs from the dividend valuation models. What is the appeal of this model?

7–12 Explain each of the three other approaches to common stock valuation: (**a**) book value, (**b**) liquidation value, and (**c**) P/E multiples. Which of them is considered the best?

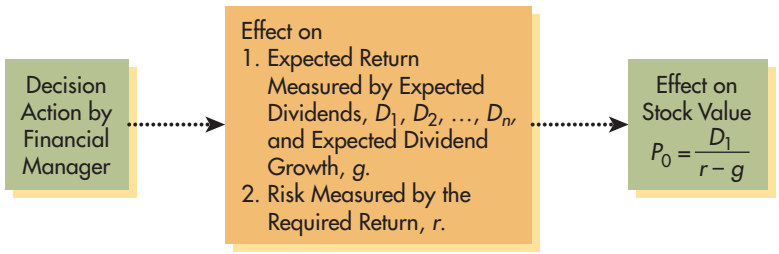
LG 6

7.4 Decision Making and Common Stock Value

Valuation equations measure the stock value at a point in time based on expected return and risk. Any decisions of the financial manager that affect these variables can cause change in the value of the firm. Figure 7.2 depicts the relationship among financial decisions, return, risk, and stock value.

FIGURE 7.2

Decision Making and Stock Value
Financial decisions, return, risk, and stock value



CHANGES IN EXPECTED DIVIDENDS

Any management action that would cause stockholders to raise their dividend expectations should increase the firm's value (as long as stockholders perceive no increase in the risk of the future dividend stream). In Equation 7.4, we can see that P_0 will increase for any rise in D_1 or g. Any action by the financial manager that will increase the level of expected dividends without changing risk (the required return) should be undertaken because it will positively affect owners' wealth.

EXAMPLE 7.9

Using the constant-growth dividend model given earlier in Example 7.3, we found Lamar Company to have a share value of $18.75. On the following day, the firm announced a major technological breakthrough that would revolutionize its industry. Current and prospective stockholders would not be expected to adjust their required return of 15%, but they would expect that future dividends will increase. Specifically, they expect that although the dividend next year, D_1, will remain at $1.50, the expected growth rate thereafter will increase from 7% to 9%. If we substitute $D_1 = \$1.50$, $r = 0.15$, and $g = 0.09$ into Equation 7.4, the resulting share value is $25 [$1.50 ÷ (0.15 − 0.09)]. The increased value therefore resulted from the higher expected future dividends reflected in the increase in growth rate.

CHANGES IN RISK

Although the required return, r, is the focus of Chapters 8 and 9, at this point we can reconsider its fundamental components. Any measure of required return consists of two components, a risk-free rate and a risk premium. We expressed this relationship as Equation 6.3 in Chapter 6, which we repeat here:

$$r = \underbrace{r^* + i}_{\substack{\text{risk-free} \\ \text{rate, } R_F}} + \underbrace{RP}_{\substack{\text{risk} \\ \text{premium}}}$$

In Chapter 8, you will learn that the real challenge in finding the required return is determining the appropriate risk premium. In Chapters 8 and 9, we will discuss how investors and managers can estimate the risk premium for any particular asset. For now, recognize that r represents the minimum return that the firm's stock must provide to shareholders to compensate them for bearing the risk of holding the firm's equity.

Any action taken by the financial manager that increases the risk shareholders must bear will also raise the risk premium required by shareholders and hence the required return. Additionally, the required return can be affected by changes in the risk-free rate, even if the risk premium remains constant. For example, if the risk-free rate increases due to a rise in expected inflation, the required return goes up, too. In Equation 7.1, we can see that an increase in the required return, r, will reduce share value, P_0, and that a decrease in the required return will increase share value. Thus, any action by the financial manager that increases risk contributes to a reduction in value, and any action that decreases risk contributes to an increase in value.

EXAMPLE 7.10

Assume that Lamar Company's 15% required return resulted from a risk-free rate of 4% and a risk premium of 11%. With this return, the firm's share value was calculated in Example 7.3 to be $18.75.

Now imagine the financial manager makes a decision that, without changing expected dividends, causes the firm's risk premium to increase to 12%. Assuming that the risk-free rate remains at 4%, the new required return on Lamar stock will be 16% (4% + 12%), and substituting $D_1 = \$1.50$, $r = 0.16$, and $g = 0.07$ into the valuation equation (Equation 7.3) results in a new share value of $16.67 [$1.50 ÷ (0.16 − 0.07)]. As expected, raising the required return, without any corresponding increase in expected dividends, makes the firm's stock value decline. Clearly, the financial manager's action was not in the owners' best interest.

COMBINED EFFECT

A financial decision rarely affects dividends and risk independently; most decisions affect both factors, often in the same direction. As firms take on more risk, their shareholders expect to see higher dividends. The net effect on value depends on the relative size of the changes in these two variables.

EXAMPLE 7.11

If we assume that the two changes illustrated for Lamar Company in the preceding examples occur simultaneously, the key variable values would be $D_1 = \$1.50$, $r = 0.16$, and $g = 0.09$. Substituting into the valuation model, we obtain a share price of $21.43 [$1.50 ÷ (0.16 − 0.09)]. The net result of the decision, which increased dividend growth (g, from 7% to 9%) as well as required return (r, from 15% to 16%), is positive. The share price increased from $18.75 to $21.43. Even with the combined effects, the decision appears to be in the best interest of the firm's owners because it increases their wealth.

→ REVIEW QUESTIONS MyLab Finance Solutions

7–13 Explain the linkages among financial decisions, return, risk, and stock value.

7–14 Assuming that all other variables remain unchanged, what effect would each of the following have on stock price? (**a**) The firm's risk premium increases. (**b**) The firm's required return decreases. (**c**) The dividend expected next year decreases. (**d**) The growth rate of dividends is expected to increase.

SUMMARY

FOCUS ON VALUE

The price of each share of a firm's common stock is the value of each ownership interest. Although common stockholders typically have voting rights, which indirectly give them a say in management, their most significant right is their claim on the residual cash flows of the firm. This claim is subordinate to those of vendors, employees, customers, lenders, the government (for taxes), and preferred stockholders. The value of the common stockholders' claim is embodied in the future cash flows they are entitled to receive. The present value of those expected cash flows is the firm's share value.

To determine this present value, forecast cash flows are discounted at a rate that reflects their risk. Riskier cash flows are discounted at higher rates, resulting in lower present values than less risky expected cash flows, which are discounted at lower rates. The value of the firm's common stock is therefore driven by its expected cash flows (returns) and risk (certainty of the expected cash flows).

In pursuing the firm's goal of **maximizing the stock price,** the financial manager must carefully consider the balance of return and risk associated with each proposal and must undertake only those actions that create value for owners. By focusing on value creation and by managing and monitoring the firm's cash flows and risk, the financial manager should be able to achieve the firm's goal of share price maximization.

REVIEW OF LEARNING GOALS

LG 1 **Differentiate between debt and equity.** Holders of equity capital (common and preferred stock) are owners of the firm. Typically, only common stockholders have a voice in management. Equityholders' claims on income and assets are secondary to creditors' claims, there is no maturity date, and dividends paid to stockholders are not tax deductible.

LG 2 **Discuss the features of both common and preferred stock.** The common stock of a firm can be privately owned, closely owned, or publicly owned. It can be sold with or without a par value. Preemptive rights allow common stockholders to avoid dilution of ownership when new shares are issued. Not all shares authorized in the corporate charter are outstanding. If a firm has treasury stock, it will have issued more shares than are outstanding. Some firms have two or more classes of common stock that differ mainly in having unequal voting rights. Proxies transfer voting rights from one party to another. The decision to pay dividends to common stockholders is made by the firm's board of directors. Firms can issue stock in foreign markets. The stock of many foreign corporations is traded in U.S. markets in the form of American depositary receipts (ADRs), which are backed by American depositary shares (ADSs).

Preferred stockholders have preference over common stockholders with respect to the distribution of earnings and assets. They do not normally have voting privileges. Preferred stock issues may have certain restrictive covenants, cumulative dividends, a call feature, and a conversion feature.

LG3 **Apply the basic valuation model to stocks, and describe the relevant cash flows and the impact of required return.** Like the value of a bond, which we discussed in Chapter 6, the value of a share of common stock is equal to the present value of all future cash flows it is expected to provide. So, Equation 6.4 can be used to find the value of a share of stock by discounting stock's expected cash flows back to their present value, using the required return commensurate with the stock's risk as the appropriate discount rate.

Although a stockholder can earn capital gains by selling stock at a price above that originally paid, what the buyer really pays for is the right to all future dividends. What about stocks that do not currently pay dividends? Such stocks have a value attributable to a future dividend stream or to the proceeds from the sale of the company. Therefore, from a valuation viewpoint, future dividends are relevant.

LG4 **Understand the concept of market efficiency and how to value stocks using zero-growth, constant-growth, and variable-growth dividend models.** Market efficiency assumes that the quick reactions of rational investors to new information cause the market value of common stock to adjust upward or downward quickly. The efficient-market hypothesis (EMH) suggests that securities are fairly priced, that they reflect fully all publicly available information, and that investors should therefore not waste time trying to find and capitalize on mispriced securities. Behavioral finance advocates challenge this hypothesis by arguing that emotion and other factors play a role in investment decisions.

The value of a share of stock is the present value of all future dividends it is expected to provide over an infinite time horizon. Three dividend growth dividend models—zero-growth, constant-growth, and variable-growth—can be considered in common stock valuation. The most widely cited model is the constant-growth dividend model.

LG5 **Discuss the free cash flow valuation model and the book value, liquidation value, and price/earnings (P/E) multiple approaches.** The free cash flow valuation model values firms that have no dividend history, startups, or an operating unit or division of a larger public company. The model finds the value of the entire company by discounting the firm's expected free cash flow at its weighted average cost of capital. The common stock value is found by subtracting the market values of the firm's debt and preferred stock from the value of the entire company.

Book value per share is the amount per share of common stock that would be received if all the firm's assets were sold for their exact book (accounting) value and the proceeds remaining after paying all liabilities (including preferred stock) were divided among the common stockholders. Liquidation value per share is the actual amount per share of common stock that would be received if all the firm's assets were sold for their market value, liabilities (including preferred stock) were paid, and the remaining money were divided among the common stockholders. The P/E multiple approach estimates stock value by multiplying the firm's expected earnings per share (EPS) by the average P/E ratio for the industry.

LG6 **Explain the relationships among financial decisions, return, risk, and the firm's value.** In a stable economy, any action by the financial manager that increases the level of expected dividends without changing risk should increase

share value; any action that reduces the level of expected dividends without changing risk should reduce share value. Similarly, any action that increases risk (required return) will reduce share value; any action that reduces risk will increase share value. An assessment of the combined effect of return and risk on stock value must be part of the financial decision-making process.

SELF-TEST PROBLEMS (Solutions in Appendix)

LG 4 IRF

ST7–1 Common stock valuation Perry Motors' common stock just paid its annual dividend of $1.80 per share. The required return on the common stock is 12%. Estimate the value of the common stock under each of the following assumptions about the dividend:

a. Dividends are expected to grow at an annual rate of 0% to infinity.
b. Dividends are expected to grow at a constant annual rate of 5% to infinity.
c. Dividends are expected to grow at an annual rate of 5% for each of the next 3 years, followed by a constant annual growth rate of 4% in year 4 to infinity.

LG 5 IRF

ST7–2 Free cash flow valuation Erwin Footwear wishes to assess the value of its Active Shoe Division. This division has debt with a market value of $12,500,000 and no preferred stock. Its weighted average cost of capital is 10%. The Active Shoe Division's estimated free cash flow each year from 2020 through 2023 is given in the following table. Beyond 2023 to infinity, the firm expects its free cash flow to grow at 4% annually.

Year (t)	Free cash flow (FCF_t)
2020	$ 800,000
2021	1,200,000
2022	1,400,000
2023	1,500,000

a. Use the free cash flow valuation model to estimate the value of Erwin's entire Active Shoe Division.
b. Use your finding in part **a** along with the data provided to find this division's common stock value.
c. If the Active Shoe Division as a public company will have 500,000 shares outstanding, use your finding in part **b** to calculate its value per share.

WARM-UP EXERCISES Select problems are available in MyLab Finance.

LG 1

E7–1 A balance sheet balances assets with their sources of debt and equity financing. If a corporation has assets equal to $5.2 million and a debt ratio of 75.0%, how much debt does the corporation have on its books?

LG 2

E7–2 Thermax Inc. has 10 million shares outstanding. The firm is planning to issue an additional 1 million shares. After selling these shares at their $15 per share offering price and netting 97% of sale proceeds, the firm is obligated to sell an additional 100,000 shares at 80% of the offering price. In total, how much will the firm net from these stock sales?

LG 2

E7–3 Anson Construction wants to raise $5 million for a new construction project. The company is now evaluating two issue alternatives—a new issue of preferred stock with face value of $100 that pays a $5.40 dividend per year; and an additional 1 million shares with an offering price of $5 per share. Give two major differences between the options from the company's perspective.

LG 3

E7–4 The common stock of Speedy PLC closed at £2.40 per share today, down £0.20 from yesterday. If the company has 5 million shares outstanding and annual earnings of £12.5 million, what is its P/E ratio today? What was its P/E ratio yesterday?

LG 4

E7–5 Hills Ltd. has just announced a dividend of €2.50 per share for the year. It plans to increase this dividend by 5% next year and maintain it at the new level for the foreseeable future. If the required return on this firm's stock is 10%, what is the value of Hills's stock?

LG 6

E7–6 Martin International PLC initiated a new corporate strategy that fixes its annual dividend at £1.40 per share forever. If the risk-free rate is 3% and the risk premium on Martin International's stock is 7%, what is the value of Martin International's stock?

PROBLEMS

Select problems are available in MyLab Finance. The MyLab icon indicates problems in Excel format available in MyLab Finance.

LG 2

P7–1 **Authorized and available shares** Bruges Corporation's Memorandum of Association authorizes issuance of 3,000,000 shares of common stock. Currently, Bruges has 2,200,000 million authorized and paid up shares and holds 500,000 shares as treasury stock. The firm wishes to raise £20,000,000 for a new unit in South East Asia. Discussions with its investment bankers indicate that the sale of new common stock will net the firm £20 per share.

a. What is the maximum number of new shares of common stock that firm can sell without receiving further authorization from shareholders?

b. Judging by the data given and your findings in part **a,** do you think the firm will be able to raise the needed funds without receiving further authorization?

c. What must the firm do to obtain authorization to issue more than the number of shares found in part **a**?

LG 2

P7–2 **Preferred dividends** Acura Labs Inc. has an outstanding issue of preferred stock with a $40 par value and an 8% annual dividend.

a. What is the annual dollar dividend? If it is paid quarterly, how much will be paid each quarter?

b. If the preferred stock is noncumulative and the board of directors has passed the preferred dividend for the last three quarters, how much must be paid to preferred stockholders in the current quarter before dividends are paid to common stockholders?

c. If the preferred stock is cumulative and the board of directors has passed the preferred dividend for the last three quarters, how much must be paid to preferred stockholders in the current quarter before dividends are paid to common stockholders?

LG 2

P7–3 Preferred dividends In each case in the following table, how many dollars of preferred dividends per share must be paid to preferred stockholders in the current period before common stock dividends are paid?

Case	Type	Par value	Dividend per share per period	Periods of dividends passed
A	Cumulative	$ 80	$4	3
B	Noncumulative	110	2.0%	2
C	Noncumulative	100	$3	1
D	Cumulative	60	1.5%	4
E	Cumulative	70	3.0%	0

LG 2

P7–4 Convertible preferred stock Stanley Industries has a fixed conversion ratio of four common shares per one share of preferred stock. The preferred stock pays a dividend of £4.00 per share per year. The common stock currently sells for £10.00 per share and pays a dividend of £1.25 per share per year.

a. Considering the conversion ratio and the price of the common shares, what is the current conversion value of each preferred share?

b. If the preferred shares are selling at £43.00 each, should an investor convert the preferred shares to common shares?

c. What factors might cause an investor not to convert from preferred to common stock?

LG 4

P7–5 Preferred stock valuation Segwick Manufacturing has an outstanding preferred stock issue with a par value of $50 per share. The preferred shares pay dividends annually at a rate of 5%.

a. What is the annual dividend on Segwick's preferred stock?

b. If investors require a return of 6% on this stock and the next dividend is payable 1 year from now, what is the price of Segwick's preferred stock?

c. Suppose that Segwick has not paid dividends on its preferred shares in the past 2 years, but investors believe it will start paying dividends again in 1 year. What is the value of Segwick's preferred stock if it is cumulative and if investors require a 6% rate of return?

Personal Finance Problem

LG 4 MyLab

P7–6 Common stock value: Zero growth Kelsey Drums Inc. is a well-established supplier of fine percussion instruments to orchestras all over the United States. The company's class A common stock has paid a dividend of $2.80 per share per year for the last 12 years. Management expects to continue to pay at that amount for the foreseeable future. Kim Arnold purchased 200 shares of Kelsey class A common stock 10 years ago at a time when the required return for the stock was 7.6%. She wants to sell her shares today. The current required rate of return for the stock is 9.25%. How much capital gain or loss will Kim have on her shares?

LG4

P7–7 **Preferred stock valuation** Liberia Publishing wishes to estimate the value of its outstanding preferred stock. The preferred issue has a £50 par value and pays an annual dividend of £7.50 per share. Similar-risk preferred stocks are currently earning an 8% annual rate of return.

a. What is the market value of the outstanding preferred stock?

b. If an investor purchases the preferred stock at the value calculated in part **a,** how much does she gain or lose per share if she sells the stock when the required return on similar-risk preferred stocks has fallen to 6%? Explain.

LG4 MyLab

P7–8 **Common stock value: Constant growth** Use the constant-growth dividend model (Gordon growth model) to find the value of each firm shown in the following table.

Firm	Dividend expected next year	Dividend growth rate	Required return
A	$1.20	8%	13%
B	4.00	5	15
C	0.65	10	14
D	6.00	8	9
E	2.25	8	20

LG4

P7–9 **Common stock valuation: Constant growth** Sweet Candy will pay a dividend of $0.72 per share next year. The CEO of the company declared that the company expects to maintain a constant growth rate of 7% per year every year from now on.

a. What will be the price per share if the required return is 10%?

b. What will be the price per share if the required return is 8%?

c. Based on your answer in parts **a** and **b,** give one disadvantage of the constant growth model.

LG4

P7–10 **Common stock value: Constant growth** The common stock of Denis and Denis Research Inc. trades for $60 per share. Investors expect the company to pay a $3.90 dividend next year, and they expect that dividend to grow at a constant rate forever. If investors require a 10% return on this stock, what is the dividend growth rate that they are anticipating?

LG4

P7–11 **Common stock value: Constant growth** Christine Law is the Chief Investment Officer for Elite Investment Company. She is now calculating the equity value of Rays Food Company. She compiled the following dividend information for the company.

Year	Dividend per share	Growth rate
2018	$5.00	_____
2019	5.15	_____
2020	5.40	_____
2021	5.62	_____
2022	5.72	_____

What is the growth rate for each year? Calculate the average growth rate of the stock. In 2022, the company paid the $5.72 dividend. Christine believes that the company's dividends will grow constantly at the average growth rate calculated. If the required return is 10%, what is the value of the stock?

Personal Finance Problem

LG 4

P7–12 **Common stock value: Constant growth** Over the past 6 years, Elk County Telephone has paid the dividends shown in the following table.

Year	Dividend per share
2019	$2.87
2018	2.76
2017	2.60
2016	2.46
2015	2.37
2014	2.25

The firm's dividend per share in 2020 is expected to be $3.02.

a. If you can earn 13% on similar-risk investments, what is the most you would be willing to pay per share in 2019, just after the $2.87 dividend?

b. If you can earn only 10% on similar-risk investments, what is the most you would be willing to pay per share?

c. Compare and contrast your findings in parts **a** and **b**, and discuss the impact of changing risk on share value.

LG 4

P7–13 **Common stock value: Variable growth** Moors Tools is considering a cash purchase of the stock of Crooks Moldings. During the year just completed, Crooks earned £4.50 per share and paid cash dividends of £2.30 per share ($D_0 = 2.30$). Crook's earnings and dividends are expected to grow at 20% per year for the next 2 years, after which they are expected to grow at 5% per year forever. What is the maximum price per share that Moors should pay for Crooks if it has a required return of 12% on investments with risk characteristics similar to those of Crooks?

Personal Finance Problem

LG 4

P7–14 **Common stock value: Variable growth** Home Place Hotels Inc. is entering into a 3-year remodeling and expansion project. The construction will have a limiting effect on earnings during that time, but when completed, it should allow the company to enjoy much improved growth in earnings and dividends. Last year, the company paid a dividend of $3.40. It expects zero growth in the next year. In years 2 and 3, 5% growth is expected, and in year 4, 15% growth. In year 5 and thereafter, growth should be a constant 10% per year. What is the maximum price per share that an investor who requires a return of 14% should pay for Home Place Hotels common stock?

LG 4

P7–15 **Common stock value: Variable growth** Bach Music's most recent annual dividend was $1.50 per share ($D_0 = 1.50$), and the firm's required return is 9%. Find the market value of Bach's shares when:

a. Dividends are expected to grow at 10% annually for 2 years, followed by a 5% constant annual growth rate in year 3 to infinity.

b. Dividends are expected to grow at 10% annually for 2 years, followed by a 0% constant annual growth rate in year 3 to infinity.

c. Dividends are expected to grow at 10% annually for 2 years, followed by an 8% constant annual growth rate in year 3 to infinity.

Personal Finance Problem

LG4

P7–16 **Free cash flow valuation** You are evaluating the potential purchase of a small business with no debt or preferred stock that is currently generating $42,500 of free cash flow (FCF_0 = $42,500). On the basis of a review of similar-risk investment opportunities, you must earn an 18% rate of return on the proposed purchase. Because you are relatively uncertain about future cash flows, you decide to estimate the firm's value using several possible assumptions about the growth rate of cash flows.

a. What is the firm's value if cash flows are expected to grow at an annual rate of 0% from now to infinity?

b. What is the firm's value if cash flows are expected to grow at a constant annual rate of 7% from now to infinity?

c. What is the firm's value if cash flows are expected to grow at an annual rate of 12% for the first 2 years, followed by a constant annual rate of 7% from year 3 to infinity?

LG5 MyLab

P7–17 **Free cash flow valuation** Nabor Industries is considering going public but is unsure of a fair offering price for the company. Before hiring an investment banker to assist in making the public offering, managers at Nabor have decided to make their own estimate of the firm's common stock value. The firm's CFO has gathered data for performing the valuation using the free cash flow valuation model.

The firm's weighted average cost of capital is 11%, and it has $1,500,000 of debt and $400,000 of preferred stock in terms of market value. The estimated free cash flows over the next 5 years, 2020 through 2024, are given below. Beyond 2024 to infinity, the firm expects its free cash flow to grow by 3% annually.

Year (t)	Free cash flow (FCF_t)
2020	$200,000
2021	250,000
2022	310,000
2023	350,000
2024	390,000

a. Estimate the value of Nabor Industries' entire company by using the free cash flow valuation model.

b. Use your finding in part **a,** along with the data provided above, to find Nabor Industries' common stock value.

c. If the firm plans to issue 200,000 shares of common stock, what is its estimated value per share?

Personal Finance Problem

LG5

P7–18 **Using the free cash flow valuation model to price an IPO** Assume that you have an opportunity to buy the stock of CoolTech Inc., an IPO being offered for $12.50 per share. Although you are very much interested in owning the company, you are concerned about whether it is fairly priced. To determine the value of the shares, you have decided to apply the free cash flow valuation model to the firm's financial data

that you've accumulated from a variety of data sources. The key values you have compiled are summarized in the following table.

Free cash flow		
Year (t)	FCF_t	Other data
2020	$ 700,000	Growth rate of *FCF*, beyond 2023 to infinity = 2%
2021	800,000	Weighted average cost of capital = 8%
2022	950,000	Market value of all debt = $2,700,000
2023	1,100,000	Market value of preferred stock = $1,000,000
		Number of shares of common stock outstanding = 1,100,000

a. Use the free cash flow valuation model to estimate CoolTech's common stock value per share.
b. Judging by your finding in part **a** and the stock's offering price, should you buy the stock?
c. On further analysis, you find that the growth rate of *FCF* beyond 2023 will be 3% rather than 2%. What effect would this finding have on your responses in parts **a** and **b**?

LG 5

P7–19 Book and liquidation value The balance sheet for Gallinas Industries is as follows.

Gallinas Industries Balance Sheet as of December 31

Assets		Liabilities and stockholders' equity	
Cash	$ 40,000	Accounts payable	$100,000
Marketable securities	60,000	Notes payable	30,000
Accounts receivable	120,000	Accrued wages	30,000
Inventories	160,000	Total current liabilities	$160,000
Total current assets	$380,000	Long-term debt	$180,000
Land and buildings (net)	$150,000	Preferred stock	$ 80,000
Machinery and equipment	250,000	Common stock (10,000 shares)	260,000
Total fixed assets (net)	$400,000	Retained earnings	100,000
Total assets	$780,000	Total liabilities and stockholders' equity	$780,000

Additional information with respect to the firm is available:
(1) Preferred stock can be liquidated at book value.
(2) Accounts receivable and inventories can be liquidated at 90% of book value.
(3) The firm has 10,000 shares of common stock outstanding.
(4) All interest and dividends are currently paid up.
(5) Land and buildings can be liquidated at 130% of book value.
(6) Machinery and equipment can be liquidated at 70% of book value.
(7) Cash and marketable securities can be liquidated at book value.

Given this information, answer the following:
a. What is Gallinas Industries' book value per share?
b. What is its liquidation value per share?
c. Compare, contrast, and discuss the values found in parts **a** and **b**.

LG 5

P7–20 **Valuation with price/earnings multiples** For each of the firms shown in the following table, use the data given to estimate its common stock value employing price/earnings (P/E) multiples.

Firm	Expected EPS	Price/earnings multiple
A	£3.00	6.3
B	0.75	15.2
C	1.80	5.7
D	2.50	11.20
E	3.2	8.40

LG 6

P7–21 **Management action and stock value** Barnes Limited's most recent dividend was €2.20 per share, its expected annual rate of dividend growth is 5%, and the required return is 12%. Its management is considering a variety of proposals to redirect the firm's activities. Determine the impact on the share price for each of the following proposed actions, and indicate the best alternative.

a. Do nothing, which will leave the key financial variables unchanged.

b. Acquire a subsidiary operation from another manufacturer in Thailand. The acquisition should increase the dividend growth rate to 8% and increase the required return to 15%.

c. Eliminate an unprofitable product line, which will increase the dividend growth rate to 7% and raise the required return to 14%.

d. Invest in a new technology that will increase the dividend growth rate to 8% and lower the required return to 10%.

e. Merge with another firm, which will decrease the dividend growth rate to 4% and decrease the required return to 8%.

LG 4 LG 6

P7–22 **Integrative: Risk and valuation** The Best Equipment Company just released a successful new and innovative product. It is expected that the product will bring huge profits to the company, and its dividend will grow at 7% every year from now on. The last annual dividend of the company was $0.50 per share. The current risk-free rate of return is 5%, and you require a 6% risk premium to hold the stock. How much will you pay for a share of the stock? Assume that the share price is $50.

LG 4 LG 6

P7–23 **Integrative: Risk and valuation** Giant Enterprises' stock has a required return of 14.8%. The company, which plans to pay a dividend of $2.60 per share in the coming year, anticipates that its future dividends will increase at an annual rate consistent with that experienced over the 2013–2019 period, when the following dividends were paid.

Year	Dividend per share
2019	$2.45
2018	2.28
2017	2.10
2016	1.95
2015	1.82
2014	1.80
2013	1.73

a. If the risk-free rate is 4%, what is the risk premium on Giant's stock?
b. Using the constant-growth dividend model, estimate the value of Giant's stock.
c. Explain what effect, if any, a decrease in the risk premium would have on the value of Giant's stock.

LG4 LG6

P7–24 **Integrative: Risk and valuation** Manchester Hospitality owns a range of restaurants in Yorkshire, England. It wishes to determine the value of McDermot Limited, a firm that it is considering acquiring for cash. Manchester Hospitality wishes to determine the applicable discount rate to use as an input to the constant growth valuation model. McDermot's stock is not publicly traded. After studying the required returns of firms similar to McDermot that are publicly traded, Manchester Hospitality believes that an appropriate risk premium on McDermot stock is about 10%.The risk-free rate of return is currently 4%. McDermot's dividend per share for each of the past 5 years is shown in the following table.

Year	Dividend per share
2019	£5.40
2018	4.85
2017	4.32
2016	3.85
2015	3.40

a. Given that McDermot is expected to pay a dividend of £5.90 next year, determine the maximum cash price that Manchester Hospitality should pay for each share of McDermot.
b. How will the following changes affect the resulting value of McDermot?
(1) A decrease in its dividend growth by 2% from that exhibited over 2015–2019 period.
(2) An increase in its risk premium to 12%.

LG4

P7–25 **ETHICS PROBLEM** Melissa is trying to value the stock of Generic Utility Inc., which is clearly not growing at all. Generic declared and paid a $5 dividend last year. The required return for utility stocks is 11%, but Melissa is unsure about the financial reporting integrity of Generic's finance team. She decides to add an extra 1% "credibility" risk premium to the required return as part of her valuation analysis.
a. What is the value of Generic's stock, assuming that the financials are trustworthy?
b. What is the value of Generic's stock, assuming that Melissa includes the extra 1% "credibility" risk premium?
c. What is the difference between the values found in parts **a** and **b**, and how might one interpret that difference?

SPREADSHEET EXERCISE

You are interested in purchasing the common stock of Azure Corporation. The firm recently paid a dividend of $3 per share. It expects its earnings—and hence its dividends—to grow at a rate of 7% for the foreseeable future. Currently, similar-risk stocks have required returns of 10%.

TO DO

a. Given the data above, calculate the present value of this security. Use the constant-growth dividend model (Equation 7.4) to find the stock value.

b. One year later, your broker offers to sell you additional shares of Azure at $73. The most recent dividend paid was $3.21, and the expected growth rate for earnings remains at 7%. If you determine that the appropriate risk premium is 6.74% and you observe that the risk-free rate, R_F, is currently 5.25%, what is the firm's current required return?

c. Applying Equation 7.4, determine the value of the stock using the new dividend and required return from part **b.**

d. Given your calculation in part **c,** would you buy the additional shares from your broker at $73 per share? Explain.

e. Given your calculation in part **c,** would you sell your old shares for $73? Explain.

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PART FOUR

Risk and the Required Rate of Return

CHAPTERS IN THIS PART

Most people intuitively understand the principle that risk and return are linked. After all, as the old saying goes, "Nothing ventured, nothing gained." In the next two chapters, we'll explore how investors and financial managers quantify risk and how they determine what amount of additional return is appropriate compensation for taking extra risk.

Chapter 8 lays the groundwork, defining the terms risk and return and explaining why investors think about risk in different ways, depending on whether they want to understand the risk of a specific investment or the risk of a broad portfolio of investments. Perhaps the most famous and widely applied theory in all finance, the capital asset pricing model (or CAPM), is introduced here. The CAPM tells investors and managers alike what return they should expect given the risk of the asset they want to invest in.

Chapter 9 applies these lessons in a managerial finance setting. Firms raise money from two broad sources, owners and lenders. Owners provide equity financing and lenders provide debt. To maximize the value of the firm, managers have to satisfy both groups, and doing so means earning returns high enough to meet investors' expectations. Chapter 9 focuses on the cost of capital or, more precisely, the weighted average cost of capital (WACC). The WACC tells managers exactly what return their investments in plant and equipment, advertising, and human resources have to earn if the firm is to satisfy its investors. Essentially, the WACC is a hurdle rate, the minimum acceptable return that a firm should earn on any investment it makes.

CHAPTER 8

Risk and Return

LEARNING GOALS

- **LG1** Understand the meaning and fundamentals of risk, return, and risk preferences.
- **LG2** Describe procedures for assessing and measuring the risk of a single asset.
- **LG3** Discuss the measurement of return and standard deviation for a portfolio and the concept of correlation.
- **LG4** Understand the risk and return characteristics of a portfolio in terms of correlation and diversification and the impact of international assets on a portfolio.
- **LG5** Review the two types of risk and the derivation and role of beta in measuring the relevant risk of both a security and a portfolio.
- **LG6** Explain the capital asset pricing model (CAPM), its relationship to the security market line (SML), and the major forces causing shifts in the SML.

MyLab Finance **Chapter Introduction Video**

WHY THIS CHAPTER MATTERS TO YOU

In your *professional* life

ACCOUNTING You need to understand the relationship between risk and return because of the effect that riskier projects will have on the firm's financial statements.

INFORMATION SYSTEMS You need to understand how to do scenario and correlation analyses to build decision packages that help management analyze the risk and return of various business opportunities.

MANAGEMENT You need to understand the relationship between risk and return and how to measure that relationship to evaluate data that come from finance personnel and translate those data into decisions that increase the value of the firm.

OPERATIONS You need to understand why investments in plant, equipment, and systems need to be evaluated in light of their impact on the firm's risk and return, which together will affect the firm's value.

In your *personal* life

The tradeoff between risk and return enters into numerous personal financial decisions. You will use these two concepts when you invest your savings, buy real estate, finance major purchases, purchase insurance, invest in securities, and implement retirement plans. Deepening your quantitative and qualitative understanding of risk and return will help you make decisions based on the tradeoffs between risk and return in light of your personal disposition toward risk.

LG 1

8.1 Risk and Return Fundamentals

Most important business decisions entail two key financial considerations: risk and return. Each financial decision presents certain risk and return characteristics, and the combination of these characteristics can increase or decrease a firm's share price. Analysts use different methods to quantify risk, depending on whether they are looking at a single asset or a **portfolio**—a collection or group of assets. We will look at both, beginning with the risk of a single asset. First, though, it is important to introduce some fundamental ideas about risk, return, and risk preferences.

portfolio
A collection or group of assets.

WHAT IS RISK?

In the most basic sense, **risk** is a measure of the uncertainty surrounding the return that an investment will earn. Investments whose returns are more uncertain are generally riskier. A $1,000 government bond that guarantees its holder $5 interest after 30 days has no risk because there is no uncertainty associated with the return. A $1,000 investment in a firm's common stock is very risky because the value of that stock may move up or down substantially over the same 30 days.

risk
A measure of the uncertainty surrounding the return that an investment will earn.

WHAT IS RETURN?

If risk is related to the uncertainty surrounding an investment's return, we must be certain we know how to measure an investment's return. The **total rate of return** is the total gain or loss experienced on an investment over a given period expressed as a percentage of the investment's value at the beginning of the period. Mathematically, an investment's total return is the sum of any cash distributions (e.g., dividends or interest payments) plus the change in the investment's value, divided by the beginning-of-period value. The expression for calculating the total rate of return earned on any asset over period t, r_t, is commonly defined as

total rate of return
The total gain or loss experienced on an investment over a given period expressed as a percentage of the investment's value; calculated by dividing the asset's cash distributions during the period, plus change in value, by its beginning-of-period value.

$$r_t = \frac{C_t + P_t - P_{t-1}}{P_{t-1}} \tag{8.1}$$

where

r_t = total return during period t
C_t = cash (flow) received from the asset investment in period t
P_t = price (value) of asset at time t
P_{t-1} = price (value) of asset at time $t - 1$

The return, r_t, reflects the combined effect of cash flow, C_t, and changes in value, $P_t - P_{t-1}$, over the period.[1]

1. This expression does not imply that an investor necessarily buys the asset at time $t - 1$ and sells it at time t. Rather, it represents the increase (or decrease) in wealth that the investor has experienced during the period by holding a particular investment.

Equation 8.1 is used to determine the rate of return over a time period as short as 1 day or as long as 10 years or more. In the most common situation, t is 1 year, and r therefore represents an annual rate of return.

EXAMPLE 8.1

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Robin wishes to determine the return on two stocks she owned during 2016, Apple Inc. and Wal-Mart. At the beginning of the year, Apple stock traded for $105.35 per share, and Wal-Mart stock was valued at $61.46. During the year, Apple paid $2.37 per share in dividends, and Wal-Mart shareholders received dividends of $2.00 per share. At the end of the year, Apple stock was worth $115.82, and Wal-Mart stock sold for $69.12. Substituting into Equation 8.1, we can calculate the annual rate of return, r, for each stock:

$$\text{Apple: } (\$2.37 + \$115.82 - \$105.35) \div \$105.35 = 12.2\%$$
$$\text{Wal-Mart: } (\$2.00 + \$69.12 - \$61.46) \div \$61.46 = 15.7\%$$

Robin made money on both stocks in 2016. On a percentage basis, her return was higher on Wal-Mart stock, though her profit in dollar terms was greater with Apple stock.

expected return
The return that an asset is expected to generate in the future, composed of a risk-free rate plus a risk premium.

The preceding example focused on the historical returns actually earned (also called *realized returns*) on two investments. This chapter concentrates on *expected returns* and the relationship between expected returns and risk. When corporate financial managers are making investment decisions, they need a way to estimate the expected returns their investment opportunities might earn. As the name implies, an asset's **expected return** is the return that the asset is expected to generate in some future time period, and it is composed of a risk-free rate plus a risk premium. Fundamentally, expected returns are driven by risk in the sense that riskier investments tend to produce higher returns. Even though the goal of this chapter is to understand the link between expected returns and risk, looking at historical returns is still instructive because it provides insights about the past behavior of different types of assets, especially how the returns produced by those assets are related to their risks.

Investment returns vary both over time and between different types of investments. By averaging historical returns over a long period, we can focus on the returns that different kinds of investments tend to generate. Table 8.1 shows both the nominal and real (i.e., after inflation) average annual rates of return from 1900 to 2016 for three different types of investments: Treasury bills, Treasury bonds, and common stocks. Although bills and bonds are both issued by the U.S. government and are therefore relatively safe investments, bills have maturities of 1 year or less, whereas bonds have maturities ranging up to 30 years. Consequently, the interest rate risk associated with Treasury bonds is much higher than with bills. Over the past 117 years, bills earned the lowest returns, just 3.8% per year

TABLE 8.1 Historical Returns on Selected Investments (1900–2016)

Investment	Average nominal return	Average real return
Treasury bills	3.8%	0.9%
Treasury bonds	5.3	2.5
Common stocks	11.4	8.4

Source: Elroy Dimson, Paul Marsh, Mike Staunton, *Credit Suisse Global Investment Returns Yearbook 2017.*

on average in nominal terms and only 0.9% annually in real terms. The latter number means that the average Treasury bill return barely exceeded the average rate of inflation. Bond returns were higher at 5.3% in nominal terms and 2.5% in real terms. Clearly, though, stocks outshone the other types of investments, earning average annual nominal returns of 11.4% and average real returns of 8.4%.

In light of these statistics, you might wonder why anyone would invest in bonds or bills if the returns on stocks are so much higher. The answer, as you will soon see, is that stocks are much riskier than either bonds or bills and that risk leads some investors to prefer the safer, albeit lower, returns on Treasury securities.

RISK PREFERENCES

risk seeking
The attitude toward risk in which investors prefer investments with greater risk, perhaps even if they have lower expected returns.

Different people react to risk in different ways. Economists use three categories to describe how investors respond to risk. First, investors who are **risk seeking** prefer investments with higher risk, so much so that they may choose investments with very low expected returns for the thrill of taking extra risk. Although most individuals do not exhibit this behavior most of the time, it is not difficult to find examples of risk-seeking behavior, particularly in the realm of gambling. By design, the average person who buys a lottery ticket or gambles in a casino loses money. After all, state governments and casinos make money from these endeavors, which implies that individuals lose on average and the expected return is negative. People nonetheless buy lottery tickets and visit casinos, and in doing so they exhibit risk-seeking behavior.

risk neutral
The attitude toward risk in which investors choose the investment with the higher expected return regardless of its risk.

A second attitude toward risk is risk neutrality. Investors who are **risk neutral** choose investments based solely on their expected returns, disregarding the risks. When choosing between two investments, *risk-neutral investors will always select the investment with the higher expected return regardless of its risk*.

risk averse
The attitude toward risk in which investors require an increased expected return as compensation for an increase in risk.

The third category of behavior with respect to risk, *and the one that describes the behavior of most people most of the time,* is risk aversion. Investors who are **risk averse** prefer less risky over more risky investments, holding the expected rate of return fixed. A risk-averse investor who believes that two different investments have the same expected return will choose the investment whose returns are more certain. However, note that it is not correct to say that a risk-averse investor always shies away from risk. Risk-averse investors merely require compensation (in the form of a higher return) to induce them to purchase riskier assets. Stated another way, when choosing between two investments, *a risk-averse investor will not make the riskier investment unless it offers a higher expected return to compensate the investor for bearing the additional risk*.

Most people have an intuitive understanding that stocks are riskier than bonds. If we take that as a given, then Table 8.1 provides direct evidence that the market is dominated by risk-averse investors. In equilibrium, stocks *must* pay higher returns (on average) than bonds; otherwise, risk-averse investors would not buy stocks. However, even among risk-averse investors, the degree to which individuals can tolerate risk varies a great deal. One investor, observing in Table 8.1 that stocks pay an average annual return that is 6.1% higher than the average return on bonds, might decide that a risk premium of that magnitude is more than enough justification for investing in stocks. Another person might prefer to invest in bonds, even though they offer much lower returns, because they are not as risky as stocks. Both investors are risk averse, but they differ in terms of their *risk tolerance*. Investors with a low risk tolerance (or a high degree of risk aversion) require a very large risk premium to induce them to hold riskier assets. Investors with a high risk tolerance will invest in riskier assets for a much lower risk premium.

→ REVIEW QUESTIONS MyLab Finance Solutions

8–1 What is risk in the context of financial decision making?

8–2 Define return, and describe how to find the total rate of return on an investment.

8–3 Compare the following risk preferences: (**a**) risk averse, (**b**) risk neutral, and (**c**) risk seeking. Which risk preference is most common among financial managers? What is the difference between risk aversion and risk tolerance?

LG 2

8.2 Risk of a Single Asset

In this section, we refine our understanding of risk. Surprisingly, the concept of risk changes when the focus shifts from the risk of a single asset held in isolation to the risk of a portfolio of assets. Here, we examine different statistical methods to quantify risk; later, we apply those methods to portfolios.

RISK ASSESSMENT

scenario analysis
An approach for assessing risk that uses several possible alternative outcomes (scenarios) to obtain a sense of the variability among returns.

range
A measure of an asset's risk, which is found by subtracting the return associated with the pessimistic (worst) outcome from the return associated with the optimistic (best) outcome.

The notion that risk is somehow connected to uncertainty is intuitive. The more uncertain you are about how an investment will perform, the riskier that investment seems. Scenario analysis provides a simple way to quantify that intuition, and probability distributions offer a more sophisticated method for analyzing the risk of an investment.

Scenario Analysis

Scenario analysis uses several possible alternative outcomes (scenarios) to obtain a sense of the variability of returns. One common method involves considering pessimistic (worst), most likely (expected), and optimistic (best) outcomes and the returns associated with them for a given asset. Given these scenarios, one way to quantify risk is to measure the range of possible outcomes. The **range** is the difference between the return provided by the optimistic and pessimistic scenarios. Intuitively, an asset with a greater range of possible returns seems more risky.

EXAMPLE 8.2

Norman Company, a manufacturer of custom golf equipment, wants to choose the better of two investments, A and B. Each requires an initial outlay of $10,000, and each has a most likely annual rate of return of 15%. Management has estimated returns associated with each investment's pessimistic and optimistic outcomes. The three estimates for each asset, along with its range, are given in Table 8.2. Asset A appears to be less risky than asset B; its range of 4% (17% − 13%) is less than the range of 16% (23% − 7%) for asset B. The risk-averse

TABLE 8.2 Assets A and B

	Asset A	Asset B
Initial investment	$10,000	$10,000
Annual rate of return		
Pessimistic	13%	7%
Most likely	15%	15%
Optimistic	17%	23%
Range	4%	16%

decision maker would prefer asset A over asset B, because A offers the same most likely return as B (15%), with lower risk (smaller range).

It's not unusual for financial managers to think about the best and worst possible outcomes when they are in the early stages of analyzing a new investment project. No matter how great the intuitive appeal of this approach, looking at the range of outcomes that an investment might produce is a highly unsophisticated way of measuring its risk. More refined methods require some basic statistical tools.

Probability Distributions

probability
The *chance* that a given outcome will occur.

Probability distributions provide a more quantitative insight into an asset's risk. The **probability** of a given outcome is its *chance* of occurring. We would expect that an outcome with an 80% probability would occur 8 out of 10 times. An outcome with a probability of 100% is certain to occur. Outcomes with a probability of zero will never occur.

EXAMPLE 8.3

Norman Company's past estimates indicate that the probabilities of the pessimistic, most likely, and optimistic outcomes are 25%, 50%, and 25%, respectively. Note that the sum of these probabilities must equal 100%; that is, the probability distribution must assign a probability to every possible outcome such that no other outcomes are possible.

MATTER OF FACT

Beware of the Black Swan

Is it ever possible to know for sure that a particular outcome can never happen—that the chance of its occurrence is 0%? In the 2007 bestseller *The Black Swan: The Impact of the Highly Improbable*, Nassim Nicholas Taleb argues that seemingly improbable or even impossible events are more likely to occur than most people think, especially in the area of finance. The book's title refers to a long-held belief that all swans were white, a belief held by many people until a black variety was discovered in Australia. Taleb reportedly earned a large fortune during the 2007–2008 financial crisis by betting that financial markets would plummet.

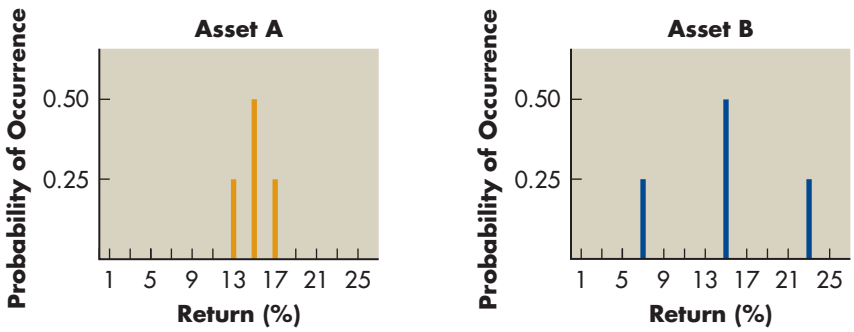
probability distribution
A model that relates probabilities to the associated outcomes.

bar chart
The simplest type of probability distribution; shows only a limited number of outcomes and associated probabilities for a given event.

A **probability distribution** is a model that relates probabilities to the associated outcomes. The simplest type of probability distribution is the **bar chart**. The bar charts for Norman Company's assets A and B are shown in Figure 8.1. Although both assets have the same average return, the range of return is much greater, or more dispersed, for asset B than for asset A: 16% versus 4%.

FIGURE 8.1

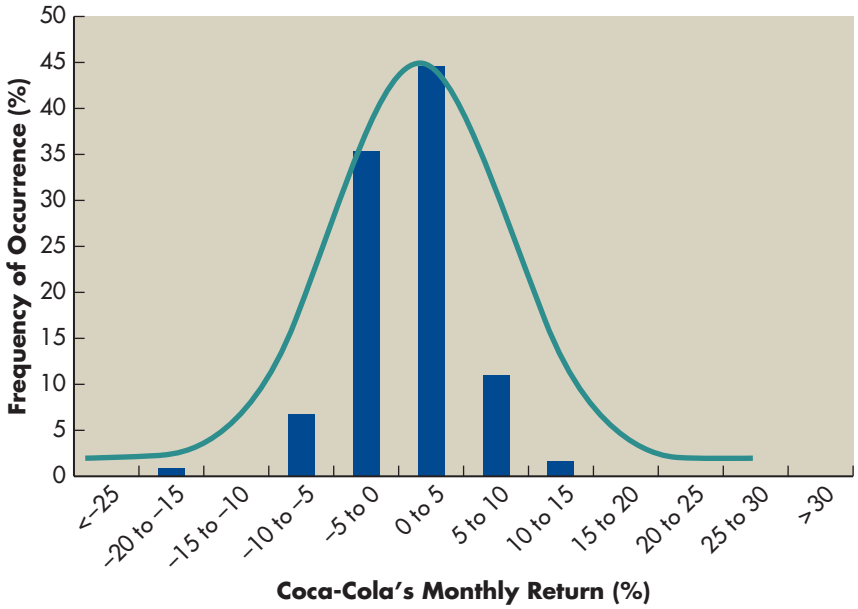
Bar Charts
Bar charts for asset A's and asset B's returns

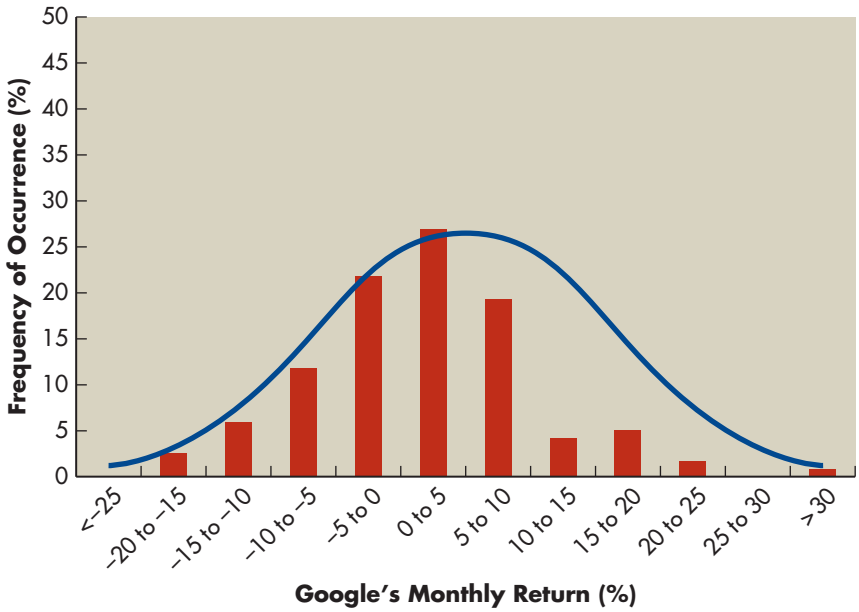


Most investments have more than two or three possible outcomes, and in most cases the probability of each outcome is unknown. One way to deal with such problems is to create a bar chart using historical data on actual returns. Figure 8.2 shows two such charts, one for Google and one for Coca-Cola, which use historical monthly returns on these two stocks from 2007 to 2017. The charts group monthly returns into bins or ranges and then show the relative frequency with which returns fell into each bin historically. For example, in the bottom part of Figure 8.2, we can see that

FIGURE 8.2

Bar Charts for Coca-Cola and Google
The bar charts use monthly returns from 2007 to 2017 on Coca-Cola and Google stock to illustrate the historical likelihood of each stock generating a return of a given magnitude.





about 27% of the time the monthly return on Google stock was between 0% and 5%. Coca-Cola's monthly return was between 0% and 5% much more often, about 45% of the time over that decade. Google's returns were far more likely to be very high or low than were Coca-Cola's. For example, Google stock achieved a monthly return of between 15% and 20% about 5% of the time, whereas Coca-Cola stock never performed that well in a single month between 2007 and 2017. In principle, we could use these historical frequencies to form estimates of the probabilities of different return outcomes for Google and Coca-Cola on a forward-looking basis.

If we had many more data points for Google and Coca-Cola monthly stock returns, the bar charts in Figure 8.2 would begin to look more and more like smooth curves representing a **continuous probability distribution**. This type of distribution can be thought of as a bar chart for a very large number of outcomes. Figure 8.2 superimposes continuous probability distributions on the bar charts for Google and Coca-Cola. It should be evident from the figure that Google stock returns have much greater dispersion than the distribution for Coca-Cola. Intuitively, Google seems more risky than Coca-Cola.

continuous probability distribution
A probability distribution showing all the possible outcomes and associated probabilities for a given event.

RISK MEASUREMENT

In addition to considering the range of returns that an investment might produce, the risk of an asset can be measured quantitatively with statistics. The most common statistical measure used to describe an investment's risk is its standard deviation.

Standard Deviation

The **standard deviation**, σ, measures the dispersion or volatility of an investment's return around the average return. We can think about an investment's average return in two ways. First, if we know all the different returns that an investment might generate, along with their associated probabilities, we define the average return, $\bar{r}$, as follows:

standard deviation (σ)
The most common statistical indicator of an asset's risk; it measures the dispersion around the average.

$$\bar{r} = \sum_{j=1}^{n} r_j \times Pr_j \tag{8.2}$$

where

r_j = return for the jth outcome
Pr_j = probability of occurrence of the jth outcome
n = number of outcomes considered

As we have already noted, in most situations we do not know every possible outcome, nor do we know the probabilities of each outcome. In that case, we estimate an investment's average return simply by taking the arithmetic mean from a series of historical returns

$$\bar{r} = \frac{\sum_{j=1}^{n} r_j}{n} \tag{8.2a}$$

where n is the number of historical returns over which we are taking the average.[2]

2. Note that if there are n outcomes and each outcome has the same probability, $1/n$, then Equations 8.2 and 8.2a are identical.

EXAMPLE 8.4

Table 8.3 presents the average returns for Norman Company's assets A and B. Column 1 gives the Pr_j's, and column 2 gives the r_j's. In each case, $n = 3$. Each asset's average return is 15%.

TABLE 8.3 Average Returns for Assets A and B

Possible outcomes	Probability Pr_j	Returns r_j	$Pr_j \times r_j$
Asset A			
Pessimistic	0.25	13%	3.25%
Most likely	0.50	15	7.50
Optimistic	0.25	17	4.25
Total	1.00		Average return 15.00%
Asset B			
Pessimistic	0.25	7%	1.75%
Most likely	0.50	15	7.50
Optimistic	0.25	23	5.75
Total	1.00		Average 15.00%

Once we determine an investment's average return, then we can calculate the standard deviation. As before, the formula we use to calculate the standard deviation depends on whether we know each possible return outcome and its associated probability or whether we do not have that information. When outcomes and their probabilities are known, the expression for the *standard deviation of returns*, σ, is

$$\sigma = \sqrt{\sum_{j=1}^{n} (r_j - \bar{r})^2 \times Pr_j} \tag{8.3}$$

In the more common situation of knowing neither the full list of possible outcomes nor their associated probabilities, we estimate the standard deviation using n observations of historical data, using the following formula:

$$\sigma = \sqrt{\frac{\sum_{j=1}^{n} (r_j - \bar{r})^2}{n - 1}} \tag{8.3a}$$

An asset with a high standard deviation has returns that fluctuate more than does an asset with a low standard deviation.

EXAMPLE 8.5

Table 8.4 presents the standard deviations for Norman Company's assets A and B, based on the data in Table 8.3. The standard deviation for asset A is 1.41%, and the standard deviation for asset B is 5.66%. The higher volatility of asset B's returns is clearly reflected in the higher standard deviation.

TABLE 8.4 Calculating the Standard Deviation of the Returns for Assets A and B

Asset A	Squared deviation	Probability	
j	$(r_j - \bar{r})^2$	Pr_j	$(r_j - \bar{r})^2 \times Pr_j$
1	$(13\% - 15\%)^2 = 4\%^2$	0.25	$4\%^2 \times 0.25 = 1\%^2$
2	$(15\% - 15\%)^2 = 0\%^2$	0.50	$0\%^2 \times 0.50 = 0\%^2$
3	$(17\% - 15\%)^2 = 4\%^2$	0.25	$4\%^2 \times 0.25 = 1\%^2$

$$\sum_{j=1}^{3}(r_j - \bar{r})^2 \times Pr_j = 1\%^2 + 0\%^2 + 1\%^2 = 2\%^2$$

$$\sigma = \sqrt{\sum_{j=1}^{3}(r_j - \bar{r})^2 \times Pr_j} = \sqrt{2\%^2} = \underline{\underline{1.41\%}}$$

Asset B			
1	$(\ 7\% - 15\%)^2 = 64\%^2$	0.25	$64\%^2 \times 0.25 = 16\%^2$
2	$(15\% - 15\%)^2 = \ 0\%^2$	0.50	$0\%^2 \times 0.50 = \ 0\%^2$
3	$(23\% - 15\%)^2 = 64\%^2$	0.25	$64\%^2 \times 0.25 = 16\%^2$

$$\sum_{j=1}^{3}(r_j - \bar{r})^2 \times Pr_j = 16\%^2 + 0\%^2 + 16\%^2 = 32\%^2$$

$$\sigma = \sqrt{\sum_{j=1}^{3}(r_j - \bar{r})^2 \times Pr_j} = \sqrt{32\%^2} = \underline{\underline{5.66\%}}$$

Historical Returns and Risk We can now use the standard deviation as a measure of risk to assess the historical (1900–2016) investment return data in Table 8.1. Table 8.5 repeats the historical nominal average returns in column 1 and shows the standard deviations associated with each of them in column 2. A close relationship is evident between the investment returns and the standard deviations: Investments with higher returns have higher standard deviations. For example, stocks have the highest average return at 11.4%, which is nearly 4 times the average return on Treasury bills. At the same time, stocks are much more volatile, with a standard deviation of 19.8%, nearly 7 times greater than the 2.9% standard deviation of Treasury bills. If we accept the idea that the standard deviation is a valid way to quantify an investment's risk, the historical data confirm the existence of a positive relationship between risk and return. That relationship reflects *risk aversion* by market participants, who require higher returns as compensation for greater risk. The historical

MATTER OF FACT

All Stocks Are Not Created Equal

Table 8.5 shows that stocks are riskier than bonds, but are some stocks riskier than others? The answer is emphatically *yes*. A recent study examined the historical returns of large stocks and small stocks and found that the average annual return on large stocks from 1926 through 2016 was 12.0%, while small stocks earned 16.6% per year on average. The higher returns on small stocks came with a cost, however. The standard deviation of small stock returns was a whopping 31.9%, whereas the standard deviation on large stocks was just 19.9%.

TABLE 8.5 Historical Returns and Standard Deviations on Selected Investments (1900–2016)

Investment	Average nominal return	Standard deviation	Coefficient of variation
Treasury bills	3.8%	2.9%	0.76
Treasury bonds	5.3	9.0	1.70
Common stocks	11.4	19.8	1.74

Source: Elroy Dimson, Paul Marsh, Mike Staunton, *Credit Suisse Global Investment Returns Yearbook 2017*.

data in columns 1 and 2 of Table 8.5 clearly show that during the 1900–2016 period, investors were, on average, rewarded with higher returns on higher-risk investments.

normal probability distribution
A symmetrical probability distribution whose shape resembles a "bell-shaped" curve.

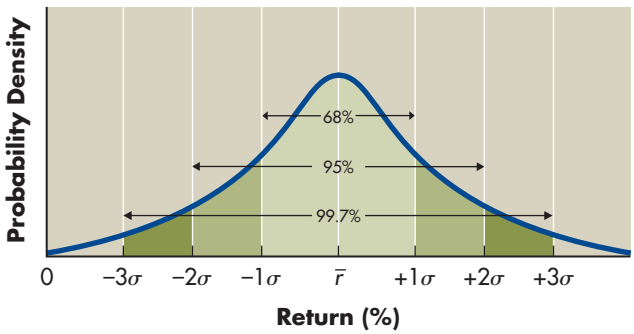
Normal Distribution A **normal probability distribution**, depicted in Figure 8.3, resembles a symmetrical "bell-shaped" curve. The symmetry of the curve means that half the probability is associated with the values to the left of the peak and half with the values to the right. As noted on the figure, for normal probability distributions, 68% of possible outcomes will lie between ±1 standard deviation from the expected return, 95% of all outcomes will lie between ±2 standard deviations from the expected return, and 99.7% of all outcomes will lie between ±3 standard deviations from the expected return.

EXAMPLE 8.6

Using the data in Table 8.5 and assuming that the probability distributions of returns for common stocks and bonds are normal, we can surmise that 68% of the possible outcomes would have a return ranging between −8.4% and 31.2% for stocks and between −3.7% and 14.3% for bonds; 95% of the possible return outcomes would range between −28.2% and 51.0% for stocks and between −12.7% and 23.3% for bonds. The greater volatility of stock returns is clearly reflected in the much wider range of possible returns for each level of confidence (68% or 95%).

FIGURE 8.3

Bell-Shaped Curve
Normal probability distribution, with percentage of return outcomes for standard deviation ranges



Coefficient of Variation: Trading Off Risk and Return

coefficient of variation (*CV*)
A measure of relative dispersion that is useful in comparing the risks of assets with differing expected returns.

The **coefficient of variation, *CV***, is a measure of relative dispersion that is useful in comparing the risks of assets with differing expected returns. The equation for the coefficient of variation is

$$CV = \frac{\sigma}{\bar{r}} \tag{8.4}$$

A higher coefficient of variation means that an investment has more volatility relative to its expected return. Because investors prefer higher returns and less risk, one might intuitively expect investors to gravitate toward investments with a low coefficient of variation. However, this logic doesn't always apply for reasons that will emerge in the next section. For now, consider the coefficients of variation in column 3 of Table 8.5. That table reveals that Treasury bills have the lowest coefficient of variation and therefore the lowest risk relative to their return. Does that mean that investors should load up on Treasury bills and divest themselves of stocks? Not necessarily.

EXAMPLE 8.7

Substituting the standard deviations (from Table 8.4) and the expected returns (from Table 8.3) for assets A and B into Equation 8.4, we find that the coefficients of variation for A and B are 0.094 (1.41% ÷ 15%) and 0.377 (5.66% ÷ 15%), respectively. Asset B has the higher coefficient of variation.

PERSONAL FINANCE EXAMPLE 8.8

Marilyn Ansbro is reviewing stocks for inclusion in her investment portfolio. The stock she wishes to analyze is Danhaus Industries Inc. (DII), a diversified manufacturer of pet products. One of her key concerns is risk; as a rule, she will invest only in stocks with a coefficient of variation below 0.75. She has gathered price and dividend data (shown in the accompanying table) for DII over the past 3 years, 2017–2019, and she plans to calculate DII's coefficient of variation using this admittedly limited historical sample.

	Stock Price		
Year	Beginning	End	Dividend paid
2017	$35.00	$36.50	$3.50
2018	36.50	34.50	3.50
2019	34.50	35.00	4.00

Substituting the price and dividend data for each year into Equation 8.1, we get the following information:

Year	Returns
2017	[$3.50 + ($36.50 − $35.00)] ÷ $35.00 = $5.00 ÷ $35.00 = 14.3%
2018	[$3.50 + ($34.50 − $36.50)] ÷ $36.50 = $1.50 ÷ $36.50 = 4.1%
2019	[$4.00 + ($35.00 − $34.50)] ÷ $34.50 = $4.50 ÷ $34.50 = 13.0%

Substituting into Equation 8.2a we get the average return, $\bar{r}_{2017–2019}$:

$$\bar{r}_{2017–2019} = (14.3\% + 4.1\% + 13.0\%) \div 3 = 10.5\%$$

Substituting the average return and annual returns into Equation 8.3a, we get the standard deviation, $\sigma_{2017–2019}$:

$$\sigma_{2017–2019} = \sqrt{[(14.3\% - 10.5\%)^2 + (4.1\% - 10.5\%)^2 + (13.0\% - 10.5\%)^2] \div (3 - 1)}$$
$$= \sqrt{(14.44\%^2 + 40.96\%^2 + 6.25\%^2) \div 2} = \sqrt{30.825\%^2} = 5.6\%$$

Finally, substituting the standard deviation of returns and the average return into Equation 8.4, we get the coefficient of variation, *CV*:

$$CV = 5.6\% \div 10.5\% = 0.53$$

Because the coefficient of variation of returns on the DII stock over the 2017–2019 period of 0.53 is well below Marilyn's maximum coefficient of variation of 0.75, she concludes that the DII stock would be an acceptable investment.

→ REVIEW QUESTIONS MyLab Finance Solutions

8–4 Explain how the range is used in scenario analysis.

8–5 What does a plot of the probability distribution of outcomes show a decision maker about an asset's risk?

8–6 What relationship exists between the size of the standard deviation and the degree of asset risk?

8–7 What does the coefficient of variation reveal about an investment's risk that the standard deviation does not?

LG3 LG4

8.3 Risk of a Portfolio

efficient portfolio
A portfolio that maximizes return for a given level of risk.

In real-world situations, the risk of any single investment would not be viewed independently of other assets. New investments must be considered in light of their impact on the risk and return of an investor's *portfolio* of assets. The financial manager's goal is to create an **efficient portfolio**, one that provides the maximum return for a given level of risk. We therefore need a way to measure the return and the standard deviation of a portfolio of assets. As part of that analysis, we will look at the statistical concept of *correlation*, which underlies the process of diversification used to develop an efficient portfolio.

PORTFOLIO RETURN AND STANDARD DEVIATION

The *return on a portfolio* is a weighted average of the returns on the individual assets from which it is formed. We can use Equation 8.5 to find the portfolio return, r_p:

$$r_p = (w_1 \times r_1) + (w_2 \times r_2) + \ldots (w_n \times r_n) = \sum_{j=1}^{n} w_j \times r_j \quad (8.5)$$

where

w_j = percentage of the portfolio's total dollar value invested in asset j

r_j = return on asset j

Of course, $\sum_{j=1}^{n} w_j = 1$, which means that 100% of the portfolio's assets must be included in this computation.

EXAMPLE 8.9

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James purchases 100 shares of Wal-Mart at a price of \$80 per share, so his total investment in Wal-Mart is \$8,000. He also buys 100 shares of Cisco Systems at \$32 per share, so the total investment in Cisco stock is \$3,200. Combining these two holdings, James's total portfolio is worth \$11,200. Of the total, 71.43% is invested in Wal-Mart (\$8,000 ÷ \$11,200), and 28.57% is invested in Cisco Systems (\$3,200 ÷ \$11,200). Thus, $w_1 = 0.7143$, $w_2 = 0.2857$, and $w_1 + w_2 = 1.0$.

The *standard deviation of a portfolio's returns* is found by applying the formula for the standard deviation of a single asset. Specifically, apply Equation 8.3 when you know the probabilities of every possible return, and apply Equation 8.3a when using historical data to estimate the standard deviation.

EXAMPLE 8.10

Assume that we wish to determine the historical average return and the standard deviation of returns for portfolio XY, created by combining equal portions (50% each) of assets X and Y. Historical returns generated by assets X and Y during the period 2014–2018 appear in part A of Table 8.6. Before focusing on the average return and standard deviation of the portfolio, we will consider those statistics for

TABLE 8.6 Historical Returns, Average Return, and Standard Deviation for Portfolio XY

A. Historical portfolio returns

Year	Asset X return, r_x	Asset Y return, r_y	Portfolio return[a]
2014	8%	16%	(0.50 × 8%) + (0.50 × 16%) = 12%
2015	10	14	(0.50 × 10%) + (0.50 × 14%) = 12%
2016	12	12	(0.50 × 12%) + (0.50 × 12%) = 12%
2017	14	10	(0.50 × 14%) + (0.50 × 10%) = 12%
2018	16	8	(0.50 × 16%) + (0.50 × 8%) = 12%

B. Average portfolio return, 2014–2018

$$\bar{r}_p = \frac{12\% + 12\% + 12\% + 12\% + 12\%}{5} = 12\%$$

C. Standard deviation of portfolio returns[b]

$$\sigma_p = \sqrt{\frac{(12\% - 12\%)^2 + (12\% - 12\%)^2 + (12\% - 12\%)^2 + (12\% - 12\%)^2 + (12\% - 12\%)^2}{5 - 1}} = 0\%$$

[a]Using Equation 8.5.

[b]Using Equation 8.3a.

each asset individually. Using Equations 8.2a and 8.3a, we can calculate the average return and standard deviation for each asset as follows:

$$\bar{r}_X = \frac{8\% + 10\% + 12\% + 14\% + 16\%}{5} = 12\%$$

$$\bar{r}_Y = \frac{16\% + 14\% + 12\% + 10\% + 8\%}{5} = 12\%$$

$$\sigma_X = \sqrt{\frac{(8\% - 12\%)^2 + (10\% - 12\%)^2 + (12\% - 12\%)^2 + (14\% - 12\%)^2 + (16\% - 12\%)^2}{5 - 1}} = 3.16\%$$

$$\sigma_Y = \sqrt{\frac{(16\% - 12\%)^2 + (14\% - 12\%)^2 + (12\% - 12\%)^2 + (10\% - 12\%)^2 + (8\% - 12\%)^2}{5 - 1}} = 3.16\%$$

Assets X and Y are quite similar in that both have an average return of 12% and a standard deviation of 3.16% during the 2014 to 2018 period. Now let us see what happens when we put the two assets together in a portfolio.

The latter columns of part A show what return a portfolio consisting of assets X and Y would have earned in each year. Notice that a rather strange outcome occurs for the portfolio. Even though the returns of assets X and Y fluctuate from year to year, the portfolio produces the same 12% return every single year. Parts B and C show the calculations behind the rather obvious conclusion that portfolio XY's average historical return is 12% and its standard deviation is 0%.

If you look carefully at the historical returns on assets X and Y, you can see they are moving in opposite directions. In other words, Asset X's return is lowest in 2014 and highest in 2018, whereas the opposite is true for Asset Y. As a result, movements in the returns of Asset X are always exactly offset by opposite movements in Asset Y's return, so the 50-50 portfolio earns the same return year after year. This result is a very special case of a crucial concept in portfolio theory called correlation, to which we now turn.

correlation
A statistical measure of the relationship between any two series of numbers.

positively correlated
Describes two series that move in the same direction.

negatively correlated
Describes two series that move in opposite directions.

correlation coefficient
A measure of the degree of correlation between two series.

perfectly positively correlated
Describes two *positively correlated* series that have a *correlation coefficient* of +1.

CORRELATION

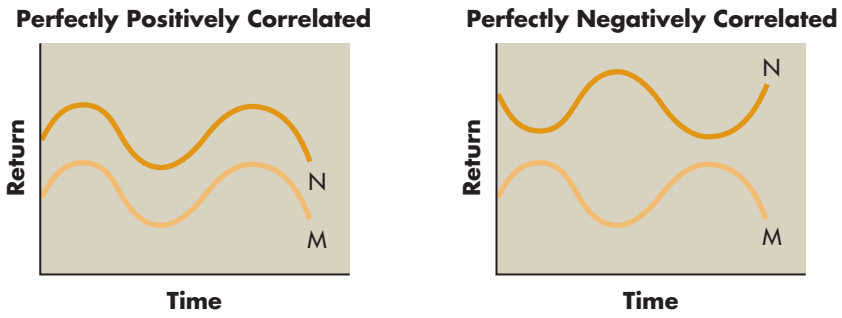
Correlation is a statistical measure of the relationship between any two series of numbers. The numbers may represent data of any kind, from investment returns to test scores. If two series tend to vary in the same direction, they are **positively correlated**. If the series vary in opposite directions, they are **negatively correlated**. For example, suppose that we gathered data on the retail price and weight of new cars. It is likely we would find that larger cars cost more than smaller ones, so we would say that among new cars, weight and price are positively correlated. If we also measured the fuel efficiency of these vehicles (as measured by the number of miles they can travel per gallon of gasoline), we would find that lighter cars are more fuel efficient than heavier cars. In that case, we would say that fuel economy and vehicle weight are negatively correlated.[3]

The degree of correlation is measured by the **correlation coefficient**, which ranges from +1 for **perfectly positively correlated** series to −1 for

3. Note here that we are talking about general tendencies. For instance, a large hybrid SUV might have better fuel economy than a smaller sedan powered by a conventional gasoline engine, but that does not change the general tendency that lighter cars achieve better fuel economy.

FIGURE 8.4

Correlations
The correlation between series M and series N



perfectly negatively correlated
Describes two *negatively correlated* series that have a *correlation coefficient* of −1.

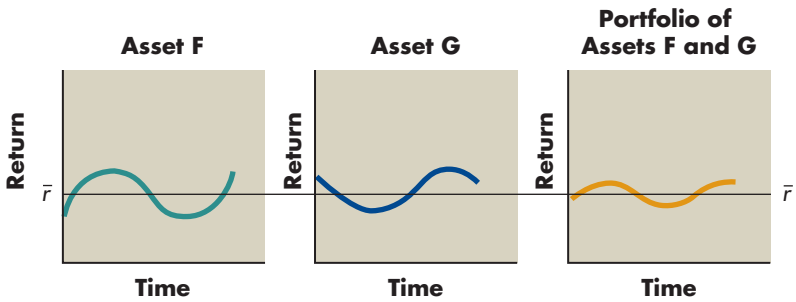
perfectly negatively correlated series. These two extremes are depicted for series M and N in Figure 8.4. The perfectly positively correlated series move exactly together without exception; the perfectly negatively correlated series move in exactly opposite directions.

DIVERSIFICATION

The concept of correlation is essential to developing an efficient portfolio. To reduce overall risk, it is best to *diversify* by combining, or adding to the portfolio, assets that have the lowest possible correlation. Combining assets that have a low correlation with each other can reduce the overall variability of a portfolio's returns. Figure 8.5 shows the returns that two assets, F and G, earn over time. Both assets earn the same average or expected return, $\bar{r}$, but note that when F's return is above average, the return on G is below average and vice versa. In other words, returns on F and G are negatively correlated, and when these two assets are combined in a portfolio, the risk of that portfolio falls without reducing the average return (i.e., the portfolio's average return is also $\bar{r}$). For risk-averse investors, that is very good news. They get rid of something they don't like (risk) without having to sacrifice what they do like (return). Even if assets are positively correlated, the lower the correlation between them the greater will be the risk reduction achieved through diversification.

FIGURE 8.5

Diversification
Combining negatively correlated assets to reduce, or diversify, risk



uncorrelated
Describes two series that lack any interaction and therefore have a *correlation coefficient* of zero.

Some assets are **uncorrelated;** that is, no interaction takes place between their returns. Combining uncorrelated assets can reduce risk, not as effectively as combining negatively correlated assets but more effectively than combining positively correlated assets. The *correlation coefficient for uncorrelated assets is zero* and acts as the midpoint between perfectly positive and perfectly negative correlation.

The creation of a portfolio that combines two assets with perfectly positively correlated returns results in overall portfolio risk that at the minimum equals that of the least risky asset and at the maximum equals that of the most risky asset. However, a portfolio combining two assets with less than perfectly positive correlation *can* reduce total risk to a level below that of either component. We have already seen an example of this in Table 8.6, where two assets with returns that varied over time, Assets X and Y, were combined into a portfolio that produced returns that did not vary at all. For a more realistic example, assume that you buy stock in a company that manufactures machine tools. The business is very *cyclical,* so the stock will do well when the economy is expanding, and it will do poorly during a recession. If you bought shares in another machine-tool company, with sales positively correlated with those of your firm, the combined portfolio would still be cyclical, and risk would not be reduced a great deal. Alternatively, however, you could buy stock in a discount retailer, whose sales are *countercyclical.* It typically performs worse during economic expansions than it does during recessions (when consumers are trying to save money on every purchase). A portfolio that contained both of these stocks might be less volatile than either stock on its own.

EXAMPLE 8.11

Table 8.7 presents historical returns from three different assets—X, Y, and Z—from 2014 to 2018, along with their average returns and standard deviations. You encountered Assets X and Y previously in Table 8.6, so here we are just adding data for a third asset, Z. Each of the assets has an expected return of 12% and a standard deviation of 3.16%. The assets therefore have equal return and equal volatility. The return patterns of assets X and Y are perfectly negatively correlated. When X enjoys its highest return, Y experiences its lowest return and vice versa. The returns of assets X and Z are perfectly positively correlated. They move in precisely the same direction, so when the return on X is high, so is the return on Z. (*Note:* The returns for X and Z are identical.)[4] Now let's consider what happens when we combine these assets in different ways to form portfolios.

Portfolio XY Portfolio XY (shown initially in Table 8.6 and repeated in Table 8.7) is created by combining equal portions of assets X and Y, the perfectly negatively correlated assets. The volatility in this portfolio, as reflected by its standard deviation, equals 0%, whereas the expected return is 12%. Thus, the formation of portfolio XY results in the complete elimination of risk because in each and every year the portfolio earns a 12% return.[5] *Whenever assets*

4. We use identical returns in this example to permit clear illustration of the concepts, but it is not necessary for the returns on X and Z to be identical for them to be perfectly positively correlated. Any return streams that move exactly together—regardless of the relative magnitude of the returns—are perfectly positively correlated.

5. Perfect negative correlation means that the ups and downs experienced by one asset are exactly offset by movements in the other asset. Therefore, the portfolio return does not vary over time.

TABLE 8.7 Average Returns and Standard Deviations for Portfolios XY and XZ

	Asset Returns			Portfolio Returns[a]	
Year	r_X	r_Y	r_Z	r_{XY}	r_{XZ}
2014	8%	16%	8%	(0.50 × 8%) + (0.50 × 16%) = 12%	(0.50 × 8%) + (0.50 × 8%) = 8%
2015	10	14	10	(0.50 × 10%) + (0.50 × 14%) = 12%	(0.50 × 10%) + (0.50 × 10%) = 10%
2016	12	12	12	(0.50 × 12%) + (0.50 × 12%) = 12%	(0.50 × 12%) + (0.50 × 12%) = 12%
2017	14	10	14	(0.50 × 14%) + (0.50 × 10%) = 12%	(0.50 × 14%) + (0.50 × 14%) = 14%
2018	16	8	16	(0.50 × 16%) + (0.50 × 8%) = 12%	(0.50 × 16%) + (0.50 × 16%) = 16%
Statistic					
Average[b]	12%	12%	12%	12%	12%
Standard deviation[c]	3.16%	3.16%	3.16%	0%	3.16%

[a]Portfolio XY, which consists of 50% of asset X and 50% of asset Y, illustrates *perfect negative correlation*. Portfolio XZ, which consists of 50% of asset X and 50% of asset Z, illustrates *perfect positive correlation*.

[b]Using Equation 8.2a.

[c]Using Equation 8.3a. Note that for any portfolio consisting of two assets, you could also calculate the portfolio standard deviation directly by using the standard deviations of the assets in the portfolio as well as the correlation coefficient between them using the following formula:

$$\sigma_p = \sqrt{w_1^2\sigma_1^2 + w_2^2\sigma_2^2 + 2w_1w_2\rho_{12}\sigma_1\sigma_2}$$

where w_1 and w_2 are the fractions of the portfolio invested in assets 1 and 2, σ_1 and σ_2 are the standard deviations of each asset, and ρ_{12} is the correlation coefficient between assets 1 and 2. So, for portfolio XY the correlation coefficient would be –1.0, and for portfolio XZ the correlation coefficient would be 1.0.

are perfectly negatively correlated, some combination of the two assets exists such that the resulting portfolio's returns are risk free.

Portfolio XZ Portfolio XZ (shown in Table 8.7) is created by combining equal portions of assets X and Z, the perfectly positively correlated assets. Individually, assets X and Z have the same standard deviation, 3.16%, and because they always move together, combining them in a portfolio does nothing to reduce risk; the portfolio standard deviation is also 3.16%. As was the case with portfolio XY, the expected return of portfolio XZ is 12%. Because both portfolios provide the same expected return, but portfolio XY achieves that expected return with no risk, portfolio XY is clearly preferred by risk-averse investors over portfolio XZ.

CORRELATION, DIVERSIFICATION, RISK, AND RETURN

In general, the lower the correlation between asset returns, the greater the risk reduction that investors can achieve by diversifying. The following example illustrates how correlation influences the risk of a portfolio but not the portfolio's expected return.

EXAMPLE 8.12

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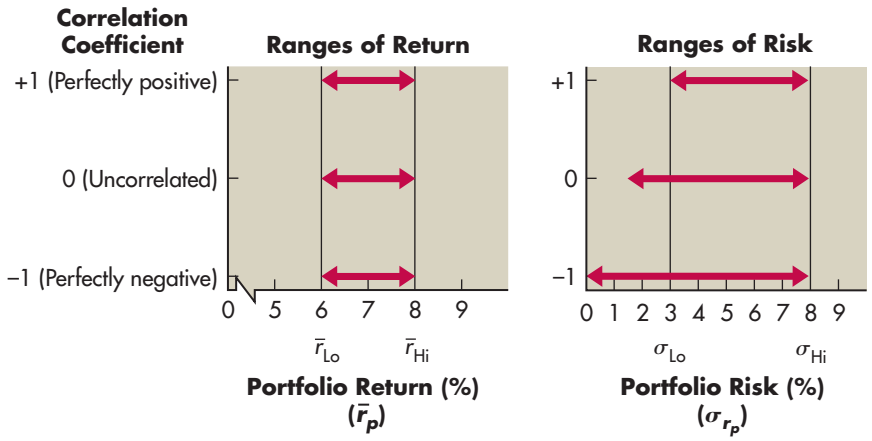
Consider two assets—Lo and Hi—with the characteristics described in the following table.

Asset	Expected return, $\bar{r}$	Risk (standard deviation), σ
Lo	6%	3%
Hi	8	8

FIGURE 8.6

Possible Correlations
Range of portfolio return ($\bar{r}_p$) and risk (σ_{r_p}) for combinations of assets Lo and Hi for various correlation coefficients



Clearly, asset Lo offers a lower return than Hi does, but Lo is also less risky than Hi. It is natural to think that a portfolio combining Lo and Hi would offer a return between 6% and 8% and that the portfolio's risk would also fall between the risk of Lo and Hi (between 3% and 8%). That intuition is only partly correct.

The performance of a portfolio consisting of assets Lo and Hi depends not only on the expected return and standard deviation of each asset (given above) but also on how the returns on the two assets are correlated. We will illustrate the results of three specific scenarios: (1) returns on Lo and Hi are perfectly positively correlated, (2) returns on Lo and Hi are uncorrelated, and (3) returns on Lo and Hi are perfectly negatively correlated.

The results of the analysis appear in Figure 8.6. Whether the correlation between Lo and Hi is +1, 0, or −1, a portfolio of those two assets must have an expected return between 6% and 8%. That is why the line segments at the left in Figure 8.6 all range between 6% and 8%. If a portfolio is mostly invested in Lo with only a little money invested in Hi, the portfolio's return will be close to 6%. If more money is invested in Hi, the portfolio return will be closer to 8%. However, the standard deviation of a portfolio depends critically on the correlation between Lo and Hi. Only when Lo and Hi are perfectly positively correlated can it be said that the portfolio standard deviation must fall between 3% (Lo's standard deviation) and 8% (Hi's standard deviation). As the correlation between Lo and Hi becomes weaker (i.e., as the correlation coefficient falls), investors may find they can form portfolios of Lo and Hi with standard deviations that are even less than 3% (i.e., portfolios that are less risky than holding asset Lo by itself). That is why the line segments at the right in Figure 8.6 vary. In the special case when Lo and Hi are perfectly negatively correlated, it is possible to diversify away all the risk and form a portfolio that is risk free.

INTERNATIONAL DIVERSIFICATION

One excellent practical example of portfolio diversification involves including foreign assets in a portfolio. The inclusion of assets from countries with business cycles that are not perfectly correlated with the U.S. business cycle reduces the

portfolio's responsiveness to market movements. The ups and the downs of different markets around the world offset one another, at least to some extent, and the result is a portfolio that is less risky than one invested entirely in the U.S. market.

Returns from International Diversification

Over long periods, internationally diversified portfolios tend to perform better (meaning that they earn higher returns relative to the risks taken) than purely domestic portfolios. However, over shorter periods, such as 1 or 2 years, internationally diversified portfolios may perform better or worse than domestic portfolios. For example, consider what happens when the U.S. economy is performing rather poorly and the dollar is depreciating in value against most foreign currencies. At such times, the dollar returns to U.S. investors on a portfolio of foreign assets can be very attractive. However, international diversification can yield subpar returns, particularly when the dollar is appreciating in value relative to other currencies. When the value of U.S. currency appreciates, the U.S. dollar value of a foreign-currency-denominated portfolio of assets declines. Even if this portfolio yields a satisfactory return in foreign currency, the return to U.S. investors will be reduced when foreign profits are translated into dollars. Subpar local currency portfolio returns, coupled with an appreciating dollar, can yield truly dismal dollar returns to U.S. investors.

Overall, though, the logic of international portfolio diversification assumes that these fluctuations in currency values and relative performance will average out over long periods. Compared to similar, purely domestic portfolios, an internationally diversified portfolio will tend to yield a comparable return at a lower level of risk.

political risk
Risk that arises from the possibility that a host government will take actions harmful to foreign investors or that political turmoil will endanger investments.

Risks of International Diversification

In addition to the risk induced by currency fluctuations, several other financial risks are unique to international investing. Most important is **political risk**, which arises from the possibility that a host government will take actions harmful to

GLOBAL FOCUS *in practice*

An International Flavor to Risk Reduction

Earlier in this chapter (see Table 8.5), we learned that from 1900 through 2016, the U.S. stock market produced an average annual nominal return of 11.4%, but that return was associated with a relatively high standard deviation: 19.8% per year. Could U.S. investors have done better by diversifying globally? The answer is somewhat mixed. Elroy Dimson, Paul Marsh, and Mike Staunton calculated the historical returns on a portfolio that included U.S. stocks as well as stocks from 22 other countries. This diversified portfolio produced returns that were not quite as high as the U.S. average, just 9.5% per year. However, the globally diversified portfolio was also less volatile, with an annual standard deviation of 17.0%. Dividing the standard deviation by the annual return produces a coefficient of variation for the globally diversified portfolio of 1.79, nearly identical to the 1.74 coefficient of variation reported for U.S. stocks in Table 8.5.

▶ *International mutual funds do not include any domestic assets, whereas global mutual funds include both foreign and domestic assets. How might this difference affect their correlation with U.S. equity mutual funds?*

Source: Elroy Dimson, Paul Marsh, and Mike Staunton, *Credit Suisse Global Investment Returns Yearbook 2017*.

foreign investors or that political turmoil will endanger investments. Political risks are particularly acute in developing countries, where unstable or ideologically motivated governments may attempt to block return of profits by foreign investors or even seize (nationalize) their assets in the host country. For example, reflecting former President Hugo Chavez's desire to broaden the country's socialist revolution, Venezuela maintained a list of priority goods for import that excluded a large percentage of the necessary inputs to the automobile production process. As a result, Toyota halted auto production in Venezuela, and three other auto manufacturers temporarily closed or deeply cut their production there. Chavez also forced most foreign energy firms to reduce their stakes and give up control of oil projects in Venezuela.

For more discussion of reducing risk through international diversification, see the *Global Focus* box.

→ REVIEW QUESTIONS MyLab Finance Solutions

8–8 What is an efficient portfolio? How can the return and standard deviation of a portfolio be determined?

8–9 Why is the correlation between asset returns important? How does diversification allow risky assets to be combined so that the risk of the portfolio is less than the risk of the individual assets in it?

8–10 How does international diversification enhance risk reduction? When might international diversification result in subpar returns? What are political risks, and how do they affect international diversification?

LG5 LG6

8.4 Risk and Return: The Capital Asset Pricing Model (CAPM)

Thus far, we have observed a tendency for riskier investments to earn higher returns, and we have learned that investors can reduce risk through diversification. Now we want to quantify the relationship between risk and return. In other words, we wish to measure how much additional return an investor should expect from taking a little extra risk. The classic theory that links risk and return for all assets is the **capital asset pricing model (CAPM)**. We will use the CAPM to understand the basic risk–return tradeoffs involved in all types of financial decisions.

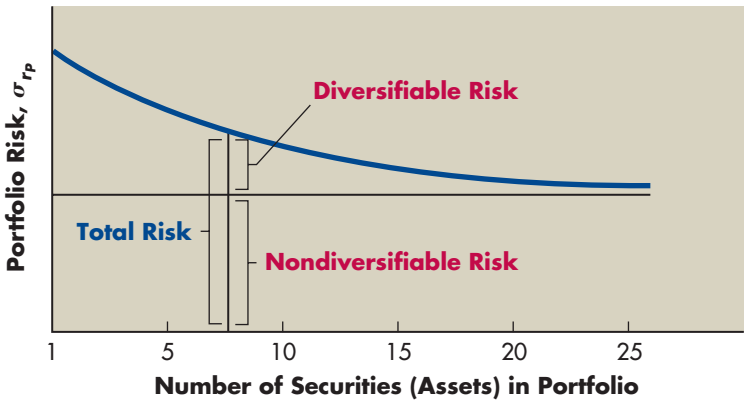
capital asset pricing model (CAPM)
The classic theory that links risk and return for all assets.

TYPES OF RISK

In the last section, we saw that the standard deviation of a portfolio may be less than the standard deviation of the individual assets in the portfolio. That's the power of diversification. To see this concept more clearly, consider what happens to the risk of a portfolio consisting of a single security (asset) to which we add securities randomly selected from, say, the population of all actively traded securities. Using the standard deviation of return, σ_{rp}, to measure the total portfolio risk, Figure 8.7 depicts the behavior of the total portfolio risk (y-axis) as more securities are added (x-axis). With the addition of securities, the total portfolio risk declines as a result of diversification, and tends to approach a lower limit.

FIGURE 8.7

Risk Reduction
Portfolio risk and diversification



total risk
The combination of a security's *nondiversifiable risk* and *diversifiable risk*.

diversifiable risk
The portion of an asset's risk that is attributable to firm-specific, random causes; can be eliminated through diversification. Also called *unsystematic risk*.

nondiversifiable risk
The relevant portion of an asset's risk attributable to market factors that affect all firms; cannot be eliminated through diversification. Also called *systematic risk*.

The **total risk** of a security can be viewed as consisting of two parts:

$$\text{Total security risk} = \text{Nondiversifiable risk} + \text{Diversifiable risk} \quad (8.6)$$

Diversifiable risk (sometimes called *unsystematic risk*) represents the portion of an asset's risk that is associated with random causes that can be eliminated through diversification. It is attributable to firm-specific events, such as strikes, lawsuits, regulatory actions, or the loss of key accounts. Figure 8.7 shows that diversifiable risk gradually disappears as the number of stocks in the portfolio increases. **Nondiversifiable risk** (also called *systematic risk*) is the portion of an asset's risk that is attributable to market factors that affect all firms; it cannot be eliminated through diversification. Factors such as war, inflation, the overall state of the economy, international incidents, and political events account for nondiversifiable risk. In Figure 8.7, nondiversifiable risk is represented by the horizontal black line below which the blue curve can never go, no matter how diversified the portfolio becomes.

Because any investor can easily create a portfolio of assets that will eliminate virtually all diversifiable risk, *the only relevant risk is nondiversifiable risk*. Any investor or firm therefore must be concerned solely with nondiversifiable risk. The measurement of nondiversifiable risk is thus of primary importance in selecting assets with the most desired risk–return characteristics.

THE MODEL: CAPM

The capital asset pricing model (CAPM) links nondiversifiable risk to expected returns. We will discuss the model in five sections. The first section deals with the beta coefficient, which is a measure of nondiversifiable risk. The second section presents an equation of the model itself, and the third section graphically describes the relationship between risk and return. The fourth section discusses the effects of changes in inflationary expectations and risk aversion on the relationship between risk and return. The fifth section offers some comments on the CAPM.

Beta Coefficient

beta coefficient (β)
A relative measure of nondiversifiable risk. An *index* of the degree of movement of an asset's return in response to a change in the *market return*.

market return
The return on the market portfolio of all traded securities.

The **beta coefficient, β**, is a relative measure of nondiversifiable risk. It is an index of the degree of movement of an asset's return in response to a change in the market return. Analysts use an asset's historical returns to estimate the asset's beta coefficient. The **market return** is the return on the market portfolio of all traded securities. Analysts often use the *Standard & Poor's 500 Stock Composite Index* or some similar stock index as the market return. Betas for actively traded stocks can be obtained from a variety of sources, but you should understand how they are derived and interpreted and how they are applied to portfolios.

Deriving Beta from Return Data Figure 8.8 plots the relationship between the returns of two stocks (Bank of America and Pepsico) and the market return. The horizontal axis measures the historical market returns and the vertical axis measures the individual stock's historical returns. The first step in deriving beta involves plotting the coordinates for the market return and asset returns from various points in time. Each blue (yellow) dot in the figure shows the return on Pepsico (Bank of America) and the return on the overall market for a particular month drawn from the period October 2014 to October 2017. By use of statistical techniques, the "characteristic line" that best explains the relationship between the asset return and the market return coordinates is fit to the data

FIGURE 8.8
Beta Derivation
Graphical derivation of beta for Bank of America and Pepsico

MyLab Finance
Animation

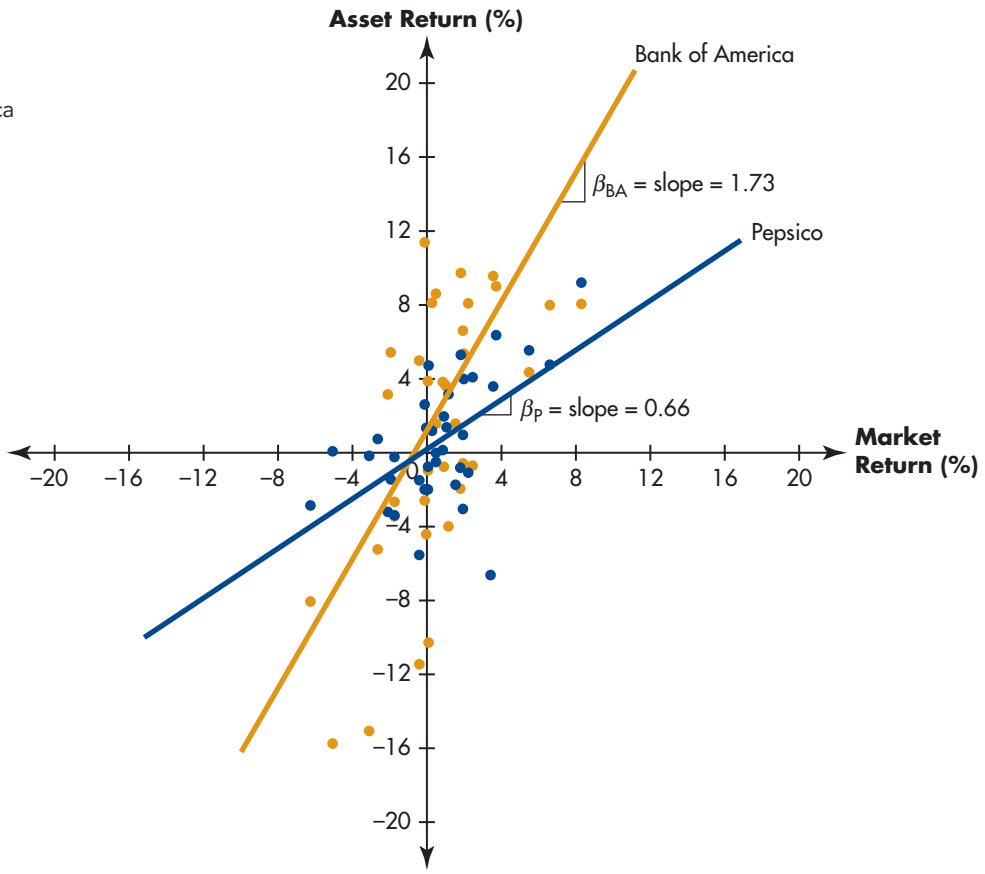


TABLE 8.8 Selected Beta Coefficients and Their Interpretations

Beta	Direction of response	Magnitude of response
2.0	Move in same direction as market	Twice as responsive as the market
1.0		Same response as the market
0.5		Only half as responsive as the market
0		Unaffected by market movements
−0.5	Move in opposite direction to market	Only half as responsive as the market
−1.0		Same response as the market
−2.0		Twice as responsive as the market

points.[6] The slope of this line is *beta*. The characteristic lines tell us that the betas for Bank of America and Pepsico are 1.73 and 0.66 respectively. Because Bank of America's stock returns are very sensitive to changing market returns, it is a riskier stock than Pepsi.

Interpreting Betas The beta coefficient for the entire market (and the average beta across all stocks) equals 1.0. All other betas are viewed in relation to this value. Asset betas may be positive or negative, but positive betas are the norm. The majority of beta coefficients fall between 0.5 and 2.0. The return of a stock that is half as responsive as the market ($\beta = 0.5$) should change by 0.5% for each 1% change in the return of the market portfolio. A stock that is twice as responsive as the market ($\beta = 2.0$) should experience a 2% change in its return for each 1% change in the return of the market portfolio. Table 8.8 provides various beta values and their interpretations. Beta coefficients for actively traded stocks can be obtained from published sources such as *Value Line Investment Survey*, via the Internet, or through brokerage firms. Betas for some selected stocks are given in Table 8.9.

MyLab Finance Animation

TABLE 8.9 Beta Coefficients for Selected Stocks (September 12, 2017)

Stock	Beta	Stock	Beta
Anheuser-Busch	0.96	Int'l Business Machines	0.95
Apple	1.38	JP Morgan Chase & Co.	1.24
Bank of America	1.73	Microsoft	1.48
Costco	0.89	Newmont Mining	0.20
Disney	1.27	PepsiCo, Inc.	0.66
eBay	1.68	Qualcomm	1.49
ExxonMobil Corp.	0.63	Sempra Energy	0.54
Gap (The), Inc.	0.38	Verizon	0.69
General Electric	1.01	Wal-Mart Stores	0.05
Intel	1.31	Xerox	0.94

Source: Data from Yahoo Finance, www.finance.yahoo.com

6. The empirical measurement of beta is approached by using *least-squares regression analysis*.

Portfolio Betas We can easily estimate the beta of a portfolio by using the betas of the individual assets it includes. Letting w_j represent the proportion of the portfolio's total dollar value represented by asset j and letting β_j equal the beta of asset j, we can use Equation 8.7 to find the portfolio beta, β_p:

$$\beta_p = (w_1 \times \beta_1) + (w_2 \times \beta_2) + \ldots + (w_n \times \beta_n) = \sum_{j=1}^{n} w_j \times \beta_j \quad (8.7)$$

Of course, $\sum_{j=1}^{n} w_j = 1$, which means that 100% of the portfolio's assets must be included in this computation.

Portfolio betas are interpreted in the same way as the betas of individual assets. They indicate the degree of responsiveness of the *portfolio's* return to changes in the market return. For example, when the market return increases by 10%, a portfolio with a beta of 0.75 will experience a 7.5% increase in its return (0.75 × 10%); a portfolio with a beta of 1.25 will experience a 12.5% increase in its return (1.25 × 10%). Clearly, a portfolio containing mostly low-beta assets will have a low beta, and one containing mostly high-beta assets will have a high beta.

PERSONAL FINANCE EXAMPLE 8.13 Mario Austino, an individual investor, wishes to assess the risk of two small portfolios he is considering, V and W. Both portfolios contain five assets, with the proportions and betas shown in Table 8.10. The betas for the two portfolios, β_V and β_W, can be calculated by substituting data from the table into Equation 8.7:

$$\beta_V = (0.10 \times 1.65) + (0.30 \times 1.00) + (0.20 \times 1.30) + (0.20 \times 1.10) + (0.20 \times 1.25)$$
$$= 0.165 + 0.300 + 0.260 + 0.220 + 0.250 = \underline{1.20}$$

$$\beta_W = (0.10 \times 0.80) + (0.10 \times 1.00) + (0.20 \times 0.65) + (0.10 \times 0.75) + (0.50 \times 1.05)$$
$$= 0.080 + 0.100 + 0.130 + 0.075 + 0.525 = \underline{0.91}$$

Portfolio V's beta is about 1.20, and portfolio W's is 0.91. These values make sense because portfolio V contains relatively high-beta assets, and portfolio W contains relatively low-beta assets. Mario's calculations show that portfolio V's returns are more responsive to changes in market returns and are therefore more

TABLE 8.10 Mario Austino's Portfolios V and W

	Portfolio V		Portfolio W	
Asset	Proportion	Beta	Proportion	Beta
1	0.10	1.65	0.10	0.80
2	0.30	1.00	0.10	1.00
3	0.20	1.30	0.20	0.65
4	0.20	1.10	0.10	0.75
5	0.20	1.25	0.50	1.05
Totals	1.00		1.00	

risky than portfolio W's. He must now decide which, if either, portfolio he feels comfortable adding to his existing investments.

The Equation

Using the beta coefficient to measure nondiversifiable risk, the *capital asset pricing model (CAPM)* is given by

$$r_j = R_F + [\beta_j \times (r_m - R_F)] \quad (8.8)$$

where

r_j = expected return or required return on asset j

R_F = risk-free rate of return, commonly measured by the return on a U.S. Treasury bill

β_j = beta coefficient or index of nondiversifiable risk for asset j

r_m = market return; expected return on the market portfolio of assets

risk-free rate of return (R_F)
The required return on a *risk-free asset,* typically a 3-month *U.S. Treasury bill.*

U.S. Treasury bills (T-bills)
Short-term IOUs issued by the U.S. Treasury; considered the *risk-free asset.*

Equation 8.8 shows that the CAPM has two parts: (1) the **risk-free rate of return**, R_F, which is the required return on a *risk-free asset,* typically a 3-month **U.S. Treasury bill (T-bill)**, a short-term IOU issued by the U.S. Treasury; and (2) the *risk premium.* These parts are, respectively, the two elements on either side of the plus sign in Equation 8.8. The $(r_m - R_F)$ portion of the risk premium is called the *market risk premium* because it represents the premium that the investor must receive for taking the average amount of risk associated with holding the market portfolio of assets.

Historical Risk Premiums Using the historical return data for stocks, bonds, and Treasury bills for the 1900–2016 period shown in Table 8.1, we can calculate the risk premiums for each investment category. The calculation (consistent with Equation 8.8) involves merely subtracting the historical U.S. Treasury bill's average return from the historical average return for a given investment:

Investment	Risk premium[a]
Stocks	11.4% − 3.8% = 7.6%
Treasury bonds	5.3% − 3.8% = 1.5%

[a]Historical average returns obtained from Table 8.1.

Reviewing the risk premiums calculated above, we can see that the risk premium is higher for stocks than for bonds. This outcome makes sense intuitively because stocks are riskier than bonds (equity is riskier than debt).

EXAMPLE 8.14

Benjamin Corporation, a growing computer software developer, wishes to determine the required return on an asset Z, which has a beta of 1.5. The risk-free rate of return is 2%; the expected return on the market portfolio of assets is 6%. Substituting $\beta_Z = 1.5$, $R_F = 2\%$, and $r_m = 6\%$ into the capital asset pricing model given in Equation 8.8 yields a required return of

$$r_Z = 2\% + [1.5 \times (6\% - 2\%)] = 2\% + 6\% = 8\%$$

The market risk premium of 4% (6% − 2%), when adjusted for the asset's index of risk (beta) of 1.5, results in a risk premium for asset Z of 6% (1.5 × 4%). That risk premium, when added to the 2% risk-free rate, results in an 8% required return.

Other things being equal, *the higher the beta, the higher the required return, and the lower the beta, the lower the required return.*

The Graph: The Security Market Line (SML)

security market line (SML) The depiction of the *capital asset pricing model (CAPM)* as a graph that reflects the required return in the marketplace for each level of nondiversifiable risk (beta).

If we depict the capital asset pricing model (Equation 8.8) graphically, it is called the **security market line** (**SML**). The SML is a straight line that shows the required return in the marketplace for each level of nondiversifiable risk (beta). In the graph, we plot risk as measured by beta, β, on the x-axis, and we plot required returns, r, on the y-axis. If you know the beta of any asset, you can use the SML to find that asset's expected or required return.

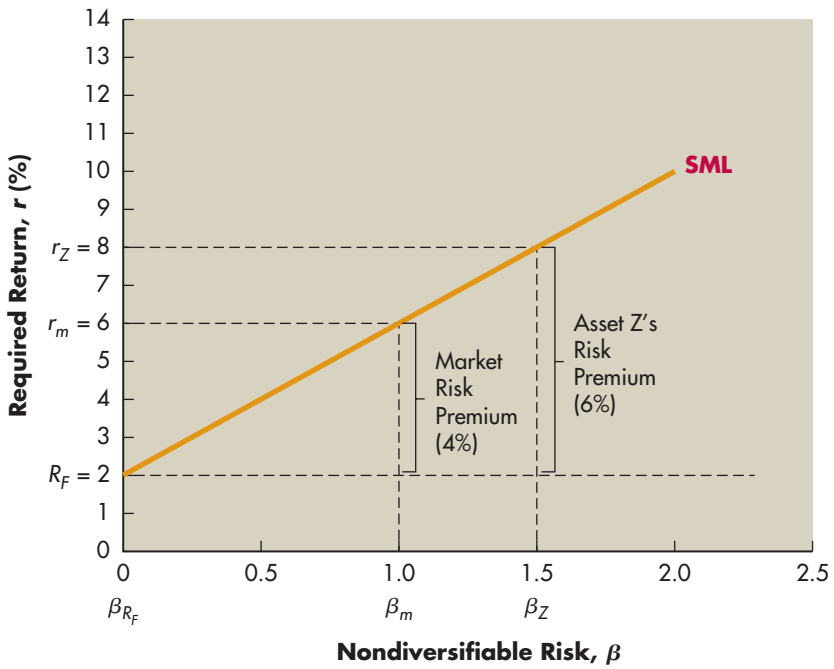
EXAMPLE 8.15

In the preceding example for Benjamin Corporation, the risk-free rate, R_F, was 2%, and the market return, r_m, was 6%. We can plot the SML by using the two sets of coordinates for the betas associated with R_F and r_m, β_{R_F} and β_m (i.e., $\beta_{R_F} = 0$,[7] $R_F = 2\%$; and $\beta_m = 1.0$, $r_m = 6\%$). Figure 8.9 presents the resulting

FIGURE 8.9

Security Market Line
Security market line (SML) with Benjamin Corporation's asset Z data shown

MyLab Finance
Animation



7. Because R_F is the rate of return on a risk-free asset, the beta associated with the risk-free asset, β_{r_f}, would equal 0. The zero beta on the risk-free asset reflects not only its absence of risk but also that the asset's return is unaffected by movements in the market return.

security market line. The line has an intercept of 2%, meaning that a security with no risk earns a 2% return. The slope of the line is 4%, equal to the risk premium on the market portfolio (6% − 2%). The figure highlights that there is a tradeoff between a security's nondiversifiable risk and its required return. Notice that asset Z, which has a beta of 1.5, has a required return of 8%. Thus, asset Z's risk premium is 6% (8% − 2%), which is higher than the market's risk premium. The general principle illustrated in the figure is that the risk premium for an asset with a beta greater than 1.0 will be greater than the risk premium of the market, whereas an asset with a beta below 1.0 will have a risk premium that is less than the market's risk premium.

Shifts in the Security Market Line

The security market line is not stable over time, and shifts in the security market line can result in a change in required return. The position and slope of the SML are affected by two major forces—inflationary expectations and risk aversion—which we analyze next.[8]

Changes in Inflationary Expectations Changes in inflationary expectations affect the risk-free rate of return, R_F. The equation for the risk-free rate of return is

$$R_F = r^* + i \tag{8.9}$$

This equation shows that, assuming a constant real rate of interest, r^*, changes in inflationary expectations, reflected in an inflation premium, i, will result in corresponding changes in the risk-free rate. Therefore, a change in inflationary expectations that results from events such as international trade embargoes or major alterations in Federal Reserve policy will produce a shift in the SML. Because the risk-free rate is a basic component of all rates of return, any change in R_F will be reflected in *all* required rates of return.

Changes in inflationary expectations result in parallel shifts in the SML in direct response to the magnitude and direction of the change. This effect can best be illustrated by an example.

EXAMPLE 8.16

In the preceding example, using the CAPM, the required return for asset Z, r_Z, was 8%. Assuming that the risk-free rate of 2% includes a 1% real rate of interest, r^*, and a 1% inflation premium, IP, then Equation 8.9 confirms that

$$R_F = 1\% + 1\% = 2\%$$

Now assume that recent economic events have resulted in an *increase of 3% in inflationary expectations, raising the inflation premium* to 4% (i_1). As a result, all returns likewise rise by 3%. In this case, the new returns (noted by subscript 1) are

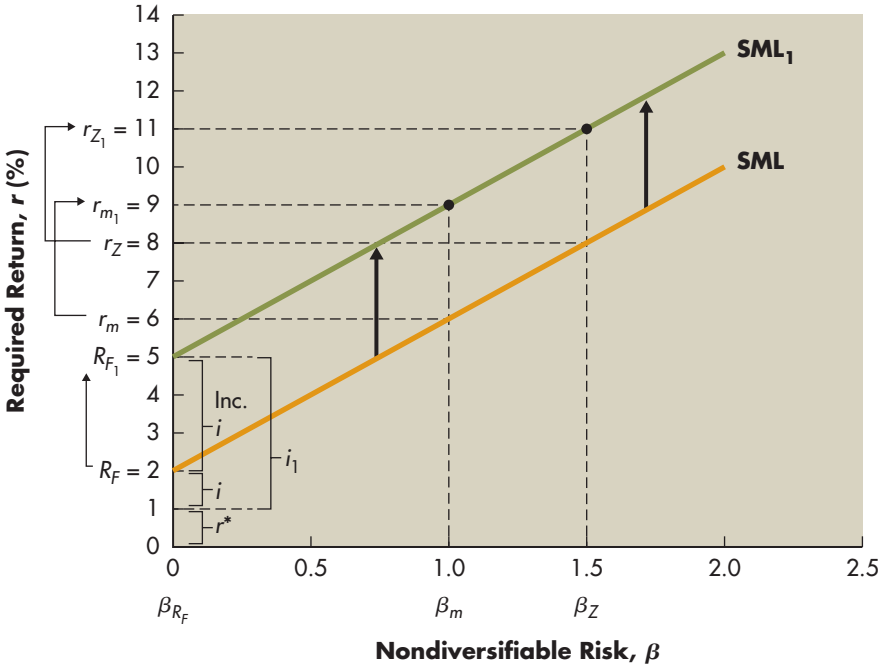
$$R_{F_1} = 5\% \text{ (rises from 2\% to 5\%)}$$
$$r_{m_1} = 9\% \text{ (rises from 6\% to 9\%)}$$

8. A firm's beta can alter over time as a result of changes in the firm's asset mix, in its financing mix, or in external factors not within management's control, such as natural disasters or shifts in consumer tastes.

FIGURE 8.10

Inflation Shifts SML
Impact of increased inflationary expectations on the SML

MyLab Finance
Animation



Substituting these values, along with asset Z's beta (β_Z) of 1.5, into the CAPM (Equation 8.8), we find that asset Z's new required return (r_{Z_1}) can be calculated:

$$r_{Z_1} = 5\% + [1.5 \times (9\% - 5\%)] = 5\% + 6\% = \underline{\underline{11\%}}$$

Comparing r_{Z_1} of 11% to r_Z of 8%, we see that the change of 3% in asset Z's required return exactly equals the change in the inflation premium. The same 3% increase results for all assets.

Figure 8.10 depicts the situation just described. It shows that the 3% increase in inflationary expectations results in a parallel shift upward of 3% in the SML. Clearly, the required returns on all assets rise by 3%. Note that the rise in the inflation premium from 5% to 8% (i to i_1) causes the risk-free rate to rise from 2% to 5% (R_F to R_{F_1}) and the market return to increase from 6% to 9% (r_m to r_{m_1}). The security market line therefore shifts upward by 3% (SML to SML$_1$), causing the required return on all risky assets, such as asset Z, to rise by 3%. The important lesson here is that *a given change in inflationary expectations will be fully reflected in a corresponding change in the returns of all assets, as reflected graphically in a parallel shift of the SML.*

Changes in Risk Aversion The slope of the security market line reflects the general risk preferences of investors in the marketplace. As discussed earlier, most investors are *risk averse;* that is, they require increased returns for increased risk. If investors become more risk averse, then the slope of the SML becomes steeper. In other words, when investors are more risk averse, they demand a higher return for

any risk level, which means that the slope of the SML is steeper. This also means that risk premiums increase with greater risk aversion.

Changes in risk aversion and the slope of the SML result from changing preferences of investors, which generally stem from economic, political, or social events. Examples of events that *increase* risk aversion include a stock market crash, assassination of a key political leader, and the outbreak of war. In general, widely shared expectations of hard times ahead tend to cause investors to become more risk averse, requiring higher returns as compensation for accepting a given level of risk. The following examples demonstrate the impact of increased risk aversion on the SML.

EXAMPLE 8.17

In the preceding examples, the SML in Figure 8.9 reflected a risk-free rate (R_F) of 2%, a market return (r_m) of 6%, a market risk premium ($r_m - R_F$) of 4%, and a required return on asset Z (r_Z) of 8% with a beta (β_Z) of 1.5. Assume that recent economic events have made investors more risk averse, causing a new higher market return (r_{m_1}) of 9%. Graphically, this change would cause the SML to pivot upward as shown in Figure 8.11, causing a new market risk premium ($r_{m_1} - R_F$) of 7%. As a result, the required return on all risky assets will increase. We can calculate the new required return for asset Z, with a beta of 1.5, by using the CAPM (Equation 8.8):

$$r_{Z_1} = 2\% + [1.5 \times (9\% - 2\%)] = 2\% + 10.5\% = \underline{\underline{12.5\%}}$$

This value appears on the new security market line (SML_1) in Figure 8.11. Note that although asset Z's risk, as measured by beta, did not change, its required

FIGURE 8.11

Risk Aversion Shifts SML
Impact of increased risk aversion on the SML

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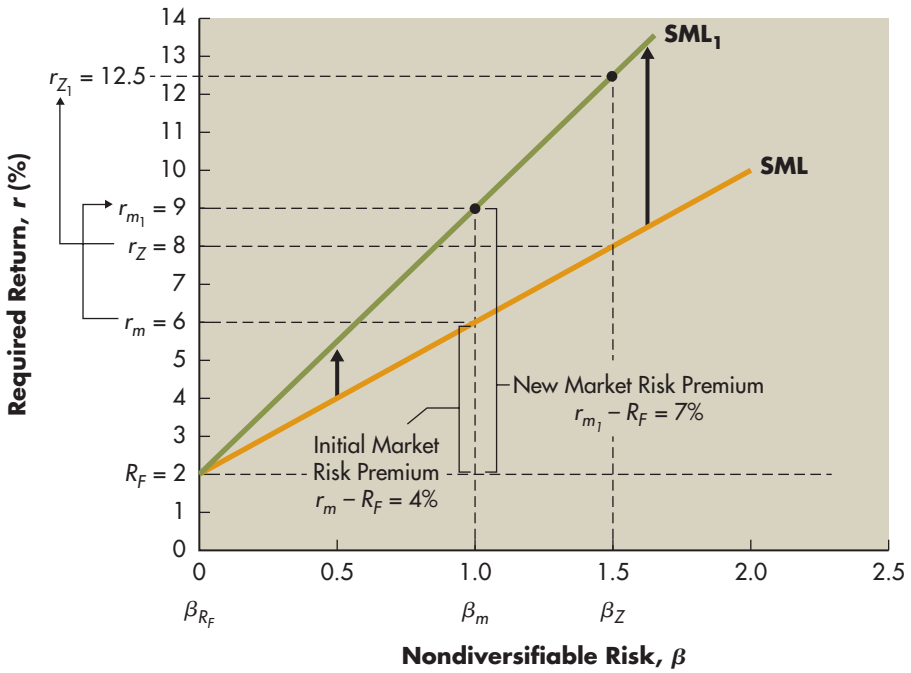
Animation



return has increased because of the increased risk aversion reflected in the market risk premium. To summarize, *greater risk aversion results in higher required returns for each level of risk. Similarly, a reduction in risk aversion causes the required return for each level of risk to decline.*

Some Comments on the CAPM

To estimate a stock's beta, analysts generally use historical data. The estimated beta may or may not actually indicate the *future* variability of returns. Therefore, the required returns specified by the model can be viewed only as rough approximations. Users of betas commonly make subjective adjustments to the historically determined betas to reflect their expectations of the future.

The CAPM was developed to explain the behavior of security prices and provide a mechanism whereby investors could assess the impact of a proposed security investment on their portfolio's overall risk and return. The CAPM assumes that markets are efficient and have the following characteristics: many small investors, all having the same information and expectations with respect to securities; no restrictions on investment, no taxes, and no transaction costs; and rational investors, who view securities similarly and are risk averse, preferring higher returns and lower risk.

Although the perfect world described in the preceding paragraph appears unrealistic, studies have supported the CAPM's main prediction that stocks with higher betas should have higher returns on average. The CAPM also sees widespread application in corporations that use the model to assess the required returns their shareholders demand (and therefore the returns the firms' managers need to achieve when they invest shareholders' money).

→ REVIEW QUESTIONS MyLab Finance Solutions

8–11 How are total risk, nondiversifiable risk, and diversifiable risk related? Why is nondiversifiable risk the only relevant risk?

8–12 What risk does beta measure? How can you find the beta of a portfolio?

8–13 Explain the meaning of each variable in the capital asset pricing model (CAPM) equation. What is the security market line (SML)?

8–14 What impact would the following changes have on the security market line and therefore on the required return for a given level of risk? (**a**) An increase in inflationary expectations. (**b**) Investors become less risk averse.

SUMMARY

FOCUS ON VALUE

A firm's risk and expected return directly affect its share price. Risk and return are the two key determinants of the firm's value. The financial manager is therefore responsible for carefully assessing the risk and return of all major decisions to ensure that the expected returns justify the level of risk being introduced.

The financial manager can expect to achieve **the firm's goal of increasing its share price** (and thereby benefiting its owners) by taking only those actions that earn returns at least commensurate with their risk. Clearly, financial managers must recognize, measure, and evaluate risk–return tradeoffs to ensure that their decisions contribute to the creation of value for owners.

REVIEW OF LEARNING GOALS

LG1 **Understand the meaning and fundamentals of risk, return, and risk preferences.** Risk is a measure of the uncertainty surrounding the return that an investment will produce. The total rate of return is the sum of cash distributions, such as interest or dividends, plus the change in the asset's value over a given period, divided by the investment's beginning-of-period value. Investment returns vary both over time and between different types of investments. Investors may be risk averse, risk neutral, or risk seeking. Most financial decision makers are risk averse. A risk-averse decision maker requires a higher expected return on a more risky investment alternative.

LG2 **Describe procedures for assessing and measuring the risk of a single asset.** The risk of a single asset is measured in much the same way as that of a portfolio of assets. Scenario analysis and probability distributions can be used to assess risk. The range, the standard deviation, and the coefficient of variation can measure risk quantitatively.

LG3 **Discuss the measurement of return and standard deviation for a portfolio and the concept of correlation.** The return of a portfolio is calculated as the weighted average of returns on the individual assets from which it is formed. The portfolio standard deviation is found by using the formula for the standard deviation of a single asset.

Correlation—the statistical relationship between any two series of numbers—can be positively correlated, negatively correlated, or uncorrelated. At the extremes, the series can be perfectly positively correlated or perfectly negatively correlated.

LG4 **Understand the risk and return characteristics of a portfolio in terms of correlation and diversification and the impact of international assets on a portfolio.** Diversification involves combining assets with low correlation to reduce the risk of the portfolio. The range of risk in a two-asset portfolio depends on the correlation between the two assets. If they are perfectly positively correlated, the portfolio's risk will be between the individual assets' risks. If they are perfectly negatively correlated, the portfolio's risk will be between the risk of the riskier asset and zero.

International diversification can further reduce a portfolio's risk. Foreign assets have the risk of currency fluctuation and political risks.

LG5 **Review the two types of risk and the derivation and role of beta in measuring the relevant risk of both a security and a portfolio.** The total risk of a security consists of nondiversifiable and diversifiable risk. Diversifiable risk can be eliminated through diversification. Nondiversifiable risk is the only relevant risk. Nondiversifiable risk is measured by the beta coefficient, a relative

measure of the relationship between an asset's return and the market return. Beta is derived by finding the slope of the "characteristic line" that best explains the historical relationship between the asset's return and the market return. The beta of a portfolio is a weighted average of the betas of the individual assets that it includes.

LG6 **Explain the capital asset pricing model (CAPM), its relationship to the security market line (SML), and the major forces causing shifts in the SML.** In the CAPM, beta relates an asset's risk relative to the market to the asset's required return. The graphical depiction of the CAPM is the SML, which shifts over time in response to changing inflationary expectations and/or changes in investor risk aversion. Changes in inflationary expectations result in parallel shifts in the SML. Increasing risk aversion results in the slope of the SML becoming steeper. Decreasing risk aversion reduces the slope of the SML. Although it has some shortcomings, the CAPM provides a useful conceptual framework for evaluating and linking risk and return.

SELF-TEST PROBLEMS (Solutions in Appendix)

LG3 LG4 **ST8–1 Portfolio analysis** You have been asked for your advice in selecting a portfolio of assets and have been given the following data:

	Expected return		
Year	Asset A	Asset B	Asset C
2019	12%	16%	12%
2020	14	14	14
2021	16	12	16

You have been told that you can create two portfolios—one consisting of assets A and B and the other consisting of assets A and C—by investing equal proportions (50%) in each of the two component assets.

a. What is the expected return for each asset over the 3-year period?
b. What is the standard deviation for each asset's return?
c. What is the expected return for each of the two portfolios?
d. How would you characterize the correlations of returns of the two assets making up each of the two portfolios identified in part **c**?
e. What is the standard deviation for each portfolio?
f. Which portfolio do you recommend? Why?

LG5 LG6 **ST8–2 Beta and CAPM** Currently under consideration is an investment with a beta, β, of 1.50. At this time, the risk-free rate of return, R_F, is 3%, and the return on the

market portfolio of assets, r_m, is 10%. You believe this investment will earn an annual rate of return of 11%.

a. If the return on the market portfolio were to increase by 10%, what would you expect to happen to the investment's return? What if the market return were to decline by 10%?

b. Use the capital asset pricing model (CAPM) to find the required return on this investment.

c. On the basis of your calculation in part **b**, would you recommend this investment? Why or why not?

d. Assume that as a result of investors becoming less risk averse, the market return drops by 3% to 8%. What effect would this change have on your responses in parts **b** and **c**?

WARM-UP EXERCISES

Select problems are available in MyLab Finance.

LG 1

E8–1 An analyst predicted last year that the stock of Mallard Inc. would offer a total return of at least 8% in the coming year. At the beginning of the year, the firm had a total stock market capitalization of $20 million. At the end of the year, its market cap was $23 million even though it experienced a loss, or negative net income, of $3 million. Did the analyst's prediction prove correct? Explain using the values for total annual return.

LG 2

E8–2 Four analysts cover the stock of Deng Chemical. One forecasts a 7% return for the coming year. The second expects the return to be 5%. The third predicts a −4% return. The fourth expects a 10% return in the coming year. You are relatively confident that the return will be positive but not very large, so you arbitrarily assign probabilities of 35%, 35%, 5%, and 25%, respectively, to the analysts' forecasts. Given these probabilities, what is Deng Chemical's expected return for the coming year?

LG 2

E8–3 The expected annual returns are 15% for investment 1 and 12% for investment 2. The standard deviation of the first investment's return is 10%; the second investment's return has a standard deviation of 5%. Which investment is less risky based solely on its standard deviation? Which investment is less risky based on its coefficient of variation?

LG 3

E8–4 Suppose your portfolio has three asset classes. The U.S. government T-bills account for 25% of the portfolio, large-company stocks constitute 50%, and small-company stocks make up the remaining 25%. If the expected returns are 4.8% for the T-bills, 15.2% for the large-company stocks, and 23.4% for the small-company stocks, what is the expected return of the portfolio?

LG 5

E8–5 You wish to calculate the risk level of your portfolio based on its beta. The five stocks in the portfolio with their respective weights and betas are shown in the accompanying table. Calculate the beta of your portfolio.

Stock	Portfolio weight	Beta
Alpha	20%	1.15
Centauri	10	0.85
Zen	15	1.60
Wren	20	1.35
Yukos	35	1.85

LG 6

E8–6 **a.** Calculate the required rate of return for an asset that has a beta of 1.8, given a risk-free rate of 5% and a market return of 10%.

b. If investors have become more risk averse due to recent geopolitical events and the market return rises to 13%, what is the required rate of return for the same asset?

c. Use your findings in part **a** to graph the initial security market line (SML), and then use your findings in part **b** to graph (on the same set of axes) the shift in the SML.

PROBLEMS

Select problems are available in MyLab Finance. The MyLab icon indicates problems in Excel format available in MyLab Finance.

LG 1

P8–1 **Rate of return** Paul Chan, a financial analyst for Smart Securities Ltd., wishes to estimate the rate of return for two similar-risk investments, A and B. Paul's research indicates that the immediate past returns will serve as reasonable estimates of future returns. A year ago, investment A and investment B had market values of $63,000 and $35,000, respectively. During the year, investment A generated cash flow of $6,100, and investment B generated cash flow of $2,800. The current market values of investments A and B are $71,000 and $32,000, respectively.

a. Calculate the expected rate of return on investments A and B using the most recent year's data.

b. Assuming the two investments are equally risky, which one should Paul recommend? Why?

LG 1

P8–2 **Return calculations** For each of the investments shown in the following table, calculate the rate of return earned over the period.

Investment	Cash flow during period	Beginning-of-period value	End-of-period value
A	−$ 2,800	$ 23,400	$ 20,100
B	16,000	225,000	324,000
C	700	6,500	8,000
D	3,580	36,600	46,500
E	−500	62,700	52,800

LG 1

P8–3 **Risk preferences** Stephen So, the financial manager for Cathay Pacific Incorporation, wishes to evaluate three prospective investments: A, B, and C. Stephen will evaluate each of these investments to decide whether they are superior to investments that his company already has in place, which have an expected return of 15% and a standard deviation of 8%. The following table shows the expected returns and standard deviations of the investments.

Investment	Expected return	Standard deviation
A	18%	9%
B	15	10
C	12	11

a. If Stephen were risk neutral, which investments would he select? Explain why.
b. If he were risk averse, which investments would he select? Why?
c. If he were risk seeking, which investments would he select? Why?
d. Given the traditional risk preference behavior exhibited by financial managers, which investment would be preferred? Why?

LG 2

P8–4 **Risk analysis** Space Software is considering an investment in a new software that detects malware threats in the financial industry. Two possible types of expansion are under review. After investigating the possible outcomes, the company made the estimates shown in the following table. The pessimistic and optimistic outcomes occur with a probability of 20% and 25%, respectively, and the most likely outcome occurs with a probability of 55%.

	Project A	Project B
Initial investment	£35,000	£35,000
Annual rate of return		
Pessimistic	12%	8%
Most likely	18%	20%
Optimistic	25%	40%

a. Determine the range of rates of return for each of the two projects.
b. Which project seems less risky? Why?
c. If you were making the investment decision, which one would you chose? Why?
d. Assume that project B's most likely outcome is 21% per year and that all other facts remain the same. Does your answer to part **c** now change? Why?

LG 2

P8–5 **Risk and probability** Micro-Pub Inc. is considering the purchase of one of two microfilm cameras, R and S. Both should provide benefits over a 10-year period, and each requires an initial investment of $4,000. Management has constructed the accompanying table showing estimates of rates of return and probabilities for pessimistic, most likely, and optimistic results.

	Camera R		Camera S	
	Amount	Probability	Amount	Probability
Initial investment	$4,000	1.00	$4,000	1.00
Annual rate of return				
Pessimistic	20%	0.25	15%	0.20
Most likely	25%	0.50	25%	0.55
Optimistic	30%	0.25	35%	0.25

a. Determine the range for the rate of return for each of the two cameras.
b. Determine the average return for each camera.
c. The purchase of which camera is riskier? Why?

LG 2

P8–6 Bar charts and risk Swan's Sportswear is thinking about bringing out a line of designer jeans. Currently, it is negotiating with two well-known designers. Because of the highly competitive nature of the industry, the two lines of jeans have been given code names. After market research, the firm has established the expectations shown in the following table about the annual rates of return.

		Annual rate of return	
Market acceptance	Probability	Line J	Line K
Very poor	0.05	0.0075	0.010
Poor	0.15	0.0125	0.025
Average	0.60	0.0850	0.080
Good	0.15	0.1475	0.135
Excellent	0.05	0.1625	0.150

Use the table to:
a. Construct a bar chart for each line's annual rate of return.
b. Calculate the average return for each line.
c. Evaluate the relative riskiness for each jeans line's rate of return using the bar charts.

LG 2

P8–7 Coefficient of variation Valley Forgings has identified four alternatives to meet its requirement for an additional production facility. The following table summarizes data gathered relative to each alternative.

Alternative	Expected return	Standard deviation of return
A	18%	6.5%
B	22	11.2
C	15	5.0
D	12	3.5

a. Calculate the coefficient of variation for each alternative.
b. If the firm wishes to minimize risk, which alternative would you recommend? Why?

LG 2

P8–8 Standard deviation versus coefficient of variation as measures of risk Greengage Inc., a successful nursery, is considering several expansion projects. All the alternatives promise to produce an acceptable return. Data on four possible projects follow.

Project	Expected return	Range	Standard deviation
A	12.0%	4.0%	2.9%
B	12.5	5.0	3.2
C	13.0	6.0	3.5
D	12.8	4.5	3.0

a. Which project is least risky, judging on the basis of range?
b. Which project has the lowest standard deviation? Explain why standard deviation may not be an entirely appropriate measure of risk for purposes of this comparison.
c. Calculate the coefficient of variation for each project. Which project do you think Greengage's owners should choose? Explain why.

Personal Finance Problem

LG 1 LG 2

P8–9 Rate of return, standard deviation, and coefficient of variation Mike is searching for a stock to include in his current stock portfolio. He is interested in Hi-Tech Inc.; he has been impressed with the company's computer products and believes that Hi-Tech is an innovative market player. However, Mike realizes that any time you consider a technology stock, risk is a major concern. The rule he follows is to include only securities with a coefficient of variation of returns below 0.90.

Mike has obtained the following price information for the period 2015 through 2018. Hi-Tech stock, being growth oriented, did not pay any dividends during these 4 years.

	Stock price	
Year	Beginning	End
2015	$14.36	$21.55
2016	21.55	64.78
2017	64.78	72.38
2018	72.38	91.80

a. Calculate the rate of return for each year, 2015 through 2018, for Hi-Tech stock.
b. Calculate the average return over this time period.
c. Calculate the standard deviation of returns over the past 4 years.
d. Based on parts **b** and **c**, determine the coefficient of variation of returns for the security.
e. Given the calculation in part **d**, what should be Mike's decision regarding the inclusion of Hi-Tech stock in his portfolio?

LG 2

P8–10 **Assessing return and risk** Dacia Gears Ltd. has two alternative projects to choose from for their new distribution facility in Europe. The annual rate of return and the related probabilities given in the following table summarize the firm's analysis to this point.

Project ACX		Project ACY	
Rate of return	Probability	Rate of return	Probability
−10%	0.01	10%	0.05
10	0.03	15	0.10
20	0.05	20	0.10
30	0.05	25	0.15
40	0.35	30	0.24
50	0.25	40	0.25
60	0.15	45	0.05
70	0.05	50	0.03
80	0.03	55	0.03
90	0.02		
100	0.01		

a. For each project, compute:
(1) The range of possible rates of return.
(2) The average return.
(3) The standard deviation of the returns.
(4) The coefficient of variation of the returns.
b. Construct a bar chart of each distribution of rates of return.
c. Which project would you consider more risky? Why?

LG 2 MyLab

P8–11 **Integrative: Expected return, standard deviation, and coefficient of variation** Three assets—F, G, and H—are currently under consideration by Perth Industries. The probability distributions of expected returns for these assets are shown in the following table.

	Asset F		Asset G		Asset H	
j	Pr_j	Return, r_j	Pr_j	Return, r_j	Pr_j	Return, r_j
1	0.10	40%	0.40	35%	0.10	40%
2	0.20	10	0.30	10	0.20	20
3	0.40	0	0.30	−20	0.40	10
4	0.20	−5			0.20	0
5	0.10	−10			0.10	−20

a. Calculate the average return, $\bar{r}$, for each of the three assets. Which provides the largest average return?
b. Calculate the standard deviation, σ_r, for each asset's returns. Which appears to have the greatest risk?
c. Calculate the coefficient of variation, CV, for each asset's returns. Which appears to have the greatest relative risk?

LG 2

P8–12 **Normal probability distribution** Answer the following questions, assuming that the rates of return associated with a given asset investment are normally distributed; that the expected return, $\bar{r}$, is 16%; and that the coefficient of variation, CV, is 0.65.

a. Find the standard deviation of returns, σ.

b. Calculate the range of expected return outcomes associated with the following probabilities of occurrences: (1) 68%, (2) 95%, and (3) 99%.

c. Draw the probability distribution associated with your findings in parts **a** and **b**.

Personal Finance Problem

LG 3 MyLab

P8–13 **Portfolio return and standard deviation** Jamie Wong is thinking of building an investment portfolio containing two stocks, L and M. Stock L will represent 40% of the dollar value of the portfolio, and stock M will account for the other 60%. The historical returns over the last 6 years, 2013–2018, for each of these stocks are shown in the following table.

	Expected return	
Year	Stock L	Stock M
2013	14%	20%
2014	14	18
2015	16	16
2016	17	14
2017	17	12
2018	19	10

a. Calculate the actual portfolio return, r_p, for each of the 6 years.

b. Calculate the average return for each stock and for the portfolio over the 6-year period.

c. Calculate the standard deviation of returns for each asset and for the portfolio. How does the portfolio standard deviation compare to the standard deviations of the individual assets?

d. How would you characterize the correlation of returns of the two stocks L and M?

e. Discuss any benefits of diversification achieved by Jamie through creation of the portfolio.

LG 3

P8–14 **Portfolio analysis** You have been given the historical return data shown in the first table on three assets—F, G, and H—over the period 2016–2019.

	Historical return		
Year	Asset F	Asset G	Asset H
2016	16%	17%	14%
2017	17	16	15
2018	18	15	16
2019	19	14	17

Using these assets, you have isolated the three investment alternatives shown in the following table.

Alternative	Investment
1	100% of asset F
2	50% of asset F and 50% of asset G
3	50% of asset F and 50% of asset H

a. Calculate the average return over the 4-year period for each of the three alternatives.
b. Calculate the standard deviation of returns over the 4-year period for each of the three alternatives.
c. Use your findings in parts **a** and **b** to calculate the coefficient of variation for each of the three alternatives.
d. On the basis of your findings, which of the three investment alternatives do you think performed better over this period? Why?

LG 4

P8–15 Correlation, risk, and return Nikki Williams wishes to evaluate the risk and return behaviors associated with various combinations of assets X and Y under three assumed degrees of correlation: perfectly positive, uncorrelated, and perfectly negative. The expected returns and standard deviations calculated for each of the assets are shown in the following table.

Asset	Expected return, $\bar{r}$	Standard deviation, σ
X	10%	5%
Y	15	8

a. If the returns of assets X and Y are perfectly positively correlated (correlation coefficient $= +1$), describe the range of (1) expected return and (2) risk associated with all possible portfolio combinations.
b. If the returns of assets X and Y are uncorrelated (correlation coefficient $= 0$), describe the approximate range of (1) expected return and (2) risk associated with all possible portfolio combinations.
c. If the returns of assets X and Y are perfectly negatively correlated (correlation coefficient $= -1$), describe the range of (1) expected return and (2) risk associated with all possible portfolio combinations.

Personal Finance Problem

LG 1 LG 4

P8–16 International investment returns Joe Martinez, a U.S. citizen living in Brownsville, Texas, invested in the common stock of Telmex, a Mexican corporation. He purchased 1,000 shares at 20.50 pesos per share. Twelve months later, he sold them at 24.75 pesos per share. He received no dividends during that time.
a. What was Joe's investment return (in percentage terms) for the year, on the basis of the peso value of the shares?

b. The exchange rate for pesos was 9.21 pesos per US$1.00 at the time of the purchase. At the time of the sale, the exchange rate was 9.85 pesos per US$1.00. Translate the purchase and sale prices into US$.
c. Calculate Joe's investment return on the basis of the US$ value of the shares.
d. Explain why the two returns are different. Which one is more important to Joe? Why?

LG5

P8–17 **Total, nondiversifiable, and diversifiable risk** David Talbot randomly selected securities from all those listed on the New York Stock Exchange for his portfolio. He began with a single security and added securities one by one until a total of 20 securities were held in the portfolio. After each security was added, David calculated the portfolio standard deviation, σ. The calculated values are shown in the following table.

Number of securities	Std. dev., σ	Number of securities	Std. dev., σ
1	14.50%	11	7.00%
2	13.30	12	6.80
3	12.20	13	6.70
4	11.20	14	6.65
5	10.30	15	6.60
6	9.50	16	6.56
7	8.80	17	6.52
8	8.20	18	6.50
9	7.70	19	6.48
10	7.30	20	6.47

a. Plot the data from the table above on a graph that has the number of securities on the *x*-axis and the portfolio standard deviation on the *y*-axis.
b. Divide the total portfolio risk in the graph into its nondiversifiable and diversifiable risk components, and label each of these on the graph.
c. Describe which of the two risk components is the relevant risk, and explain why it is relevant. How much of this risk exists in David Talbot's portfolio?

LG5 MyLab

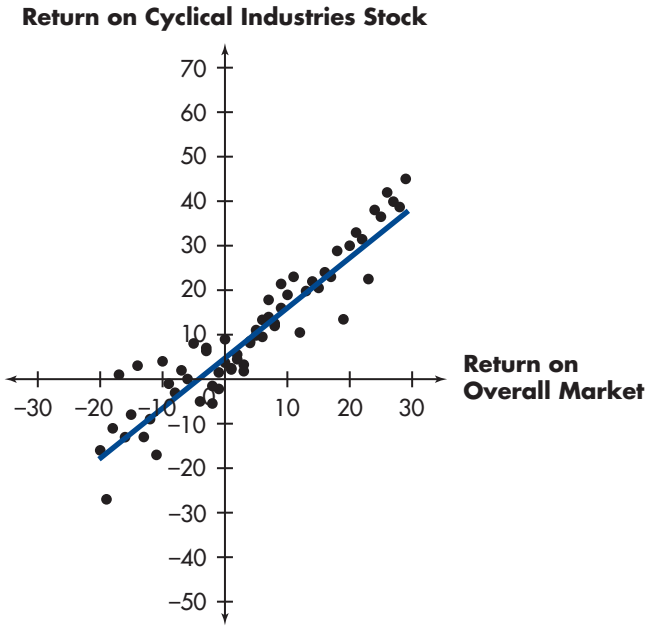
P8–18 **Graphical derivation of beta** A firm wishes to estimate graphically the betas for two assets, A and B. It has gathered the return data shown in the following table for the market portfolio and for both assets over the past 10 years, 2009–2018.

	Actual return		
Year	Market portfolio	Asset A	Asset B
2009	6%	11%	16%
2010	2	8	11
2011	−13	−4	−10
2012	−4	3	3
2013	−8	0	−3
2014	16	19	30
2015	10	14	22
2016	15	18	29
2017	8	12	19
2018	13	17	26

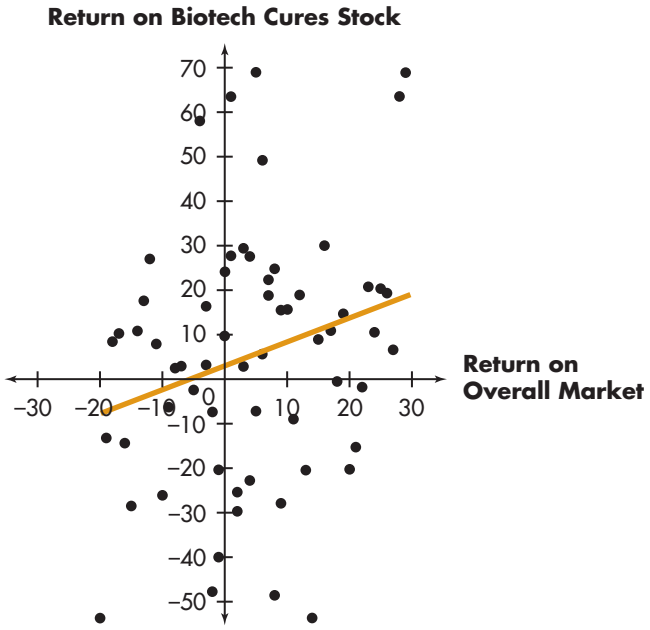
a. On a set of "market return (x-axis)–asset return (y-axis)" axes, use the data given to draw the characteristic line for asset A and for asset B.
b. Use the characteristic lines from part **a** to estimate the betas for assets A and B.
c. Use the betas found in part **b** to comment on the relative risks of assets A and B.

LG 5

P8–19 Graphical derivation and interpreting beta You are analyzing the performance of two stocks. The first, shown in Panel A, is Cyclical Industries Incorporated. Cyclical Industries makes machine tools and other heavy equipment, the demand for which rises and falls closely with the overall state of the economy. The second stock, shown in Panel B, is Biotech Cures Corporation. Biotech Cures uses biotechnology to develop new pharmaceutical compounds to treat incurable diseases. Biotech's fortunes are driven largely by the success or failure of its scientists to discover new and effective drugs. Each data point on the graph shows the monthly return on the stock of interest and the monthly return on the overall stock market. The lines drawn through the data points represent the characteristic lines for each security.



Panel A



Panel B

a. Which stock do you think has a higher standard deviation? Why?
b. Which stock do you think has a higher beta? Why?
c. Which stock do you think is riskier? What does the answer to this question depend on?

LG 5

P8–20 Interpreting beta Schembri Investment Company Ltd. wishes to assess the impact of changes in the market return on an asset that has a beta of 0.80.
a. If the market return increased by 42%, what impact would this change be expected to have on the asset's return?
b. If the market return decreased by 32%, what impact would this change be expected to have on the asset's return?

c. If the market return did not change, what impact, if any, would be expected on the asset's return?
d. Would this asset be considered more or less risky than the market? Explain.

LG 5

P8–21 **Betas** Answer the following questions for assets W to Z shown in the table.

Asset	Beta
W	0.90
X	−0.60
Y	1.80
Z	2.30

a. What impact would a 10% decrease in the market return be expected to have on each asset's return?
b. What impact would a 10% increase in the market return be expected to have on each asset's return?
c. If you believed that the market return would decrease in the near future, which asset would you prefer? Why?
d. If you believed that the market return would increase in the near future, which asset would you prefer? Why?

Personal Finance Problem

LG 5

P8–22 **Betas and risk rankings** Thomas Hill is considering three stocks—A, B, and C—for possible inclusions in his existing portfolio. Stock A has a beta of 0.75, stock B has a beta of 1.60, and stock C has a beta of −0.50.

a. Rank these stocks from the most risky to the least risky.
b. If the return on the market portfolio increased by 15%, what change would you expect in the return for each stock?
c. If the return on the market portfolio decreased by 10%, what change would you expect in the return for each stock?
d. If you believed the stock market was getting ready to experience a significant decline, which stock would you probably add to your portfolio? Why?
e. If you anticipated a major stock market rally, which stock would you add to your portfolio? Why?

Personal Finance Problem

LG 5

P8–23 **Portfolio betas** Joe Moss is attempting to evaluate two possible portfolios, which consist of the same five assets held in different proportions. He is particularly interested in using beta to compare the risks of the portfolios, so he has gathered the data shown in the following table.

		Portfolio weights	
Asset	Asset beta	Portfolio X	Portfolio Y
1	2.5	20%	10%
2	0.8	10	30
3	1.2	30	10
4	0.9	10	30
5	1.6	30	20
Totals		100%	100%

a. Calculate the betas for portfolios X and Y.
b. Compare the risks of these portfolios to the market as well as to each other. Which portfolio is riskier?

LG6

P8–24 **Capital asset pricing model (CAPM)** For each case in the following table, use the capital asset pricing model to find the required return.

States	Risk-free rate, R_F	Market return, r_m	Beta, β
A	6%	22%	2.40
B	3	8	−0.50
C	10	15	0.90
D	12	18	1.00
E	5	10	0.70

Personal Finance Problem

LG5 LG6

P8–25 **Beta coefficients and the capital asset pricing model** Suppose you are wondering how much risk you must undertake to generate an acceptable return on your investment portfolio. The risk-free return currently is 3%. The return on the overall stock market is 12%. Use the CAPM to calculate how high the beta coefficient of your investment portfolio would have to be to achieve each of the following expected portfolio returns.
a. 13%
b. 25%
c. 16%
d. 18%
e. Assume you are risk averse. What is the highest return you can expect if you are unwilling to take more than an average risk?

LG6

P8–26 **Manipulating CAPM** Use the basic equation for the capital asset pricing model (CAPM) to work each of the following situations.
a. Find the required return for an asset with a beta of 2.20 when the risk-free rate and market return are 5% and 32%, respectively.
b. Find the risk-free rate for a firm with a required return of 23.75% and a beta of 1.25 when the market return is 20%.
c. Find the market return for an asset with a required return of 18% and a beta of 1.20 when the risk-free rate is 8%.
d. Find the beta for an asset with a required return of 15% when the risk-free rate and market return are 3% and 15%, respectively.

Personal Finance Problem

LG1 LG3 LG5 LG6

P8–27 **Portfolio return and beta** Jamie Peters invested $100,000 to set up the following portfolio 1 year ago.

Asset	Cost	Beta at purchase	Yearly income	Value today
A	$20,000	0.80	$1,600	$20,000
B	35,000	0.95	1,400	36,000
C	30,000	1.50	—	34,500
D	15,000	1.25	375	16,500

a. Calculate the portfolio beta on the basis of the original cost figures.
b. Calculate the percentage return of each asset in the portfolio for the year.
c. Calculate the percentage return of the portfolio on the basis of original cost, using income and gains during the year.
d. At the time Jamie made his investments, investors were estimating that the market return for the coming year would be 10%. The estimate of the risk-free rate of return averaged 4% for the coming year. Calculate an expected rate of return for each stock on the basis of its beta and the expectations of market and risk-free returns.
e. On the basis of the actual results, explain how each stock in the portfolio performed relative to those CAPM-generated expectations of performance. What factors could explain these differences?

LG 6

P8–28 **Security market line (SML)** Assume that the risk-free rate, R_F, is currently 9% and that the market return, r_m, is currently 13%.
a. Draw the security market line (SML) on a set of "nondiversifiable risk (x-axis)–required return (y-axis)" axes.
b. Calculate and label the market risk premium on the axes in part **a.**
c. Given the previous data, calculate the required return on asset A having a beta of 0.80 and asset B having a beta of 1.30.
d. Draw in the betas and required returns from part **c** for assets A and B on the axes in part **a.** Label the risk premium associated with each asset, and discuss them.

LG 6

P8–29 **Shifts in the security market line** Assume that the risk-free rate, R_F, is currently 8%; the market return, r_m, is 12%; and asset A has a beta, β_A, of 1.10.
a. Draw the security market line (SML) on a set of "nondiversifiable risk (x-axis)–required return (y-axis)" axes.
b. Use the CAPM to calculate the required return, r_A, on asset A, and depict asset A's beta and required return on the SML drawn in part **a.**
c. Assume that as a result of recent economic events, inflationary expectations have declined by 2%, lowering R_F and r_m to 6% and 10%, respectively. Draw the new SML on the axes in part **a,** and calculate and show the new required return for asset A.
d. Assume that as a result of recent events, investors have become more risk averse, causing the market return to rise by 1%, to 13%. Ignoring the shift in part **c,**

draw the new SML on the same set of axes that you used before, and calculate and show the new required return for asset A.

e. From the previous changes, what conclusions can be drawn about the impact of (1) decreased inflationary expectations and (2) increased risk aversion on the required returns of risky assets?

LG 6

P8–30 Integrative: Risk, return, and CAPM Wolff Enterprises must consider several investment projects, A through E, using the capital asset pricing model (CAPM) and its graphical representation, the security market line (SML). Relevant information is presented in the following table.

Item	Rate of return	Beta, β
Risk-free asset	9%	0.00
Market portfolio	14	1.00
Project A	—	1.50
Project B	—	0.75
Project C	—	2.00
Project D	—	0.00
Project E	—	−0.50

a. Calculate (1) the required rate of return and (2) the risk premium for each project, given its level of nondiversifiable risk.

b. Use your findings in part **a** to draw the security market line (required return relative to nondiversifiable risk).

c. Discuss the relative nondiversifiable risk of projects A through E.

d. Assume that recent economic events have caused investors to become less risk averse, causing the market return to decline by 2%, to 12%. Calculate the new required returns for assets A through E, and draw the new security market line on the same set of axes that you used in part **b.**

e. Compare your findings in parts **a** and **b** with those in part **d.** What conclusion can you draw about the impact of a decline in investor risk aversion on the required returns of risky assets?

LG 1

P8–31 ETHICS PROBLEM Risk is a major concern of almost all investors. When shareholders invest their money in a firm, they expect managers to take risks with those funds. What ethical limits should managers observe when taking risks with other people's money?

SPREADSHEET EXERCISE

Jane is considering investing in three different stocks or creating three distinct two-stock portfolios. Jane views herself as a rather conservative investor. She is able to obtain historical returns for the three securities for the years 2012 through 2018. The data are given in the following table.

Year	Stock A	Stock B	Stock C
2012	10%	10%	12%
2013	13	11	14
2014	15	8	10
2015	14	12	11
2016	16	10	9
2017	14	15	9
2018	12	15	10

In any of the possible two-stock portfolios, the weight of each stock in the portfolio will be 50%. The three possible portfolio combinations are AB, AC, and BC.

TO DO

Create a spreadsheet similar to Tables 8.6 and 8.7 to answer the following:

a. Calculate the average return for each individual stock.
b. Calculate the standard deviation for each individual stock.
c. Calculate the average returns for portfolios AB, AC, and BC.
d. Calculate the standard deviations for portfolios AB, AC, and BC.
e. Would you recommend that Jane invest in the single stock A or the portfolio consisting of stocks A and B? Explain your answer from a risk–return viewpoint.
f. Would you recommend that Jane invest in the single stock B or the portfolio consisting of stocks B and C? Explain your answer from a risk–return viewpoint.

MyLab Finance Visit www.pearson.com/mylab/finance for **Chapter Case: *Analyzing Risk and Return on Chargers Products' Investments,*** Group Exercises, and numerous online resources.

CHAPTER 9

The Cost of Capital

LEARNING GOALS

- LG1 Understand the basic concept of the cost of capital.
- LG2 List the primary sources of capital available to firms.
- LG3 Determine the cost of long-term debt, and explain why the after-tax cost of debt is the relevant cost of debt.
- LG4 Determine the cost of preferred stock.
- LG5 Calculate the required return on a company's common stock, and explain how it relates to the cost of retained earnings and the cost of new issues of common stock.
- LG6 Calculate the weighted average cost of capital (WACC), and discuss alternative weighting schemes.

MyLab Finance **Chapter Introduction Video**

WHY THIS CHAPTER MATTERS TO YOU

In your *professional* life

ACCOUNTING You need to understand the various sources of capital and how their costs are calculated to provide the data necessary to determine the firm's overall cost of capital.

INFORMATION SYSTEMS You need to understand the various sources of capital and how their costs are calculated to develop systems that will estimate the costs of those sources of capital as well as the overall cost of capital.

MANAGEMENT You need to understand the cost of capital to select long-term investments after assessing their acceptability and relative rankings.

MARKETING You need to understand the firm's cost of capital because proposed projects must earn returns in excess of it to be acceptable.

OPERATIONS You need to understand the firm's cost of capital to assess the economic viability of investments in plant and equipment needed to improve or grow the firm's capacity.

In your *personal* life

Knowing your *personal cost of capital* will allow you to make informed decisions about your personal consuming, borrowing, and investing. Managing personal wealth is a lot like managing the wealth of a business because you need to understand the tradeoffs between consuming wealth and growing wealth and how growing wealth can be accomplished by investing your own monies or borrowed monies. Understanding the cost of capital concepts will allow you to make better long-term decisions and maximize the value of your personal wealth.

LG1 LG2

9.1 Overview of the Cost of Capital

cost of capital
Represents the firm's cost of financing and is the minimum rate of return that a project must earn to increase the firm's value.

Chapter 1 established that the firm's goal is to maximize shareholder wealth. To do so, managers must make investments that are worth more than they cost. That is, investments need to have positive net present values (NPVs). In this chapter, you will learn about the cost of capital, which is (usually) the rate of return that financial managers use in determining which investment opportunities add value to the firm. The **cost of capital** represents the firm's cost of financing and is the minimum rate of return that a project must earn to increase firm value. When investors (i.e., stockholders and lenders) provide funding to a firm, they do so with the expectation that the firm will pay them a return. The returns that investors require constitute a cost of capital the firm must pay to investors. Investments that produce returns above the cost of capital will have positive

FOCUS ON ETHICS *in practice*

The Cost of Capital Also Rises

Gertrude Stein—who shaped 20th century art and literature through discussions in her 1920s Paris home with the likes of Pablo Picasso and Ernest Hemingway—famously wrote of Oakland, California, "There is no there, there." Had she lived until September 2016, she might have said the same about consumer accounts in the mega bank across the bay in San Francisco.

Wells Fargo entered 2016 in an enviable position. The bank easily weathered the 2008 financial crisis by remaining focused on its core business—retail banking in bricks-and-mortar branches. In July 2015, *U.S. News and World Report* touted Wells as the "best bank stock today," and in February 2016, *The Banker* awarded the distinction of "most valuable brand in banking" for the fourth consecutive year. Shrewd acquisitions and a knack for cross-selling vaulted Wells into the company of the world's largest banks—a long way from its start as part bank, part stagecoach in the 1850s.

Then, on September 8, 2016, the stagecoach threw a wheel—news broke that aggressive sales quotas had driven Wells employees to open millions of unauthorized accounts. When the dust settled, CEO John Stumpf was out, and the bank faced a $185 million fine from the Consumer Financial Protection Bureau in addition to $110 million in civil settlements with wronged customers. Even worse, consumer faith earned over 164 years was badly shaken. Wells Fargo became the largest business to ever lose accreditation with the Better Business Bureau.

The account scandal had broader financial consequences. In the month following disclosure, the price of Wells's stock tumbled 13.5% as damaging details emerged. Then on October 18, in an uncommon move for an investment-grade firm, Wells Fargo postponed its planned issue of new 10-year bonds when S&P Global Ratings raised the likelihood of a downgrade in the bank's credit rating. At the time, comparable Wells's debt offered a yield 162 basis points (100 bps = 1 percentage point) over Treasuries—up from 151 before the scandal broke.

The bank's weighted average cost of capital rose as well, reflecting a higher beta on common stock on top of the higher risk premium on debt. Going into 2016, Wells had not reported a loss in 45 years—a record in part traceable to emphasis on consumer financial products and services, which rank among the most steady business lines for commercial banks. This emphasis helps account for the low beta on Wells Fargo common stock, 0.9 in August 2016—meaning Wells stock was less risky than the average stock (beta = 1) as well as the stocks of other mega banks like Bank of America (beta = 1.6). But bad publicity from the scandal together with Wells' decision to end sales quotas produced a 40% drop in new checking accounts in 2016 and a 43% falloff in credit-card applications. Such declines go far to explain why Wells' beta climbed to 1.0 by year-end 2016.

▶ *Many feel only muscular government regulation—supported by severe punishment for transgressions—can deter corporations from unethical acts. How did markets punish Wells Fargo? In your opinion, how much of a role should markets play in policing corporate ethics?*

NPVs and will increase the value of the firm, because these investments are worth more than they cost. In contrast, projects with returns below the cost of capital will have negative NPVs and will decrease firm value.

The cost of capital is an extremely important financial concept. It acts as a major link between the firm's long-term investment decisions and the wealth of the firm's owners as determined by the market value of their shares. Managers use the cost of capital in a variety of ways. First, the cost of capital is usually the discount rate that managers apply to NPV calculations in deciding whether to undertake a particular investment. Second, as was highlighted in the chapter opener, managers use the cost of capital as a kind of benchmark against which they can judge their performance. To be specific, managers assess whether the returns they are earning on capital investments exceed or fall short of the firm's cost of capital. Third, managers use the cost of capital to value entire companies, as is necessary when a firm engages in mergers and acquisitions.

Many factors affect a firm's cost of capital, not the least of which is the ethical conduct of senior managers; read the *Focus on Ethics* box to see how an ethical lapse increased the cost of capital at Wells Fargo.

THE BASIC CONCEPT

capital
A firm's long-term sources of financing, which include both debt and equity.

capital structure
The mix of debt and equity financing that a firm employs.

Firms need money to pay for their investments. The term **capital** refers to a firm's long-term sources of financing, which include both debt and equity. Firms raise capital by selling securities such as common stock, preferred stock, and bonds to investors and by reinvesting profits back into the firm. A firm's **capital structure** refers to the mixture of debt and equity financing it employs. Some firms prefer capital structures that are close to 100% equity, while other firms borrow heavily. Table 9.1 shows the percentages of debt and equity financing in place at a number of well-known firms in 2017.

Table 9.1 shows that in 2017 General Electric's total capital had a market value of $494.5 billion. The company had debt outstanding with a market value of $250.2 billion and equity outstanding with a market value of $244.3 billion. Thus, debt accounted for about 51% of the company's long-term financing, and equity accounted for the remaining 49%. As another way to look at this, investors entrusted GE's managers with $494.5 billion, and to be successful, GE's managers need to invest that money in assets producing sufficient cash flows to provide both GE bondholders and stockholders the returns they expect. Whatever returns GE's assets produce ultimately flow back to its investors.

TABLE 9.1 Capital Structures of Well-Known Companies in 2017

Company	Value of Outstanding Debt ($ billions)	% Debt	Value of Outstanding Equity ($ billions)	% Equity	Total Capital ($ billions)
Alphabet	$ 3.9	1%	$643.5	99%	$647.40
Johnson & Johnson	23.5	6	341.6	94	365.10
Procter & Gamble	30.5	12	220.4	88	250.90
Dow Chemical	19.3	20	75.0	80	94.30
General Electric	250.2	51	244.3	49	494.50
General Motors	55.0	53	49.6	47	104.60

Now consider this thought experiment. Suppose you want to purchase a tiny fraction, say, 1/10,000,000, of GE's debt and the same fraction of its equity. To do this, you must buy $25,020 worth of GE bonds and $24,430 worth of GE stock. Your total portfolio is worth $49,450, and 51% of your portfolio consists of GE debt, with the other 49% consisting of GE equity, the very same percentages in GE's overall capital structure. What would your expected return on this portfolio be?

The answer is that the expected return on your portfolio would be the same as the overall expected return earned by GE.[1] By purchasing the same fraction (1/10,000,000) of GE's debt and equity, you have created a portfolio earning a return that mimics the overall return earned by debt and equity investors at GE, a return known as the **weighted average cost of capital (WACC)**. The WACC is a weighted average of the firm's cost of debt capital and its cost of equity capital, where the weights correspond to the percentage of each type of financing used by the firm. The WACC reflects the overall cost of financing to the firm, not just the cost of one financing source.

weighted average cost of capital (WACC)
A weighted average of a firm's cost of debt and equity financing, where the weights reflect the percentage of each type of financing used by the firm.

Managers must take into account the costs of both forms of capital when they make investment decisions because the cash flows produced by investments must be sufficient to satisfy the expectations of both types (debt and equity) of investors. As Table 9.1 illustrates, most firms do finance their activities with a blend of equity and debt. In Chapter 13, we will explore the factors that determine what mix of debt and equity is optimal for any particular firm. For now, we will simply say that most firms have a desired mix of financing, and the cost of capital must reflect the cost of each type of financing used. To capture all the relevant financing costs, assuming some desired mix of financing, we need to look at the overall cost of capital rather than just the cost of any single source of financing.

EXAMPLE 9.1

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A firm is currently considering two investment opportunities. Two financial analysts, working independently of each other, are evaluating these opportunities. Assume the following information about investments A and B.

Investment A

Cost	$100,000
Life	20 years
Expected Return	7%

The analyst studying this investment recalls that the company recently issued bonds paying a 6% rate of return. He reasons that because the investment project earns 7% while the firm can issue debt at 6%, the project must be worth doing, so he recommends that the company undertake this investment.

Investment B

Cost	$100,000
Life	20 years
Expected Return	12%

1. From the basic accounting equation, we know that assets equal debt plus equity, $A = D + E$. Divide both sides of this equation by 10,000,000 to obtain $0.0000001A = 0.0000001D + 0.0000001E$. By purchasing 1/10,000,000 of GE's debt and equity (which is the right side of the previous equation), you have created a claim against 1/10,000,000 of GE's assets. Thus, the return on your portfolio is the same as the return produced by GE's assets.

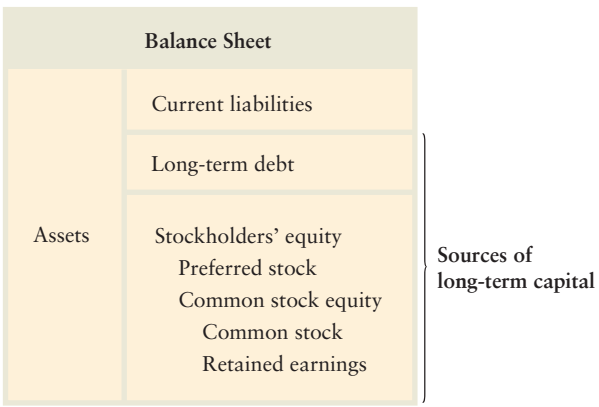
The analyst assigned to this project knows that the firm has common stock outstanding and that investors who hold the company's stock expect a 14% return on their investment. The analyst decides that the firm should not undertake this investment because it produces only a 12% return while the company's shareholders expect a 14% return.

In this example, each analyst is making a mistake by focusing on one source of financing rather than on the overall financing mix. What if instead the analysts used a combined cost of financing? By weighting the cost of each source of financing by its relative proportion in the firm's capital structure, the firm can obtain a *weighted average cost of capital (WACC)*. Assuming this firm desires a 50–50 mix of debt and equity, the WACC is $10\%[(0.50 \times 6\% \text{ debt}) + (0.50 \times 14\% \text{ equity})]$. With this average cost of financing, the firm should reject the first opportunity (7% expected return $<$ 10% WACC) and accept the second (12% expected return $>$ 10% WACC).

SOURCES OF LONG-TERM CAPITAL

In this chapter, our concern is only with the long-term sources of capital available to a firm because they are the sources that supply the financing necessary to support the firm's major investments. The process by which firms make investment decisions designed to maximize shareholders' wealth is called capital budgeting. We study capital budgeting in Part Five, but at this point it is sufficient to say that capital budgeting activities are chief among the responsibilities of financial managers and that they cannot be carried out without knowing the appropriate cost of capital with which to judge the firm's investment opportunities.

Long-term capital for firms derives from four basic sources: long-term debt, preferred stock, common stock, and retained earnings. All entries on the right-hand side of the balance sheet, other than current liabilities, represent these sources:



Not every firm will use all of these financing sources. In particular, the number of firms that issue preferred stock is relatively small. Even so, most firms will have some mix of funds from these sources in their capital structures. Although a firm's existing mix of financing sources may reflect its target capital structure, ultimately the marginal cost of capital necessary to raise the next marginal dollar of financing is most relevant for evaluating the firm's future investment opportunities.

→ REVIEW QUESTIONS MyLab Finance Solutions

9–1 What is the cost of capital?

9–2 What role does the cost of capital play in the firm's long-term investment decisions? How does it relate to the firm's ability to maximize shareholder wealth?

9–3 What does the firm's capital structure represent?

9–4 What are the typical sources of long-term capital available to the firm?

LG 3

9.2 Cost of Long-Term Debt

cost of long-term debt
The financing cost associated with new funds raised through long-term borrowing.

Firms that borrow money pay interest to lenders. That interest is a cost to the borrower, but interest alone does not fully reflect a firm's borrowing cost. If a firm borrows money by issuing bonds, it will incur costs specifically tied to the process of issuing new securities, separate from the interest payments made on those securities. In addition, in the United States, the tax laws allow firms to treat interest payments as a tax-deductible expense.[2] That deduction reduces a firm's taxes, and thereby reduces the cost of debt. The **cost of long-term debt**, r_d, is the financing cost associated with new funds raised through long-term borrowing, taking into account the firm's interest payments and other borrowing costs. Typically, firms raise long-term debt by issuing corporate bonds, though they may also borrow on a long-term basis from banks or other financial institutions.

NET PROCEEDS

net proceeds
Funds actually received by the firm from the sale of a security.

flotation costs
The total costs of issuing and selling a security.

The **net proceeds** from the sale of a bond, or any security, are the funds that the firm receives from the sale. Net proceeds are less than total proceeds due to **flotation costs,** which represent the total costs of issuing and selling securities. These costs apply to all public offerings of securities: debt, preferred stock, and common stock. They include two components: (1) *underwriting costs,* or compensation earned by investment bankers for selling the security; and (2) *administrative costs,* or issuer expenses such as legal and accounting costs.

When firms sell bonds, they usually set the coupon rate so that the bonds will sell close to par value, but often by the time the bond sale occurs, interest rates have moved slightly and the bond may sell slightly above par (at a premium) or slightly below par (at a discount). The total proceeds from a bond sale equal the market price of the bond (which may not equal par value) times the number of bonds sold.

EXAMPLE 9.2

Duchess Corporation, a major hardware manufacturer, is contemplating selling $10 million worth of 20-year, 6% coupon bonds, each with a par value of $1,000. Because bonds with similar risk earn returns equal to 6%, Duchess's bonds will sell in the market at par value, and they will have a yield to maturity (YTM) equal to the coupon rate, 6%. However, Duchess will incur flotation costs equal to 2% of the par value of the bond ($0.02 \times \$1{,}000$), or $20. The *net proceeds* to the firm from the sale of each bond are therefore $980.

2. The Tax Cuts and Jobs Act of 2017 placed a limit on how much interest firms can deduct. The limit is based on a complex formula that changes over time, but roughly firms cannot deduct interest that exceeds 30% of their EBIT. In this chapter, we will usually assume that firms are below this limit and can fully deduct all interest payments.

BEFORE-TAX COST OF DEBT

The before-tax cost of debt, r_d, is simply the rate of return the firm must pay on new borrowing. If a firm could issue bonds without incurring flotation costs, then the firm's before-tax cost of debt would equal the return required by bondholders. Flotation costs mean that a firm's before-tax cost of debt is slightly higher than the bondholders' required return. You can find a firm's before-tax cost of debt for bonds in any of three ways: quotation, calculation, or approximation.

Using Market Quotations

A relatively quick method for finding the before-tax cost of debt is to observe the *yield to maturity (YTM)* on the firm's existing bonds or bonds of similar risk issued by other companies. The YTM of existing bonds reflects the rate of return required by the market. For example, if the market requires a YTM of 6% for a similar-risk bond, managers can use this value as an estimate of the before-tax cost of debt, r_d, for new bonds. You can find bond yields in sources such as the *Wall Street Journal*.

Calculating the Cost

Managers can calculate the cost of debt associated with a particular bond issue by calculating the bond's YTM. To calculate the YTM, remember that managers must know the cash flows the bond will provide as well as its market price. Taking the costs of issuing the bonds into account requires managers to use the net proceeds from the bond issue rather than the market price.[3] This approach finds the before-tax cost of debt by calculating the YTM generated by the bond's cash flows, given the net proceeds that the firm receives when it issues the bonds. The YTM represents the annual before-tax percentage cost of the debt.

EXAMPLE 9.3

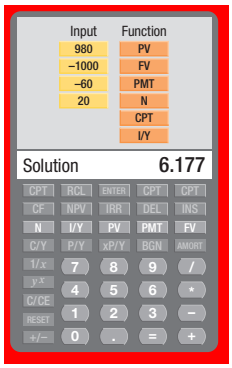
In the preceding example, Duchess receives proceeds of $980 by issuing a 20-year bond with a $1,000 par value and 6% coupon interest rate. To calculate the before-tax cost of debt, begin by writing down the cash flows associated with this bond issue. The cash flow pattern consists of an initial inflow (the net proceeds) followed by a series of annual outflows (the interest payments). In the final year, when the debt is retired, an outflow representing the repayment of the principal also occurs. The cash flows associated with Duchess Corporation's bond issue are as follows:

End of year(s)	Cash flow
0	$ 980
1–20	−60
20	−1,000

3. As an alternative, managers can account for flotation costs by treating them as cash outflows associated with the investment that the bonds are being issued to fund. In this approach, the cost of debt is the YTM calculated using the bond's market price rather than the net proceeds.

Duchess can determine the before-tax cost of debt by finding the YTM, which is the discount rate that equates the present value of the bond outflows to the initial inflow.

MyLab Finance Financial Calculator



Calculator use (*Note:* Most calculators require either the present value [net proceeds] or the future value [annual interest payments and repayment of principal] to be input as negative numbers when we calculate yield to maturity. That approach is used here.) Using the calculator and the inputs shown at the left, you should find the before-tax cost of debt (yield to maturity) to be 6.177%.

Spreadsheet use The before-tax cost of debt on the Duchess Corporation bond can be calculated using an Excel spreadsheet. The following Excel spreadsheet shows that by referencing the cells containing the bond's net proceeds, coupon payment, years to maturity, and par value as part of Excel's RATE function, you can quickly determine that the appropriate before-tax cost of debt for Duchess Corporation's bond is 6.177%.

MyLab

	A	B
1	FINDING THE BEFORE-TAX COST OF DEBT	
2	Par value	–$1,000
3	Coupon interest rate	6.0%
4	Interest payments per year	1
5	Interest payment	–$60
6	Number of years to maturity	20
7	Net proceeds from sale of bond	$980
8	Before-tax cost of debt	6.177%

Entry in Cell B8 =RATE(B6*B4,B5,B7,B2,0).
The minus sign appears before the $1,000 in B2 and the $60 in B5 because these values are cash outflows for the corporation.

Approximating the Cost

Although not as precise as using a calculator, there is a method for approximating the before-tax cost of debt. The before-tax cost of debt, r_d, for a bond with a $1,000 par value can be approximated by

$$r_d = \frac{I + \dfrac{\$1{,}000 - N_d}{n}}{\dfrac{N_d + \$1{,}000}{2}} \tag{9.1}$$

where

I = annual interest in dollars
N_d = net proceeds from the sale of debt (bond)
n = number of years to the bond's maturity

EXAMPLE 9.4

Substituting the appropriate values from the Duchess Corporation example into the approximation formula given in Equation 9.1, we get

$$r_d = \frac{\$60 + \frac{\$1{,}000 - \$980}{20}}{\frac{\$980 + \$1{,}000}{2}} = \frac{\$60 + \$1}{\$990}$$

$$= \frac{\$61}{\$990} = 0.06162 \text{ or } 6.162\%$$

This approximate value of before-tax cost of debt is close to 6.177%, but it lacks the precision of the value derived using the calculator or spreadsheet.

AFTER-TAX COST OF DEBT

Unlike the dividends paid to common and preferred stockholders, the interest payments paid to bondholders are tax deductible, so the interest expense on debt reduces taxable income (as long as interest does not exceed 30% of EBIT) and, therefore, the firm's tax liability. In effect, this means the after-tax cost of debt to the firm will be less than the stated rate of return paid to bondholders on their bonds. To find the firm's net cost of debt, we must account for the tax savings created by debt and solve for the cost of long-term debt on an after-tax basis. The after-tax cost of debt equals the product of the before-tax cost, r_d, and the term, 1 minus the tax rate, T:

$$\text{After-tax cost of debt} = r_d \times (1 - T) \tag{9.2}$$

EXAMPLE 9.5

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Duchess Corporation has a 21% tax rate. Using the 6.177% before-tax debt cost calculated above and applying Equation 9.2, we find an after-tax cost of debt of $4.88\% [6.177\% \times (1 - 0.21)]$. If Duchess' interest expense reaches 30% of EBIT, then any *additional* interest expense is not deductible and for any additional borrowing the before- and after-tax cost of debt are equal. Recall that when bondholders purchase a Duchess bond at par value, they expect to earn a 6% YTM. Incorporating the issuance costs and the tax benefit of debt, the firm's after-tax cost of debt is just 4.88%, quite a bit less than the 6% return offered to bondholders. In most cases, debt is the least expensive form of financing available to a firm. Debt is a relatively inexpensive form of financing for two main reasons. First, debt is less risky than preferred or common stock. That alone makes debt a low-cost form of financing because investors accept lower returns on bonds than on stock. Second, the firm enjoys a tax benefit from issuing debt that it does not receive when it uses equity capital.

PERSONAL FINANCE EXAMPLE 9.6

MyLab Finance Solution Video

Kait and Kasim Sullivan, a married couple in the 28% income-tax bracket, wish to borrow $60,000 to pay for a new luxury car. To finance the purchase, either they can borrow the $60,000 through the auto dealer at an annual interest rate of 4.5%, or they can take a $60,000 second

mortgage on their home. The best annual rate they can get on the second mortgage is 5.5%. They already have qualified for both loans being considered.

If they borrow from the auto dealer, the interest on this loan will not be deductible for federal tax purposes. However, the interest on the second mortgage would be tax deductible because the tax law allows individuals to deduct interest paid on a home mortgage. To choose the least-cost financing, the Sullivans calculated the after-tax cost of both sources of long-term debt. Because interest on the auto loan is not tax deductible, its after-tax cost equals its before-tax cost of 4.5%. Because the interest on the second mortgage is tax deductible, its after-tax cost can be found using Equation 9.2:

$$\text{After-tax cost of debt} = 5.5\% \times (1 - 0.28) = 5.5\% \times 0.72 = 3.96\%$$

Because the 3.96% after-tax cost of the second mortgage is less than the 4.5% cost of the auto loan, the Sullivans may decide to use the second mortgage to finance the auto purchase.

Considered in isolation, a firm's least expensive after-tax source of financing is usually debt. However, even if debt is cheaper than other forms of financing, this does not imply that firms should always finance their investments with debt. Financing with debt puts the firm's existing shareholders in a riskier position because the firm must repay lenders regardless of whether it is profitable. Therefore, if a firm chooses to borrow more, its existing shareholders will demand a higher rate of return, thus raising the firm's cost of equity financing. The increase in cost of equity could partially or fully offset the benefit of using low-cost debt as a financing source, so firms must carefully weigh the tradeoffs they face when using different sources of capital. Finding the optimal mix of debt and equity capital is a problem that we will explore in depth in a later chapter.

→ REVIEW QUESTIONS MyLab Finance Solutions

9–5 What are the net proceeds from the sale of a bond? What are flotation costs, and how do they affect a bond's net proceeds?

9–6 What methods can be used to find the before-tax cost of debt?

9–7 How is the before-tax cost of debt converted into the after-tax cost?

→ EXCEL REVIEW QUESTION MyLab Finance Solutions

9–8 The interest expense on debt provides a tax deduction for the issuer, so any calculation of a firm's net cost of debt should reflect this benefit. Using the information provided at MyLab Finance, compute a firm's after-tax cost of debt with a spreadsheet model.

LG 4

9.3 Cost of Preferred Stock

Preferred stock represents a special type of ownership interest in the firm. It gives preferred stockholders the right to receive dividends before the firm can distribute any earnings to common stockholders. The key characteristics of preferred stock were described in Chapter 7, but we provide a brief review here.

PREFERRED STOCK DIVIDENDS

When companies issue preferred shares, the shares usually pay a fixed dividend and have a fixed par value. When discussing the features of a particular preferred stock issue, investors may refer to the fixed dividend either in dollar terms or as a percentage of the stock's par value. For example, suppose a company issues preferred stock that promises an annual $4 dividend in perpetuity and has a par value of $50. The dividend equals 8% of the preferred's par value, so investors might refer to this stock as a "$4 preferred share" or an "8% preferred share."

CALCULATING THE COST OF PREFERRED STOCK

cost of preferred stock, r_p
The ratio of the preferred stock dividend to the firm's net proceeds from the sale of preferred stock.

The **cost of preferred stock, r_p**, is the ratio of the preferred stock dividend to the firm's net proceeds from the sale of the preferred stock. As with bonds, net proceeds equal the total proceeds minus any flotation costs. The following equation gives the cost of preferred stock, r_p, in terms of the annual dollar dividend, D_p, and the net proceeds from the sale of the stock, N_p:

$$r_p = \frac{D_p}{N_p} \tag{9.3}$$

EXAMPLE 9.7

Duchess Corporation is contemplating issuance of an 8% preferred stock they expect to sell at par value for $80 per share. The cost of issuing and selling the stock will be $2.50 per share. The first step in finding the cost of the stock is to calculate the dollar amount of the annual preferred dividend, which is $6.40 (0.08 × $80). The net proceeds per share from the proposed sale of stock equals the sale price minus the flotation costs ($80 − $2.50 = $77.50). Substituting the annual dividend, D_p, of $6.40 and the net proceeds, N_p, of $77.50 into Equation 9.3 gives the cost of preferred stock, 8.258% ($6.4 ÷ $77.50).

The cost of Duchess's preferred stock (8.258%) is slightly greater than the 8% return that preferred stockholders require because of the issuance costs that Duchess must pay. The cost of preferred stock is much greater than the after-tax cost of its long-term debt (3.706%). This difference exists both because interest payments are tax deductible, whereas preferred dividends are not, and because preferred stock is riskier than long-term debt and therefore must pay a higher return.

→ REVIEW QUESTION MyLab Finance Solution

9–9 How would you calculate the cost of preferred stock?

LG5

9.4 Cost of Common Stock

The cost of common stock is the return required on the stock by investors in the marketplace, possibly adjusted to account for costs of issuing new shares of stock. There are two forms of common stock financing: (1) retained earnings and (2) new issues of common stock. As a first step in finding each of these costs, we must estimate the required return on common stock.

FINDING THE COST OF COMMON STOCK EQUITY

cost of common stock equity
The costs associated with using common stock equity financing. The cost of common stock equity is equal to the required return on the firm's common stock in the absence of flotation costs. Thus, the cost of common stock equity is the same as the cost of retained earnings, but the cost of issuing new common equity is higher.

The **cost of common stock equity** reflects the costs that firms incur to utilize common stock financing. Just as the costs of debt and preferred stock were influenced by the required returns of bondholders and preferred stockholders, the cost of common stock equity will reflect the return required by the firm's stockholders. However, calculating the required return for common stock is more difficult than finding the required return on bonds or preferred shares. With bonds, the YTM provides an easy-to-calculate estimate of the return that bondholders expect, and likewise with preferred stock—the ratio of the preferred share's dividend to its market price indicates the return that preferred shareholders expect. Dividends on common shares, however, are not fixed, as are bond interest payments and preferred dividends. Moreover, for most common stocks, a significant component of the return that investors receive comes in the form of a capital gain resulting from reinvestment of the firm's earnings in the business. Therefore, managers require a different approach to calculate the required return on common stock. Two techniques are used for this calculation. One relies on the constant-growth valuation model, while the other makes use of the capital asset pricing model (CAPM).

Using the Constant-Growth Valuation (Gordon Growth) Model

constant-growth valuation (Gordon growth) model
A model that calculates the value of common stock as the present value of an infinite dividend stream that grows at a constant rate.

In Chapter 7, we found that the value of a share of common stock equals the present value of all future dividends paid to shareholders. Valuing common stock therefore requires estimates of future dividend payments. One simple way to derive such estimates is to assume that dividends will grow at a constant rate forever. The **constant-growth valuation model**, also known as the **Gordon growth model**, values common stock by making that very assumption. The key expression derived for this model is

$$P_0 = \frac{D_1}{r_s - g} \tag{9.4}$$

where

P_0 = current value of common stock
D_1 = dividend expected in 1 year
r_s = required return on common stock
g = constant rate of growth in dividends

Solving Equation 9.4 for r_s results in the following expression for the required return on common stock:

$$r_s = \frac{D_1}{P_0} + g \tag{9.5}$$

Equation 9.5 indicates that the required return on common stock equals the ratio of the dividend expected in 1 year to the current market price, plus the dividend growth rate. The first term captures the rate of return that shareholders expect to earn from dividends, and the second term captures the return they expect to earn from capital gains.

EXAMPLE 9.8

Duchess Corporation wishes to determine the required return on its common stock, r_s. The market price, P_0, of its common stock is $50 per share. Duchess recently paid a $3.80 dividend. The company has increased its dividend for several consecutive years. Just 5 years ago, Duchess paid a dividend of $2.98 on its common stock.

Using a financial calculator or electronic spreadsheet, in conjunction with the technique described earlier in this text for finding growth rates, we can calculate the average annual dividend growth rate, g, over the past 5 years. The average dividend growth rate is about 5%. If Duchess continues to increase the dividend at this rate, then next year's dividend will be 5% more than the $3.80 dividend that it just paid, or $3.99. Substituting $D_1 = \$3.99$, $P_0 = \$50$, and $g = 5\%$ into Equation 9.5 yields the cost of common stock equity:

$$r_s = \frac{\$3.99}{\$50} + 0.05 = 0.0798 + 0.05 = 0.1298 = 12.98\%$$

Because this estimate depends on a somewhat imprecise forecast of the company's long-run dividend growth rate, a kind of false precision arises in concluding that the required return on equity is 12.98%, so we will just round up to 13%.

Using the Capital Asset Pricing Model (CAPM)

capital asset pricing model (CAPM)
Describes the relationship between the required return, r_s, and the nondiversifiable risk of the firm as measured by the beta coefficient, β.

Recall from Chapter 8 that the **capital asset pricing model (CAPM)** describes the relationship between the required or expected return on some asset j, r_j, and the nondiversifiable risk of the asset as measured by the beta coefficient, β_j. The basic CAPM is

$$r_j = R_F + [\beta_j \times (r_m - R_F)] \tag{9.6}$$

where

R_F = risk-free rate of return

r_m = market return; return on the market portfolio of assets

If Duchess wants to use the CAPM to estimate the required return on its common stock, it needs three pieces of information: the risk-free rate, the return on the overall stock market, and the beta of its common shares.

EXAMPLE 9.9

Duchess Corporation now wishes to calculate the required return on its common stock, r_s, by using the CAPM. The firm's investment advisors and its own analysts indicate that the risk-free rate, R_F, equals 3%; the firm's beta, β, equals 1.5; and the market return, r_m, equals 9%. Substituting these values into Equation 9.6, the company estimates that the required return on its common stock, r_s, is 12%:

$$r_s = 3.0\% + [1.5 \times (9.0\% - 3.0\%)] = 3.0\% + 9\% = 12.0\%$$

Notice that this estimate of the required return on Duchess stock does not line up exactly with the estimate obtained from the constant-growth model. That is to be expected because the two models rely on different assumptions. In practice, analysts at Duchess might average the two figures to arrive at a final estimate for the required return on common stock.

Comparing Constant-Growth and CAPM Techniques

The CAPM technique differs from the constant-growth valuation model in that it directly considers the firm's risk, as reflected by beta, in determining the required return on common stock equity. The constant-growth model does not look at risk directly; it uses an indirect approach to infer what return shareholders expect based upon the price they are willing to pay for the stock today, P_0, given estimates of the firm's future dividends. Using the constant-growth model to find the required return on a stock is somewhat analogous to finding the required return on a bond by calculating its YTM. Both calculations rely on a security's current market price and its future cash flows to arrive at a required return. With bonds, the future cash flows are relatively easy to predict, whereas with common stock, the long-run dividend stream is much harder to estimate.

Flotation Costs and the Cost of Common Equity

Recall that for debt and preferred stock, the firm may face flotation costs, which increase the cost of capital to the firm. Thus far we have ignored these costs related to common equity, so the estimates we have obtained for Duchess reflect only the required return on the company's stock. If Duchess issues new shares of common stock, its cost of equity will exceed the return that its shareholders require due to flotation costs. The firm could treat those costs as cash outflows associated with the specific project that prompts the firm to issue new shares in the first place, or it could make an adjustment to the required return on equity to reflect flotation costs. Unlike the CAPM, the constant-growth model offers a relatively easy way to adjust for flotation costs in finding the cost of common stock.

When a firm issues new common stock, a variety of costs reduce the net proceeds the firm receives. These costs include the underwriting fees and administrative costs discussed earlier. In addition, investment bankers usually sell new shares of common stock at a slight discount to their current market value, a phenomenon known as *underpricing*. Underpricing represents a cost to issuers because it requires them to sell a greater number of shares (which will over time receive a greater amount of dividends) than would be the case if shares were sold at full market value.

cost of a new issue of common stock, r_n
The cost of common stock, net of underpricing and associated flotation costs.

Our purpose in finding the firm's overall cost of capital is to determine the after-tax cost of *new* funds required for financing projects. The **cost of a new issue of common stock, r_n,** is determined by calculating the cost of common stock, net of underpricing and associated flotation costs. We can use the constant-growth valuation model expression for the required return on common stock, r_s, as a starting point. If we let N_n represent the net proceeds from the sale of new common stock after subtracting underpricing and flotation costs, the cost of the new issue, r_n, can be expressed as:[4]

$$r_n = \frac{D_1}{N_n} + g \tag{9.7}$$

4. An alternative form of this equation is

$$r_n = \frac{D_1}{P_0 \times (1 - f)} + g \tag{9.7a}$$

where f represents the *percentage* reduction in current market price expected as a result of underpricing and flotation costs. Simply stated, N_n in Equation 9.7 is equivalent to $p_0 \times (1 - f)$ in Equation 9.7a.

The net proceeds from the sale of new common stock, N_n, will be less than the current market price, P_0. Therefore, the cost of new issues, r_n, will always be greater than the return that stockholders require, r_s. The cost of new common stock is normally greater than any other long-term financing cost because common stock is riskier, and therefore must pay a higher return, than any other security that firms issue.

EXAMPLE 9.10

In the constant-growth valuation example, we found that Duchess Corporation's required return on common stock, r_s, was 13%, using the following values: an expected dividend, D_1, of \$3.99; a current market price, P_0, of \$50; and an expected growth rate of dividends, g, of 5%.

To determine its cost of new common stock, r_n, Duchess Corporation has estimated that on average, new shares can be sold for \$48. Thus, Duchess's shares will be underpriced by \$2 per share. A second cost associated with a new issue is flotation costs of \$1.50 per share that would be paid to issue and sell the new shares. The total underpricing and flotation costs per share are therefore \$3.50.

Subtracting the \$3.50-per-share underpricing and flotation cost from the current \$50 share price results in expected net proceeds of \$46.50 per share. Substituting $D_1 = \$3.99$, $N_n = \$46.50$, and $g = 5\%$ into Equation 9.7 results in a cost of new common stock, r_n:

$$r_n = \frac{\$3.99}{\$46.50} + 0.05 = 0.0858 + 0.05 = 0.1358 = 13.58\%$$

Duchess Corporation's cost of new common stock is therefore between 13% and 14%.

COST OF RETAINED EARNINGS

In our discussion of the cost of equity financing so far, we have assumed that firms would raise equity by issuing new shares of common stock, but they may also use earnings they have retained to reinvest in the business. If firms use retained earnings to finance new investment, they incur no incremental flotation costs. This does not mean that retained earnings are free for the firm to use, however. Retained earnings have an opportunity cost, meaning that if the firm did not use them to reinvest in investment projects, it could distribute them to shareholders as dividends, and the shareholders could make other investments with them. Thus, the **cost of retained earnings, r_r**, to the firm is the same as the required return on the firm's common stock, r_s.

cost of retained earnings, r_r
The cost of using retained earnings as a financing source. The cost of retained earnings is equal to the required return on a firm's common stock, r_s.

$$r_r = r_s \tag{9.8}$$

It is not necessary to adjust the cost of retained earnings for flotation costs because by retaining earnings the firm "raises" equity capital without incurring these costs.

EXAMPLE 9.11

The cost of retained earnings for Duchess Corporation equals the required return on equity. Recall that we calculated the required return using two methods. With the constant-growth model, we estimated the required return on equity to be 13% (before accounting for flotation costs and underpricing), and with the CAPM, the required return on equity was 12%. Thus, the cost for Duchess

MATTER OF FACT

Retained Earnings, the Preferred Source of Financing

In the United States and most other countries, firms rely more heavily on retained earnings than any other financing source. For example, a 2016 survey of U.K. firms conducted by the Bank of England found that about 80% of the companies surveyed listed retained earnings as one of their primary sources of funds. Bank loans were a distant second choice, mentioned as a primary source of funds by roughly 58% of the companies.[5]

Corporation to finance investments through retained earnings, r_r, falls somewhere in the range of 12.0% to 13.0%. Both estimates are lower than the cost of a new issue of common stock because by using retained earnings the firm avoids the additional costs associated with issuing new equity.

→ REVIEW QUESTIONS MyLab Finance Solutions

9–10 What premise about share value underlies the constant-growth valuation (Gordon growth) model that we use to measure the cost of common stock equity, r_s?

9–11 How do the constant-growth valuation model and capital asset pricing model methods for finding the cost of common stock differ?

9–12 Why is the cost of financing a project with retained earnings less than the cost of financing it with a new issue of common stock?

LG 6

9.5 Weighted Average Cost of Capital

As noted earlier, the *weighted average cost of capital (WACC)*, r_{wacc}, reflects the expected average cost of the different forms of capital used by a company. It equals the weighted average cost of each specific type of capital, where the weights equal the proportion of each capital source in the firm's capital structure.

CALCULATING THE WEIGHTED AVERAGE COST OF CAPITAL (WACC)

Calculating the WACC is straightforward: Multiply the individual cost of each form of financing by its proportion in the firm's capital structure and sum the weighted values. As an equation, the weighted average cost of capital, r_{wacc}, can be specified as

$$r_{wacc} = (w_d \times r_d)(1 - T) + (w_p \times r_p) + (w_s \times r_{s \text{ or } n}) \quad (9.9)$$

5. Jumana Salehee, Iren Levina, and Srdan Tatomir, "The financial system and productive investment: new survey evidence," *Bank of England Quarterly Bulletin*, Q1 2017.

where

w_d = proportion of long-term debt in capital structure
w_p = proportion of preferred stock in capital structure
w_s = proportion of common stock equity in capital structure
$w_d + w_p + w_s = 1.0$

We want to highlight four important points related to Equation 9.9:

1. The weights must be nonnegative and sum to 1.0. Simply stated, the WACC must account for all financing costs within the firm's capital structure.
2. The weights are based on the market value of each capital source as a percentage of the market value of the firm's total capital. For example, w_s is based on the market value of the firm's stock, not on its par value or the value of equity shown on the firm's balance sheet.
3. We multiply the firm's common stock equity weight, w_s, by either the required return on the firm's stock, r_s, or the cost of new common stock, r_n. Remember that when firms finance investments with retained earnings, the cost of retained earnings, r_r, is the same as the required return on the firm's stock. However, when the firm issues new shares, the cost of equity is higher due to flotation costs, so the firm may use r_n in Equation 9.9.
4. We multiply the firm's cost of debt by $(1 - T)$ to capture the tax deduction tied to interest payments.

EXAMPLE 9.12

In earlier examples, we found the costs of the various types of capital for Duchess Corporation to be as follows:

$$r_d(1 - T) = 4.880\% = 4.88\%$$
$$r_p = 8.258\% = 8.26\%$$
$$r_s = 13.00\%$$

Duchess has total capital with a market value of $1 billion. The market value of the firm's outstanding long-term debt is $400 million, the value of its preferred stock is $100 million, and the market value of its common stock is $500 million. Thus, the weights for the weighted average cost of capital (WACC) calculation are as follows:

Source of capital	Weight
Long-term debt	40%
Preferred stock	10
Common stock equity	50
Total	100%

Because the firm expects to have a sizable amount of retained earnings available, it plans to use the required return on equity, r_s (or, equivalently, the cost of retained earnings, r_r), as the cost of common stock equity. The calculation for Duchess Corporation's WACC appears in Table 9.2. The resulting WACC for Duchess is 9.28%. This establishes a hurdle rate for Duchess, meaning that the company should accept investment opportunities that promise returns above 9.28% as long as those investment opportunities are not riskier than the firm's current investments.

TABLE 9.2 Calculation of the Weighted Average Cost of Capital for Duchess Corporation

Source of capital	Weight w	Cost r	Weighted cost $w \times r$
Long-term debt	0.40	4.88%	1.95%
Preferred stock	0.10	8.26	0.83
Common stock equity	0.50	13.00	6.50
Totals	1.00		WACC = 9.28%

CAPITAL STRUCTURE WEIGHTS

market value weights
Weights that use market values to measure the proportion of each type of capital in the firm's financial structure.

We noted earlier that when calculating a firm's WACC, analysts should use **market value weights** for the percentages of each type of financing, rather than book or par values. This is because the market value better reflects the value of the funds that investors have placed in the hands of managers and on which investors expect to earn a return. For debt, the difference between market value and book value is usually not extremely large, but for equity the difference can be enormous. For example, on its March 2017 balance sheet, Netflix reported common stock equity of about $3 billion and a similar value for long-term debt. Those numbers would suggest that Netflix was financed with a 50-50 mix of debt and equity. However, the market value of Netflix stock was about $70 billion! The market value of equity was vastly greater than its book value because market values are inherently forward looking, whereas book values take a more historical perspective. Investors expected Netflix to generate much more cash flow in the future than it had in the past, and that view was reflected in the market value of the company's stock, but not in the value of equity on its books. Of course, the investors who held Netflix debt could earn only a fixed return (i.e., the interest payments they were promised) no matter how well the company performed in the future, so although the market value of the company's debt might rise and fall somewhat as market interest rates move, the market value of debt could never exceed its book value to the same degree that was true for equity. The notion that Netflix was financed with a 50-50 mix of debt and equity was grossly incorrect—based on market values, equity investors provided about 96% of the firm's capital with debt, accounting for just 4% of total capital.

The preceding example raises another subtle point about the weights in the WACC calculation. In 2016, equity accounted for 96% of the total financing used by Netflix. But in the 5-year period from 2012 to 2016, the return on Netflix common stock averaged almost 66% per year. Thus, the market value of Netflix equity was increasing very rapidly, and an almost unavoidable consequence of such an increase was that the capital structure at Netflix became heavily tilted toward equity. Even if managers at Netflix had desired to maintain a capital structure that had more of a balance between debt and equity, it might have been difficult for them to borrow money rapidly enough to maintain that balance given how fast the company's stock price was increasing. Suppose that Netflix managers determined that the optimal capital structure for their company should contain 25% debt and 75% equity. In other words, imagine that a 25-75 mixture of debt and equity was the **target capital structure** for the company. In that case, an

target capital structure
The mix of debt and equity financing that a firm desires over the long term. The target capital structure should reflect the optimal mix of debt and equity for a particular firm.

alternative to using the actual market value weights in the WACC calculation (4% debt and 96% equity) would be to use the *target capital structure weights* (25% debt and 75% equity). Doing so would be a way to anticipate how the company's capital structure might evolve in the near term as managers take actions to move their actual capital structure to the desired target.

→ REVIEW QUESTIONS MyLab Finance Solutions

9–13 What is the weighted average cost of capital (WACC), and how is it calculated?

9–14 What is the relationship between the firm's target capital structure and the weighted average cost of capital (WACC)?

9–15 Describe the logic underlying the use of target weights to calculate the WACC, and compare and contrast this approach with the use of historical weights. What is the preferred weighting scheme?

SUMMARY

FOCUS ON VALUE

The cost of capital is an extremely important rate of return, particularly in capital budgeting decisions. It is an overall cost that blends the costs of the firm's debt and equity financing sources. Because the cost of capital is the pivotal rate of return used in the investment decision process, its accuracy can significantly affect the quality of these decisions.

Underestimation of the cost of capital can make poor projects look attractive; overestimation can make good projects look unattractive. By applying the techniques presented in this chapter to estimate the firm's cost of capital, the financial manager will improve the likelihood that the firm's long-term decisions will be consistent with its overall goal of **maximizing shareholder wealth.**

REVIEW OF LEARNING GOALS

LG 1 **Understand the basic concept of the cost of capital.** The cost of capital is the minimum rate of return that a firm must earn on its investments to increase the firm's value. The weighted average cost of capital is a number that blends the costs of each type of capital that a firm uses and establishes a minimum rate of return that the firm's investment should earn.

LG 2 **List the primary sources of capital available to firms.** The primary sources of capital for most firms include debt, preferred stock, common stock, and retained earnings.

LG 3 **Determine the cost of long-term debt, and explain why the after-tax cost of debt is the relevant cost of debt.** Managers can find the before-tax cost of long-term debt by using cost quotations, calculations (either by calculator or spreadsheet), or an approximation. The after-tax cost of debt is the product of

the before-tax cost of debt and 1 minus the tax rate. The after-tax cost of debt is the relevant cost of debt because it is the lowest possible cost of debt for the firm due to the deductibility of interest expenses.

LG4 **Determine the cost of preferred stock.** The cost of preferred stock is the ratio of the preferred stock dividend to the firm's net proceeds from the sale of preferred stock.

LG5 **Calculate the required return on a company's common stock, and explain how it relates to the cost of retained earnings and the cost of new issues of common stock.** The required return on the firm's stock can be calculated by using the constant-growth valuation (Gordon growth) model or the CAPM. The cost of retained earnings is equal to the required return on common stock equity. An adjustment to the required return on common stock equity to reflect underpricing and flotation costs is necessary to find the cost of new issues of common stock.

LG6 **Calculate the weighted average cost of capital (WACC), and discuss alternative weighting schemes.** The firm's WACC is a weighted average of the firm's cost of debt and equity capital, where the weights are based on the market values of each type of financing relative to the total market value of all financing used by the firm.

SELF-TEST PROBLEM (Solutions in Appendix)

LG3 LG4 LG5 LG6

ST9–1 **Individual financing costs and WACC** Humble Manufacturing is interested in measuring its overall cost of capital. The firm is in the 21% tax bracket. The company's financial analysts have gathered the following data:

Debt The firm can raise debt by selling $1,000-par-value, 10% coupon interest rate, 10-year bonds on which annual interest payments will be made. When these bonds are issued, their market price will be $970. The firm must also pay flotation costs of $20 per bond.

Preferred stock The firm can sell 11% (annual dividend) preferred stock at its $100-per-share par value. Analysts expect that the cost of issuing and selling the preferred stock will be $4 per share.

Common stock The firm's common stock is currently selling for $80 per share. The firm expects to pay cash dividends of $6 per share next year. The firm's dividends have been growing at an annual rate of 6%, and this growth will continue in the future. The stock will have to be underpriced by $4 per share, and flotation costs amount to $4 per share.

Retained earnings The firm expects to have $225,000 of retained earnings available in the coming year. Once the firm exhausts these retained earnings, it will use new common stock as the form of common stock equity financing.

a. Calculate the individual cost of each source of financing. (Round to the nearest 0.1%.)

b. Calculate the firm's weighted average cost of capital (WACC) using the weights shown in the following table, which are based on the firm's target capital structure proportions. (Round to the nearest 0.1%.)

Source of capital	Weight
Long-term debt	40%
Preferred stock	15
Common stock equity	45
Total	100%

c. In which, if any, of the investments shown in the following table do you recommend that the firm invest? Explain your answer. How much new financing is required?

Investment opportunity	Expected rate of return	Initial investment
A	11.2%	$100,000
B	9.7	500,000
C	12.9	150,000
D	16.5	200,000
E	11.8	450,000
F	10.1	600,000
G	10.5	300,000

WARM-UP EXERCISES

Select problems are available in MyLab Finance.

LG 3

E9–1 CG Forest and Paper Ltd. raises capital by selling £5,000,000 worth of debt with flotation costs equal to 3% of its par value. If the debt matures in 15 years and has coupon rate of 6% (paid annually), what is the bond's YTM?

LG 4

E9–2 People's Consulting Group has been asked to consult on a potential preferred stock offering by Brave New World. This 9% preferred stock issue would be sold at its par value of $55 per share. Flotation costs would total $3 per share. Calculate the cost of this preferred stock.

LG 5

E9–3 Belle Fashions supplies garments to high street retailers. They have been paying dividends steadily for 10 years. During that time, dividends have grown at a compound annual rate of 5%. If Belle Fashions's current stock price is £5.80 and the firm plans to pay a dividend of £0.70 next year, what is the required return on Belle's common stock?

LG 6

E9–4 Garba Exports Ltd. is a manufacturer of cotton yarn. It has 40% debt and 60% equity in its capital structure. The firm's estimated after-tax cost of debt is 7% and its estimated cost of equity is 12%. Determine the firm's weighted average cost of capital (WACC).

LG 6

E9–5 Oxy Corporation uses debt, preferred stock, and common stock to raise capital. The firm's capital structure targets the following proportions: debt, 55%; preferred stock, 10%; and common stock, 35%. If the cost of debt is 6.7%, preferred stock costs 9.2%, and common stock costs 10.6%, what is Oxy's weighted average cost of capital (WACC)?

PROBLEMS

Select problems are available in MyLab Finance. The MyLab icon indicates problems in Excel format available in MyLab Finance.

LG 1

P9–1 **Concept of cost of capital and WACC** Mace Manufacturing is in the process of analyzing its investment decision-making procedures. Two projects evaluated by the firm recently involved building new facilities in different regions, North and South. The basic variables surrounding each project analysis and the resulting decision actions are summarized in the following table.

Basic variables	North	South
Initial cost	−$6 million	−$5 million
Life	15 years	15 years
Expected return	8%	15%
Least-cost financing		
Source	Debt	Equity
Cost (after-tax)	7%	16%
Decision		
Action	Invest	Don't invest
Reason	8% > 7% cost	15% < 16% cost

a. An analyst evaluating the North facility expects that the project will be financed by debt that costs the firm 7%. What recommendation do you think this analyst will make regarding the investment opportunity?

b. Another analyst assigned to study the South facility believes that funding for that project will come from the firm's retained earnings at a cost of 16%. What recommendation do you expect this analyst to make regarding the investment?

c. Explain why the decisions in parts **a** and **b** may not be in the best interests of the firm's investors.

d. If the firm maintains a capital structure containing 40% debt and 60% equity, find its weighted average cost of capital (WACC) using the data in the table.

e. If both analysts had used the WACC calculated in part **d**, what recommendations would they have made regarding the North and South facilities?

f. Compare and contrast the analyst's initial recommendations with your findings in part **e**. Which decision method seems more appropriate? Explain why.

LG 3

P9–2 **Cost of debt using both methods** Currently, Jackson Real Estate Inc. can sell 10-year, $100-par-value bonds paying annual interest at a 6% coupon rate. Jackson

can sell its bonds for $106.20 each. Jackson will incur flotation costs of $2.50 per bond in this process. The firm is in the 25% tax bracket.

a. Find the net proceeds from sale of the bond, N_d.
b. Show the cash flow from the firm's point of view over the maturity of the bond.
c. Calculate the before-tax and after-tax costs of debt.
d. Use the approximation formula to estimate the before-tax and after-tax costs of debt.
e. Compare the costs of debt calculated in parts **c** and **d.** Which approach do you prefer? Why?

Personal Finance Problem

LG 3

P9–3 Before-tax cost of debt and after-tax cost of debt Jim Paige is opening his own restaurant, and he is taking out a 10-year mortgage. Jim will borrow $400,000 from a bank, and to repay the loan he will make 120 monthly payments (principal and interest) of $4,420.82 per month over the next 10 years. Jim is in the 30% tax bracket.

a. What is the before-tax interest rate (per year) on Jim's loan?
b. What is the after-tax interest rate that Jim is paying?

LG 3

P9–4 Cost of debt using the approximation formula For each of the following $1,000-par-value bonds, assuming annual interest payment and a 21% tax rate, calculate the after-tax cost to maturity, using the approximation formula.

Bond	Life (years)	Underwriting fee	Discount (−) or premium (+)	Coupon interest rate
A	20	$25	−$20	9%
B	16	40	+10	10
C	15	30	−15	12
D	25	15	par	9
E	22	20	−60	11

LG 3 MyLab

P9–5 The cost of debt Gronseth Drywall Systems Inc. is in discussions with its investment bankers regarding the issuance of new bonds. The investment banker has informed the firm that different maturities will carry different coupon rates and sell at different prices. The firm must choose among several alternatives. In each case, the bonds will have a $1,000 par value and flotation costs will be $30 per bond. The company is taxed at a rate of 21%. Calculate the after-tax cost of financing with each of the following alternatives.

Alternative	Coupon rate	Time to maturity (years)	Premium or discount
A	9%	16	$250
B	7	5	50
C	6	7	par
D	5	10	−75

Personal Finance Problem

LG 3

P9–6 **After-tax cost of debt** Bill William intends to purchase a new racing car. He has decided to borrow money to pay the $500,000 purchase price of the car. He is in the 40% federal income tax bracket. He can either borrow the money at an interest rate of 10% from the car dealer, or he could take out a second mortgage on his home. That mortgage would come with an interest rate of 8%. Interest payments on the mortgage would be tax deductible for Bill, but interest payments on the loan from the car dealer cannot be deducted on Bill's federal tax return.

a. Calculate the after-tax cost of borrowing from the car dealership.
b. Calculate the after-tax cost of borrowing through a second mortgage on Bill's home.
c. Which source of borrowing is less costly for Bill?
d. Should Bill consider any other factors when deciding which loan to take out to pay for the racing car?

LG 4

P9–7 **Cost of preferred stock** Mavis Taylor Corporation has just issued preferred stock. The stock has a 6% annual dividend and a $100 par value, and was sold at $98.5 per share. Flotation costs were an additional $3 per share.

a. Calculate the cost of the preferred stock.
b. If the firm sells the preferred stock with a 10% annual dividend and net $93.00 after flotation costs, what is its cost?

LG 4 MyLab

P9–8 **Cost of preferred stock** Determine the cost for each of the following preferred stocks.

Preferred stock	Par value	Sale price	Flotation cost	Annual dividend
A	$ 25	$ 28	$3.00	6%
B	55	63	$5.00	8%
C	20	28	$2.00	$3.00
D	100	112	5% of par	12%
E	35	43	$2.50	7%

LG 5

P9–9 **Cost of common stock equity: CAPM** Brigham Jewellery Corporation common stock has a beta, β, of 1.8. The risk-free rate is 5%, and the market return is 16%.

a. Determine the risk premium on Brigham common stock.
b. Determine the required return that Brigham common stock should provide.
c. Determine Brigham's cost of common stock equity using the CAPM.

LG 5

P9–10 **Cost of common stock equity** Ross Textiles wishes to measure its cost of common stock equity. The firm's stock is currently selling for $70.67. The firm just recently paid a dividend of $4. The firm has been increasing dividends regularly. Five years ago, the dividend was just $2.99.

After underpricing and flotation costs, the firm expects to net $69 per share on a new issue.

a. Determine average annual dividend growth rate over the past 5 years. Report your answer to the nearest whole percentage. Using that growth rate, what dividend would you expect the company to pay next year?
b. Determine the net proceeds, N_n, that the firm will actually receive.

c. Using the constant-growth valuation model, determine the required return on the company's stock, r_s, which should equal the cost of retained earnings, r_r.
d. Using the constant-growth valuation model, determine the cost of new common stock, r_n.

LG 5 MyLab

P9–11 Retained earnings versus new common stock Using the data for each firm shown in the following table, calculate the cost of retained earnings and the cost of new common stock using the constant-growth valuation model.

Firm	Current market price per share	Dividend growth rate	Projected dividend per share next year	Underpricing per share	Flotation cost per share
A	$50.00	8%	$2.25	$2.00	$1.00
B	20.00	4	1.00	0.50	1.50
C	42.50	6	2.00	1.00	2.00
D	19.00	2	2.10	1.30	1.70

LG 3 LG 4 LG 5 LG 6

P9–12 The effect of tax rate on WACC K. Bell Jewelers wishes to explore the effect on its cost of capital of the rate at which the company pays taxes. The firm wishes to maintain a capital structure of 40% debt, 10% preferred stock, and 50% common stock. The cost of financing with retained earnings is 10%, the cost of preferred stock financing is 8%, and the before-tax cost of debt financing is 6%. Calculate the weighted average cost of capital (WACC) given the tax rate assumptions in parts **a** to **c.**
a. Tax rate = 40%
b. Tax rate = 35%
c. Tax rate = 25%
d. Describe the relationship between changes in the rate of taxation and the WACC.

LG 6

P9–13 WACC: Market value weights Boots Mechanics is based in Manchester, United Kingdom. The market values and after-tax costs of various sources of capital used by the company are shown in the following table.

Source of capital	Market value	Individual cost
20-year bond	£ 6,000,000	8%
Common stock equity	4,000,000	14
Long-term loan	10,000,000	10

a. Calculate the WACC for Boots Mechanics.
b. Explain how the company can use this cost if it wants to invest in a new project.

LG 6

P9–14 WACC: Book weights and market weights Webster Company has compiled the information shown in the following table.

Source of capital	Book value	Market value	After-tax cost
Long-term debt	$4,000,000	$3,840,000	6.0%
Preferred stock	40,000	60,000	13.0
Common stock equity	1,060,000	3,000,000	17.0
Totals	$5,100,000	$6,900,000	

a. Calculate the WACC using book value weights.
b. Calculate the WACC using market value weights.
c. Compare the answers obtained in parts **a** and **b.** Explain the differences.

LG6

P9–15 **WACC and target weights** After careful analysis, Dexter Brothers has determined that its optimal capital structure is composed of the sources and target market value weights shown in the following table.

Source of capital	Target market value weight
Long-term debt	30%
Preferred stock	15
Common stock equity	55
Total	100%

The cost of debt is 4.2%, the cost of preferred stock is 9.5%, the cost of retained earnings is 13.0%, and the cost of new common stock is 15.0%. All are after-tax rates. The company's debt represents 25%, the preferred stock represents 10%, and the common stock equity represents 65% of total capital on the basis of the current market values of the three components. The company expects to have a significant amount of retained earnings available and does not expect to sell any new common stock.
a. Calculate the WACC on the basis of historical market value weights.
b. Calculate the WACC on the basis of target market value weights.
c. Compare the answers obtained in parts **a** and **b.** Explain the differences.

LG3 LG4 LG5 LG6

P9–16 **Cost of capital** GB Timbers GmbH, based in Germany, supplies timber products to construction and manufacturing industries. The company reported after-tax earnings available to common stock of €3,200,000. From these earnings, the management paid a dividend of €0.80 on each of its 4,000,000 common shares outstanding. The capital structure of the company includes 30% debt, 40% common stock, and 30% preferred stock. The tax rate applicable to GB Timbers is 30%.
a. If the market price of the common stock is €3.60 and dividends are expected to grow at a rate of 8% per year for the foreseeable future, what is the required return on the company's common stock?
b. If underpricing and flotation costs on new shares of common stock amount to € 0.40 per share, what is the company's cost of new common stock financing?
c. The company can issue a €1.00 dividend preferred stock for a market price of €10.00 per share. Flotation costs would amount to €0.60 per share. What is the cost of preferred stock financing?
d. In addition, the company can issue €100-par-value, 8% coupon, 10-year bonds that can be sold for €110 each. Flotation costs would amount to €2 per bond. Use the estimation formula to figure the approximate cost of debt financing.
e. What is the WACC?

LG3 LG4 LG5 LG6 MyLab

P9–17 **Calculation of individual costs and WACC** Dillon Labs has asked its financial manager to measure the cost of each specific type of capital as well as the weighted average cost of capital (WACC). The WACC is to be measured by using the following weights: 40% long-term debt, 10% preferred stock, and 50% common stock equity (retained earnings, new common stock, or both). The firm's tax rate is 21%.

Debt The firm can sell for $1,020 a 10-year, $1,000-par-value bond paying annual interest at a 7% coupon rate. A flotation cost of 3% of the par value is required.

Preferred stock An 8% (annual dividend) preferred stock having a par value of $100 can be sold for $98. An additional fee of $2 per share must be paid to the underwriters.

Common stock The firm's common stock is currently selling for $59.43 per share. The stock has paid a dividend that has gradually increased for many years, rising from $2.70 ten years ago to the $4 dividend payment that the company just recently made. If the company wants to issue new common shares, it will sell them $1.50 below the current market value to attract investors, and the company will pay $2 per share in flotation costs.

a. Calculate the after-tax cost of debt.
b. Calculate the cost of preferred stock.
c. Calculate the cost of common stock (both retained earnings and new common stock).
d. Calculate the WACC for Dillon Labs.

Personal Finance Problem

LG 6

P9–18 **Weighted average cost of capital (WACC)** Mandy Robertson has just bought a new house and wants to consolidate her finances. She has three loans outstanding. They all mature in 5 years, and she can repay them without penalty any time before maturity. The following table shows the amounts owed on each loan and the annual interest rate associated with each loan.

Loan	Balance due	Annual interest rate
Car	£12,000	6%
Credit card	9,000	22
Personal	3,000	14

Mandy can also borrow an additional £24,000 to pay off all her loans. Her bank will charge a 12% annual interest rate for a period of 5 years.

Should Mandy do nothing (pay off her loans individually) or borrow this additional sum to repay her loans together?

LG 3 LG 4 LG 5 LG 6

P9–19 **Calculation of individual costs and WACC** Lang Enterprises is interested in measuring its overall cost of capital. Current investigation has gathered the following data. The firm is in the 21% tax bracket.

Debt The firm can raise debt by selling $1,000-par-value, 8% coupon interest rate, 20-year bonds on which annual interest payments will be made. To sell the issue, an average discount of $30 per bond would have to be given. The firm also must pay flotation costs of $30 per bond.

Preferred stock The firm can sell 8% preferred stock at its $95-per-share par value. The cost of issuing and selling the preferred stock is expected to be $5 per share. Preferred stock can be sold under these terms.

Common stock The firm's common stock is currently selling for $90 per share. The firm expects to pay cash dividends of $7 per share next year. The firm's dividends have been growing at an annual rate of 6%, and this growth is expected to continue into the future. The stock must be underpriced by $7 per share, and flotation costs are expected to amount to $5 per share. The firm can sell new common stock under these terms.

Retained earnings When measuring this cost, the firm does not concern itself with the tax bracket or brokerage fees of owners. It expects to have available $100,000 of retained earnings in the coming year; once these retained earnings are exhausted, the firm will use new common stock as the form of common stock equity financing.

a. Calculate the after-tax cost of debt.
b. Calculate the cost of preferred stock.
c. Calculate the cost of common stock.
d. Calculate the firm's WACC using the capital structure weights shown in the following table. (Round answer to the nearest 0.1%.)

Source of capital	Weight
Long-term debt	30%
Preferred stock	20
Common stock equity	50
Total	100%

LG 6

P9–20 **Weighted average cost of capital (WACC)** Tack Laser Ltd., a high-end medical equipment manufacturer, is trying to decide whether to revise its target capital structure. Currently, it targets a structure with 40% debt, but it is considering a target capital structure with 60% debt. Tack Laser currently has an 8% after-tax cost of debt and a 14% cost of common stock. The company does not have any other stock or debt outstanding.

a. What is Tack Laser's current WACC?
b. Assuming that its cost of debt and equity remain unchanged, what will be Laser Tack's WACC under the revised target capital structure?
c. Do you think that shareholders are affected by the increase in debt to 60%? If so, how are they affected? Are their common stock claims riskier now?
d. Suppose that in response to the increase in debt, Tack Laser's shareholders increase their required return so that the cost of common equity is 18%. What will its new WACC be in this case? Is it still advisable for the management to revise the target capital structure?
e. Based on your answers to parts **a** to **d**, explain the tradeoff between financing with debt versus equity.

LG 1

P9–21 **ETHICS PROBLEM** During the 1990s, General Electric put together a long string of consecutive quarters in which the firm managed to meet or beat the earnings forecasts of Wall Street stock analysts. Some skeptics wondered if GE "managed" earnings to meet Wall Street's expectations, meaning that GE used accounting gimmicks to conceal the true volatility in its business. How do you think GE's long-run track record of meeting or beating earnings forecasts affected its cost of capital? If investors learn that GE's performance was achieved largely through accounting gimmicks, how do you think they would respond?

SPREADSHEET EXERCISE

Nova Corporation is interested in measuring the cost of each specific type of capital as well as the weighted average cost of capital (WACC). Historically, the firm has raised capital in the following manner:

Source of capital	Weight
Long-term debt	35%
Preferred stock	12
Common stock equity	53

The tax rate of the firm is currently 21%. The needed financial information and data are as follows:

Debt Nova can raise debt by selling $1,000-par-value, 6.5% coupon interest rate, 10-year bonds on which annual interest payments will be made. To sell the issue, an average discount of $20 per bond needs to be given. There is an associated flotation cost of 2% of par value.

Preferred stock Preferred stock can be sold under the following terms: The security has a par value of $100 per share, the annual dividend rate is 6% of the par value, and the flotation cost is expected to be $4 per share. The preferred stock is expected to sell for $102 before cost considerations.

Common stock The current price of Nova's common stock is $35 per share. The cash dividend is expected to be $3.25 per share next year. The firm's dividends have grown at an annual rate of 5%, and it is expected that the dividend will continue at this rate for the foreseeable future. The flotation costs are expected to be approximately $2 per share. Nova can sell new common stock under these terms.

Retained earnings The firm expects to have available $100,000 of retained earnings in the coming year. Once these retained earnings are exhausted, the firm will use new common stock as the form of common stock equity financing. (*Note:* When measuring this cost, the firm does not concern itself with the tax bracket or brokerage fees of owners.)

TO DO

Create a spreadsheet to answer the following questions:

a. Calculate the after-tax cost of debt.
b. Calculate the cost of preferred stock.
c. Calculate the cost of retained earnings.
d. Calculate the cost of new common stock.
e. Calculate the firm's WACC using retained earnings and the capital structure weights shown in the table above.
f. Calculate the firm's WACC using new common stock and the capital structure weights shown in the table above.

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PART FIVE

Long-Term Investment Decisions

CHAPTERS IN THIS PART

Probably nothing that financial managers do contributes more to the firm's goal of maximizing shareholder value than making good investment decisions. The term *capital budgeting* describes the process for evaluating and selecting investment projects. Often, investment projects can be very large, such as building a new plant or launching a new product line. These endeavors can create enormous value for shareholders, but they can also bankrupt the company. In Part Five, you'll learn how financial managers decide which investment opportunities to pursue.

Chapter 10 discusses the capital budgeting tools that financial managers and analysts use to evaluate the merits of an investment. Some of these techniques are quite intuitive and simple to use, such as payback analysis. Others are a little more complex, such as the net present value and internal rate of return approaches. In general, the more complex techniques provide more comprehensive evaluations, but the simpler approaches often lead to the same value-maximizing decisions.

Chapter 11 illustrates how to develop the capital budgeting cash flows and introduces additional techniques for evaluating the risks inherent in investment projects. After studying this chapter, you will understand the inputs that are necessary to build the relevant cash flows needed to determine whether a particular investment is likely to create or destroy value for shareholders. You will also understand how financial managers assess the risk associated with investment projects and adjust the capital budgeting process accordingly.

CHAPTER 10

Capital Budgeting Techniques

LEARNING GOALS

- LG1 Understand the key elements of the capital budgeting process.
- LG2 Calculate, interpret, and evaluate the payback period.
- LG3 Calculate, interpret, and evaluate the net present value (NPV) and economic value added (EVA).
- LG4 Calculate, interpret, and evaluate the internal rate of return (IRR).
- LG5 Use net present value profiles to compare NPV and IRR techniques.
- LG6 Discuss NPV and IRR in terms of conflicting rankings and the strengths of each approach.

MyLab Finance Chapter Introduction Video

WHY THIS CHAPTER MATTERS TO YOU

In your *professional* life

ACCOUNTING You need to understand capital budgeting techniques to help determine the relevant cash flows associated with proposed capital expenditures.

INFORMATION SYSTEMS You need to understand capital budgeting techniques to design decision modules that help reduce the amount of work required to analyze proposed capital expenditures.

MANAGEMENT You need to understand capital budgeting techniques to correctly analyze the relevant cash flows of proposed projects and decide whether to accept or reject them.

MARKETING You need to understand capital budgeting techniques to grasp how the firm's decision makers will evaluate proposals for new marketing programs, for new products, and for the expansion of existing product lines.

OPERATIONS You need to understand capital budgeting techniques to know how the firm's decision makers will evaluate proposals for the acquisition of new equipment and plants.

In your *personal* life

You can apply the capital budgeting techniques used by financial managers to measure either the value of a given asset purchase or its compound rate of return. The IRR technique is widely applied in personal finance to measure both the actual and the forecast rate of returns on investment securities, real estate, credit card debt, consumer loans, and leases.

LG 1

10.1 Overview of Capital Budgeting

capital budgeting
The process of evaluating and selecting long-term investments that contribute to the firm's goal of maximizing owners' wealth.

Long-term investments represent sizable outlays of funds that commit a firm to some course of action. Consequently, the firm needs procedures to analyze and select its long-term investments. **Capital budgeting** is the process of evaluating and selecting long-term investments that contribute to the firm's goal of maximizing owners' wealth. Firms typically make a variety of long-term investments, such as investments in fixed assets, which include property (land), plant, and equipment, and investments in research and development. These assets, often referred to as earning assets, generally provide the basis for the firm's earning power and value.

When undertaking large investments, firms typically have to answer two separate questions. First, is the investment a good one, meaning does it create value for shareholders? Second, where will the money to pay for the investment come from? Will the firm pay the up-front costs using equity, debt, or a mixture of the two? For now we focus exclusively on the first decision, the investment decision. Chapters 10 and 11 concentrate on the tools that financial managers use to make good investment decisions without regard to the specific method of financing used. We begin by discussing the motives for capital expenditure.

MOTIVES FOR CAPITAL EXPENDITURE

capital expenditure
An outlay of funds by the firm that the firm expects to produce benefits over a period of time greater than 1 year.

operating expenditure
An outlay of funds by the firm resulting in benefits received within 1 year.

A **capital expenditure** is an outlay of funds that the firm expects to produce benefits over a period of time greater than 1 year. An **operating expenditure** is an outlay resulting in benefits received within 1 year. Fixed-asset outlays are capital expenditures, but not all capital expenditures are classified as fixed assets. A $600,000 outlay for a new machine with a usable life of 15 years is a capital expenditure that would appear as a fixed asset on the firm's balance sheet. A $6 million outlay for an advertising campaign that produces benefits over a long period is also a capital expenditure, but it would rarely be shown as a fixed asset. In either case, the potential expenditure of funds to generate benefits over a long time period is an investment project that the firm's analysts should evaluate to determine whether it is likely to increase or decrease shareholder value.

Companies invest large sums in many different kinds of projects. Some of the more common investment projects are capital expenditures to expand operations, to replace or renew fixed assets, and to obtain some other, less tangible benefit over a long period.

STEPS IN THE PROCESS

capital budgeting process
Consists of five distinct but interrelated steps: *proposal generation, review and analysis, decision making, implementation,* and *follow-up.*

The **capital budgeting process** consists of five distinct but interrelated steps:

1. *Proposal generation.* Managers at all levels in a business make proposals for new investment projects that are reviewed by finance personnel. Proposals that require large outlays receive greater scrutiny than less costly ones.
2. *Review and analysis.* Financial managers perform formal review and analysis to assess the merits of investment proposals.
3. *Decision making.* Firms typically delegate capital expenditure decisions on the basis of dollar limits. Generally, the board of directors or a team of very senior executives must authorize expenditures beyond a certain amount. Often, plant managers have authority to make decisions necessary to keep the production line moving.

4. *Implementation*. Following approval, firms make expenditures and implement projects. Expenditures for a large project often occur in phases.
5. *Follow-up*. Managers monitor results and compare actual costs and benefits to the projections that they originally used to justify making the investment. Managers may take actions to expand, contract, or shut down investments when actual outcomes differ from projected ones.

Each step in the process is important. Review and analysis and decision making (Steps 2 and 3) consume the majority of time and effort, however. Follow-up (Step 5) is an important but often ignored step aimed at allowing the firm to improve the accuracy of its cash flow estimates and increase the value of its investments on an ongoing basis. Our focus here is on project review and analysis (Step 2) and decision making (Step 3).

BASIC TERMINOLOGY

Before developing the concepts, techniques, and practices related to the capital budgeting process, we need to explain some basic terminology. In addition, we will present some key assumptions that simplify the discussion in the remainder of this chapter and in Chapter 11.

Independent versus Mutually Exclusive Projects

independent projects
Projects whose cash flows are unrelated to (or independent of) one another; accepting or rejecting one project does not change the desirability of other projects.

mutually exclusive projects
Projects that compete with one another so that the acceptance of one eliminates from further consideration all other projects that serve a similar function.

Most investments fall into one of two categories: (1) independent projects, or (2) mutually exclusive projects. **Independent projects** are those with cash flows unrelated to (or independent of) one another; accepting or rejecting one project does not change the desirability of other projects. **Mutually exclusive projects** are those that have essentially the same function and therefore compete with one another. Accepting one project eliminates from further consideration all other projects that serve a similar function. For example, a firm in need of increased production capacity could obtain it by (1) expanding its plant, (2) acquiring another company, or (3) contracting with another company for production. Clearly, accepting any one option eliminates the immediate need for either of the others.

Unlimited Funds versus Capital Rationing

unlimited funds
The financial situation in which a firm is able to accept all independent projects that provide an acceptable return.

capital rationing
The financial situation in which a firm has only a fixed number of dollars available for capital expenditures and numerous projects compete for these dollars.

The availability of funds for capital expenditures affects the firm's decisions. If a firm has **unlimited funds** for investment (or if it can raise as much money as it needs by borrowing or issuing stock), making capital budgeting decisions is quite simple: The firm should invest in all projects that will provide an acceptable return. Often, though, firms operate under **capital rationing** instead, which means that they have a fixed budget available for capital expenditures and that numerous projects will compete for these dollars. We present procedures for dealing with capital rationing in Chapter 11. For now, we will assume that if a firm identifies an investment project that will make its shareholders better off, the firm can either use its existing financial resources or raise external funding to pay for the investment.

Accept–Reject versus Ranking Approaches

accept–reject approach
The evaluation of capital expenditure proposals to determine whether they meet the firm's minimum acceptance criterion.

Two standard approaches to capital budgeting decisions are available. The **accept–reject approach** involves evaluating capital expenditure proposals to determine whether they meet the firm's minimum acceptance criterion.

Managers might use this approach if they have sufficient funds to invest in every project that creates value for shareholders, or they might use it to narrow down a large list of investment opportunities, only some of which will receive additional scrutiny.

ranking approach
The ranking of capital expenditure projects on the basis of some predetermined measure, such as how much value the project creates for shareholders.

The second method, the **ranking approach,** involves ranking projects on the basis of some predetermined measure, such as how much value the project creates for shareholders. The purpose of ranking projects is to ensure that if the firm cannot invest in every worthwhile project, it invests in the combination of projects that maximize shareholder wealth. In other words, ranking is useful in selecting the "best" of a group of acceptable projects and in evaluating projects when firms have limited capital.

CAPITAL BUDGETING TECHNIQUES

Large firms evaluate dozens, perhaps even hundreds, of different ideas for new investments each year. To ensure that the investment projects selected have the best chance of increasing the value of the firm, financial managers need tools to help them evaluate the merits of individual projects and to rank competing investments. A number of techniques are available for performing such analyses. The best techniques take into account the time value of money as well as the tradeoff between risk and return. Project evaluation methods that fail to account for money's time value or for risk may not lead to shareholder value maximization.

Bennett Company's Relevant Cash Flows

We will use one basic problem to illustrate all the techniques described in this chapter. The problem concerns Bennett Company, a medium-sized metal fabricator that is currently contemplating two projects with conventional cash flow patterns:[1] Project A requires an initial investment of $420,000, and project B requires an initial investment of $450,000. The projected cash flows for the two projects appear in Table 10.1 and on the timelines in Figure 10.1. Both projects

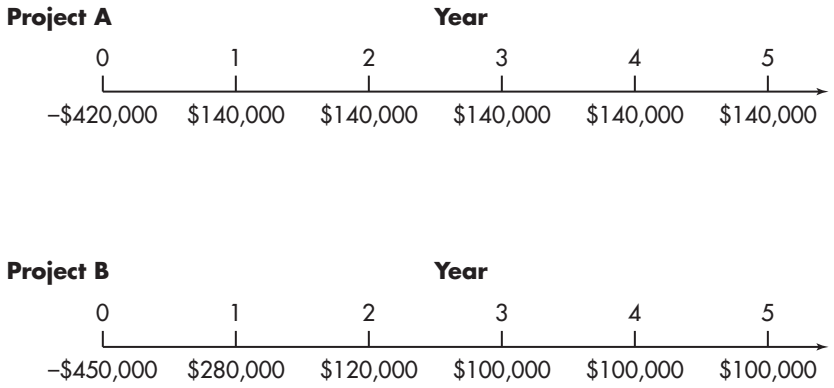
TABLE 10.1 Capital Expenditure Data for Bennett Company

	Project A	Project B
Initial investment	−$420,000	−$450,000
Year	Operating cash inflows	
1	$140,000	$280,000
2	140,000	120,000
3	140,000	100,000
4	140,000	100,000
5	140,000	100,000

1. A conventional cash flow pattern is one in which the up-front cash flow is negative and all subsequent cash flows are positive. A nonconventional pattern occurs if the up-front cash flow is positive and subsequent cash flows are negative (e.g., when a firm sells extended warranties and pays benefits later) or when the cash flows fluctuate between positive and negative (as might occur when firms have to reinvest in a project to extend its life).

FIGURE 10.1

Bennett Company's Projects A and B
Timelines depicting the conventional cash flows of projects A and B



involve one initial cash outlay followed by annual cash inflows, a fairly typical pattern for new investments. We begin with a look at the three most widely used capital budgeting techniques: payback period, net present value, and internal rate of return.

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10–1 What is the financial manager's goal in selecting investment projects for the firm? Define the capital budgeting process, and explain how it helps managers achieve their goal.

LG 2

10.2 Payback Period

payback period
The time it takes an investment to generate cash inflows sufficient to recoup the initial outlay required to make the investment.

Small and medium-sized firms often use the payback period approach to evaluate proposed investments. The **payback period** is the time it takes an investment to generate cash inflows sufficient to recoup the initial outlay required to make the investment. In the case of an annuity (such as the Bennett Company's project A), you can calculate the payback period by dividing the initial investment by the annual cash inflow. For a mixed stream of cash inflows (such as project B), simply add up the yearly cash inflows until the accumulated sum equals (or exceeds) the initial investment.

Many firms use the payback period because it is simple to calculate and to understand. Unfortunately, the payback method has some serious flaws, which we will discuss shortly, and because of those flaws making investment decisions based on the payback period may not accomplish the firm's goal of maximizing shareholder wealth.

DECISION CRITERIA

When firms use the payback period to decide whether to accept or reject an investment opportunity, managers follow this decision rule:

- If the payback period is less than the maximum acceptable payback period, accept the project.
- If the payback period is greater than the maximum acceptable payback period, reject the project.

What is the maximum acceptable payback period? Ultimately, managers decide what payback period they deem acceptable, but that decision is quite subjective—perhaps even arbitrary. The length of the maximum acceptable payback period often depends on factors such as the type of project (expansion, replacement or renewal, other), the product life cycle, the perceived risk of the project, and the perceived relationship between the payback period and the share value.

EXAMPLE 10.1

We can calculate the payback period for Bennett Company's projects A and B, using the data in Table 10.1. For project A, which is an annuity, the payback period is 3.0 years ($420,000 initial investment ÷ $140,000 annual cash inflow). Because project B generates a mixed stream of cash inflows, the calculation of its payback period is not as clear-cut. In year 1, the firm will recover $280,000 of its $450,000 initial investment. By the end of year 2, $400,000 ($280,000 from year 1 + $120,000 from year 2) will have been recovered. At the end of year 3, $500,000 will have been recovered. Only 50% of the year-3 cash inflow of $100,000 is needed to complete the payback of the initial $450,000. The payback period for project B is therefore 2.5 years (2 years + 50% of year 3).

If Bennett's maximum acceptable payback period were 2.75 years, project A would be rejected and project B would be accepted. If the maximum acceptable payback period were 2.25 years, both projects would be rejected. If the projects were being ranked, B would be preferred over A because it has a shorter payback period. Note, however, that no matter what payback period Bennett requires, it is unclear from payback analysis which investment will do the most to increase shareholder wealth. All we can say is that project B recoups the initial investment more rapidly than does project A.

MATTER OF FACT

Payback in India

A 2017 survey of firms in India found that two-thirds of those firms always or almost always conducted payback analysis when they made major investment decisions. Similar to results found in U.S. firms, small companies in India were more likely than large firms to use the payback approach. For all its flaws, the payback approach still sees widespread use around the world.

PROS AND CONS OF PAYBACK ANALYSIS

Large firms sometimes use the payback approach to evaluate small projects (or as one of several metrics used to judge a larger project's merits), and small firms use it to evaluate most projects. The payback method's popularity results from its simplicity and intuitive appeal. By measuring how quickly the firm recovers its initial investment, the payback period also gives at least some consideration to the timing of cash flows. Likewise, the payback approach offers a crude way to adjust for project risk if managers require a faster payback on riskier endeavors.

The major weakness of the payback period is that the appropriate payback period is merely a subjectively determined number. No firm connection exists between the payback period and the goal of shareholder wealth maximization. To make that point another way, it is easy to think of an investment project that takes

a long time to pay off (and hence would be rejected for having a very slow payback period) but creates enormous value for shareholders. For example, almost any research and development project conducted by a pharmaceutical firm would fit this description. It takes years for a drug to progress through the initial discovery phase and a series of clinical trials before the firm can sell it to patients. That process can cost drug companies millions or even hundreds of millions of dollars, and almost no drug compound can recover those costs within a few years. However, a successful drug creates enormous value for shareholders in the long run.

PERSONAL FINANCE EXAMPLE 10.2 Gabriela Perez is considering investing $20,000 to obtain a 5% interest in a rental property. Her good friend and real estate agent, Josh Williams, put the deal together, and he estimates that Gabriela should receive between $4,000 and $6,000 per year in cash from her 5% interest in the property. Gabriela expects to remain in the 25% income-tax bracket for quite a while, and she will not make an investment unless the after-tax cash flows pay back the initial cost in fewer than 7 years.

Gabriela's calculation of the payback period on this deal begins with computing the range of annual after-tax cash flow:

$$\begin{aligned}\text{After-tax cash flow} &= (1 - \text{tax rate}) \times \text{Pre-tax cash flow}\\ &= (1 - 0.25) \times \$4{,}000 = \$3{,}000\\ &= (1 - 0.25) \times \$6{,}000 = \$4{,}500\end{aligned}$$

The after-tax cash flow ranges from $3,000 to $4,500. Dividing the $20,000 initial investment by each of the estimated after-tax cash flows, we get the payback period:

$$\begin{aligned}\text{Payback period} &= \text{Initial investment} \div \text{After-tax cash flow}\\ &= \$20{,}000 \div \$3{,}000 = 6.67 \text{ years}\\ &= \$20{,}000 \div \$4{,}500 = 4.44 \text{ years}\end{aligned}$$

Because Gabriela's proposed rental property investment will pay itself back in either scenario in fewer than 7 years, the investment is acceptable.

In addition to lacking a firm connection to the shareholder value maximization goal, the payback approach suffers from a second weakness—payback calculations fail to fully account for the time value of money.[2] An example illustrates this weakness.

EXAMPLE 10.3 DeYarman Enterprises, a small medical appliance manufacturer, is considering two mutually exclusive projects named Gold and Silver (i.e., DeYarman can invest in only one project, not both). The firm uses the payback period to choose projects, and it requires any investment to recover its initial cost within 4 years. The cash flows and payback period for each project appear in Table 10.2. Both

2. To consider differences in timing explicitly in applying the payback method, some firms use the *discounted payback approach*. To find the discounted payback period, managers first calculate the present value of the cash inflows at the appropriate discount rate and then find the payback period by using those cash flows rather than undiscounted cash flows.

TABLE 10.2 Relevant Cash Flows and Payback Periods for DeYarman Enterprises' Projects

	Project Gold	Project Silver
Initial investment	−$50,000	−$50,000
Year	Operating cash inflows	
1	$ 5,000	$40,000
2	5,000	2,000
3	40,000	8,000
4	10,000	10,000
5	10,000	10,000
Payback period	3 years	3 years

projects have 3-year payback periods, which would suggest that they are equally desirable. But comparing the cash flow patterns of each investment immediately reveals that Silver produces more cash flow sooner than Gold. In year 1, Silver generates $40,000 in cash inflow compared to just $5,000 for Gold. We know that because money has a time value, it is preferable to receive cash flow sooner rather than later. The payback approach fails to recognize that benefit. Any capital budgeting tool that properly accounts for the time value of money would suggest that project Silver is better for shareholders than project Gold.

A third weakness of the payback method is that it places no value on (i.e., totally ignores) cash flows that arrive after the payback period. Thus, the payback method will fail to recognize the true value of investments that deliver cash flow in the more distant future.

EXAMPLE 10.4

Rashid Company, a software developer, has two investment opportunities, X and Y. Data for X and Y appear in Table 10.3. The payback period for project X is 2 years; for project Y, it is 3 years. Strict adherence to the payback approach suggests that project X is preferable to project Y. However, if we look beyond the payback period, we see that project X returns only an additional $1,200 ($1,000 in year 3 + $100 in year 4 + $100 in year 5), whereas project Y returns an

TABLE 10.3 Calculation of the Payback Period for Rashid Company's Two Alternative Investment Projects

	Project X	Project Y
Initial investment	−$10,000	−$10,000
Year	Operating cash inflows	
1	$5,000	$3,000
2	5,000	4,000
3	1,000	3,000
4	100	4,000
5	100	3,000
Payback period	2 years	3 years

additional $7,000 ($4,000 in year 4 + $3,000 in year 5). On the basis of this information, project Y appears preferable to X. The payback approach ignored the cash inflows occurring after the end of the payback period.

→ REVIEW QUESTIONS MyLab Finance Solutions

10–2 What is the payback period? How is it calculated?

10–3 What weaknesses are commonly associated with the use of the payback period to evaluate a proposed investment?

LG3

10.3 Net Present Value (NPV)

The method used by most large companies to evaluate investment projects is called *net present value (NPV)*. The intuition behind the NPV method is simple. When firms make investments, they are spending money that they obtained, in one form or another, from investors. Investors expect a return on the money that they give to firms, so a firm should undertake an investment only if the present value of the cash flow that the investment generates is greater than the cost of making the investment in the first place. Because the *NPV* method takes into account the time value of investors' money, it is more likely to identify value-increasing investments than is the payback rule. The NPV method discounts the investment's cash flows at a rate that reflects the investment's risk—cash flows from riskier investments are discounted at higher rates. The discount rate in an NPV calculation is the minimum return that a project must earn to satisfy the firm's investors. Projects with lower returns fail to meet investors' expectations and therefore decrease the firm's value, and projects with higher returns increase the firm's value.

net present value (NPV)
A capital budgeting technique that measures an investment's value by calculating the present value of its cash inflows and outflows.

In many cases, an investment project begins with a cash outflow that is then followed by a series of cash inflows over several years. In this instance, the **net present value (NPV)** is found by subtracting a project's initial investment (CF_0) from the present value of its cash inflows (CF_t) discounted at a rate that is appropriate given the investment's risk (r):

$$\text{NPV} = \text{Present value of cash inflows} - \text{Initial investment}$$

$$NPV = \sum_{t=1}^{n} \frac{CF_t}{(1 + r)^t} - CF_0 \tag{10.1}$$

Of course, not every investment opportunity has this kind of standard cash flow pattern. Sometimes firms receive money up front and have to pay out cash in later years. Other times a project requires several years of cash outflows before inflows begin. Therefore, a more general equation for an investment's NPV is

$$NPV = \sum_{t=0}^{n} \frac{CF_t}{(1 + r)^t} \tag{10.1a}$$

where CF_t in any period (including period 0) can be positive or negative.

Even though the investments that firms make are not equally risky, in practice some firms apply the same discount rate to every investment project. When that is the case, firms typically use their weighted average cost of capital (WACC) as the discount rate, r, in Equations 10.1 and 10.1a.

DECISION CRITERIA

When managers use the NPV method to decide whether to accept or reject an investment proposal, the decision rule they follow is:

- If the NPV is greater than $0, accept the project.
- If the NPV is less than $0, reject the project.

If the NPV is greater than $0, the firm will earn a return greater than its cost of capital. Such action should increase the market value of the firm, and therefore the wealth of its owners, by an amount equal to the NPV.

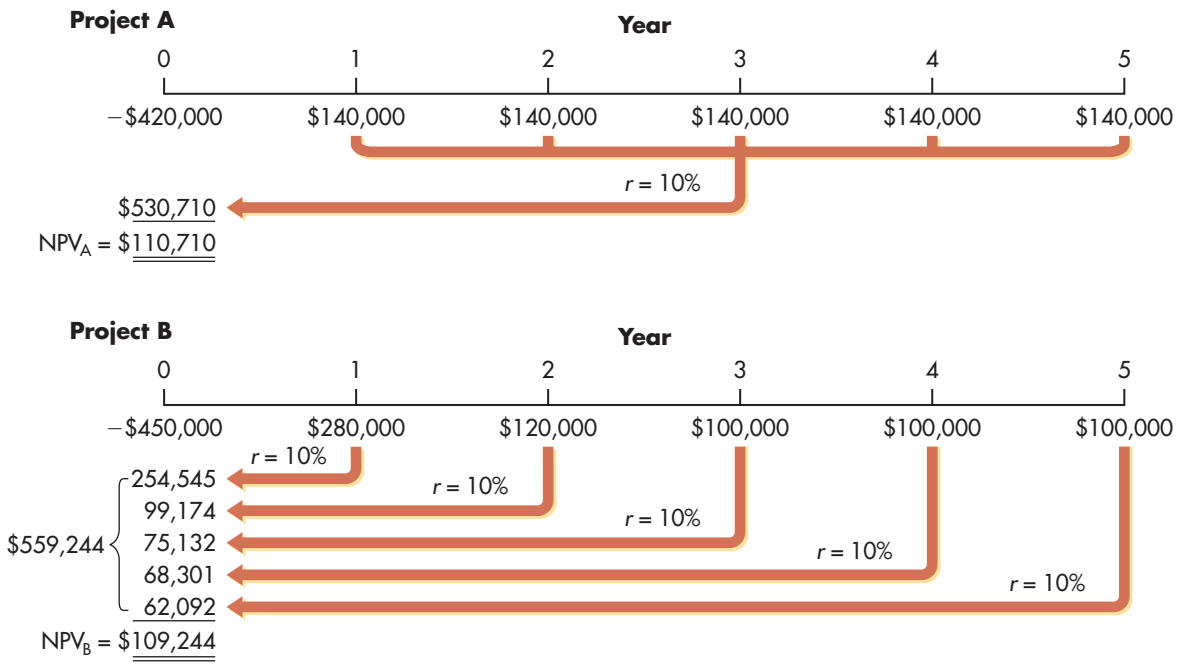
EXAMPLE 10.5

MyLab Finance Solution Video

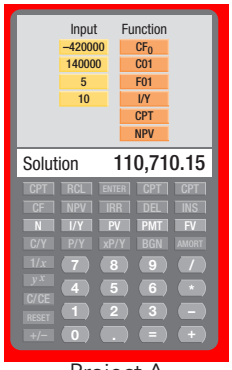
We can illustrate the NPV approach by using the Bennett Company data presented in Table 10.1. Figure 10.2 shows the calculation of the NPV for projects A and B, assuming that Bennett discounts project cash flows at 10%. These calculations result in net present values for projects A and B of $110,710 and $109,244, respectively. Both projects are acceptable because the net present value of each is

FIGURE 10.2

Calculation of NPVs for Bennett Company's Capital Expenditure Alternatives
Timelines depicting the cash flows and NPV calculations for projects A and B

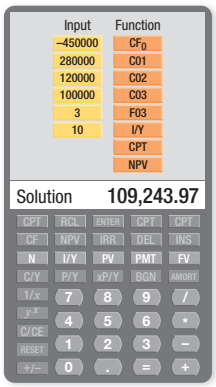


MyLab Finance Financial Calculator



Project A

MyLab Finance Financial Calculator



Project B

greater than $0. If the projects were being ranked, however, project A would be considered superior to B because its net present value is higher than that of B.

Calculator use We can use the cash flow register CF and preprogrammed NPV function in a financial calculator to perform the NPV calculation. The keystrokes for project A begin with entering the investment amount as a cash outflow at time 0, $CF_0 = -420{,}000$, then enter the first annuity cash inflow, $CF_1 = 140{,}000$, and then indicate the frequency of the annuity's cash inflow, $F01 = 5$. After entering the discount rate, $I/Y = 10$, compute the NPV.

The keystrokes for project B—the mixed stream—appear in the left margin. Because the last three cash inflows for project B are the same ($CF_3 = CF_4 = CF_5 = 100{,}000$), after inputting the first of these cash inflows, CF_3, we merely input its frequency, $F03 = 3$.

The calculated NPVs for projects A and B of $110,710 and $109,244, respectively, agree with the NPVs already cited.

Spreadsheet use The following Excel screenshot illustrates how to calculate the NPVs using a spreadsheet.

MyLab

	A	B	C
1	DETERMINING THE NET PRESENT VALUE		
2	Firm's cost of capital		10%
3		Year-End Cash Flow	
4	Year	Project A	Project B
5	0	$ −420,000	$ −450,000
6	1	$ 140,000	$ 280,000
7	2	$ 140,000	$ 120,000
8	3	$ 140,000	$ 100,000
9	4	$ 140,000	$ 100,000
10	5	$ 140,000	$ 100,000
11	NPV	$ 110,710	$ 109,244
12	Choice of project		Project A

Entry in Cell B11 is
=NPV(C2,B6:B10)+B5.
Copy the entry in Cell B11 to Cell C11.
Entry in Cell C12 is =IF(B11>C11,B4,C4).

NPV AND THE PROFITABILITY INDEX

A variation of the NPV rule is called the profitability index (PI). For a project that has an initial cash outflow followed by cash inflows, the profitability index (PI) is simply equal to the present value of cash inflows divided by the absolute value of the initial cash outflow:[3]

$$PI = \frac{\sum_{t=1}^{n} \frac{CF_t}{(1 + r)^t}}{|CF_0|} \tag{10.2}$$

3. For projects with outflows that span several years, the denominator in Equation 10.2 becomes the absolute value of the present value of those early cash outflows.

When companies evaluate investment opportunities using the PI, the decision rule they follow is to invest in the project when the index is greater than 1.0. A PI greater than 1.0 implies that the present value of cash inflows is greater than the (absolute value of the) initial cash outflow, so a profitability index greater than 1.0 corresponds to a net present value greater than 0. In other words, the NPV and PI methods will always come to the same conclusion regarding whether a particular investment is worth doing or not.

EXAMPLE 10.6

MyLab Finance Solution Video

We can refer back to Figure 10.2, which shows the present value of cash inflows for projects A and B, to calculate the PI for each of Bennett's investment options:

$$PI_A = \$530{,}710 \div \$420{,}000 = 1.26$$
$$PI_B = \$559{,}244 \div \$450{,}000 = 1.24$$

According to the profitability index, both projects are acceptable (because PI $>$ 1.0 for both), which shouldn't be surprising because we already know that both projects have positive NPVs. Furthermore, in this particular case, the NPV rule and the PI both indicate that project A is preferred over project B. It is not always true that the NPV and PI methods will rank projects in exactly the same order. Different rankings can occur when alternative projects require initial outlays that have very different magnitudes.

NPV AND ECONOMIC VALUE ADDED

Economic Value Added (EVA), a registered trademark of the consulting firm Stern Stewart & Co., is another close cousin of the NPV method. Whereas the NPV approach calculates the value of an investment over its entire life, the EVA approach gives managers a tool to measure an investment's performance on a year-by-year basis. The EVA method begins the same way that NPV does: by calculating a project's net cash flows. However, the EVA approach subtracts from those cash flows a charge that is designed to capture the return that the firm's investors demand on the project. That is, the EVA calculation asks whether a project generates positive cash flows above and beyond what investors demand. If so, the project is worth undertaking.

pure economic profit
A profit above and beyond the normal competitive rate of return in a line of business.

The EVA method determines whether a project earns a *pure economic profit*. When accountants say that a firm has earned a profit, they mean that revenues are greater than expenses. But the term **pure economic profit** refers to a profit that is higher than expected given the competitive rate of return on a particular line of business. A firm that shows a positive profit on its income statement may or may not earn a pure economic profit, depending on how large the profit is relative to the capital invested in the business. For instance, in the four quarters ending on March 31, 2017, Exxon Mobile Corporation, the oil-producing giant, reported that it had earned a net profit of $10 billion. Does that seem like a large profit? Perhaps it doesn't when you consider that Exxon's balance sheet showed total assets of more than $344 billion. In other words, Exxon's profit represented a return of 2.9% on the firm's assets. That return was slightly less than the return offered by a 30-year Treasury bond at that time. Exxon shareholders surely expect a risk premium above Treasury rates, so the company's performance fell below the expectations of their investors. Thus, the company earned a *pure economic loss* over those four quarters. Stated differently, Exxon's EVA

during that period was negative because it did not earn a return greater than its cost of capital.

EXAMPLE 10.7

Suppose that a certain project costs $1,000,000 up front, but after that it will generate net cash inflows each year (in perpetuity) of $120,000. To calculate the NPV of this project, we would simply discount the cash flows and add them up. If the firm's cost of capital is 10%, the project's NPV is:[4]

$$\text{NPV} = -\$1{,}000{,}000 + (\$120{,}000 \div 0.10) = \$200{,}000$$

To calculate the investment's economic value added in any particular year, we start with the annual $120,000 cash flow. Next, we assign a charge that accounts for the return that investors demand on the capital invested by the firm in the project. In this case, the firm invested $1,000,000, and investors expect a 10% return. This means that the project's annual capital charge is $100,000 ($1,000,000 × 10%), and its EVA is $20,000 per year:

$$\begin{aligned}\text{EVA} &= \text{project cash flow} - [(\text{cost of capital}) \times (\text{invested capital})] \\ &= \$120{,}000 - \$100{,}000 = \$20{,}000\end{aligned}$$

In other words, this project earns more than its cost of capital each year, so the project is clearly worth doing. To calculate the EVA for the project over its entire life, we would simply discount the annual EVA figures using the firm's cost of capital. In this case, the project produces an annual EVA of $20,000 in perpetuity. Discounting at 10% gives a project EVA of $200,000 ($20,000 ÷ 0.10), identical to the NPV. In this example, both the NPV and EVA methods reach the same conclusion, namely, that the project creates $200,000 in value for shareholders. If the cash flows in our example had fluctuated through time rather than remaining fixed at $120,000 per year, an analyst would calculate the investment's EVA every year and then discount those figures to the present, using the firm's cost of capital. If the resulting figure is positive, the project generates a positive EVA and is worth doing.

→ REVIEW QUESTIONS MyLab Finance Solutions

10–4 How is the net present value (NPV) calculated for a project with a conventional cash flow pattern?

10–5 What decision rule do managers follow when they use NPV to accept or reject investment ideas? How is an investment's NPV related to the firm's market value?

10–6 Explain the similarities and differences between NPV, PI, and EVA.

→ EXCEL REVIEW QUESTION MyLab Finance Solutions

10–7 Almost all firms have to deal with limited financial resources and therefore cannot undertake all positive NPV projects. With the information provided at MyLab Finance, use a spreadsheet to rank various projects based on their NPVs.

4. We are using Equation 5.7 to calculate the present value of the perpetual stream of $120,000 cash flows.

LG4

10.4 Internal Rate of Return (IRR)

internal rate of return (IRR)
The discount rate that equates the NPV of an investment opportunity with $0 (because the present value of cash inflows equals the initial investment); it is the rate of return that the firm will earn if it invests in the project and receives the given cash inflows.

The **internal rate of return (IRR)** is the discount rate that makes the NPV of an investment opportunity equal to $0. In other words, the IRR is the discount rate that equates the present value of a project's cash inflows to the present value of its cash outflows. The IRR has another interpretation, similar to the yield to maturity (YTM) on a bond. The IRR is the average annual compound rate of return that a company earns on an investment project, assuming that project inflows and outflows occur as projected. Mathematically, the IRR is the value of r in Equation 10.1 that causes the NPV to equal $0. Replacing r in Equation 10.1 with IRR, we have

$$\$0 = \sum_{t=1}^{n} \frac{CF_t}{(1 + IRR)^t} - CF_0 \tag{10.3}$$

Or, recognizing that projects may have cash inflows or outflows in any time period (including period 0), we can define the IRR more generally as

$$0 = \sum_{t=0}^{n} \frac{CF_t}{(1 + IRR)^t} \tag{10.3a}$$

DECISION CRITERIA

When managers rely on the IRR approach to accept or reject proposed investments, the decision rule they apply is:

- If the IRR is greater than the cost of capital, accept the project.
- If the IRR is less than the cost of capital, reject the project.

By following this rule, managers accept only investments expected to earn a rate of return that meets or exceeds the firm's required rate of return. Investing in those projects should increase the market value of the firm and therefore the wealth of its owners.

CALCULATING THE IRR

With most financial calculators, you merely punch in all cash flows as if to calculate an NPV and then depress IRR to find the internal rate of return. Spreadsheets also have preprogrammed functions that allow you to calculate a project's IRR very quickly.

EXAMPLE 10.8

MyLab Finance Solution Video

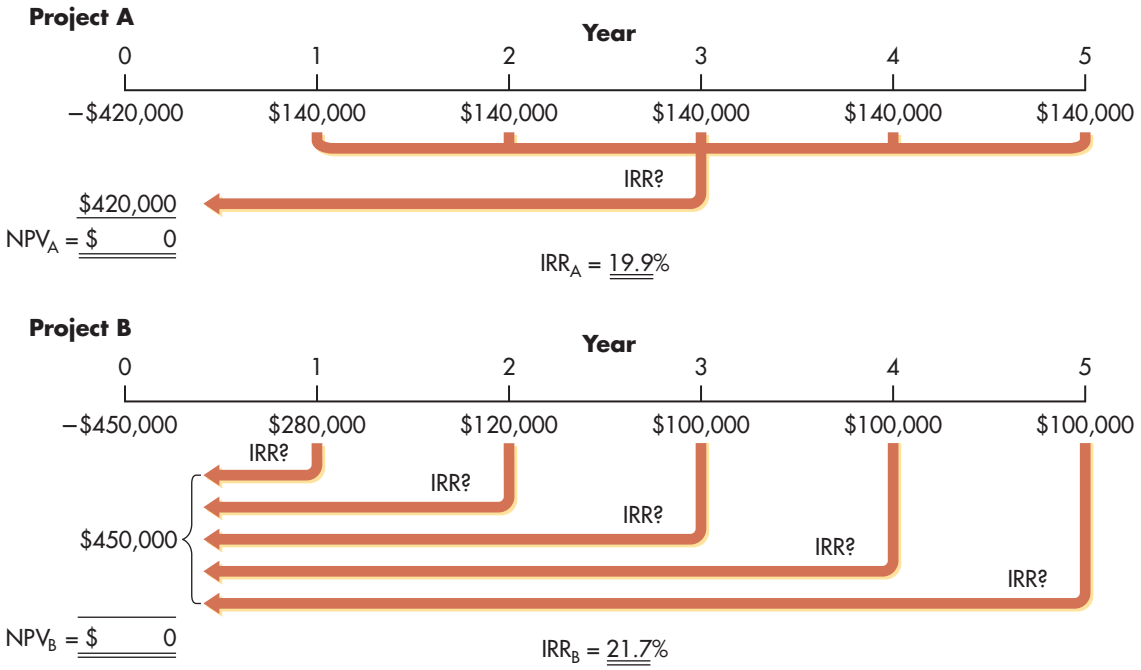
We can demonstrate the internal rate of return (IRR) approach by using the Bennett Company data presented in Table 10.1. Algebraically, the IRR for project A is the number that solves this equation:

$$0 = -420{,}000 + \frac{\$140{,}000}{(1 + IRR)^1} + \frac{\$140{,}000}{(1 + IRR)^2} + \frac{\$140{,}000}{(1 + IRR)^3} + \frac{\$140{,}000}{(1 + IRR)^4} + \frac{\$140{,}000}{(1 + IRR)^5}$$

Again, we are looking for the discount rate that makes the NPV of project A's cash flows equal to zero. One way to solve this equation is to use a trial-and-error approach, trying different values for the IRR until reaching a solution.

FIGURE 10.3

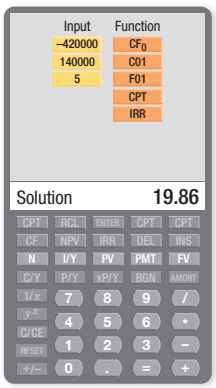
Calculation of IRRs for Bennett Company's Capital Expenditure Alternatives
Timelines depicting the cash flows and IRR calculations for projects A and B



Likewise, the IRR for project B is the discount rate that makes the NPV of that project's cash flows equal zero.

Figure 10.3 uses timelines to depict the framework for finding the IRRs for Bennett's projects A and B. We can see in the figure that the IRR is the unknown discount rate that causes the NPV to equal $0.

MyLab Finance Financial Calculator



Project A

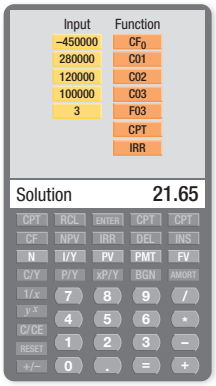
Calculator use To find the IRR using the preprogrammed function in a financial calculator, the keystrokes for each project are the same as those shown on page 458 for the NPV calculation, except that you don't enter a value for I/Y or compute NPV. Instead, once the cash flows have been entered you push CPT and IRR as shown here and on page 463.

Comparing the IRRs of projects A and B given in Figure 10.3 to Bennett Company's 10% cost of capital, we can see that both projects are acceptable because the return on each project is greater than the cost of capital:

$$\text{IRR}_A = 19.9\% > 10.0\%$$
$$\text{IRR}_B = 21.7\% > 10.0\%$$

Comparing the two projects' IRRs, Bennett's managers rank project B over project A because project B delivers a higher IRR ($\text{IRR}_B = 21.7\% > \text{IRR}_A = 19.9\%$). If these projects are mutually exclusive, meaning that Bennett can choose one project or the other but not both, the IRR decision technique would recommend project B.

MyLab Finance **Financial Calculator**



Project B

Spreadsheet use The internal rate of return also can be calculated as shown on the following Excel spreadsheet.

MyLab

	A	B	C
1	DETERMINING THE INTERNAL RATE OF RETURN		
2		Year-End Cash Flow	
3	Year	Project A	Project B
4	0	$ −420,000	$ −450,000
5	1	$ 140,000	$ 280,000
6	2	$ 140,000	$ 120,000
7	3	$ 140,000	$ 100,000
8	4	$ 140,000	$ 100,000
9	5	$ 140,000	$ 100,000
10	IRR	19.9%	21.7%
11	Choice of project		Project B

Entry in Cell B10 is =IRR(B4:B9).
Copy the entry in Cell B10 to Cell C10.
Entry in Cell C11 is =IF(B10>C10,B3,C3).

In the preceding example, the IRR suggests that project B, which has an IRR of 21.7%, is preferable to project A, which has an IRR of 19.9%. This ranking conflicts with the NPV ranking obtained previously—project A had a higher NPV than project B. Such conflicts are not unusual. There is no guarantee that NPV and IRR will rank projects in the same order. However, both methods usually reach the same conclusion about whether a single project, considered in isolation, is acceptable or not.

PERSONAL FINANCE EXAMPLE 10.9 Tony DiLorenzo is evaluating an investment opportunity. He is comfortable with the investment's level of risk. On the basis of competing investment opportunities, he believes this investment must earn a minimum compound annual after-tax return of 9% to be acceptable. Tony's initial investment would be $7,500, and he expects to receive annual after-tax cash flows of $500 per year in each of the first 4 years, followed by $700 per year at the end of years 5 through 8. He plans to sell the investment at the end of year 8 and net $9,000, after taxes.

To calculate the investment's IRR, Tony first summarizes the after-tax cash flows as shown in the following table:

Year	Cash flow
0	−$7,500 (Initial investment)
1	500
2	500
3	500
4	500
5	700
6	700
7	700
8	9,700 ($700 + $9,000)

Substituting the after-tax cash flows for years 0 through 8 into a financial calculator or spreadsheet, he finds the investment's IRR of 9.54%. Given that the projected IRR of 9.54% exceeds Tony's required minimum return of 9%, the investment is acceptable.

→ REVIEW QUESTIONS MyLab Finance Solutions

10–8 What is the internal rate of return (IRR) on an investment? How is it determined?

10–9 What is the decision rule that managers follow when they use the IRR method to accept or reject investment proposals? How is that decision rule related to the firm's market value?

10–10 Do the net present value (NPV) and internal rate of return (IRR) agree with respect to accept–reject decisions? With respect to ranking decisions? Explain.

→ EXCEL REVIEW QUESTION MyLab Finance Solutions

10–11 In addition to using NPV to evaluate projects, most firms also use IRR. With the information provided at MyLab Finance, use a spreadsheet to rank various projects based on their IRRs.

LG5 LG6

10.5 Comparing NPV and IRR Techniques

The NPV and IRR decision rules do not always agree on which projects managers should undertake, especially when projects are mutually exclusive (but not only then). In this section, we discuss why these disagreements between methods arise and how to resolve them.

NET PRESENT VALUE PROFILES

net present value profile
Graph that depicts a project's NPVs calculated at different discount rates.

As we will discuss later in this text, managers are typically not satisfied to do a simple NPV or IRR calculation and accept or reject an investment idea based solely on that calculation. Instead, managers want to see how sensitive an investment's NPV is to changes in the assumptions used to generate the NPV. One example of this type of sensitivity analysis is called a **net present value profile**, which is simply a graph showing a project's NPV calculated at different discount rates. Managers use these profiles not only to see how changes in discount rates affect project NPVs but also to compare different projects, especially when the NPV and IRR methods provide conflicting rankings.

EXAMPLE 10.10

To prepare net present value profiles for Bennett Company's two projects, A and B, the first step is to develop a number of "discount rate–net present value" coordinates. Three coordinates are easy to obtain for each project; they are at a discount rate of 0%, at a discount rate of 10% (the cost of capital, r), and the IRR. The net present value at a 0% discount rate is the sum of all the cash inflows minus the initial investment. Using the data in Table 10.1 and assuming a 0% discount rate, we get

For project A:

($140,000 + $140,000 + $140,000 + $140,000 + $140,000) − $420,000
= $280,000

TABLE 10.4 Discount Rate–NPV Coordinates for Projects A and B

Discount rate	Net present value	
	Project A	Project B
0%	$280,000	$250,000
10	110,710	109,244
19.9	0	—
21.7	—	0

For project B:

($280,000 + $120,000 + $100,000 + $100,000 + $100,000) − $450,000 = $250,000

The net present values for projects A and B at the 10% cost of capital are $110,710 and $109,244, respectively (from Figure 10.2). Because the IRR is the discount rate for which net present value equals zero, the IRRs (from Figure 10.3) of 19.9% for project A and 21.7% for project B result in $0 NPVs. Table 10.4 summarizes the three sets of coordinates for each of the projects.

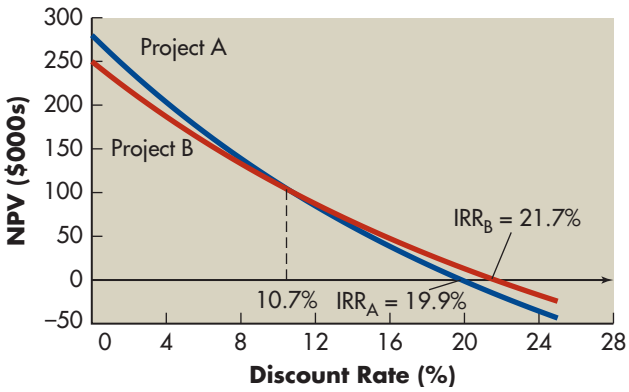
Of course, it is easy to generate more coordinates by simply calculating the NPV for each project at other discount rates. Plotting all of those coordinates results in the net present value profiles for projects A (the blue curve) and B (the red curve) shown in Figure 10.4. The figure reveals three important facts:

1. The IRR of project B is greater than that of project A, so managers using the IRR method to rank projects will choose B over A if both projects are acceptable.
2. The NPV of project A is sometimes higher and sometimes lower than that of project B, depending on the discount rate; thus, the NPV method will not consistently rank A above B or vice versa. The NPV ranking will depend on the firm's cost of capital.
3. When the cost of capital is approximately 10.7%, projects A and B have identical NPVs.

The cost of capital for Bennett Company is 10%; at that rate, project A has a higher NPV than project B (the blue line is above the red line in Figure 10.4 when

FIGURE 10.4

NPV Profiles
Net present value profiles for Bennett Company's projects A and B



the discount rate is 10%). Therefore, the NPV and IRR methods rank the two projects differently. If Bennett's cost of capital were a little higher, say 12%, the NPV method would rank project B over project A and there would be no conflict in the rankings provided by the NPV and IRR approaches.

CONFLICTING RANKINGS

Ranking different investment opportunities is an important consideration when projects are mutually exclusive or when capital rationing is necessary. When projects are mutually exclusive, ranking enables the firm to determine which project is best from a financial standpoint. When capital rationing is necessary, ranking projects will provide a logical starting point for determining which group of projects to accept. As we'll see, **conflicting rankings** using NPV and IRR result from *differences in the reinvestment rate assumption, the timing of each project's cash flows, and the magnitude of the initial investment.*

conflicting rankings
Conflicts in the ranking given a project by NPV and IRR, resulting from *differences in the magnitude and timing of cash flows.*

Reinvestment Assumption

intermediate cash inflows
Cash inflows received prior to the termination of a project.

One underlying cause of conflicting rankings is different implicit assumptions about the reinvestment of **intermediate cash inflows,** cash inflows received prior to the termination of a project. The NPV calculation implicitly assumes that the firm can reinvest intermediate cash inflows at the cost of capital. The IRR approach, however, assumes that the firm reinvests intermediate cash inflows at a rate equal to the project's IRR.[5] We can demonstrate these differing assumptions with an example.

EXAMPLE 10.11

A project requiring a $170,000 initial investment will provide operating cash inflows of $52,000, $78,000, and $100,000 in each of the next 3 years. The NPV of the project (at the firm's 10% cost of capital) is $16,867, and its IRR is 15%, so clearly the project is acceptable.

$$NPV = -\$170{,}000 + \frac{\$52{,}000}{1.10} + \frac{\$78{,}000}{1.10^2} + \frac{\$100{,}000}{1.10^3} = \$16{,}867$$

$$0 = -\$170{,}000 + \frac{\$52{,}000}{1 + IRR} + \frac{\$78{,}000}{(1 + IRR)^2} + \frac{\$100{,}000}{(1 + IRR)^3}$$

$$IRR = 15\%$$

Now let's see what happens if we assume that the firm reinvests cash flows as they come in. Table 10.5 shows how much the firm can earn by reinvesting each intermediate cash flow at either 10% (the cost of capital) or 15% (the project's IRR). If we assume that the firm earns 10% on reinvested cash flows, the firm could accumulate $248,720 in 3 years. Now suppose we discount that value

5. To eliminate the reinvestment rate assumption of the IRR, some practitioners calculate the *modified internal rate of return (MIRR)*. The MIRR is found by converting each cash inflow to its future value measured at the end of the project's life and then summing the future values of all inflows to get the project's *terminal value*. Each future value is found by using the cost of capital, thereby eliminating the reinvestment rate criticism of the traditional IRR. The MIRR represents the discount rate that causes the terminal value just to equal the initial investment. Because it uses the cost of capital as the reinvestment rate, the MIRR is generally viewed as a better measure of a project's true profitability than the IRR. Although this technique is frequently used in commercial real estate valuation and is a preprogrammed function on some financial calculators, its failure to resolve the issue of conflicting rankings and its theoretical inferiority to NPV have resulted in the MIRR receiving only limited attention and acceptance in the financial literature.

TABLE 10.5 Reinvestment Rate Comparisons for a Project

Year	Operating cash inflows	Number of years earning interest (t)	Reinvestment rate 10% Future value	Reinvestment rate 15% Future value
1	$ 52,000	2	$ 62,920	$ 68,770
2	78,000	1	85,800	89,700
3	100,000	0	100,000	100,000
		Future value end of year	$248,720	$258,470

NPV @ 10% = $16,867
IRR = 15%

Note: Initial investment in this project is $170,000.

back to the present, using the 10% cost of capital. In doing so, we are asking the question, what is the project worth today if it costs $170,000 and the firm can reinvest cash flows at 10%? We have

$$PV = \frac{\$248{,}720}{(1.10)^3} = \$186{,}867$$

$$NPV = \$186{,}867 - \$170{,}000 = \$16{,}867$$

The project's NPV calculated this way is $16,867, which matches the number stated at the beginning of this example. This confirms what we said earlier, namely, that the NPV approach assumes that the firm reinvests cash flows at the cost of capital. It is interesting that if the firm invests $170,000 today and 3 years later has accumulated $248,720, then its average annual return over that period is 13.5%, not the 15% figure obtained in the IRR calculation.

$$\$170{,}000(1 + r)^3 = \$248{,}720$$

$$r = 0.135 = 13.5\%$$

Next, assume that the firm reinvests intermediate cash flows at 15%. Table 10.5 shows that the firm can accumulate $258,470 in 3 years by reinvesting cash flows as they arrive. If undertaking this project costs $170,000 and the firm can reinvest cash flows at 15%, what is the project worth today, assuming a 10% cost of capital? Discounting $258,470 back to the present, we obtain

$$PV = \frac{\$258{,}470}{(1.10)^3} = \$194{,}192$$

$$NPV = \$194{,}192 - \$170{,}000 = \$24{,}192$$

This time the NPV is larger than it was before, and that difference is driven entirely by the 15% reinvestment rate assumption. Table 10.6 summarizes the important lessons from this example. The project's NPV is $16,867, but if the firm can reinvest cash flows only at the cost of capital, the project effectively earns a 13.5% annual return. The project's IRR is 15%, but that assumes the firm can reinvest cash flows at 15%. If the firm could do so, the project would be even more valuable than the NPV calculation indicates.

TABLE 10.6 Project Cash Flows after Reinvestment

	Reinvestment rate	
	10%	15%
Initial investment	−$170,000	
Year	Operating cash inflows	
1	$ 0	$ 0
2	0	0
3	248,720	258,470
NPV @ 10%	**$16,867**	$24,192
IRR	13.5%	**15.0%**

Timing of the Cash Flow

Another reason the IRR and NPV methods may provide different rankings for investment options has to do with differences in the timing of cash flows. Go back to the timelines for investments A and B in Figure 10.1. The up-front investment required by each investment is similar, but after that, the timing of each project's cash flows is quite different. Project B has a large cash inflow almost immediately (in year 1), whereas project A provides cash flows that are distributed evenly across time. Because so much of project B's cash flows arrive early in its life (especially compared to the timing for project A), the NPV of project B will not be particularly sensitive to changes in the discount rate. Project A's NPV, in contrast, will fluctuate more as the discount rate changes. In essence, project B is somewhat akin to a short-term bond, whose price doesn't change much when interest rates move, and project A is more like a long-term bond, whose price fluctuates a great deal when rates change.

You can see this pattern if you review the NPV profiles for projects A and B in Figure 10.4. The blue line representing project A is considerably steeper than the red line representing project B. At very low discount rates, project A has a higher NPV, but as the discount rate increases, the NPV of project A declines rapidly. When the discount rate is high enough, the NPV of project B overtakes that of project A.

We can summarize this discussion as follows. Because project A's cash flows arrive later than project B's cash flows do, when the firm's cost of capital is relatively low (to be specific, below about 10.7%), the NPV method will rank project A ahead of project B. At a higher cost of capital, the early arrival of project B's cash flows becomes more advantageous, and the NPV method will rank project B over project A. The differences in the timing of cash flows between the two projects do not affect the ranking provided by the IRR method, which always puts project B ahead of project A. Table 10.7 illustrates how the conflict in rankings between the NPV and IRR approaches depends on the firm's cost of capital.

Magnitude of the Initial Investment

Suppose that someone offered you the following two investment options. You could invest $2 today and receive $3 tomorrow, or you could invest $1,000 today and receive $1,100 tomorrow. The first investment provides a return (an IRR) of 50% in just 1 day, a return that surely would surpass any reasonable hurdle rate. But after

TABLE 10.7 Ranking Projects A and B Using IRR and NPV Methods

Method	Project A	Project B
IRR		✓
NPV		
if $r < 10.7\%$	✓	
if $r > 10.7\%$		✓

making this investment, you're only better off by $1. On the other hand, the second choice offers a return of 10% in a single day. That's far less than the first opportunity, but earning 10% in a single day is still a very high return. In addition, if you accept this investment, you will be $100 better off tomorrow than you were today.

Most people would choose the second option presented above, even though the rate of return on that option (10%) is far less than the rate offered by the first option (50%). They reason (correctly) that it is sometimes better to accept a lower return on a larger investment than to accept a very high return on a small investment. Said differently, most people know that they are better off taking the investment that pays them a $100 profit in just 1 day rather than the investment that generates just a $1 profit.[6]

The preceding example illustrates what is known as the scale (or magnitude) problem. The scale problem occurs when two projects are very different in terms of how much money is required to invest in each project. In these cases, the IRR and NPV methods may rank projects differently. The IRR approach (and the PI method) may favor small projects with high returns (like the $2 loan that turns into $3), whereas the NPV approach favors the investment that makes the investor the most money (like the $1,000 investment that yields $1,100 in 1 day). In the case of the Bennett Company's projects, the scale problem is not likely to be the cause of the conflict in project rankings because the initial investment required to fund each project is quite similar.

To summarize, it is important for financial managers to watch for conflicts in project rankings provided by the NPV and IRR methods, but differences in the magnitude and timing of cash inflows do not guarantee conflicts in ranking. In general, the greater the difference between the magnitude and timing of cash inflows, the greater the likelihood of conflicting rankings. Conflicts based on NPV and IRR can be reconciled computationally; to do so, we create and analyze an incremental project reflecting the difference in cash flows between the two mutually exclusive projects.

WHICH APPROACH IS BETTER?

Many companies use both the NPV and IRR techniques because current technology makes them easy to calculate. Although the IRR approach suffers from several problems that do not befall the NPV method, both techniques see widespread use. The IRR technique is popular despite its theoretical shortcomings, so clearly firms find value in both methods.

6. Note that the profitability index also provides an incorrect ranking in this example. The first option has a PI of 1.5 ($3 ÷ $2), and the second option's PI equals 1.1 ($1,100 ÷ $1,000). Just like the IRR, the PI suggests that the first option is better, but we know that the second option makes more money.

Theoretical View

On a theoretical basis, NPV is the better approach to capital budgeting for several reasons. Most importantly, the NPV measures how much wealth a project creates (or destroys if the NPV is negative) for shareholders. Given that the financial manager's objective is to maximize shareholder wealth, the NPV approach has the clearest link to this objective and therefore is the "gold standard" for evaluating investment opportunities.

multiple IRRs
More than one IRR resulting from a capital budgeting project with a *nonconventional cash flow pattern;* the maximum number of IRRs for a project is equal to the number of sign changes in its cash flows.

For an investment project, the NPV calculation always provides a single answer, but sometimes the IRR calculation has more than one solution. A project with a nonconventional cash flow pattern may have **multiple IRRs**. Mathematically, the maximum number of real roots to an equation is equal to its number of sign changes. Take an equation like $x^2 - 5x + 6 = 0$, which has two sign changes in its coefficients—from positive $(+x^2)$ to negative $(-5x)$ and then from negative $(-5x)$ to positive $(+6)$. If we factor the equation (remember factoring from high school math?), we get $(x - 2) \times (x - 3)$, which means that two different values solve the equation: x can equal either 2 or 3. Substitute either number back into the equation, and you'll see that the equation is valid.

This same outcome can occur when finding the IRR for projects with nonconventional cash flows because they have more than one sign change in the stream of cash flows. When a project has multiple IRRs, analysts face a problem in trying to implement the IRR decision rule. Suppose that a certain investment has two IRRs, 7% and 14%, and suppose that the firm considering the investment has a cost of capital of 10%. The IRR rule says that the firm should accept the investment if the IRR exceeds the cost of capital, but in this case one IRR is greater than the cost of capital and one IRR is below it. In such a situation, it is not clear whether to accept or reject the project. That such a challenge does not exist when using NPV enhances its theoretical superiority.

Practical View

Evidence suggests that despite the theoretical superiority of NPV, financial managers use the IRR approach just as often as the NPV method. The appeal of the IRR technique is due to the general disposition of business people to think in terms of rates of return rather than actual dollar returns. Because interest rates, profitability, and so on are most often expressed as annual rates of return, the use of IRR makes sense to financial decision makers. They tend to find NPV less intuitive because it does not measure benefits relative to the amount invested. Firms that analyze investments using the IRR technique also calculate project

MATTER OF FACT

Which Methods Do Companies Actually Use?

Researchers surveyed chief financial officers (CFOs) about what methods they used to evaluate capital investment projects. One interesting finding was that many companies use more than one of the approaches we've covered in this chapter. The most popular approaches by far were IRR and NPV, used by 76% and 75% (respectively) of the CFOs responding to the survey. These techniques enjoy wider use in larger firms, with the payback approach more common in smaller firms.[7]

7. John R. Graham and Campbell R. Harvey, "The theory and practice of corporate finance: Evidence from the field," *Journal of Financial Economics* 60 (2001), pp. 187–243.

FOCUS ON ETHICS *in practice*

Baby You Can Drive My Car—Just Not a VW Diesel

Volkswagen had come a long way. In 1934, Hitler challenged German industry to come up with an inexpensive vehicle for ordinary families—"a People's Car." Ferdinand Porsche's design got the nod, and construction began on a factory to produce Beetles in modern-day Wolfsburg, Germany—still the corporate headquarters. By 2015, VW was the world's second largest automaker, producing 10.2 million cars annually. Not content with second, CEO Martin Winterkorn announced plans to pass Toyota and lead the industry "economically and ecologically" by 2018.

Then, on September 18, 2015, Volkswagen's fortunes changed. The U.S. Environmental Protection Agency (EPA) charged the company with deliberately programming diesel engines on eight passenger models to fool emissions tests. Allegedly, "defeat devices" enabled the cars to meet government standards during testing, despite spewing up to 40 times permissible levels of nitrogen-oxide pollutants in ordinary driving. VW later conceded that roughly 11 million cars worldwide contained such devices.

Volkswagen paid a big price immediately. Within days, the EPA ordered VW to recall nearly 500,000 diesel cars, and the company suspended U.S. sales of all 2015 and 2016 models alleged to have defeat devices. Within a week, VW stock plummeted 33%, the yield on its outstanding five-year debt doubled, and Winterkorn resigned. Within a month, Standard & Poor's downgraded the company's short- and long-term debt from A to A– and indicated further downgrades were possible.

By November, it was clear the scandal wasn't going away. On top of the cost of recalls, Volkswagen faced staggering government fines and civil settlements. Even worse, the scandal was damaging the brand—sales of VW-group cars worldwide fell 5.3% in October 2015. The capital budget took the first hit. Net present value was under assault from two directions—a higher cost of capital and lower expected cash flows. With lower credit ratings, VW would now pay more for debt financing. Declining sales meant lower expected cash flows from R&D and new factories. Accordingly, VW forgot about burying Toyota and cut the capital budget roughly 8%—the first reduction since global auto sales crashed during the Great Recession.

In March 2017, Volkswagen pled guilty in U.S. court to conspiracy and obstruction of justice. The record fine pushed the cost of the emissions scandal in the U.S. alone to roughly 1.3 times the entire company's net income for 2014. For its ethical transgressions, VW saw not only current earnings but also growth opportunities squashed like a bug.

▶ *The U.S. boasts the world's largest auto market but also the toughest emissions standards. Volkswagen believed boosting U.S. sales with "clean diesel" cars was key to overtaking Toyota. What role did VW's desire to be top automaker play in the emissions scandal?*

▶ *Ferdinand Piëch, grandson of Ferdinand Porsche, served as Volkswagen's CEO from 1993 to 2002 and board chairman until 2015. He also selected the next two CEOs (including Winterkorn). What role did insider succession play in the scandal?*

Environmental Protection Agency, "EPA, California Notify Volkswagen of Clean Air Act Violations/Carmaker Allegedly Used Software that Circumvents Emissions Testing for Certain Air Pollutants," *Press Release*, September 18, 2015. Ewing, Jack and Jad Mouawad. "VW Cuts Its R&D Budget in Face of Costly Emissions Scandal," *New York Times*, November 20, 2015.

NPVs as well, so the theoretical shortcomings of the IRR most likely do not often lead managers to make suboptimal decisions.

The *Focus on Ethics* box recounts how an ethical lapse at Volkswagen dramatically reduced the NPVs (and IRRs) of its investment opportunities, at least for a few years.

→ REVIEW QUESTIONS MyLab Finance Solutions

10–12 How is a net present value profile used to compare projects? What causes conflicts in the ranking of projects via net present value and internal rate of return?

10–13 Does the assumption concerning the reinvestment of intermediate cash inflow tend to favor NPV or IRR? In practice, which technique is preferred and why?

SUMMARY

FOCUS ON VALUE

The financial manager must apply appropriate decision techniques to assess whether proposed investment projects create value. Most large companies use the net present value (NPV) or the internal rate of return (IRR) method for capital budgeting. Both the NPV and IRR approaches indicate whether a proposed investment creates or destroys shareholder value.

The NPV method clearly indicates the expected dollar amount of wealth creation from a proposed project, whereas an IRR calculation does not measure the wealth created by an investment. For several reasons, NPV and IRR do not necessarily rank projects in the same way. NPV is the theoretically preferred approach. In practice, however, IRR enjoys widespread use because of its intuitive appeal. Regardless, the application of NPV and IRR to good estimates of cash flows should enable the financial manager to recommend projects that are consistent with the firm's goal of **maximizing shareholder wealth.**

REVIEW OF LEARNING GOALS

LG1 **Understand the key elements of the capital budgeting process.** Managers use capital budgeting techniques to make investment decisions that maximize the value of the firm. Applied to each project's cash flows, they indicate which capital expenditures are consistent with the firm's goal of maximizing owners' wealth.

LG2 **Calculate, interpret, and evaluate the payback period.** The payback period is the amount of time required for the firm to recover its initial investment. Shorter payback periods are preferred. The payback period is relatively easy to calculate, has simple intuitive appeal, focuses on a project's cash flows, and is at least a crude way of adjusting for a project's risk. However, the payback method does not have a strong connection to the wealth maximization goal. It offers only crude adjustments for the time value of money and for project risk.

LG3 **Calculate, interpret, and evaluate the net present value (NPV) and economic value added (EVA).** The NPV method measures the wealth generated by a project; positive NPV projects create value, while negative NPV projects destroy value. The rate at which cash flows are discounted in calculating NPV is called the discount rate, required return, cost of capital, or opportunity cost. Projects that earn returns exceeding this rate create value for shareholders. The EVA method begins the same way that NPV does: by calculating a project's net cash flows. However, the EVA approach subtracts from those cash flows a charge that is designed to capture the return that the firm's investors demand on the project. That is, the EVA calculation asks whether a project generates positive cash flows above and beyond what investors demand. If so, the project is worth undertaking.

LG4 **Calculate, interpret, and evaluate the internal rate of return (IRR).** The IRR is the compound annual rate of return that the firm will earn by investing in a project and receiving the projected cash inflows, assuming that the firm can reinvest intermediate cash flows at a rate equal to the project's IRR. By accepting only those projects with IRRs in excess of the firm's cost of capital, the firm should enhance its market value and the wealth of its owners. Both NPV and IRR yield the same accept–reject decisions, but they often provide conflicting rankings.

LG5 **Use net present value profiles to compare NPV and IRR techniques.** A net present value profile is a graph that depicts projects' NPVs for various discount rates. The NPV profile is prepared by developing a number of "discount rate–net present value" coordinates (including discount rates of 0%, the cost of capital, and the IRR for each project) and then plotting them on the same set of discount rate–NPV axes.

LG6 **Discuss NPV and IRR in terms of conflicting rankings and the strengths of each approach.** Conflicting rankings of projects frequently emerge from NPV and IRR as a result of differences in the reinvestment rate assumption as well as the magnitude and timing of cash flows. NPV assumes reinvestment of intermediate cash inflows at the more conservative cost of capital; IRR assumes reinvestment at the project's IRR. Theoretically speaking, the NPV approach is superior because it does a better job of ranking projects and because it does not suffer from some of the mathematical quirks that occasionally affect IRR calculations. Even so, many firms use the IRR approach because it has a very intuitive interpretation and is easy for managers to understand and to communicate to others.

SELF-TEST PROBLEM (Solutions in Appendix)

LG2 LG3 LG4 LG5 LG6 ST10–1 IRF

All techniques with NPV profile: Mutually exclusive projects Fitch Industries is in the process of choosing the better of two equal-risk, mutually exclusive capital expenditure projects, M and N. The relevant cash flows for each project are shown in the following table. The firm's cost of capital is 9%.

	Project M	Project N
Initial investment (CF_0)	−$40,000	−$40,000
Year (t)	Cash inflows (CF_t)	
1	$14,000	$23,000
2	14,000	12,000
3	14,000	10,000
4	14,000	9,000

a. Calculate each project's payback period.
b. Calculate the net present value (NPV) for each project.
c. Calculate the internal rate of return (IRR) for each project.
d. Summarize the preferences dictated by each measure you calculated, and indicate which project you would recommend. Explain why.
e. Draw the net present value profiles for these projects on the same set of axes, and explain the circumstances under which a conflict in rankings might exist.

WARM-UP EXERCISES

Select problems are available in MyLab Finance.

LG 2

E10–1 Volkswagen AG (VW) uses a maximum payback period of 4 years and currently must choose between two mutually exclusive electric car projects. Project Crozz requires an initial outlay of €25,000,000; Project Buzz requires an initial outlay of €15,000,000. Using the expected cash inflows given for each project in the following table, calculate each project's payback period. Which project meets VW's standards?

	Expected cash inflows (CF_t)	
Year	Crozz	Buzz
1	€6,000,000	€4,000,000
2	5,000,000	4,000,000
3	5,000,000	4,000,000
4	4,000,000	4,000,000
5	3,000,000	3,000,000
6	3,000,000	3,000,000

LG 3

E10–2 Sweet Taters Corporation is considering the acquisition of a new cooking machine. The initial investment (CF_0) estimate is $2.52 million. The machine purchased will have a 5-year life with no salvage value. Using a 10% discount rate, determine the net present value (NPV) of the machine given its expected operating cash inflows shown in the following table. Based on the project's NPV, should Sweet Taters Corporation make this investment?

Year	Cash inflow (CF_t)
1	$400,000
2	375,000
3	300,000
4	350,000
5	200,000

LG 3

E10–3 Axis Corp. is considering investment in the best of two mutually exclusive projects. Project Kelvin involves an overhaul of the existing system; it will cost $52,500 and generate cash inflows of $24,500 per year for the next 3 years.

Project Thompson involves replacement of the existing system; it will cost $265,000 and generate cash inflows of $61,000 per year for 6 years. Using an 8.75% cost of capital, calculate each project's NPV, and make a recommendation based on your findings.

LG 4

E10–4 RII, a Japanese electronic accessories firm, uses the internal rate of return (IRR) to select projects. Project RK100 Rubber Keyboard requires an initial investment of ¥1,000,000 and generates cash inflows of ¥220,000 per year for 5 years. Project MK300 Mechanical Keyboard requires an initial investment of ¥2,000,000 and generates cash inflows of ¥550,000 per year for 5 years. Calculate the IRR for each project and recommend the best project based on this measure.

LG 4 LG 5

E10–5 Cooper Electronics uses NPV profiles to visually evaluate competing projects. Key data for the two projects under consideration are given in the following table. Using these data, graph, on the same set of axes, the NPV profiles for each project, using discount rates of 0%, 8%, and the IRR.

	Terra	Firma
Initial investment (CF_0)	−$30,000	−$25,000
Year	Operating cash inflows (CF_t)	
1	$ 7,000	$6,000
2	10,000	9,000
3	12,000	9,000
4	10,000	8,000

PROBLEMS

Select problems are available in MyLab Finance. The MyLab icon indicates problems in Excel format available in MyLab Finance.

LG 2

P10–1 **Payback period** Quick Profit Entity is considering a capital expenditure that requires an initial investment of $84,000 and returns after-tax cash inflows of $7,000 per year for 20 years. The firm has a maximum acceptable payback period of 8 years.

a. Determine the payback period for this project.

b. Should Quick Profit accept the project? Explain.

LG 2

P10–2 **Payback comparisons** Soviet Services has a 5-year maximum acceptable payback period. The firm is considering purchasing a new washing machine and must choose between two alternatives ones. The first machine, IntelWash, requires an initial investment of $25,000 and generates annual after-tax cash inflows of $6,500 for each of the next 8 years. The second machine, KwikWash, requires an initial investment of $75,000 and provides an annual cash inflow after taxes of $9,500 for 15 years.

a. Determine the payback period for IntelWash and KwikWash.

b. Comment on the acceptability of the machines, assuming they are independent projects.

c. Which machine should Soviet Services purchase? Why?
d. Do the machines in this problem illustrate any of the weaknesses of using payback? Discuss.

LG 2

P10–3 Choosing between two projects with acceptable payback periods Conad, an Italian supermarket chain, is considering two mutually exclusive projects. Each project requires an initial investment (CF_0) of €1,000,000. Francesco Pugliese, the general director of Conad, has set a maximum payback period of 5 years. The net receivable cash inflows associated with each project are shown in the following table.

	Cash inflows (CF_t)	
Year	Project A	Project B
1	€200,000	€100,000
2	200,000	200,000
3	200,000	300,000
4	200,000	400,000
5	190,000	10,000
6	190,000	10,000

a. Determine the payback period of each project.
b. Because the projects are mutually exclusive, Conad must choose one. Which should the company invest in?
c. Explain why the payback period might not be the best method for choosing between the projects.

Personal Finance Problem

LG 2

P10–4 Long-term investment decision, payback method Francesco Giovanni's business partner, Pepino, has proposed that they invest in a coffee shop. This investment costs €90,000 today and promises to pay €22,000, €25,000, €25,000, €20,000, and €18,000 over the next 5 years. Alternatively, Pepino suggests they can invest €90,000 in a restaurant, which promises to pay €15,000, €15,000, €15,000, €35,000, and €40,000 over the next 5 years.
a. How long will it take for Francesco and Pepino to recoup their initial investment in the coffee shop?
b. How long will it take them to recoup their initial investment in the restaurant?
c. Using the payback period, which project should Francesco and Pepino choose?
d. Do you see any problems with their choice?

LG 3

P10–5 NPV Diamantis Masoutis S.A. is considering the following 10-year projects. Comment on the acceptability of each project. Assume that the firm has a cost of capital of 5%.
a. Initial investment is €1,000,000; cash inflows are €100,000 per year.
b. Initial investment is €2,000,000; cash inflows are €250,000 per year.
c. Initial investment is €2,500,000; cash inflows are €400,000 per year.

LG 3

P10–6 NPV for varying costs of capital Empire Hotel is considering acquiring new flat-panel displays to replace the antiquated computer terminals at the registration desk. The new computer displays require an initial investment of $235,000 and will generate after-tax cash inflows of $65,000 per year for 5 years. For each of the costs of capital listed, (1) calculate the net present value (NPV), (2) indicate whether to accept or reject the machine, and (3) explain your decision.
a. The cost of capital is 8%.
b. The cost of capital is 10%.
c. The cost of capital is 15%.

LG3 MyLab

P10–7 **Net present value: Independent projects** Using a 10% cost of capital, calculate the net present value for each of the independent projects shown in the following table, and indicate whether each is acceptable.

	Cash flows (CF_t) in thousands				
Year	A	B	C	D	E
0	−$250	−$375	−$550	−$750	−$1,150
1	50	45	350	200	80
2	90	55	210	235	135
3	140	65	165	250	190
4	80	55	55	265	255
5		45	45	100	315
6		35	10	50	380
7		25			275
8		15			100
9		5			45
10					25

LG3

P10–8 **NPV** Simes Innovations Inc. is negotiating to purchase exclusive rights to manufacture and market a solar-powered toy car. The car's inventor has offered Simes the choice of either a one-time payment of $1,500,000 today or a series of five year-end payments of $385,000.

a. If Simes has a cost of capital of 9%, which form of payment should it choose?

b. What yearly payment would make the two offers identical in value at a cost of capital of 9%?

c. Would your answer to part **a** of this problem be different if the yearly payments were made at the beginning of each year? Show what difference, if any, that change in timing would make to the present value calculation.

d. The after-tax cash inflows associated with this purchase are projected to amount to $250,000 per year for 15 years. Will this factor change the firm's decision about how to fund the initial investment?

LG3

P10–9 **NPV and maximum return** DC Fragrance considers purchasing a new fragrance-mixing machine for a $245,000 initial investment. The machine generates an annual after-tax cash inflow of $68,500 for 5 years.

a. Determine the net present value (NPV) of the machine, assuming that the firm has a 15% cost of capital. Is the project acceptable?

b. If the firm's cost of capital is lower than 15%, does the investment in the machine become more or less desirable? What is the highest cost of capital (closest whole percentage rate) that the firm can have and still find that purchasing the machine is worthwhile? Discuss this finding in light of your response in part **a.**

LG3 MyLab

P10–10 **NPV: Mutually exclusive projects** The BMW Group is considering the replacement of one of its car-manufacturing robot lines. Three alternative replacement robot lines are under consideration. The relevant cash flows associated with each line are shown in the following table. The firm's cost of capital is 15%.

	Robot line A	Robot line B	Robot line C
Initial investment (CF_0)	−€850,000	−€600,000	€1,500,000
Year (t)	Cash inflows (CF_t)		
1	€150,000	€120,000	€800,000
2	150,000	140,000	300,000
3	150,000	160,000	200,000
4	150,000	180,000	200,000
5	150,000	200,000	200,000
6	150,000	250,000	300,000
7	150,000	—	400,000
8	150,000	—	500,000

a. Calculate the net present value (NPV) of each line.
b. Using NPV, evaluate the acceptability of each line.
c. Rank the lines from best to worst, using NPV.
d. Calculate the profitability index (PI) for each line.
e. Rank the lines from best to worst, using PI.

Personal Finance Problem

LG 3

P10–11 **Long-term investment decision, NPV method** Mavis Chan is a financial controller of a listed company, and has researched the financial pros and cons of enrolling in a 1-year Executive MBA (EMBA) program at a local university. The tuition and books for the EMBA program will have an up-front cost of $67,000. If she enrolls in the EMBA program, Mavis will quit her current job, which pays $86,000 per year after taxes (for simplicity, treat any lost earnings as part of the up-front cost). On average, a person with an EMBA degree earns an extra $48,000 per year (after taxes) over a business career of 40 years. Mavis believes that her opportunity cost of capital is 5%. Given her estimates, find the net present value (NPV) of entering this EMBA program. Are the benefits of further education worth the associated costs?

LG 2 LG 3

P10–12 **Payback and NPV** Neil Corporation has three projects under consideration. The cash flows for each project are shown in the following table. The firm has a 16% cost of capital.

	Project A	Project B	Project C
Initial investment (CF_0)	−$40,000	−$40,000	−$40,000
Year (t)	Cash inflows (CF_t)		
1	$13,000	$ 7,000	$19,000
2	13,000	10,000	16,000
3	13,000	13,000	13,000
4	13,000	16,000	10,000
5	13,000	19,000	7,000

a. Calculate each project's payback period. Which project is preferred according to this method?
b. Calculate each project's net present value (NPV). Which project is preferred according to this method?
c. Comment on your findings in parts **a** and **b**, and recommend the best project. Explain your recommendation.

LG 3

P10–13 **NPV and EVA** Assume Project X costs $860,000 initially and will generate cash flows in perpetuity of $320,000. The firm's cost of capital is 12%.

a. Calculate the project's NPV.
b. Calculate the annual EVA in a typical year.
c. Calculate the overall project EVA and compare to your answer in part **a.**

LG 4 MyLab

P10–14 **Internal rate of return** For each of the projects shown in the following table, calculate the internal rate of return (IRR). Then indicate, for each project, the maximum cost of capital that the firm could have and still find the IRR acceptable.

	Project A	Project B	Project C	Project D
Initial investment (CF_0)	−$90,000	−$490,000	−$20,000	−$240,000
Year (t)	Cash inflows (CF_t)			
1	$20,000	$150,000	$7,500	$120,000
2	25,000	150,000	7,500	100,000
3	30,000	150,000	7,500	80,000
4	35,000	150,000	7,500	60,000
5	40,000	—	7,500	—

LG 4

P10–15 **Internal rate of return** Sigma is an insurance company based in Albania. Altin, a product manager, is responsible for evaluating the viability of a new insurance product, which covers electronic equipment. A buyer of this proposed policy would be required to pay Sigma only once, at the time of purchasing the equipment. A buyer who purchases the 3-year policy will pay Sigma L30,000 (Albanian lek). Altin estimates that the repair costs that Sigma must cover will average L11,000 for each of the policy's 3 years. If Sigma has a cost of capital of 9%, should Altin approve the new insurance product?

LG 4

P10–16 **IRR: Mutually exclusive projects** Ocean Pacific Restaurant is evaluating two mutually exclusive projects for expanding the seating capacity at the restaurant. The following table shows the relevant cash flows for the projects. The firm's cost of capital is 4%.

	Project A	Project B
Initial investment (CF_0)	−$980,000	−$363,000
Year (t)	Cash inflows (CF_t)	
1	$150,000	$110,000
2	170,000	98,000
3	220,000	93,000
4	270,000	82,000
5	340,000	67,000

a. Calculate the IRR to the nearest whole percent for each of the projects.
b. Assess the acceptability of each project based on the IRRs found in part **a.**
c. Which project, on this basis, is preferred?

Personal Finance Problem

LG4 LG5 **P10–17** **Problems with the IRR method** Wesfarmers, an Australian conglomerate, is considering investing in a project that has the following unusual cash flow pattern.

Year (t)	CF_t
0	A$1,000
1	−2,000
2	3,500
3	−1,050
4	100
5	−2,600

a. Calculate the project's NPV at each of the following discount rates: 0%, 5%, 10%, 20%, 30%, and 50%.
b. What do the calculations tell you about this project's IRR? The IRR rule tells managers to invest if a project's IRR is greater than the cost of capital. If Wesfarmers' cost of capital is 12%, should it accept or reject this investment?
c. According to you, what is the best way to make decisions for projects with unusual cash flows?

LG4 **P10–18** **IRR, investment life, and cash inflows** Oak Enterprises accepts projects earning more than the firm's 15% cost of capital. Oak is currently considering a 10-year project that provides annual cash inflows of $10,000 and requires an initial investment of $61,450. (*Note:* All amounts are after taxes.)
a. Determine the IRR of this project. Is it acceptable?
b. Assuming that the cash inflows remain at $10,000 per year, how many additional years would the flows have to continue to make the project acceptable (i.e., to make it have an IRR of 15%)?
c. With a 10-year life, an initial investment of $61,540, and a cost of capital of 15%, what is the minimum annual cash inflow the investment would have to provide in order for this project to make sense for Oak's shareholders?

LG3 LG4 **P10–19** **NPV and IRR** Gigantic Group has prepared the following estimates for a long-term expansion project. The initial investment is $248,250, and the project is expected to yield after-tax cash inflows of $65,000 per year for 5 years. The firm has an 8% cost of capital.
a. Determine the net present value (NPV) for the project.
b. Determine the internal rate of return (IRR) for the project.
c. Would you recommend that the firm accept or reject the project? Explain your answer.

LG3 LG4 **P10–20** **NPV, with rankings** Botany Bay Inc., a maker of casual clothing, is considering four projects. Because of past financial difficulties, the company has a high cost of capital at 15%.

	Project A	Project B	Project C	Project D
Initial investment (CF_0)	−$50,000	−$100,000	−$80,000	−$180,000
Year (t)	Cash inflows (CF_t)			
1	$20,000	$35,000	$20,000	$100,000
2	20,000	50,000	40,000	80,000
3	20,000	50,000	60,000	60,000

a. Calculate the NPV of each project, using a cost of capital of 15%.
b. Rank acceptable projects by NPV.
c. Calculate the IRR of each project, and use it to determine the highest cost of capital at which all the projects would be acceptable.

LG2 LG3 LG4 MyLab P10–21 **All techniques, conflicting rankings** Nicholson Roofing Materials Inc. is considering two mutually exclusive projects, each with an initial investment of $150,000. The company's board of directors has set a maximum 4-year payback requirement and has set its cost of capital at 9%. The cash inflows associated with the two projects are shown in the following table.

	Cash inflows (CF_t)	
Year	Project A	Project B
1	$45,000	$75,000
2	45,000	60,000
3	45,000	30,000
4	45,000	30,000
5	45,000	30,000
6	45,000	30,000

a. Calculate the payback period for each project.
b. Calculate the NPV of each project at 0%.
c. Calculate the NPV of each project at 9%.
d. Derive the IRR of each project.
e. Rank the projects by each of the techniques used. Make and justify a recommendation.
f. Go back one more time and calculate the NPV of each project using a cost of capital of 12%. Does the ranking of the two projects change compared to your answer in part **e**? Why?

LG2 LG3 LG4 P10–22 **Payback, NPV, and IRR** Woolworths Ltd. is evaluating the feasibility of investing A$1,000,000 in a new store in Sydney, having a 5-year life. The firm has estimated the cash inflows from the proposed store, as shown in the following table. The firm has an 8% cost of capital.

Year (t)	Cash inflows (CF_t)
1	A$100,000
2	200,000
3	300,000
4	400,000
5	500,000

a. Calculate the payback period for the proposed investment.
b. Calculate the net present value (NPV) for the proposed investment.
c. Calculate the internal rate of return (IRR), rounded to the nearest whole percent, for the proposed investment.
d. Evaluate the acceptability of investing in the store using NPV and IRR. What recommendation would you make relative to the implementation of the project? Why?

LG3 LG4 LG5 MyLab

P10–23 **NPV, IRR, and NPV profiles** Thomas Company is considering two mutually exclusive projects. The firm, which has a 12% cost of capital, has estimated its cash flows as shown in the following table.

	Project A	Project B
Initial investment (CF_0)	−$130,000	−$85,000
Year (t)	Cash inflows (CF_t)	
1	$25,000	$40,000
2	35,000	35,000
3	45,000	30,000
4	50,000	10,000
5	55,000	5,000

a. Calculate the NPV of each project, and assess its acceptability.
b. Calculate the IRR for each project, and assess its acceptability.
c. Draw the NPV profiles for both projects on the same set of axes.
d. Evaluate and discuss the rankings of the two projects on the basis of your findings in parts **a, b,** and **c.**
e. Explain your findings in part **d** in light of the pattern of cash inflows associated with each project.

LG2 LG3 LG4 LG5 LG6

P10–24 **All techniques: Decision among mutually exclusive investments** Pound Industries is attempting to select the best of three mutually exclusive projects. The initial investment and after-tax cash inflows associated with these projects are shown in the following table.

Cash flows	Project A	Project B	Project C
Initial investment (CF_0)	−$60,000	−$100,000	−$110,000
Cash inflows (CF_t), $t = 1$ to 5	20,000	31,500	32,500

a. Calculate the payback period for each project.
b. Calculate the net present value (NPV) of each project, assuming that the firm has a cost of capital equal to 13%.
c. Calculate the internal rate of return (IRR) for each project.
d. Draw the net present value profiles for both projects on the same set of axes, and discuss any conflict in ranking that may exist between NPV and IRR.
e. Summarize the preferences dictated by each measure, and indicate which project you would recommend. Explain why.

LG2 LG3 LG4 LG5 LG6

P10–25 **All techniques with NPV profile: Mutually exclusive projects** Apart from opening a new store in Sydney, as described in Problem 10–22, Woolworths Ltd. is also considering opening a store in Canberra. Like the Sydney store, this store will have the same initial cost of A$1,000,000. The company must now decide which store to invest in: Sydney or Canberra. The cash flows associated with each proposed store are shown in the following table.

	Project A	Project B
Initial investment	A$1,000,000	
Year (t)	Sydney	Canberra
1	A$100,000	A$250,000
2	200,000	250,000
3	300,000	250,000
4	400,000	250,000
5	500,000	250,000

a. Calculate the payback period for each proposed store.
b. Calculate the net present value (NPV) for each proposed store.
c. Calculate the internal rate of return (IRR), rounded to the nearest whole percent, for each proposed store.
d. Draw the net present value profiles for each store on the same set of axes, and discuss any conflict in ranking that may exist between NPV and IRR.
e. Evaluate the acceptability of each proposed store dictated by each measure, and indicate which project you would recommend. Explain why.

LG 6

P10–26 Integrative: Multiple IRRs BP is evaluating an unusual investment project. What makes the project unusual is the stream of cash inflows and outflows shown in the following table.

Year	Cash flow
0	£3,100,000
1	−4,000,000
2	1,000,000
3	−3,100,000
4	3,000,000

a. Why is it difficult to calculate the payback period for this project?
b. Calculate the investment's net present value (NPV) at each of the following discount rates: 0%, 5%, 10%, 15%, 20%, 25%, 30%, and 35%.
c. What does your answer to part **b** tell you about this project's internal rate of return (IRR)?
d. Should BP invest in this project if its cost of capital is 6%? What if the cost of capital is 12%?
e. In general, when faced with investment projects like this one, how should a firm decide whether to invest in the project or reject it?

LG 3 LG 5

P10–27 Integrative: Conflicting Rankings The High-Flying Growth Company (HFGC) has been expanding very rapidly in recent years, making its shareholders rich in the process. The average annual rate of return on the stock in the past few years has been 20%, and HFGC managers believe that 20% is a reasonable figure for the firm's cost of capital. To sustain a high growth rate, HFGC's CEO argues that the company must continue to invest in projects that offer the highest rate of return possible. Two projects are currently under review. The first is an expansion of the firm's production capacity, and the second involves introducing one of the firm's existing products into a new market. Cash flows from each project appear in the following table.

a. Calculate the NPV, IRR, and PI for both projects.
b. Rank the projects based on their NPVs, IRRs, and PIs.

c. Do the rankings in part **b** agree or not? If not, why not?
d. The firm can afford to undertake only one of these investments, and the CEO favors the product introduction because it offers a higher rate of return (i.e., a higher IRR) than the plant expansion. What do you think the firm should do? Why?

Year	Plant expansion	Product introduction
0	−$3,500,000	−$500,000
1	1,500,000	250,000
2	2,000,000	350,000
3	2,500,000	375,000
4	2,750,000	425,000

LG4 LG5

P10-28 **Problems with IRR** Antonio is discussing an investment opportunity with his friend Vincenzo. It has the following projected cash flows.

Year	Cash flow
0	€150,000
1	−315,000
2	165,000

a. Calculate the investment's net present value (NPV) at each of the following discount rates: 0%, 5%, 7.5%, 10%, 15%, 20%, 25%, and 30%.
b. What does the NPV profile tell you about this project's internal rate of return (IRR)?
c. If Antonio follows the IRR decision rule and his cost of capital is 5%, should he accept or reject the investment opportunity? Why is it hard to make a decision on this investment based solely on the IRR rule?
d. If Antonio's cost of capital is 5%, should he reject or accept the investment based on its NPV?

LG1 LG6

P10–29 **ETHICS PROBLEM** Diane Dennison is a financial analyst working for a large chain of discount retail stores. Her company is looking at the possibility of replacing the existing fluorescent lights in all of its stores with LED lights. The main advantage of making this switch is that the LED lights are much more efficient and will cost less to operate. In addition, the LED lights last much longer and will have to be replaced after 10 years, whereas the existing lights have to be replaced after 5 years. Of course, making this change will require a large investment to purchase new LED lights and to pay for the labor of switching out tens of thousands of bulbs. Diane plans to use a 10-year horizon to analyze this proposal, figuring that changes to lighting technology will eventually make this investment obsolete.

Diane's friend and coworker, David, has analyzed another energy-saving investment opportunity that involves replacing outdoor lighting with solar-powered fixtures in a few of the company's stores. David also used a 10-year horizon to conduct his analysis. Cash flow forecasts for each project appear below. The company uses a 10% discount rate to analyze capital budgeting proposals.

Year	LED project	Solar project
0	–$4,200,000	–$500,000
1	700,000	60,000
2	700,000	60,000
3	700,000	60,000
4	700,000	60,000
5	1,000,000	60,000
6	700,000	60,000
7	700,000	60,000
8	700,000	60,000
9	700,000	60,000
10	700,000	60,000

a. What is the NPV of each investment? Which investment (if either) should the company undertake?

b. David approaches Diane for a favor. David says that the solar lighting project is a pet project of his boss, and David really wants to get the project approved to curry favor with his boss. He suggests to Diane that they roll their two projects into a single proposal. The cash flows for this combined project would simply equal the sum of the two individual projects. Calculate the NPV of the combined project. Does it appear to be worth doing? Would you recommend investing in the combined project?

c. What is the ethical issue that Diane faces? Is any harm done if she does the favor for David as he asks?

SPREADSHEET EXERCISE

The Drillago Company is involved in searching for locations in which to drill for oil. The firm's current project requires an initial investment of $15 million and has an estimated life of 10 years. The expected future cash inflows for the project appear in the following table.

Year	Cash inflows
1	$ 600,000
2	1,000,000
3	1,000,000
4	2,000,000
5	3,000,000
6	3,500,000
7	4,000,000
8	6,000,000
9	8,000,000
10	12,000,000

The firm's current cost of capital is 13%.

TO DO

Create a spreadsheet to answer the following questions.

a. Calculate the project's net present value (NPV). Is the project acceptable under the NPV technique? Explain.

b. Calculate the project's internal rate of return (IRR). Is the project acceptable under the IRR technique? Explain.

c. In this case, did the two methods produce the same results? Generally, is there a preference between the NPV and IRR techniques? Explain.

d. Calculate the payback period for the project. If the firm usually accepts projects that have payback periods between 1 and 7 years, is this project acceptable?

CHAPTER 11

Capital Budgeting Cash Flows and Risk Refinements

LEARNING GOALS

- **LG1** Discuss net and incremental cash flows, and describe the three major types of net cash flows.
- **LG2** Discuss replacement versus expansion decisions, sunk costs and opportunity costs, and international capital budgeting.
- **LG3** Calculate the initial investment, operating cash flows, and terminal cash flow associated with a proposed investment project.
- **LG4** Understand the importance of recognizing risk in the analysis of capital budgeting projects, and discuss risk and cash flows, scenario analysis, and simulation as behavioral approaches for dealing with risk.
- **LG5** Describe the determination and use of risk-adjusted discount rates (RADRs), portfolio effects, and the practical aspects of RADRs.
- **LG6** Select the best of a group of unequal-lived, mutually exclusive projects using annualized net present values (ANPVs), and explain the role of real options and the objective and procedures for selecting projects under capital rationing.

MyLab Finance **Chapter Introduction Video**

WHY THIS CHAPTER MATTERS TO YOU

In your *professional* life

ACCOUNTING You need to understand capital budgeting cash flows to provide revenue, cost, depreciation, and tax data for use in developing and monitoring project cash flows, and you also need to understand the risk caused by the variability of cash flows.

INFORMATION SYSTEMS You need to understand capital budgeting cash flows to maintain and facilitate the retrieval of cash flow data for projects and also understand how risk is incorporated into capital budgeting techniques so as to design decision modules for analyzing proposed investment projects.

MANAGEMENT You need to understand capital budgeting cash flows and behavioral approaches for dealing with risk so that you will know which cash flows are relevant in making decisions about proposals for acquiring additional production facilities, for new marketing programs, for new products, and for the expansion of existing product lines.

MARKETING You need to understand capital budgeting cash flows and how the risk of proposed projects is measured in capital budgeting so that you can make revenue and cost estimates for proposals for new marketing programs, for new products, and for the expansion of existing product lines.

OPERATIONS You need to understand cash flows so that you can make revenue and cost estimates for proposals for the acquisition of new equipment and production facilities. You need to understand that capital budgeting cash flows associated with proposals for the acquisition of new equipment and plants will be evaluated by the firm's decision makers, especially projects that are risky, have unequal lives, may need to be abandoned or slowed, or have limited capital.

In your *personal* life

You are not mandated to provide financial statements prepared using GAAP, so you naturally focus on cash flows. When considering a major outflow of funds (e.g., purchase of a house, funding of a college education), you can project the associated cash flows and use these estimates to determine the value and affordability of the assets and any associated future outlays. You should also consider risk in the decision-making process. Failing to incorporate risk into your financial decision-making process will likely result in poor decisions and reduced personal wealth.

LG1 LG2

11.1 Project Cash Flows

net cash flows
The net (or the sum of) incremental after-tax cash flows over a project's life.

incremental cash flows
The additional after-tax cash flows—outflows or inflows—that will occur only if the investment is made.

Chapter 10 introduced the capital budgeting process and the techniques financial managers use for evaluating and selecting long-term investment projects. To evaluate these opportunities, financial managers must identify the net cash flows associated with the investment opportunity. A project's **net cash flows** are the net (or the sum of) incremental after-tax cash flows over a project's life. The **incremental cash flows** represent the additional after-tax cash flows—outflows or inflows—that will occur only if the firm makes the investment. As noted in Chapter 4, we focus on cash flows rather than accounting figures because cash flows directly affect the firm's ability to pay bills and purchase assets. Once they have estimates of incremental cash flows in place, managers can evaluate the investment project using the valuation techniques introduced in Chapter 10. The *Focus on Ethics* box on page 491 discusses what can go wrong when managers fail to make investment decisions based on *incremental* cash flows.

The remainder of this chapter is devoted to the procedures that managers use to estimate the incremental cash flows associated with an investment project and the ways managers apply those cash flow estimates to make investment decisions.

MAJOR CASH FLOW TYPES

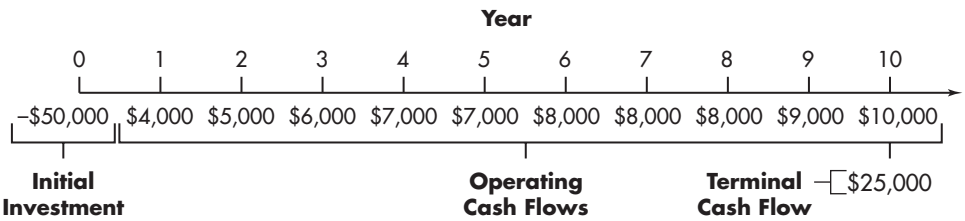
The cash flows of any project may include (1) an initial investment, (2) operating cash flows, and (3) a terminal cash flow. In the typical pattern, the initial investment is a net cash outflow that occurs at the beginning (time zero) of the project, the operating cash flows occur over the life of the project and tend to be net cash inflows, and the terminal cash flow occurs at the end of the project. In most situations, the terminal cash flow will be a net inflow. However, for any particular investment, any of these net cash flows could be inflows or outflows, since each is a function of the sum of incremental cash inflows and outflows that take place for a particular period during the project's life.

initial investment
The incremental cash flows for a project at time zero.

operating cash flows
The net incremental after-tax cash flows occurring each period during the project's life.

Figure 11.1 depicts on a timeline the net cash flows for a proposed investment project. The **initial investment** for the project is a $50,000 cash outflow at time zero. The incremental cash flows that make up the initial investment typically include the cost of acquiring new assets, the proceeds from the disposal of the old assets, and cash flows resulting from up-front changes to net working capital. The **operating cash flows,** which are the sum of incremental

FIGURE 11.1
Major Net Cash Flow Types
Timeline for major net cash flow types



after-tax cash flows occurring each period during the project's life, gradually increase from $4,000 in the first year to $10,000 in the 10th year. For this project, the operating cash flows are all cash inflows, but that is not always the case. The **terminal cash flow** is a net after-tax cash flow occurring in the project's final year. It is often attributable to liquidation of the project. In this case, the terminal cash flow is an inflow of $25,000, received at the end of the project's 10-year life. Note that the terminal cash flow does not include the $10,000 operating cash inflow for year 10; in other words, total cash flows in year 10 are $35,000.

terminal cash flow
The net after-tax cash flow occurring in the final year of the project.

REPLACEMENT VERSUS EXPANSION DECISIONS

Many common investments that firms undertake involve a decision to expand the firm's activities. Expansion decisions include investments designed to increase the capacity of a factory, to launch a product in a new market, or to open a new location. Identifying incremental cash flows along with developing net cash flow estimates is relatively straightforward in these sorts of projects. The initial investment, operating cash flows, and terminal cash flow are merely the net after-tax cash flows associated with the proposed expansion project. For example, if Target Corporation opens a new retail store in a town that previously had no Target stores, the initial investment would include the cost of opening the new store and stocking it with inventory. Operating cash flows would include all the cash inflows and outflows associated with running a Target store in a typical year. All cash flows are incremental because if Target does not open a store in this location, it has no cash outflows or inflows.

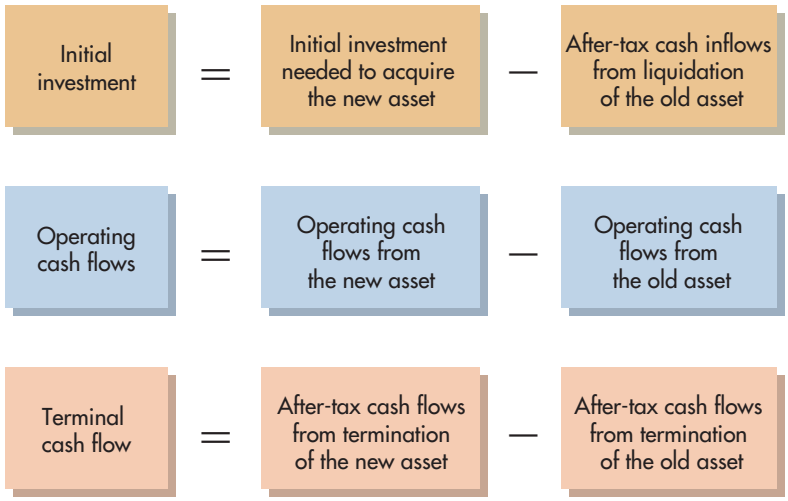
Perhaps an even more common situation occurs when a firm must decide whether to replace some asset that it already owns with a new asset. Such decisions include replacing old equipment, upgrading computers and software, or remodeling facilities.

Identifying incremental cash flows for these sorts of investment projects is more complicated because the firm must compare the cash flows that result from the new investment to the cash flows that would have occurred if no investment had been made. For instance, if a company buys new equipment to replace existing machinery, the initial investment includes the cost of the new equipment as well as any cash flows associated with the removal and sale of the old equipment. Similarly, identifying incremental operating cash flows is more complex for replacement decisions than for expansion decisions. If Target Corporation remodels one of its existing stores, that is a kind of replacement decision because the remodeled store "replaces" the old one. To estimate the incremental operating cash flows, financial analysts at Target must forecast the revenues and expenses from the new store and compare those to the revenues and expenses the old store would have generated had it not been remodeled. For investments that have a limited life span, the terminal cash flow is the difference between the after-tax cash flows expected upon termination of the new asset versus the old asset. Figure 11.2 illustrates these relationships.

Actually, in one sense you can view all capital budgeting decisions as replacement decisions. You can think of an expansion project as being equivalent to a replacement project in which the cash flows from the old asset being replaced are zero. In light of this and the fact that replacement decisions are so common in business, we will focus on these decisions in most of our examples here.

FIGURE 11.2

Relevant Net Cash Flows for Replacement Decisions
Calculation of the three types of relevant net cash flows for a replacement decision



SUNK COSTS AND OPPORTUNITY COSTS

When estimating the incremental cash flows associated with a proposed investment opportunity, the firm must take care to treat sunk costs and opportunity costs properly. These costs are easy to mishandle, classifying costs as incremental when they are not or ignoring costs that should be counted as part of a project's incremental cash flows. **Sunk costs** are cash outlays that have already been made (past outlays) and cannot be recovered, whether or not the firm follows through and makes an investment. Suppose that before building a new store, managers at Target first invest a lot of time and money to assess the market for the proposed store. This analysis might look at the population and average income in the surrounding community, the local cost of labor, taxes, and many other factors. The process may cost tens of thousands of dollars. However, once it is completed, those costs are sunk and should not influence the company's decision to open a new store. Whether Target opens a new store or not, it cannot recover the costs of analyzing the investment opportunity in the local market. Sunk costs are irrelevant and should not be included in a project's incremental cash flows.

sunk costs
Cash outlays that have already been made (past outlays) and cannot be recovered, whether or not the firm follows through and makes an investment.

Opportunity costs are cash flows that the firm could have realized from the best alternative use of assets already in place. When a firm undertakes a replacement project, it repurposes or replaces some portion of its existing assets to generate a new cash flow stream and, in doing so, forgoes any of the future cash inflows that the existing assets would have provided had they not been replaced. Thus, the incremental operating cash flows for a replacement project will be the difference between the new operating cash flows and the forgone operating cash flows. Opportunity costs therefore represent cash flows that the firm will not realize as a result of using that asset in the proposed project. Thus, any opportunity costs are relevant and should be included as part of the cash flow projections when determining a project's net cash flows.

opportunity costs
Cash flows that could have been realized from the best alternative use of an owned asset.

FOCUS ON ETHICS *in practice*

Fumbling Sunk Costs

A core concept in economics is marginal analysis: Decisions should depend on incremental costs and benefits. Costs already incurred that cannot be recovered—*sunk costs*—are irrelevant. Surprisingly, businesses often wrongly consider sunk costs, a practice sometimes called the *Concorde Fallacy* after the most notorious case. Long after the Supersonic Transport Aircraft proved a commercial disaster, the British and French governments continued funding it because no senior official wanted to concede the project had been folly. When considering project renewal, managers have an ethical duty to focus on net present value and avoid letting emotional factors or concerns about their own reputations distort investment decisions.

Professional sports offer the best-known example of the Concorde Fallacy—a team signs a marquee player to an expensive long-term contract, then sticks with him no matter what. Consider the case of Robert Griffin III (RGIII), the 2011 Heisman Trophy–winning quarterback drafted second by the National Football League (NFL) Washington Redskins. Griffin cost the Redskins plenty—a 4-year guaranteed contract worth $21.1 million as well as numerous draft picks traded to obtain the second overall pick in the draft. The deal also gave the Redskins an option to keep RGIII around a fifth year for a hefty sum; here sunk costs entered the equation.

In the first year of the contract, the investment paid off handsomely—Griffin was named Offensive Rookie of the Year, and the Redskins won their division for the first time in 13 years. But late that season, RGIII suffered the first of many injuries that kept him from regaining rookie form. Just before the 2015 season (the fourth and final year of the initial contract) the Redskins took advantage of their right to sign Griffin for 2016, promising a cool $16.2 million. At the time, the move was called "the biggest blunder in NFL history" because of the injury risk. The Redskins tried to hedge by not guaranteeing the salary—meaning the full amount would be owed only if RGIII stayed healthy the entire 2016 season. But under the terms of the initial contract, the team was on the hook if a 2015 injury prevented him from playing in 2016. Sure enough, in the 2015 preseason, Griffin suffered a concussion—forcing the Redskins to bench him to prevent further injury that could carry over and cost $16.2 million. The team owned up to the mistake by releasing a now-healthy RGIII after the 2015 season.

Recent research suggests NFL teams routinely fail to ignore sunk costs. One study looked at factors influencing the number of games started by defensive players. The empirical model included performance measures like solo tackles for linebackers as well as contract size to test for the Concorde Fallacy. Other things equal, performance rather than compensation should determine which players should start more games; contracts are sunk because a player is paid the same dollars whether he begins the game on the field or the bench. Contracts turned out to have a large impact—a 15% increase in a defensive player's compensation boosted the number of starts as much as nine extra solo tackles would. In other words, more expensive players were more likely to start even if they did not perform better than players on the bench. From an economic perspective, choosing starters based on sunk costs deserves a flag for illegal procedure.

▶ *Recommitting to a losing project for emotional or reputational reasons can destroy shareholder wealth. What safeguards could a firm use to remove such bias from recommitment decisions?*

Sources: Chris Isidore, "Redskins' RG3 contract may be biggest blunder in NFL history," *CNN Money*, September 1, 2015; Quinn A. W. Keefer, 2015, "Performance feedback does not eliminate sunk cost fallacy," *Journal of Labor Research*, Vol. 36, pp. 409–426.

EXAMPLE 11.1

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Jankow Equipment is considering enhancing its drill press X12, which it purchased 3 years earlier for $237,000, by retrofitting it with the computerized control system from an obsolete piece of equipment it owns. The obsolete equipment could be sold today for about $42,000, but without its computerized control system, it would be worth nothing. Jankow is in the process of estimating the labor and materials costs of retrofitting the system to drill press X12 and the benefits expected from the retrofit. The $237,000 cost of drill press X12 is a sunk cost because it represents an earlier cash outlay. It would not be included as

a cash outflow when determining the cash flows relevant to the retrofit decision. However, if Jankow uses the computerized control system of the obsolete machine, then Jankow will have an opportunity cost of $42,000, which is the cash the company could have received by selling the obsolete equipment in its current condition. By retrofitting the drill press, Jankow gives up the opportunity to sell the old equipment for $42,000. This opportunity cost would be included as a cash outflow associated with using the computerized control system.

MATTER OF FACT

Who Receives the Most FDI?

foreign direct investment (FDI)
The transfer of capital, managerial, and technical assets to a foreign country.

Foreign direct investment (FDI), which involves the transfer of capital, managerial, and technical assets to a foreign country, plays an important role in the U.S. economy. According to the 2016 *World Investment Report*, global flows of FDI totaled $1.8 trillion, the highest level since the global economic and financial crisis began in 2008 and within 10% of the 2007 peak.

As tends to be the case, the United States was the world's largest recipient of FDI, receiving $380 billion in FDI, and the largest provider, investing $300 billion in countries around the world. Hong Kong and mainland China were the second and third largest recipients of FDI, receiving $175 billion and $135 billion, respectively.

→ REVIEW QUESTIONS MyLab Finance Solutions

11-1 Why is it important to evaluate capital budgeting projects on the basis of incremental cash flows?

11-2 What three types of net cash flows may exist for a given project? How can expansion decisions be treated as replacement decisions? Explain.

11-3 What effect do sunk costs and opportunity costs have on a project's net cash flows?

11-4 How can firms mitigate currency risk and political risk when investing in a foreign country?

LG 3

11.2 Finding the Initial Investment

The term *initial investment* as used here refers to the relevant, up-front net cash flow that managers should consider when evaluating a prospective investment opportunity. Our discussion of capital budgeting will focus on projects with initial investments that occur at time zero, the time at which a firm makes the capital expenditure. We calculate the initial investment by netting all of the incremental cash flows that occur at time zero: subtracting all the cash outflows occurring at time zero from all the cash inflows that occur at that time.

The basic format for determining the initial investment appears in Table 11.1. The cash flows that make up a project's initial investment include the installed cost of the new asset, the after-tax proceeds (if any) from the sale of the old asset that the firm is replacing, and the change (if any) in net working capital. Note that for expansion projects there will be no after-tax proceeds from the sale of an old asset, so the initial investment is simply the installed cost of the new asset and any change in net working capital.

TABLE 11.1 The Basic Format for Determining Initial Investment

(1) **Installed cost of the new asset =**	
Cost of the new asset	
+ Installation costs	
(2) **After-tax proceeds from the sale of the old asset =**	
Proceeds from the sale of the old asset	
± Tax on the sale of the old asset	
(3) **Change in net working capital**	
Initial Investment = (1) − (2) ± (3)	

cost of the new asset
The cash outflow necessary to acquire a new asset.

installation costs
Any added costs that are necessary to place the new asset into operation.

installed cost of the new asset
The cost of the new asset plus its installation costs; equals the asset's depreciable value.

after-tax proceeds from the sale of the old asset
The difference between the old asset's sale proceeds and any applicable tax liability or refund related to its sale.

proceeds from the sale of the old asset
The before-tax cash inflow net of any removal costs that results from the sale of the old asset and is normally subject to some type of tax treatment.

tax on the sale of the old asset
Tax that depends on the relationship between the old asset's sale price and its book value and on existing government tax rules.

book value
The asset's value on the firm's balance sheet as determined by accounting principles. The difference between what an asset cost (including installation costs) and the accumulated depreciation on the asset.

INSTALLED COST OF THE NEW ASSET

As Table 11.1 shows, managers calculate the installed cost of a new asset by adding the cost of the new asset to its installation costs. The **cost of the new asset** is the cash outflow necessary to acquire the new asset, which is usually simply its purchase price. **Installation costs** are any added costs necessary to place the new asset into operation. The IRS requires the firm to add installation costs to the purchase price of an asset to determine its depreciable value, which is expensed over a period of years. The **installed cost of the new asset,** calculated by adding the cost of the new asset to its installation costs, equals its depreciable value.

AFTER-TAX PROCEEDS FROM THE SALE OF THE OLD ASSET

Table 11.1 shows that the *after-tax proceeds from the sale of the old asset* decrease the firm's initial investment. The **after-tax proceeds from the sale of the old asset** include the old asset's sale proceeds and any applicable tax liability or refund related to its sale.

The **proceeds from the sale of the old asset** represent the before-tax cash inflow net of any removal costs that results from selling the old asset. Normally, selling an old asset triggers a tax-related cash flow, either additional tax payments or a tax refund. The **tax on the sale of the old asset** depends on the relationship between the asset's sale price and its book value and on existing government tax rules.

Book Value

The **book value** of an asset is the asset's value on the firm's balance sheet as determined by accounting principles. An asset's book value is usually just the difference between what the asset cost (including installation costs) and the accumulated depreciation on the asset.[1]

$$\text{Book value} = \text{Installed cost of asset} - \text{Accumulated depreciation} \quad (11.1)$$

1. Recall that firms can keep one set of books for financial reporting purposes and another set for tax purposes. The book value we refer to here is the value on the books for tax purposes, also known as the asset's *tax basis*.

TABLE 11.2 Tax Treatments for the Sales of Assets

Tax case	Definition	Tax treatment	Tax Consequence
Gain on the sale of asset	Portion of the sale price that is *greater than* book value	All gains above book value are taxed as ordinary income.	21% of gain is a tax liability.
Loss on the sale of asset	Amount by which sale price is *less than* book value	If the asset is depreciable and used in business, then loss is deducted from ordinary income.	21% of loss is a tax savings.
		If the asset is *not* depreciable or is *not* used in business, then loss is deductible only against capital gains.	21% of loss is a tax savings.

EXAMPLE 11.2

Hudson Industries, a small electronics company, acquired a machine tool 2 years ago with an installed cost of $100,000. The asset was not eligible for 100% bonus depreciation under current tax law, so it was being depreciated under MACRS, using a 5-year recovery period. Table 4.2 shows that under MACRS for a 5-year recovery period, 20% and 32% of the installed cost would be depreciated in years 1 and 2, respectively. In other words, 52% (20% + 32%) of the $100,000 cost, or $52,000 (0.52 × $100,000), would be the accumulated depreciation after 2 years. Substituting into Equation 11.1, we get

$$\text{Book value} = \$100{,}000 - \$52{,}000 = \underline{\underline{\$48{,}000}}$$

The book value of Hudson's asset at the end of year 2 is therefore $48,000.

Three tax treatments are possible and depend on the asset's selling price: The asset may be sold for (1) more than its book value, (2) its book value, or (3) less than its book value. In the first case, the firm generates a gain on the sale of the asset, in the second case it breaks even, and in the third case it realizes a loss on the sale of the asset. In the breakeven case, there is no tax consequence related to the asset sale; however, the other two cases have associated tax consequences. The tax treatments for the sale of an asset for more or less than book value are defined and summarized in Table 11.2. We will use an example to illustrate.

EXAMPLE 11.3

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The old asset purchased 2 years ago for $100,000 by Hudson Industries has a current book value of $48,000. What will happen if the firm now decides to sell the asset and replace it? The tax consequences depend on the sale price. Figure 11.3 depicts the taxable income resulting from four possible sale prices in light of the asset's initial purchase price of $100,000 and its current book value of $48,000. The tax consequences of each of these sale prices are described in the following paragraphs.

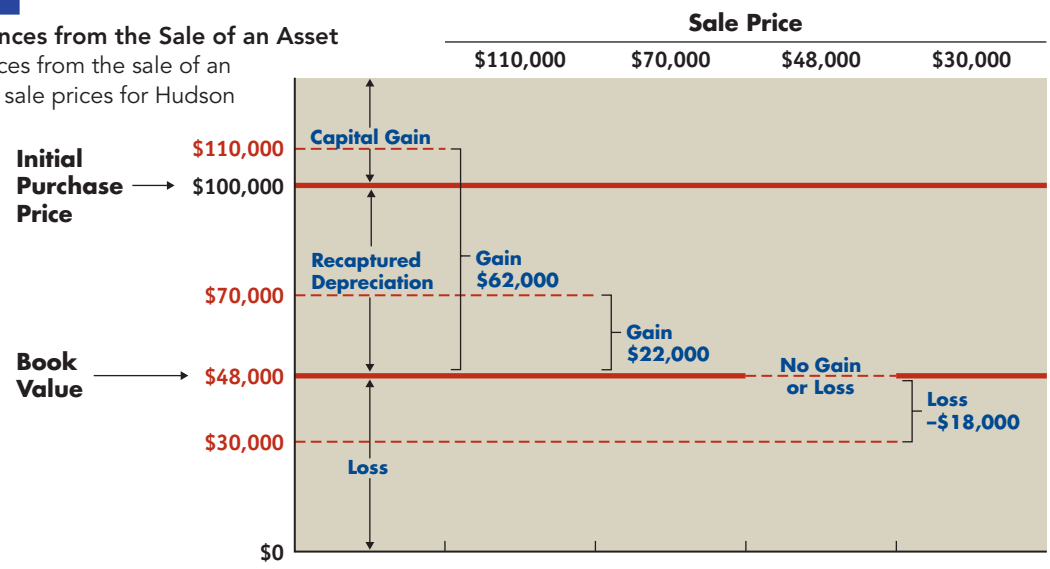
The sale of the asset for more than its book value If Hudson sells the old asset for $110,000, it realizes a gain of $62,000 ($110,000 − $48,000). Technically, this gain is made up of two parts: a capital gain and **recaptured depreciation,** which is the portion of the sale price that is above book value and below the initial purchase price. For Hudson, the capital gain is $10,000 ($110,000 sale price − $100,000 initial purchase price); recaptured depreciation is $52,000 (the $100,000 initial purchase price − $48,000 book value).

recaptured depreciation
The portion of an asset's sale price that is above its book value and below its initial purchase price.

FIGURE 11.3

Tax Consequences from the Sale of an Asset

Tax consequences from the sale of an asset at various sale prices for Hudson Industries



The tax treatment of capital gains can be quite complex, so to keep things simple we assume that the total gain above book value of $62,000 is taxed at Hudson's ordinary corporate income tax rate of 21%, resulting in taxes of $13,020 (0.21 × $62,000). Hudson would not have paid these taxes had they not replaced the old equipment, so the taxes are part of the incremental cash flows at time zero. That is, the taxes constitute a portion of the replacement project's initial investment. In effect, the taxes raise the amount of the firm's initial investment in the new asset by reducing the proceeds from the sale of the old asset.

If Hudson instead sells the old asset for $70,000, it experiences a gain above book value (in the form of recaptured depreciation) of $22,000 ($70,000 − $48,000), as shown under the $70,000 sale price in Figure 11.3. This gain is taxed as ordinary income. Because the firm is in the 21% tax bracket, the taxes on the $22,000 gain are $4,620 (0.21 × $22,000). This amount in taxes should be used in calculating the initial investment in the new asset.

The sale of the asset for its book value If Hudson sells the old asset for $48,000, there is no gain or loss on the sale, as Figure 11.3 shows. Because there is no gain or loss, there is no incremental tax effect of the sale.

The sale of the asset for less than its book value If Hudson sells the asset for $30,000, it experiences a loss of $18,000 ($48,000 − $30,000), as shown under the $30,000 sale price in Figure 11.3. The firm may use the loss to offset ordinary operating income, which saves the firm $3,780 (0.21 × $18,000) in taxes. And, if current operating earnings are not sufficient to offset the loss, the firm may be able to apply these losses to prior or future years' taxes.

MATTER OF FACT

Ignoring Working Capital Can Kill the Bottom Line

The REL 2015 Working Capital Survey of the top 1000 companies in North America and Europe found that only 1% of companies had improved their working capital performance for the previous 3 years. Surprisingly, the survey found that when not facing a crisis only a few companies actively made an effort to manage working capital. Not surprisingly, the survey found that this indifference came at a cost: A significant number of companies in the survey lost 15% or more of their EBIT due to inefficient or nonexistent working capital management.

CHANGE IN NET WORKING CAPITAL

net working capital
The difference between the firm's current assets and its current liabilities.

Net working capital is the difference between the firm's current assets and its current liabilities. Changes in net working capital often accompany capital budgeting decisions. If a firm acquires new machinery to expand its production output, it will experience an increase in levels of cash, accounts receivable, inventories, accounts payable, and expense accruals. These increases result from the need for more cash to support expanded operations, more accounts receivable and inventories to support increased sales, and more accounts payable and expense accruals to support increased outlays made to meet expanded product demand. As noted in Chapter 4, increases in cash, accounts receivable, and inventories are *outflows of cash,* whereas increases in accounts payable and expense accruals are *inflows of cash*.

change in net working capital
The difference between the change in current assets and the change in current liabilities.

The difference between the change in current assets and the change in current liabilities is the **change in net working capital.** Generally, when a company makes a major new investment, current assets increase by more than current liabilities, resulting in a greater investment in net working capital. This increased investment in working capital is treated as an initial outflow.[2] If the change in net working capital were negative, it would be shown as an initial inflow. The change in net working capital—regardless of whether it is an increase or a decrease—*is not taxable* because it merely involves a net buildup or net reduction of current accounts.

EXAMPLE 11.4

Danson Company is expanding. Analysts expect that the changes summarized in Table 11.3 will occur and will be maintained over the life of the expansion. Current assets will increase by $22,000, and current liabilities will increase by $9,000, resulting in a $13,000 increase in net working capital. This increase in net working capital is part of the initial cash outflow required to begin the expansion project, so we treat it as a cash outflow in calculating the initial investment.

2. When changes in net working capital apply to the initial investment associated with a proposed investment project, we treat them as part of the initial investment, which takes place at time zero. In practice, the change in net working capital will frequently occur over a period of months as the firm implements its capital expenditure. Furthermore, additional changes to working capital may occur through the entire life of the project, in which case those changes become part of the cash inflows or outflows in subsequent years.

TABLE 11.3 Calculation of Change in Net Working Capital for Danson Company

Current account	Change in balance	
Cash	+ $ 4,000	
Accounts receivable	+ 10,000	
Inventories	+ 8,000	
(1) Current assets		+ $22,000
Accounts payable	+ $ 7,000	
Expense accruals	+ 2,000	
(2) Current liabilities		+ $ 9,000
Change in net working capital = (1) − (2)		+ $13,000

CALCULATING THE INITIAL INVESTMENT

A variety of tax and other considerations enter into the initial investment calculation. The following example illustrates calculation of the initial investment according to the format in Table 11.1.[3]

EXAMPLE 11.5

Powell Corporation is trying to determine the initial investment required to replace an old machine with a new one. The new machine costs $380,000, and an additional $20,000 will be necessary to install it. It will be depreciated under MACRS, using a 5-year recovery period.[4] The old machine was purchased 3 years ago at a cost of $240,000 and was being depreciated under MACRS, using a 5-year recovery period. The firm can sell the old machine for $280,000. The firm expects that a $35,000 increase in current assets and an $18,000 increase in current liabilities will accompany the replacement resulting in a $17,000 ($35,000 − $18,000) increase in net working capital. The firm's tax rate is 21%.

The only component of the initial investment calculation that is difficult to obtain is taxes. The tax consequences of the sale of the old machine depend on the selling price relative to the asset's book value. To find the book value of the old machine, use the depreciation percentages from Table 4.2 of 20%, 32%, and 19% for years 1, 2, and 3, respectively. The book value is the difference between the original $240,000 purchase price and the accumulated depreciation over the 3 years that the asset was in use. The resulting book value is

$$\$240{,}000 - [(0.20 + 0.32 + 0.19) \times \$240{,}000] = \$69{,}600$$

Powell Corporation realizes a gain of $210,400 ($280,000 − $69,600) on the sale. The total taxes on the gain are $44,184 (0.21 × $210,400). Powell's financial analysts must subtract these taxes from the $280,000 sale price of the old machine to calculate the after-tax proceeds from its sale.

3. For simplicity, throughout the discussions of capital budgeting, we assume that all assets evaluated as candidates for replacement have usable lives that are equal to the lives of the assets they replace. This assumption enables us to avoid the problem of unequal lives, which is discussed later.

4. Were the machine eligible for 100% bonus depreciation under the tax law, the initial investment would be reduced by an immediate $84,000 (0.21 × $400,000) tax savings.

Substituting the relevant amounts into the format in Table 11.1 results in an initial investment of $181,184, which represents the net cash outflow required at time zero.

Installed cost of new machine		
Cost of new machine	$380,000	
+ Installation costs	20,000	
Total installed cost		$400,000
− After-tax proceeds from the sale of the old machine		
Proceeds from the sale of the old machine	$280,000	
− Tax on the sale of the old machine	44,184	
Total after-tax proceeds		235,816
+ Change in net working capital		17,000
Initial investment		181,184

→ REVIEW QUESTIONS MyLab Finance Solutions

11-5 Explain how to use each of the following inputs to calculate the initial investment: (**a**) cost of the new asset, (**b**) installation costs, (**c**) proceeds from the sale of the old asset, (**d**) tax on the sale of the old asset, and (**e**) change in net working capital.

11-6 How do you calculate the book value of an asset?

11-7 What three tax situations may result from the sale of an asset that is being replaced?

11-8 Referring to the basic format for calculating an initial investment, explain how a firm would determine the depreciable value of the new asset.

LG 3

11.3 Finding the Operating Cash Flows

Operating cash flows are the net incremental after-tax cash flows that occur after a firm makes a new investment and begins operating with the new investment in place. Finding the operating cash flows requires identifying all the incremental cash flows related to the firm's operations that will be affected by the investment decision; this includes any current incremental cash flows that will be forgone and any new incremental cash flows that will be created. In this section, we use the income statement format to clarify what we mean by incremental, after-tax cash flows.

INTERPRETING THE TERM CASH FLOWS

All costs and benefits expected from a proposed project must be measured on a cash flow basis. Cash outflows represent costs incurred by the firm, and cash inflows represent dollars that the firm receives and can then spend. Cash flows generally are not equal to accounting profits. This is so in part because accounting rules do not allow firms to fully deduct or expense the cost of fixed assets at the time of purchase. Instead, firms expense a portion of this cost through depreciation deductions each year over the useful life of the fixed asset. As a result, when a firm pays cash for a fixed asset, the firm's profits will not fully reflect the cost of the asset in the year of purchase. In subsequent years, firms reduce their profits by taking depreciation expenses, even though no cash outlays are tied to those depreciation charges.

INTERPRETING THE TERM AFTER-TAX

Cash flows that result from investment projects must be measured on an after-tax basis because the firm will not have the use of any cash flows until it has both satisfied the government's tax claims and captured the government's tax refunds, credits, or other tax breaks. Firms can use only the after-tax cash flows to pay returns to lenders and shareholders, so when making investment decisions, analysts must take care to measure incremental cash flows after taxes.

A simple technique can convert after-tax net profits into operating cash flows. The calculation requires adding depreciation and any other noncash charges (amortization and depletion) deducted as expenses on the firm's income statement back to net profits after taxes. Recognize that depreciation expenses are not actually cash inflows themselves. Adding depreciation to profit simply recognizes that the profit calculation requires firms to deduct an expense not tied to a specific cash outlay. Adding depreciation to after-tax profit "corrects" this issue and provides a number that better matches the actual cash inflows and outflows.

EXAMPLE 11.6

Powell Corporation's estimates of its revenue and expenses (excluding depreciation and interest), with and without the proposed new machine described in Example 11.5, are given in Table 11.4. Note that both the expected usable life of the new machine and the remaining usable life of the old machine are 5 years. The new machine's depreciable value is the sum of the $380,000 purchase price and the $20,000 installation cost. The firm calculates annual depreciation deductions on the new machine, using the MACRS percentages based on a 5-year recovery period.[5] The resulting depreciation on this machine for each of the 6 years, as well as the remaining 3 years of depreciation (years 4, 5, and 6) on the old machine, are calculated in Table 11.5.[6]

The income statement format in Table 11.6 illustrates how to calculate the operating cash flows each year. Note that we exclude interest because we are focusing purely on the "investment decision." The interest is relevant to the "financing decision," which we will address later in this text. Because we exclude interest

TABLE 11.4 Powell Corporation's Revenue and Expenses (Excluding Depreciation and Interest) for New and Old Machines

With new machine			With old machine		
Year	Revenue	Expenses (excl. depr. and int.)	Year	Revenue	Expenses (excl. depr. and int.)
1	$2,520,000	$2,300,000	1	$2,200,000	$1,990,000
2	2,520,000	2,300,000	2	2,300,000	2,110,000
3	2,520,000	2,300,000	3	2,400,000	2,230,000
4	2,520,000	2,300,000	4	2,400,000	2,250,000
5	2,520,000	2,300,000	5	2,250,000	2,120,000

5. Were the new machine eligible for 100% bonus depreciation under the tax law, there would be no depreciation deductions for the *new machine* in years 1-6 because Powell would deduct the entire cost in year 0.

6. It is important to recognize that although both machines will provide 5 years of use, the new machine will be depreciated over the 6-year period, whereas the old machine, as noted in the preceding example, has been depreciated over 3 years and therefore has remaining only its final 3 years (years 4, 5, and 6) of depreciation (12%, 12%, and 5%, respectively, under MACRS).

TABLE 11.5 Depreciation Expense for New and Old Machines for Powell Corporation

Year	Cost	Applicable MACRS depreciation percentages (from Table 4.2)	Depreciation
With new machine			
1	$400,000	20%	$400,000 × 20% = $ 80,000
2	400,000	32	$400,000 × 32% = $128,000
3	400,000	19	$400,000 × 19% = $ 76,000
4	400,000	12	$400,000 × 12% = $ 48,000
5	400,000	12	$400,000 × 12% = $ 48,000
6	400,000	5	$400,000 × 5% = $ 20,000
Totals		100%	$400,000
With old machine			
1	$240,000	12% (year-4 depreciation)	$240,000 × 12% = $28,800
2	240,000	12 (year-5 depreciation)	$240,000 × 12% = $28,800
3	240,000	5 (year-6 depreciation)	$240,000 × 5% = $12,000
4	Because the old machine is at the end of the third year of its cost recovery at the time the analysis is performed, it has only the final 3 years of depreciation (as noted above) still applicable.		0
5			0
6			0
Total			$69,600[a]

[a]The total $69,600 represents the book value of the old machine at the end of the third year, as calculated in Example 11.5.

expense, "earnings before interest and taxes" (EBIT) is equivalent to "net profits before taxes," and the calculation of "operating cash flow" (OCF) in Table 11.6 is identical to the definition that we provided in Chapter 4 (defined in Equation 4.3).

Substituting the data from Tables 11.4 and 11.5 into this format and assuming a 21% tax rate, we get Table 11.7, which demonstrates the calculation of operating cash flows for each year for both the new and the old machines.

TABLE 11.6 Calculation of Operating Cash Flows Using the Income Statement Format

Revenue
− Expenses (excluding depreciation and interest)
Earnings before interest, taxes, depreciation, and amortization (EBITDA)
− Depreciation
Earnings before interest and taxes (EBIT)
− Taxes (rate = T)
Net operating profit after taxes [NOPAT = EBIT × (1 − T)]
+ Depreciation
Operating cash flows (OCF) (same as OCF in Equation 4.3)

TABLE 11.7 Calculation of Operating Cash Flows for Powell Corporation's New and Old Machines

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
With new machine						
Revenue[a]	$2,520,000	$2,520,000	$2,520,000	$2,520,000	$2,520,000	$ 0
− Expenses (excluding depreciation and interest)[b]	2,300,000	2,300,000	2,300,000	2,300,000	2,300,000	0
Earnings before interest, taxes, depreciation, and amortization	$ 220,000	$ 220,000	$ 220,000	$ 220,000	$ 220,000	$ 0
− Depreciation[c]	80,000	128,000	76,000	48,000	48,000	20,000
Earnings before interest and taxes	$ 140,000	$ 92,000	$ 144,000	$ 172,000	$ 172,000	−$20,000
− Taxes (rate, $T = 21\%$)	29,400	19,320	30,240	36,120	36,120	− 4,200
Net operating profit after taxes	$ 110,600	$ 72,680	$ 113,760	$ 135,880	$ 135,880	−$15,800
+ Depreciation[c]	80,000	128,000	76,000	48,000	48,000	20,000
Operating cash flows	$ 190,600	$ 200,680	$ 189,760	$ 183,880	$ 183,880	$ 4,200
With old machine						
Revenue[a]	$2,200,000	$2,300,000	$2,400,000	$2,400,000	$2,250,000	$ 0
− Expenses (excluding depreciation and interest)[b]	1,990,000	2,110,000	2,230,000	2,250,000	2,120,000	0
Earnings before interest, taxes, depreciation, and amortization	$ 210,000	$ 190,000	$ 170,000	$ 150,000	$ 130,000	$ 0
− Depreciation[c]	28,800	28,800	12,000	0	0	0
Earnings before interest and taxes	$ 181,200	$ 161,200	$ 158,000	$ 150,000	$ 130,000	$ 0
− Taxes (rate, $T = 21\%$)	38,052	33,852	33,180	31,500	27,300	0
Net operating profit after taxes	$ 143,148	$ 127,348	$ 124,820	$ 118,500	$ 102,700	$ 0
+ Depreciation[c]	28,800	28,800	12,000	0	0	0
Operating cash flows	$ 171,948	$ 156,148	$ 136,820	$ 118,500	$ 102,700	$ 0

[a]From column 1 of Table 11.4.
[b]From column 2 of Table 11.4.
[c]From column 3 of Table 11.5.

Because the new machine is depreciated over 6 years, the analysis must be performed over the 6-year period to account for all the tax benefits of depreciation. The resulting operating cash flows appear in the final row of Table 11.7 for each machine. The $4,200 year-6 operating cash inflow for the new machine results solely from the tax benefit of its year-6 depreciation deduction.[7]

INTERPRETING THE TERM INCREMENTAL

The final step in estimating the net operating cash flows for a proposed replacement project is to calculate the incremental cash flows. The differences in cash flows that occur with the new machines compared to cash flows that occurred with the old machine are incremental cash flows.

7. Although here we have calculated the year-6 operating cash flow for the new machine, this cash flow will later be eliminated as a result of the assumed sale of the machine at the end of year 5.

EXAMPLE 11.7

Table 11.8 demonstrates the calculation of Powell Corporation's net operating cash flows for each year of the replacement project. The estimates of operating cash flows developed in Table 11.7 for the new and old machines appear in columns 1 and 2, respectively. Column 2 values represent the amount of operating cash flows that Powell Corporation will receive if it does not replace the old machine. If the new machine replaces the old machine, the firm's operating cash flows for each year will be those shown in column 1. Subtracting the old machine's operating cash flows from the new machine's operating cash flows, we get the net operating cash flows for the replacement project for each year, shown in column 3. These net operating cash flows represent the amounts by which each respective year's operating cash flow will change as a result of the replacement project. For example, in year 1, Powell Corporation's operating cash flow would increase by $18,652 if the proposed project were undertaken. These are the relevant cash flows that analysts should consider when evaluating the benefits of making a capital budgeting decision regarding the replacement of the old machine with the new machine.[8]

TABLE 11.8 Operating Cash Flows for Powell Corporation

	Operating cash flows		
Year	New machine[a]	Old machine[a]	Net OCF
1	$190,600	$171,948	$190,600 − $171,948 = $18,652
2	200,680	156,148	$200,680 − $156,148 = $44,532
3	189,760	136,820	$189,760 − $136,820 = $52,940
4	183,880	118,500	$183,880 − $118,500 = $65,380
5	183,880	102,700	$183,880 − $102,700 = $81,180
6	4,200	0	$ 4,200 − $ 0 = $ 4,200

[a]From final row for respective machine in Table 11.7.

8. We can use the following equation to calculate the net operating cash flow for a replacement project in year t, $NOCF_t$:

$$NOCF_t = [\Delta EBITDA_t \times (1 - T)] + (\Delta D_t \times T)$$

where

$\Delta EBITDA_t$ = change in earnings before interest, taxes, depreciation, and amortization [revenues – expenses (excl. depr. and int.)] in year t

T = firm's marginal tax rate

ΔD_t = change in depreciation expense in year t

Applying this formula to the Powell Corporation data given in Tables 11.4 and 11.5 for year 3, we get the following values of variables:

$$\Delta EBITDA_3 = (\$2{,}520{,}000 - \$2{,}300{,}000) - (\$2{,}400{,}000 - \$2{,}230{,}000)$$
$$= \$220{,}000 - \$170{,}000 = \$50{,}000$$
$$\Delta D_3 = \$76{,}000 - \$12{,}000 = \$64{,}000$$
$$T = 0.21$$

Substituting into the equation yields

$$NOCF_3 = [\$50{,}000 \times (1 - 0.21)] + (\$64{,}000 \times 0.21)$$
$$= \$39{,}500 + \$13{,}440 = \underline{\$52{,}940}$$

The $52,940 of net cash inflow for year 3 is the same value as that calculated for year 3 in column 3 of Table 11.8.

→ REVIEW QUESTIONS MyLab Finance Solutions

11-9 How does depreciation enter into the calculation of operating cash flows? How does the income statement format in Table 11.6 relate to Equation 4.3 for finding operating cash flow (OCF)?

11-10 How are the net operating cash flows that are associated with a replacement decision calculated?

LG 3

11.4 Finding the Terminal Cash Flow

A project's terminal cash flow is the cash flow resulting from termination and liquidation of a project at the end of its economic life. It represents the after-tax cash flow, exclusive of operating cash flows, that occurs in the final year of the project. For replacement projects, analysts must take into account the proceeds from both the new asset and the old asset. The proceeds from the sale of the new and the old asset, often called "salvage value," represent the amount net of any removal costs expected on termination of the project. For expansion types of investment projects, the proceeds from the old asset are zero. Regardless of the project type, a change in new working capital often takes place at the end of a project life, so this incremental cash flow, too, must be included in the terminal cash flow. Table 11.9 shows a basic format for calculating an investment project's terminal cash flow.

AFTER-TAX PROCEEDS FROM THE SALE OF NEW AND OLD ASSETS

When the investment being analyzed involves replacing an old asset with a new one, two elements are key in finding the terminal cash flow. First, at the end of the project's life, the firm will dispose of the new asset, possibly by selling it, so the after-tax proceeds from selling the new asset represent an incremental cash inflow. However, remember that if the firm had not replaced the old asset, the firm would have received proceeds from the sale of the old asset at the end of the project (rather than counting those after-tax proceeds at the beginning of the project timeline as part of the initial investment). Because the firm no longer has the opportunity to obtain the proceeds from selling the old machine at the end of

TABLE 11.9 The Basic Format for Determining Terminal Cash Flow

(1) After-tax proceeds from the sale of the new asset =
Proceeds from the sale of the new asset
± Tax on the sale of the new asset
(2) After-tax proceeds from the sale of the old asset =
Proceeds from the sale of the old asset
± Tax on the sale of the old asset
(3) Change in net working capital
Terminal cash flow = (1) − (2) ± (3)

the project's life, we must count as an incremental cash outflow the after-tax proceeds that the firm would have received from disposal of the old asset.

Recall that taxes come into play whenever an asset sells for a value different from its book value. If the net proceeds from the sale exceed book value, a tax payment shown as an outflow (deduction from sale proceeds) will occur. When the net proceeds from the sale fall short of book value, a tax benefit shown as a cash inflow (addition to sale proceeds) will result. Table 11.2 summarizes the tax treatments and consequences when assets sell for a price other than book value. For assets sold to net exactly book value, no taxes will be due.

CHANGE IN NET WORKING CAPITAL

When we calculated the initial investment, we took into account any change in net working capital that is attributable to the new asset. Now, when we calculate the terminal cash flow, the change in net working capital represents the reversion of any initial net working capital investment. Most often, this will show up as a cash inflow due to the reduction in net working capital; with termination of the project, the need for the increased net working capital investment usually ends. As long as no changes in working capital occur after the initial investment, the amount recovered at termination will equal the amount shown in the calculation of the initial investment. If working capital changes year to year as a firm expands or contracts operations, then those changes should be incorporated into the yearly operating cash flows. Changes to working capital by themselves do not trigger incremental taxes, so there are no tax consequences to consider.

Calculating the terminal cash flow involves the same procedures used to find the initial investment. In the following example, we calculate the terminal cash flow for a replacement decision.

EXAMPLE 11.8

Continuing with the Powell Corporation example, assume that the firm expects to liquidate the new machine at the end of its 5-year usable life, to net $50,000 after paying removal and cleanup costs. Had the new machine not replaced the old machine, the old machine would have been liquidated after 5 years to net $10,000. The firm expects to recover its $17,000 net working capital investment upon termination of the project. The firm pays taxes at a rate of 21%.

From the analysis of the operating cash flows presented earlier, we can see that the new machine will have a book value of $20,000 (equal to the year-6 depreciation) after 5 years. The old machine would have been fully depreciated and therefore would have a book value of zero after 5 years. Because the sale price of $50,000 for the new machine is below its initial installed cost of $400,000, but greater than its book value of $20,000, the firm will pay taxes only on the recaptured depreciation of $30,000 ($50,000 sale proceeds − $20,000 book value). Applying the ordinary tax rate of 21% to this $30,000 results in a tax of $6,300 (0.21 × $30,000) on the sale of the new machine. Its after-tax sale proceeds would therefore equal $43,700 ($50,000 sale proceeds − $6,300 taxes). Because the old machine would have been sold for $10,000 at termination, which is less than its original purchase price of $240,000 and above its book value of zero, it would have experienced a taxable gain of $10,000 ($10,000 sale price − $0 book value). Applying the 21% tax rate to the $10,000 gain, the firm would have owed a tax of $2,100 (0.21 × $10,000) on the sale of the old machine at the end of year 5. The firm's after-tax sale proceeds from the

old machine would have equaled $7,900 ($10,000 sale price − $2,100 taxes). Substituting the appropriate values into the format in Table 11.9 results in the terminal cash inflow of $52,800.

After-tax proceeds from the sale of the new machine		
Proceeds from the sale of the new machine	$50,000	
− Tax on sale of the new machine	6,300	
Total after-tax proceeds: new machine		$43,700
− After-tax proceeds from the sale of the old machine		
Proceeds from the sale of the old machine	$10,000	
− Tax on the sale of the old machine	2,100	
Total after-tax proceeds: old machine		7,900
+ Change in net working capital		17,000
Terminal cash flow		$52,800

→ REVIEW QUESTION MyLab Finance Solution

11-11 Explain how the terminal cash flow is calculated for replacement projects.

LG3 LG4

11.5 Risk in Capital Budgeting (Behavioral Approaches)

In our discussion of capital budgeting thus far, we have assumed that a firm's investment projects all have the same risk, which implies that the acceptance of any project would not change the firm's overall risk. In actuality, these assumptions often do not hold: Projects are not equally risky, and undertaking a major new investment can increase or decrease the firm's overall risk. We will now relax these assumptions and focus on how managers evaluate the risks of different projects. Naturally, we will use many of the risk concepts developed in Chapter 8.

We continue the Bennett Company example from Chapter 10. The relevant cash flows and NPVs for Bennett Company's two mutually exclusive projects—A and B—appear in Table 11.10.

MATTER OF FACT

What Does Your Gut Say?

A survey of more than 1,000 U.S. CEOs asked business leaders what tools they used to allocate capital within their firms. The leading answer, given by almost 80% of the survey respondents, was that CEOs use the NPV method to decide how to invest the firm's money. But nearly half the CEOs also said that their "gut feel" for a project was an important factor in their decisions.

Source: John Graham and Campbell Harvey, 2015, "Capital allocation and delegation of decision-making authority within firms," *Journal of Financial Economics*, Vol. 115, pp. 449–470.

TABLE 11.10 Relevant Cash Flows and NPVs for Bennett Company's Projects

	Project A	Project B
A. Relevant cash flows		
Initial investment	−$420,000	−$450,000
Year	Operating cash inflows	
1	$140,000	$280,000
2	140,000	120,000
3	140,000	100,000
4	140,000	100,000
5	140,000	100,000
B. Decision technique		
NPV @ 10% cost of capital[a]	$110,710	$109,244

[a]From Figure 10.2 on page 457; calculated using a financial calculator.

Firms use *behavioral approaches* to get a "feel" for a project's risk, whereas other approaches try to quantify and measure project risk. Here we present a few behavioral approaches to dealing with risk in capital budgeting: breakeven analysis, scenario analysis, and simulation.

BREAKEVEN ANALYSIS

risk (in capital budgeting)
The uncertainty surrounding the cash flows that a project will generate or, more formally, the degree of variability of cash flows.

In the context of capital budgeting, the term **risk** refers to the uncertainty surrounding the cash flows that a project will generate. More formally, risk in capital budgeting is related to the degree of variability of cash flows. Projects with a broad range of possible cash flows are usually more risky than projects that have a narrow range of possible cash flows.

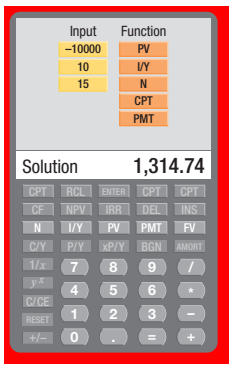
In many projects, risk stems almost entirely from the cash flows that a project will generate several years in the future because managers generally know with relative certainty how much the project's initial investment will cost. The subsequent cash flows, of course, derive from a number of variables related to revenues, expenditures, and taxes. Forecasts of an investment project's cash flow rely on many assumptions about sales, the cost of raw materials, labor rates, utility costs, tax rates, and many other factors. We will concentrate on the risk in the cash flows, but remember that this risk actually results from the interaction of these underlying variables. Therefore, to assess the risk of a proposed capital expenditure, the analyst must evaluate the probability that the cash inflows will be large enough to produce a positive NPV.

EXAMPLE 11.9

MyLab Finance Solution Video

Treadwell Tire Company, a tire retailer with a 10% cost of capital, is considering investing in either of two mutually exclusive projects, A and B. Each requires a $10,000 initial investment, and both are expected to provide constant annual cash inflows over their 15-year lives. For either project to be acceptable, its NPV must be greater than zero. In other words, the present value of the annuity (i.e., the project's cash inflows) must be greater than the initial cash outflow. If we let CF equal the annual cash inflow and CF_0 equal the initial investment, an

MyLab Finance Financial Calculator



breakeven cash inflow
The minimum level of cash inflow necessary for a project to be acceptable, that is, NPV > $0.

investment project with an annuity-like cash flow pattern (such as projects A and B) will have a positive NPV if the following condition holds:[8]

$$\text{NPV} = \left(\frac{CF}{r}\right) \times \left[1 - \frac{1}{(1 + r)^n}\right] - CF_0 > \$0 \qquad (11.2)$$

By substituting $r = 10\%$, $n = 15$ years, and $CF_0 = \$10{,}000$, we can find the **breakeven cash inflow,** the minimum annual cash inflow necessary for Treadwell's projects to create value for shareholders.

Calculator use Recognizing that the initial investment (CF_0) is the present value (PV), we can use the calculator inputs shown at the left to find the breakeven cash inflow (CF), which is an ordinary annuity (PMT).

Spreadsheet use The breakeven cash inflow also can be calculated as shown on the following Excel spreadsheet.

MyLab

	A	B
1	BREAKEVEN CASH INFLOW	
2	Initial investment	–$10,000
3	Cost of capital	10%
4	Number of years	15
5	Breakeven cash inflow	$1,314.74

Entry in Cell B5 is =PMT(B3,B4,B2,0,0). The minus sign appears before the initial investment in B4 because it is a cash outflow.

The calculator and spreadsheet values indicate that, for the projects to be acceptable, they must have annual cash inflows of at least $1,315. Given this breakeven level of cash inflows, managers can assess the risk of each project by determining the probability that the project's cash inflows will equal or exceed this level. Analysts can obtain estimates of that probability using various statistical techniques, but often managers make judgments about the likelihood of a project generating enough cash flow to break even based on their experience with other similar projects. For now, let us suppose that managers have estimated the probability that projects A and B will generate at least $1,315 in annual cash flow as follows:

Probability of $CF_A > \$1{,}315 \rightarrow 100\%$

Probability of $CF_B > \$1{,}315 \rightarrow 65\%$

Because project A is certain (100% probability) to have a positive net present value, whereas project B will have only a 65% chance of having a positive NPV, project A seems less risky than project B.

The example clearly identifies risk as it relates to the chance that a project is acceptable, but it does not address the issue of cash flow variability. Even though project B has a greater chance of loss than project A, it might result in higher

8. This equation makes use of the algebraic shortcut for the present value of an annuity, introduced in Personal Finance Example 5.7.

potential NPVs. Recall that the combination of risk and return is what determines value. Similarly, the benefit of a capital expenditure and its impact on the firm's value must be viewed in light of both risk and return. The analyst must therefore consider the variability of cash inflows and NPVs to assess project risk and return fully.

SCENARIO ANALYSIS

In dealing with project risk, financial analysts use scenario analysis to capture the variability of cash inflows and NPVs. *Scenario analysis* is a behavioral approach that uses several possible alternative outcomes (scenarios) to obtain a sense of the variability of returns, measured here by NPV. This technique often proves useful in getting a feel for the variability of return in response to changes in a key outcome. In capital budgeting, one of the most common scenario approaches is to estimate the NPVs associated with pessimistic (worst), most likely (expected), and optimistic (best) estimates of cash inflow. The range can be determined by subtracting the pessimistic-outcome NPV from the optimistic-outcome NPV.

EXAMPLE 11.10

Continuing with Treadwell Tire Company, assume that the financial manager created three scenarios for each project: pessimistic, most likely, and optimistic. Table 11.11 summarizes the cash inflows and resulting NPVs in each case. Comparing the ranges of cash inflows ($1,000 for project A and $4,000 for project B) and, more important, the ranges of NPVs ($7,606 for project A and $30,424 for B) suggests that project A is less risky than project B. Given that both projects have the same most likely NPV of $5,212, a risk-averse decision maker would likely take project A because it has less risk (smaller NPV range) and no possibility of loss (all NPVs $>$ $0).

TABLE 11.11 Scenario Analysis of Treadwell's Projects A and B

	Project A	Project B
Initial investment	**−$10,000**	**−$10,000**
	Annual cash inflows	
Outcome		
Pessimistic	$1,500	$ 0
Most likely	2,000	2,000
Optimistic	2,500	4,000
Range	1,000	4,000
	Net present values[a]	
Outcome		
Pessimistic	$1,409	−$10,000
Most likely	5,212	5,212
Optimistic	9,015	20,424
Range	7,606	30,424

[a]These values were calculated by using the corresponding annual cash inflows. A 10% cost of capital and a 15-year life for the annual cash inflows were used.

The widespread availability of computers and spreadsheets has greatly enhanced the use of scenario analysis because technology allows analysts to create a wide range of different scenarios quickly.

SIMULATION

simulation
A statistics-based behavioral approach that applies predetermined probability distributions and random numbers to estimate risky outcomes.

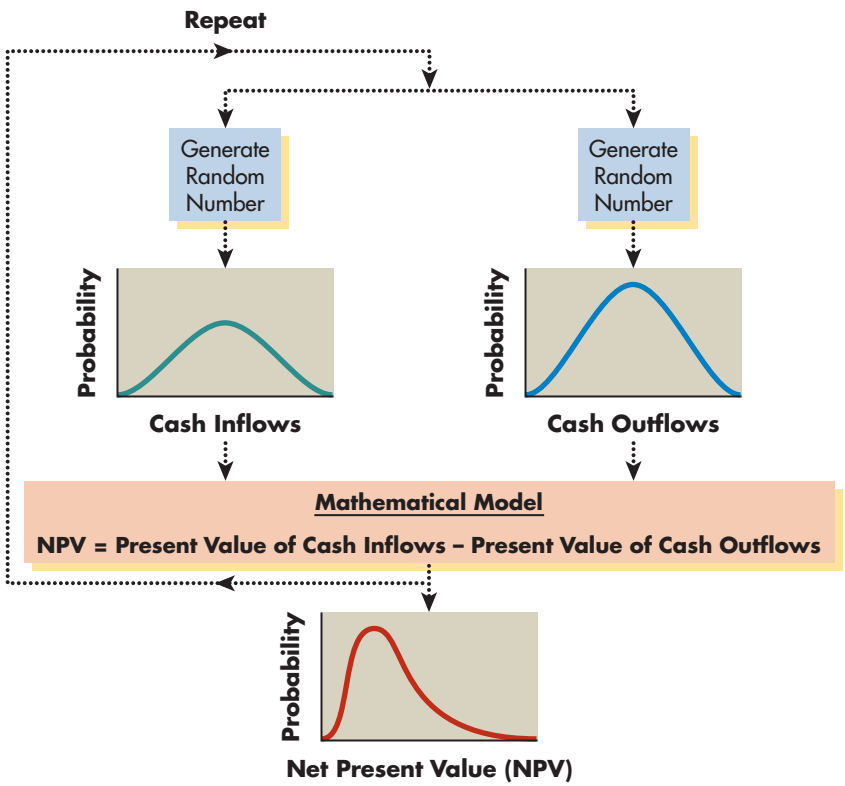
Simulation is a statistics-based behavioral approach that applies predetermined probability distributions and random numbers to estimate risky outcomes. By tying the various cash flow components together in a mathematical model and repeating the process numerous times, the financial manager can develop a probability distribution of project returns.

Figure 11.4 presents a flowchart of the simulation of the net present value of a project. The process of generating random numbers and using the probability distributions for cash inflows and cash outflows enables the financial manager to determine values for each of these variables. Substituting these values into the mathematical model results in an NPV. By repeating this process perhaps a thousand times, managers can create a probability distribution of net present values.

Although Figure 11.4 simulates only gross cash inflows and cash outflows, more sophisticated simulations using individual inflow and outflow components,

FIGURE 11.4

NPV Simulation
Flowchart of a net present value simulation



such as sales volume, sale price, raw material cost, labor cost, and maintenance expense, are quite common. From the distribution of returns, the decision maker can determine not only the expected value of the return but also the probability of achieving or surpassing a given return. The use of computers has made the simulation approach feasible.

The output of simulation provides an excellent basis for decision making because it enables the decision maker to view a continuum of risk–return trade-offs rather than a single-point estimate.

→ REVIEW QUESTIONS MyLab Finance Solutions

11-12 Define risk in terms of the cash flows from a capital budgeting project. How can determination of the breakeven cash inflow be used to gauge project risk?

11-13 Describe how each of the following behavioral approaches can be used to deal with project risk: (**a**) scenario analysis and (**b**) simulation.

→ EXCEL REVIEW QUESTION MyLab Finance Solution

11-14 To judge the sensitivity of a project's NPV, financial managers will often compare a project's forecasted cash inflows to the breakeven cash flows. Using the information provided at MyLab Finance, develop a spreadsheet to compare forecasted and breakeven cash inflows.

LG5

11.6 Risk-Adjusted Discount Rates

The approaches for dealing with risk that have been presented so far enable the financial manager to get a "feel" for project risk. Unfortunately, they do not explicitly recognize project risk. We will now illustrate the most popular risk-adjustment technique that uses the net present value (NPV) decision method. The NPV decision rule of accepting only those projects with NPVs $>$ \$0 will continue to hold. Close examination of the basic equation for NPV, Equation 10.1, should make it clear that because the initial investment (CF_0) is known with certainty, a project's risk is embodied in the present value of its cash inflows:

$$\text{NPV} = \sum_{t=1}^{n} \frac{CF_t}{(1 + r)^t} - CF_0$$

Two opportunities to adjust the present value of cash inflows for risk exist: (1) The cash inflows (CF_t) can be adjusted, or (2) the discount rate (r) can be adjusted. Adjusting the cash inflows is highly subjective, so here we describe the more common process of adjusting the discount rate. In addition, we consider the portfolio effects of project analysis as well as the practical aspects of the risk-adjusted discount rate.

DETERMINING RISK-ADJUSTED DISCOUNT RATES (RADRs)

A popular approach for risk adjustment involves the use of risk-adjusted discount rates (RADRs). This approach uses Equation 10.1 but employs a risk-adjusted discount rate, as noted in the following expression:[9]

$$NPV = \sum_{t=1}^{n} \frac{CF_t}{(1 + RADR)^t} - CF_0 \quad (11.3)$$

risk-adjusted discount rate (RADR)
The rate of return that must be earned on a given project to compensate the firm's owners adequately, that is, to maintain or improve the firm's share price.

The **risk-adjusted discount rate (RADR)** is the rate of return that must be earned on a given project to compensate the firm's owners adequately (i.e., to maintain or improve the firm's share price). The higher the risk of a project, the higher the RADR and therefore the lower the net present value for a given stream of cash inflows.

PERSONAL FINANCE EXAMPLE 11.11 Talor Namtig is considering investing $1,000 in either of two stocks, A or B. She plans to hold the stock for exactly 5 years and expects both stocks to pay $80 in annual end-of-year cash dividends. After 5 years, she estimates that she will sell stock A for $1,200 and stock B for $1,500. Talor has carefully researched the two stocks and believes that although stock A has average risk, stock B is considerably riskier. Her research indicates that she should earn an annual return on an average-risk stock of 11%. Because stock B is considerably riskier, she will require a 14% return from it. Talor makes the following calculations to find the risk-adjusted net present values (NPVs) for the two stocks:

$$NPV_A = \frac{\$80}{(1 + 0.11)^1} + \frac{\$80}{(1 + 0.11)^2} + \frac{\$80}{(1 + 0.11)^3} + \frac{\$80}{(1 + 0.11)^4} + \frac{\$80}{(1 + 0.11)^5} + \frac{\$1,200}{(1 + 0.11)^5} - \$1,000 = \underline{\underline{\$7.81}}$$

$$NPV_B = \frac{\$80}{(1 + 0.14)^1} + \frac{\$80}{(1 + 0.14)^2} + \frac{\$80}{(1 + 0.14)^3} + \frac{\$80}{(1 + 0.14)^4} + \frac{\$80}{(1 + 0.14)^5} + \frac{\$1,500}{(1 + 0.14)^5} - \$1,000 = \underline{\underline{\$53.70}}$$

Although Talor's calculations indicate that both stock investments are acceptable (NPVs $>$ $0) on a risk-adjusted basis, she should invest in stock B because it has a higher NPV.

Because the logic underlying the use of RADRs is closely linked to the capital asset pricing model (CAPM) developed in Chapter 8, here we review that model and discuss its use in finding RADRs.

9. The risk-adjusted discount rate approach can be applied in using the internal rate of return as well as the net present value. When the IRR is used, the risk-adjusted discount rate becomes the hurdle rate that the IRR must exceed for acceptance of the project. When NPV is used, the projected cash inflows are merely discounted at the risk-adjusted discount rate.

Review of CAPM

In Chapter 8, we used the capital asset pricing model (CAPM) to link the relevant risk and return for all assets traded in efficient markets. In the development of the CAPM, the total risk of an asset was defined as

$$\text{Total risk} = \text{Nondiversifiable risk} + \text{Diversifiable risk} \tag{11.4}$$

For assets traded in an efficient market, the diversifiable risk, which results from uncontrollable or random events, can be eliminated through diversification. The relevant risk is therefore the nondiversifiable risk, the risk for which owners of these assets are rewarded. Nondiversifiable risk for securities is commonly measured by using beta, which is an index of the degree of movement of an asset's return in response to a change in the market return.

Using beta, β_j, to measure the relevant risk of any asset j, the CAPM is

$$r_j = R_F + [\beta_j \times (r_m - R_F)] \tag{11.5}$$

where

r_j = required return on asset j
R_F = risk-free rate of return
β_j = beta coefficient for asset j
r_m = return on the market portfolio of assets

In Chapter 8, we demonstrated that the required return on any asset could be determined by substituting values of R_F, β_j, and r_m into the CAPM (Equation 11.5). Any security expected to earn in excess of its required return would be acceptable, and those expected to earn an inferior return would be rejected.

Using CAPM to Find RADRs

If we assume for a moment that real corporate assets such as computers, machine tools, and special-purpose machinery are traded in efficient markets, the CAPM can be redefined as

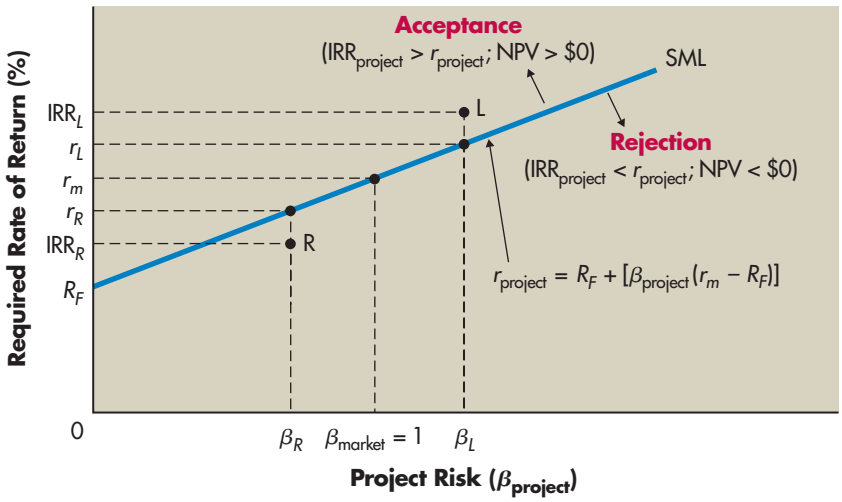
$$r_{\text{project } j} = R_F + [\beta_{\text{project } j} \times (r_m - R_F)] \tag{11.6}$$

The *security market line* (SML)—the graphical depiction of the CAPM—is shown for Equation 11.6 in Figure 11.5. Any project having an IRR above the SML would be acceptable because its IRR would exceed the required return, r_{project}; any project with an IRR below r_{project} would be rejected. In terms of NPV, any project falling above the SML would have a positive NPV, and any project falling below the SML would have a negative NPV.[10]

10. Whenever the IRR is above the cost of capital or required return (IRR $> r$), the NPV is positive, and whenever the IRR is below the cost of capital or required return (IRR $< r$), the NPV is negative. Because by definition the IRR is the discount rate that causes NPV to equal zero and the IRR and NPV always agree on accept–reject decisions, the relationship noted in Figure 11.5 logically follows.

FIGURE 11.5

CAPM and SML
CAPM and SML in capital budgeting decision making



EXAMPLE 11.12

Figure 11.5 shows two projects, L and R. Project L has a beta, β_L, and generates an internal rate of return, IRR_L. The required return for a project with risk β_L is r_L. Because project L generates a return greater than that required ($IRR_L > r_L$), this project is acceptable. Project L will have a positive NPV when its cash inflows are discounted at its required return, r_L. Project R, in contrast, generates an IRR below that required for its risk, β_R ($IRR_R < r_R$). This project will have a negative NPV when its cash inflows are discounted at its required return, r_R. Project R should be rejected.

APPLYING RADRs

Because the CAPM is based on an assumed efficient market, which does not always exist for real corporate (nonfinancial) assets such as plant and equipment, managers sometimes argue that the CAPM is not directly applicable in calculating RADRs. Instead, financial managers sometimes assess the total risk of a project and use it to determine the risk-adjusted discount rate (RADR), which can be used in Equation 11.3 to find the NPV.

To avoid damaging its market value, a firm must use the correct discount rate to evaluate a project. If a firm fails to incorporate all relevant risks in its decision-making process, it may discount a risky project's cash inflows at too low a rate and accept an otherwise unacceptable project. The firm's market price may drop later as investors recognize that the firm itself has become more risky. Conversely, if the firm discounts a project's cash inflows at too high a rate, it may reject an otherwise acceptable project. In this case, the firm's market price may drop because investors who believe that the firm is being overly conservative will sell their stock, applying downward pressure on the firm's market value.

Unfortunately, no formal mechanism is available for linking total project risk to the level of required return. As a result, most firms subjectively determine

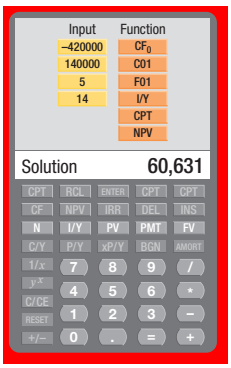
the RADR by adjusting their existing required return. They adjust it up or down, depending on whether the proposed project is more or less risky, respectively, than the average risk of the firm. This CAPM type of approach provides a "rough estimate" of the project risk and required return because both the project risk measure and the linkage between risk and required return are estimates.

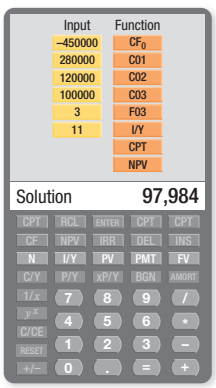
EXAMPLE 11.13

Bennett Company wishes to use the risk-adjusted discount rate approach to determine, according to NPV, whether to implement project A or project B. In addition to the data presented in part A of Table 11.10, Bennett's management, after much analysis, subjectively assigned "risk indexes" of 1.6 to project A and 1.0 to project B. The risk index is merely a numerical scale used to classify project risk: Higher index values are assigned to higher-risk projects and vice versa. The CAPM-type relationship used by the firm to link risk (measured by the risk index) and the required return (RADR) are shown in the following table. Management developed this relationship after analyzing CAPM and the risk–return relationships of the projects they considered and implemented during the past few years.

	Risk index	Required return (RADR)
	0.0	6% (risk-free rate, R_F)
	0.2	7
	0.4	8
	0.6	9
	0.8	10
Project B →	1.0	11
	1.2	12
	1.4	13
Project A →	1.6	14
	1.8	16
	2.0	18

MyLab Finance Financial Calculator





Because project A is riskier than project B, its RADR of 14% is greater than project B's 11%. The net present value of each project, calculated using its RADR, is found as shown on the timelines in Figure 11.6. The results clearly show that project B is preferable because its risk-adjusted NPV of $97,984 is greater than the $60,631 risk-adjusted NPV for project A. As reflected by the NPVs in part B of Table 11.10, if the discount rates were not adjusted for risk, project A would be preferred to project B.

Calculator use We can again use the preprogrammed NPV function in a financial calculator to simplify the NPV calculation. The keystrokes for project A—the annuity—are as shown at the left. The keystrokes for project B—the mixed stream—are also shown at the left. The calculated NPVs for projects A and B of $60,631 and $97,984, respectively, agree with those shown in Figure 11.6.

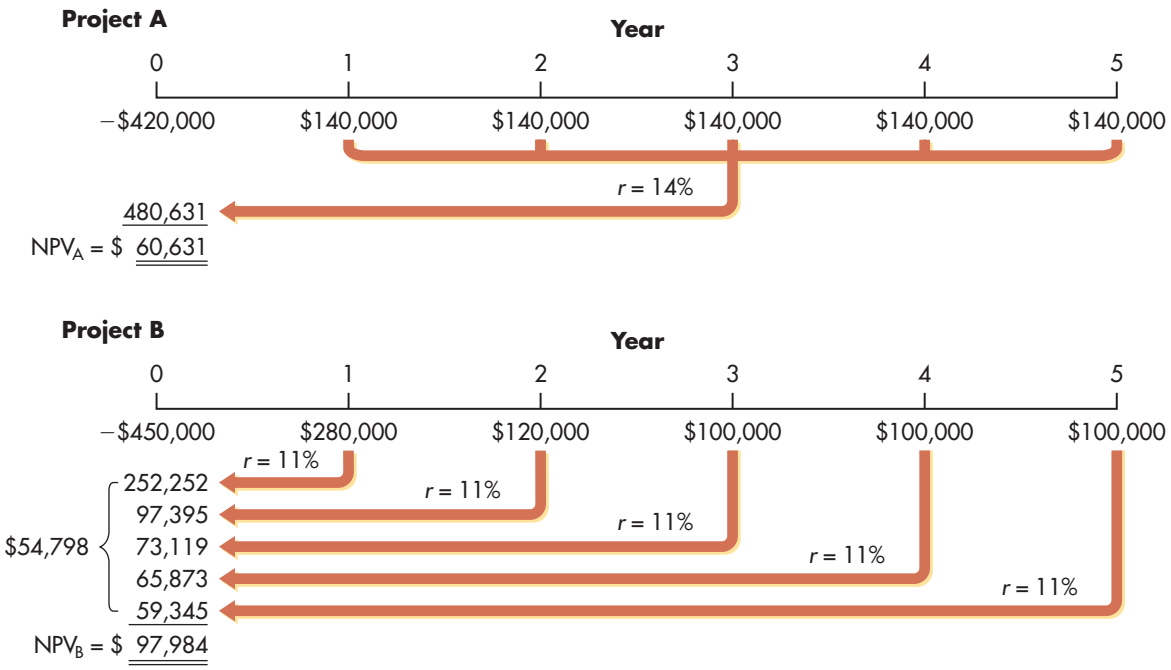
Spreadsheet use Analysis of projects using risk-adjusted discount rates (RADRs) also can be performed as shown on the following Excel spreadsheet.

	A	B	C	D
1	ANALYSIS OF PROJECTS USING RISK-ADJUSTED DISCOUNT RATES			
2	Year(s)	Cash Inflow	Present Value	Formulas for Calculated Values in Column C
3	Project A			
4	5	$140,000	$480,631	=–PV(C7,A4,B4,0,0)
5	Initial Investment		–$420,000	
6	Net Present Value		$60,631	=SUM(C4:C5)
7	Required Return (RADR)		14%	
8	Project B			
9	1	$280,000	$252,252	=–PV(C17,A9,0,B9,0)
10	2	$120,000	$97,395	=–PV(C17,A10,0,B10,0)
11	3	$100,000	$73,119	=–PV(C17,A11,0,B11,0)
12	4	$100,000	$65,873	=–PV(C17,A12,0,B12,0)
13	5	$100,000	$59,345	=–PV(C17,A13,0,B13,0)
14	Initial Investment		–$450,000	
15	Net Present Value		$97,984	=SUM(C9:C14)
16	Required Return (RADR)		11%	
17	Choice of project		B	=IF(C6>=C16,"A","B")
	The minus signs appear before the entries in Cells C4 and C9:C13 to convert the results to positive values.			

FIGURE 11.6

Calculation of NPVs for Bennett Company's Capital Expenditure Alternatives Using RADRs

Timelines depicting the cash flows and NPV calculations using RADRs for projects A and B



Note: When we use the risk indexes of 1.6 and 1.0 for projects A and B, respectively, along with the table above, a risk-adjusted discount rate (RADR) of 14% results for project A and an RADR of 11% results for project B.

The usefulness of risk-adjusted discount rates should now be clear. The real difficulty lies in estimating project risk and linking it to the required return (RADR).

PORTFOLIO EFFECTS

As noted in Chapter 8, because investors are not rewarded for taking diversifiable risk, they should hold a diversified portfolio of securities to eliminate that risk. Because a business firm can be viewed as a portfolio of assets, is it similarly important that the firm maintain a diversified portfolio of assets?

It seems logical that the firm could reduce the variability of its cash flows by holding a diversified portfolio. By combining two projects with negatively correlated cash inflows, the firm could reduce the combined cash inflow variability and therefore the risk.

Are firms rewarded for diversifying risk in this fashion? If they are, the value of the firm could be enhanced through diversification into other lines of business. Surprisingly, the value of the stock of firms whose shares are traded publicly in an efficient marketplace is generally not affected by diversification. In other words, diversification is not normally rewarded and therefore is generally not necessary.

Why are firms not rewarded for diversification? It is because investors themselves can diversify by holding securities in a variety of firms; they do not need the firm to do it for them. Investors can also diversify more readily. They can make transactions more easily and at a lower cost because of the greater availability of information and trading mechanisms.

Of course, if a firm acquires a new line of business and its cash flows tend to respond more to changing economic conditions (i.e., greater nondiversifiable risk), greater returns would be expected. If, for the additional risk, the firm earned a return in excess of that required (IRR $>$ r), the value of the firm could be enhanced. Also, other benefits, such as increased cash, greater borrowing capacity, and guaranteed availability of raw materials, could result from and therefore justify diversification, despite any immediate impact on cash flow.

Although a strict theoretical view supports the use of a technique that relies on the CAPM framework, the presence of market imperfections causes the market for real corporate assets to be inefficient at least some of the time. The relative inefficiency of this market, coupled with difficulties associated with measuring nondiversifiable project risk and its relationship to return, tends to favor the use of total risk to evaluate capital budgeting projects. Therefore, the use of total risk as an approximation for the relevant risk does have widespread practical appeal.

RADRs IN PRACTICE

Despite the appeal of total risk, *RADRs are often used in practice*. Their popularity stems from two facts: (1) They are consistent with the general disposition of financial decision makers toward rates of return, and (2) they are easily estimated and applied. The first reason is clearly a matter of personal preference, but the second is based on the computational convenience and well-developed procedures involved in the use of RADRs.

In practice, firms often establish a number of *risk classes,* with a RADR assigned to each. Like the CAPM-type risk–return relationship described earlier, management develops the risk classes and RADRs based on both CAPM and the

TABLE 11.12 Bennett Company's Risk Classes and RADRs

Risk class	Description	Risk-adjusted discount rate, RADR
I	*Below-average risk:* Projects with low risk. Typically involve routine replacement without renewal of existing activities.	8%
II	*Average risk:* Projects similar to those currently implemented. Typically involve replacement or renewal of existing activities.	10%[a]
III	*Above-average risk:* Projects with higher than normal, but not excessive, risk. Typically involve expansion of existing or similar activities.	14%
IV	*Highest risk:* Projects with very high risk. Typically involve expansion into new or unfamiliar activities.	20%

[a]This RADR is actually the firm's cost of capital, which is discussed in detail in Chapter 9. It represents the firm's required return on its existing portfolio of projects, which is assumed to be unchanged with acceptance of the "average-risk" project.

risk–return behaviors of past projects. The financial manager then subjectively places each new project in the appropriate risk class and uses the corresponding RADR to evaluate it. This evaluation is sometimes done on a division-by-division basis, in which case each division has its own set of risk classes and associated RADRs, similar to those for Bennett Company in Table 11.12. The use of *divisional costs of capital* and associated risk classes enables a large multidivisional firm to incorporate differing levels of divisional risk into the capital budgeting process and still recognize differences in the levels of individual project risk.

EXAMPLE 11.14

Assume that the management of Bennett Company decided to use risk classes to analyze projects and so placed each project in one of four risk classes according to its perceived risk. The classes ranged from I for the lowest-risk projects to IV for the highest-risk projects. Associated with each class was an RADR appropriate to the risk level of projects in the class, as given in Table 11.12. Bennett classified as lower-risk those projects that tend to involve routine replacement or renewal activities; higher-risk projects involve expansion, often into new or unfamiliar activities.

The financial manager of Bennett has assigned project A to class III and project B to class II. The cash flows for project A would be evaluated using a 14% RADR, and project B's would be evaluated using a 10% RADR.[11] The NPV of project A at 14% was calculated in Figure 11.6 to be $60,631, and the NPV for project B at a 10% RADR was shown in Table 11.10 to be $109,244. Clearly, with RADRs based on the use of risk classes, project B is preferred over project A. As noted earlier, this result is contrary to the preferences shown in Table 11.10, where differing risks of projects A and B were not taken into account.

11. Note that the 10% RADR for project B using the risk classes in Table 10.3 differs from the 11% RADR used in the preceding example for project B. This difference is attributable to the less precise nature of the use of risk classes.

→ REVIEW QUESTIONS MyLab Finance Solutions

11-15 Describe the basic procedures involved in using risk-adjusted discount rates (RADRs). How is this approach related to the capital asset pricing model (CAPM)?

11-16 Explain why a firm whose stock is actively traded in the securities markets need not concern itself with diversification. Despite this reason, how is the risk of capital budgeting projects frequently measured? Why?

11-17 How are risk classes often used to apply RADRs?

LG6

11.7 Capital Budgeting Refinements

The manager must often make refinements in the analysis of capital budgeting projects to accommodate special circumstances. These adjustments permit the relaxation of certain simplifying assumptions presented earlier. Three areas frequently requiring special forms of analysis include (1) comparison of mutually exclusive projects having unequal lives, (2) recognition of real options, and (3) capital rationing caused by a binding budget constraint.

COMPARING PROJECTS WITH UNEQUAL LIVES

The financial manager must often select the best of a group of unequal-lived projects. If the projects are independent, the length of the project lives is not critical. But when unequal-lived projects are mutually exclusive, the impact of differing lives must be considered because the projects do not provide service over comparable time periods. This step is especially important when continuing service is needed from the project under consideration. The discussions that follow assume that the unequal-lived, mutually exclusive projects being compared are ongoing. If they were not, the project with the highest NPV would be selected.

The Problem

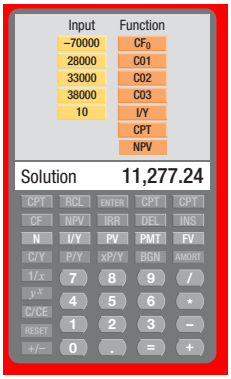
A simple example will demonstrate the general problem of noncomparability caused by the need to select the best of a group of mutually exclusive projects with differing usable lives.

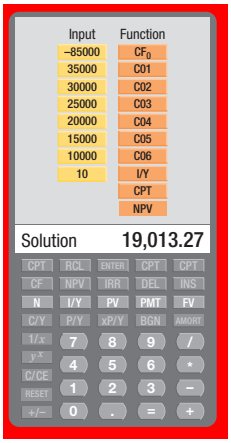
EXAMPLE 11.15

The AT Company, a regional cable television company, is evaluating two projects, X and Y. The following table gives relevant cash flows for each project. The applicable cost of capital for use in evaluating these equally risky projects is 10%.

	Project X	Project Y
Initial investment	−$70,000	−$85,000
Year	Annual cash inflows	
1	$28,000	$35,000
2	33,000	30,000
3	38,000	25,000
4	–	20,000
5	–	15,000
6	–	10,000

MyLab Finance **Financial Calculator**





Calculator use With the preprogrammed NPV function in a financial calculator, we use the keystrokes shown at the left for project X and for project Y to find their respective NPVs of $11,277.24 and $19,013.27.

Spreadsheet use The net present values of two projects with unequal lives also can be compared as shown on the following Excel spreadsheet.

MyLab

	A	B	C
1	COMPARISON OF NET PRESENT VALUES OF TWO PROJECTS WITH UNEQUAL LIVES		
2		Cost of Capital	10%
3		Cash Flows	
4	Year	Project X	Project Y
5	0	−$70,000	−$85,000
6	1	$28,000	$35,000
7	2	$33,000	$30,000
8	3	$38,000	$25,000
9	4		$20,000
10	5		$15,000
11	6		$10,000
12	NPV	$11,277.24	$19,013.27
13	Choice of project		Project Y

Entry in Cell B12 is =NPV(C2,B6:B11)+B5.
Copy the entry in Cell B12 to Cell C12.
Entry in Cell C13 is
=IF(B12>C12,B4,IF(C12>B12,C4,"Indifferent")).

Ignoring the differences in project lives, we can see that both projects are acceptable (both NPVs are greater than zero) and that project Y is preferred over project X. If the projects were independent and only one could be accepted, project Y—with the larger NPV—would be preferred. If the projects were mutually exclusive, their differing lives would have to be considered. Project Y provides 3 more years of service than project X.

The analysis in the preceding example is incomplete if the projects are mutually exclusive (which will be our assumption throughout the remaining discussions). To compare these unequal-lived, mutually exclusive projects correctly, we must consider the differing lives in the analysis; an incorrect decision could result from simply using NPV to select the better project. Although a number of approaches are available for dealing with unequal lives, here we present the most efficient technique: the *annualized net present value (ANPV) approach*.

annualized net present value (ANPV) approach
An approach to evaluating unequal-lived projects that converts the net present value of unequal-lived, mutually exclusive projects into an equivalent annual amount (in NPV terms).

Annualized Net Present Value (ANPV) Approach

The **annualized net present value (ANPV) approach**[12] converts the net present value of unequal-lived, mutually exclusive projects into an equivalent annual amount (in NPV terms) that can help in selecting the best project.[13] This net present value–based approach can be applied to unequal-lived, mutually exclusive projects by using the following steps:

12. This approach is also called the "equivalent annual annuity (EAA)" or the "equivalent annual cost." The term annualized net present value (ANPV) is used here due to its descriptive clarity.

13. The theory underlying this as well as other approaches for comparing projects with unequal lives assumes that each project can be replaced in the future for the same initial investment and that each will provide the same expected future cash inflows. Although changing technology and inflation will affect the initial investment and expected cash inflows, the lack of specific attention to them does not detract from the usefulness of this technique.

Step 1 Calculate the net present value of each project j, NPV_j, over its life, n_j, using the appropriate cost of capital, r.

Step 2 Convert the NPV_j into an annuity having life n_j. That is, find an annuity that has the same life and the same NPV as the project.

Step 3 Select the project that has the highest ANPV.

EXAMPLE 11.16

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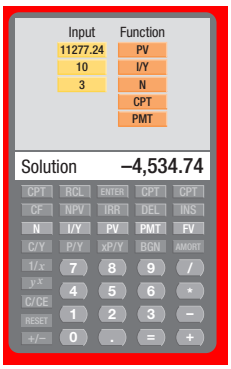
By using the AT Company data presented earlier for projects X and Y, we can apply the three-step ANPV approach as follows:

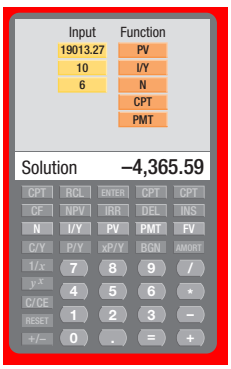
Step 1 The net present values of projects X and Y discounted at 10%—as calculated in the preceding example for a single purchase of each asset—are

$$NPV_X = \$11{,}277.24$$
$$NPV_Y = \$19{,}013.27$$

Step 2 In this step, we want to convert the NPVs from Step 1 into annuities. For project X, we are trying to find the answer to the question, what 3-year annuity (equal to the life of project X) has a present value of $11,277.24 (the NPV of project X)? Likewise, for project Y we want to know what 6-year annuity has a present value of $19,013.27. Once we have these values, we can determine which project, X or Y, delivers a higher annual cash flow on a present value basis.

MyLab Finance Financial Calculator





Calculator use The keystrokes required to find the ANPV on a financial calculator are identical to those demonstrated in Chapter 5 for finding the annual payments on an installment loan. These keystrokes are shown at the left for project X and for project Y. The resulting ANPVs for projects X and Y are $4,534.74 and $4,365.59, respectively. (Note that the calculator solutions are shown as negative values because the PV inputs were entered as positive values.)

Spreadsheet use The annualized net present values of two projects with unequal lives also can be compared as shown on the following Excel spreadsheet.

MyLab

	A	B	C
1	COMPARISON OF ANNUALIZED NET PRESENT VALUES OF TWO PROJECTS WITH UNEQUAL LIVES		
2		Cost of Capital	10%
3		Cash Flows	
4	Year	Project X	Project Y
5	0	–$70,000	–$85,000
6	1	$28,000	$35,000
7	2	$33,000	$30,000
8	3	$38,000	$25,000
9	4		$20,000
10	5		$15,000
11	6		$10,000
12	NPV	$11,277.24	$19,013.27
13	ANPV	$4,534.74	$4,365.59
14	Choice of project		Project X

Entry in Cell B12 is =NPV(C2,B6:B11)+B5.
Copy the entry in Cell B12 to Cell C12.
Entry in Cell B13 is =–PMT(C2,A8,B12,0,0).
Entry in Cell C13 is =–PMT(C2,A11,C12,0,0).
Entry in Cell C14 is
=IF(B13>C13,B4,IF(C13>B13,C4,"Indifferent")).

Step 3 Reviewing the ANPVs calculated in Step 2, we can see that project X would be preferred over project Y. Given that projects X and Y are mutually exclusive, project X would be the recommended project because it provides the higher annualized net present value.

RECOGNIZING REAL OPTIONS

real options
Opportunities that are embedded in capital projects and that enable managers to alter their cash flows and risk in a way that affects project acceptability (NPV). Also called *strategic options.*

The procedures described in Chapter 10 and thus far in this chapter suggest that to make capital budgeting decisions, we must (1) estimate relevant cash flows, (2) apply an appropriate decision technique such as NPV or IRR to those cash flows, and (3) recognize and adjust the decision technique for project risk. Although this traditional procedure is believed to yield good decisions, a more strategic approach has emerged in recent years. This more modern view considers any **real options,** opportunities embedded in capital projects ("real," rather than financial, asset investments) that enable managers to alter their cash flows and risk in a way that affects project acceptability (NPV). Because these opportunities are more likely to exist in, and be more important to, large "strategic" capital budgeting projects, they are sometimes called strategic options.

Table 11.13 briefly describes some of the more common types of real options—abandonment, flexibility, growth, and timing. It should be clear from their descriptions that each of these option types could be embedded in a capital budgeting decision and that explicit recognition of them would probably alter the cash flow and risk of a project and change its NPV.

By explicitly recognizing real options when making capital budgeting decisions, managers can make improved, more strategic decisions that consider in advance the economic impact of certain contingent actions on project cash flow

TABLE 11.13 Major Types of Real Options

Option type	Description
Abandonment option	The option to abandon or terminate a project prior to the end of its planned life. This option allows management to avoid or minimize losses on projects that turn bad. Explicitly recognizing the abandonment option when evaluating a project often increases its NPV.
Flexibility option	The option to incorporate flexibility into the firm's operations, particularly production. It generally includes the opportunity to design the production process to accept multiple inputs, to use flexible production technology to create a variety of outputs by reconfiguring the same plant and equipment, and to purchase and retain excess capacity in capital-intensive industries subject to wide swings in output demand and long lead time in building new capacity from scratch. Recognition of this option embedded in a capital expenditure should increase the NPV of the project.
Growth option	The option to develop follow-on projects, expand markets, expand or retool plants, and so on that would not be possible without implementation of the project being evaluated. If a project being considered has the measurable potential to open new doors if successful, recognition of the cash flows from such opportunities should be included in the initial decision process. Growth opportunities embedded in a project often increase the NPV of the project in which they are embedded.
Timing option	The option to determine when various actions with respect to a given project are taken. This option recognizes the firm's opportunity to delay acceptance of a project for one or more periods, to accelerate or slow the process of implementing a project in response to new information, or to shut down a project temporarily in response to changing product market conditions or competition. As in the case of the other option types, the explicit recognition of timing opportunities can improve the NPV of a project that fails to recognize this option in an investment decision.

and risk. Such recognition will cause the project's strategic NPV to differ from its traditional NPV, as indicated by Equation 11.7.

$$NPV_{strategic} = NPV_{traditional} + \text{Value of real options} \quad (11.7)$$

Application of this relationship is illustrated in the following example.

EXAMPLE 11.17

Assume that a strategic analysis of Bennett Company's projects A and B (see cash flows and NPVs in Table 11.10) finds no real options embedded in project A and two real options embedded in project B. The two real options in project B are as follows: (1) The project would have, during the first 2 years, some downtime resulting in unused production capacity that could be applied to contract manufacturing for another firm; and (2) the project's computerized control system could, with some modification, control two other machines, thereby reducing labor cost, without affecting operation of the new project.

Bennett's management estimated the NPV of the contract manufacturing over the 2 years following implementation of project B to be $27,000 and the NPV of the computer control sharing to be $22,000. Management believed there was a 60% chance that the contract manufacturing option would be exercised and only a 30% chance that the computer control sharing option would be exercised. The combined value of these two real options would be the sum of their expected values:

$$\begin{aligned}\text{Value of real options for project B} &= (0.60 \times \$27{,}000) + (0.30 \times \$22{,}000) \\ &= \$16{,}200 + \$6{,}600 = \$22{,}800\end{aligned}$$

Substituting the $22,800 real options value along with the traditional NPV of $109,244 for project B (from Table 11.10) into Equation 11.7, we get the strategic NPV for project B:

$$NPV_{strategic} = \$109{,}244 + \$22{,}800 = \underline{\underline{\$132{,}044}}$$

Bennett Company's project B therefore has a strategic NPV of $132,044, which is above its traditional NPV and now exceeds project A's NPV of $110,710. Clearly, recognition of project B's real options improved its NPV (from $109,244 to $132,044) and causes it to be preferred over project A (NPV of $132,044 for B > NPV of $110,710 for A), which has no real options embedded in it.

It is important to realize that recognition of attractive real options when determining NPV could cause an otherwise unacceptable project ($NPV_{traditional} < \$0$) to become acceptable ($NPV_{strategic} > \$0$). The failure to recognize the value of real options could therefore cause management to reject acceptable projects. Although discerning embedded real options requires more strategic thinking and analysis, it is important for the financial manager to identify and incorporate real options in the NPV process. The procedures for doing so efficiently are emerging, and the use of the strategic NPV that incorporates real options is expected to become more commonplace in the future.

CAPITAL RATIONING

Firms commonly operate under *capital rationing* in that they have more acceptable independent projects than they can fund. In theory, capital rationing should not exist. Firms should accept all projects that have positive NPVs (or IRRs > the

cost of capital). However, in practice, most firms operate under capital rationing. Generally, firms attempt to isolate and select the best acceptable projects subject to a capital expenditure budget set by management. Research has found that management internally imposes capital expenditure constraints to avoid what it deems to be "excessive" levels of new financing, particularly debt. Although failing to fund all acceptable independent projects is theoretically inconsistent with the goal of maximizing owner wealth, here we will discuss capital rationing procedures because they are widely used in practice.

The objective of capital rationing is to select the group of projects that provides the highest overall net present value and does not require more dollars than are budgeted. As a prerequisite to capital rationing, the best of any mutually exclusive projects must be chosen and placed in the group of independent projects. Next we discuss two basic approaches to project selection under capital rationing.

internal rate of return approach
An approach to capital rationing that involves graphing project IRRs in descending order against the total dollar investment to determine the group of acceptable projects.

investment opportunities schedule (IOS)
The graph that plots project IRRs in descending order against the total dollar investment.

Internal Rate of Return Approach

The **internal rate of return approach** involves graphing project IRRs in descending order against the total dollar investment. This graph is called the **investment opportunities schedule (IOS)**. By drawing the cost-of-capital line and then imposing a budget constraint, the financial manager can determine the group of acceptable projects. The problem with this technique is that it does not guarantee the maximum dollar return to the firm. It merely provides an intuitively appealing solution to capital rationing problems.

EXAMPLE 11.18

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Tate Company, a fast-growing plastics company, is confronted with six projects competing for its fixed budget of $250,000. The initial investment and IRR for each project are as follows:

Project	Initial investment	IRR
A	−$ 80,000	12%
B	−70,000	20
C	−100,000	16
D	−40,000	8
E	−60,000	15
F	−110,000	11

The firm has a cost of capital of 10%. Figure 11.7 presents the IOS that results from ranking the six projects in descending order on the basis of their IRRs. According to the schedule, only projects B, C, and E should be accepted. Together they will absorb $230,000 of the $250,000 budget. Projects A and F are acceptable but cannot be chosen because of the budget constraint. Project D is not worthy of consideration; its IRR is less than the firm's 10% cost of capital.

The drawback of this approach is that it offers no guarantee that the acceptance of projects B, C, and E will maximize total dollar returns and therefore owners' wealth.

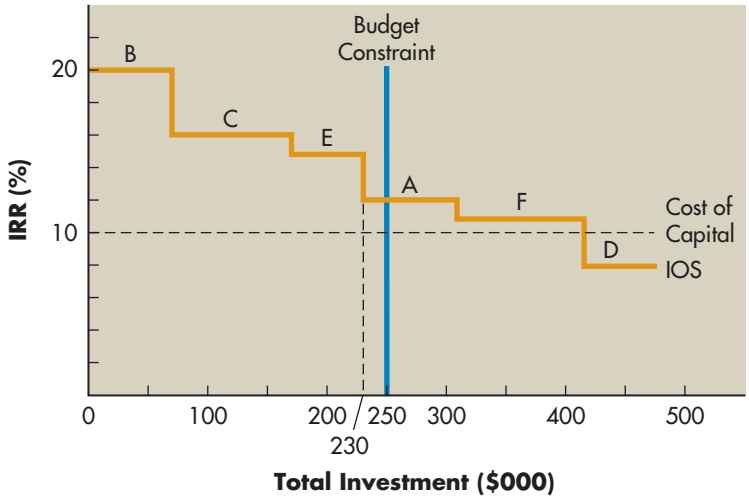
net present value approach
An approach to capital rationing that is based on the use of present values to determine the group of projects that will maximize owners' wealth.

Net Present Value Approach

The **net present value approach** is based on the use of present values to determine the group of projects that will maximize owners' wealth. It is implemented by ranking projects on the basis of IRRs and then evaluating the present value of the

FIGURE 11.7

Investment Opportunities Schedule
Investment opportunities schedule (IOS) for Tate Company projects



benefits from each potential project to determine the combination of projects with the highest overall present value. This method is the same as maximizing net present value because the entire budget is viewed as the total initial investment. Any portion of the firm's budget that is not used does not increase the firm's value. At best, the unused money can be invested in marketable securities or returned to the owners in the form of cash dividends. In either case, the wealth of the owners is not likely to be enhanced.

EXAMPLE 11.19

The projects described in the preceding example are ranked in Table 11.14 on the basis of IRRs. The present value of the cash inflows associated with the projects is also included in the table. Projects B, C, and E, which together require $230,000, yield a present value of $336,000. However, if projects B, C, and A were implemented, the total budget of $250,000 would be used, and the present value of the cash inflows would be $357,000, which is greater than the return expected from selecting the projects on the basis of the highest IRRs. Implementing B, C, and A is preferable because they maximize the present value for the given budget. The

TABLE 11.14 Rankings for Tate Company Projects

Project	Initial investment	IRR	Present value of inflows at 10%	
B	–$ 70,000	20%	$112,000	
C	–100,000	16	145,000	
E	–60,000	15	79,000	
A	–80,000	12	100,000	
F	–110,000	11	126,500	Cutoff point
D	–40,000	8	36,000	(IRR < 10%)

firm's objective is to use its budget to generate the highest present value of inflows. Assuming that any unused portion of the budget does not gain or lose money, the total NPV for projects B, C, and E would be $106,000 ($336,000 − $230,000), whereas the total NPV for projects B, C, and A would be $107,000 ($357,000 − $250,000). Selection of projects B, C, and A will therefore maximize NPV.

→ REVIEW QUESTIONS MyLab Finance Solutions

11-18 Explain why a mere comparison of the NPVs of unequal-lived, ongoing, mutually exclusive projects is inappropriate. Describe the annualized net present value (ANPV) approach for comparing unequal-lived, mutually exclusive projects.

11-19 What are real options? What are some major types of real options?

11-20 What is the difference between the strategic NPV and the traditional NPV? Do they always result in the same accept–reject decisions?

11-21 What is capital rationing? In theory, should capital rationing exist? Why does it frequently occur in practice?

11-22 Compare and contrast the internal rate of return approach and the net present value approach to capital rationing. Which is better? Why?

→ EXCEL REVIEW QUESTION MyLab Finance Solution

11-23 Comparing projects with unequal lives is often done by comparing the projects' annualized net present value. With the information provided at MyLab Finance, use a spreadsheet to compare projects based on their ANPV.

SUMMARY

FOCUS ON VALUE

A key responsibility of financial managers is to review and analyze proposed investment decisions to make sure the firm undertakes only those that contribute positively to the value of the firm. Using a variety of tools and techniques, financial managers estimate the cash flows that a proposed investment will generate and then apply decision techniques to assess the investment's impact on the firm's value. The most difficult and important aspects of the capital budgeting process are developing good estimates of the relevant cash flows and properly refining the process to account for risk.

The relevant cash flows are the net after-tax incremental cash flows resulting from a proposed investment. These estimates represent the cash flow benefits that are likely to accrue to the firm as a result of implementing the investment. When evaluating investment cash flows, it is important to remember that not all capital budgeting projects have the same risk as the firm's existing projects. The financial manager must adjust projects for differences in risk when evaluating their acceptability. Without such adjustments, management could mistakenly accept projects that destroy shareholder value or could reject projects that create shareholder value.

Risk-adjusted discount rates (RADRs) provide a mechanism for adjusting the discount rate to make it consistent with the risk–return preferences of market participants. Procedures for comparing projects with unequal lives, for explicitly recognizing real options embedded in capital projects, and for selecting projects under capital rationing enable the financial manager to refine the capital budgeting process further. These procedures, along with risk-adjustment techniques, should enable the financial manager to make capital budgeting decisions that are consistent with the firm's goal of **maximizing stock price.**

REVIEW OF LEARNING GOALS

LG1 **Discuss net and incremental cash flows, and describe the three major types of net cash flows.** A project's net cash flows are the net (or the sum of) incremental after-tax cash flows over a project's life. The incremental cash flows represent the additional after-tax cash flows—outflows or inflows—that will occur only if the investment is made. The three major net cash flow types of any project include (1) an initial investment, (2) operating cash flows, and (3) terminal cash flow. The initial investment occurs at time zero, the operating cash flows occur during the project's life, and the terminal cash flow occurs at the end of the project.

LG2 **Discuss replacement versus expansion decisions, sunk costs and opportunity costs, and international capital budgeting.** For replacement decisions, the differences between the cash flows of the new asset and the old asset are incremental cash flows. Expansion decisions are viewed as replacement decisions in which all cash flows from the old asset are zero. When estimating relevant cash flows, ignore sunk costs and include opportunity costs as cash outflows. In international capital budgeting, currency risks and political risks can be minimized through careful planning.

LG3 **Calculate the initial investment, operating cash flows, and terminal cash flow associated with a proposed investment project.** The initial investment is the initial cash flow required, taking into account the installed cost of the new asset, the after-tax proceeds from the sale of the old asset, and any change in net working capital. The operating cash flows are the sum of incremental after-tax cash flows occurring each period during a project's life. The net cash flows for a replacement project are the difference between the operating cash flows of the new project and those of the old project. The terminal cash flow represents the after-tax cash flow (exclusive of operating cash flows) that is expected from liquidation of a project. It is calculated for replacement projects by finding the difference between the after-tax proceeds from the sales of the new and the old assets at termination and adjusting this difference for any change in net working capital.

LG4 **Understand the importance of recognizing risk in the analysis of capital budgeting projects, and discuss risk and cash flows, scenario analysis, and simulation as behavioral approaches for dealing with risk.** The cash flows associated with capital budgeting projects typically have different levels of risk, and the acceptance of a project generally affects the firm's overall risk. Various behavioral approaches help the manager to get a "feel" for the level of project risk. Risk in capital budgeting is the degree of variability of cash flows, which for conventional capital budgeting projects stems almost entirely from net cash

flows. Finding the breakeven cash inflow and estimating the probability that it will be realized make up one behavioral approach for assessing capital budgeting risk. Scenario analysis is another behavioral approach for capturing the variability of cash inflows and NPVs. Simulation is a statistically based approach that results in a probability distribution of project returns.

LG 5 **Describe the determination and use of risk-adjusted discount rates (RADRs), portfolio effects, and the practical aspects of RADRs.** The risk of a project whose initial investment is known with certainty is embodied in the present value of its cash inflows, using NPV. There are two opportunities to adjust the present value of cash inflows for risk: (1) adjust the cash inflows or (2) adjust the discount rate. Because adjusting the cash inflows is highly subjective, adjusting discount rates is more popular. RADRs use a market-based adjustment of the discount rate to calculate NPV. The RADR is closely linked to CAPM, but because real corporate assets are generally not traded in an efficient market, the CAPM cannot be applied directly to capital budgeting. Instead, firms develop some CAPM-type relationship to link a project's risk to its required return, which is used as the discount rate. Often, for convenience, firms will rely on total risk as an approximation for relevant risk when estimating required project returns. RADRs are commonly used in practice because decision makers find rates of return easy to estimate and apply.

LG 6 **Select the best of a group of unequal-lived, mutually exclusive projects using annualized net present values (ANPVs), and explain the role of real options and the objective and procedures for selecting projects under capital rationing.** The ANPV approach is the most efficient method of comparing ongoing, mutually exclusive projects that have unequal usable lives. It converts the NPV of each unequal-lived project into an equivalent annual amount, its ANPV. Real options are opportunities that are embedded in capital projects and that allow managers to alter their cash flow and risk in a way that affects project acceptability (NPV). By explicitly recognizing real options, the financial manager can find a project's strategic NPV. Capital rationing exists when firms have more acceptable independent projects than they can fund. Capital rationing commonly occurs in practice. Its objective is to select from all acceptable projects the group that provides the highest overall net present value and does not require more dollars than are budgeted. The two basic approaches for choosing projects under capital rationing are the internal rate of return approach and the net present value approach.

SELF-TEST PROBLEMS (Solutions in Appendix)

LG 3

ST11-1 Book value, taxes, and initial investment Irvin Enterprises, a sole proprietorship, is purchasing a new piece of equipment to replace the old equipment. The new version costs $75,000 and requires $5,000 in installation costs. It will be depreciated under MACRS, using a 5-year recovery period. The old piece of equipment was purchased 4 years ago for an installed cost of $50,000; it was being depreciated under MACRS, using a 5-year recovery period. The old equipment can be sold today for

$55,000 net of any removal or cleanup costs. As a result of the proposed replacement, the firm's investment in net working capital is expected to increase by $15,000. The firm pays taxes at a rate of 40%. (Table 4.2 contains the applicable MACRS depreciation percentages.)

a. Calculate the book value of the old piece of equipment.
b. Determine the taxes, if any, attributable to the sale of the old equipment.
c. Find the initial investment associated with the proposed equipment replacement.

LG 3

ST11-2 Determining net cash flows A machine in use by a partnership was purchased 2 years ago for $40,000. The machine is being depreciated under MACRS, using a 5-year recovery period. It has 3 years of life remaining, and it can be sold today to net $42,000. A new machine, using a 3-year MACRS recovery period, can be purchased at a price of $140,000. It requires $10,000 to install and has a 3-year usable life. If the new machine is acquired, the investment in accounts receivable will be expected to rise by $10,000, the inventory investment will increase by $25,000, and accounts payable will increase by $15,000. Earnings before interest, taxes, depreciation, and amortization are expected to be $70,000 for each of the next 3 years with the old machine and to be $120,000 in the first year and $130,000 in the second and third years with the new machine. At the end of 3 years, the market value of the old machine will equal zero, but the new machine could be sold to net $35,000 before taxes. The firm is subject to a 40% tax rate. (Table 4.2 contains the applicable MACRS depreciation percentages.)

a. Determine the initial investment associated with the proposed replacement decision.
b. Calculate the operating cash flows for years 1 to 4 associated with the proposed replacement. (*Note:* Only depreciation cash flows must be considered in year 4.)
c. Calculate the terminal cash flow associated with the proposed replacement decision. (*Note:* This decision is made at the end of year 3.)
d. Depict on a timeline the net cash flows found in parts **a**, **b**, and **c** that are associated with the proposed replacement decision, assuming it is terminated at the end of year 3.

LG 5
IRF

ST11-3 Risk-adjusted discount rates CBA Company is considering two mutually exclusive projects, A and B. The following table shows the CAPM-type relationship between a risk index and the required return (RADR) applicable to CBA Company.

Risk index	Required return (RADR)
0.0	7.0% (risk-free rate, R_F)
0.2	8.0
0.4	9.0
0.6	10.0
0.8	11.0
1.0	12.0
1.2	13.0
1.4	14.0
1.6	15.0
1.8	16.0
2.0	17.0

Project data are as follows:

	Project A	Project B
Initial investment (CF_0)	−$15,000	−$20,000
Project life	3 years	3 years
Annual cash inflow (CF)	$7,000	$10,000
Risk index	0.4	1.8

a. Ignoring any differences in risk and assuming that the firm's cost of capital is 10%, calculate the net present value (NPV) of each project.
b. Use NPV to evaluate the projects, using risk-adjusted discount rates (RADRs) to account for risk.
c. Compare, contrast, and explain your findings in parts **a** and **b.**

WARM-UP EXERCISES

Select problems are available in MyLab Finance.

LG 2

E11-1 Iridium Corp. has spent $3.5 billion over the past decade developing a satellite-based telecommunication system. It is currently trying to decide whether to spend an additional $350 million on the project. The firm expects that this outlay will finish the project and will generate cash flow of $15 million per year over the next 5 years. A competitor has offered $450 million for the satellites already in orbit. Classify the firm's outlays as sunk costs *or* opportunity costs, and specify the incremental cash flows.

LG 3

E11-2 Landscapes Unlimited has spent $2,200 evaluating a new service area for expanding its business territory. The expansion will require the purchase of a new truck for $35,000 and fitting the truck with a flatbed that will cost $6,500 to install. The company would realize $8,250 in after-tax proceeds from the sale of an old truck. If Landscapes' working capital is unaffected by this project, what is the initial investment amount for this project?

LG 3

E11-3 Hoffmann-La Roche is considering purchasing a capsule counting and packing machine for €5,500,000 and incurs an additional €130,000 in installation expenses. It is replacing older machines that can be sold for €250,000, resulting in taxes from a gain on the sale of €20,000. Because of this transaction, current assets will increase by €150,000, and current liabilities by €50,000. Calculate the initial investment in the new machine.

LG 4

E11-4 Omni Motors is considering buying new equipment with an initial investment value of $30,000. The equipment has a 5-year life and no residual value at the end of the 5 years. There are many uncertainties in the industry and, therefore, the company has estimated expected cash inflows for three different scenarios: pessimistic, most likely, and optimistic. The following table lists the company's cost of capital is 10.5%, and the expected cash inflows. Calculate the NPV for each given scenario. Should Omni make this investment?

	Expected cash inflows		
Year	Pessimistic	Most likely	Optimistic
1	$4,500	$6,500	$ 8,350
2	3,500	5,770	7,630
3	5,620	7,850	12,520
4	3,680	7,240	11,410
5	2,950	4,260	9,110

LG 5

E11-5 Mulliri Vjeter, an Albanian coffee shop chain, uses a subjective risk assessment tool of its own design. The tool is a simple index by which projects are ranked by level of perceived risk on a scale of 1 to 5. The scale is re-created in the following table.

Risk index	Required return
1	6% (current risk-free rate)
2	7%
3	8% (current IRR)
4	9%
5	10%

The company is analyzing two projects based on their RADRs. Project Arabica requires an initial investment of L2,000,000 (Lek or L is the currency of Albania) and is assigned a risk index of 2. Project Brasilia requires an initial investment of L1,500,000 and is assigned a risk index of 5. The two projects have 5-year lives. Arabica is expected to generate cash inflows of L850,000 each year, while project Brasilia is expected to generate L350,000 each year. Use each project's RADR to select the best project.

LG 6

E11-6 Kubi Software Inc., based in Turkey, has hired Rezart to advise the firm on a capital budgeting issue involving two unequal-lived, mutually exclusive projects, Gamma and Beta. The cash flows for each project are presented in the following table. Calculate the NPV and the annualized net present value (ANPV) for each project, using the firm's cost of capital of 10%. Which project should Rezart recommend?

	Project Gamma	Project Beta
Initial investment	−L400,000	−L600,000
Year	Cash inflows	
1	L170,000	L265,000
2	250,000	222,000
3	380,000	370,000
4	–	190,000
5	–	110,000

LG 6

E11-7 Powerswitch Electric is faced with a capital budget of $150,000 for the coming year. It is considering six investment projects and has a cost of capital of 7%. The six projects along with their initial investments and their IRRs are listed in the following table. Using the data given, prepare an investment opportunities schedule (IOS). Which projects does the IOS suggest should be funded? Does this group of projects maximize NPV? Explain.

Project	Initial investment	IRR
1	−$75,000	8%
2	−40,000	10
3	−35,000	7
4	−50,000	11
5	−45,000	9
6	−20,000	6

PROBLEMS

Select problems are available in MyLab Finance. The MyLab icon indicates problems in Excel format available in MyLab Finance.

LG 1 LG 2

P11-1 **Net cash flow and timeline depiction** For each of the following projects, determine the net cash flows, and depict the cash flows on a timeline.

a. A project that requires an initial investment of $120,000 and will generate annual operating cash inflows of $25,000 for the next 18 years. In each of the 18 years, maintenance of the project will require a $5,000 cash outflow.

b. A new machine with an installed cost of $85,000. Sale of the old machine will yield $30,000 after taxes. Operating cash inflows generated by the replacement will exceed the operating cash inflows of the old machine by $20,000 in each year of a 6-year period. At the end of year 6, liquidation of the new machine will yield $20,000 after taxes, which is $10,000 greater than the after-tax proceeds expected from the old machine had it been retained and liquidated at the end of year 6.

c. An asset that requires an initial investment of $2 million and will yield annual operating cash inflows of $300,000 for each of the next 10 years. Operating cash outlays will be $20,000 for each year except year 6, when an overhaul requiring an additional cash outlay of $500,000 will be required. The asset's liquidation value at the end of year 10 is expected to be zero.

LG 2

P11-2 **Replacement versus expansion cash flows** Stable Nuclear Corporation has estimated the cash flows over the 5-year lives for two projects, A and B. These cash flows are summarized in the table below.

	Project A	Project B
Initial investment	−$60,000	$38,000[a]
Year	Operating cash inflows	
1	20,000	14,000
2	18,000	12,000
3	16,000	13,000
4	12,000	8,000
5	10,000	6,000

[a]After-tax cash inflow expected from liquidation.

a. If project A is a replacement for project B and the $38,000 initial investment shown for project B is the after-tax cash inflow expected from liquidating it, what would be the net cash flows for this replacement decision?
b. Instead, if project A is an expansion decision, what would be the net cash flows and how can it be viewed as a special form of a replacement decision? Explain.

LG 2

P11-3 Sunk costs and opportunity costs Luxottica Group spent 2 years and €1,000,000 to develop its new line of folding eyewear to replace an older line. To begin manufacturing them, the company will have to invest €2,500,000 in new equipment. The new eyewear line is expected to generate an increase in operating cash inflows of €1,100,000 per year for the next 8 years. The company has determined that the existing line could be sold to a competitor for €300,000.
a. How should the €1,000,000 in development costs be classified?
b. How should the €300,000 sale price for the existing line be classified?
c. Depict all the known incremental cash flows on a timeline.

LG 2

P11-4 Sunk costs and opportunity costs Gen-X Industries is developing the incremental cash flows associated with the proposed replacement of an existing machine tool with a new, technologically advanced one. Given the following costs related to the proposed project, explain whether each would be treated as a sunk cost or an opportunity cost in developing the incremental cash flows associated with the proposed replacement decision.
a. Gen-X would be able to use the same tooling, which had a book value of $40,000, on the new machine tool as it had used on the old one.
b. Gen-X would be able to use its existing computer system to develop programs for operating the new machine tool. The old machine tool did not require these programs. Although the firm's computer has excess capacity available, the capacity could be leased to another firm for an annual fee of $17,000.
c. Gen-X would have to obtain additional floor space to accommodate the larger new machine tool. The space that would be used is currently being leased to another company for $10,000 per year.
d. Gen-X would use a small storage facility to store the increased output of the new machine tool. The storage facility was built by Gen-X 3 years earlier at a cost of $120,000. Because of its unique configuration and location, it is currently of no use to either Gen-X or any other firm.
e. Gen-X would retain an existing overhead crane, which it had planned to sell for its $180,000 market value. Although the crane was not needed with the old machine tool, it would be used to position raw materials on the new machine tool.

Personal Finance Problem

LG 2

P11-5 Sunk and opportunity cash flows Hans has been living in his current apartment in the Helmholtzkiez neighborhood in Berlin for the past 10 years. During that time, he has replaced the coffee maker for €300, has replaced the washing machine for €350, and has had to make miscellaneous repair and maintenance expenditures of approximately €2,000. He has decided to move to the Bergmannkiez neighborhood and rent the apartment for €1,200 per month. Advertising in a real estate agency will cost €100. Hans also wants to paint the interior of the apartment, and this will cost him about €400.

The apartment should be ready to rent after that. In reviewing the financial situation, Hans views all the expenditures as being relevant, so he plans to net out the estimated expenditures discussed above from the rental income.

a. Does Hans understand the difference between sunk costs and opportunity costs? Explain the two concepts to him.

b. Which of the expenditures should be classified as sunk cash flows, and which should be viewed as opportunity cash flows?

LG 3 MyLab

P11-6 **Book value** Find the book value for each of the assets shown in the following table, assuming that MACRS depreciation is being used. (See Table 4.2 for the applicable depreciation percentages.)

Asset	Installed cost	Recovery period (years)	Elapsed time since purchase (years)
A	$ 890,000	5	2
B	67,000	7	4
C	34,000	3	1
D	4,280,000	10	5
E	753,000	5	3

LG 3

P11-7 **Change in net working capital calculation** MSF Manufacturing is considering the purchase of a new machine to improve its production efficiency. The company has total current assets of $865,000 and total current liabilities of $673,000. As a result of the proposed replacement, the following changes are anticipated in the levels of the current asset and current liability accounts noted.

Account		Change
Cash	+	$43,500
Inventories	−	69,000
Accounts receivable	+	378,000
Accounts payable		0
Notes payable	+	230,000
Accruals	+	38,000
Marketable securities		0

a. Using the information given, calculate any change in net working capital that is expected to result from the proposed replacement plan.

b. Explain why a change in these current accounts would be relevant in determining the initial investment for the proposed capital expenditure.

c. Would the change in net working capital enter into any of the other cash flow components that make up the project's relevant cash flows? Explain.

LG 3

P11-8 **Calculating initial investment** Miller Dental Inc. is considering replacing its laser checking system, which was purchased 3 years ago at a cost of $568,000. The system can be sold today for $253,000. It is being depreciated using MACRS and a 5-year recovery period (see Table 4.2). A new laser checking system will cost $870,000 to purchase and install. Replacement of the laser checking system would not involve any change in net working capital. Assume a 20% tax rate.

a. Calculate the book value of the existing laser checking system.
b. Calculate the after-tax proceeds of its sale for $253,000.
c. Calculate the initial investment associated with the replacement project.

LG 3

P11-9 Initial investment at various sale prices Novartis International AG is considering replacing one labeling system with a new model. The old system was purchased 2 years ago for an installed cost of CHf 500,000. The firm is depreciating the labeling system using a straight line amortization schedule for 5 years. The new machine costs CHf 700,000 and requires CHf 50,000 in installation costs. The firm is subject to a tax of 24%, including the cantonal tax rates. In each of the following cases, calculate the initial investment for the replacement.

a. Novartis sells the old labeling system for CHf 400,000.
b. Novartis sells the old labeling system for CHf 300,000.
c. Novartis sells the old labeling system for CHf 200,000.
d. Novartis sells the old labeling system for CHf 100,000.

LG 3

P11-10 Calculating initial investment DuPree Coffee Roasters Inc. wishes to expand and modernize its facilities. The installed cost of a proposed computer-controlled automatic-feed roaster will be $130,000. The firm has a chance to sell its 4-year-old roaster for $35,000. The existing roaster originally cost $60,000 and was being depreciated using MACRS and a 7-year recovery period. (See Table 4.2 for the applicable depreciation percentages.) DuPree is subject to a 21% tax rate.

a. What is the book value of the existing roaster?
b. Calculate the after-tax proceeds of the sale of the existing roaster.
c. Calculate the change in net working capital using the figures in the following table.

Anticipated Changes in Current Assets and Current Liabilities	
Expense accruals	−$20,000
Inventory	+ 50,000
Accounts payable	+ 40,000
Accounts receivable	+ 70,000
Cash	0
Notes payable	+ 15,000

d. Calculate the initial investment associated with the new roaster.

LG 3

P11-11 Operating cash inflows A partnership is considering renewing its equipment to meet increased demand for its product. The cost of equipment modifications is $1.9 million plus $100,000 in installation costs. The firm will depreciate the equipment modifications under MACRS, using a 5-year recovery period. (See Table 4.2 for the applicable depreciation percentages.) Additional sales revenue from the renewal should amount to $1,200,000 per year, and additional operating expenses and other costs (excluding depreciation and interest) will amount to 40% of the additional sales. The firm is subject to a tax rate of 40%. (*Note:* Answer the following questions for each of the next 6 years.)

a. What incremental earnings before interest, taxes, depreciation, and amortization will result from the renewal?
b. What incremental net operating profits after taxes will result from the renewal?
c. What operating cash flows will result from the renewal?

Personal Finance Problem

LG 3

P11-12 **Operating cash flows** Michele operates a local tourist agency. He has been using an Olivetti personal computer (PC) for several years and believes it is time to buy a new one. He would like to know the operating cash flows associated with the replacement of the old PC. The following data are available:

There are 5 years of remaining useful life on the old PC.

The old PC has a zero book value.

The new PC is expected to last 5 years.

Michele will follow a straight-line depreciation for the new PC.

Depreciation value of the new PC is €1,500.

He is subject to a 24% tax rate.

The new PC is expected to be more efficient and durable than the previous one and can result in reduced operating expenses of €500 per year.

Michele will buy an antivirus software for the PC that calls for annual payments of €20.

Create an operating cash flow statement for the replacement of Michele's Olivetti personal computer. Show the operating cash flow for the next 5 years.

LG 3 MyLab

P11-13 **Operating cash flows** Hoffmann-La Roche is considering replacing one permeability test equipment with a new model. The old equipment is fully depreciated and would last 3 more years. The new equipment is expected to have a 5-year life and depreciation charges of CHf 20,000 in year 1; CHf 32,000 in year 2; CHf 19,000 in year 3; and CHf 12,000 in both year 4 and year 5. The firm estimates the revenues and expenses (excluding depreciation and interest) for the new and old machineries to be as shown in the table below. The firm is subject to a 24% tax rate, including the cantonal tax rates.

	New equipment		Old equipment	
Year	Revenue	Expenses (excluding depreciation and interest)	Revenue	Expenses (excluding depreciation and interest)
1	CHf 400,000	CHf 300,000	CHf 350,000	CHf 250,000
2	410,000	300,000	350,000	250,000
3	420,000	300,000	350,000	250,000
4	430,000	300,000	350,000	250,000
5	440,000	300,000	350,000	250,000

a. Calculate the operating cash flows associated with each equipment.
b. Calculate the operating cash flows resulting from the proposed equipment replacement.
c. Depict on a timeline the operating cash flows calculated in part **b.**

LG 3

P11-14 **Terminal cash flow: Various lives and sale prices** Looner Industries is currently analyzing the purchase of a new machine that costs $160,000 and requires $20,000 in installation costs. Net working capital will increase immediately by $30,000, but those funds will be

recovered at the end of the machine's life. The firm plans to depreciate the machine under MACRS, using a 5-year recovery period (see Table 4.2), and expects to sell it to net $10,000 before taxes at the end of its usable life. The firm is subject to a 40% tax rate.

a. Calculate the terminal cash flow for a usable life of (1) 3 years, (2) 5 years, and (3) 7 years.

b. Discuss the effect of usable life on terminal cash flows, using your findings in part **a.**

c. Assuming a 5-year usable life, calculate the terminal cash flow if the machine were sold to net (1) $9,000 or (2) $170,000 (before taxes) at the end of 5 years.

d. Discuss the effect of sale price on terminal cash flow, using your findings in part **c.**

LG 3

P11-15 **Terminal cash flow: Replacement decision** Russell Industries is considering replacing a fully depreciated machine that has a remaining useful life of 10 years with a newer, more sophisticated machine. The new machine will cost $200,000 and will require $30,000 in installation costs. It will be depreciated under MACRS, using a 5-year recovery period (see Table 4.2 for the applicable depreciation percentages). A $25,000 increase in net working capital will be required to support the new machine. The firm's managers plan to evaluate the potential replacement over a 4-year period. They estimate that the old machine could be sold at the end of 4 years to net $15,000 before taxes; the new machine at the end of 4 years will be worth $75,000 before taxes. Calculate the terminal cash flow at the end of year 4 that is relevant to the proposed purchase of the new machine. The firm is subject to a 40% tax rate.

LG 3

P11-16 **Net cash flows: No terminal value** Central Laundry is replacing an existing piece of machinery with a new model. The old machine was purchased 3 years ago for $50,000 and was being depreciated under MACRS, using a 5-year recovery period. The machine has 5 years of usable life remaining. The new machine costs $76,000, requires $4,000 in installation costs, and will be depreciated under MACRS, using a 5-year recovery period (see Table 4.2). The firm can currently sell the old machine for $55,000 without incurring any removal or cleanup costs. The firm's tax rate is 21%. The revenues and expenses (excluding depreciation and interest) for the new and old machines for the next 5 years appear in the table below.

	New machine		Old machine	
Year	Revenue	Expenses (excl. depr. and int.)	Revenue	Expenses (excl. depr. and int.)
1	$750,000	$720,000	$674,000	$660,000
2	750,000	720,000	676,000	660,000
3	750,000	720,000	680,000	660,000
4	750,000	720,000	678,000	660,000
5	750,000	720,000	674,000	660,000

a. Calculate the initial investment associated with replacement of the old machine by the new one.

b. Determine the operating cash flows associated with the proposed replacement. (*Note:* Be sure to consider the depreciation in year 6.)

c. Depict on a timeline the net cash flows found in parts **a** and **b** associated with the proposed replacement decision.

d. How would your answers change if the new machine is eligible for 100% bonus depreciation?

LG 3

P11-17 **Integrative: Determining net cash flows** Pirelli & C. S.p.A. is considering purchasing a new rubber extrusion line that produces rolling bands, flanks, and the other products used in the process of tire manufacturing. This line will replace the existing one, which was purchased 5 years ago, at an installed cost of €400,000; it was being depreciated under straight-line amortization, and with a usable life of 5 more years. The new line costs €1,200,000 and requires €150,000 in installation costs; it has a 5-year usable life and would be depreciated under straight-line amortization, using a 5-year recovery period for the calculation. Pirelli can currently sell the existing line for €150,000 without incurring any additional costs. To support the increased business resulting from purchase of the new line, accounts receivable would increase by €400,000, inventories by €300,000, and accounts payable by €570,000. At the end of 5 years, the existing line would have a market value of zero; the new line would be sold to net €300,000 after removal and cleanup costs and before taxes. The firm is subject to a 24% tax rate. The estimated earnings before interest, taxes, depreciation, and amortization over the 5 years for both the new and the existing line are shown in the following table.

	Earnings before interest, taxes, depreciation, and amortization	
Year	New line	Existing line
1	€450,000	€280,000
2	450,000	250,000
3	450,000	200,000
4	450,000	180,000
5	450,000	150,000

a. Calculate the initial investment associated with the replacement of the existing line by the new one.
b. Determine the operating cash flows associated with the proposed line replacement.
c. Determine the terminal cash flow expected at the end of year 5 from the proposed line replacement.
d. Depict on a timeline the incremental cash flows associated with the proposed line replacement decision.

LG 4

P11-18 **Recognizing risk** Spin Corp., a media services firm with net earnings of $3,200,000 in the past year, is considering the following projects.

Project	Initial investment	Details
A	−$ 35,000	Replace existing office furnishings.
B	−500,000	Purchase digital video editing equipment for use with several existing accounts.
C	−450,000	Develop proposal to bid for a $2,000,000 per year 10-year contract with the U.S. Navy, not now an account.
D	−685,000	Purchase the exclusive rights to market a quality educational television program in syndication to local markets in the European Union, a part of the firm's existing business activities.

The media services business is cyclical and highly competitive. The board of directors has asked you, as chief financial officer, to do the following:

a. Evaluate the risk of each proposed project and rank it "low," "medium," or "high."

b. Comment on why you chose each ranking.

LG 4

P11-19 Breakeven cash inflows and risk Taiwan Semiconductor Manufacturing Co. Ltd. (TSMC), one of the world's largest semiconductor foundries, is considering building a new production facility close to one of its main business partners. Once the facility is built, TSMC will be the exclusive supplier for that client for the subsequent 5 years. The company is considering one of two plant designs. The first is to build a 300 mm GIGAFABs wafer plant, which will cost NT$40 million to build (NT$ stands for New Taiwan dollar). The second is a 200 mm wafer plant, which will cost NT$30 million to build. The 300 mm GIGAFABs facility allows for the production of the most current state-of-the-art wafers, which are then used for the production of semiconductors. The company estimates that its client will order NT$15 million of product per year if the 300 mm GIGAFABs facility is built, but if the 200 mm wafer plant is built, TSMC expects to sell NT$10 million worth of product annually to its client. The company has enough resources to build either type of plant, and in the absence of risk differences, accepts the project with the highest NPV. The cost of capital is 12%.

a. Find the NPV for each project. Are the projects acceptable?

b. Find the breakeven cash inflow for each project.

c. The company has estimated the probabilities of achieving various ranges of cash inflows for the two projects as shown in the following table. What is the probability that each project will achieve at least the breakeven cash inflow found in part **b**?

	Probability of achieving cash inflow in given range	
Range of cash inflow (NT$ million)	300 mm wafer plant	200 mm wafer plant
0–5	0%	5%
5–8	10	10
8–11	20	60
11–15	60	25
15–20	10	0

d. Which project is more risky? Which project has the potentially higher NPV? Discuss the risk-return tradeoffs of the two projects.

e. If TSMC wants to minimize losses (i.e., NPV < NT$0), which project would you recommend? Which would you recommend if the goal were to achieve a higher NPV?

LG 4

P11-20 Basic scenario analysis Aluminum Projects is in the process of evaluating two new aluminum cutting machines with the intention of purchasing one of them. The firm's financial analysts have developed pessimistic, most likely, and optimistic estimates of the annual cash inflows for the two machines, which are shown in the following table.

	Machine A	Machine B
Initial investment (CF_0)	$5,000	$5,500
Outcome	Annual cash inflows (CF)	
Pessimistic	$550	$850
Most likely	$950	$1,050
Optimistic	$1,350	$1,200

a. Determine the range of annual cash inflows for each machine.
b. Assume that firm's cost of capital is 10% and that both machines have 12-year lives. Construct a table similar to this one for the NPVs for each machine. Include the range of NPVs for each machine.
c. Based on the range of the cash flows and the NPVs of each machine, which machine should be acquired?
d. Which machine should the firm invest in if it is not willing to take risks? Why?

LG 4

P11-21 **Scenario analysis** Novartis International AG, a global healthcare company based in Switzerland, is considering producing either a generic multivitamin or a specific blend of vitamins A, C, and D. Novartis expects both products to provide benefits over a 12-year period, and each has a required (initial) investment of CHf520,000 (CHf stands for Swiss Franc). The company uses a 6.35% cost of capital. Management has constructed the following table of estimated annual cash inflows for pessimistic, most likely and optimistic results:

	Generic multivitamin	Blend of A, C, and D
Initial investment (CF_0)	−CHf520,000	−CHf520,000
Outcome	Annual cash inflows (CF)	
Pessimistic	50	40
Most likely	75	75
Optimistic	100	120

a. Determine the range of annual cash inflows for each of the two products.
b. Construct a table similar to this one for the NPVs associated with each outcome for both products.
c. Find the range of NPVs, and subjectively compare the risks associated with these products.
d. Which product do you recommend? Why?

Personal Finance Problem

LG 4

P11-22 **Impact of inflation on investments** The Choc Shop is considering buying new equipment with an initial investment outlay of $32,000. The equipment has a 5-year life with cash inflows in years 1 to 5 of $11,500, $12,000, $12,500, $10,000, and $9,500, respectively. The current opportunity cost is 6% per year. However, the economists have forecasted that inflation may rise by 1% or may fall by the same amount over the next 5 years. Inflation will only influence the opportunity cost since the cash inflows are fixed.

Assume a direct positive impact of inflation on the prevailing rates (Fisher effect) and answer the following questions. (Assume that inflation has an impact on the opportunity cost, but that the cash flows are contractually fixed and are not affected by inflation).

a. Calculate the net present value (NPV) of the investment under the current required rate of return.
b. Calculate the net present value (NPV) of the investment under a period of rising inflation.
c. Calculate the net present value (NPV) of the investment under a period of falling inflation.
d. Based on your answers in parts a, b, and c, describe the relationship between changes in inflation and asset valuation.

LG 4

P11-23 **Simulation** Ogden Corporation has compiled the following information on a capital expenditure proposal:

(1) The projected cash inflows are normally distributed with a mean of $36,000 and a standard deviation of $9,000.
(2) The projected cash outflows are normally distributed with a mean of $30,000 and a standard deviation of $6,000.
(3) The firm has an 11% cost of capital.
(4) The probability distributions of cash inflows and cash outflows are not expected to change over the project's 10-year life.

a. Describe how the foregoing data can be used to develop a simulation model for finding the net present value of the project.
b. Discuss the advantages of using a simulation to evaluate the proposed project.

LG 5 MyLab

P11-24 **Risk-adjusted discount rates: Basic** Mayflower Interiors is considering investing in one of three mutually exclusive projects, X, Y, and Z. The firm's cost of capital, r, is 13.5% and the risk-free rate, R_F, is 10%. The firm has gathered the basic cash flow and risk index data for each project as shown in the following table.

	Project (j)		
	X	Y	Z
Initial investment (CF_0)	−$16,500	−$13,000	−$21,000
Year (t)	Cash inflows (CF_t)		
1	$5,500	$6,500	$ 5,000
2	5,500	4,500	6,500
3	5,500	5,200	7,500
4	5,500	2,200	11,500
Risk index (RI_j)	1.70	1.00	0.40

a. Find the net present value (NPV) of each project, using the firm's cost of capital. Which project is preferred in this situation?
b. The firm uses the following equation to determine the risk-adjusted discount rate, $RADR_j$ for each project j:

$$RADR_j = R_F + [RI_j \times (r - R_F)]$$

where

R_F = risk-free rate of return
RI_j = risk index for project j
r = cost of capital

Substitute each project's risk index into this equation to determine its RADR.

c. Use the RADR for each project to determine its risk-adjusted NPV. Which project is preferable in this situation?

d. Based on your answers in parts **a** and **c**, which project should the firm accept? Explain your answer.

LG 5

P11-25 **Risk-adjusted discount rates: Tabular** Wentworth Art School is evaluating a few investment alternatives and opportunities. It has developed a CAPM-type relationship linking a risk index to the required return (RADR), as shown in the following table.

Risk index	Required return (RADR)
0.0	6.5% (risk-free rate, R_F)
0.2	7.5
0.4	8.5
0.6	9.5
0.8	10.5
1.0	11.5
1.2	12.5
1.4	13.5
1.6	14.5
1.8	15.5
2.0	16.5

The Wentworth Art School is considering two mutually exclusive projects. Following are the data that the firm has been able to gather about the projects. All the cash inflows have already been adjusted for taxes.

	Painting project	Sculpture project
Initial investment (CF_0)	$25,000	$35,000
Project life	5 years	5 years
Annual cash inflow (CF)	$7,500	$11,600
Risk index	0.4	1.6

a. Evaluate the two projects using risk-adjusted discount rates.

b. Discuss your findings in part **a**, and recommend the preferred project.

Personal Finance Problem

LG 5

P11-26 **Mutually exclusive investments and risk** Diane Smith is interested in two mutually exclusive investments. Both investments have a time horizon of 8 years. The first investment opportunity requires an initial investment of $10,000, to receive equal and consecutive year-end payments of $2,500. The second investment opportunity requires an initial investment of $8,500, to receive equal and consecutive year-end payments of $2,000. Diane requires a 9.5% return on the first investment, and an 8% return on the second investment opportunity.

a. Calculate the net present value of the first investment.

b. Calculate the net present value of the second investment.

c. Being mutually exclusive, which investment should Diane choose? Explain.

d. Which investment was relatively more risky? Explain.

LG 5

P11-27 **Risk-adjusted rates of return using CAPM** Roots to Branches Corp., a company specializing in event décor, is considering two mutually exclusive investments. The company wishes to use a CAPM-type risk-adjusted discount rate (RADR) in its analysis. Management expects that the appropriate market rate of return is 10%, while they observe that the current risk-free rate of return is 6.5%. The following table shows cash flows associated with the two investment projects.

	Roots	Branches
Initial investment (CF_0)	−$82,000	−$85,000
Year (t)	Cash inflows (CF_t)	
1	$35,000	$24,000
2	35,000	34,000
3	35,000	42,000
4	35,000	44,000

a. Use a risk-adjusted discount rate approach to calculate the net present value of each project, given that the RADR factor for project Roots is 1.40 and for project Branches is 1.60. The RADR factors are similar to project betas. (Refer to Equation 12.5 to calculate the required project return for each.)

b. Discuss your findings in part **a,** and recommend the preferred project.

LG 5

P11-28 **Risk classes and RADR** Patek Philippe & Co. is attempting to select one of three mutually exclusive projects for the redesign of its classic watches: Nautilius, Grand Complications, and Calatrava. Although all the projects have 5-year lives, they possess differing degrees of risk. Project Nautilius has the highest risk and is in class V; project Grand Complications is in class II, the below-average-risk class; and project Calatrava is in class III, the average-risk class. The basic cash flow data for each project and the risk classes and risk-adjusted discount rates (RADRs) used by the firm are shown in the following tables.

	Nautilius	Grand Complications	Calatrava
Initial investment (CF_0)	−€180,000	−€235,000	−€310,000
Year (t)	Cash inflows (CF_t)		
1	€80,000	€50,000	€90,000
2	70,000	60,000	90,000
3	60,000	70,000	90,000
4	60,000	80,000	90,000
5	60,000	90,000	90,000

Risk Classes and RADRs

Risk class	Description	Risk-adjusted discount rate (RADR)
I	Lowest risk	8%
II	Below-average risk	13
III	Average risk	15
IV	Above-average risk	20
V	Highest risk	22

a. Find the risk-adjusted NPV for each project.

b. Which project, if any, would you recommend that the firm undertake?

LG 6

P11-29 **Unequal lives: ANPV approach** Evans Industries wishes to select the best of three possible machines, each of which is expected to satisfy the firm's ongoing need for additional aluminum-extrusion capacity. The three machines—A, B, and C—are equally risky. The firm plans to use a 12% cost of capital to evaluate each of them. The following table shows the initial investment and annual cash inflows over the life of each machine.

	Machine A	Machine B	Machine C
Initial investment (CF_0)	−$92,000	−$65,000	−$100,500
Year (t)	Cash inflows (CF_t)		
1	$12,000	$10,000	$30,000
2	12,000	20,000	30,000
3	12,000	30,000	30,000
4	12,000	40,000	30,000
5	12,000	–	30,000
6	12,000	–	–

a. Calculate the NPV for each machine over its life. Rank the machines in descending order on the basis of NPV.
b. Use the annualized net present value (ANPV) approach to evaluate and rank the machines in descending order on the basis of ANPV.
c. Compare and contrast your findings in parts **a** and **b.** Which machine would you recommend that the firm acquire? Why?

LG 6

P11-30 **Unequal lives: ANPV approach** Warehouse Systems Enterprises (WSE) has designed a new inventory management system. Management must choose from three alternative courses of action. The firm can: (1) sell the design of the new system outright to a warehouse with payment over 3 years; (2) license the design to another warehouse for a period of 5 years, its likely product life; or (3) manufacture and market the equipment itself, an alternative with expected cash inflows for 6 years. The company has a cost of capital of 15%. The following table shows the cash flows associated with each alternative.

Alternative	Sell	License	Manufacture
Initial investment (CF_0)	−$230,000	−$230,000	−$440,000
Year (t)	Cash inflows (CF_t)		
1	$200,000	$250,000	$195,000
2	240,000	100,000	195,000
3	190,000	90,000	195,000
4	–	65,000	195,000
5	–	55,000	195,000
6	–	–	195,000

a. Calculate the NPV of each alternative and rank them in order of acceptability on the basis of NPV.
b. Calculate the annualized net present value (ANPV) of each alternative, and rank them accordingly.
c. Which alternative should WSE accept? Why?

Personal Finance Problem

LG 6

P11-31 NPV and ANPV decisions Richard and Linda Butler decide that it is time to purchase a high-definition (HD) television because the technology has improved and prices have fallen over the past 3 years. From their research, they narrow their choices to two sets, the Samsung 64-inch plasma with 1080p capability and the Sony 64-inch plasma with 1080p features. The price of the Samsung is $2,350, and the Sony will cost $2,700. They expect to keep the Samsung for 3 years; if they buy the more expensive Sony unit, they will keep the Sony for 4 years. They expect to sell the Samsung for $400 by the end of 3 years; they expect to sell the Sony for $350 at the end of year 4. Richard and Linda estimate the end-of-year entertainment benefits (i.e., not going to movies or events and watching at home) from the Samsung to be $900 and from the Sony to be $1,000. Both sets can be viewed as quality units and are equally risky purchases. They estimate their opportunity cost to be 9%.

The Butlers wish to choose the better alternative from a purely financial perspective. To perform this analysis they wish to do the following:

a. Determine the NPV of the Samsung HD plasma TV.
b. Determine the ANPV of the Samsung HD plasma TV.
c. Determine the NPV of the Sony HD plasma TV.
d. Determine the ANPV of the Sony HD plasma TV.
e. Which set should the Butlers purchase? Why?

LG 6

P11-32 Real options and the strategic NPV Suppose Dave Marberger, the CFO of Godiva Chocolatier, has just completed an evaluation of a proposed capital expenditure for the expansion of the firm's chocolate factory in Brussels. Using the traditional NPV methodology, he has found the project unacceptable because

$$NPV_{traditional} = -€10{,}000{,}000 < €0$$

Before recommending rejection of the expansion project, he has decided to assess whether real options might be embedded in the firm's cash flows. His evaluation uncovered three options:

Option 1: Abandonment. The project could be abandoned at the end of 3 years, resulting in an addition to NPV of €15,000,000.

Option 2: Growth. If the project outcomes occurred, an opportunity to expand the firm's product offerings further would become available at the end of 4 years. Exercise of this option is estimated to add €25,000,000 to the project's NPV.

Option 3: Timing. Certain phases of the proposed expansion project could be delayed if market and competitive conditions caused the firm's forecast revenues to develop more slowly than planned. Such a delay in implementation at that point has an NPV of €100,000,000.

Dave estimated that there was a 25% chance that the abandonment option would need to be exercised, a 40% chance that the growth option would be exercised, and only a 5% chance that the implementation of certain phases of the project would affect timing.

a. Use the information provided to calculate the strategic NPV, $NPV_{strategic}$, for Godiva's proposed expansion.
b. On the basis of your findings in part **a**, what action should Dave recommend to management with regard to the proposed expansion?
c. In general, how does this problem demonstrate the importance of considering real options when making capital budgeting decisions?

LG 6

P11-33 **Capital rationing: IRR and NPV approaches** Hotel Amazing is attempting to select the best of a group of independent projects competing for the firm's fixed capital budget of $5.5 million. Management recognizes that any unused portion of this budget will earn less than the 12% cost of capital, thereby resulting in a present value of inflows that is less than the initial investment. A summary of the independent projects are shown in the following table.

Project	Initial investment	IRR	Present value of inflows at 12%
A	−$4,900,000	17%	$5,600,000
B	−900,000	19	1,250,000
C	−2,100,000	18	2,250,000
D	−1,600,000	15	1,800,000
E	−750,000	20	920,000
F	−2,600,000	19	3,100,000
G	−1,250,000	21	1,310,000

a. Use the internal rate of return (IRR) approach to select the best group of projects.
b. Use the net present value (NPV) approach to select the best group of projects.
c. Are the projects selected in parts **a** and **b** the same? Explain your answer.
d. Which projects should Hotel Amazing implement? Why?

LG 6

P11-34 **Capital rationing: NPV approach** A firm with a 13% cost of capital must select the optimal group of projects from those shown in the following table, given its capital budget of $1 million.

Project	Initial investment	NPV at 13% cost of capital
A	−$300,000	$ 84,000
B	−200,000	10,000
C	−100,000	25,000
D	−900,000	90,000
E	−500,000	70,000
F	−100,000	50,000
G	−800,000	160,000

a. Calculate the present value of cash inflows associated with each project.
b. Select the optimal group of projects, keeping in mind that unused funds are costly.

LG 5

P11-35 **ETHICS PROBLEM** In less than three decades, China has become the second largest economy in the world. But this rapid growth has led to a lot of environmental and health issues. These developments have placed environmental pollution at the top of the government's reform agenda. Suppose that Sinochem Group, a large conglomerate primarily engaged in the production and trading of chemicals, fertilizer, and exploration and production of oil, is considering building a large chemical production factory near the Huangpu River. The NPV of the project is ¥20,000,000. This value does not include fines for cleaning up the river of the chemical waste from the factory, which

might additionally cost at least ¥3,000,000. On the other hand, the company may invest in a particular filtering solution which reduces pollution to zero, but has a cost of ¥5,000,000. Which solution would you choose if you were the CEO of the company?

SPREADSHEET EXERCISE

Dyno Corporation has two projects that it would like to undertake. However, due to capital restraints, the two projects—Alpha and Beta—must be treated as mutually exclusive. Both projects are equally risky, and the firm plans to use a 10% cost of capital to evaluate each. Project Alpha has an estimated life of 12 years, and project Beta has an estimated life of 9 years. The cash flow data have been prepared as given in the following table.

	Cash flows	
	Project Alpha	Project Beta
CF_0	−$5,500,000	−$6,500,000
CF_1	300,000	400,000
CF_2	500,000	600,000
CF_3	500,000	800,000
CF_4	550,000	1,100,000
CF_5	700,000	1,400,000
CF_6	800,000	2,000,000
CF_7	950,000	2,500,000
CF_8	1,000,000	2,000,000
CF_9	1,250,000	1,000,000
CF_{10}	1,500,000	
CF_{11}	2,000,000	
CF_{12}	2,500,000	

TO DO

Create a spreadsheet to answer the following questions.

a. Calculate the NPV for each project over its respective life. Rank the projects in descending order on the basis of NPV. Which one would you choose?

b. Use the annualized net present value (ANPV) approach to evaluate and rank the projects in descending order on the basis of ANPV. Which one would you choose?

c. Compare and contrast your findings in parts **a** and **b**. Which project would you recommend that the firm choose? Explain.

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PART SIX

Long-Term Financial Decisions

CHAPTERS IN THIS PART

Chapters 10 and 11 focused on how firms should invest money, but those chapters were silent on where firms obtained the money to invest in the first place. In Chapters 12 and 13, we examine firms' long-term financial decisions. Broadly speaking, these chapters focus on the tradeoffs associated with different sources of investment capital.

Chapter 12 looks at the firm's most basic long-term financial decision: whether to raise money by selling stock (equity) or by borrowing money (debt). We call a firm's mix of debt and equity financing its capital structure. Some firms choose a capital structure that contains no debt at all, whereas other firms rely more heavily on debt financing than on equity. The capital structure choice is extremely important because how much debt a firm uses influences the returns a firm can provide to its investors as well as the risks associated with those returns. More debt generally means higher returns, but also higher risks. Chapter 12 illustrates how firms balance that tradeoff.

Chapter 13 focuses on payout policy. Payout policy refers to the decisions that firms make about whether and how to distribute cash to shareholders via dividends and share repurchases. In terms of decision making, we can observe a similarity between capital structure and payout policy. Some firms choose to distribute no cash at all, preferring instead to reinvest cash in the business or to build up large cash reserves for possible use in strategic investments like acquisitions. Other firms pay billions in dividends and stock buybacks each year. Chapter 13 explains the factors that firms consider when forming their payout policies.

CHAPTER 12

Leverage and Capital Structure

LEARNING GOALS

- **LG1** Discuss leverage, capital structure, breakeven analysis, the operating breakeven point, and the effect of changing costs on the breakeven point.
- **LG2** Understand operating, financial, and total leverage and the relationships among them.
- **LG3** Describe the types of capital, external assessment of capital structure, the capital structure of non–U.S. firms, and capital structure theory.
- **LG4** Explain the optimal capital structure using a graphical view of the firm's cost-of-capital functions and a zero-growth valuation model.
- **LG5** Discuss the EBIT–EPS approach to capital structure.
- **LG6** Review the return and risk of alternative capital structures, their linkage to market value, and other important considerations related to capital structure.

MyLab Finance **Chapter Introduction Video**

WHY THIS CHAPTER MATTERS TO YOU

In your *professional* life

ACCOUNTING You need to understand how to calculate and analyze operating and financial leverage and to be familiar with the tax and earnings effects of various capital structures.

INFORMATION SYSTEMS You need to understand the types of capital and what capital structure is because you will provide much of the information needed in management's determination of the best capital structure for the firm.

MANAGEMENT You need to understand leverage so that you can control risk and magnify returns for the firm's owners and to understand capital structure theory so that you can make decisions about the firm's optimal capital structure.

MARKETING You need to understand breakeven analysis, which you will use in pricing and product feasibility decisions.

OPERATIONS You need to understand the impact of fixed and variable operating costs on the firm's breakeven point and its operating leverage because these costs will have a major effect on the firm's risk and return.

In your *personal* life

Like corporations, you routinely incur debt, using both credit cards for short-term needs and negotiated long-term loans. When you borrow over the long term, you experience the benefits and consequences of leverage. Also, the level of your outstanding debt relative to net worth is conceptually the same as a firm's capital structure. It reflects your financial risk and affects the availability and cost of borrowing.

LG1 LG2

12.1 Leverage

leverage
Refers to the effects that fixed costs have on the returns that shareholders earn; higher leverage generally results in higher but more volatile returns.

Leverage refers to the effects that fixed costs have on the returns that shareholders earn. By "fixed costs," we mean costs that do not rise and fall with changes in a firm's sales. Firms have to pay fixed costs whether business conditions are good or bad. These costs may be operating costs, such as those incurred by purchasing and operating plant and equipment, or they may be financial costs, such as the fixed costs of making debt payments. We say that a firm with higher fixed costs has greater leverage. Generally, leverage magnifies both returns and risks. A firm with more leverage may earn higher returns on average than a firm with less leverage, but the returns on the more leveraged firm will also be more volatile.

Many business risks are beyond the control of managers, but not those associated with leverage. Managers can either increase or decrease leverage by adopting strategies that rely more heavily on fixed or variable costs. For example, a choice that many firms confront is whether to make their own products or to outsource manufacturing to another firm. A company that does its own manufacturing may invest billions in factories around the world. These factories generate costs whether they are running or not, so a firm that manufactures its own products will tend to have higher leverage. In contrast, a company that outsources production can quickly reduce its costs when demand is low simply by not placing orders. Therefore, such a firm will generally have lower leverage compared to a firm that manufactures in house.

capital structure
The mix of long-term debt and equity maintained by a firm.

Managers also influence leverage by choosing a specific **capital structure**, which is the mix of long-term debt and equity maintained by a firm. The more debt a firm issues, the higher are its debt repayment costs, and those costs must be paid regardless of how the firm's products are selling. Because leverage can have such a large impact on a firm, the financial manager must understand how to measure and evaluate leverage, particularly when making capital structure decisions.

Table 12.1 uses an income statement to highlight where different sources of leverage come from.

- *Operating leverage* relates to the relationship between the firm's sales revenue and its earnings before interest and taxes (EBIT) or *operating profits*. When costs of operations (such as cost of goods sold and operating expenses) are largely fixed, small changes in revenue will lead to much larger changes in EBIT.

TABLE 12.1 General Income Statement Format and Types of Leverage

Operating leverage	Sales revenue	Total leverage
	Less: Cost of goods sold	
	Gross profits	
	Less: Operating expenses	
Financial leverage	Earnings before interest and taxes (EBIT)	
	Less: Interest	
	Net profits before taxes	
	Less: Taxes	
	Net profits after taxes	
	Less: Preferred stock dividends	
	Earnings available for common stockholders	
	Earnings per share (EPS)	

- *Financial leverage* relates to the relationship between the firm's EBIT and its common stock earnings per share (EPS). On the income statement, you can see that the deductions taken from EBIT to get to EPS include interest, taxes, and preferred dividends. Taxes are clearly variable, rising and falling with the firm's profits, but interest expense and preferred dividends are usually fixed. When these fixed items are large (i.e., when the firm has a lot of financial leverage), small changes in EBIT produce larger changes in EPS.
- *Total leverage* is the combined effect of operating and financial leverage. It relates to the relationship between the firm's sales revenue and EPS.

We will examine the three types of leverage concepts in detail. First, though, we look at breakeven analysis, which lays the foundation for leverage concepts by demonstrating how fixed costs affect the firm's operations.

BREAKEVEN ANALYSIS

breakeven analysis
Used to determine the level of operations necessary to cover all costs and to evaluate the profitability associated with various levels of sales; also called *cost-volume-profit analysis.*

operating breakeven point
The level of sales necessary to cover all *operating costs;* the point at which EBIT = $0.

Firms use **breakeven analysis,** also called *cost-volume-profit analysis,* (1) to determine the level of operations necessary to cover all costs and (2) to evaluate the profitability associated with various levels of sales. The firm's **operating breakeven point** is the level of sales necessary to cover all operating costs. At that point, earnings before interest and taxes (EBIT) equal $0.[1]

The first step in finding the operating breakeven point is to divide the cost of goods sold and operating expenses into fixed and variable operating costs. Fixed costs are costs that the firm must pay in a given period regardless of the sales volume achieved during that period. These costs are typically contractual; rent, for example, is a fixed cost. Because fixed costs do not vary with sales, we typically measure them relative to time. For instance, we would typically measure rent as the amount due per month. Variable costs vary directly with sales volume. Shipping costs, for example, are a variable cost.[2] We typically measure variable costs in dollars per unit sold.

Algebraic Approach

Using the following variables, we can recast the operating portion of the firm's income statement given in Table 12.1 into the algebraic representation shown in Table 12.2, where

$$\begin{aligned} P &= \text{sale price per unit} \\ Q &= \text{sales quantity in units} \\ FC &= \text{fixed operating cost per period} \\ VC &= \text{variable operating cost per unit} \end{aligned}$$

Rewriting the algebraic calculations in Table 12.2 as a formula for earnings before interest and taxes yields Equation 12.1:

$$\text{EBIT} = (P \times Q) - FC - (VC \times Q) \tag{12.1}$$

1. Quite often, managers calculate the breakeven point so that it represents the point at which all costs—both operating and financial—are covered. For now, we focus on the operating breakeven point as a way to introduce the concept of operating leverage. We will discuss financial leverage later.

2. Some costs, commonly called semifixed or semivariable, are partly fixed and partly variable. An example is sales commissions that are fixed for a certain volume of sales and then increase to higher levels for higher volumes. For convenience and clarity, we assume that all costs can be classified as either fixed or variable.

TABLE 12.2 Operating Leverage, Costs, and Breakeven Analysis

	Item	Algebraic representation
Operating leverage	Sales revenue	$(P \times Q)$
	Less: Fixed operating costs	$-\ FC$
	Less: Variable operating costs	$-\ (VC \times Q)$
	Earnings before interest and taxes	EBIT

Simplifying Equation 12.1 yields

$$\text{EBIT} = Q \times (P - VC) - FC \tag{12.2}$$

As noted above, the operating breakeven point is reached when sales just cover all fixed and variable operating costs, which means that EBIT equals \$0. Setting EBIT equal to \$0 and solving Equation 12.2 for Q yields

$$Q = \frac{FC}{P - VC} \tag{12.3}$$

where Q is the firm's operating breakeven point.[3]

EXAMPLE 12.1

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Assume that Cheryl's Posters, a small poster retailer, has fixed operating costs of \$2,500. Its sale price is \$10 per poster, and its variable operating cost is \$5 per poster. Applying Equation 12.3 to these data yields

$$Q = \frac{\$2{,}500}{\$10 - \$5} = \frac{\$2{,}500}{\$5} = 500 \text{ units}$$

At sales of 500 units, the firm's EBIT should just equal \$0. The firm will have positive EBIT for sales greater than 500 units and negative EBIT, or a loss, for sales less than 500 units. We can confirm this conclusion by substituting values above and below 500 units, along with the other values given, into Equation 12.1.

Graphical Approach

Figure 12.1 presents in graphical form the breakeven analysis of the data in the preceding example. The firm's operating breakeven point is the point at which its total operating cost—the sum of its fixed and variable operating costs—equals sales revenue. At this point, EBIT equals \$0. The figure shows that for sales

3. Because the firm is assumed to be a single-product firm, its operating breakeven point is found in terms of unit sales, Q. For multiproduct firms, the operating breakeven point is generally found in terms of dollar sales, S. We can find S by substituting the contribution margin, which is 100% minus total variable operating costs as a percentage of total sales, denoted $VC\%$, into the denominator of Equation 12.3. The result is Equation 12.3a:

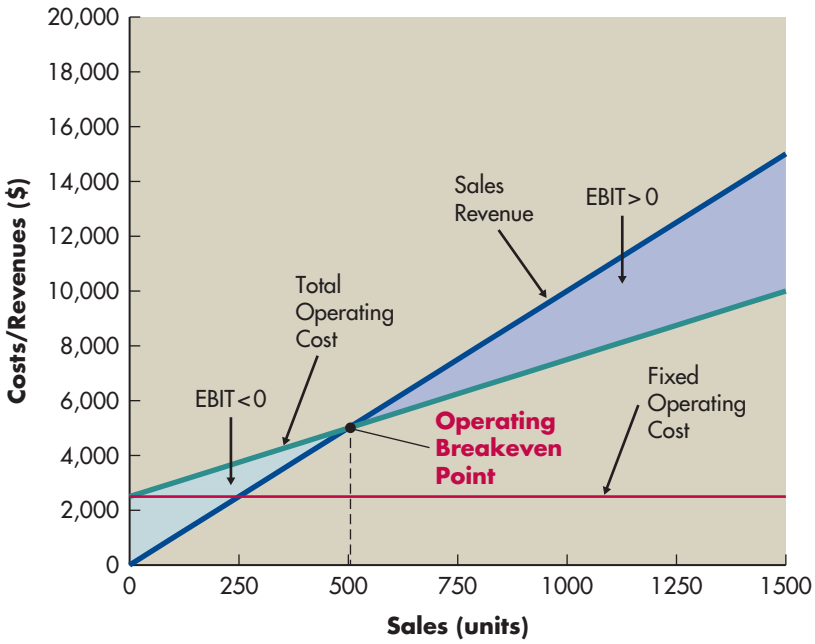
$$S = \frac{FC}{1 - VC\%} \tag{12.3a}$$

This multiproduct-firm breakeven point assumes that the firm's product mix remains the same at all levels of sales.

FIGURE 12.1

Breakeven Analysis
Graphical operating breakeven analysis

MyLab Finance Animation



below 500 units, total operating cost exceeds sales revenue, and EBIT is less than $0 (a loss). For sales above the breakeven point of 500 units, sales revenue exceeds total operating cost, and EBIT is greater than $0.

Changing Costs and the Operating Breakeven Point

A firm's operating breakeven point is sensitive to a number of variables: the fixed operating cost (FC), the sale price per unit (P), and the variable operating cost per unit (VC). Refer to Equation 12.3 to see how increases or decreases in these variables affect the breakeven point. The sensitivity of the breakeven sales volume (Q) to an increase in each of these variables is summarized in Table 12.3. As might be expected, an increase in cost (FC or VC) tends to increase the operating breakeven point, whereas an increase in the sale price per unit (P) decreases the operating breakeven point.

TABLE 12.3 Sensitivity of Operating Breakeven Point to Increases in Key Breakeven Variables

Increase in variable	Effect on operating breakeven point
Fixed operating cost (FC)	Increase
Sale price per unit (P)	Decrease
Variable operating cost per unit (VC)	Increase

Note: Decreases in each of the variables shown would have the opposite effect on the operating breakeven point.

EXAMPLE 12.2

Assume that Cheryl's Posters wishes to evaluate the impact of several options: (1) increasing fixed operating costs to $3,000; (2) increasing the sale price per unit to $12.50; (3) increasing the variable operating cost per unit to $7.50; and (4) simultaneously implementing all three of these changes. Substituting the appropriate data into Equation 12.3 yields

$$\text{(1) Operating breakeven point} = \frac{\$3{,}000}{\$10 - \$5} = 600 \text{ units}$$

$$\text{(2) Operating breakeven point} = \frac{\$2{,}500}{\$12.50 - \$5} = 333\tfrac{1}{3} \text{ units}$$

$$\text{(3) Operating breakeven point} = \frac{\$2{,}500}{\$10 - \$7.50} = 1{,}000 \text{ units}$$

$$\text{(4) Operating breakeven point} = \frac{\$3{,}000}{\$12.50 - \$7.50} = 600 \text{ units}$$

If we compare the resulting operating breakeven points to the initial value of 500 units, we can see that the cost increases (actions 1 and 3) raise the breakeven point, whereas the revenue increase (action 2) lowers the breakeven point. The combined effect of increasing all three variables (action 4) also results in an increased operating breakeven point.

PERSONAL FINANCE EXAMPLE 12.3

Rick Polo is considering having a new fuel-saving device installed in his car. The installed cost of the device is $240 paid up front plus a monthly fee of $15. He can terminate use of the device any time without penalty. Rick estimates that the device will reduce his average monthly gas consumption by 20%, which, assuming no change in his monthly mileage, translates into a savings of about $28 per month. He is planning to keep the car for 2 more years and wishes to determine whether he should have the device installed in his car.

To assess the financial feasibility of purchasing the device, Rick calculates the number of months it will take to break even. Letting the installed cost of $240 represent the fixed cost (FC), the monthly savings of $28 represent the benefit (P), and the monthly fee of $15 represent the variable cost (VC), and substituting these values into the breakeven point equation, Equation 12.3, we get

$$\begin{aligned}\text{Breakeven point (in months)} &= \$240 \div (\$28 - \$15) = \$240 \div \$13 \\ &= \underline{\underline{18.5 \text{ months}}}\end{aligned}$$

Because the fuel-saving device pays itself back in 18.5 months, which is less than the 24 months that Rick is planning to continue owning the car, he should have the fuel-saving device installed in his car.

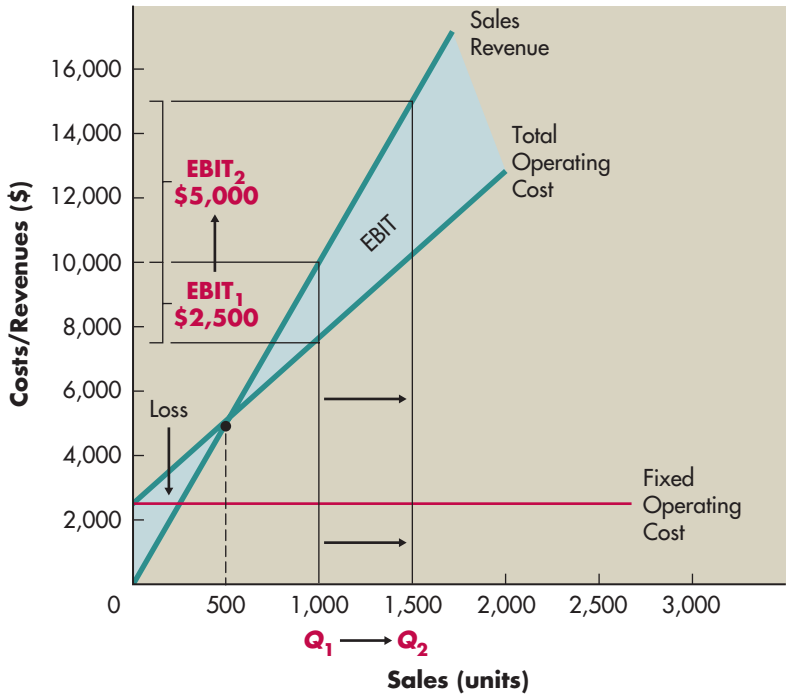
OPERATING LEVERAGE

operating leverage
The use of *fixed operating costs* to magnify the effects of changes in sales on the firm's earnings before interest and taxes.

Operating leverage results from the existence of fixed costs that the firm must pay to operate. Using the structure presented in Table 12.2, we can define **operating leverage** as the use of fixed operating costs to magnify the effects of changes in sales on the firm's earnings before interest and taxes.

FIGURE 12.2

Operating Leverage
Breakeven analysis and operating leverage



EXAMPLE 12.4

Using the data for Cheryl's Posters (sale price, $P = \$10$ per unit; variable operating cost, $VC = \$5$ per unit; fixed operating cost, $FC = \$2{,}500$), Figure 12.2 presents the operating breakeven graph originally shown in Figure 12.1. The additional notations on the graph indicate that as the firm's sales increase from 1,000 to 1,500 units (Q_1 to Q_2), its EBIT increases from \$2,500 to \$5,000 ($EBIT_1$ to $EBIT_2$). In other words, a 50% increase in sales (1,000 to 1,500 units) results in a 100% increase in EBIT (\$2,500 to \$5,000). Table 12.4 includes the

TABLE 12.4 The EBIT for Various Sales Levels

	Case 2		Case 1
	−50%		+50%
Sales (in units)	500	1,000	1,500
Sales revenue[a]	\$5,000	\$10,000	\$15,000
Less: Variable operating costs[b]	2,500	5,000	7,500
Less: Fixed operating costs	2,500	2,500	2,500
Earnings before interest and taxes (EBIT)	\$ 0	\$ 2,500	\$ 5,000
	−100%		+100%

[a]Sales revenue = \$10/unit × sales in units.
[b]Variable operating costs = \$5/unit × sales in units.

data for Figure 12.2 as well as relevant data for a 500-unit sales level. We can illustrate two cases using the 1,000-unit sales level as a reference point:

Case 1 A 50% increase in sales (from 1,000 to 1,500 units) results in a 100% increase in earnings before interest and taxes (from $2,500 to $5,000).

Case 2 A 50% decrease in sales (from 1,000 to 500 units) results in a 100% decrease in earnings before interest and taxes (from $2,500 to $0).

From the preceding example, we see that operating leverage works in both directions. When a firm has fixed operating costs, operating leverage is present. An increase in sales results in a more-than-proportional increase in EBIT; a decrease in sales results in a more-than-proportional decrease in EBIT.

Measuring the Degree of Operating Leverage (DOL)

degree of operating leverage (DOL)
The numerical measure of the firm's operating leverage.

The **degree of operating leverage** (DOL) is a numerical measure of the firm's operating leverage. It can be derived using the equation[4]

$$\text{DOL} = \frac{\text{Percentage change in EBIT}}{\text{Percentage change in sales}} \tag{12.4}$$

Whenever the percentage change in EBIT resulting from a given percentage change in sales is greater than the percentage change in sales, operating leverage exists. In other words, as long as DOL is greater than 1, there is operating leverage.

EXAMPLE 12.5

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Applying Equation 12.4 to cases 1 and 2 in Table 12.4 yields the following results:

Case 1 $$\frac{+100\%}{+50\%} = 2.0$$

Case 2 $$\frac{-100\%}{-50\%} = 2.0$$

These calculations show that Cheryl's Posters' EBIT changes twice as much (on a percentage basis) as its sales. For a given base level of sales, the higher the value resulting from applying Equation 12.4, the greater the degree of operating leverage.

A more direct formula for calculating the degree of operating leverage at a base sales level, Q, is[5]

$$\text{DOL at base sales level } Q = \frac{Q \times (P - VC)}{Q \times (P - VC) - FC} \tag{12.5}$$

4. The degree of operating leverage also depends on the base level of sales used as a point of reference. The closer the base sales level is to the operating breakeven point, the greater the operating leverage. Comparison of the degree of operating leverage of two firms is valid only when using the same base level of sales for both firms.

5. Technically, the formula for DOL given in Equation 12.5 should include absolute value signs because it is possible to get a negative DOL when the EBIT for the base sales level is negative. Because we assume that the EBIT for the base level of sales is positive, we do not use the absolute value signs.

EXAMPLE 12.6

Substituting $Q = 1{,}000$, $P = \$10$, $VC = \$5$, and $FC = \$2{,}500$ into Equation 12.5 gives us

$$\text{DOL at 1,000 units} = \frac{1{,}000 \times (\$10 - \$5)}{1{,}000 \times (\$10 - \$5) - \$2{,}500} = \frac{\$5{,}000}{\$2{,}500} = 2.0$$

As before, the DOL value of 2.0 means that at Cheryl's Posters a change in sales volume results in an EBIT change that is twice as large in percentage terms.[6]

See the *Focus on Practice* box for a discussion of operating leverage at the semiconductor company Qualcomm.

FOCUS ON PRACTICE *in practice*

Qualcomm's Leverage

Qualcomm Inc., one of the largest semiconductor companies in the United States, designs and sells wireless telecommunications chips. Unlike some other chip manufacturers, such as Intel, Qualcomm is largely a *fabless* company, meaning that it does not own and operate its own fabrication (i.e., manufacturing) plants, but rather outsources the production of the devices it sells to third parties. This strategy makes Qualcomm's fixed costs lower than those of other firms that manufacture their own products.

Even so, some of Qualcomm's costs are fixed. The company invests heavily in research and development, and it incurs those costs well before it knows what the demand for new devices will be. In addition, Qualcomm's labor force, numbering roughly 30,000 employees, is highly skilled. Many of the company's workers have advanced degrees in technical fields such as electrical engineering. Although we often think of labor as a variable cost, most companies do not lay off their most skilled workers due to a temporary decline in sales. Thus, at least some of Qualcomm's payroll is best considered a fixed cost, at least in the short run.

To what extent do Qualcomm's fixed costs give the company operating leverage? As demonstrated in the following table, the company experienced sales increases in every year from 2011 to 2014, but the percentage increase in EBIT was significantly greater than the gain in sales only in 2011. From 2012 to 2014, Qualcomm's degree of operating leverage hovered at or below 1.0, prompting some Wall Street analysts to question why the company was not able to increase its profits faster during a period of rapid sales gains. In 2015 and 2016, Qualcomm fell behind the leading edge of technology, and some of its core chips for cell phones were no longer competitive. As a result, sales fell in 2 consecutive years, and EBIT fell even faster. In 2015 and 2016, Qualcomm's degree of operating leverage roughly doubled what it had been in the previous 4 years. Qualcomm experienced the downside of operating leverage in 2015 and 2016 without benefiting from it in the previous years when sales were on the rise.

▶ *Summarize the pros and cons of operating leverage.*

Item	FY2011	FY2012	FY2013	FY2014	FY2015	FY2016
Sales revenue (millions)	$14,566	$19,121	$24,866	$26,487	$25,281	$23,554
EBIT (millions)	$4,882	$5,705	$7,561	$8,034	$7,212	$6,269
(1) Percent change in sales	32.4%	31.4%	30.0%	6.5%	−4.6%	−6.8%
(2) Percent change in EBIT	48.6%	16.8%	32.5%	6.2%	−10.2%	−13.1%
DOL [(2) ÷ (1)]	1.5	0.5	1.1	1.0	2.2	1.9

6. When total revenue in dollars from sales—instead of unit sales—is available, the following equation, in which TR = total revenue in dollars at a base level of sales and TVC = total variable operating costs in dollars, can be used:

$$\text{DOL at base dollar sales } TR = \frac{TR - TVC}{TR - TVC - FC}$$

This formula is especially useful for finding the DOL for multiproduct firms. It should be clear that because in the case of a single-product firm, $TR = Q \times P$ and $TVC = Q \times VC$, substitution of these values into Equation 12.5 results in the equation given here.

Fixed Costs and Operating Leverage

Changes in fixed operating costs affect operating leverage significantly. Firms sometimes can alter the mix of fixed and variable costs in their operations. For example, a firm could compensate sales representatives with a fixed salary and bonus rather than on a pure percent-of-sales commission basis. Or it could outsource some of its activities, such as manufacturing, paying manufacturing costs only when sales volume justifies doing so. To best illustrate the effects of changes in fixed operating costs on operating leverage, we will continue our example.

EXAMPLE 12.7

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Assume that Cheryl's Posters eliminates sales commissions and increases salaries. This exchange results in a reduction in the variable cost per unit from $5 to $4.50 and an increase in the fixed costs from $2,500 to $3,000. Table 12.5 presents an analysis like that in Table 12.4, but using the new costs. Although the EBIT of $2,500 at the 1,000-unit sales level is the same as before the shift in cost structure, Table 12.5 shows that the firm has increased its operating leverage by increasing fixed costs and lowering variable costs.

With the substitution of the appropriate values into Equation 12.5, the degree of operating leverage at the 1,000-unit base level of sales becomes

$$\text{DOL at 1,000 units} = \frac{1{,}000 \times (\$10 - \$4.50)}{1{,}000 \times (\$10 - \$4.50) - \$3{,}000} = \frac{\$5{,}500}{\$2{,}500} = 2.2$$

Comparing this value to the DOL of 2.0 before the shift to more fixed costs makes it clear that the higher the firm's fixed operating costs relative to variable operating costs, the greater the degree of operating leverage. Under the new cost structure, a 50% change in sales would lead to a 110% (50% × 2.2) change in EBIT.

FINANCIAL LEVERAGE

financial leverage
The use of *fixed financial costs* to magnify the effects of changes in earnings before interest and taxes on the firm's earnings per share.

Financial leverage results from the presence of fixed financial costs that the firm must pay. Using the framework in Table 12.1, we can define **financial leverage**

TABLE 12.5 Operating Leverage and Increased Fixed Costs

	Case 2		Case 1
	−50%		+50%
Sales (in units)	500	1,000	1,500
Sales revenue[a]	$5,000	$10,000	$15,000
Less: Variable operating costs[b]	2,250	4,500	6,750
Less: Fixed operating costs	3,000	3,000	3,000
Earnings before interest and taxes (EBIT)	−$ 250	$ 2,500	$ 5,250
	−110%		+110%

[a]Sales revenue was calculated as indicated in Table 12.4.
[b]Variable operating costs = $4.50/unit × sales in units.

as the use of fixed financial costs to magnify the effects of changes in earnings before interest and taxes on the firm's earnings per share. The two most common fixed financial costs are (1) interest on debt and (2) preferred stock dividends. Firms must pay these expenses regardless of the amount of EBIT available to pay them.[7]

EXAMPLE 12.8

Green Foods, a small organic food company, expects EBIT of $10,000 in the current year. It has a $20,000 bond with a 7% (annual) coupon rate of interest and an issue of 600 shares of $4 (annual dividend per share) preferred stock outstanding. It also has 1,000 shares of common stock outstanding. The annual interest on the bond issue is $1,400 (0.07 × $20,000). The annual dividends on the preferred stock are $2,400 ($4.00/share × 600 shares). Table 12.6 presents the earnings per share (EPS) corresponding to levels of EBIT of $6,000, $10,000, and $14,000, assuming that the firm is in the 21% tax bracket. The table illustrates two situations:

Case 1 A 40% increase in EBIT (from $10,000 to $14,000) results in an 72% increase in earnings per share (from $4.39 to $7.55).

Case 2 A 40% decrease in EBIT (from $10,000 to $6,000) results in an 72% decrease in earnings per share (from $4.39 to $1.23).

TABLE 12.6 The EPS for Various EBIT Levels[a]

	Case 2		Case 1
	−40%		+40%
EBIT	$6,000	$10,000	$14,000
Less: Interest (I)	1,400	1,400	1,400
Net profits before taxes	$4,600	$ 8,600	$12,600
Less: Taxes (T = 0.21)	966	1,806	2,646
Net profits after taxes	$3,634	$ 6,794	$ 9,954
Less: Preferred stock dividends (PD)	2,400	2,400	2,400
Earnings available for common (EAC)	$1,234	$ 4,394	$ 7,554
Earnings per share (EPS)	= $1.23	= $4.39	= $7.55
	−72%		+72%

[a]As noted in Chapter 2, for accounting and tax purposes, interest is a *tax-deductible expense*, whereas dividends must be paid from after-tax cash flows.

The effect of financial leverage is such that an increase in the firm's EBIT results in a more-than-proportional increase in the firm's earnings per share, whereas a decrease in the firm's EBIT results in a more-than-proportional decrease in EPS.

7. Although a firm's board of directors can elect to stop paying preferred stock dividends, the firm typically cannot pay dividends on common stock until the preferred shareholders receive all the dividends they are owed. Although failure to pay preferred dividends cannot force the firm into bankruptcy, it increases the common stockholders' risk because they cannot receive dividends until the claims of preferred stockholders are satisfied.

Measuring the Degree of Financial Leverage (DFL)

degree of financial leverage (DFL)
The numerical measure of the firm's financial leverage.

The **degree of financial leverage (DFL)** is a numerical measure of the firm's financial leverage. Computing it is much like computing the degree of operating leverage. One approach for obtaining the DFL is[8]

$$\text{DFL} = \frac{\text{Percentage change in EPS}}{\text{Percentage change in EBIT}} \tag{12.6}$$

Whenever the percentage change in EPS resulting from a given percentage change in EBIT is greater than the percentage change in EBIT, financial leverage exists. In other words, whenever DFL is greater than 1, there is financial leverage.

EXAMPLE 12.9

Applying Equation 12.6 to cases 1 and 2 in Table 12.6 yields the following two cases:

$$\text{Case 1} \quad \frac{+72\%}{+40\%} = 1.8$$

$$\text{Case 2} \quad \frac{-72\%}{-40\%} = 1.8$$

These calculations show that when Green Foods' EBIT changes, its EPS changes 1.8 times as fast on a percentage basis due to the firm's financial leverage. The higher this value is, the greater the degree of financial leverage.

PERSONAL FINANCE EXAMPLE 12.10

Shanta and Ravi Shandra wish to assess the impact effect of additional long-term borrowing on their degree of financial leverage (DFL). The Shandras currently have $4,200 available after meeting all their monthly living (operating) expenses, before making monthly loan payments. They currently have monthly loan payment obligations of $1,700 and are considering the purchase of a new car, which would result in a $500 per month increase (to $2,200) in their total monthly loan payments. Because a large portion of Ravi's monthly income represents commissions, the Shandras believe that the $4,200 per month currently available for making loan payments could vary by 20% above or below that amount.

To assess the potential impact of the additional borrowing on their financial leverage, the Shandras calculate their DFL for both current ($1,700) and proposed ($2,200) loan payments, as shown on the next page, using the currently available $4,200 as a base and a 20% change.

Based on their calculations, the amount the Shandras will have available after loan payments with their current debt changes by 1.68% for every 1% change in the amount they will have available for making the loan payments. This change is considerably less responsive—and therefore less risky—than the 2.10% change in

8. This approach is valid only when the same base level of EBIT is used to calculate and compare these values. In other words, the base level of EBIT must be held constant to compare the financial leverage associated with different levels of fixed financial costs.

the amount available after loan payments for each 1% change in the amount available for making loan payments with the proposed additional $500 in monthly debt payments. Although it appears that the Shandras can afford the additional loan payments, they must decide if, given the variability of Ravi's income, they are comfortable with the increased financial leverage and risk.

	Current DFL			Proposed DFL		
Available for making loan payments	$4,200	(+20%)	$5,040	$4,200	(+20%)	$5,040
Less: Loan payments	1,700		1,700	2,200		2,200
Available after loan payments	$2,500	(+33.6%)	$3,340	$2,000	(+42%)	$2,840
	DFL = $\frac{+33.6\%}{+20\%} = 1.68$			DFL = $\frac{+42\%}{+20\%} = 2.10$		

A more direct formula for calculating the degree of financial leverage at a base level of EBIT is given by Equation 12.7, where we use the notation from Table 12.6.[9] Note that in the denominator the term $1/(1 - T)$ converts the after-tax preferred stock dividend to a before-tax amount for consistency with the other terms in the equation.

$$\text{DFL at base level EBIT} = \frac{\text{EBIT}}{\text{EBIT} - I - \left(PD \times \frac{1}{1 - T}\right)} \tag{12.7}$$

EXAMPLE 12.11

Entering EBIT = $10,000, I = $1,400, PD = $2,400, and the tax rate (T = 0.21) from Table 12.6 into Equation 12.7 yields

$$\text{DFL at \$10,000 EBIT} = \frac{\$10{,}000}{\$10{,}000 - \$1{,}400 - \left(\$2{,}400 \times \frac{1}{1 - 0.21}\right)}$$

$$= \frac{\$10{,}000}{\$5{,}562} = 1.8$$

Note that the formula given in Equation 12.7 provides a more direct method for calculating the degree of financial leverage than does the approach using Table 12.6 and Equation 12.6.

9. By using the formula for DFL in Equation 12.7, it is possible to get a negative value for the DFL if the EPS for the base level of EBIT is negative. Rather than show absolute value signs in the equation, we instead assume that the base-level EPS is positive.

TOTAL LEVERAGE

total leverage
The use of *fixed costs, both operating and financial,* to magnify the effects of changes in sales on the firm's earnings per share.

We also can assess the combined effect of operating and financial leverage on the firm's risk by using a framework similar to that used in developing the individual concepts of leverage. This combined effect, or **total leverage,** can be defined as the use of *fixed costs, both operating and financial,* to magnify the effects of changes in sales on the firm's earnings per share. Total leverage can therefore be viewed as the total impact of the fixed costs in the firm's operating and financial structure.

EXAMPLE 12.12

Cables Inc., a computer cable manufacturer, expects sales of 20,000 units at $5 per unit in the coming year and must meet the following obligations: variable operating costs of $2 per unit, fixed operating costs of $10,000, interest of $20,000, and preferred stock dividends of $12,000. The firm is in the 21% tax bracket and has 5,000 shares of common stock outstanding. Table 12.7 presents the levels of earnings per share associated with the expected sales of 20,000 units and with sales of 30,000 units.

Table 12.7 illustrates that as a result of a 50% increase in sales (from 20,000 to 30,000 units), the firm would experience a 203% increase in earnings per share (from $2.34 to $7.08). Although not shown in the table, a 50% decrease in sales would, conversely, result in a 203% decrease in earnings per share. In this example, the impact of total leverage is considerable, resulting in a percentage change in earnings per share that is 4.1 times the percentage change in sales, whether sales are increasing or decreasing.

TABLE 12.7 The Total Leverage Effect

		+50%		
Sales (in units)	20,000	30,000		
Sales revenue[a]	$100,000	$150,000	DOL = +60% / +50%	
Less: Variable operating costs[b]	40,000	60,000	= 1.2	
Less: Fixed operating costs	10,000	10,000		
Earnings before interest and taxes (EBIT)	$ 50,000	$ 80,000		DTL = +203% / +50%
		+60%		= 4.1
Less: Interest	20,000	20,000		
Net profits before taxes	$ 30,000	$ 60,000		
Less: Taxes ($T = 0.21$)	6,300	12,600	DFL = +203% / +60%	
Net profits after taxes	$ 23,700	$ 47,400	= 3.4	
Less: Preferred stock dividends	12,000	12,000		
Earnings available for common stockholders	$ 11,700	$ 35,400		
Earnings per share (EPS)	$11,700 / 5,000 = $2.34	$35,400 / 5,000 = $7.08		
		+203%		

[a]Sales revenue = $5/unit × sales in units.
[b]Variable operating costs = $2/unit × sales in units.

Measuring the Degree of Total Leverage (DTL)

degree of total leverage (DTL)
The numerical measure of the firm's total leverage.

The **degree of total leverage** (DTL) is a numerical measure of the firm's total leverage. It can be computed much like operating and financial leverage are computed. One approach for measuring DTL is[10]

$$\text{DTL} = \frac{\text{Percentage change in EPS}}{\text{Percentage change in sales}} \tag{12.8}$$

Whenever the percentage change in EPS resulting from a given percentage change in sales is greater than the percentage change in sales, total leverage exists. In other words, as long as the DTL is greater than 1, there is total leverage.

EXAMPLE 12.13

Applying Equation 12.8 to the data in Table 12.7 yields

$$\text{DTL} = \frac{+203\%}{+50\%} = 4.1$$

Because this result is much greater than 1, Cables Inc. has a great deal of total leverage that is arising from operating leverage, financial leverage, or both. The higher the value is, the greater the degree of total leverage.

A more direct formula for calculating the degree of total leverage at a given base level of sales, Q, is provided by the following equation,[11] which uses the same notation presented earlier:

$$\text{DTL at base sales level } Q = \frac{Q \times (P - VC)}{Q \times (P - VC) - FC - I - \left(PD \times \frac{1}{1 - T}\right)} \tag{12.9}$$

EXAMPLE 12.14

Substituting $Q = 20{,}000$, $P = \$5$, $VC = \$2$, $FC = \$10{,}000$, $I = \$20{,}000$, $PD = \$12{,}000$, and the tax rate ($T = 0.21$) into Equation 12.9 yields

$$\text{DTL at 20,000 units} = \frac{20{,}000 \times (\$5 - \$2)}{20{,}000 \times (\$5 - \$2) - \$10{,}000 - \$20{,}000 - \left(\$12{,}000 \times \frac{1}{1 - 0.21}\right)}$$

$$= \frac{\$60{,}000}{\$14{,}810} = 4.1$$

10. This approach is valid only when the same base level of sales is used to calculate and compare these values. In other words, the base level of sales must be held constant if we are to compare the total leverage associated with different levels of fixed costs.

11. By using the formula for DTL in Equation 12.9, it is possible to get a negative value for the DTL if the EPS for the base level of sales is negative. For our purposes, rather than show absolute value signs in the equation, we instead assume that the base-level EPS is positive.

Clearly, the formula used in Equation 12.9 provides a more direct method for calculating the degree of total leverage than does the approach using Table 12.7 and Equation 12.8.

Relationship of Operating, Financial, and Total Leverage

Total leverage reflects the combined impact of operating and financial leverage on the firm. High operating leverage and high financial leverage will cause total leverage to be high. The opposite will also be true. The relationship between operating leverage and financial leverage is multiplicative rather than additive. The relationship between the degree of total leverage (DTL) and the degrees of operating leverage (DOL) and financial leverage (DFL) is given by

$$\text{DTL} = \text{DOL} \times \text{DFL} \tag{12.10}$$

EXAMPLE 12.15

Substituting the values calculated for DOL and DFL, shown on the right-hand side of Table 12.7, into Equation 12.10 yields

$$\text{DTL} = 1.2 \times 3.4 = 4.1$$

The resulting degree of total leverage is the same value that we calculated directly in the preceding examples.

→ REVIEW QUESTIONS MyLab Finance Solutions

12–1 What does the term leverage mean? How are operating leverage, financial leverage, and total leverage related to the income statement?

12–2 What is the operating breakeven point? How do changes in fixed operating costs, the sale price per unit, and the variable operating cost per unit affect it?

12–3 What is operating leverage? What causes it? How do you measure the degree of operating leverage (DOL)?

12–4 What is financial leverage? What causes it? How do you measure the degree of financial leverage (DFL)?

12–5 What is the general relationship among operating leverage, financial leverage, and the total leverage of the firm? Do these types of leverage complement one another? Why or why not?

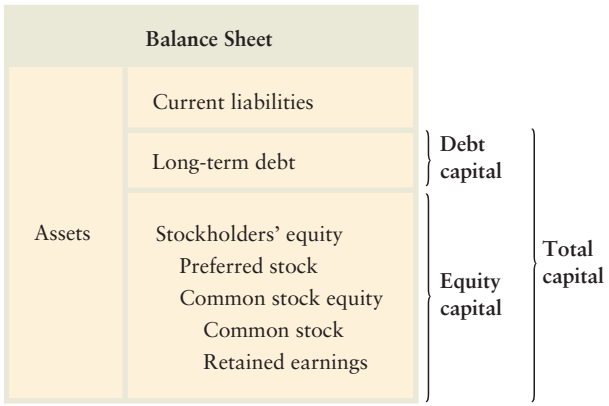
LG3 LG4

12.2 The Firm's Capital Structure

Capital structure is one of the most complex areas of financial decision making because of its interrelationship with other financial decision variables. Poor capital structure decisions can reduce the value of the firm by increasing the cost of capital, thereby lowering the NPVs of investment projects and making more of them unacceptable. Effective capital structure decisions can increase the value of the firm by lowering the cost of capital, resulting in higher NPVs and more acceptable investment opportunities.

TYPES OF CAPITAL

All the items on the right-hand side of the firm's balance sheet, excluding current liabilities, are sources of capital. The following simplified balance sheet illustrates the basic breakdown of total capital into its two components, debt and equity:



The cost of debt is lower than the cost of other forms of financing. Lenders demand relatively lower returns because they take the least risk of any contributors of long-term capital. Lenders have a higher priority of claim against any earnings or assets available for payment, and they can exert far greater legal pressure against the company to make payment than can owners of preferred or common stock. The tax deductibility of interest payments also lowers the debt cost to the firm substantially, though less so since the Tax Cuts and Jobs Act of 2017 lowered the corporate tax rate to a flat 21%.

Unlike debt capital, which the firm must eventually repay, equity capital remains invested in the firm indefinitely. The two main sources of equity are (1) preferred stock and (2) common stock and retained earnings. Common stock is typically the most expensive form of equity, followed by retained earnings and then preferred stock. Our concern here is the relationship between debt and equity. The more debt a firm uses, the greater will be the firm's financial leverage. That leverage makes stockholders' claims more risky, increasing the cost of equity. In addition, as a firm borrows more its cost of debt may rise as lenders question the firm's ability to repay debts. Whether the firm borrows very little or a great deal, it is always true that stockholders' claims are riskier than those of lenders, so the cost of equity always exceeds the cost of debt.

EXTERNAL ASSESSMENT OF CAPITAL STRUCTURE

We saw earlier that *financial leverage* results from the use of fixed-cost financing, such as debt and preferred stock, to magnify return and risk. The amount of leverage in the firm's capital structure can influence its value by affecting return and risk. Those outside the firm can make a rough assessment of capital structure by using measures found in the firm's financial statements. Some of these important debt ratios were presented in Chapter 3. For example, a direct measure of the degree of indebtedness is the *debt ratio* (total liabilities ÷ total assets). The higher this ratio is, the greater the relative amount of debt (or financial leverage) in the firm's capital

TABLE 12.8 Median Debt Ratios for Key Economic Sectors (Fiscal Year 2016)

NAICS Industry	Debt ratio	Times interest earned ratio
Energy	48%	0.3
Materials	27	10.1
Industrials	52	6.8
Consumer discretionary	55	8.5
Consumer staples	55	7.0
Healthcare	38	6.0
Financial	87	NA
Information technology	46	19.2
Telecommunications	55	5.1
Utilities	46	1.5

structure. Measures of the firm's ability to meet contractual payments associated with debt include the *times interest earned ratio* (EBIT ÷ interest) and the *fixed-payment coverage ratio* (see page 140). These ratios provide indirect information on financial leverage. Generally, the smaller these ratios are, the greater the firm's financial leverage is, and the less able it is to meet payments as they come due.

The level of debt (financial leverage) that is acceptable for one industry or line of business can be highly risky in another, because different industries and lines of business have different operating characteristics. Table 12.8 presents the debt and times interest earned ratios for selected industries and lines of business. Significant industry differences are evident in these data. Differences in debt positions also likely exist within an industry or line of business.

PERSONAL FINANCE EXAMPLE 12.16 Those who lend to individuals, like lenders to corporations, typically use ratios to assess the applicant's ability to meet the contractual payments associated with the requested debt. The lender, after obtaining information from a loan application and other sources, calculates ratios and compares them to predetermined allowable values. Typically, if the applicant's ratio values are within an acceptable range, the lender will make the requested loan.

The best example of this process is a real estate mortgage loan application. The mortgage lender usually invokes the following two requirements:

1. Monthly mortgage payments may not exceed 25% to 30% of monthly gross (before-tax) income
2. Total monthly installment payments (including the mortgage payment) may not exceed 33% to 38% of monthly gross (before-tax) income

Assume that the Loo family is applying for a mortgage loan. The family's monthly gross (before-tax) income is $5,380, and they currently have monthly installment loan obligations that total $560. The $275,000 mortgage loan they are applying for will require monthly payments of $1,400. The lender requires (1) the monthly mortgage payment to be less than 28% of monthly gross income and (2) total monthly installment payments (including the mortgage payment) to be less than

37% of monthly gross income. The lender calculates and evaluates these ratios for the Loos, as shown below.

1. Mortgage payment ÷ Gross income = $1,400 ÷ $5,380
   = 26% < 28% maximum, therefore **OK**
2. Total installment payments ÷ Gross income = ($560 + $1,400) ÷ $5,380
   = $1,960 ÷ $5,380
   = 36.4% < 37% maximum, therefore **OK**

The Loos' ratios meet the lender's standards. So, assuming they have adequate funds for the down payment and meet other lender requirements, the Loos will be granted the loan.

CAPITAL STRUCTURE OF NON–U.S. FIRMS

In general, non–U.S. companies have much higher degrees of indebtedness than their U.S. counterparts. This is largely because U.S. capital markets are more developed than those elsewhere and have played a greater role in corporate financing than has been the case in other countries. In most European countries, and especially in Japan and other Pacific Rim nations, large commercial banks are more actively involved in the financing of corporate activity than has been true in the United States. Furthermore, in many of these countries, banks are allowed to make large equity investments in nonfinancial corporations, a practice prohibited for U.S. banks. Finally, share ownership tends to be more tightly controlled among founding-family, institutional, and even public investors in Europe and Asia than is the case for most large U.S. corporations. Tight ownership enables owners to understand the firm's financial condition better, resulting in their willingness to tolerate a higher degree of indebtedness.

MATTER OF FACT

Leverage Around the World

A study of the use of long-term debt in 42 countries found that firms in Argentina used more long-term debt than firms in any other country. Relative to their assets, firms in Argentina used almost 60% more long-term debt than did U.S. companies. Indian firms were heavy users of long-term debt as well. At the other end of the spectrum, companies from Italy, Greece, and Poland used very little long-term debt. In those countries, firms used only about 40% as much long-term debt as did their U.S. counterparts.

Nonetheless, similarities do exist between U.S. corporations and those in other countries. First, the same industry patterns of capital structure tend to be found all around the world. For example, in nearly all countries, pharmaceutical and other high-growth industrial firms usually have lower debt ratios than do steel companies, airlines, and electric utility companies. In part, it has to do with the nature of the assets held by these firms. High-growth firms whose main assets are intangibles (such as patents and rights to intellectual property) tend to borrow less than firms having tangible assets that can be pledged as collateral for

loans. Second, the capital structures of the largest U.S.-based multinational companies, which have access to capital markets around the world, typically resemble the capital structures of multinational companies from other countries more than they resemble those of smaller U.S. companies. In other words, in most countries larger firms tend to borrow more than smaller firms do. Third, companies that are riskier and have more volatile income streams tend to borrow less, as do firms that are highly profitable. Finally, the worldwide trend is away from reliance on banks for financing and toward greater reliance on security issuance. Over time, the differences in the capital structures of U.S. and non–U.S. firms will probably lessen.

CAPITAL STRUCTURE THEORY

Although it is difficult to provide financial managers with a precise methodology for determining a firm's optimal capital structure, research suggests that optimal capital structure lies within a range. In this regard, financial theory does offer help in understanding the factors that influence a firm's optimal capital structure and how capital structure affects the firm's value.

In 1958, Franco Modigliani and Merton H. Miller[12] (commonly known as "M and M") demonstrated mathematically that, in a world with perfect markets,[13] the capital structure that a firm chooses does not affect its value. Many researchers, including M and M, have examined whether capital structure may affect firm value in imperfect, real-world markets. The consensus is that there is an optimal capital structure that balances the benefits and costs of debt financing. The major benefit of debt is the tax savings that arise because firms can deduct interest expense from taxable income. The costs of debt financing are related to (1) the increased probability of bankruptcy associated with heavier borrowing, (2) the *agency costs* of the lender's constraining the firm's actions, and (3) the costs associated with managers having more information about the firm's prospects than do investors.

Tax Benefits

When interest expense is tax-deductible, borrowing reduces firms' taxes, lowering the government's share of earnings and increasing the share going to investors. Interest deductibility essentially subsdizes a firm's cost of debt. Letting r_d equal the before-tax cost of debt and letting T equal the tax rate, the after-tax cost of debt is $r_d \times (1 - T)$.[14]

Bankruptcy Costs and the Probability of Bankruptcy

What happens when a firm is unable to pay its debts and goes bankrupt? In theory, because lenders have a higher priority claim than shareholders, when a firm cannot repay its lenders in full, the shareholders walk away empty handed and lenders receive whatever assets remain. In that situation, lenders might liquidate

12. Franco Modigliani and Merton H. Miller, "The cost of capital, corporation finance, and the theory of investment," *American Economic Review* (June 1958), pp. 261–297.

13. In perfect markets (1) there are no taxes, (2) there are no brokerage or flotation costs for securities, (3) there are no information asymmetries (i.e., investors and managers have the same information about the firm's investment prospects), and (4) investors can borrow at the same rate as corporations.

14. Current tax law prohibits firms from deducting interest that exceeds 30% of EBIT. However, firms can carry forward interest expense that is nondeductible in one year to subsequent years. Furthermore, the 30% limitation does not apply to small firms such as Cooke Company in the examples to follow.

the firm's remaining assets, or they might hire a new management team to run the firm in the hope that this team can make the firm profitable again. In essence, after bankruptcy, ownership of the firm transfers from its former stockholders to its lenders.

In practice, the ownership transition just described can be slow, contentious, and expensive. A firm in or approaching bankruptcy incurs a variety of costs that siphon cash flows away from the firm's investors. These *bankruptcy costs* reduce the value of the firm relative to what it would be in the absence of those costs. Bankruptcy costs may include *direct costs,* such as the fees paid to lawyers to negotiate with lenders, or the costs may be *indirect*, such as missed investment opportunities the firm does not undertake because managers are too distracted by the bankruptcy process to focus on running the business. Because these costs reduce the cash flows that investors receive and thereby lower the value of the firm, managers must exercise care in taking any actions that could increase the probability of bankruptcy with its attendant costs. Bankruptcy risk depends on how much exposure the firm has to business risk and financial risk.

Business Risk We define *business risk* as the risk that is reflected in fluctuations of the firm's cash flows before considering any debt financing. Business risk varies across industries and across firms within an industry, no matter what capital structures those firms choose. A number of factors influence whether business risk is high or low in a particular industry or firm. In general, firms with more operating leverage are exposed to greater business risk than firms with less operating leverage. We have already seen that greater operating leverage leads to more volatility in the cash flows generated by a firm. Although operating leverage is an important factor influencing business risk, two other factors—revenue stability and cost stability—also affect it. *Revenue stability* reflects the variability of the firm's sales revenues. Because revenue is simply the product of the quantity of goods and services sold by a firm times the price charged by the firm, a firm with relatively stable revenues is one that has steady demand for what it produces and that can sell its output for a price that does not fluctuate a great deal. Such a firm has low business risk. Firms with highly volatile product demand and prices have unstable revenues that result in high levels of business risk. *Cost stability* reflects the relative predictability of input prices such as those for labor and materials. The more predictable and stable these input prices are, the lower the business risk.

Business risk varies among firms, regardless of their lines of business, and is not affected by capital structure decisions. The higher a firm's business risk, the more cautious the firm must be in establishing its capital structure. Firms with high business risk therefore tend toward less highly leveraged capital structures, and firms with low business risk tend toward more highly leveraged capital structures. We will hold business risk constant throughout the discussions that follow.

EXAMPLE 12.17

Cooke Company, a soft drink manufacturer, is preparing to make a capital structure decision. It has obtained estimates of sales and the associated levels of earnings before interest and taxes (EBIT) from its forecasting group. There is a 25% chance that sales will total $400,000, a 50% chance that sales will total

TABLE 12.9 Sales and Associated EBIT Calculations for Cooke Company ($000)

Probability of sales	0.25	0.50	0.25
Sales revenue	$400	$600	$800
Less: Fixed operating costs	200	200	200
Less: Variable operating costs (50% of sales)	200	300	400
Earnings before interest and taxes (EBIT)	$ 0	$100	$200

$600,000, and a 25% chance that sales will total $800,000. Fixed operating costs total $200,000, and variable operating costs equal 50% of sales. Table 12.9 summarizes this information and calculates the EBIT for each scenario.

Table 12.9 shows that there is a 25% chance that the EBIT will be $0, a 50% chance that it will be $100,000, and a 25% chance that it will be $200,000. These EBIT data effectively reflect a certain level of business risk that captures the firm's operating leverage, sales revenue variability, and cost predictability. When developing the firm's capital structure, the financial manager must be mindful of the degree of business risk the firm faces.

Financial Risk In addition to the business risk that a firm faces, if the firm uses debt in its capital structure, it also bears financial risk. *Financial risk* refers to fluctuations in the cash flows that a firm generates for its shareholders that result from financing the firm's activities with debt or other fixed-cost forms of financing. The more fixed-cost financing—debt (including financial leases) and preferred stock—a firm has in its capital structure, the greater its financial leverage and risk. Financial risk depends on the capital structure decision made by the management, and that decision should be influenced by the business risk the firm faces.

Total Risk The *total risk* of a firm—business and financial risk combined—determines the likelihood that the firm could go bankrupt when cash flows fall so much that the firm is unable to meet its financial obligations. A continuation of the Cooke Company example demonstrates financial risk, its relationship to business risk, and their combined impact.

EXAMPLE 12.18 Cooke Company's current capital structure is as follows:

Current capital structure	
Long-term debt	$ 0
Common stock equity (25,000 shares at $20)	500,000
Total capital (assets)	$500,000

For simplicity we assume that the firm has no current liabilities, which means that its total capital equals total assets. Suppose Cooke is considering seven alternative capital structures corresponding to different amounts of debt and equity.

TABLE 12.10 Capital Structures Associated with Alternative Debt Ratios for Cooke Company

Debt ratio (1)	Capital structure ($000) Total assets[a] (2)	Debt [(1) × (2)] (3)	Equity [(2) − (3)] (4)	Shares of common stock outstanding (000) [(4) ÷ $20][b] (5)
0%	$500	$ 0	$500	25.00
10	500	50	450	22.50
20	500	100	400	20.00
30	500	150	350	17.50
40	500	200	300	15.00
50	500	250	250	12.50
60	500	300	200	10.00

[a]Because the firm has no current liabilities, its total assets equal its total capital of $500,000.
[b]The $20 value represents the value per share of common stock equity noted earlier.

Currently, the company has a debt ratio of 0%, but it may increase that ratio to any of the following values: 10%, 20%, 30%, 40%, 50%, and 60%. If the company decides to use at least some long-term debt financing, it will use the proceeds from borrowing to retire equity, leaving total capital and total assets at $500,000.[15] In other words, Cooke has no plans to borrow money to finance new investment. Table 12.10 shows the mix of debt and equity associated with the seven possible capital structures as well as the number of shares of common stock outstanding under each alternative.

If Cooke Company decides to borrow money, the interest rate it will pay on its debt depends in part on how much the firm borrows. Lenders generally charge higher rates on loans to more heavily indebted borrowers. Table 12.11 shows the

TABLE 12.11 Level of Debt, Interest Rate, and Dollar Amount of Annual Interest Associated with Cooke Company's Alternative Capital Structures

Capital structure debt ratio	Debt ($000)	Interest rate on *all* debt	Interest ($000)
0%	$ 0	0.0%	$0.00 × 0.0 = $ 0.00
10	50	5.0	$ 50 × 0.05 = $ 2.50
20	100	5.5	$100 × 0.055 = $ 5.50
30	150	6.0	$150 × 0.06 = $ 9.00
40	200	6.5	$200 × 0.065 = $13.00
50	250	7.0	$250 × 0.07 = $17.50
60	300	7.5	$300 × 0.075 = $22.50

15. This assumption is needed so that we can assess alternative capital structures without having to consider the returns associated with the investment of additional funds raised. Attention here is given only to the mix of capital, not to its investment.

interest rate that Cooke will have to pay (on all of its debt) for each proposed capital structure. The table also indicates how much interest expense Cooke will pay at each debt level.

Table 12.12 demonstrates how Cooke can increase its financial risk by using more debt in its capital structure. The table calculates the expected value of Cooke's EPS, the standard deviation of EPS, and the coefficient of variation of

TABLE 12.12 Calculation of EPS for Selected Debt Ratios ($000) for Cooke Company

Probability of EBIT		0.25	0.50	0.25
Debt ratio = 0%				
EBIT (Table 12.9)		$ 0.00	$100.00	$200.00
Less: Interest (Table 12.11)		0.00	0.00	0.00
Net profits before taxes		$ 0.00	$100.00	$200.00
Less: Taxes ($T = 0.40$)		0.00	40.00	80.00
Net profits after taxes		$ 0.00	$ 60.00	$120.00
EPS (25.0 shares, Table 12.10)		$ 0.00	$ 2.40	$ 4.80
Expected EPS[a]	$2.40			
Standard deviation of EPS[a]	$1.70			
Coefficient of variation of EPS[a]	0.71			
Debt ratio = 30%				
EBIT (Table 12.9)		$ 0.00	$100.00	$200.00
Less: Interest (Table 12.11)		9.00	9.00	9.00
Net profits before taxes		−$ 9.00	$ 91.00	$191.00
Less: Taxes ($T = 0.40$)		−3.60[b]	36.40	76.40
Net profits after taxes		−$ 5.40	$ 54.60	$114.60
EPS (17.50 shares, Table 12.10)		−0.31	$ 3.12	$ 6.55
Expected EPS[a]	$3.12			
Standard deviation of EPS[a]	$2.42			
Coefficient of variation of EPS[a]	0.78			
Debt ratio = 60%				
EBIT (Table 12.9)		$ 0.00	$100.00	$200.00
Less: Interest (Table 12.11)		22.50	22.50	22.50
Net profits before taxes		−$22.50	$ 77.50	$177.50
Less: Taxes ($T = 0.40$)		−9.00[b]	31.00	71.00
Net profits after taxes		−$13.50	$ 46.50	$106.50
EPS (10.00 shares, Table 12.10)		−$ 1.35	$ 4.65	$ 10.65
Expected EPS[a]	$4.65			
Standard deviation of EPS[a]	$4.24			
Coefficient of variation of EPS[a]	0.91			

[a]Chapter 8 presented the procedures required to calculate the expected value, standard deviation, and coefficient of variation.

[b]We assume that when the firm earns a net loss, it can deduct that loss against past earnings, and thereby obtain a tax benefit equal to 40% times the current period's net loss.

EPS for each of three debt levels: 0%, 30%, and 60%.[16] For each capital structure, Table 12.12 shows the values of EBIT that Cooke might generate (as well as their associated probabilities from Table 12.9), the interest expense that Cooke must pay (from Table 12.11), and the resulting EPS figures (using the number of outstanding shares from Table 12.10).

Table 12.12 shows that with no debt at all, Cooke's earnings per share has an expected value of $2.40, with a standard deviation of $1.70 and a coefficient of variation of 0.71. Those figures indicate that even if Cooke borrows no money, its EPS is still risky, and that is because of Cooke's business risk. If Cooke decides to borrow money, its risk will increase due to financial risk. With 30% debt, the expected EPS rises to $3.12, but risk increases, too. The standard deviation of EPS is $2.42 at a 30% debt level, and the coefficient of variation rises to 0.78. With 60% debt, expected EPS is at its highest level, $4.65, but its standard deviation is $4.24, which is more than twice the standard deviation of EPS in the no-debt capital structure. Likewise, the coefficient of variation is highest at 60% debt, reaching 0.86.

Table 12.13 summarizes the pertinent data for all seven alternative capital structures.[17] As the firm's financial leverage increases, the expected EPS rises, demonstrating that by borrowing more money, Cooke can deliver higher returns to shareholders. However, as leverage increases, so does risk, as reflected in both the standard deviation of EPS and the coefficient of variation. Cooke's shareholders will not be indifferent to the increase in risk they face as the firm borrows more money. In fact, they will demand a higher return as compensation for bearing that additional risk. Cooke's managers must decide how to weigh the higher EPS that borrowing helps the company deliver against the higher risk that debt imposes on shareholders.

Figure 12.3 illustrates the nature of the risk–return tradeoff associated with the seven capital structures under consideration by plotting the data from

TABLE 12.13 Expected EPS, Standard Deviation, and Coefficient of Variation for Alternative Capital Structures for Cooke Company

Capital structure debt ratio	Expected EPS	Standard deviation of EPS	Coefficient of variation of EPS
0%	$2.40	$1.70	$1.70 ÷ $2.40 = 0.71
10	2.60	1.88	$1.88 ÷ $2.60 = 0.73
20	2.84	2.12	$2.12 ÷ $2.84 = 0.75
30	3.12	2.42	$2.42 ÷ $3.12 = 0.78
40	3.48	2.83	$2.83 ÷ $3.48 = 0.81
50	3.96	3.39	$3.39 ÷ $3.96 = 0.86
60	4.65	4.24	$4.24 ÷ $4.65 = 0.91

16. We use the coefficient of variation here to assess the risk of Cooke's EPS relative to its expected value. As Cooke increases the percentage of debt in its capital structure, earnings become more volatile, so stockholders will demand a higher rate of return. To know exactly how much higher the required return on equity would be as debt increases, we would need an estimate of the beta of Cooke's stock at each debt level. We show the coefficient of variation here only to convey the idea that the risk of the company's earnings, even relative to the expected EPS figure, is increasing as debt is rising.

17. The values for expected EPS, the standard deviation of EPS, and the coefficient of variation for the 0%, 30%, and 60% debt levels come directly from Table 12.12. We do not show the step-by-step calculations to produce those figures for the 10%, 20%, and 50% debt levels, but the process is the same, as shown in Table 12.12.

FIGURE 12.3

Expected EPS and Coefficient of Variation of EPS

Expected EPS and coefficient of variation of EPS for alternative capital structures for Cooke Company

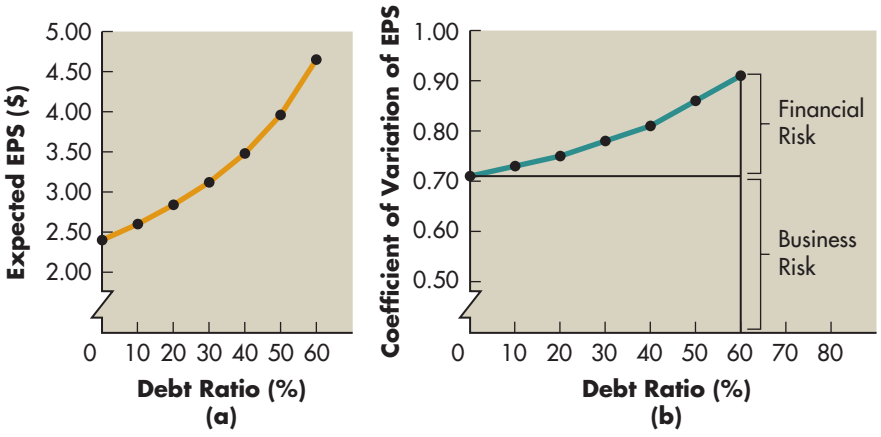


Table 12.13. The figure shows that as debt is substituted for equity (as the debt ratio increases), the level of EPS rises (graph **a**). If we look at risk as measured by the coefficient of variation (graph **b**), we can see that risk increases with increasing leverage. A portion of the risk simply reflects Cooke's business risk, but the portion that changes in response to increasing financial leverage is financial risk.

Clearly, a risk–return tradeoff exists relative to the use of financial leverage. Later in the chapter, we will address how to combine these factors into a valuation framework. The key point here is that as a firm introduces more leverage into its capital structure, it will typically experience increases in both the expected return and the associated risk.

Agency Costs Imposed by Lenders

As noted in Chapter 1, the managers of firms typically act as *agents* of the owners (stockholders). The owners give the managers the authority to manage the firm for the owners' benefit. The *agency problem* created by this relationship extends not only to the relationship between owners and managers but also to that between owners and lenders.

When a lender provides funds to a firm, the interest rate charged is based on the lender's assessment of the firm's risk. The lender–borrower relationship therefore depends on the lender's expectations for the firm's subsequent behavior. The borrowing rates are, in effect, locked in when the loans are negotiated. After obtaining a loan at a certain rate, the firm could increase its risk by investing in risky projects or by incurring additional debt. Such action could weaken the lender's position in terms of its claim on the cash flow of the firm. From another point of view, if these risky investment strategies paid off, the stockholders would benefit. Because payment obligations to the lender remain unchanged, the excess cash flows generated by a positive outcome from the riskier action would enhance the value of the firm to its owners. In other words, if the risky investments pay off, the owners receive all the benefits; if the risky investments do not pay off, the lenders share in the costs if the firm cannot fully repay its debts.

Managers acting on behalf of stockholders therefore have an incentive to take advantage of lenders. To avoid this situation, lenders impose certain constraints on borrowers, who as a result incur *agency costs*. Lenders typically protect themselves by including provisions in the loan agreement limiting the firm's ability to alter its business and financial risk. These loan provisions may require firms to maintain a minimum level of liquidity, or they may restrict how the firm can spend money—for example, by restricting dividend payments.

By including appropriate provisions in the loan agreement, the lender limits management's ability to take actions that increase the firm's risk and thus protects itself against the adverse consequences of this agency problem. Of course, in exchange for incurring agency costs by agreeing to the operating and financial constraints placed on it by the loan provisions, the firm should benefit by obtaining funds at a lower cost.

Asymmetric Information

asymmetric information
The situation in which managers of a firm have more information about operations and future prospects than do investors.

When two or more parties in an economic transaction have different information, we say that there is **asymmetric information.** In the context of capital structure decisions, asymmetric information simply means that managers of the firm have more information about the firm's operations and future prospects than investors have. To understand how asymmetric information between managers and investors could have implications for a firm's capital structure, consider the following illustrations of the *pecking order and signaling theories*.

Pecking Order Theory Suppose that managers of a firm have a highly profitable investment opportunity that requires financing. Managers would like to tell investors about this great investment opportunity, but investors are skeptical. After all, managers always have incentives to claim that their investment decisions will lead to fabulous profits, but investors have no way to verify these claims. If managers try to sell stock to finance the investments, investors are only willing to pay a price reflecting the verifiable information they have, which means that managers must sell stock at a discount (relative to the price they could get if there were no asymmetric information). This situation makes raising new equity very costly, and sometimes managers may decide to pass up positive NPV investments to avoid having to sell equity to investors at a discount.

As one solution to this problem, managers can maintain financial slack, cash reserves from retained earnings that they can use to finance new investments. When firms do not have enough financial slack to finance their profitable investment opportunities, managers will prefer to raise external financing by issuing debt rather than equity. Providers of debt financing receive a fixed return, so when the new investment begins to generate high returns for the firm, those cash flows will largely go to the firm's existing stockholders.

pecking order theory
A hierarchy of financing that begins with retained earnings, which is followed by debt financing and finally external equity financing.

The consequence is a financial **pecking order,** meaning a hierarchy of financing that begins with retained earnings, followed by debt, and finally new stock issues. When managers want to finance a new project, they will first do so using retained earnings. If internally generated cash is insufficient to fund new investments, managers will raise external financing through the debt markets. Issuing new equity is their last resort.

This pecking order theory is consistent with several facts about firms' financing decisions. First, companies fund the vast majority of new investments through retained earnings, raising external financing infrequently. Second, firms do raise debt with greater frequency than equity, as the pecking order theory predicts.

Third, as we have already noted, profitable companies (who have plenty of financial slack) generally tend to borrow less than unprofitable firms.

Signaling Theory An old saying goes, "Put your money where your mouth is." The idea is that anyone can brag, but only those who are willing to put real dollars at stake behind their claims are credible. How does this aphorism relate to capital structure decisions? Suppose, for example, that management has information that the prospects for the firm's future are very good. Managers could issue a press release trying to convince investors that the firm's future is bright, but investors will want tangible evidence for the claims. Furthermore, providing that evidence has to be costly to the firm; otherwise, other firms with less rosy prospects will just mimic the actions of the firm with truly excellent prospects. One thing that managers might do is to borrow a lot of money by issuing debt. In so doing, they are demonstrating to the market their faith that the firm will generate sufficient cash flows in the future to retire the outstanding debt. Firms whose prospects are not as good will hesitate to issue a lot of debt because they may have difficulty repaying the debt and may even go bankrupt. In other words, issuing debt is a credible **signal** that managers believe the firm's performance will be very good in the future. Debt financing is a *positive signal* suggesting management's belief that the stock is "undervalued" and therefore a bargain.

signal
A financing action by management that is believed to reflect its view of the firm's stock value; generally, debt financing is viewed as a *positive signal* that management believes the stock is "undervalued," and a stock issue is viewed as a *negative signal* that management believes the stock is "overvalued."

By the same token, when firms decide to issue stock, investors worry that this move could be a *negative signal*, indicating the managers' belief that the firm's future profitability may be rather poor and that the stock price is currently overvalued. Therefore, investors often interpret the announcement of a stock issue as bad news, and the stock price declines.

Most research casts doubt on the importance of signaling as a primary determinant of firms' capital structure choices. For instance, we have already seen that the most profitable firms tend to borrow less, whereas the signaling theory says that profitable firms should borrow more as a way to convince investors of just how high the firm's future profits will be. Furthermore, in surveys that ask managers to describe how they choose between debt and equity financing, managers rarely say they choose debt as a way to convey information to investors. Still, the signaling theory predicts that a firm's stock price should rise when it issues debt and fall when it issues equity, and this is exactly what happens in the real world much of the time.

OPTIMAL CAPITAL STRUCTURE

What, then, is the optimal capital structure? To provide insight into an answer, we will examine some basic financial relationships. Because the value of a firm equals the present value of its future cash flows, it follows that *managers can maximize the value of the firm by minimizing the cost of capital, holding cash flows constant*. In other words, the present value of future cash flows is at its highest when the discount rate (the cost of capital) is at its lowest. By using a modification of the simple zero-growth valuation model (see Equation 7.2 in Chapter 7), we can define the value of the firm, V, as

$$V = \frac{\text{EBIT} \times (1 - T)}{r_{wacc}} = \frac{\text{NOPAT}}{r_{wacc}} \tag{12.11}$$

where

EBIT = earnings before interest and taxes
T = tax rate
NOPAT = net operating profits after taxes, which are the after-tax operating earnings available to the debt and equity holders, EBIT $\times$ $(1-T)$
r_{wacc} = weighted average cost of capital

If we hold NOPAT (and therefore EBIT) constant, the value of the firm, V, reaches a maximum when the weighted average cost of capital, r_{wacc}, is at a minimum.

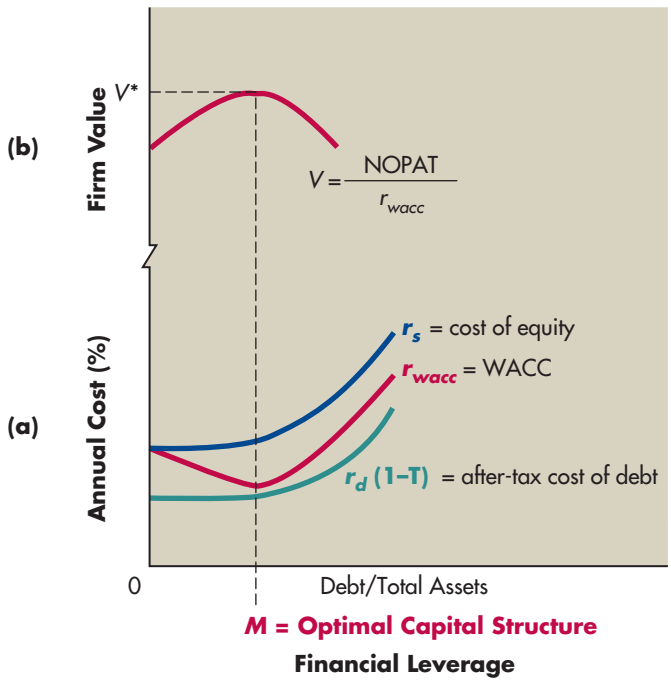
Cost Functions

Figure 12.4(*a*) plots three cost functions—the after-tax cost of debt, the cost of equity, and the weighted average cost of capital (WACC)—as a function of financial leverage measured by the debt ratio (debt to total assets). The after-tax *cost of debt*, $r_d(1 - T)$ is relatively low at low debt levels, but it slowly increases as leverage increases to compensate lenders for rising risk. The *cost of equity*, r_s, is greater than the cost of debt. It increases as financial leverage increases, but it generally rises more rapidly than the cost of debt. The cost of equity rises because the stockholders require a higher return as leverage increases to compensate for the higher degree of financial risk.

The *weighted average cost of capital*, r_{wacc}, results from a weighted average of the firm's debt and equity capital costs. At a debt ratio of zero, the firm is 100% equity financed. As managers substitute debt for equity and the debt ratio

FIGURE 12.4

Cost Functions and Value
Capital costs and the optimal capital structure



increases, the WACC declines because the savings from using low-cost, tax-deductible debt offset the increased cost of equity that occurs as leverage increases. In this range, the tax benefits of additional debt outweigh the costs of borrowing more. However, as the debt ratio continues to increase, the increased debt and equity costs eventually cause the WACC to rise, which occurs after point *M* in Figure 12.4(*a*). In other words, the bankruptcy costs, agency costs, and other costs associated with higher debt levels eventually outweigh the additional tax benefits the firm could generate by borrowing even more. This behavior results in a U-shaped weighted average cost-of-capital function.

Graphical View of Optimal Structure

optimal capital structure
The capital structure at which the weighted average cost of capital is minimized, thereby maximizing the firm's value.

The **optimal capital structure** is the mixture of debt and equity that minimizes the WACC and maximizes the value of the firm. In Figure 12.4(*a*), point *M* represents the *minimum weighted average cost of capital,* the point of optimal financial leverage and hence of optimal capital structure for the firm. Figure 12.4(*b*) is a graph of the value of the firm that results from substitution of r_{wacc} in Figure 12.4(*a*) for various levels of financial leverage into the zero-growth valuation model in Equation 12.11. As shown in Figure 12.4(*b*), at the optimal capital structure, point *M*, the value of the firm reaches a maximum at V^*.

As a practical matter, finding the precise mix of debt and equity that maximizes the firm's value is very difficult. The costs and benefits of debt are not always easy to quantify. For example, when managers decide to rely more heavily on debt, they know the probability that the firm could go bankrupt (and incur bankruptcy costs) increases, but exactly how much it increases is uncertain. Likewise, managers have no way to obtain precise estimates of the bankruptcy costs that the firm will incur if bankruptcy occurs. Accordingly, firms generally try to operate in a range that places them near what they believe to be the optimal capital structure. In other words, firms usually manage toward a *target capital structure*.

→ REVIEW QUESTIONS MyLab Finance Solutions

12–6 What is a firm's capital structure? What ratios assess the degree of financial leverage in a firm's capital structure?

12–7 In what ways are the capital structures of U.S. firms and non–U.S. firms different? How are they similar?

12–8 What is the major benefit of debt financing? How does it affect the firm's cost of debt?

12–9 What are business risk and financial risk? How does each influence the firm's capital structure decisions?

12–10 Briefly describe the agency problem that exists between owners and lenders. How do lenders cause firms to incur agency costs to resolve this problem?

12–11 How does asymmetric information affect the firm's capital structure decisions? How do the firm's financing actions give investors signals that reflect management's view of stock value?

12–12 How do the cost of debt, the cost of equity, and the weighted average cost of capital (WACC) behave as the firm's financial leverage increases from zero? Where is the optimal capital structure? What is its relationship to the firm's value at that point?

LG5

12.3 EBIT–EPS Approach to Capital Structure

EBIT–EPS approach
An approach for selecting the capital structure that maximizes earnings per share (EPS) over the expected range of earnings before interest and taxes (EBIT).

It should be clear from earlier chapters that the goal of the financial manager is to maximize the value of the firm. One of the widely followed variables affecting the firm's value is its earnings, which represent the returns earned on behalf of owners. Even though focusing exclusively on earnings ignores risk (the other key variable affecting the firm's stock price), we can gain some useful insights into the merits of alternative capital structures by studying how changing debt levels impact earnings. The **EBIT–EPS approach** to capital structure involves selecting the capital structure that maximizes EPS over the expected range of earnings before interest and taxes (EBIT).

PRESENTING A FINANCING PLAN GRAPHICALLY

To analyze the effects of a firm's capital structure on the owners' returns, we consider the relationship between earnings before interest and taxes (EBIT) and earnings per share (EPS). In other words, we want to see how changes in EBIT lead to changes in EPS under different capital structures. In all our examples, we will assume that business risk remains constant. That is, the firm's basic operational risks remain constant, and only financial risk varies as capital structures change. EPS is a measure of the owners' returns that is closely related to the firm's share price.[18]

Data Required

To draw a graph illustrating how changes in EBIT lead to changes in EPS, we simply need to find two coordinates and plot a straight line between them. On our graph, we will plot EBIT on the horizontal axis and EPS on the vertical axis. The following example illustrates the approach for constructing the graph.

EXAMPLE 12.19

We can plot coordinates on the EBIT–EPS graph by assuming specific EBIT values and calculating the EPS associated with them.[19] Such calculations for three capital structures—debt ratios of 0%, 30%, and 60%—for Cooke Company appear in Table 12.12. For EBIT values of $100,000 and $200,000, the associated EPS values calculated there are summarized in the table below the graph in Figure 12.5.

18. The relationship between EPS and owner wealth is not necessarily one of cause and effect. As indicated in Chapter 1, maximizing profits is not the same as maximizing owners' wealth. Nevertheless, changes in earnings per share often have an impact on owners' wealth because earnings are usually positively correlated with cash flows, and they provide investors with useful information about how a firm is likely to perform going forward.

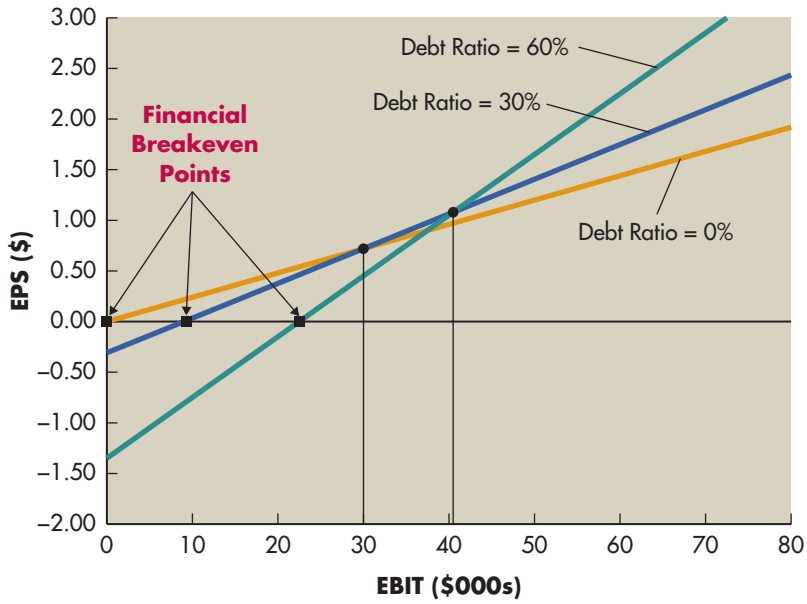
19. A convenient method for finding one EBIT–EPS coordinate is to calculate the financial breakeven point, the level of EBIT for which the firm's EPS just equals $0. It is the level of EBIT needed just to cover all fixed financial costs: annual interest (I) and preferred stock dividends (PD). The equation for the financial breakeven point is

$$\text{Financial breakeven point} = I + \frac{PD}{1 - T}$$

where T is the tax rate. It can be seen that when $PD = \$0$, the financial breakeven point is equal to I, the annual interest payment.

FIGURE 12.5

EBIT–EPS Approach
A comparison of selected capital structures for Cooke Company (data from Table 12.12)



Capital structure debt ratio	EBIT $100,000 Earnings per share (EPS)	EBIT $200,000 Earnings per share (EPS)
0%	$2.40	$ 4.80
30	3.12	6.55
60	4.65	10.65

financial breakeven point
The level of EBIT necessary to just cover all *fixed financial costs;* the level of EBIT for which EPS = $0.

Plotting the Data

Figure 12.5 shows the relationship between EBIT and EPS for three possible capital structures for the Cooke Company. Each line in the figure represents a different capital structure, and where the lines cross the horizontal axis defines a financial breakeven point. The **financial breakeven point** is the point at which EPS equals $0, which means that the firm generates just enough EBIT to cover its fixed financial costs, which in this case include only interest expense. You can see that for the capital structure with 0% debt, EPS does not fall below $0 unless EBIT does. In contrast, for the 30% and 60% capital structures, EPS will be negative unless the firm earns sufficient EBIT to cover its interest expense.

COMPARING ALTERNATIVE CAPITAL STRUCTURES

In addition to identifying the financial breakeven point for each capital structure, Figure 12.5 identifies the ranges of EBIT over which each possible capital structure produces the highest EPS.

EXAMPLE 12.20

Cooke Company's capital structure alternatives appear on the EBIT–EPS axes in Figure 12.5. This figure shows that each capital structure is superior to the others in terms of maximizing EPS over certain ranges of EBIT. Having no debt at all (debt ratio = 0%) is best for levels of EBIT between $0 and $30,000. That conclusion makes sense because when business conditions are relatively weak, Cooke would have difficulty meeting its financial obligations if it had any debt. Between $30,000 and $40,500 of EBIT, the capital structure associated with a debt ratio of 30% produces higher EPS than either of the other two capital structures. And when EBIT exceeds $40,500, the 60% debt ratio capital structure provides the highest earnings per share.[20] Again, the intuition behind this result is fairly straightforward. When business is booming, the earnings going to shareholders are greater if the firm uses a great deal of debt. The firm pays lenders a relatively low rate of return, and the shareholders keep the rest.

CONSIDERING RISK IN EBIT–EPS ANALYSIS

When interpreting EBIT–EPS analysis, it is important to consider the risk of each capital structure alternative. Figure 12.5 illustrates two aspects that relate to the risk of a particular capital structure: (1) the *financial breakeven point* (EBIT–axis intercept) and (2) the *degree of financial leverage* reflected in the slope of the capital structure line. *The higher the financial breakeven point and the steeper the slope of the capital structure line, the greater the financial risk.*[21]

Further assessment of risk can be performed by using ratios. As financial leverage (measured by the debt ratio) increases, we expect a corresponding decline in the firm's ability to make scheduled interest payments (measured by the times interest earned ratio).

EXAMPLE 12.21

Reviewing the three capital structures plotted for Cooke Company in Figure 12.5, we can see that as the debt ratio increases, so does the financial risk of each alternative. Both the financial breakeven point and the slope of the capital structure lines increase with increasing debt ratios. If we use the $100,000 EBIT value, for

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20. An algebraic technique helps to identify the indifference points between the capital structure alternatives. This technique involves expressing each capital structure as an equation stated in terms of earnings per share, setting the equations for two capital structures equal to each other, and solving for the level of EBIT that causes the equations to be equal. When we use the notation from footnote 18 and let n equal the number of shares of common stock outstanding, the general equation for the earnings per share from a financing plan is

$$\text{EPS} = \frac{(1 - T) \times (\text{EBIT} - I) - PD}{n}$$

Comparing Cooke Company's 0% and 30% capital structures, we get

$$\frac{(1 - 0.40) \times (\text{EBIT} - \$0) - \$0}{25.00} = \frac{(1 - 0.40) \times (\text{EBIT} - \$9.00) - \$0}{17.50}$$

$$\frac{0.60 \times \text{EBIT}}{25.00} = \frac{0.60 \times \text{EBIT} - \$5.40}{17.50}$$

$$10.50 \times \text{EBIT} = 15.00 \times \text{EBIT} - \$135.00$$

$$\$135.00 = 4.50 \times \text{EBIT}$$

$$\text{EBIT} = \$30$$

The calculated value of the indifference point between the 0% and 30% capital structures is therefore $30,000, as can be seen in Figure 12.5.

21. The degree of financial leverage (DFL) is reflected in the slope of the EBIT–EPS function. The steeper the slope, the greater the degree of financial leverage, because the change in EPS (y-axis) that results from a given change in EBIT (x-axis) increases with increasing slope and decreases with decreasing slope.

example, the times interest earned ratio (EBIT ÷ interest) for the zero-leverage capital structure is infinity ($100,000 ÷ $0); for the 30% debt case, it is 11.1 ($100,000 ÷ $9,000); and for the 60% debt case, it is 4.4 ($100,000 ÷ $22,500). Because lower times interest earned ratios reflect higher risk, these ratios support the conclusion that the risk of the capital structures increases with increasing financial leverage. The capital structure for a debt ratio of 60% is riskier than that for a debt ratio of 30%, which in turn is riskier than the capital structure for a debt ratio of 0%.

BASIC SHORTCOMING OF EBIT–EPS ANALYSIS

The most important point to recognize when using EBIT–EPS analysis is that this technique tends to concentrate on maximizing earnings rather than maximizing owner wealth as reflected in the firm's stock price. The EPS-maximizing approach generally ignores risk. If investors did not require risk premiums (additional returns) as the firm increased the proportion of debt in its capital structure, a strategy involving maximizing EPS would also maximize stock price. But because risk premiums rise with increases in financial leverage, maximizing EPS does not necessarily maximize the value of the firm. To select the best capital structure, firms must integrate both return (EPS) and risk (via the required return, r_s) into a valuation framework consistent with the capital structure theory presented earlier.

→ REVIEW QUESTION MyLab Finance Solutions

12–13 Explain the EBIT–EPS approach to capital structure. Include in your explanation a graph indicating the financial breakeven point; label the axes. Is this approach consistent with maximization of the owners' wealth?

LG 6

12.4 Choosing the Optimal Capital Structure

This section describes the procedures for linking to market value the return and risk associated with alternative capital structures.

LINKAGE

To determine the firm's value under alternative capital structures, the firm must find the level of return that it must earn to compensate owners for the risk being incurred. This approach is consistent with the overall valuation framework developed in Chapters 6 and 7 and applied to capital budgeting decisions in Chapters 10 and 11.

Financial analysts can estimate the required return associated with a given level of financial risk in a number of ways. Theoretically, the preferred approach would be first to estimate the beta associated with each alternative capital structure and then to use the CAPM framework presented in Equation 8.8 to calculate the required return, r_s. A more operational approach involves linking the financial risk associated with each capital structure alternative directly to the required return. Such an approach is similar to the CAPM-type approach demonstrated in Chapter 12 for linking project risk and required return (RADR). Here it involves estimating the required return associated with each level of financial risk as measured by a statistic such as the coefficient of variation of EPS. Regardless of the approach used, one would expect the required return to increase as the financial risk increases.

EXAMPLE 12.22

Cooke Company, using as risk measures the coefficients of variation of EPS associated with each of the seven alternative capital structures, estimated the associated required returns, which are shown in Table 12.14. As expected, the estimated required return of owners, r_s, increases with increasing risk, as measured by the coefficient of variation of EPS.

TABLE 12.14 Required Returns for Cooke Company's Alternative Capital Structures

Capital structure debt ratio	Coefficient of variation of EPS (from Table 12.13)	Estimated required return, r_s
0%	0.71	8.50%
10	0.73	8.75
20	0.75	9.00
30	0.78	9.50
40	0.81	11.00
50	0.86	13.00
60	0.91	15.50

ESTIMATING VALUE

The value of the firm's stock associated with alternative capital structures can be estimated using one of the standard valuation models. If, for simplicity, we assume that all earnings are paid out as dividends, we can use a standard zero-growth valuation model such as that developed in Chapter 7. The model, originally stated in Equation 7.2, is restated here with EPS substituted for dividends (because in each year the dividends would equal EPS):

$$P_0 = \frac{\text{EPS}}{r_s} \tag{12.12}$$

By substituting the expected level of EPS and the associated required return, r_s, into Equation 12.12, we can estimate the per-share value of the firm, P_0.

EXAMPLE 12.23

We can now estimate the value of Cooke Company's stock under each of the alternative capital structures. Substituting the expected EPS (from Table 12.13) and the required returns, r_s (from Table 12.14), into Equation 12.12 for each capital structure, we obtain the share values given in the last column of Table 12.15. Plotting the resulting share values against the associated debt ratios, as shown in Figure 12.6, clearly illustrates that the maximum share value occurs at the capital structure associated with a debt ratio of 30%.

MAXIMIZING VALUE VERSUS MAXIMIZING EPS

Throughout this text, we have specified the goal of the financial manager as maximizing owner wealth, not profit. Although some relationship exists between expected profit and value, there is no reason to believe that profit-maximizing

TABLE 12.15 Calculation of Share Value Estimates Associated with Alternative Capital Structures for Cooke Company

Capital structure debt ratio	Expected EPS (from Table 12.13)	Estimated required return, r_s (from Table 12.14)	Estimated share value
0%	$2.40	8.50%	$2.40 ÷ 0.085 = $28.24
10	2.60	8.75	$2.60 ÷ 0.0875 = $29.71
20	2.84	9.00	$2.84 ÷ 0.09 = $31.56
30	3.12	9.50	$3.12 ÷ 0.095 = $32.84
40	3.48	11.00	$3.48 ÷ 0.11 = $31.64
50	3.96	13.00	$3.96 ÷ 0.13 = $30.46
60	4.65	15.50	$4.65 ÷ 0.155 = $30.00

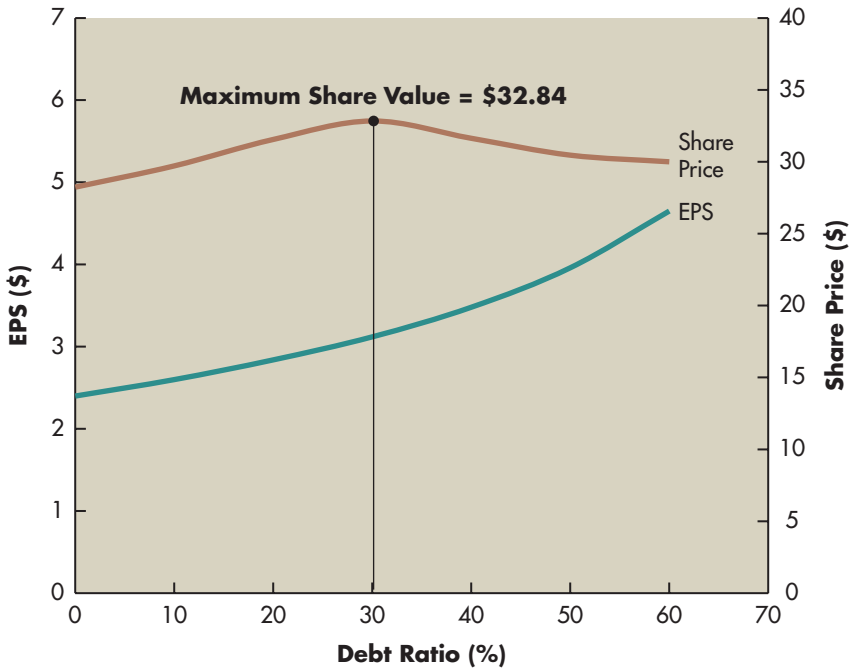
strategies necessarily result in wealth maximization. It is therefore the wealth of the owners as reflected in the estimated share value that should serve as the criterion for selecting the best capital structure. A final look at Cooke Company will highlight this point.

EXAMPLE 12.24

Further analysis of Figure 12.6 clearly shows that although the firm's profits (EPS) are maximized at a debt ratio of 60%, share value is maximized at a 30% debt ratio. Therefore, the preferred capital structure would be the 30% debt

FIGURE 12.6

Estimating Value
Estimated share value and EPS for alternative capital structures for Cooke Company



ratio. The two approaches provide different conclusions because EPS maximization does not account for risk.

SOME OTHER IMPORTANT CONSIDERATIONS

Because finding the optimal capital structure involves a great deal of uncertainty, managers must temper any quantitative analysis of capital structure with other important considerations. Table 12.16 summarizes some of the more important additional factors involved in capital structure decisions.

TABLE 12.16 Important Factors to Consider in Making Capital Structure Decisions

Concern	Factor	Description
Business risk	Revenue stability	Firms that have stable and predictable revenues can more safely undertake highly leveraged capital structures than can firms with volatile patterns of sales revenue. Firms with growing sales tend to benefit from added debt; they can reap the positive benefits of financial leverage, which magnifies the effect of these increases.
	Cash flow	When considering a new capital structure, the firm must focus on its ability to generate the cash flows necessary to meet obligations. Cash forecasts reflecting an ability to service debts (and preferred stock) must support any shift in capital structure.
Agency costs	Contractual obligations	A firm may be contractually constrained with respect to the type of funds that it can raise. For example, a firm might be prohibited from selling additional debt except when the claims of holders of such debt are made subordinate to the existing debt. Contractual constraints on the sale of additional stock, as well as on the ability to distribute dividends on stock, might also exist.
	Management preferences	Occasionally, a firm will impose an internal constraint on the use of debt to limit its risk exposure to a level deemed acceptable to management. In other words, because of risk aversion, the firm's management constrains the firm's capital structure at a level that may or may not be the true optimum.
	Control	A management group concerned about control may prefer to issue debt rather than (voting) common stock. Under favorable market conditions, a firm that wanted to sell equity could make a *preemptive offering* or issue *nonvoting shares*, allowing each shareholder to maintain proportionate ownership. Generally, only in closely held firms or firms threatened by takeover does control become a major concern in the capital structure decision.
Asymmetric information	External risk assessment	The firm's ability to raise funds quickly and at favorable rates depends on the external risk assessments of lenders and bond raters. The firm must consider the impact of capital structure decisions both on share value and on published financial statements from which lenders and raters assess the firm's risk.
	Timing	At times when interest rates are low, debt financing might be more attractive; when interest rates are high, the sale of stock may be more appealing. Sometimes both debt and equity capital become unavailable at reasonable terms. General economic conditions—especially those of the capital market—can thus significantly affect capital structure decisions.

→ REVIEW QUESTIONS MyLab Finance Solutions

12–14 Why do maximizing EPS and maximizing value not necessarily lead to the same conclusion about the optimal capital structure?

12–15 What important factors in addition to quantitative factors should a firm consider when it is making a capital structure decision?

SUMMARY

FOCUS ON VALUE

The amount of leverage (fixed-cost assets or funds) used by a firm directly affects its risk, return, and share value. Generally, higher leverage raises risk and return, and lower leverage reduces risk and return. Operating leverage concerns the level of fixed operating costs; financial leverage focuses on fixed financial costs, particularly interest on debt, lease payments, and any preferred stock dividends. The firm's capital structure determines its financial leverage. Because of its fixed interest payments, the more debt a firm uses relative to its equity, the greater its financial leverage.

The value of the firm is clearly affected by its degree of operating leverage and by the composition of its capital structure. The financial manager must therefore carefully consider the types of operating and financial costs the firm will incur, recognizing that higher risk comes with greater fixed costs. Major decisions with regard to both operating cost structure and capital structure must therefore focus on their impact on the firm's value. The firm should implement only those leverage and capital structure decisions that are consistent with its goal of **maximizing its stock price.**

REVIEW OF LEARNING GOALS

LG1 **Discuss leverage, capital structure, breakeven analysis, the operating breakeven point, and the effect of changing costs on the breakeven point.** Leverage results from the use of fixed costs to magnify returns to a firm's owners. Capital structure, the firm's mix of long-term debt and equity, affects leverage and therefore the firm's value. Breakeven analysis measures the level of sales necessary to cover total operating costs. The operating breakeven point may be calculated algebraically by dividing fixed operating costs by the difference between the sale price per unit and variable operating cost per unit, or it may be determined graphically. The operating breakeven point increases with increased fixed and variable operating costs and decreases with an increase in sale price, and vice versa.

LG2 **Understand operating, financial, and total leverage and the relationships among them.** Operating leverage is the use of fixed operating costs by the firm to magnify the effects of changes in sales on EBIT. The higher the fixed operating costs, the greater the operating leverage. Financial leverage is the use of fixed financial costs by the firm to magnify the effects of changes in EBIT on EPS. The higher the fixed financial costs, the greater the financial leverage. The total

leverage of the firm is the use of fixed costs—both operating and financial—to magnify the effects of changes in sales on EPS.

LG3 **Describe the types of capital, external assessment of capital structure, the capital structure of non–U.S. firms, and capital structure theory.** Debt capital and equity capital make up a firm's capital structure. Capital structure can be externally assessed by using financial ratios: debt ratio, times interest earned ratio, and fixed-payment coverage ratio. Non–U.S. companies tend to have much higher degrees of indebtedness than do their U.S. counterparts, primarily because U.S. capital markets are more developed.

Research suggests there is an optimal capital structure that balances the firm's benefits and costs of debt financing. The major benefit of debt financing is the tax shield. The costs of debt financing include the probability of bankruptcy, agency costs imposed by lenders, and asymmetric information, which typically causes firms to raise funds in a pecking order so as to send positive signals to the market and thereby enhance shareholder wealth.

LG4 **Explain the optimal capital structure using a graphical view of the firm's cost-of-capital functions and a zero-growth valuation model.** The zero-growth valuation model defines the firm's value as its net operating profits after taxes (NOPAT), or after-tax EBIT, divided by its weighted average cost of capital. Assuming that NOPAT is constant, the value of the firm is maximized by minimizing its weighted average cost of capital (WACC). The optimal capital structure minimizes the WACC. Graphically, the firm's WACC exhibits a U-shaped curve whose minimum value defines the optimal capital structure that maximizes owner wealth.

LG5 **Discuss the EBIT–EPS approach to capital structure.** The EBIT–EPS approach evaluates capital structures in light of the returns they provide the firm's owners and their degree of financial risk. Under the EBIT–EPS approach, the preferred capital structure is the one expected to provide maximum EPS over the firm's expected range of EBIT. Graphically, this approach reflects risk in terms of the financial breakeven point and the slope of the capital structure line. The major shortcoming of EBIT–EPS analysis is that it concentrates on maximizing earnings (returns) rather than owners' wealth, which considers risk as well as return.

LG6 **Review the return and risk of alternative capital structures, their linkage to market value, and other important considerations related to capital structure.** The best capital structure can be selected by using a valuation model to link return and risk factors. The preferred capital structure is the one that results in the highest estimated share value, not the highest EPS. Other important nonquantitative factors must also be considered when making capital structure decisions.

SELF-TEST PROBLEMS (Solutions in Appendix)

LG1 LG2 **ST12–1 Breakeven point and all forms of leverage** TOR most recently sold 100,000 units at $7.50 each; its variable operating costs are $3.00 per unit, and its fixed operating costs are $250,000. Annual interest charges total $80,000, and the firm has

8,000 shares of $5 (annual dividend) preferred stock outstanding. It currently has 20,000 shares of common stock outstanding. Assume that the firm is subject to a 40% tax rate.

a. At what level of sales (in units) would the firm break even on operations (i.e., EBIT = $0)?

b. Calculate the firm's earnings per share (EPS) in tabular form at (1) the current level of sales and (2) a 120,000-unit sales level.

c. Using the current $750,000 level of sales as a base, calculate the firm's degree of operating leverage (DOL).

d. Using the EBIT associated with the $750,000 level of sales as a base, calculate the firm's degree of financial leverage (DFL).

e. Use the degree of total leverage (DTL) concept to determine the effect (in percentage terms) of a 50% increase in TOR's sales from the $750,000 base level on its earnings per share.

LG 5

ST12–2 **EBIT–EPS analysis** Newlin Electronics is considering additional financing of $10,000. It currently has $50,000 of 12% (annual interest) bonds and 10,000 shares of common stock outstanding. The firm can obtain the financing through a 12% (annual interest) bond issue or through the sale of 1,000 shares of common stock. The firm has a 21% tax rate.

a. Calculate two EBIT–EPS coordinates for each plan by selecting any two EBIT values and finding their associated EPS values.

b. Plot the two financing plans on a set of EBIT–EPS axes.

c. On the basis of your graph in part **b**, at what level of EBIT does the bond plan become superior to the stock plan?

LG 3 LG 6

ST12–3 **Optimal capital structure** Hawaiian Macadamia Nut Company has collected the data in the following table with respect to its capital structure, expected earnings per share, and required return.

Capital structure debt ratio	Expected earnings per share	Required return, r_s
0%	$3.12	13%
10	3.90	15
20	4.80	16
30	5.44	17
40	5.51	19
50	5.00	20
60	4.40	22

a. Compute the estimated share value associated with each of the capital structures, using the simplified method described in this chapter (see Equation 12.12).

b. Determine the optimal capital structure on the basis of (1) maximization of expected earnings per share and (2) maximization of share value.

c. Which capital structure do you recommend? Why?

WARM-UP EXERCISES

Select problems are available in MyLab Finance.

LG 1 **E12–1** Shelby's Photographs has fixed operating costs of $16,500 and variable operating costs of $8 per photograph pack. The photograph packs sell for $20 each. How many photograph packs must be sold for the firm to break even in terms of EBIT?

LG 1 **E12–2** Rio Mare currently has fixed operating costs of €1,100,000, and it sells canned tuna for €1.50 per can, while incurring variable operating costs of €0.65 per can. If the company can invest in better storing technology that would simultaneously raise its fixed costs to €1,200,000, but lower its variable costs to €0.50 per can, what will the impact be on its operating breakeven point in cans of tuna?

LG 2 **E12–3** Chico's has sales of 15,000 units at a price of $20 per unit. The firm incurs fixed operating costs of $30,000 and variable operating costs of $12 per unit. What is Chico's degree of operating leverage (DOL) at a base level of sales of 15,000 units?

LG 2 **E12–4** Parker Investments has EBIT of $20,000, interest expense of $3,000, and preferred dividends of $4,000. If it pays taxes at a rate of 38%, what is Parker's degree of financial leverage (DFL) at a base level of EBIT of $20,000?

LG 4 **E12–5** Shaga shpk is an Albanian company that produces and sells furniture. Last year it had sales of 2,000 units at a price of L12,000 per unit (Albania's currency is Albanian lek, L). It faced fixed operating costs of L12,500,000 and variable costs of L4,000 per unit. The company is subject to a tax rate of 15% and has a weighted average cost of capital of 10%. Calculate Shaga's net operating profit after taxes (NOPAT), and use them to estimate the value of the firm.

PROBLEMS

Select problems are available in MyLab Finance. The MyLab icon indicates problems in Excel format available in MyLab Finance.

LG 1 **P12–1** **Breakeven point: Algebraic** The Golf Shop needs to forecast the number of a specific golf set it needs to sell to break even. The golf set sells for $1,250 per set. The fixed operating costs are $21,000 while the variable operating costs are $750 per set. How many sets must The Golf Shop sell to breakeven on this specific golf set?

LG 1 MyLab **P12–2** **Breakeven comparisons: Algebraic** Jaipur Rugs, FabIndia, and Ashok Carpets are three carpet and rug manufacturing companies in India. Based on the information in the table below, answer the questions that follow:

Firm	Jaipur Rugs	FabIndia	Ashok Carpets
Sale price per unit	INR 1,500	INR 1,900	INR 2,150
Variable operating cost per unit	800	950	1,000
Fixed operating cost	500,000	640,000	700,000

a. What is the operating breakeven point in units for each firm?
b. How would you rank these firms in terms of their risk?

LG1

P12–3 Breakeven point: Algebraic and graphical Fine Leather Enterprises sells its single product for $129.00 per unit. The firm's fixed operating costs are $473,000 annually, and its variable operating costs are $86.00 per unit.

a. Find the firm's operating breakeven point in units.
b. Label the *x*-axis "Sales (units)" and the *y*-axis "Costs/Revenues ($)," and then graph the firm's sales revenue, total operating cost, and fixed operating cost functions on these axes. In addition, label the operating breakeven point and the areas of loss and profit (EBIT).

LG1 MyLab

P12–4 Breakeven analysis Anke Perks is opening an arts and crafts store that focuses on canvases, paints, and pencils. Each canvas is sold for $24. The variable operating costs are $14 per canvas while the fixed operating costs are $4,000.

a. Calculate how many canvases Anke needs to sell to reach her operating breakeven point.
b. Calculate the total operating costs at the breakeven point based on part **a.**
c. Anke's business plan assumed that she would be able to sell 420 canvases per month. Will Anke be able to make a profit at this sales level?
d. How much EBIT will Anke generate if she sells 420 canvases per month?

Personal Finance Problem

LG1

P12–5 Breakeven analysis Paul Scott has a 2014 Cadillac that he wants to update with a satellite-based emergency response system so that he will have access to roadside assistance should he need it. Adding this feature to his car requires a flat fee of $500, and the service provider requires monthly charges of $20. In his line of work as a traveling salesperson, he estimates that this device can save him time and money, about $35 per month. He plans to keep the car for another 3 years.

a. Calculate the breakeven point for the device in months.
b. Based on **a,** should Paul have the system installed in his car?

LG1

P12–6 Breakeven point: Changing costs/revenues Anki is a Finnish manufacturer of rugs. Last year, it sold rugs for €350, with a variable operating cost of €200 per rug and a fixed operating expense of €1,050,000.

a. How many rugs must Anki sell this year to achieve the breakeven point for the stated operating costs if all figures remain the same as for last year?
b. How many rugs must Anki sell this year to achieve the breakeven point for the stated operating costs if fixed operating costs increase to €1,300,000 and all other figures remain the same?
c. How many rugs must Anki sell this year to achieve the breakeven point for the stated operating costs if the selling price decreases to €320, and all other costs don't change?
d. How many rugs must Anki sell this year to achieve the breakeven point for the stated operating costs if the variable operating cost per rug increases to €220 and all other figures remain the same?
e. What conclusions about the operating breakeven point can be drawn for your answers?

LG 1

P12–7 **Breakeven analysis** Antonio and his friend, Giancarlo, are both talented painters. Last year they began painting original artistic postcards, which they gave to their friends as holiday gifts. In addition, they began selling these at a crafts fair and sold them mainly for fun. At the last fair, a buyer who really liked the postcards offered them a contract to paint 500 postcards of a specific design for €2,000. With the increase in demand, Antonio and Giancarlo decide to open a business, calling it A&G. They priced each postcard at €4.00 each. Variable operating costs amounted to an average of €1.50 per postcard. To produce the postcards for the contract, they have to buy a specific machine to cut the postcards, which will cost them €700.

a. Calculate A&G's operating breakeven point.
b. Calculate A&G's EBIT on the contract.
c. If Antonio decides to renegotiate the contract at a price of €5.00 per postcard, what will the EBIT be?
d. If the buyer refuses to pay more than €4.00 per postcard, but is willing to negotiate quantity, what quantity of postcards will result in an EBIT of €1,200?
e. At this time, A&G's postcards come in 20 different varieties. While the average variable cost per postcard is €1.50, the actual cost varies from unit to unit. What recommendation would you give to Antonio and Giancarlo with regard to pricing and the numbers and types of units that they offer for sale?

LG 2

P12–8 **EBIT sensitivity** Millard's Enterprises sells wooden baby chairs for $28 per chair. The fixed operating costs are $23,000, and the variable operating cost is $18 per chair.

a. Calculate Millard's Enterprises' EBIT with an estimated sales of 12,000 chairs.
b. Calculate EBIT for sales of 10,000 and 14,000 chairs, respectively.
c. Calculate the percentage changes in units sold (with 12,000 chairs as the base level) and related percentage changes in EBIT when sales are 10,000 and 14,000 chairs, respectively.
d. Based on the answer in part **c,** comment on the sensitivity of changes in EBIT in response to changes in sales.

LG 2 MyLab

P12–9 **Degree of operating leverage** Diane's Florist has fixed operating costs of $3,825, variable operating costs of $9.50 per flower arrangement, and an average selling price of $24.50 per flower arrangement.

a. What is Diane's Florist's operating breakeven point in units (flower arrangements)?
b. Calculate the EBIT for sales of 260, 300, and 340 flower arrangements, respectively.
c. Calculate the percentage changes in units (flower arrangements) sold and EBIT if sales change from the base of 300 flower arrangements to 260 and 340 flower arrangements, respectively.
d. Calculate the degree of operating leverage (DOL) at 300 flower arrangements.

LG 2

P12–10 **Degree of operating leverage: Graphical** Olivetti Corporation has fixed operating costs of €850,000, variable costs of €350 per unit of personal computers (PC) produced, and a selling price of €550 per unit.

a. Calculate the operating breakeven point in units of PC produced.
b. Compute the degree of operating leverage (DOL) using the following unit sales as a base: 3,500, 4,000, 4,500, and 5,000. Use the formula given in the text.

c. Graph the DOL figures that you computed in part b (on the *y*-axis) against base sales levels (on the *x*-axis).
d. Compute the DOL at 4,250 units, and add this point to your graph.
e. What principle do your graph and figures illustrate?

LG 2

P12–11 **EPS calculations** Maitland Enterprises has $70,000 of 10% (annual interest) bonds outstanding, 500 shares of preferred stock paying an annual dividend of $45 per share, and 6,000 shares of common stock outstanding. Maitland Enterprises is taxed at 40%. Calculate the earnings per share (EPS) when EBIT is:
a. $130,000
b. $95,000
c. $73,800

LG 2

P12–12 **Degree of financial leverage** The Plastic Corporation has a current capital structure consisting of $150,000 of 15% debt and 3,500 shares of common stock. The tax rate is 40%.
a. Determine the earnings per share (EPS) when EBIT is $75,000 and $99,500.
b. Calculate the degree of financial leverage (DFL) using EBIT of $75,000 as a base.
c. What is the meaning of The Plastic Corporation's DFL?

Personal Finance Problem

LG 2

P12–13 **Financial leverage** Margaret has just received an MS degree from Oxford University. She has outstanding school loans that require a monthly payment of £800. She wants to rent a small apartment in London near her new workplace and estimates that this purchase will add £1,000 per month to her existing monthly expenses. Margaret will have £1,950 available after meeting all her monthly living expenses. This amount can vary by plus or minus 20%.
a. To assess the potential impact of the additional borrowing on her financial leverage, calculate the DFL in tabular form for both the current and proposed rent payments, using Margaret's available £1,950 as a base and a 20% change.
b. Can Margaret afford the additional rent payment?
c. Should Margaret take on the additional rent payment?

LG 2 LG 5

P12–14 **DFL and graphical display of financing plans** Wells and Associates has an EBIT of $67,500. Interest costs are $22,500, and the firm has 15,000 shares of common stock outstanding. Assume a 40% tax rate.
a. Use the degree of financial leverage (DFL) formula to calculate the DFL for the firm.
b. Using a set of EBIT–EPS axes, plot Wells and Associates' financing plan.
c. If the firm also has 1,000 shares of preferred stock paying a $6.00 annual dividend per share, what is the DFL?
d. Plot the financing plan, including the 1,000 shares of $6.00 preferred stock, on the axes used in part **b**.
e. Briefly discuss the graph of the two financing plans.

LG 1 LG 2 MyLab

P12–15 **Integrative: Multiple leverage measures** Hugg-a-Bugg Soft Toys manufactures teddy bears, selling 350,000 teddy bears at $26 per teddy bear. Fixed

operating costs are $28,000, while variable operating costs are $16 per teddy bear. The manufacturer has annual interest charges of $4,500 on long-term debts, preferred dividends of $3,000, and a 40% tax rate.

a. Calculate the operating breakeven point in units.
b. Use the degree of operating leverage (DOL) formula to calculate DOL at base sales levels.
c. Use the degree of financial leverage (DFL) formula to calculate DFL.
d. Use the degree of total leverage (DTL) formula to calculate DTL.

LG 2

P12–16 **Integrative: Leverage and risk** Firm R has sales of 100,000 units at $2.00 per unit, variable operating costs of $1.70 per unit, and fixed operating costs of $6,000. Interest is $10,000 per year. Firm W has sales of 100,000 units at $2.50 per unit, variable operating costs of $1.00 per unit, and fixed operating costs of $62,500. Interest is $17,500 per year. Assume that both firms are in the 40% tax bracket.

a. Compute the degree of operating, financial, and total leverage for firm R.
b. Compute the degree of operating, financial, and total leverage for firm W.
c. Compare the relative risks of the two firms.
d. Discuss the principles of leverage that your answers illustrate.

LG 1 LG 2

P12–17 **Integrative: Multiple leverage measures and prediction** Profarma shpk, an Albanian pharmaceutical company, makes a patented flu medicine that wholesales for L600. Each bottle of the flu medicine has variable operating costs of L400, while fixed costs are L2,000,000 per year. The firm pays L150,000 interest and preferred dividends of L40,000 per year. At this point the firm is selling 11,000 bottles of medicine per year and is taxed at a rate of 15%.

a. Calculate Profarma's operating breakeven point.
b. On the basis of the firm's current sales of 11,000 bottles per year and its interest and preferred dividend costs, calculate its EBIT and earnings available for common stockholders.
c. Calculate the firm's degree of operating leverage (DOL).
d. Calculate the firm's degree of financial leverage (DFL).
e. Calculate the firm's degree of total leverage (DTL).
f. Profarma has entered into a special contract with the Albanian government to produce and sell an additional 5,500 bottles of the flu medicine in the coming year. Use the DOL, DFL, and DTL to predict and calculate the changes in EBIT and earnings available for common stockholders. Check your work by a simple calculation of Profarma's EBIT and earnings available for common stockholders, using the basic information given.

Personal Finance Problem

LG 3

P12–18 **Capital Structure** Altin Greene is looking to buy a new apartment in Tirana, the capital of Albania. He visits Credins Bank and reviews all the data that is required to get a loan. He must submit his personal financial data, like his income from work, expenses, and other existing loan payments. The bank then decides, based on specific ratios and data, whether to concede the loan. The list of requirements are:

(1) Monthly mortgage payments $< 25\%$ of monthly gross (before-tax) income.
(2) Total monthly installment payments (including the mortgage payments) $< 35\%$ of monthly gross (before-tax) income.

Altin submits the following financial data:

Monthly gross (before-tax) income	L120,000
Monthly installment loan obligations	15,000
Requested mortgage	12,000,000
Monthly mortgage payments	34,000

a. Calculate the ratio for requirement 1.
b. Calculate the ratio for requirement 2.
c. Assuming that Altin has adequate funds for the down payment and meets other lender requirements, will he be granted the loan?

LG 3

P12–19 Various capital structures Welding Manufacturing is currently totally equity financed. Welding Manufacturing is contemplating a change in its capital structure. Management is considering the following debt ratios: 10%, 20%, 30%, 40%, 50%, 60%, and 90%. The amount of total assets remains unchanged at $1,500,000. Calculate the amount of debt and equity for each of the debt ratios.

LG 3

P12–20 Debt and financial risk Barrilla Group's CEO has made the forecast of sales as shown in the following table.

Sales	Probability
€12,000,000	0.25
€15,500,000	0.50
€18,300,000	0.25

The company has fixed operating costs of €1,500,000 and variable operating costs of 75% of the sales level. The company pays €135,000 in interest per year. The tax rate is 24%.

a. Compute the earnings before interest and taxes (EBIT) for each level of sales.
b. Compute the earnings per share (EPS) for each level of sales, the expected EPS, the standard deviation of the EPS, and the coefficient of variation of EPS, assuming that there are 25,500 shares of common stock outstanding.
c. Barilla has the opportunity to reduce its leverage to zero and pay no interest. This change will require that the number of shares outstanding be increased to 30,000. Repeat part b under this assumption.
d. Compare you findings in parts **b** and **c**, and comment on the effect of the reduction of debt to zero on the firm's financial risk.

LG 4

P12–21 EPS and optimal debt ratio Williams Glassware has estimated, at various debt ratios, the expected earnings per share and the standard deviation of the earnings per share, as shown in the following table.

Debt ratio	Earnings per share (EPS)	Standard deviation of EPS
0%	$2.30	$1.15
20	3.00	1.80
40	3.50	2.80
60	3.95	3.95
80	3.80	5.53

a. Estimate the optimal debt ratio on the basis of the relationship between earnings per share and the debt ratio. You will probably find it helpful to graph the relationship.
b. Graph the relationship between the coefficient of variation and the debt ratio. Label the areas associated with business risk and financial risk.

LG 5

P12–22 EBIT-EPS and capital structure Geniaware is considering two capital structures. The key information is shown in the following table. Assume a 24% tax rate.

Source of capital	Structure A	Structure B
Long-term debt	€75,000 at 16% coupon rate	€50,000 at 15% coupon rate
Common stock	8,000 shares	10,000 shares

a. Calculate the EBIT-EPS coordinates for each of the structures for EBIT values of €30,000 and €50,000 with their associated EPS values.
b. Plot the two capital structures on a set of EBIT-EPS axes.
c. Indicate over what EBIT range, if any, each structure is preferred.
d. Discuss the leverage and risk aspects of each structure.
e. If the firm is fairly certain that its EBIT will exceed €55,000, which structure would you recommend? Why?

LG 5

P12–23 EBIT-EPS and preferred stock Suppose SpazioDatti is considering adding preferred stock to its capital structures. The key information is shown in the following table. Assume a 24% tax rate.

Source of capital	Structure A	Structure B
Long-term debt	€100,000 at 10% coupon rate	€50,000 at 5% coupon rate
Common stock	5,000 shares	10,000 shares
Preferred stock	€10,000 with a 12% annual dividend	€20,000 with a 12% annual dividend

a. Calculate the EBIT-EPS coordinates for each of the structures for EBIT values of €30,000 and €40,000 with their associated EPS values.
b. Plot the two capital structures on a set of EBIT-EPS axes.
c. Discuss the leverage and risk aspects of each structure.
d. Indicate over what EBIT range, if any, each structure is preferred.
e. If the firm is fairly certain that its EBIT will exceed €42,000, which structure would you recommend? Why?

LG 3 LG 4 LG 6

P12–24 Integrative: Optimal capital structure Medallion Cooling Systems has total assets of $10,000,000, EBIT of $2,000,000, and preferred dividends of $200,000 and is taxed at a rate of 40%. In an effort to determine the optimal capital structure, the firm has assembled data on the cost of debt, the number of shares of common stock for various levels of indebtedness, and the overall required return on investment:

Capital structure debt ratio	Cost of debt, r_d	Number of common stock shares	Required return, r_s
0%	0%	200,000	12%
15	8	170,000	13
30	9	140,000	14
45	12	110,000	16
60	15	80,000	20

a. Calculate earnings per share for each level of indebtedness.
b. Use Equation 12.12 and the earnings per share calculated in part **a** to calculate a price per share for each level of indebtedness.
c. Choose the optimal capital structure. Justify your choice.

LG 3 LG 4 LG 6

P12–25 Integrative: Optimal capital structure Theodora works as a financial analyst for Berrios S.A., a construction company headquartered in Athens, Greece. She has been asked to make an analysis of the possibilities of optimizing the capital structure of the company. She starts her analysis by making the following forecast of sales, with the associated probabilities of occurrence noted.

Sales	Probability
€355,000	25%
€500,000	50%
€625,000	25%

The company has fixed operating costs of €170,000 per year, and variable operating costs represent 50% of sales. The current capital structure consists of 20,000 shares of common stock that have a €20 per share book value. The marketplace has assigned the following required returns to risky earnings per share.

Coefficient of variation of EPS	Estimated required return, r_s
0.60	10%
0.65	12%
0.70	14%
0.75	16%
0.80	18%
0.90	20%
1.00	22%
1.10	24%

The company wants to shift the capital structure by increasing debt and decreasing common stock, in order to maximize EPS or shareholder value. The market has assigned four different debt ratios that are shown in the following table, along with an estimate, for each ratio, of the corresponding required interest rate on all debt.

Debt ratio	Interest rate on *all* debt
20%	10%
30%	12%
40%	14%
50%	16%

The corporate tax rate in Greece is currently 29%. The market value of the equity for a leveraged firm can be found by using the simplified method (see Equation 13.12).

a. Calculate the expected earnings per share (EPS), the standard deviation of EPS, and the coefficient of variation of EPS for the four proposed capital structures.

b. Determine the optimal capital structure, assuming (1) maximization of earnings per share and (2) maximization of share value.

c. Construct a graph (similar to Figure 13.6) showing the relationships in part **b**.

LG3 LG4 LG5 LG6

P12–26 Integrative: Optimal capital structure Cosmetic Manufacturers is contemplating changing the capital structure of the firm. The firm has $45,000,000 in total assets, earnings before interest and taxes of $8,500,000, and is taxed at a rate of 40%.

a. Complete the following table, showing the values of debt, equity, and the total number of shares of common stock. Assume a book value of $20 per share.

% Debt	Total assets	Debt ($)	Equity ($)	Number of shares @ R20
0%	$45,000,000	$____	$____	____
10	$45,000,000	____	____	____
20	$45,000,000	____	____	____
30	$45,000,000	____	____	____
40	$45,000,000	____	____	____
50	$45,000,000	____	____	____
60	$45,000,000	____	____	____

b. Calculate the total debt and yearly interest expenses based on the before-tax cost of debt at various levels of indebtedness.

% Debt	Total debt ($)	Before-tax cost of debt, r_d	Interest expense ($)
0%	$____	0.0%	$____
10	____	7.0	____
20	____	8.0	____
30	____	9.5	____
40	____	11.0	____
50	____	12.5	____
60	____	15.5	____

c. Using an **EBIT** of $7,500,000, a 40% tax rate, and the information developed in parts **a** and **b**, calculate the most likely earnings per share for the firm at each level of indebtedness.

% Debt	EBIT	Interest expense	EBT	Taxes	Net income	Number of shares	EPS
0%	$7,500,000	$____	$____	$____	$____	$____	$____
10	$7,500,000	____	____	____	____	____	____
20	$7,500,000	____	____	____	____	____	____
30	$7,500,000	____	____	____	____	____	____
40	$7,500,000	____	____	____	____	____	____
50	$7,500,000	____	____	____	____	____	____
60	$7,500,000	____	____	____	____	____	____

d. Using the EPS developed in part **c**, and the estimates of required return, r_s, estimate the value per share at various levels of indebtedness. Mark the level of indebtedness in the following table that results in the maximum price per share, P_0.

% Debt	EPS	r_s	P_0
0%	$____	10.0%	$____
10	____	10.3%	____
20	____	10.9%	____
30	____	11.4%	____
40	____	12.6%	____
50	____	14.8%	____
60	____	17.5%	____

e. Based on your answer in parts **a** to **d**, which debt ratio would you recommend? Explain your answer.

LG 3 LG 4 LG 5 LG 6

P12–27 Integrative: Optimal capital structure Attica Group, a transportation company, has fixed operating costs of €250,000 and variable costs of 60% of sales. It has made the following sales estimates, with the probabilities noted.

Sales	Probability
€1,200,000	20%
€1,240,000	60%
€1,280,000	20%

The company wants to analyze four different capital structures: 0%, 30%, 50%, and 80% debt ratios. The total assets are assumed constant at €4,000,000. Its common stock has a book value of €25 per share, and the corporate tax rate in

Greece is 29%. The following additional data have been gathered for analyzing the capital structures under consideration.

Capital structure debt ratio	Before-tax cost of debt, r_d	Required return, r_s
0%	2.0%	4.0%
30	2.5	4.5
50	3.0	5.0
80	3.5	8.0

a. Calculate the level of EBIT associated with the three levels of sales.
b. Calculate the amount of debt, the amount of equity, and the number of shares of common stock outstanding for each of the four capital structures.
c. Calculate the annual interest rate on the debt under each of the four capital structures.
d. Calculate the EPS associated with each of the three levels of EBIT calculated in part **a** for each of the capital structures being considered.
e. Calculate (1) the expected EPS, (2) the standard deviation of EPS, and (3) the coefficient of variation of EPS for each of the capital structures, using your findings in part **d.**
f. Plot the expected EPS and the coefficient of variation of EPS against the capital structures (x-axis) on separate sets of axes, and comment on the return and risk relative to capital structure.
g. Using the EBIT-EPS data developed in part **d,** plot the 0%, and the 30% capital structures on the same set of EBIT-EPS axes, and discuss the ranges over which each is preferred. What is the major problem with the use of this approach?
h. Using the valuation model given in Equation 13.12, and your findings in part **e,** estimate the share value of each of the capital structures.
i. Compare and contrast your findings in parts **f** and **h**. Which structure is preferred if the goal is to maximize EPS? Which structure is preferred if the goal is to maximize share price? Which capital structure do you recommend? Explain.

LG 3

P12–28 ETHICS PROBLEM "Information asymmetry lies at the heart of the ethical dilemma that managers, stockholders, and bondholders confront when companies initiate management buyouts or swap debt for equity." Comment on this statement. What steps might a board of directors take to ensure that the company's actions are ethical with regard to all parties?

SPREADSHEET EXERCISE

Starstruck Company would like to determine its optimal capital structure. Several of its managers believe that the best method is to rely on the estimated earnings per share (EPS) of the firm because they believe that profits and stock price are closely related. The financial managers have suggested another method that uses estimated required returns to estimate the share value of the firm. The following financial data are available.

Capital structure debt ratio	Estimated EPS	Estimated required return
0%	$1.75	11.40%
10	1.90	11.80
20	2.25	12.50
30	2.55	13.25
40	3.18	18.00
50	3.06	19.00
60	3.10	25.00

TO DO

a. Based on the given financial data, create a spreadsheet to calculate the estimated share values associated with the seven alternative capital structures. Refer to Table 12.15.

b. Use Excel to graph the relationship between capital structure and the estimated EPS of the firm. What is the optimal debt ratio? Refer to Figure 12.6.

c. Use Excel to graph the relationship between capital structure and the estimated share value of the firm. What is the optimal debt ratio? Refer to Figure 12.6.

d. Do both methods lead to the same optimal capital structure? Which method do you favor? Explain.

e. What is the major difference between the EPS and share value methods?

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CHAPTER 13

Payout Policy

LEARNING GOALS

- LG1 Understand cash payout procedures, their tax treatment, and the role of dividend reinvestment plans.
- LG2 Describe the residual theory of dividends and the key arguments with regard to dividend irrelevance and relevance.
- LG3 Discuss the key factors involved in establishing a dividend policy.
- LG4 Review and evaluate the three basic types of dividend policies.
- LG5 Evaluate stock dividends from accounting, shareholder, and company points of view.
- LG6 Explain stock splits and the firm's motivation for undertaking them.

MyLab Finance Chapter Introduction Video

WHY THIS CHAPTER MATTERS TO YOU

In your *professional* life

ACCOUNTING You need to understand the types of dividends and payment procedures for them because you will have to record and report the declaration and payment of dividends; you also will provide the financial data that management must have to make dividend decisions.

INFORMATION SYSTEMS You need to understand types of dividends, payment procedures, and the financial data the firm must have to make and implement dividend decisions.

MANAGEMENT To make appropriate dividend decisions for the firm, you need to understand types of dividends, arguments about the relevance of dividends, the factors that affect dividend policy, and types of dividend policies.

MARKETING You need to understand factors affecting dividend policy because you may want to argue that the firm would fare better by retaining funds for use in new marketing programs or products, rather than paying them out as dividends.

OPERATIONS You need to understand factors affecting dividend policy because you may find that the firm's dividend policy imposes limitations on planned expansion, replacement, or renewal projects.

In your *personal* life

Many individual investors buy common stock for the anticipated cash dividends. From a personal finance perspective, you should understand why and how firms pay dividends, as well as the informational and financial implications of receiving them. Such understanding will help you select common stocks that have dividend-paying patterns consistent with your long-term financial goals.

LG 1

13.1 The cs of Payout Policy

payout policy
Decisions that a firm makes regarding whether to distribute cash to shareholders, how much cash to distribute, and the means by which cash should be distributed.

The term **payout policy** refers to the decisions that firms make about whether to distribute cash to shareholders, how much cash to distribute, and by what means the cash should be distributed. Although these decisions might seem less important than the investment decisions covered in Chapters 10 and 11 and the financing choices discussed in Chapter 12, they are important decisions that managers and boards of directors face routinely. Investors monitor firms' payout policies carefully, and unexpected changes in those policies can have significant effects on firms' stock prices. The recent history of Whirlpool Corporation demonstrates many important dimensions of payout policy.

ELEMENTS OF PAYOUT POLICY

Dividends are not the only means by which firms can distribute cash to shareholders. Firms can also conduct share repurchases, in which they typically buy back some of their outstanding common stock through purchases in the open market. Whirlpool Corporation, like many other companies, uses both methods to put cash in the hands of its stockholders. In addition to increasing its dividend payout, Whirlpool repurchased $525 million worth of its common stock in 2016 and pledged to continue share buybacks in 2017, even though the company's total free cash flow in 2016 was just $543 million. In other words, counting the combined value of Whirlpool's dividends and share repurchases, the company paid out more than 100% of its free cash flow in 2016 to stockholders. To do so, Whirlpool had to take on additional long-term debt.

When we observe the decisions that companies make regarding payouts to shareholders, some common patterns emerge:

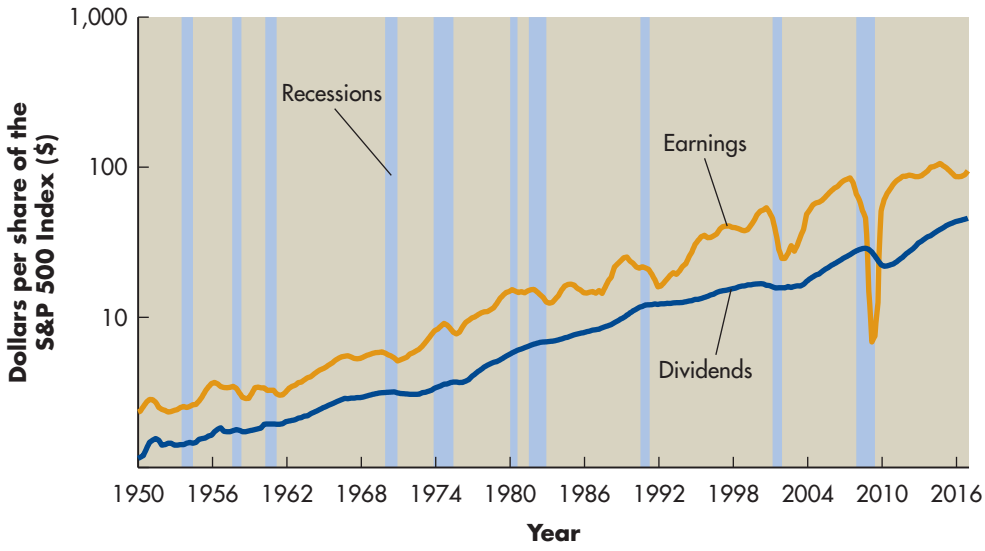
1. Rapidly growing firms generally do not pay out cash to shareholders.
2. Slowing growth, positive cash flow generation, and favorable tax conditions can prompt firms to initiate cash payouts to investors. The ownership base of the company can also figure importantly in the decision to distribute cash.
3. Firms can make cash payouts through dividends or share repurchases. Many companies use both methods. In some years, more cash is paid out via dividends, but sometimes share repurchases are larger than dividend payments.
4. When business conditions are weak, firms are more willing to reduce share buybacks than to cut dividends. Firms may even be willing to borrow money temporarily to avoid cutting dividends.

TRENDS IN EARNINGS AND DIVIDENDS

Figure 13.1 illustrates both long-term trends and cyclical movements in earnings and dividends paid by large U.S. firms that are part of the Standard & Poor's 500 Stock Composite Index. The figure plots monthly earnings and dividend payments from 1950 through 2016. The top line represents the earnings per share of firms in the S&P 500 index, and the bottom line represents dividends per share. The vertical bars highlight 10 periods during which the U.S. economy was in recession. The figure yields several important lessons. First, observe that over the long term the earnings and dividends lines tend to move together. Figure 13.1 uses a logarithmic scale, so the slope of each line represents the

FIGURE 13.1

Per-Share Earnings and Dividends of the S&P 500 Index
Monthly U.S. dollar amount of earnings and dividends per share of the S&P 500 index from 1950 through 2016 (the figure uses a logarithmic vertical scale)



growth rate of earnings or dividends. Over the 67 years shown in the figure, the two lines tend to have about the same slope, meaning that earnings and dividends grow at about the same rate when you take a long-term perspective. It makes perfect sense: Firms pay dividends out of earnings, so for dividends to grow over the long-term, earnings must grow, too.

Second, the earnings series is much more volatile than the dividends series. That is, the line plotting earnings per share is quite bumpy, but the dividend line is much smoother, which suggests that firms do not adjust their dividend payments each time earnings move up or down. Instead, firms tend to smooth dividends, increasing them slowly when earnings are growing rapidly and maintaining dividend payments, rather than cutting them, when earnings decline.

To see this second point more clearly, look closely at the vertical bars in Figure 13.1. It is apparent that during recessions corporate earnings usually decline, but dividends either do not decline at all or do not decline as sharply as earnings. In 6 of the last 10 recessions, dividends were actually higher when the recession ended than just before it began, although the last two recessions are notable exceptions to this pattern. Note also that, just after the end of a recession, earnings typically increase quite rapidly. Dividends increase, too, but not as fast.

A third lesson from Figure 13.1 is that the effect of the most recent recession on both corporate earnings and dividends was large by historical standards. An enormous earnings decline occurred from 2007 to 2009. This decline forced firms to cut dividends more drastically than they had in years; nonetheless, the drop in dividends was slight compared with the earnings decrease.

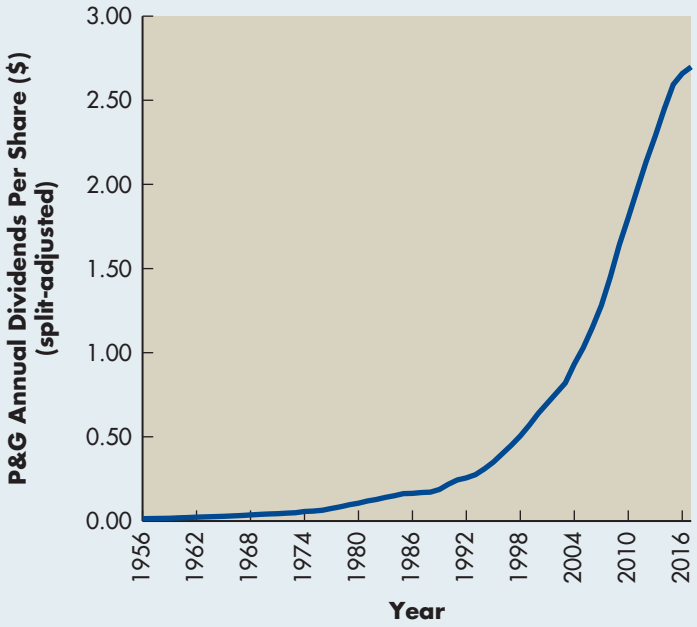
TRENDS IN DIVIDENDS AND SHARE REPURCHASES

When firms want to distribute cash to shareholders, they can either pay dividends or repurchase outstanding shares. Figure 13.2 plots aggregate dividends and share repurchases from 1971 through 2016 for all U.S. firms listed on U.S.

MATTER OF FACT

P&G's Dividend History

Few companies have replicated the dividend achievements of the consumer products giant Procter & Gamble (P&G). P&G has paid dividends every year for more than a century, and it increased its dividend in every year from 1956 through 2017.



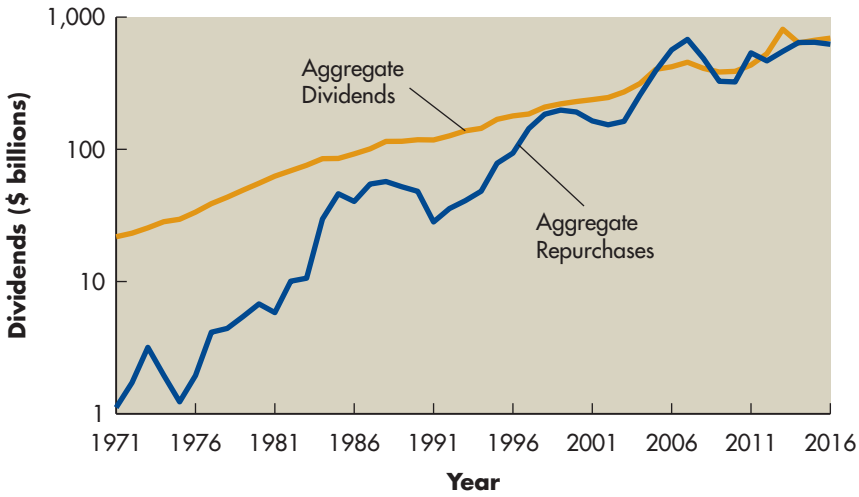
stock exchanges (again, the figure uses a logarithmic vertical scale). A quick glance at the figure reveals that share repurchases played a relatively minor role in firms' payout practices in the 1970s. In 1971, for example, aggregate dividends totaled nearly $21.8 billion, but share repurchases that year were just $1.1 billion. In the 1980s, share repurchases began to grow rapidly and then slowed again in the early 1990s. The value of aggregate share repurchases first eclipsed total dividend payments in 2006. That year, firms paid $421 billion in dividends, but they repurchased $565 billion worth of stock. Share repurchases continued to outpace dividends for 2 more years, peaking at $678 billion in 2007. Repurchases retreated for the next 3 years, but then began to pick up again in 2011, along with dividends.

Whereas aggregate dividends rise smoothly over time, Figure 13.2 shows that share repurchases display much more volatility. The largest drops in repurchase activity occurred in 1974–1975, 1981, 1986, 1989–1991, 2000–2002, and 2008–2011. All these drops correspond to periods when the U.S. economy was mired in or just emerging from a recession. During most of these periods, dividends continued to grow modestly. Only during the most recent, severe recession did both share repurchases and dividends fall.

Combining the lessons from Figures 13.1 and 13.2, we can draw three broad conclusions about firms' payout policies. First, firms exhibit a strong desire to

FIGURE 13.2

Aggregate Dividends and Repurchases for All U.S. Publicly Listed Companies
Aggregate U.S. dollar amount of dividends and share repurchases for all U.S. companies listed on U.S. stock exchanges in each year from 1971 through 2016 (the figure uses a logarithmic vertical scale)



maintain modest, steady growth in dividends that is roughly consistent with the long-run growth in earnings. Second, share repurchases have accounted for a growing fraction of total cash payouts over time. If dividends have grown in step with earnings while share repurchases have grown more rapidly, then the implication is that the total cash paid out by firms, relative to earnings, has been rising over time. Third, when earnings fluctuate, firms adjust their short-term payouts primarily by adjusting share repurchases (rather than dividends), cutting buybacks during recessions, and increasing them rapidly during economic expansions.

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13–1 What two ways can firms distribute cash to shareholders?

13–2 Why do rapidly growing firms generally pay no dividends?

13–3 The dividend payout ratio equals dividends paid divided by earnings. How would you expect this ratio to behave during a recession? What about during an economic boom?

MATTER OF FACT

Share Repurchases Gain Worldwide Popularity

The growing importance of share repurchases in corporate payout policy is not confined to the United States. In most of the world's largest economies, repurchases have been on the rise in recent years, eclipsing dividend payments at least some of the time in countries as diverse as Belgium, Denmark, Finland, Hungary, Ireland, Japan, Netherlands, South Korea, and Switzerland. A study of payout policy at firms from 25 different countries found that share repurchases rose at an annual rate of 19% from 1999 through 2008.

FOCUS ON ETHICS *in practice*

Buyback Mountain

Stock repurchases, or buybacks, have become the preferred way for large firms to shuttle cash to shareholders. From the end of the Great Recession through 2016, S&P 500 companies spent $3.3 trillion repurchasing shares—compared with paying just $2.3 trillion in dividends. Finance theory offers two reasons shareholders love repurchases. First, buybacks are "tax efficient"—meaning the typical investor pays less tax on cash received from a repurchase than a dividend. Second, for firms with few attractive investments, buybacks reduce management's temptation to waste available cash.

Two other motives for repurchasing stock are potentially less kind to shareholders—earnings management and market timing. Other things equal, repurchases reduce the number of outstanding shares, thereby increasing earnings per share (EPS). This gambit is attractive because the market often wallops firms that miss their earnings targets. Dangling from this stick, there is a carrot—CEO compensation is often tied to EPS. But repurchasing stock just to magnify earnings could harm shareholders. A recent study looked at firms that would have just missed their EPS forecast but for a stock repurchase; these firms reduced capital expenditures and R&D in subsequent quarters. In other words, management repurchased stock to get EPS over the hump, rather than use the cash to invest in the company's future.

Another justification often given for buybacks is market timing. Suppose management's assessment of company prospects suggests the stock price should be higher. If there is no credible way to correct the market's misperception, a stock buyback may offer the best alternative for enhancing shareholder value. Repurchasing undervalued shares means remaining stockholders will profit when the market comes to its senses. The only problem is management's view may be wishful thinking. Indeed, *The Economist* recently observed, "managers in aggregate are about as good at predicting share prices as dart-throwing simians."

But managers who repurchase "undervalued" stock may not just be monkeying around with shareholder value. Recent research found more than half of repurchasing firms were able to buy stock back at small discounts relative to the average market price during the repurchase month—the median discount was 0.88%. Furthermore, firms that repurchased infrequently got even better deals. The median discount for firms buying just once a year was 5.9%, compared with 1.5% for monthly buybacks—presumably because less frequent repurchasers have more flexibility to "time the market" to take advantage of undervaluation.

Recent data point to a slowdown in the repurchase boom. Through March 2017, buyback volume of S&P 500 companies was off 1.6% from the prior quarter and 17.5% from first quarter 2016. Even with the decline, the $133.1 billion in stock repurchased from January through March exceeded buybacks in 24 of the last 31 quarters. Going forward, it appears firms sitting on mountains of cash are unlikely to quit buying back shares.

▶ *Given the market generally punishes firms that miss their EPS forecast, do you believe it is ethical to use stock repurchases just to hit the target?*

Sources: Almeida, Heitor; Vyacheslav Fos; and Mathias Kronlund. "The Real Effect of Share Repurchases," *Journal of Financial Economics 119* (2016): 168–185. *The Economist*. "Share Buy-Backs: The Repurchase Revolution," September 12, 2014. Ditmar, Amy, and Laura Casares Field. "Do Corporate Managers Know When Their Shares are Undervalued? New Evidence Based on Actual (and Not Just Announced) Stock Buybacks," *Journal of Applied Corporate Finance 28* (Fall 2016): 73–84.

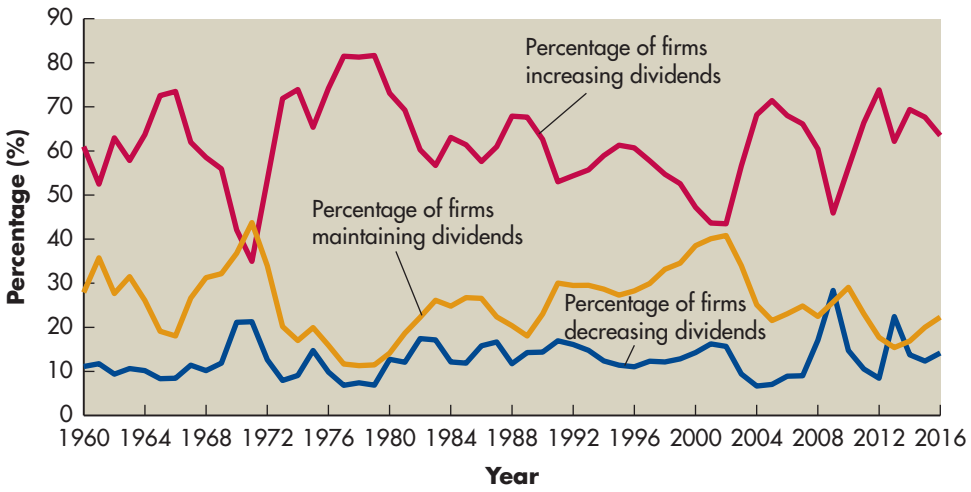
LG 1

13.2 The Mechanics of Payout Policy

At quarterly or semiannual meetings, a firm's board of directors decides whether and in what amount to pay cash dividends. If the firm has already established a precedent of paying dividends, the decision facing the board is usually whether to maintain or increase the dividend, and that decision is based primarily on the firm's recent performance and its ability to generate cash flow in the future. Boards rarely cut dividends unless they believe that the firm's ability to generate cash is in serious jeopardy. Figure 13.3 shows the percentage of U.S. dividend-paying companies that increased, decreased, or maintained

FIGURE 13.3

U.S. Publicly Listed Companies Maintaining, Increasing, or Decreasing Dividends
Percentage of U.S. dividend-paying companies that increased, decreased, or maintained their dividend payment each year from 1960 to 2016



their dividend payment each year from 1960 to 2016. The figure excludes dividend-payers from the financial services and regulated utility industries because regulators heavily influence the dividend decisions of those firms. Figure 13.3 shows that most firms that pay dividends increase their payments over time. In a typical year about 62% of dividend payers raise their dividend, which is about 5 times greater than the percentage of firms cutting dividends. Notice, however, that the percentage of firms increasing their dividend was particularly low in 1971, 2001, 2002, and 2009. In each of those years the U.S. economy was in or just emerging from a recession.

Cutting the dividend payment is clearly something that firms try to avoid, as fewer than 13% of firms reduce the dividend in an average year. But dividend cuts tend to rise when recessions occur. Just over 28% of dividend-paying firms actually cut their dividend in 2009 as the U.S. economy swooned. The percentage of firms just maintaining their dividend also tends to rise when business conditions are weak. In an average year about 25% of firms hold their dividend steady, but in 1971 almost 44% of firms chose to pay the same dividend that they paid in 1970. In fact, during the period 1960 to 2016, there were just three episodes in which the percentage of firms maintaining or cutting their dividend was greater than the percentage of firms increasing the dividend: 1970 to 1971, 2000 to 2002, and 2009. All three periods correspond to recessions.

date of record (dividends)
Set by the firm's directors, the date on which all persons whose names are recorded as stockholders receive a declared dividend at a specified future time.

ex dividend
A period usually beginning 2 *business days* prior to the date of record, during which a stock is sold without the right to receive the current dividend.

CASH DIVIDEND PAYMENT PROCEDURES

When a firm's directors declare a dividend, they issue a statement indicating the dividend amount and setting three important dates: the *date of record,* the *ex-dividend date,* and the *payment date*. All persons whose names are recorded as stockholders on the **date of record** receive the dividend. These stockholders are often referred to as *holders of record.*

Because of the time needed to make bookkeeping entries when a stock is traded, the stock usually begins selling **ex dividend** 2 *business days* prior to the

date of record. Investors who purchase a stock on or after the ex dividend date do not receive the current dividend. A simple way to determine the first day on which the stock sells ex dividend is to subtract 2 business days from the date of record.

payment date
Set by the firm's directors, the actual date on which the firm mails the dividend payment to the holders of record.

The **payment date** is the actual date on which the firm mails the dividend payment to the holders of record. It is generally a few weeks after the record date. An example will clarify the various dates and the accounting effects.

EXAMPLE 13.1

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On April 17, 2017, the board of directors of Whirlpool announced that the firm's next quarterly cash dividend would be $1.10 per share, payable on June 15, 2017, to shareholders of record on Friday, May 19, 2017. Whirlpool shares would begin trading ex dividend on the previous Wednesday, May 17. At the time of the announcement, Whirlpool had about 74 million shares of common stock outstanding, so the total dividend payment would be $81.4 million. Figure 13.4 shows a timeline depicting the key dates relative to the Whirlpool dividend. Before the dividend was declared, the key accounts of the firm were as follows (dollar values quoted in thousands):[1]

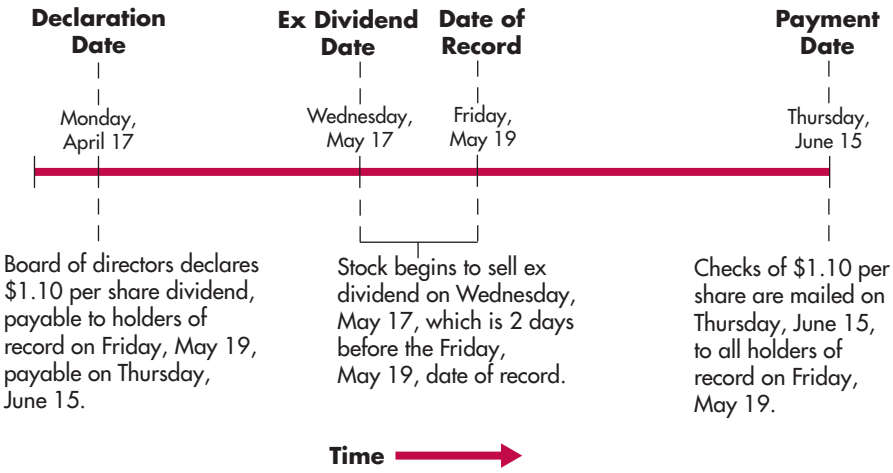
Cash	$951,000	Dividends payable	$0
		Retained earnings	$7,394,000

When the dividend was announced by the directors, $81.4 million of the retained earnings ($1.10 per share × 74 million shares) was transferred to the dividends payable account. The key accounts thus became

Cash	$951,000	Dividends payable	$81,400
		Retained earnings	$7,312,600

FIGURE 13.4

Dividend Payment Timeline
Timeline for the announcement and payment of a cash dividend for Whirlpool



1. The accounting transactions described here reflect only the effects of the dividend. Whirlpool's actual financial statements during this period will reflect many other transactions.

When Whirlpool actually paid the dividend on June 15, this produced the following balances in the key accounts of the firm:

Cash	$869,600	Dividends payable	$0
		Retained earnings	$7,312,600

The net effect of declaring and paying the dividend was to reduce the firm's total assets (and stockholders' equity) by almost $81.4 million.

SHARE REPURCHASE PROCEDURES

The mechanics of cash dividend payments are virtually the same for every dividend paid by every public company. With share repurchases, firms can use at least two different methods to get cash into the hands of shareholders. The most common method of executing a share repurchase program is called an open-market share repurchase. In an **open-market share repurchase,** as the name suggests, firms simply buy back some of their outstanding shares on the open market. Firms have a great deal of latitude regarding when and how they execute these open-market purchases. Some firms make purchases in fixed amounts at regular intervals, whereas other firms try to behave more opportunistically, buying back more shares when they think the share price is relatively low and fewer shares when they think the price is high.

open-market share repurchase
A share repurchase program in which firms simply buy back some of their outstanding shares on the open market.

In contrast, firms sometimes repurchase shares through a *self-tender offer* or simply a *tender offer*. In a **tender offer share repurchase,** a firm announces the price it is willing to pay to buy back shares and the quantity of shares it wishes to repurchase. The tender offer price is usually set at a significant premium above the current market price. Shareholders who want to participate let the firm know how many shares they would like to sell back to the firm at the stated price. If shareholders do not offer to sell back as many shares as the firm wants to repurchase, the firm may either cancel or extend the offer. If the offer is oversubscribed, meaning that shareholders want to sell more shares than the firm wants to repurchase, the firm typically repurchases shares on a pro rata basis. For example, if the firm wishes to buy back 10 million shares, but investors offer to sell 20 million shares back to the firm, the firm would repurchase exactly half of the shares tendered by each shareholder.

tender offer share repurchase
A repurchase program in which a firm offers to repurchase a fixed number of shares, usually at a premium relative to the market value, and shareholders decide whether or not they want to sell back their shares at that price.

A third method of buying back shares is called a **Dutch auction share repurchase.** In a Dutch auction, the firm specifies a range of prices at which it is willing to repurchase shares and the quantity of shares that it desires. Investors can tender their shares to the firm at any price in the specified range, which allows the firm to trace out a demand curve for their stock. That is, the demand curve specifies how many shares investors will sell back to the firm at each price in the offer range. This analysis allows the firm to determine the minimum price required to repurchase the desired quantity of shares, and every shareholder receives that price.

Dutch auction share repurchase
A repurchase method in which the firm specifies how many shares it wants to buy back and a range of prices at which it is willing to repurchase shares. Investors specify how many shares they will sell at each price in the range, and the firm determines the minimum price required to repurchase its target number of shares. All investors who tender receive the same price.

EXAMPLE 13.2

In June 2017, Lifeway Foods announced a Dutch auction repurchase for 6 million common shares at prices ranging from $8.50 to $9.50 per share. Lifeway shareholders were instructed to contact the company to indicate how many shares they would be willing to sell at different prices in this range. Suppose that after accumulating this information from investors, Lifeway constructed the following demand schedule:

Offer price	Shares tendered	Cumulative total
$8.50	1,000,000	1,000,000
8.75	1,500,000	2,500,000
9.00	3,500,000	6,000,000
9.25	4,000,000	10,000,000
9.50	4,500,000	14,500,000

At a price of $9, shareholders are willing to tender a total of 6 million shares, exactly the amount that Lifeway wants to repurchase. Each shareholder who expressed a willingness to tender shares at a price of $9 *or less* receives $9, and Lifeway repurchases all 6 million shares at a cost of roughly $54 million.

TAX TREATMENT OF DIVIDENDS AND REPURCHASES

For many years, dividends and share repurchases had very different tax consequences. The dividends that investors received were generally taxed at ordinary income tax rates. Therefore, if a firm paid $10 million in dividends, that payout would trigger significant tax liabilities for the firm's shareholders (at least those subject to personal income taxes). However, when firms repurchased shares, the taxes triggered by that type of payout were generally much lower. Several reasons accounted for this difference. Only those shareholders who sold their shares as part of the repurchase program had any immediate tax liability. Shareholders who did not participate did not owe any taxes. Furthermore, some shareholders who did participate in the repurchase program might not owe any taxes on the funds they received if they were tax-exempt institutions or if they sold their shares at a loss. Finally, even those shareholders who participated in the repurchase program and sold their shares for a profit paid taxes only at the (usually lower) capital gains tax rate (assuming the shares were held for at least 1 year) and even that tax applied only to the gain, not to the entire value of the shares repurchased. Consequently, investors could generally expect to pay far less in taxes on money that a firm distributed through a share repurchase compared to money paid out as dividends. That differential tax treatment in part explains the growing popularity of share repurchase programs in recent decades.

The *Jobs and Growth Tax Relief Reconciliation Act of 2003* significantly changed the tax treatment of corporate dividends for most taxpayers. Prior to passage of the 2003 law, dividends received by investors were taxed as ordinary income at rates as high as 35%. The 2003 act reduced the tax rate on corporate dividends for most taxpayers to the tax rate applicable to capital gains, which was a maximum rate of 15%. This change significantly diminished the degree of "double taxation" of dividends, which results when the corporation is first taxed on its income and then shareholders pay taxes on the dividends they receive. After-tax cash flow to dividend recipients was much greater at the lower dividend tax rate; the result was noticeably higher dividend payouts by corporations after the passage of the 2003 legislation.

Several tax changes have been enacted since 2003. Under current tax law, stockholders face tax rates on dividends and capital gains as low as 0% or as high as 23.8%, depending on their income level.

PERSONAL FINANCE EXAMPLE 13.3

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The board of directors of Espinoza Industries Inc., on October 4 of the current year, declared a quarterly dividend of $0.46 per share payable to all holders of record on Friday, October 26, with a payment date of November 19. Rob and Kate Heckman, who purchased 500 shares of Espinoza's common stock on Thursday, October 15, wish to determine whether they will receive the recently declared dividend and, if so, when and how much they would net after taxes from the dividend given that the dividends would be subject to a 15% federal income tax.

Given the Friday, October 26, date of record, the stock would begin selling *ex dividend* 2 business days earlier on Wednesday, October 24. Purchasers of the stock on or before Tuesday, October 23, would receive the right to the dividend. Because the Heckmans purchased the stock on October 15, they would be eligible to receive the dividend of $0.46 per share. Thus, the Heckmans will receive $230 in dividends ($0.46 per share × 500 shares), which will be mailed to them on the November 19 payment date. Because they are subject to a 15% federal income tax on the dividends, the Heckmans will net $195.50 [(1 − 0.15) × $230] after taxes from the Espinoza Industries dividend.

DIVIDEND REINVESTMENT PLANS

dividend reinvestment plans (DRIPs)
Plans that enable stockholders to use dividends received on the firm's stock to acquire additional shares—even fractional shares—at little or no transaction cost.

Today, many firms offer **dividend reinvestment plans (DRIPs)**, which enable stockholders to use dividends received on the firm's stock to acquire additional shares—even fractional shares—at little or no transaction cost. Some companies even allow investors to make their initial purchases of the firm's stock directly from the company without going through a broker. With DRIPs, plan participants typically can acquire shares at about 5% below the prevailing market price. From its point of view, the firm can issue new shares to participants more economically, avoiding the underpricing and flotation costs that would accompany the public sale of new shares. The existence of a DRIP may enhance the market appeal of a firm's shares.

STOCK PRICE REACTIONS TO CORPORATE PAYOUTS

What happens to the stock price when a firm pays a dividend or repurchases shares? In theory, the answers to those questions are straightforward. Take a dividend payment, for example. Suppose that a firm has $1 billion in assets, financed entirely by 10 million shares of common stock. Each share should be worth $100 ($1 billion ÷ 10,000,000 shares). Now suppose that the firm pays a $1 per share cash dividend, for a total dividend payout of $10 million. The assets of the firm fall to $990 million. Because shares outstanding remain at 10 million, each share should be worth $99. In other words, the stock price should fall by $1, exactly the amount of the dividend. The reduced share price simply reflects that cash formerly held by the firm is now in the hands of investors. To be precise, this reduction in share price should occur not when the dividend checks are mailed but rather when the stock begins trading ex dividend.

For share repurchases, the intuition is that "you get what you pay for." In other words, if the firm buys back shares at the going market price, the reduction in cash is exactly offset by the reduction in the number of shares outstanding, so the market price of the stock should remain the same. Once again, consider the firm with

$1 billion in assets and 10 million shares outstanding worth $100 each. Let's say that the firm decides to distribute $10 million in cash by repurchasing 100,000 shares of stock. After the repurchase is completed, the firm's assets will fall by $10 million to $990 million, but the shares outstanding will fall by 100,000 to 9,900,000. The new share price is therefore $990,000,000 ÷ 9,900,000, or $100, as before.

In practice, taxes and a variety of other market imperfections may cause the actual change in share price in response to a dividend payment or share repurchase to deviate from what we expect in theory. In the case of dividends, stock prices do fall, on average, on ex dividend dates, but the decline in the stock price is usually less than the dividend payment. Furthermore, the stock price reaction to a cash payout may be different than the reaction to an announcement about an upcoming payout. For example, when a firm announces that it will increase its dividend, the share price usually rises on that news, even though the share price will fall when the dividend is actually paid. The next section discusses in greater depth the impact of payout policy on the value of the firm.

→ REVIEW QUESTIONS MyLab Finance Solutions

13–4 Who are holders of record? When does a stock sell ex dividend?

13–5 What effect did the *Jobs and Growth Tax Relief Reconciliation Act of 2003* have on the taxation of corporate dividends? On corporate dividend payouts?

13–6 What benefit is available to participants in a dividend reinvestment plan? How might the firm benefit from such a plan?

LG 2

13.3 Relevance of Payout Policy

The financial literature has reported numerous theories and empirical findings concerning payout policy. Although this research provides some interesting insights about payout policy, capital budgeting and capital structure decisions are generally considered more important than payout decisions. In other words, firms should not sacrifice good investment and financing decisions for a payout policy of questionable importance.

The most important question about payout policy is this one: Does payout policy have a significant effect on the value of a firm? A number of theoretical and empirical answers to this question have been proposed, but as yet there is no widely accepted rule to help a firm find its "optimal" payout policy. Most theories that have been proposed to explain the consequences of payout policy have focused on dividends. From here on, we will use the terms *dividend policy* and *payout policy* interchangeably, meaning that we make no distinction between dividend payouts and share repurchases in terms of the theories that try to explain whether these policies have an effect on the firm's value.

residual theory of dividends
A school of thought suggesting that the dividend paid by a firm should be viewed as a *residual*, that is, the amount left over after all acceptable investment opportunities have been undertaken.

RESIDUAL THEORY OF DIVIDENDS

The **residual theory of dividends** is a school of thought suggesting that the dividend paid by a firm should be viewed as a *residual*, that is, the amount left over after all acceptable investment opportunities have been undertaken. This view of

dividends is echoed in the comments from Jeff Fettig, CEO of Whirlpool. In announcing a dividend increase, Mr. Fettig said that his company was focused on returning cash to shareholders, "while funding our brands and innovation programs." In other words, Whirlpool would first fund the investments it needed to make in its business, and then it would return remaining cash to shareholders through dividends.

Using this residual approach, the firm would treat the dividend decision in three steps, as follows:

Step 1 Determine its optimal level of capital expenditures, which would be the level that exploits all a firm's positive NPV projects.

Step 2 Using the optimal capital structure proportions (see Chapter 12), estimate the total amount of equity financing needed to support the expenditures generated in Step 1.

Step 3 Because the cost of retained earnings, r_r, is less than the cost of new common stock, r_n, use retained earnings to meet the equity requirement determined in Step 2. If retained earnings are inadequate to meet this need, sell new common stock. If the available retained earnings are in excess of this need, distribute the surplus amount—the residual—as dividends.

According to this approach, as long as the firm's equity need exceeds the amount of retained earnings, no cash dividend is paid. The argument for this approach is that sound management includes making certain the company has the money it needs to compete effectively. This view of dividends suggests that the required return of investors, r_s, is *not* influenced by the firm's dividend policy, a premise that in turn implies that dividend policy is irrelevant in the sense that it does not affect the firm's value.

THE DIVIDEND IRRELEVANCE THEORY

The residual theory of dividends implies that if the firm cannot invest its earnings to receive a return exceeding the cost of capital, it should distribute the earnings by paying dividends to stockholders. This approach suggests that dividends represent an earnings residual rather than an active decision variable that affects the firm's value. Such a view is consistent with the **dividend irrelevance theory** put forth by Merton H. Miller and Franco Modigliani.[2] They argue that the firm's value is determined solely by the earning power and risk of its assets (investments) and that the manner in which it splits its earnings stream between dividends and internally retained (and reinvested) funds does not affect this value. Miller and Modigliani's theory suggests that in a perfect world (certainty, no taxes, no transactions costs, and no other market imperfections), the value of the firm is unaffected by the distribution of dividends.

dividend irrelevance theory
Miller and Modigliani's theory that, in a perfect world, the firm's value is determined solely by the earning power and risk of its assets (investments) and that the manner in which it splits its earnings stream between dividends and internally retained (and reinvested) funds does not affect this value.

Of course, real markets do not satisfy the "perfect markets" assumptions of Miller and Modigliani's original theory. One market imperfection that may be important is taxation. Historically, dividends have usually been taxed at higher rates than capital gains. A firm that pays out its earnings as dividends may trigger

2. Merton H. Miller and Franco Modigliani, "Dividend policy, growth and the valuation of shares," *Journal of Business* 34 (October 1961), pp. 411–433.

higher tax liabilities for its investors than a firm that retains earnings. As a firm retains earnings, its share price should rise, and investors enjoy capital gains. Investors can defer paying taxes on these gains indefinitely simply by not selling their shares. Even if they do sell their shares, they may pay a relatively low tax rate on the capital gains. In contrast, when a firm pays dividends, investors receive cash immediately and pay taxes at the rates dictated by then-current tax laws.

Even though this discussion makes it seem that retaining profits rather than paying them out as dividends may be better for shareholders on an after-tax basis, Miller and Modigliani argue that this assumption may not be the case. They observe that not all investors are subject to income taxation. Some institutional investors, such as pension funds, do not pay taxes on the dividends and capital gains they earn. The payout policies of different firms, then, have no impact on the taxes such investors have to pay. Therefore, Miller and Modigliani argue, a **clientele effect** can exist in which different types of investors are attracted to firms with different payout policies due to tax effects. Tax-exempt investors may invest more heavily in firms that pay dividends because they are not affected by the typically higher tax rates on dividends. Investors who would have to pay higher taxes on dividends may prefer to invest in firms that retain more earnings rather than paying dividends. If a firm changes its payout policy, the value of the firm will not change; instead, what will change is the type of investor who holds the firm's shares. According to this argument, tax clienteles mean that payout policies cannot affect the firm's value, but they can affect the ownership base of the company.

clientele effect
The argument that different payout policies attract different types of investors but still do not change the value of the firm.

In summary, Miller and Modigliani and other proponents of dividend irrelevance argue that, all else being equal, an investor's required return—and therefore the value of the firm—is unaffected by dividend policy. In other words, there is no "optimal" dividend policy for a particular firm.

ARGUMENTS FOR DIVIDEND RELEVANCE

Miller and Modigliani's assertion that dividend policy was irrelevant sounded radical when first proposed. The prevailing wisdom at the time was that payout policy could improve the value of the firm and therefore had relevance. The key argument in support of **dividend relevance theory** is attributed to Myron J. Gordon and John Lintner,[3] who suggest that there is, in fact, a direct relationship between the firm's dividend policy and its market value. Fundamental to this proposition is their **bird-in-the-hand argument**, which suggests that investors see current dividends as less risky than future dividends or capital gains: "A bird in the hand is worth two in the bush." Gordon and Lintner argue that current dividend payments reduce investor uncertainty, causing investors to discount the firm's earnings at a lower rate and, all else being equal, to place a higher value on the firm's stock. Conversely, if firms reduce or do not pay dividends, investor uncertainty will increase, raising the required return and lowering the stock's value.

dividend relevance theory
The theory, advanced by Gordon and Lintner, that there is a direct relationship between a firm's dividend policy and its market value.

bird-in-the-hand argument
The belief, in support of dividend relevance theory, that investors see current dividends as less risky than future dividends or capital gains.

Miller and Modigliani argued that the bird-in-the-hand theory was a fallacy. They said that investors who want immediate cash flow from a firm that did not pay dividends could simply sell off a portion of their shares. Remember that the

3. Myron J. Gordon, "Optimal investment and financing policy," *Journal of Finance* 18 (May 1963), pp. 264–272; and John Lintner, "Dividends, earnings, leverage, stock prices, and the supply of capital to corporations," *Review of Economics and Statistics* 44 (August 1962), pp. 243–269.

stock price of a firm that retains earnings should rise over time as cash builds up inside the firm. By selling a few shares every quarter or every year, investors could, according to Miller and Modigliani, replicate the same cash flow stream that they would have received if the firm had paid dividends rather than retaining earnings. In other words, investors could create their own "homemade dividends" if firms chose not to pay dividends.

Studies have shown that large changes in dividends do affect share price. Increases in dividends result in higher share price, and decreases in dividends result in lower share price. One interpretation of this evidence is that what matters is not the dividends per se but rather the **informational content** of dividends with respect to future earnings. In other words, investors view a change in dividends, up or down, as a *signal* that management expects future earnings to change in the same direction. Investors view an increase in dividends as a *positive signal*, and they bid up the share price. They view a decrease in dividends as a *negative signal* that causes investors to sell their shares, resulting in the share price decreasing.

informational content
The information provided by the dividends of a firm with respect to future earnings, which causes owners to bid up or down the price of the firm's stock.

Another argument supporting the idea that dividends can affect the value of the firm is the *agency cost theory*. Recall that agency costs are costs that arise due to the separation between the firm's owners and its managers. Managers sometimes have different interests than owners do. Managers may want to retain earnings simply to increase the size of the firm's asset base. Greater prestige and perhaps higher compensation are associated with running a larger firm. Shareholders are aware of the temptations that managers face, and they worry that retained earnings may not be invested wisely. The *agency cost theory* says that a firm that commits to paying dividends is reassuring shareholders that managers will not waste their money. Given this reassurance, investors will pay higher prices for firms promising regular dividend payments.

Although many other arguments related to dividend relevance have been put forward, empirical studies have not provided evidence that conclusively settles the debate about whether and how payout policy affects the firm's value. As we have already said, even if dividend policy really matters, it may be less important than other decisions that financial managers make, such as the decision to invest in a large new project or the decision about what combination of debt and equity the firm should use to finance its operations. Still, most financial managers today, especially those running large corporations, believe that payout policy can affect the value of the firm.

→ REVIEW QUESTIONS MyLab Finance Solutions

13–7 Does following the residual theory of dividends lead to a stable dividend? Is this approach consistent with dividend relevance?

13–8 Contrast the basic arguments about dividend policy advanced by Miller and Modigliani and by Gordon and Lintner.

LG3

13.4 Factors Affecting Dividend Policy

dividend policy
The plan of action to be followed whenever the firm makes a dividend decision.

The **dividend policy** represents a plan of action to be followed whenever the firm makes a dividend decision. Firms develop policies consistent with their goals. Before we review some popular types of dividend policies, we discuss five factors that firms consider in establishing a dividend policy. They are legal constraints,

contractual constraints, the firm's growth prospects, owner considerations, and market considerations.

LEGAL CONSTRAINTS

Most states prohibit corporations from paying out as cash dividends any portion of the firm's "legal capital," which is typically measured by the par value of common stock. Other states define legal capital to include not only the par value of the common stock but also any paid-in capital in excess of par. These *capital impairment restrictions* are generally established to provide a sufficient equity base to protect creditors' claims. An example will clarify the differing definitions of capital.

EXAMPLE 13.4

The stockholders' equity account of Miller Flour Company, a large grain processor, is presented in the following table.

Miller Flour Company
Stockholders' Equity

Common stock at par	$100,000
Paid-in capital in excess of par	200,000
Retained earnings	140,000
Total stockholders' equity	$440,000

In states where the firm's legal capital is defined as the par value of its common stock, the firm could pay out $340,000 ($200,000 + $140,000) in cash dividends without impairing its capital. In states where the firm's legal capital includes all paid-in capital, the firm could pay out only $140,000 in cash dividends.

Firms sometimes impose an earnings requirement limiting the amount of dividends. With this restriction, the firm cannot pay more in cash dividends than the sum of its most recent and past retained earnings. However, *the firm is not prohibited from paying more in dividends than its current earnings.*[4]

EXAMPLE 13.5

Assume that Miller Flour Company, from the preceding example, in the year just ended has $30,000 in earnings available for common stock dividends. As the table in Example 13.4 indicates, the firm has past retained earnings of $140,000. Thus, it can legally pay dividends of up to $170,000.

If a firm has overdue liabilities or is legally insolvent or bankrupt, most states prohibit it from paying cash dividends. In addition, the Internal Revenue Service

4. A firm that has an operating loss in the current period can still pay cash dividends as long as sufficient retained earnings against which to charge the dividend are available and, of course, as long as it has the cash with which to make the payments.

prohibits firms from accumulating earnings to reduce the owners' taxes. If the IRS can determine that a firm has accumulated an excess of earnings to allow owners to delay paying ordinary income taxes on dividends received, it may levy an **excess earnings accumulation tax** on any retained earnings above $250,000 for most businesses.

excess earnings accumulation tax
The tax the IRS levies on retained earnings above $250,000 for most businesses when it determines that the firm has accumulated an excess of earnings to allow owners to delay paying ordinary income taxes on dividends received.

During the recent financial crisis, a number of financial institutions received federal financial assistance. Those firms had to agree to restrictions on dividend payments to shareholders until they repaid the money they received from the government. Bank of America, for example, had more than 30 years of consecutive dividend increases before accepting federal bailout money. As part of its bailout, Bank of America had to cut dividends to $0.01 per share. Even in the absence of a crisis, financial institutions may face limits on dividend payments if regulators deem that such payments would reduce an institution's equity capital below an acceptable level. Utility companies also face regulatory constraints on their dividend payouts.

CONTRACTUAL CONSTRAINTS

Often, the firm's ability to pay cash dividends is constrained by restrictive provisions in a loan agreement. Generally, these constraints prohibit the payment of cash dividends until the firm achieves a certain level of earnings, or they may limit dividends to a certain dollar amount or percentage of earnings. Constraints on dividends help to protect creditors from losses due to the firm's insolvency.

GROWTH PROSPECTS

The firm's financial requirements are directly related to how much it expects to grow and what assets it will need to acquire. It must evaluate its profitability and risk to develop insight into its ability to raise capital externally. In addition, the firm must determine the cost and speed with which it can obtain financing. Generally, a large, mature firm has adequate access to new capital, whereas a rapidly growing firm may not have sufficient funds available to support its acceptable projects. A growth firm likely has to depend heavily on internal financing through retained earnings, so it is likely to pay out only a very small percentage of its earnings as dividends. A more established firm is in a better position to pay out a large proportion of its earnings, particularly if it has ready sources of financing.

OWNER CONSIDERATIONS

The firm must establish a policy that has a favorable effect on the wealth of its owners. One consideration is the tax status of a firm's owners. If a firm has a large percentage of wealthy stockholders who have sizable incomes, it may decide to pay out a lower percentage of its earnings to allow the owners to delay the payment of taxes until they sell the stock. Because cash dividends are taxed at the same rate as capital gains (as a result of the 2003 and 2012 Tax Acts), this strategy benefits owners through the tax deferral rather than as a result of a lower tax rate. Lower-income shareholders, however, who need dividend income, will prefer a higher payout of earnings.

A second consideration is the owners' investment opportunities. A firm should not retain funds for investment in projects yielding lower returns than the owners could obtain from external investments of equal risk. If it appears that the owners have better opportunities externally, the firm should pay out a higher percentage of its earnings. If the firm's investment opportunities are at least as good as similar-risk external investments, a lower payout is justifiable.

A final consideration is the potential dilution of ownership. If a firm pays out a high percentage of earnings, new equity capital will have to be raised with common stock. The result of a new stock issue may be dilution of both control and earnings for the existing owners. By paying out a low percentage of its earnings, the firm can minimize the possibility of such dilution.

MARKET CONSIDERATIONS

catering theory
A theory that says firms cater to the preferences of investors, initiating or increasing dividend payments during periods in which high-dividend stocks are particularly appealing to investors.

One of the more recent theories proposed to explain firms' payout decisions is called the *catering theory*. According to the **catering theory**, investors' demands for dividends fluctuate over time. For example, during an economic boom accompanied by a rising stock market, investors may be more attracted to stocks that offer prospects of large capital gains. When the economy is in recession and the stock market is falling, investors may prefer the security of a dividend. The catering theory suggests that firms are more likely to initiate dividend payments or to increase existing payouts when investors exhibit a strong preference for dividends. Firms *cater to* the preferences of investors.

→ REVIEW QUESTION MyLab Finance Solution

13–9 What five factors do firms consider in establishing dividend policy? Briefly describe each of them.

LG4 13.5 Types of Dividend Policies

The firm must formulate its dividend policy with two objectives in mind: providing for sufficient financing and maximizing the wealth of the firm's owners. Three different dividend policies are described in the following sections. A particular firm's dividend policy may incorporate elements of each.

dividend payout ratio
Indicates the percentage of each dollar earned that a firm distributes to the owners in the form of cash. It is calculated by dividing the firm's cash dividend per share by its earnings per share.

constant-payout-ratio dividend policy
A dividend policy based on the payment of a certain percentage of earnings to owners in each dividend period.

CONSTANT-PAYOUT-RATIO DIVIDEND POLICY

One type of dividend policy involves the use of a constant payout ratio. The **dividend payout ratio** indicates the percentage of each dollar earned that the firm distributes to the owners in the form of cash. It equals the firm's cash dividend per share divided by its earnings per share. With a **constant-payout-ratio dividend policy**, the firm pays a certain percentage of earnings to owners in each dividend period.

The problem with this policy is that if the firm's earnings drop or if a loss occurs in a given period, the dividends may be low or even nonexistent. Because dividends are often considered an indicator of the firm's future condition and status, the firm's stock price may be adversely affected.

EXAMPLE 13.6

Peachtree Industries, a miner of potassium, has a policy of paying out 40% of earnings in cash dividends. In periods when a loss occurs, the firm's policy is to pay no cash dividends. Data on Peachtree's earnings, dividends, and average stock prices for the past 6 years follow.

Year	Earnings/share	Dividends/share	Average price/share
2019	−$0.50	$0.00	$42.00
2018	3.00	1.20	52.00
2017	1.75	0.70	48.00
2016	−1.50	0.00	38.00
2015	2.00	0.80	46.00
2014	4.50	1.80	50.00

Dividends increased in 2017 and in 2018 but decreased in the other years. In years of decreasing dividends, the firm's stock price dropped; when dividends increased, the price of the stock increased. Peachtree's sporadic dividend payments appear to make its owners uncertain about the returns they can expect.

REGULAR DIVIDEND POLICY

regular dividend policy
A dividend policy based on the payment of a fixed-dollar dividend in each period.

The **regular dividend policy** is based on the payment of a fixed-dollar dividend in each period. Often, firms that use this policy increase the regular dividend once a *sustainable* increase in earnings has occurred. Under this policy, dividends are almost never decreased.

EXAMPLE 13.7

The dividend policy of Woodward Laboratories, a producer of a popular artificial sweetener, is to pay annual dividends of $1.00 per share until per-share earnings have exceeded $4.00 for 3 consecutive years. At that point, the annual dividend is raised to $1.50 per share, and a new earnings plateau is established. The firm does not anticipate decreasing its dividend unless its liquidity is in jeopardy. Data for Woodward's earnings, dividends, and average stock prices for the past 12 years follow.

Year	Earnings/share	Dividends/share	Average price/share
2019	$4.50	$1.50	$47.50
2018	3.90	1.50	46.50
2017	4.60	1.50	45.00
2016	4.20	1.00	43.00
2015	5.00	1.00	42.00
2014	2.00	1.00	38.50
2013	6.00	1.00	38.00
2012	3.00	1.00	36.00
2011	0.75	1.00	33.00
2010	0.50	1.00	33.00
2009	2.70	1.00	33.50
2008	2.85	1.00	35.00

Whatever the level of earnings, Woodward Laboratories paid dividends of $1.00 per share through 2016. In 2017, the dividend increased to $1.50 per share because earnings in excess of $4.00 per share had been achieved for 3 years. In 2017, the firm also had to establish a new earnings plateau for further dividend increases. Woodward Laboratories' average price per share exhibited a stable, increasing behavior in spite of a somewhat volatile pattern of earnings.

target dividend-payout ratio
A dividend policy under which the firm attempts to pay out a certain percentage of earnings as a stated dollar dividend and adjusts that dividend toward a target payout as proven earnings increases occur.

Often, a regular dividend policy is built around a **target dividend-payout ratio.** Under this policy, the firm attempts to pay out a certain *percentage* of earnings, but rather than let dividends fluctuate, it pays a stated dollar dividend and adjusts that dividend toward the target payout as proven earnings increases occur. For instance, Woodward Laboratories appears to have a target payout ratio of around 35%. The payout was about 35% ($1.00 ÷ $2.85) when the dividend policy was set in 2008, and when the dividend was raised to $1.50 in 2017, the payout ratio was about 33% ($1.50 ÷ $4.60).

LOW-REGULAR-AND-EXTRA DIVIDEND POLICY

low-regular-and-extra dividend policy
A dividend policy based on paying a low regular dividend, supplemented by an additional ("extra") dividend when earnings are higher than normal in a given period.

extra dividend
An additional dividend optionally paid by the firm when earnings are higher than normal in a given period.

Some firms establish a **low-regular-and-extra dividend policy,** paying a low regular dividend, supplemented by an additional ("extra") dividend when earnings are higher than normal in a given period. By calling the additional dividend an **extra dividend**, the firm avoids setting expectations that the dividend increase will be permanent. This policy is especially common among companies that experience cyclical shifts in earnings.

By establishing a low regular dividend that is paid each period, the firm gives investors the stable income necessary to build confidence in the firm, and the extra dividend permits them to share in the earnings from an especially good period. Firms using this policy may raise the level of the regular dividend once proven increases in earnings have been achieved. The extra dividend should not be a regular event; otherwise, investors will begin to see it as part of the regular dividend paid by the firm and react to cuts in the extra dividend by reducing the share price.

→ REVIEW QUESTION MyLab Finance Solution

13–10 Describe a constant-payout-ratio dividend policy, a regular dividend policy, and a low-regular-and-extra dividend policy. What are the effects of these policies?

LG5 LG6

13.6 Other Forms of Dividends

Two common transactions that bear some resemblance to cash dividends are stock dividends and stock splits. Although the stock dividends and stock splits are closely related to each other, their economic effects are quite different from those of cash dividends or share repurchases. Whereas cash dividends and repurchases fundamentally transfer money from the firm to investors, the effects of stock dividends and stock splits are mostly cosmetic.

STOCK DIVIDENDS

stock dividend
The payment, to existing owners, of a dividend in the form of stock.

A **stock dividend** is the payment, to existing owners, of a dividend in the form of stock. Often firms pay stock dividends as a replacement for or a supplement to cash dividends. In a stock dividend, investors simply receive additional shares in proportion to the shares they already own. No cash is distributed, and no real value is transferred from the firm to investors. Instead, because the number of outstanding shares increases, the stock price declines roughly in line with the amount of the stock dividend.

Accounting Aspects

small (ordinary) stock dividend
A stock dividend representing less than 20% to 25% of the common stock outstanding when the dividend is declared.

In an accounting sense, the payment of a stock dividend is a shifting of funds between stockholders' equity accounts rather than an outflow of funds. When a firm declares a stock dividend, the procedures for announcement and distribution are the same as those described earlier for a cash dividend. The accounting entries associated with the payment of a stock dividend vary depending on its size. A **small (ordinary) stock dividend** is a stock dividend that represents less than 20% to 25% of the common stock outstanding when the dividend is declared. Small stock dividends are most common.

EXAMPLE 13.8

The current stockholders' equity on the balance sheet of Garrison Corporation, a distributor of prefabricated cabinets, is as shown in the following accounts.

Preferred stock	$300,000
Common stock (100,000 shares at $4 par)	$400,000
Paid-in capital in excess of par	$600,000
Retained earnings	$700,000
Total stockholders' equity	$2,000,000

Garrison, which has 100,000 shares of common stock outstanding, declares a 10% stock dividend when the market price of its stock is $15 per share. When Garrison issues 10,000 new shares (10% of 100,000) at the prevailing market price of $15 per share, it shifts $150,000 ($15 per share × 10,000 shares) from retained earnings to the common stock and paid-in capital accounts. Garrison adds a total of $40,000 ($4 par × 10,000 shares) to common stock, and it adds the remaining $110,000 [($15 − $4) × 10,000 shares] to the paid-in capital in excess of par. The resulting account balances are as follows:

Preferred stock	$300,000
Common stock (110,000 shares at $4 par)	$440,000
Paid-in capital in excess of par	$710,000
Retained earnings	$550,000
Total stockholders' equity	$2,000,000

The firm's total stockholders' equity has not changed; the company has merely shifted funds among stockholders' equity accounts.

Shareholder's Viewpoint

The shareholder receiving a stock dividend typically receives nothing of value. After the firm pays the dividend, the per-share value of the shareholder's stock decreases in proportion to the dividend in such a way that the market value of his or her total holdings in the firm remains unchanged. Therefore, stock dividends are usually nontaxable. The shareholder's proportion of ownership in the firm also remains the same, and *as long as the firm's earnings remain unchanged,* so does the dollar value of his or her share of total earnings. (However, if the firm's earnings and cash dividends increase when the stock dividend is issued, an increase in share value is likely to result.)

EXAMPLE 13.9

Ms. Xu owned 10,000 shares of Garrison Corporation's stock. The company's recent earnings were $220,000, and they are not expected to change in the near future. Before the stock dividend, Ms. Xu owned 10% (10,000 shares ÷ 100,000 shares) of the firm's stock, which was selling for $15 per share. Earnings per share were $2.20 ($220,000 ÷ 100,000 shares). Because Ms. Xu owned 10,000 shares, her stock represented a claim against Garrison's earnings of $22,000 ($2.20 per share × 10,000 shares). After receiving the 10% stock dividend, Ms. Xu has 11,000 shares, which again is 10% of the ownership (11,000 shares ÷ 110,000 shares). The market price of the stock should drop to $13.64 per share [$15 × (1.00 ÷ 1.10)], which means that the market value of Ms. Xu's holdings is $150,000 (11,000 shares × $13.64 per share). This is the same as the initial value of her holdings (10,000 shares × $15 per share). The future earnings per share drops to $2 ($220,000 ÷ 110,000 shares) because the same $220,000 in earnings must now be divided among 110,000 shares. Because Ms. Xu still owns 10% of the stock, her share of total earnings is still $22,000 ($2 per share × 11,000 shares).

In summary, if the firm's earnings remain constant and total cash dividends do not increase, a stock dividend results in a lower per-share market value for the firm's stock.

The Company's Viewpoint

Stock dividends are more costly to issue than cash dividends, but certain advantages may outweigh these costs. Firms find the stock dividend to be a way to give owners something without having to use cash. Generally, when a firm needs to preserve cash to finance rapid growth, it uses a stock dividend. When the stockholders recognize that the firm is reinvesting the cash flow to maximize future earnings, the market value of the firm should at least remain unchanged. However, if the stock dividend is paid to retain cash for satisfying past-due bills, a decline in market value may result.

STOCK SPLITS

stock split
A method commonly used to lower the market price of a firm's stock by increasing the number of shares belonging to each shareholder.

Although not a type of dividend, *stock splits* have an effect on a firm's share price similar to that of stock dividends. A **stock split** is a method firms use to lower the market price of their stock by increasing the number of shares belonging to each shareholder. In a 2-for-1 split, for example, the firm exchanges two new shares for each old share. The result is that each new share is worth about

half the value of each old share. A stock split has no effect on the firm's capital structure and is usually nontaxable.

Quite often, a firm believes that its stock is priced too high and that lowering the market price will enhance trading activity. Stock splits are often made prior to issuing additional stock to enhance that stock's marketability and stimulate market activity. Firms often increase dividends and announce other important news at the same time that they split their stock, so the total market value of the firm may rise slightly after a split.[5]

EXAMPLE 13.10

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Delphi Company, a forest products concern, had 200,000 shares of $2-par-value common stock and no preferred stock outstanding. Because the stock is selling at a high market price, the firm has declared a 2-for-1 stock split. The total before- and after-split stockholders' equity is shown in the following table.

Before split		After 2-for-1 split	
Common stock		**Common stock**	
(200,000 shares at $2 par)	$ 400,000	(400,000 shares at $1 par)	$ 400,000
Paid-in capital in excess of par	4,000,000	Paid-in capital in excess of par	4,000,000
Retained earnings	2,000,000	Retained earnings	2,000,000
Total stockholders' equity	$6,400,000	Total stockholders' equity	$6,400,000

The insignificant effect of the stock split on the firm's books is obvious.

reverse stock split
A method used to raise the market price of a firm's stock by exchanging a certain number of outstanding shares for one new share.

Usually firms splitting their stock increase the number of shares outstanding, but sometimes firms engage in a **reverse stock split** in which more than one outstanding share is exchanged for one new share. For example, in a 1-for-3 split, a firm replaces three outstanding shares with one new share. In a reverse stock split, the firm's stock price rises due to the reduction in shares outstanding. Firms may conduct a reverse split if their stock price is getting so low that the exchange where the stock trades threatens to delist the stock. For example, the New York Stock Exchange requires that the average closing price of a listed security must be no less than $1 over any consecutive 30-day trading period. In June 2017, Xerox conducted a 1-for-4 reverse split of its stock, largely because the company had divested a large part of its existing business in a spinoff—a transaction that used significant assets of Xerox to create a new, independent company called Conduent. That transaction essentially divided the prior value of Xerox into two pieces, and the result was a sharp decline in the price of Xerox stock (which for Xerox shareholders was offset by the value of the new shares in Conduent that they received after the spinoff). Xerox managers believed that by conducting a reverse split, they would increase the price of Xerox stock to a level that would make it more liquid and therefore more attractive to investors.

5. Eugene F. Fama, Lawrence Fisher, Michael C. Jensen, and Richard Roll, "The adjustment of stock prices to new information," *International Economic Review* 10 (February 1969), pp. 1–21, found that the stock price increases before the split announcement and that the increase in stock price is maintained if dividends per share are increased but is lost if dividends per share are *not* increased, following the split.

PERSONAL FINANCE EXAMPLE 13.11 Shakira Washington, a single investor in the 24% federal income tax bracket, owns 260 shares of Advanced Technology Inc., common stock. She originally bought the stock 2 years ago at its initial public offering (IPO) price of $9 per share. The stock of this fast-growing technology company is currently trading for $60 per share, so the current value of her Advanced Technology stock is $15,600 (260 shares × $60 per share). Because the firm's board believes that the stock would trade more actively in the $20 to $30 price range, it just announced a 3-for-1 stock split. Shakira wishes to determine the impact of the stock split on her holdings and taxes.

Because the stock will split 3 for 1, after the split Shakira will own 780 shares (3 × 260 shares). She should expect the market price of the stock to drop to $20 (1/3 × $60) immediately after the split; the value of her after-split holding will be $15,600 (780 shares × $20 per share). Because the $15,600 value of her after-split holdings in Advanced Technology stock exactly equals the before-split value of $15,600, Shakira has experienced neither a gain nor a loss on the stock as a result of the 3-for-1 split. Even if there were a gain or loss attributable to the split, Shakira would not have any tax liability unless she actually sold the stock and realized that (or any other) gain or loss.

→ REVIEW QUESTIONS MyLab Finance Solutions

13–11 Why do firms issue stock dividends? Comment on the following statement: "I have a stock that promises to pay a 20% stock dividend every year, and therefore it guarantees that I will break even in 5 years."

13–12 Compare a stock split with a stock dividend.

SUMMARY

FOCUS ON VALUE

Payout policy refers to the cash flows that a firm distributes to its common stockholders through share repurchases and dividends. A share of common stock gives its owner the right to receive all future dividends. The present value of all those future dividends determines the firm's stock value.

Corporate payouts not only represent cash flows to shareholders but also contain useful information about the firm's current and future performance. Such information affects the shareholders' perception of the firm's risk. A firm can also pay stock dividends or initiate stock splits. Although those transactions are largely cosmetic, they can influence a firm's value if they convey new information about the firm to investors.

Although the theory of relevance of dividends is still evolving, the behavior of most firms and stockholders suggests that dividend policy affects share prices. Therefore, financial managers try to develop and implement dividend policy that is consistent with the firm's goal of **maximizing stock price.**

REVIEW OF LEARNING GOALS

LG1 **Understand cash payout procedures, their tax treatment, and the role of dividend reinvestment plans.** The board of directors makes the cash payout decision and, for dividends, establishes the record and payment dates. As a result of tax-law changes, investors pay taxes on corporate dividends at a maximum rate of 23.8%. Some firms offer dividend reinvestment plans that allow stockholders to acquire shares in lieu of cash dividends.

LG2 **Describe the residual theory of dividends and the key arguments with regard to dividend irrelevance and relevance.** The residual theory suggests that dividends should be viewed as the earnings left after all acceptable investment opportunities have been undertaken. Miller and Modigliani argue in favor of dividend irrelevance, using a perfect world in which market imperfections such as transaction costs and taxes do not exist. Gordon and Lintner advance the theory of dividend relevance, basing their argument on the uncertainty-reducing effect of dividends, supported by their bird-in-the-hand argument. Empirical studies fail to provide clear support of dividend relevance. Even so, the actions of financial managers and stockholders tend to support the belief that dividend policy does affect stock value.

LG3 **Discuss the key factors involved in establishing a dividend policy.** A firm's dividend policy should provide for sufficient financing and maximize stockholders' wealth. Dividend policy is affected by legal and contractual constraints, by growth prospects, and by owner and market considerations. Legal constraints prohibit corporations from paying out as cash dividends any portion of the firm's "legal capital," nor can firms with overdue liabilities and legally insolvent or bankrupt firms pay cash dividends. Contractual constraints result from restrictive provisions in the firm's loan agreements. Growth prospects affect the relative importance of retaining earnings rather than paying them out in dividends. The tax status of owners, the owners' investment opportunities, and the potential dilution of ownership are important owner considerations. Finally, market considerations are related to the stockholders' preference for the continuous payment of fixed or increasing streams of dividends.

LG4 **Review and evaluate the three basic types of dividend policies.** With a constant-payout-ratio dividend policy, the firm pays a fixed percentage of earnings to the owners each period; dividends move up and down with earnings, and no dividend is paid when a loss occurs. Under a regular dividend policy, the firm pays a fixed-dollar dividend each period; it increases the amount of dividends only after a proven increase in earnings. The low-regular-and-extra dividend policy is similar to the regular dividend policy except that it pays an extra dividend when the firm's earnings are higher than normal.

LG5 **Evaluate stock dividends from accounting, shareholder, and company points of view.** Firms may pay stock dividends as a replacement for or supplement to cash dividends. The payment of stock dividends involves a shifting of funds between capital accounts rather than an outflow of funds. Stock dividends do not change the market value of stockholders' holdings, proportion of ownership, or share of total earnings. Therefore, stock dividends are usually

nontaxable. However, stock dividends may satisfy owners and enable the firm to preserve its market value without having to use cash.

LG6 **Explain stock splits and the firm's motivation for undertaking them.** Stock splits are used to enhance trading activity of a firm's shares by lowering or raising their market price. A stock split merely involves accounting adjustments; it has no effect on the firm's cash or on its capital structure and is usually nontaxable.

To retire outstanding shares, firms can repurchase stock in lieu of paying a cash dividend. Reducing the number of outstanding shares increases earnings per share and the market price per share. Stock repurchases also defer the tax payments of stockholders.

SELF-TEST PROBLEM (Solutions in Appendix)

LG6 **ST13–1** **Stock repurchase** The Off-Shore Steel Company has earnings available for common stockholders of $2 million and has 500,000 shares of common stock outstanding at $60 per share. The firm is currently contemplating the payment of $2 per share in cash dividends.

a. Calculate the firm's current earnings per share (EPS) and price/earnings (P/E) ratio.
b. If the firm can repurchase stock at $62 per share, how many shares can be purchased in lieu of making the proposed cash dividend payment?
c. How much will the EPS be after the proposed repurchase? Why?
d. If the stock sells at the old P/E ratio, what will the market price be after repurchase?
e. Compare and contrast the earnings per share before and after the proposed repurchase.
f. Compare and contrast the stockholders' position under the dividend and repurchase alternatives.

WARM-UP EXERCISES Select problems are available in MyLab Finance.

LG1 **E13–1** Royal Mail Group, a British postal services provider, pays regular dividends. It declared a dividend of £0.077 per share for its shareholders on record on December 7. The Group has 1 million shares outstanding and will pay the dividend on the January 8. How much cash is needed to pay the dividend? When will the stock begin selling ex dividend?

LG2 **E13–2** Staff Excellence Enterprises identified two independent projects to enhance staff training programs. The investments would require financing of $750,000 and $980,800, respectively. Retained earnings are $1.3 million, and the firm has a capital structure with 40% debt and 60% equity. What dividends, if any, can be paid out by applying the residual theory? Calculate the resulting dividend payout ratio.

LG 3

E13–3 Legal & General, an insurance company, has the following stockholders' equity account:

Common stock (5,871,000 shares at £1 par)	£5,871,000
Paid-in capital in excess of par	£4,000,000
Retained earnings	£550,000
Total stockholders' equity	£10,421,000

Assuming that laws and regulators in the United Kingdom define legal capital solely as the par value of common stock, how much of a per-share dividend can Legal & General pay? If legal capital was more broadly defined, to include all paid-in capital, how much of a per-share dividend could Legal & General pay?

LG 4

E13–4 The board of Kopi Industries is considering a new dividend policy that would set dividends at 60% of earnings. The recent past has witnessed earnings per share (EPS) and dividends paid per share as shown in the following table.

Year	EPS	Dividend/share
2016	$1.75	$0.95
2017	1.95	1.20
2018	2.05	1.25
2019	2.25	1.30

Based on Kopi's historical dividend payout ratio, discuss whether a constant payout ratio of 60% would benefit shareholders.

LG 5

E13–5 Legal & General, with the equity account as described in E14-3, announces its plans to issue an additional 58,710 shares of common stock as part of its stock dividend plan. The current market price of Legal & General is £2.69 per share. Show how the proposed dividend would affect the stockholder's equity account.

PROBLEMS

Select problems are available in MyLab Finance. The MyLab icon indicates problems in Excel format available in MyLab Finance.

LG 1

P13–1 **Dividend payment procedures** At the quarterly dividend meeting, Perfect Frame Manufacturing declared a $2.00 per share dividend for the holders on record on Monday, March 10. The outstanding common stock is 250,000 shares. The dividend payment date was set as Monday, March 31. Prior to the dividend declaration, the firm's key accounts were as follows:

Cash	$650,000	Dividends payable	$0
		Retained earnings	2,000,000

a. When is the ex-dividend date?
b. Calculate the amount of dividend payable on March 31.
c. What values would the key accounts have after the March 31 payment date?
d. All other things being equal, what will happen to the stock price on the ex-dividend date?
e. What is the net effect of declaring and paying dividends on the total assets of Perfect Frame Manufacturing?

Personal Finance Problem

LG 1

P13–2 Dividend payment Sandra Gray owns 800 shares of Steel & Fittings Corporation. At the annual dividend meeting, a cash dividend of $1.05 was declared to be paid on September 30 to all the holders of record as at September 9.

a. What is the amount of the dividend Sandra would receive on September 30?
b. If Sandra increased her stockholding to 900 shares on September 10, what is the amount of the dividend she would receive on September 30?
c. What effect does declaring this dividend have on stock prices on September 7?
d. If Sandra sold 200 shares for a total of $1,000 on September 15, what is the amount of the dividend she would receive on September 30?

LG 2

P13–3 Residual dividend policy A new intern is trying to understand the dividend policy of your firm. Having studied dividend policies at university, the intern wonders why the firm chose its current dividend policy. The intern also wants to know how to estimate the dividend amount that you are likely to pay next year. You may not have all the information for the intern, but you do know the following:

(1) The firm follows a residual dividend policy.
(2) The total capital budget for next year is dependent on the outcome of a feasibility study, and will either be $1.5 million, $2.5 million, or $3.5 million.
(3) The forecasted level of potential retained earnings for next year is $2.2 million.
(4) The firm wants to maintain a debt ratio of 60%.

a. Describe the purpose of a residual dividend policy.
b. Calculate the expected amount of the dividend, if any, for each of the three capital budget amounts.
c. Explain why there are differences in the amounts of the dividend for the three capital budget amounts.

LG 3

P13–4 Dividend constraints Plastic Enterprises' stockholders' equity account is as follows:

Common stock (280,000 shares at $3.50 par)	$980,000
Paid-in capital in excess of par	$900,000
Retained earnings	$1,200,000
Total stockholders' equity	$3,080,000

The earnings available for the common stockholders are $280,000 and are included as part of the $1,200,000 retained earnings.

a. Calculate the maximum dividend per share that the firm can pay if the legal capital includes all paid-in capital.

b. Calculate the maximum dividend per share that the firm can pay if the legal capital includes only the value of the common stock.

c. If Plastic Enterprises has $25,000 in cash, what is the largest per-share dividend it can pay without borrowing, assuming legal capital includes all paid-in capital?

d. What is the purpose of capital impairment restrictions when developing a dividend policy?

LG 3

P13–5 Dividend constraints A firm has $800,000 in paid-in capital, retained earnings of $40,000 (including the current year's earnings), and 25,000 shares of common stock outstanding. In the current year, it has $29,000 of earnings available for the common stockholders.

a. What is the most the firm can pay in cash dividends to each common stockholder? (Assume that legal capital includes all paid-in capital.)

b. What effect would a cash dividend of $0.80 per share have on the firm's balance sheet entries?

c. If the firm cannot raise any new funds from external sources, what do you consider the key constraint with respect to the magnitude of the firm's dividend payments? Why?

LG 4

P13–6 Low-regular-and-extra dividend policy Cromwall Laboratories has a target payout ratio of 60%. However, the board realizes that adhering strictly to the payout ratio will cause the dividend payout to fluctuate. Therefore, the board has declared a regular dividend of $0.75 per share per year while paying extra cash dividends if funds are available. Earnings per share for the period 2015 to 2020 are shown in the following table.

Year	EPS	Year	EPS
2020	$3.50	2017	$2.40
2019	3.10	2016	2.35
2018	2.80	2015	1.95

a. Calculate the payout ratio for each year on the basis of the regular dividend payment and the EPS given.

b. For each year, what is the difference between the regular $0.75 dividend and a 60% payout?

c. Cromwall Laboratories decides to pay an extra dividend of $0.50 in years when the difference between the regular $0.75 dividend and the 60% payout is at least $0.70. Indicate the dividend payments and "extra" dividend payments, if any, for each year.

d. The company estimates future earnings per share will remain above $3.20 per share for most years. If the board wants to increase the regular dividend from $0.75 to $1.25, what factors should it consider before implementing the new regular dividend?

LG 4

P13–7 Alternative dividend policies Over the past 10 years, a firm has had the earnings per share shown in the following table.

Year	Earnings per share	Year	Earnings per share
2019	$4.00	2014	$2.40
2018	3.80	2013	1.20
2017	3.20	2012	1.80
2016	2.80	2011	−0.50
2015	3.20	2010	0.25

a. If the firm's dividend policy were based on a constant payout ratio of 40% for all years with positive earnings and 0% otherwise, what would be the annual dividend for each year?

b. If the firm had a dividend payout of $1.00 per share, increasing by $0.10 per share whenever the dividend payout fell below 50% for 2 consecutive years, what annual dividend would the firm pay each year?

c. If the firm's policy were to pay $0.50 per share each period except when earnings per share exceed $3.00, when an extra dividend equal to 80% of earnings beyond $3.00 would be paid, what annual dividend would the firm pay each year?

d. Discuss the pros and cons of each dividend policy described in parts **a** through **c.**

LG 4

P13–8 Alternative dividend policies Steel Enterprises' earnings per share for the period 2013–2020 are summarized in the table below. Use this information to calculate the dividends per share for each of the years and scenarios presented in parts **a** through **d.**

Year	Earnings per share
2020	$2.40
2019	2.00
2018	1.79
2017	−0.95
2016	1.64
2015	1.28
2014	1.01
2013	0.86

a. For positive earnings only, pay out 40% of earnings.

b. Pay $0.75 per share and increase to $0.85 per share when earnings per share exceed $1.60 per share.

c. Pay $0.75 per share and pay an extra dividend of $0.50 per share when the earnings per share exceed $1.60.

d. Pay $0.75 per share and pay an extra dividend of 50% of earnings above $1.50 per share.

e. Compare each of the dividend policies described in parts **a** through **d.**

LG 5

P13–9 **Stock dividend: Firm** The stockholders' equity account for Paper Manufacturers is shown below. The firm's common stock has a current market price of $20 per share.

Preferred stock	$100,000
Common stock (120,000 shares at $4 par)	$480,000
Paid-in capital in excess of par	$1,920,000
Retained earnings	$360,000
Total stockholders' equity	$2,860,000

a. How will the stockholders' equity account change if Paper Manufacturers pays a 5% stock dividend?
b. How will the stockholders' equity account change if Paper Manufacturers pays (1) a 10%, and (2) a 15% stock dividend?
c. What are the effects of stock dividends on stockholders' equity?

LG 5

P13–10 **Cash versus stock dividend** Luxottica, an Italian eyewear company, has the following stockholders' equity account. The firm's common stock currently sells for €40 per share.

Preferred stock	€1,000,000
Common stock (100,000 shares at €20 par)	€2,000,000
Paid-in capital in excess of par	€5,000,000
Retained earnings	€850,000
Total stockholders' equity	€8,850,000

a. Show the effects on the firm of a cash dividend of €0.1, €0.5, €1,0 and €2.0 per share.
b. Show the effects on the firm of a 1%, 5%, 10% and 20% stock dividend.
c. Compare the effects in parts **a** and **b.** What are the most significant differences between the two methods of paying dividends?

Personal Finance Problem

LG 5

P13–11 **Stock dividend: Investor** John McKay holds 500 common shares of Smart Life Corporation. The corporation has 50,000 shares outstanding. The current price per share is $25. Smart Life Corporation has reported earnings available to common stockholders of $220,000. The firm intends to retain its earnings and pay a 10% stock dividend.
a. Calculate the current earnings per share.
b. What is John's percentage of ownership of Smart Life Corporation before the stock dividend?
c. What is John's percentage of ownership of Smart Life Corporation after the stock dividend?
d. What do you expect the market price of the stock to be after the stock dividend?

Personal Finance Problem

LG 5 MyLab

P13–12 **Stock dividend: Investor** Security Data Company has outstanding 50,000 shares of common stock currently selling at $40 per share. The firm most recently had earnings available for common stockholders of $120,000, but it has decided to retain these funds and is considering either a 5% or a 10% stock dividend in lieu of a cash dividend.

a. Determine the firm's current earnings per share.
b. If Sam Waller currently owns 500 shares of the firm's stock, determine his proportion of ownership currently and under each of the proposed stock dividend plans. Explain your findings.
c. Calculate and explain the market price per share under each of the stock dividend plans.
d. For each of the proposed stock dividends, calculate the earnings per share after payment of the stock dividend.
e. What is the value of Sam's holdings under each of the plans? Explain.
f. Should Sam have any preference with respect to the proposed stock dividends? Why or why not?

LG 6

P13–13 **Stock split: Firm** The stockholders' equity account of Paper Weight Company is as follows:

Preferred stock	$300,000
Common stock (200,000 shares at $5 par)	$1,000,000
Paid-in capital in excess of par	$500,000
Retained earnings	$820,000
Total stockholders' equity	$2,620,000

a. How will the stockholders' equity account change if Paper Weight Company declares a 2-for-1 stock split?
b. How will the stockholders' equity account change if Paper Weight Company declares a 1-for-2 reverse stock split?
c. Indicate the change, if any, expected if the firm declares a 3-for-1 stock split.
d. How will the stockholders' equity account change if Paper Weight Company declares a 1-for-4 reverse stock split?
e. Discuss your observations based on your answers in parts **a** to **d.**

Personal Finance Problem

LG 6

P13–14 **Stock splits** Brembo, an Italian automotive braking-systems supplier, announced that it was going to split the stock 5-for-1. Brambilla Fumagalli owns 100 shares of the company, which he had purchased for €40 per share years ago. Just before the stock split, Brembo's shares were trading for €64.

Answer the following questions about the impact of the stock split on Brambilla's holdings and taxes. He is in the 23% tax bracket.

a. How many shares of Brembo will Brambilla own after the stock split?
b. Immediately after the split, what do you expect the value of Brembo to be?
c. Compare the total value of Brambilla's stock holdings before and after the split, given that the price of Brembo stock immediately after the split was €12.8. What do you find?
d. Does Brambilla experience a gain or loss on the stock as a result of the 5-for-1 split?
e. What is Brambilla's tax liability from the event?

LG 5 LG 6

P13–15 **Stock split versus stock dividend** Distilled Water Corporation is a company specializing in water purification and distributing bottled water to retailers. The

corporation is considering a 3-for-2 stock split. The current stock price is $25 per share. The stockholders' equity account is as follows:

Preferred stock	$500,000
Common stock (150,000 shares at $6 par)	$900,000
Paid-in capital in excess of par	$2,850,000
Retained earnings	$760,000
Total stockholders' equity	$5,010,000

a. What changes will occur in the stockholders' equity account from the 3-for-2 stock split?
b. What change would you expect in the stock price as a result of the stock split?
c. Calculate the maximum cash dividend per share that the firm could pay on common stock before and after the stock split, assuming that legal capital includes all paid-in capital.
d. A stockholder owns 200 shares. Based on the maximum dividends payable (see part **c**), would the stockholder prefer the 3-for-2 stock split?
e. Differentiate between stock splits and stock dividends.

LG5 LG6

P13–16 **Stock dividend versus stock split: Firm** The board of Diamantis Masoutis S.A. is considering increasing the number of shares, and making the price more appealing to investors. It is considering either a 30% stock dividend or a 2-for-1 stock split. Currently the firm's equity account and other per-share information are as follows:

Preferred stock	€100,000
Common stock (50,000 shares at €2 par)	€100,000
Paid-in capital in excess of par	€400,000
Retained earnings	€300,000
Total stockholders' equity	€900,000
Price per share	€15.00
Earnings per share	€2.50
Dividend per share	€1.20

a. Show the effect on the equity accounts and per-share data of a 30% stock dividend.
b. Show the effect on the equity accounts and per-share data of a 2-for-1 stock split.
c. Which option is going to accomplish Masoutis' goal of reducing the current stock price while maintaining a stable level of retained earnings?
d. What legal constraints might encourage the firm to choose a stock split over a stock dividend?

LG6

P13–17 **Stock Repurchase** The following data are available on Volkswagen AG as of December 22, 2017:

Earnings available to stockholders	€3,631,450,000
Number of shares of common stock outstanding	295,000,000
Earnings per share	€ 12.31
Market price per share	€ 170.19
Price/earnings ratio (P/E)	13.82

The firm's board is currently considering whether it should use €295,000,000 of its earnings to pay cash dividends of €1 per share or to repurchase stock at €170.20 per share.

a. Calculate the approximate number of shares the firm can repurchase at the €170.20 per share price, using the funds that would have gone to pay the cash dividend.
b. What is the EPS after the repurchase? Explain your calculations.
c. If the stock still sells at 13.82 times earnings, what will the market price be after the repurchase?
d. Compare the pre- and post-repurchase earnings per share.
e. Compare the stockholders' positions under the dividend and repurchase alternatives. What are the tax implications under each alternative?

LG 6

P13–18 **Stock repurchase** Heidelberg Cement, one of the world's largest building materials companies is concerned about preserving the wealth of its stockholders during a cyclical downturn in the building and construction business. The company has a constant dividend payout of €2.5 tied to a target payout ratio of 30%. Heidelberg Cement's management is preparing a share repurchase recommendation to present to the firm's board of directors. The following data has been gathered from the last 2 years.

	2017	2018
Earnings available to common stockholders	€805,585,200	€900,000,000
Number of shares outstanding	198,420,000	198,420,000
Earnings per share	€ 4.06	€ 4.54
Market price per share	€ 89.89	€ 90.00
Price/earnings ratio	22.14	19.82

a. How many shares should the company have outstanding in 2018 if its earnings available for common stockholders in that year are €900,000,000 and it pays a dividend of €2.5 given a target payout ratio of 30%?
b. How many shares would the company have to repurchase to have the level of shares outstanding in part **a**?

LG 6

P13–19 **ETHICS PROBLEM** Assume that you are the CFO of a company contemplating a stock repurchase next quarter. You know that there are several methods of reducing the current quarterly earnings, which may cause the stock price to fall prior to the announcement of the proposed stock repurchase. What course of action would you recommend to your CEO? If your CEO came to you first and recommended reducing the current quarter's earnings, what would be your response?

SPREADSHEET EXERCISE

One way to lower the market price of a firm's stock is via a stock split. Rock-O Corporation finds itself in a different situation: Its stock has been selling at relatively low prices. To increase the market price of the stock, the company chooses to use a reverse stock split of 2-for-3.

The company currently has 700,000 common shares outstanding and no preferred stock. The common stock carries a par value of $1. At this time, the paid-in capital in excess of par is $7,000,000, and the firm's retained earnings are $3,500,000.

TO DO

Create a spreadsheet to determine the following:

a. The stockholders' equity section of the balance sheet before the reverse stock split.
b. The stockholders' equity section of the balance sheet after the reverse stock split.

PART SEVEN

Short-Term Financial Decisions

CHAPTERS IN THIS PART

Short-term financial decisions are guided by the same financial management principles as long-term financial decisions, but the time frame is different: days, weeks, and months rather than years. Working capital management focuses on managing short-term cash flows by evaluating their timing, risk, and impact on firm value. Although long-term financial decisions ultimately determine the firm's ability to maximize shareholder wealth, long-term outcomes may not even be realized if financial managers fail to make effective short-term financial decisions.

Chapter 14 discusses the techniques and strategies for managing working capital and current assets. The chapter also introduces the fundamentals of net working capital and the importance of the cash conversion cycle. Chapter 15 discusses the importance of controlling accounts payable expenses and managing other current liabilities. You will learn how some companies finance current assets by using current liabilities, including accounts payable, accruals, lines of credit, commercial paper, and short-term loans. Successful adherence to the fundamentals of working capital management will help ensure that the firm can meet its operating obligations and maximize its long-term investments.

CHAPTER 14

Working Capital and Current Assets Management

LEARNING GOALS

- LG1 Understand working capital management, net working capital, and the related tradeoff between profitability and risk.
- LG2 Describe the cash conversion cycle, its funding requirements, and the key strategies for managing it.
- LG3 Discuss inventory management: differing views, common techniques, and international concerns.
- LG4 Explain the credit selection process and the quantitative procedure for evaluating changes in credit standards.
- LG5 Review the procedures for quantitatively considering early payment discount changes, other aspects of credit terms, and credit monitoring.
- LG6 Understand the management of receipts and disbursements, including float, speeding up collections, slowing down payments, cash concentration, zero-balance accounts, and investing in marketable securities.

MyLab Finance Chapter Introduction Video

WHY THIS CHAPTER MATTERS TO YOU

In your *professional* life

ACCOUNTING You need to understand the cash conversion cycle and the management of inventory, accounts receivable, and receipts and disbursements of cash.

INFORMATION SYSTEMS You need to understand the cash conversion cycle, inventory, accounts receivable, and receipts and disbursements of cash to design financial information systems that facilitate effective working capital management.

MANAGEMENT You need to understand the management of working capital so that you can efficiently manage current assets and decide whether to finance the firm's funds requirements aggressively or conservatively.

MARKETING You need to understand credit selection and monitoring because sales will be affected by the availability of credit to purchasers; sales will also be affected by inventory management.

OPERATIONS You need to understand the cash conversion cycle because you will be responsible for reducing the cycle through the efficient management of production, inventory, and costs.

In your *personal* life

You often will face short-term purchasing decisions, which tend to focus on consumable items. Many involve tradeoffs between quantity and price: Should you buy large quantities to pay a lower unit price, hold the items, and use them over time? Or should you buy smaller quantities more frequently and pay a slightly higher unit price? Analyzing these types of short-term purchasing decisions will help you make the most of your money.

LG 1

14.1 Net Working Capital Fundamentals

The balance sheet provides information about the structure of a firm's investments on the one hand and the structure of its financing sources on the other hand. In previous chapters we studied capital budgeting, which focuses on the long-term assets on the left-hand side of a firm's balance sheet, and capital structure, which focuses on the long-term liabilities and equity on the balance sheet. In this chapter and the next we turn our focus to the choices that confront financial analysts as they manage the firm's short-term assets and liabilities. As with all other financial decisions, the object is to manage current assets and liabilities in a way that maximizes the value of the firm.

WORKING CAPITAL MANAGEMENT

working capital (or short-term financial) management
Management of current assets and current liabilities.

In Chapter 4 you learned that changes in a firm's net working capital directly impact free cash flow, and in Chapter 7 you saw that a firm's value depends on its free cash flow. Thus, managers can increase firm value by managing working capital accounts such as receivables, inventories, and payables efficiently. The goal of **working capital (or short-term financial) management** is to manage each of the firm's current assets and current liabilities to achieve a balance between profitability and risk that contributes positively to the firm's value.

Firms reduce financing costs or increase the funds available for expansion by minimizing the amount of funds tied up in working capital. Therefore, it should not be surprising to learn that working capital is one of the financial manager's most important and time-consuming activities. Surveys by *CFO* magazine and Duke University have found that corporate CFOs spend almost 30 hours per month engaged in working capital and cash management, which is more time than they spend on any other single activity. Similar surveys have revealed that CFOs believe their efforts to manage working capital effectively add as much value to the firm as any of their other activities.

MATTER OF FACT

CFOs Value Working Capital Management

A survey of CFOs from firms around the world suggests that working capital management sits at the top of the list of most valued finance functions. Among 19 different finance functions, CFOs viewed working capital management as equally important as capital structure, debt issuance and management, bank relationships, and tax management. Their satisfaction with the performance of working capital management was quite the opposite, however. CFOs viewed the performance of working capital management as better only than that of pension management. Consistent with their view that working capital management is a high-value but low-satisfaction activity, CFOs identified working capital as the finance function second most in need of additional resources.[1]

1. Henri Servaes and Peter Tufano, "CFO views on the importance and execution of the finance function," *CFO Views* (January 2006), pp. 1–104.

NET WORKING CAPITAL

working capital
The portion of the firm's assets used in day-to-day transactions. The primary elements of working capital circulate from one form to another in the ordinary course of business.

Working capital consists of the portion of the firm's assets used in day-to-day transactions. The primary elements of working capital circulate from one form to another in the ordinary course of business. This idea embraces the recurring transition from cash (and marketable securities) to inventories to accounts receivable and back to cash.

Current liabilities represent the firm's short-term financing, because they include all debts that come due in 1 year or less. These debts usually include amounts owed to suppliers (accounts payable), employees and governments (accruals), and banks (notes payable), among others. (You can refer to Chapter 3 for a full discussion of balance sheet items.)

Net working capital is the difference between the firm's current assets and its current liabilities. When current assets exceed current liabilities, the firm has positive net working capital. When current assets are less than current liabilities, the firm has negative net working capital.

The conversion of current assets from inventory to accounts receivable to cash provides an important source of funds that firms use to pay current liabilities. The cash outlays for current liabilities are relatively predictable. When the firm incurs an obligation, managers generally know when the corresponding payment will be due. More difficult to predict are the cash inflows: the conversion of the current assets to more liquid forms. The more predictable its cash inflows, the less net working capital a firm needs. Because most firms are unable to match cash inflows to cash outflows with certainty, they usually need current assets that more than cover outflows for current liabilities. In general, the greater the margin by which a firm's current assets cover its current liabilities, the greater the firm's ability to pay its bills as they come due.

TRADEOFF BETWEEN PROFITABILITY AND RISK

A tradeoff exists between a firm's profitability and its risk. Profitability, in this context, is the relationship between revenues and costs generated by using the firm's assets—both current and fixed—in productive activities. A firm can increase its profits by (1) increasing revenues or (2) decreasing costs. Risk, in the context of working capital management, is the probability that a firm will be unable to pay its bills as they come due. A firm that cannot pay its bills as they come due is **insolvent.** Other things being equal, the greater the firm's net working capital, the lower its risk of insolvency. In other words, the more net working capital, the more liquid the firm and therefore the lower its risk of becoming insolvent. Using these definitions of profitability and risk, we can demonstrate the tradeoff between them by considering changes in current assets and current liabilities separately.

insolvent
Describes a firm that is unable to pay its bills as they come due.

Changes in Current Assets

To understand how changing the level of the firm's current assets affects its profitability–risk tradeoff, consider the ratio of current assets to total assets. This ratio indicates the percentage of total assets that is current. The upper portion of Table 14.1 summarizes the effects on both profitability and risk of an increase or decrease in this ratio, holding total assets constant. When the ratio increases—that is, when current assets increase—profitability decreases. Why? The answer is because for most firms current assets are less profitable than fixed assets. Fixed assets add more value to a firm's products than do current assets.

TABLE 14.1 Effects of Changing Ratios on Profits and Risk

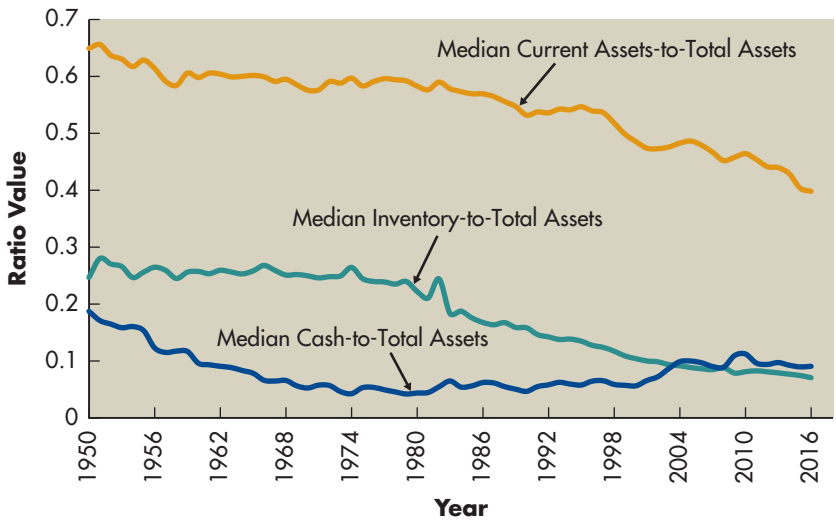
Ratio	Change in ratio	Effect on profit	Effect on risk
Current assets / Total assets	Increase	Decrease	Decrease
	Decrease	Increase	Increase
Current liabilities / Total assets	Increase	Increase	Increase
	Decrease	Decrease	Decrease

The upper line in Figure 14.1 shows the median ratio of current assets divided by total assets among all U.S. public companies (excluding financial firms) from 1950 to 2016. The figure clearly shows that over time firms have been cutting their investments in current assets, consistent with the view that current assets provide lower returns to shareholders.[2] The middle line in Figure 14.1 shows that most of the reduction in that ratio has been driven by reductions in inventory as a percentage of assets. Improvements in information technology over the past half-century allowed firms to manage their inventories much more efficiently, ordering and holding goods in inventory only when needed.

Other things being equal, if firms cut back on current assets, they tend to increase risk. However, note the behavior of the bottom line in Figure 14.1. That line tracks the ratio of cash and marketable securities divided by total assets. That ratio, after reaching a low point in 1979, has been increasing for more than

FIGURE 14.1

Yearly Medians for All U.S.–Listed Nonfinancial Companies



2. In part, the decline in the ratio of current assets to total assets is due to a shift in the mix of public companies operating in the United States. Since 1950, the economy has shifted away from manufacturing and toward service-oriented companies. To the extent that many service providers carry little or no inventory, an increasing number of such firms would tend to lower the current assets to total assets ratio. If we focused only on manufacturing firms, we would see that this ratio remained relatively steady over this period, but the inventory-to-assets ratio also dropped for these firms.

three decades. Increasing cash holdings tends to offset the rise in risk associated with a lower investment in working capital. In other words, while firms are increasing their risk by cutting back on their holdings of current assets, they are increasing their holdings of the *least risky current asset*—cash. Remember that as you go down the asset side of the balance sheet, the risk associated with the assets increases. Cash and marketable securities are less risky than accounts receivable. Receivables in turn are less risky than inventories, which are less risky than fixed assets. The nearer an asset is to cash, the less risky it is, and companies are holding more cash today than they have since the early 1960s. At the same time that companies are trying to limit their investments in current assets to earn higher returns, they are increasing their cash holdings to mitigate the risk associated with a less liquid balance sheet.

Changes in Current Liabilities

We also can demonstrate how changing the level of the firm's current liabilities affects its profitability–risk tradeoff by using the ratio of current liabilities to total assets. This ratio indicates the percentage of total assets that has been financed with current liabilities. Again, assuming that total assets remain unchanged, the effects on both profitability and risk of an increase or decrease in the ratio are summarized in the lower portion of Table 14.1. When the ratio increases, profitability increases. Why? Here it is because the firm uses more of the less-expensive current liabilities financing and less long-term financing. Current liabilities are less expensive because they bear no interest (with the exception of notes payable). However, when the ratio of current liabilities to total assets increases, the risk of insolvency also rises because the increase in current liabilities in turn decreases net working capital. The opposite effects on profit and risk result from a reduction in the ratio of current liabilities to total assets.

→ REVIEW QUESTIONS MyLab Finance Solutions

14–1 Why is working capital management one of the most important and time-consuming activities of the financial manager? What is net working capital?

14–2 What is the relationship between the predictability of a firm's cash inflows and its required level of net working capital? How are net working capital, liquidity, and risk of insolvency related?

14–3 Why does an increase in the ratio of current assets to total assets decrease both profits and risk as measured by net working capital? How do changes in the ratio of current liabilities to total assets affect profitability and risk?

LG 2

14.2 Cash Conversion Cycle

cash conversion cycle (CCC)
The length of time between when a firm pays cash for raw materials and when it receives cash from collecting receivables.

Central to working capital management is an understanding of the firm's *cash conversion cycle*. The **cash conversion cycle** (CCC) is the length of time between when a firm pays cash for its raw materials and when it receives cash from collecting its receivables. Companies with a long cash conversion cycle must wait a long time after they pay their suppliers before they receive payment from

customers, and the gap between when a firm pays and when it receives payment creates a need for financing to sustain the firm's operations. This cycle frames discussion of the management of the firm's current assets in this chapter and that of the management of current liabilities in Chapter 15. We begin by demonstrating the calculation and application of the cash conversion cycle.

CALCULATING THE CASH CONVERSION CYCLE

operating cycle (OC)
The time from the beginning of the production process to collection of cash from the sale of the finished product.

A firm's **operating cycle (OC)** is the time from the beginning of the production process to collection of cash from the sale of the finished product. The operating cycle encompasses two major short-term asset categories, inventory and accounts receivable. The OC equals the sum of the *average age of inventory (AAI)* and the *average collection period (ACP)*:

$$OC = AAI + ACP \tag{14.1}$$

MATTER OF FACT

Increasing Speed Lowers Working Capital

A firm can lower its working capital if it can speed up its operating cycle. For example, if a firm accepts bank credit (like a Visa card), it will receive cash sooner after the sale is transacted than if it has to wait until the customer pays its accounts receivable.

However, the process of producing and selling a product also includes the purchase of production inputs (raw materials) on account, which results in accounts payable. Accounts payable reduce the number of days a firm's resources are tied up in the operating cycle. The time it takes to pay the accounts payable, measured in days, is the *average payment period (APP)*. The operating cycle less the average payment period yields the cash conversion cycle. The formula for the cash conversion cycle is

$$CCC = OC - APP \tag{14.2}$$

Substituting the relationship in Equation 14.1 into Equation 14.2, we can see that the cash conversion cycle has three main components—(1) average age of the inventory, (2) average collection period, and (3) average payment period.

$$CCC = AAI + ACP - APP \tag{14.3}$$

If a firm can pay its suppliers at the same time that it collects payment from customers, its cash conversion cycle is zero days. However, most firms must pay their bills before they collect on their sales, meaning that the cash conversion cycle is greater than zero. Furthermore, each day of the cash conversion cycle represents a day for which the firm needs financing (other than money collected from sales) to sustain its operations. The longer the cash conversion cycle, the greater a firm's financing need. If a firm changes any of the components of the cash conversion cycle, it changes the financial resources tied up in the day-to-day operation of the firm.

EXAMPLE 14.1

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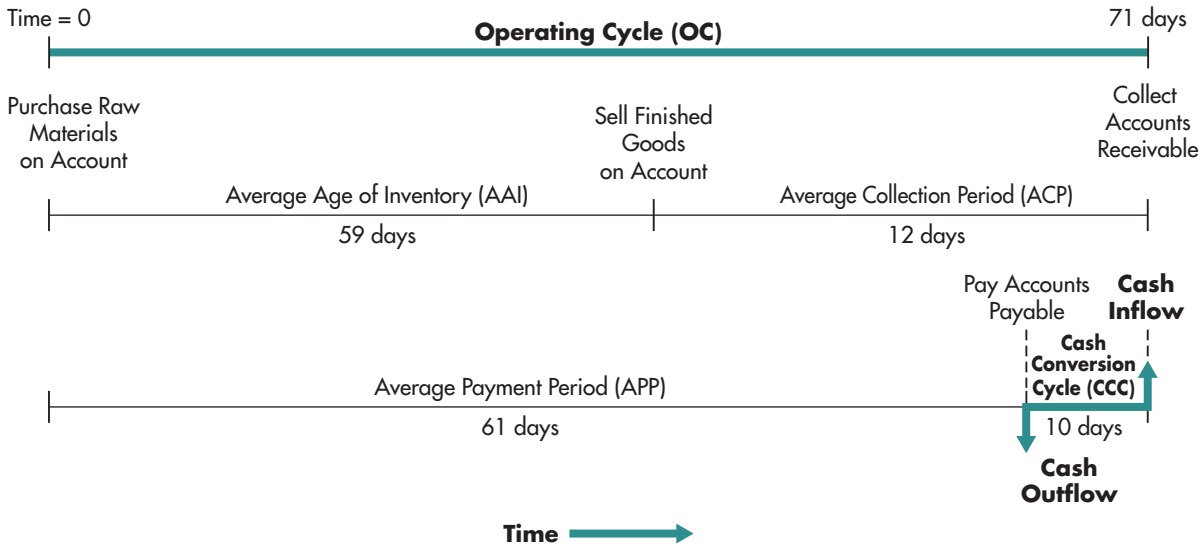
In its 2017 annual report, Best Buy reported that it had revenues of $39.40 billion, cost of goods sold of $29.96 billion, accounts receivable of $1.34 billion, inventory of $4.86 billion, and accounts payable of $4.98 billion. From this information (and assuming for simplicity that cost of goods sold equals purchases), we can determine that the company's average age of inventory was 59 days, its average collection period was 12 days, and its average payment period was 61 days. Thus, the cash conversion cycle for Best Buy was just 10 days ($59 + 12 - 61 = 10$). Figure 14.2 presents Best Buy's cash conversion cycle as a timeline.

FIGURE 14.2

Timeline for Best Buy's Cash Conversion Cycle

Best Buy's operating cycle in 2017 was 71 days, and its cash conversion cycle was 12 days.



If we add Best Buy's inventory and receivables balances and subtract accounts payable, we find that the company has $1.22 billion invested in the working capital components of this cash conversion cycle. That gives the company plenty of motivation to make improvements. Changes in any of the component cycles will change the resources tied up in Best Buy's operations. For example, if Best Buy could reduce its inventory from 59 days to 50 days, holding all else equal, its working capital requirement would fall by more than $750 million, illustrating why companies pay close attention to working capital management.

FUNDING REQUIREMENTS OF THE CASH CONVERSION CYCLE

We can use the cash conversion cycle as a basis for discussing how the firm funds its required investment in operating assets. We first differentiate between permanent and seasonal funding needs and then describe aggressive and conservative seasonal funding strategies.

permanent funding requirement
A constant investment in operating assets resulting from constant sales over time.

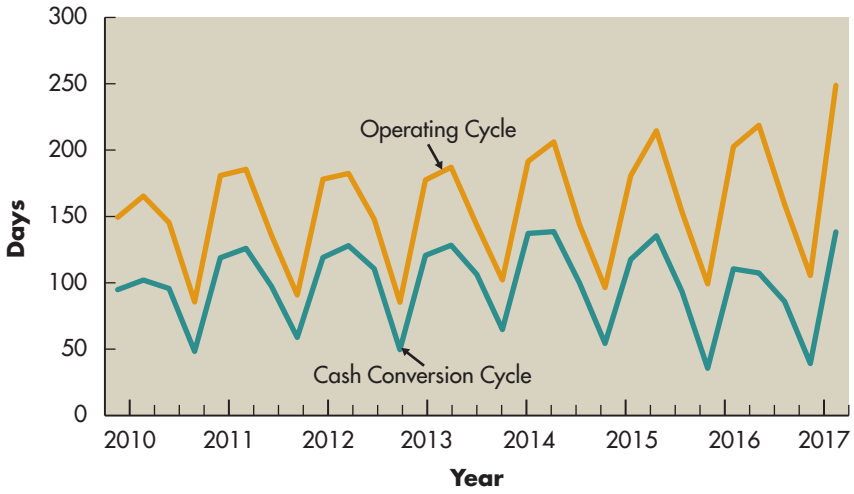
seasonal funding requirement
An investment in operating assets that varies over time as a result of cyclical sales.

Permanent versus Seasonal Funding Needs

If the firm's sales are constant, its investment in operating assets should also be constant, and the firm will have only a **permanent funding requirement.** If the firm's sales are seasonal, its investment in operating assets will vary over time with its sales cycles, and the firm will have **seasonal funding requirements** in addition to the permanent funding required for its minimum investment in operating assets.

FIGURE 14.3

Seasonal Pattern in Mattel's Operating and Cash Conversion Cycles
Mattel's operating and cash conversion cycles peak in the first half of each calendar year and decline in the second half.



To highlight the difference between permanent and seasonal funding requirements, consider the performance of the U.S. toy company, Mattel, Inc. As you might expect from a company that sells toys, Mattel generates much higher revenue in the last three months of the calendar year than during any other quarter. For example, the company's sales from October to December in any given year are typically more than 2 times greater than sales from January to March. As a consequence, by December 31 each year, the company's inventory (in terms of days of inventory on hand) is at a low point for the year, and the firm spends the next 6 months building inventory back up to be ready for the next busy season. Payables track inventory closely, while receivables follow with a short lag, usually peaking the quarter after inventory does.

Figure 14.3 shows the implications of this seasonal pattern for Mattel's operating and cash conversion cycles from 2010 through early 2017. Both cycles tend to rise during the first six months of the calendar year and fall in the last two quarters. The gap between the high and low points is significant. From 2010 to 2017, the peak cash conversion cycle averaged about 125 days, whereas the cycle's low point was typically about 50 days. At a minimum, we can say that Mattel needed financing sufficient to cover a 50-day cash conversion cycle. Hence, that determines the size of Mattel's permanent funding requirement. However, the 75-day difference between Mattel's longest and shortest cash conversion cycle means that the company has a significant seasonal funding need during the first half of each year.

EXAMPLE 14.2

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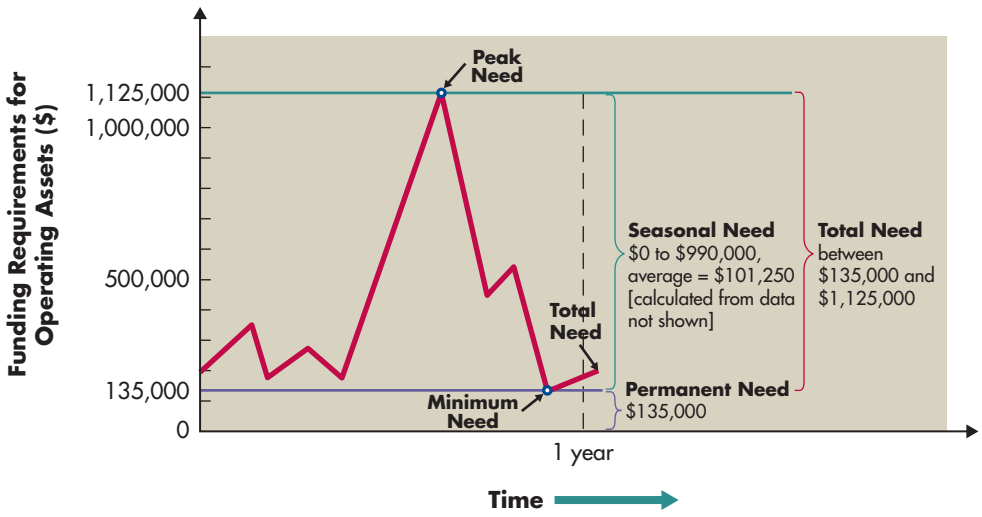
Nicholson Company holds, on average, $50,000 in cash and marketable securities, $1,250,000 in inventory, and $750,000 in accounts receivable. Nicholson's business is very stable over time, so its operating assets can be viewed as permanent. In addition, Nicholson's accounts payable of $425,000 are stable over time. Thus, Nicholson has a permanent investment in operating assets of $1,625,000 ($50,000 + $1,250,000 + $750,000 − $425,000). That amount would also equal its permanent funding requirement.

FIGURE 14.4

Semper Pump Company's Total Funding Requirements
Semper Pump Company's peak funds need is $1,125,000, and its minimum need is $135,000.



In contrast, Semper Pump Company, which produces bicycle pumps, has seasonal funding needs. Semper has seasonal sales; its peak sales are driven by the summertime purchases of bicycle pumps. Semper holds, at minimum, $25,000 in cash and marketable securities, $100,000 in inventory, and $60,000 in accounts receivable. At peak times, Semper's inventory increases to $750,000, and its accounts receivable increase to $400,000. To capture production efficiencies, Semper produces pumps at a constant rate throughout the year. Thus, accounts payable remain at $50,000 throughout the year. Accordingly, Semper has a permanent funding requirement for its minimum level of operating assets of $135,000 ($25,000 + $100,000 + $60,000 − $50,000) and peak seasonal funding requirements (in excess of its permanent need) of $990,000 [($25,000 + $750,000 + $400,000 − $50,000) − $135,000]. Semper's total funding requirements for operating assets vary from a minimum of $135,000 (permanent) to a seasonal peak of $1,125,000 ($135,000 + $990,000). Figure 14.4 depicts these needs over time.

aggressive funding strategy
A funding strategy under which the firm funds its seasonal requirements with short-term debt and its permanent requirements with long-term debt or equity.

conservative funding strategy
A funding strategy under which the firm funds both its seasonal and its permanent requirements with long-term debt or equity.

Aggressive versus Conservative Seasonal Funding Strategies

Short-term funds are typically less expensive than long-term funds. That is, interest rates on short-term loans are typically lower than rates on long-term loans (or equity) because the yield curve is typically upward sloping. However, long-term funds allow the firm to lock in its cost of funds over a period of time and thus avoid the risk of increases in short-term interest rates. Also, long-term funding ensures that the required funds are available to the firm when needed. Short-term funding entails the risk that the firm may not be able to obtain the funds needed to cover its seasonal peaks. Under an **aggressive funding strategy,** the firm funds its seasonal requirements with short-term debt and its permanent requirements with long-term debt or equity. Under a **conservative funding**

strategy, the firm funds both its seasonal and its permanent requirements with long-term debt or equity.

EXAMPLE 14.3

Semper Pump Company has a permanent funding requirement of $135,000 in operating assets and seasonal funding requirements that vary between $0 and $990,000 and average $101,250 (calculated from data not shown). If Semper can borrow short-term funds at 6.25% and long-term funds at 8%, and if it can earn 5% on the investment of any surplus balances, then the annual cost of an aggressive strategy for seasonal funding will be

Cost of short-term financing	= 0.0625 ×	$101,250	=	$6,328.13
+ Cost of long-term financing	= 0.0800 ×	$135,000	=	$10,800.00
− Earnings on surplus balances	= 0.0500 ×	$0	=	$0
Total cost of aggressive strategy				$17,128.13

Because under this strategy the amount of financing exactly equals the estimated funding need, no surplus balances exist.

Alternatively, Semper can choose a conservative strategy, under which surplus cash balances are fully invested. (In Figure 14.4, this surplus will be the difference between the peak need of $1,125,000 and the total need, which varies between $135,000 and $1,125,000 during the year.) The cost of the conservative strategy will be

Cost of short-term financing	= 0.0625 ×	$0	=	$0
+ Cost of long-term financing	= 0.0800 ×	$1,125,000	=	$90,000.00
− Earnings on surplus balances	= 0.0500 ×	$888,750	=	$44,437.50
Total cost of conservative strategy				$45,562.50

The average surplus balance would be calculated by subtracting the sum of the permanent need ($135,000) and the average seasonal need ($101,250) from the seasonal peak need ($1,125,000) to get $888,750 ($1,125,000 − $135,000 − $101,250). This represents the surplus amount of financing that Semper could invest, on average, in short-term assets that earn a 5% annual return.

These calculations demonstrate that for Semper, the aggressive strategy is far less expensive than the conservative strategy. However, it is equally clear that Semper has substantial peak-season operating-asset needs and that it must have adequate funding available to meet the peak needs and ensure ongoing operations.

The aggressive strategy's heavy reliance on short-term financing makes it riskier than the conservative strategy because of interest rate swings and possible difficulties in obtaining needed short-term financing quickly when seasonal peaks occur. The conservative strategy avoids these risks through the locked-in interest rate and long-term financing, but it is more costly because of the negative spread between the earnings rate on surplus funds (5% in the example) and the cost of the long-term funds that create the surplus (8% in the example). Where the firm operates, between the extremes of the aggressive and conservative seasonal funding strategies, depends on management's disposition toward risk and the strength of its banking relationships.

STRATEGIES FOR MANAGING THE CASH CONVERSION CYCLE

Some firms establish a target cash conversion cycle and then monitor and manage the actual cash conversion cycle toward the targeted value. A positive cash conversion cycle, as was the case for Best Buy in 2017, means the firm must use debt or equity to support its operating assets. Those sources of funds are costly, so the firm benefits by minimizing their use in supporting operating assets. In other words, to maximize shareholder wealth, managers should work to minimize the length of the cash conversion cycle (subject to a variety of constraints mentioned below), which minimizes the need for costly financing. Managers can achieve this goal by implementing a combination of the following strategies:

1. Turn over inventory as quickly as possible without stockouts that result in lost sales.
2. Collect accounts receivable as quickly as possible without losing sales from high-pressure collection techniques or from credit terms that are not competitive in the market.
3. Manage mail, processing, and clearing time to reduce them when collecting from customers and to increase them when paying suppliers.
4. Pay accounts payable as slowly as possible without damaging the firm's credit rating or its relationships with suppliers.

Techniques for implementing these four strategies are the focus of the remainder of this chapter and the following chapter.

→ REVIEW QUESTIONS MyLab Finance Solutions

14–4 What is the difference between the firm's operating cycle and its cash conversion cycle?

14–5 Why is it helpful to divide the funding needs of a seasonal business into its permanent and seasonal funding requirements when developing a funding strategy?

14–6 What are the benefits, costs, and risks of an aggressive funding strategy and of a conservative funding strategy? Under which strategy is the borrowing often in excess of the actual need?

14–7 Why is it important for a firm to minimize the length of its cash conversion cycle?

LG 3

14.3 Inventory Management

The first component of the cash conversion cycle is the average age of inventory. The objective for managing inventory, as noted earlier, is to turn over inventory as quickly as possible (or equivalently, to minimize the average age of inventory) without losing sales from stockouts. The financial manager tends to act as an advisor or "watchdog" in matters concerning inventory. He or she does not have direct control over inventory but does provide input to the inventory management process.

DIFFERING VIEWPOINTS ABOUT INVENTORY LEVEL

Viewpoints about appropriate inventory levels commonly differ among a firm's finance, marketing, manufacturing, and purchasing managers. Each views inventory levels in light of his or her own objectives. The financial manager's general disposition toward inventory levels is to keep them low, to ensure that the firm's money is not being unwisely invested in excess resources. The marketing manager, in contrast, would like to have large inventories of the firm's finished products. This would ensure that all orders could be filled quickly, eliminating the need for backorders due to stockouts.

The manufacturing manager's major responsibility is to implement the production plan so that it results in the desired amount of finished goods of acceptable quality available on time at a low cost. In fulfilling this role, the manufacturing manager would keep raw materials inventories high to avoid production delays. He or she also would favor large production runs for the sake of lower unit production costs, which would result in high finished goods inventories.

The purchasing manager is concerned solely with the raw materials inventories. He or she must have on hand, in the correct quantities at the desired times and at a favorable price, whatever raw materials are required by production. Without proper control, in an effort to get quantity discounts or in anticipation of rising prices or a shortage of certain materials, the purchasing manager may purchase larger quantities of resources than are actually needed at the time.

COMMON TECHNIQUES FOR MANAGING INVENTORY

Numerous techniques are available for effectively managing the firm's inventory. Here we briefly consider four commonly used techniques.

ABC System

ABC inventory system
Inventory management technique that divides inventory into three groups—A, B, and C, in descending order of importance and level of monitoring—on the basis of the dollar investment in each.

A firm using the **ABC inventory system** divides its inventory into three groups: A, B, and C. The A group includes those items with the largest dollar investment. Typically, this group consists of 20% of the firm's inventory items but 80% of its investment in inventory. The B group consists of items that account for the next largest investment in inventory. The C group comprises a large number of items that require a relatively small investment.

The inventory group of each item determines the item's level of monitoring. The A group items receive the most intense monitoring because of the high dollar investment. Typically, managers track A group items on a perpetual inventory system that allows daily verification of each item's inventory level. B group items are frequently controlled through periodic, perhaps weekly, checking of their levels. Managers monitor C group items with unsophisticated techniques, such as the two-bin method. With the **two-bin method,** the item is stored in two bins. As an item is needed, inventory is removed from the first bin. When that bin is empty, an order is placed to refill the first bin while inventory is drawn from the second bin. The second bin is used until empty, and so on.

two-bin method
Unsophisticated inventory-monitoring technique that is typically applied to C group items and involves reordering inventory when one of two bins is empty.

The large dollar investment in A and B group items suggests the need for a better method of inventory management than the ABC system. The EOQ model, discussed next, is an appropriate model for managing A and B group items.

Economic Order Quantity (EOQ) Model

economic order quantity (EOQ) model
Inventory management technique for determining an item's optimal order size, which is the size that minimizes the total of its order costs and carrying costs.

order costs
The fixed clerical costs of placing and receiving an inventory order.

carrying costs
The variable costs per unit of holding an item in inventory for a specific period of time.

One technique for determining the optimal order size for inventory items is the **economic order quantity (EOQ) model.** The EOQ model considers various costs of inventory and then determines what order size minimizes total inventory cost.

The EOQ model works by trading off two categories of inventory costs: *order costs* and *carrying costs*. **Order costs** include the fixed clerical costs of placing and receiving orders: the cost of writing a purchase order, of processing the resulting paperwork, and of receiving an order and checking it against the invoice. The more orders a firm places, the higher are order costs. In the EOQ model, we measure order costs in dollars per order. **Carrying costs** are the variable costs per unit of holding an item of inventory for a specific period of time. Carrying costs include storage costs, insurance costs, the costs of deterioration and obsolescence, and the opportunity cost of investing funds in inventory rather than in other assets that earn a return. A firm can push carrying costs down by placing many small orders rather than a few large ones. In the EOQ model, we measure carrying costs in dollars per unit per period.

Order costs decrease as the size of the order increases and the number of orders falls. Carrying costs, however, increase with increases in the order size. The EOQ model analyzes the tradeoff between order costs and carrying costs to determine the order quantity that minimizes the total inventory cost.

Mathematical Development of EOQ A formula can be developed for determining the firm's EOQ for a given inventory item, where

S = usage in units per period
O = cost per order
Q = order quantity in units
C = carrying cost per unit per period

The first step is to derive the cost functions for order cost and carrying cost. Total order cost equals the cost per order (O) times the number of orders. The number of orders equals $S \div Q$, the usage in units per period (S) divided by the order quantity in units (Q), so the order cost equals

$$\text{Order cost} = O \times (S \div Q) \tag{14.4}$$

The carrying cost is the cost of carrying a unit of inventory per period (C) multiplied by the firm's average inventory. The average inventory is $Q \div 2$ because the EOQ model assumes that a firm's inventory is drawn down at a steady rate between orders. That is, the average inventory is the order quantity (Q) divided by 2. Thus, carrying cost equals

$$\text{Carrying cost} = C \times (Q \div 2) \tag{14.5}$$

total cost of inventory
The sum of order costs and carrying costs of inventory.

The firm's **total cost of inventory** equals the sum of the order cost and the carrying cost. Thus, the total cost function is

$$\text{Total cost} = [O \times (S \div Q)] + [C \times (Q \div 2)] \tag{14.6}$$

Because the EOQ is the order quantity that minimizes the total cost function, we must solve the total cost function for the EOQ.[3] The resulting equation is

$$\text{EOQ} = \sqrt{\frac{2 \times S \times O}{C}} \tag{14.7}$$

Remember that the EOQ as defined by Equation 14.7 is simply the size of the order that the firm should place to minimize costs. Think intuitively about what Equation 14.7 says regarding the optimal order quantity. If the rate at which the firm uses inventory, S, increases, then the order quantity should be higher. That makes sense because if a firm uses inventory very rapidly and if it places small orders, it will have to place many of them and order costs will be very high. Similarly, Equation 14.7 says that if the carrying cost per unit (C) is high, the order quantity should be smaller. That makes sense, too, because if inventory is costly to hold (perhaps because it spoils or because its value declines rapidly), a firm does not want to hold a large inventory balance.

PERSONAL FINANCE EXAMPLE 14.4

Individuals sometimes are confronted with personal finance decisions involving cost tradeoffs similar to the tradeoff between the fixed order costs and variable carrying costs of inventory that corporations face. Take the case of the von Dammes, who supplement the income they earn from their primary jobs by painting houses in their spare time.

The von Dammes estimate that over the course of a year they will buy 250 gallons of paint at an average cost of $20 per gallon. For every trip they make to the paint store, the von Dammes spend about $10 in fuel and other costs related to the wear and tear on their personal vehicle. They store the paint in a self-storage unit and estimate that they spend about $2 per gallon of paint in storage costs. How often should they visit the paint store, and how much paint should they purchase on each visit?

Applying the EOQ model to this problem, we have:

$S = 250$ gallons per year $\quad O = \$10$ per order $\quad C = \$2$ per gallon

$$EOQ = \sqrt{\frac{2 \times 250 \times \$10}{\$2}} = 50$$

The von Dammes should purchase 50 gallons of paint each time they visit the store. Given their annual use of 250 gallons, they will make 5 trips to the store per year.

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3. In this simple model, the EOQ occurs at the point where the order cost $[O \times (S \div Q)]$ just equals the carrying cost $[C \times (Q \div 2)]$. To demonstrate, we set the two costs equal and solve for Q:

$$[O \times (S \div Q)] = [C \times (Q \div 2)]$$

Then cross-multiplying, we get

$$2 \times O \times S = C \times Q^2$$

Dividing both sides by C, we get

$$Q^2 = (2 \times O \times S) \div C$$

so

$$Q = \sqrt{(2 \times O \times S) \div C}$$

reorder point
The point at which to reorder inventory, expressed as days of lead time × daily usage.

Reorder Point Once the firm has determined its economic order quantity, it must determine when to place an order. The **reorder point** reflects the number of days of lead time the firm needs to place and receive an order and the firm's daily usage of the inventory item. Assuming that the firm uses inventory at a constant rate, the formula for the reorder point is

$$\text{Reorder point} = \text{Days of lead time} \times \text{Daily usage} \tag{14.8}$$

For example, if a firm knows it takes 3 days to place and receive an order and if it uses 15 units per day of the inventory item, the reorder point is 45 units of inventory (3 days × 15 units/day). Thus, as soon as the item's inventory level falls to the reorder point (45 units, in this case), the firm places an order for the item's EOQ. If the estimates of lead time and usage are correct, the order will arrive exactly as the inventory level reaches zero. However, lead times and usage rates are not precise, so most firms hold **safety stock** (extra inventory) to prevent stockouts of important items.

safety stock
Extra inventory that is held to prevent stockouts of important items.

EXAMPLE 14.5

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MAX Company, a producer of dinnerware, has an A group inventory item that is vital to the production process. This item costs $1,500, and MAX uses 1,100 units of the item per year. MAX wants to determine its optimal order strategy for the item. To calculate the EOQ, we need the following inputs:

$$\text{Order cost per order} = \$150$$
$$\text{Carrying cost per unit per year} = \$200$$

Substituting into Equation 14.7, we get

$$\text{EOQ} = \sqrt{\frac{2 \times 1{,}100 \times \$150}{\$200}} \approx \underline{\underline{41}} \text{ units}$$

The reorder point for MAX depends on the number of days MAX operates per year. Assuming that MAX operates 250 days per year and uses 1,100 units of this item, its daily usage is 4.4 units (1,100 ÷ 250). If its lead time is 2 days and MAX wants to maintain a safety stock of 4 units, the reorder point for this item is $[(2 \times 4.4) + 4]$, or 12.8 units. However, orders are made only in whole units, so MAX places the order when the inventory falls to 13 units.

The firm's goal for inventory is to turn it over as quickly as possible without stockouts. Inventory turnover is best calculated by dividing cost of goods sold by average inventory. The EOQ model determines the optimal order size and, indirectly, through the assumption of constant usage, the average inventory. Thus, the EOQ model determines the firm's optimal inventory turnover rate, given the firm's specific costs of inventory.

just-in-time (JIT) system
Inventory management technique that minimizes inventory investment by having materials arrive at exactly the time they are needed for production.

Just-in-Time (JIT) System

Firms use the **just-in-time (JIT) system** to minimize inventory investment. The philosophy is that materials should arrive at exactly the time they are needed for production. Ideally, the firm would have only work-in-process

inventory. Because its objective is to minimize inventory investment, a JIT system uses no (or very little) safety stock. Extensive coordination among the firm's employees, its suppliers, and shipping companies must exist to ensure that material inputs arrive on time. Failure of materials to arrive on time results in a shutdown of the production line until the materials do arrive. Likewise, a JIT system requires high-quality parts from suppliers. When quality problems arise, production must be stopped until the problems are resolved.

The goal of the JIT system is manufacturing efficiency. It uses inventory as a tool for attaining efficiency by emphasizing quality of the materials used and their timely delivery. When JIT is working properly, it forces process inefficiencies to surface.

Knowing the level of inventory is, of course, an important part of any inventory management system. To meet this goal, radio frequency identification technology may be the "next new thing" in improving inventory and supply chain management.

Computerized Systems for Resource Control

materials requirement planning (MRP) system
Inventory management technique that applies EOQ concepts and uses a computer to compare production needs to available inventory balances and determine when orders should be placed for various items on a product's bill of materials.

manufacturing resource planning II (MRP II)
An extension of MRP that uses a sophisticated computerized system to integrate data from numerous areas such as finance, accounting, marketing, engineering, and manufacturing and generate production plans as well as numerous financial and management reports.

enterprise resource planning (ERP)
A computerized system that electronically integrates external information about the firm's suppliers and customers with the firm's departmental data so that information on all available resources—human and material—can be instantly obtained in a fashion that eliminates production delays and controls costs.

Today, a number of systems are available for controlling inventory and other resources. One of the most basic is the **materials requirement planning (MRP) system**. Firms use that system to determine what materials to order and when to order them. MRP applies EOQ concepts to determine how much to order. Using a computer, MRP simulates each product's bill of materials, inventory status, and manufacturing process. The *bill of materials* is simply a list of all parts and materials that go into making the finished product. For a given production plan, the computer simulates material requirements by comparing production needs to available inventory balances. On the basis of the time it takes for a product that is in process to move through the various production stages and the lead time to get materials, the MRP system determines when orders should be placed for various items on the bill of materials. The objective of this system is to lower the firm's inventory investment without impairing production. If the firm's pretax cost of capital for investments of equal risk is 10%, every dollar of investment released from inventory will increase before-tax profits by $0.10.

An extension of MRP is **manufacturing resource planning II (MRP II),** which integrates data from numerous areas such as finance, accounting, marketing, engineering, and manufacturing, using a sophisticated computer system. This system generates production plans as well as numerous financial and management reports. In essence, it models the firm's processes so that the firm can assess and monitor the effects of changes in one area of operations on other areas. For example, the MRP II system would allow the firm to determine the effect of an increase in labor costs on sales and profits.

Whereas MRP and MRP II tend to focus on internal operations, **enterprise resource planning (ERP)** systems expand the focus to the external environment by including information about suppliers and customers. ERP electronically integrates all of a firm's departments so that, for example, production can call up sales information and immediately know how much must be produced to fill customer orders. Because all available resources—human

and material—are known, the system can eliminate production delays and control costs. ERP systems automatically note changes, such as a supplier's inability to meet a scheduled delivery date, so that production can make necessary adjustments.

INTERNATIONAL INVENTORY MANAGEMENT

International inventory management is typically much more complicated for exporters in general, and for multinational companies in particular, than for purely domestic firms. The production and manufacturing economies of scale that might be expected from selling products globally may prove elusive if products must be tailored for individual local markets, as frequently happens, or if actual production takes place in factories around the world. When raw materials, intermediate goods, or finished products must be transported over long distances—particularly by ocean shipping—there will be more delays, confusion, damage, and theft than occur in a one-country operation. The international inventory manager therefore puts a premium on flexibility. He or she is usually less concerned about ordering the economically optimal quantity of inventory than about making sure that sufficient quantities of inventory are delivered where they are needed, when they are needed, and in a condition to be used as planned.

→ REVIEW QUESTIONS MyLab Finance Solutions

14–8 What are likely to be the viewpoints of each of the following managers about the levels of the various types of inventory: finance, marketing, manufacturing, and purchasing? Why is inventory an investment?

14–9 Briefly describe the following techniques for managing inventory: (1) ABC system, economic order quantity (EOQ) model, (2) just-in-time (JIT) system, and (3) three computerized systems for resource control, MRP, MRP II, and ERP.

14–10 What factors make managing inventory more difficult for exporters and multinational companies?

LG4 LG5

14.4 Accounts Receivable Management

The second component of the cash conversion cycle is the average collection period. This period is the average length of time from a sale on credit until the payment becomes usable funds for the firm. The average collection period has two parts. The first part is the time from the sale until the customer mails the payment. The second part is the time from when the payment is mailed until the firm has the collected funds in its bank account. The first part of the average collection period involves managing the credit available to the firm's customers, and the second part involves collecting and processing payments. This section of the chapter discusses the firm's accounts receivable credit management.

The objective for managing accounts receivable is to collect accounts receivable as quickly as possible without losing sales from high-pressure collection techniques or by offering credit terms that are not competitive in the industry. Accomplishing this goal encompasses three topics: (1) credit selection and standards, (2) credit terms, and (3) credit monitoring.

CREDIT SELECTION AND STANDARDS

Credit selection involves application of techniques for determining which customers should receive credit. This process involves evaluating the customer's creditworthiness and comparing it to the firm's **credit standards,** its minimum requirements for extending credit to a customer.

credit standards
The firm's minimum requirements for extending credit to a customer.

Five C's of Credit

five C's of credit
The five key dimensions—character, capacity, capital, collateral, and conditions—used by credit analysts to provide a framework for in-depth credit analysis.

One credit selection technique is known as the **five C's of credit,** which provides a framework for in-depth credit analysis. Because of the time and expense involved, this credit selection method is used for large-dollar credit requests. The five C's are as follows:

1. *Character:* The applicant's record of meeting past obligations.
2. *Capacity:* The applicant's ability to repay the requested credit, as judged in terms of financial statement analysis focused on cash flows available to repay debt obligations.
3. *Capital:* The applicant's debt relative to equity.
4. *Collateral:* The amount of assets the applicant has available for use in securing the credit. The larger the amount of available assets, the greater the chance that a firm will recover funds if the applicant defaults.
5. *Conditions:* Current general and industry-specific economic conditions and any unique conditions surrounding a specific transaction.

Analysis via the five C's of credit does not yield a routine accept/reject decision, so its use requires an analyst experienced in reviewing and granting credit requests. Application of this framework tends to ensure that the firm's credit customers will pay, without being pressured, within the stated credit terms.

Credit Scoring

credit scoring
A credit selection method commonly used with high-volume/small-dollar credit requests; relies on a credit score determined by applying statistically derived weights to a credit applicant's scores on key financial and credit characteristics.

Credit scoring is a method of credit selection that firms commonly use with high-volume/small-dollar credit requests. **Credit scoring** applies statistically derived weights to a credit applicant's scores on key financial and credit characteristics to predict whether he or she will pay the requested credit in a timely fashion. The procedure results in a score that measures the applicant's overall credit strength, and the score is used to make the accept/reject decision for granting the applicant credit. Credit scoring is most commonly used by large credit card operations, such as those of banks, oil companies, and department stores. The purpose of credit scoring is to make a relatively informed credit decision quickly and inexpensively, recognizing that the cost of a single bad scoring decision is small. However, if bad debts from scoring decisions increase, managers must reevaluate the scoring system. The *Focus on Ethics* box discusses a case in which a customer stole millions of dollars of merchandise from a national retail chain through fraudulent credit applications.

FOCUS ON ETHICS *in practice*

If You Can Bilk It, They Will Come

For many non-financial firms, extending trade credit is an important part of doing business. A challenge for these firms is that, unlike banks, they often lack long experience managing such accounts—thereby opening the door to employee or customer fraud.

A recent survey by the Association of Certified Fraud Examiners indicates the typical firm loses 5% of revenues annually to internal fraud. Companies with fewer than 100 employees are most at risk. The typical fraudster has 1 to 5 years employment tenure and no criminal history. "Lapping" is the most common type of internal accounts-receivable fraud—a clerk pockets payments to customer A's account, then uses payments from customer B to keep A's account current, credits customer B's account with payments from customer C, and so on.

A few simple safeguards can go a long way toward preventing internal fraud or catching it early (which cuts losses dramatically):

- Segregating and rotating duties that involve receiving or disbursing payments.
- Requiring all employees to take annual vacations.
- Training managers to review subordinate work with an eye for possible fraud.
- Creating internal "hotlines" for employees to report suspected impropriety.

The last safeguard is particularly important as internal fraud is mostly commonly exposed by employee tips.

Large companies are less vulnerable because they can invest more in prevention and detection. But even big firms can get hurt when they leave an opening. Consider a recent case of customer fraud at Lowe's—a home-improvement retailer with over 1,800 stores in the U.S., Canada, and Mexico. In January 2017, federal authorities arrested Kenneth Cassidy of Brooklyn, New York for allegedly opening at least 173 "pre-funded" trade-credit accounts at individual stores throughout the U.S.—each with a different fake company name and counterfeit check. Individual stores sent the applications and checks to corporate headquarters in North Carolina for processing, so up to 10 days could elapse before a check bounced. But, in the interim, Lowe's extended credit to the bogus company for the full "pre-funding" of the account. By not making sure the checks cleared first, Lowe's allowed Cassidy to steal over $2.6 million in merchandise.

Interestingly, the fraud appears to have relied on marginal analysis. Cassidy recognized Lowe's had a materiality threshold for investigating scams, so he kept the pre-funding checks under $1,600 to reduce the chance of discovery. Keeping the fake checks small, however, had a "shoe-leather" cost—the time and energy necessary to apply for accounts in hundreds of stores. By trading off capture risk and shoe-leather costs, Cassidy was able to bilk Lowes from June 2012 to December 2016.

The moral: If accounts-receivable policies leave an opening for fraud, some bad guy will find it.

▶ *Small firms are frequent victims of internal fraud because (i) the owner knows and trusts all employees and (ii) size makes segregating duties difficult. Careful monitoring through micromanagement, audits, and cameras can reduce vulnerability but at the risk of losing the "family feel" of a small business. How should small firms weigh the benefits of reducing fraud losses against the costs of lower employee morale?*

"Report to the Nations on Occupational Fraud and Abuse," *2014 Global Fraud Study*. Fairbanks, Phil. "Feds Say Man Used 173 Accounts to Scam Lowe's of $2.6 million." Additional facts obtained from court documents.

Changing Credit Standards

Financial analysts sometimes contemplate changing the firm's credit standards to improve returns and create greater value for owners. To demonstrate, consider the following changes and effects on profits that should result from the *relaxation* of credit standards.

Effects of Relaxation of Credit Standards

Variable	Direction of change	Effect on profits
Sales volume	Increase	Positive
Investment in accounts receivable	Increase	Negative
Bad-debt expenses	Increase	Negative

If managers tighten credit standards, the opposite effects would likely occur.

EXAMPLE 14.6

Dodd Tool, a manufacturer of lathe tools, is currently selling a product for $10 per unit. Sales (all on credit) for last year were 60,000 units. The variable cost per unit is $6. The firm's total fixed costs are $120,000.

The firm is currently contemplating a relaxation of credit standards that should result in the following: a 5% increase in unit sales to 63,000 units; an increase in the average collection period from 30 days (the current level) to 45 days; and an increase in bad-debt expenses from 1% of sales (the current level) to 2%. The firm determines that its cost of tying up funds in receivables is 10% before taxes.

To determine whether to relax its credit standards, Dodd Tool must calculate its effect on the firm's additional profit contribution from sales, the cost of the marginal investment in accounts receivable, and the cost of marginal bad debts.

Additional Profit Contribution from Sales Because fixed costs are "sunk" and therefore unaffected by a change in the sales level, the only cost relevant to a change in sales is variable costs. Sales are expected to increase by 5%, or 3,000 units. The profit contribution per unit will equal the difference between the sale price per unit ($10) and the variable cost per unit ($6). The profit contribution per unit therefore will be $4. The total additional profit contribution from sales will be $12,000 (3,000 units × $4 per unit).

Cost of the Marginal Investment in Accounts Receivable To determine the cost of the marginal investment in accounts receivable, Dodd must find the difference between the cost of carrying receivables under the two credit standards. Because its concern is only with the out-of-pocket costs, the relevant cost is the variable cost. The average investment in accounts receivable can be calculated by using the formula

$$\text{Average investment in accounts receivable} = \frac{\text{Total variable cost of annual sales}}{\text{Turnover of accounts receivable}} \tag{14.9}$$

where

$$\text{Turnover of accounts receivable} = \frac{365}{\text{Average collection period}}$$

The total variable cost of annual sales under the present and proposed plans can be found as follows, using the variable cost per unit of $6.

Total variable cost of annual sales

$$\text{Under present plan: } (\$6 \times 60{,}000 \text{ units}) = \$360{,}000$$
$$\text{Under proposed plan: } (\$6 \times 63{,}000 \text{ units}) = \$378{,}000$$

The turnover of accounts receivable is the number of times each year that the firm's accounts receivable are actually turned into cash. It equals 365 (the number of days per year) divided by the average collection period.

Turnover of accounts receivable

$$\text{Under present plan: } \frac{365}{30} = 12.2$$
$$\text{Under proposed plan: } \frac{365}{45} = 8.1$$

By substituting the cost and turnover data just calculated into Equation 14.9 for each case, we get the following average investments in accounts receivable:

Average investment in accounts receivable

$$\text{Under present plan: } \frac{\$360{,}000}{12.2} = \$29{,}508$$

$$\text{Under proposed plan: } \frac{\$378{,}000}{8.1} = \$46{,}667$$

We calculate the marginal investment in accounts receivable and its cost as follows:

Cost of marginal investment in accounts receivable

Average investment under proposed plan	$46,667
− Average investment under present plan	$29,508
Marginal investment in accounts receivable	$17,159
× Cost of funds tied up in receivables	0.10
Cost of marginal investment in A/R	$ 1,716

The resulting value of $1,716 is a cost because it represents the maximum amount that could have been earned before taxes on the $17,159 had it been placed in an equally risky investment earning 10% before taxes.

Cost of Marginal Bad Debts We find the cost of marginal bad debts by taking the difference between the levels of bad debts before and after the proposed relaxation of credit standards.

Cost of marginal bad debts

Under proposed plan: (0.02 × $10/unit × 63,000 units) =	$12,600
− Under present plan: (0.01 × $10/unit × 60,000 units) =	$ 6,000
Cost of marginal bad debts	$ 6,600

Note that the bad-debt costs are calculated by using the sale price per unit ($10) to deduct not just the true loss of variable cost ($6) that results when a customer fails to pay its account but also the profit contribution per unit (in this case, $4) that is included in the "additional profit contribution from sales." Thus, the resulting cost of marginal bad debts is $6,600.

Making the Credit Standard Decision To decide whether to relax its credit standards, the firm must compare the additional profit contribution from sales to the added costs of the marginal investment in accounts receivable and marginal bad debts. If the additional profit contribution is greater than marginal costs, the firm should relax credit standards.

EXAMPLE 14.7

The results and key calculations related to Dodd Tool's decision whether to relax its credit standards are summarized in Table 14.2. The net addition to total profits resulting from such an action will be $3,684 per year. Therefore, the firm *should* relax its credit standards as proposed.

TABLE 14.2 Effects on Dodd Tool of a Relaxation of Credit Standards

Additional profit contribution from sales		
[3,000 units × ($10 − $6)]		$12,000
Cost of marginal investment in A/R[a]		
Average investment under proposed plan:		
$\frac{\$6 \times 63{,}000}{8.1} = \frac{\$378{,}000}{8.1}$	$46,667	
− Average investment under present plan:		
$\frac{\$6 \times 60{,}000}{12.2} = \frac{\$360{,}000}{12.2}$	29,508	
Marginal investment in A/R	$17,159	
Cost of marginal investment in A/R (0.10 × $17,159)		−1,716
Cost of marginal bad debts		
Bad debts under proposed plan (0.02 × $10 × 63,000)	$12,600	
− Bad debts under present plan (0.01 × $10 × 60,000)	6,000	
Cost of marginal bad debts		−6,600
Net profit from implementation of proposed plan		$ 3,684

[a]The denominators 8.1 and 12.2 in the calculation of the average investment in accounts receivable under the proposed and present plans are the accounts receivable turnovers for each of these plans (365 ÷ 45 = 8.1 and 365 ÷ 30 = 12.2).

The procedure described here for evaluating a proposed change in credit standards is also commonly used to evaluate other changes in the management of accounts receivable. If Dodd Tool had been contemplating tightening its credit standards, for example, the cost would have been a reduction in the profit contribution from sales, and the return would have been from reductions in the cost of the investment in accounts receivable and in the cost of bad debts. Another application of this procedure is demonstrated later in this chapter.

Managing International Credit

Credit management is difficult enough for managers of purely domestic companies, and these tasks become much more complex for companies that operate internationally. It is partly because (as we have seen before) international operations typically expose a firm to exchange rate risk. It is also due to the dangers and delays involved in shipping goods long distances and in having to cross international borders.

Exports of finished goods are usually priced in the currency of the importer's local market; most commodities, in contrast, are priced in dollars. Therefore, a U.S. company that sells a product in Japan, for example, would have to price that product in Japanese yen and extend credit to a Japanese wholesaler in the local currency (yen). If the yen depreciates against the dollar before the U.S. exporter collects on its account receivable, the U.S. company experiences an exchange rate loss; the yen collected are worth fewer dollars than at the time the sale was made. Of course, the yen could just as easily appreciate against the dollar, yielding an exchange rate gain to the U.S. exporter.

For a major currency such as the Japanese yen, the exporter can *hedge* against this risk by using the currency futures, forward, or options markets, but it is costly to do so, particularly for relatively small amounts. If the exporter is

selling to a customer in a developing country, probably no effective instrument will be available for protecting against exchange rate risk at any price. This risk may be further magnified because credit standards may be much lower (and acceptable collection techniques much different) in developing countries than in the United States. Although it may seem tempting to just "not bother" with exporting, U.S. companies no longer can concede foreign markets to international rivals. These export sales, if carefully monitored and (where possible) effectively hedged against exchange rate risk, often prove very profitable.

CREDIT TERMS

credit terms
The terms of sale for customers who have been extended credit by the firm.

early payment discount
A percentage deduction from the purchase price; available to the credit customer that pays its account within a specified time.

Credit terms are the terms of sale for customers who have been extended credit by the firm. Terms of *net 30* mean the customer has 30 days from the beginning of the credit period (typically the end of month or the date of invoice) to pay the full invoice amount. Some firms offer **early payment discounts,** percentage deductions from the purchase price for paying within a specified time. For example, terms of *2/10 net 30* mean the customer can take a 2% discount from the invoice amount if the customer pays within 10 days of the beginning of the credit period. Otherwise, the customer owes the full invoice within 30 days.

A firm's business strongly influences its regular credit terms. For example, a firm selling perishable items will have very short credit terms because its items have little long-term collateral value; a firm in a seasonal business may tailor its terms to fit the industry cycles. A firm wants its regular credit terms to conform to its industry's standards. If its terms are more restrictive than its competitors', it may lose business; if its terms are less restrictive than its competitors', it may attract poor-quality customers that probably could not pay under the standard industry terms. Accordingly, the firm's regular credit terms should match the industry standards, but individual customer terms should reflect the riskiness of the customer.

Early Payment Discount

Including an early payment discount in the credit terms is an effective way to speed up collections without putting pressure on customers. The discount provides an incentive for customers to pay sooner. By speeding collections, the discount decreases the firm's investment in accounts receivable, but it also decreases the per-unit profit. Additionally, initiating a discount should reduce bad debts because customers will pay sooner, and it should increase sales volume because customers who take the discount pay a lower price for the product. Accordingly, firms that consider offering a discount must perform a benefit–cost analysis to determine whether extending a discount is profitable.

EXAMPLE 14.8

MAX Company has annual sales of $10 million and an average collection period of 40 days (turnover = 365 ÷ 40 = 9.1). That period has two main components. First, consistent with the firm's credit terms of net 30, MAX finds that it takes customers 32 days to mail payments on average (not everyone pays within 30 days). Second, it takes 8 days for MAX to receive, process, and collect payments once they are mailed. MAX is considering initiating an early payment discount by changing its credit terms from net 30 to 2/10 net 30. The firm expects this change to reduce the amount of time until the payments are placed in the mail, resulting in an average collection period of 25 days (turnover = 365 ÷ 25 = 14.6).

TABLE 14.3 Analysis of Initiating an Early Payment Discount for MAX Company

Additional profit contribution from sales [50 units × ($3,000 − $2,300)]		$ 35,000
Cost of marginal investment in A/R[a]		
Average investment presently (without discount): $\frac{\$2,300 \times 1,100 \text{ units}}{9.1} = \frac{\$2,530,000}{9.1}$	$278,022	
− Average investment with proposed discount:[b] $\frac{\$2,300 \times 1,150 \text{ units}}{14.6} = \frac{\$2,645,000}{14.6}$	181,164	
Reduction in accounts receivable investment	$ 96,858	
Cost savings from reduced investment in accounts receivable (0.10 × $96,858)[c]		9,686
Cost of discount (0.02 × 0.80 × 1,150 × $3,000)		−55,200
Net profit from initiation of proposed discount		−$ 10,514

[a]In analyzing the investment in accounts receivable, we use the variable cost of the product sold ($1,500 raw materials cost + $800 production cost = $2,300 per unit variable cost) instead of the sale price because the variable cost is a better indicator of the firm's investment.

[b]The average investment in accounts receivable with the proposed discount is estimated to be tied up for an average of 25 days instead of the 40 days under the original terms.

[c]MAX's opportunity cost of funds is 14%.

As noted earlier in Example 14.5, MAX has a raw material with current annual usage of 1,100 units. Each finished product produced requires one unit of this raw material at a variable cost of $1,500 per unit, incurs another $800 of variable cost in the production process, and sells for $3,000 on terms of net 30. Variable costs therefore total $2,300 ($1,500 + $800). MAX estimates that 80% of its customers will take the 2% discount and that offering the discount will increase sales of the finished product by 50 units (from 1,100 to 1,150 units) per year but will not alter its bad-debt percentage. MAX's opportunity cost of funds invested in accounts receivable is 10%. Should MAX offer the proposed discount? An analysis similar to that demonstrated earlier for the credit standard decision, presented in Table 14.3, shows a net loss from the discount of $10,514. Thus, MAX should not initiate the proposed discount. However, other discounts may be advantageous.

Early Payment Discount Period

early payment discount period
The number of days after the beginning of the credit period during which the discount is available.

The financial manager can change the **early payment discount period,** the number of days after the beginning of the credit period during which the discount is available. The net effect of changes in this period is difficult to analyze because of the nature of the forces involved. For example, if a firm were to increase its discount period by 10 days (e.g., changing its credit terms from 2/10 net 30 to 2/20 net 30), the following changes could occur: (1) Sales would increase, positively affecting profit; (2) bad-debt expenses would decrease, positively affecting profit; and (3) the profit per unit would decrease as a result of more people taking the discount, negatively affecting profit.

The difficulty for the financial manager lies in assessing what impact an increase in the discount period would have on the firm's investment in accounts

receivable. This investment will decrease because some customers not currently taking advantage of the discount may now do so. However, the investment in accounts receivable will increase for two reasons: (1) Customers who are already taking the discount will continue to do so but will pay later, and (2) new customers attracted by the new policy will result in new accounts receivable. If the firm were to decrease the discount period, the effects would be the opposite of those just described.

Credit Period

credit period
The number of days after the beginning of the credit period until full payment of the account is due.

Changes in the **credit period,** the number of days after the beginning of the credit period until full payment of the account is due, also affect a firm's profitability. For example, increasing a firm's credit period from net 30 days to net 45 days should increase sales, positively affecting profit. But both the investment in accounts receivable and bad-debt expenses would also increase, negatively affecting profit. The increased investment in accounts receivable would result from both more sales and generally slower receivables turnover, on average, as a result of the longer credit period. The increase in bad-debt expenses results because the longer the credit period, the more time available for a firm to fail, making it unable to pay its accounts payable. A decrease in the length of the credit period is likely to have the opposite effects. Note that the variables affected by an increase in the credit period behave in the same way they would have if the credit standards had been relaxed, as demonstrated earlier in Table 14.2.

CREDIT MONITORING

credit monitoring
The ongoing review of a firm's accounts receivable to determine whether customers are paying according to the stated credit terms.

The final issue a firm should consider in its accounts receivable management is credit monitoring. **Credit monitoring** is an ongoing review of the firm's accounts receivable to determine whether customers are paying according to the stated credit terms. If they are not paying in a timely manner, credit monitoring will alert the firm to the problem. Slow payments are costly to a firm because they lengthen the average collection period and thus increase the firm's investment in accounts receivable. Firms usually monitor the credits by watching the average collection period and by constructing an aging schedule for their accounts receivable.

Average Collection Period

The average collection period is the second component of the cash conversion cycle. As noted in Chapter 3, it is the average number of days that credit sales are outstanding. The average collection period has two components: (1) the time from sale until the customer places the payment in the mail and (2) the time to receive, process, and collect the payment once it has been mailed by the customer. The formula for finding the average collection period is

$$\text{Average collection period} = \frac{\text{Accounts receivable}}{\text{Average sales per day}} \tag{14.10}$$

Assuming receipt, processing, and collection time is constant, the average collection period tells the firm, on average, when its customers pay their accounts.

Knowing its average collection period enables the firm to determine whether there is a general problem with accounts receivable. For example, a

firm that has credit terms of net 30 would expect its average collection period (minus receipt, processing, and collection time) to equal about 30 days. If the actual collection period is significantly greater than 30 days, the firm has reason to review its credit operations. If the firm's average collection period is increasing over time, it has cause for concern about its accounts receivable management. A first step in analyzing an accounts receivable problem is to "age" the accounts receivable. By this process, the firm can determine whether the problem exists in its accounts receivable in general or is attributable to a few specific accounts.

aging schedule
A credit-monitoring technique that breaks down accounts receivable into groups on the basis of their time of origin; it indicates the percentages of the total accounts receivable balance that have been outstanding for specified periods of time.

Aging of Accounts Receivable

An **aging schedule** breaks down accounts receivable into groups on the basis of their time of origin. The breakdown is typically made on a month-by-month basis, going back 3 or 4 months. The resulting schedule indicates the percentages of the total accounts receivable balance that have been outstanding for specified periods of time. The purpose of the aging schedule is to enable the firm to pinpoint problems. A simple example will illustrate the form and evaluation of an aging schedule.

EXAMPLE 14.9

The accounts receivable balance on the books of Dodd Tool on December 31, 2018, was $200,000. The firm extends net 30-day credit terms to its customers. To gain insight into the firm's relatively lengthy—51.3-day—average collection period, Dodd prepared the following aging schedule.

Age of account	Balance outstanding	Percentage of total balance outstanding
0–30 days	$ 80,000	40%
31–60 days	36,000	18
61–90 days	52,000	26
91–120 days	26,000	13
Over 120 days	6,000	3
Totals at 12/31/18	$200,000	100%

Because Dodd extends 30-day credit terms to its customers, they have 30 days after the end of the month of sale to remit payment. Therefore, we see that 40% of the accounts are current (age $<$ 30 days) and the remaining 60% are overdue (age $>$ 30 days). Eighteen percent of the balance outstanding is 1–30 days overdue, 26% is 31–60 days overdue, 13% is 61–90 days overdue, and 3% is more than 90 days overdue. Although the collections seem generally slow, a noticeable irregularity in these data is the high percentage of the balance outstanding that is 31–60 days overdue (ages of 61–90 days). Clearly, a problem must have occurred 61–90 days ago. Investigation may reveal that the problem can be attributed to the hiring of a new credit manager, the acceptance of a new account that made a large credit purchase but has not yet paid for it, or an ineffective collection policy. When this type of discrepancy is found in the aging schedule, the analyst should determine, evaluate, and remedy its cause.

TABLE 14.4 Common Collection Techniques

Technique[a]	Brief description
Letters	After a certain number of days, the firm sends a polite letter reminding the customer of the overdue account. If the account is not paid within a certain period after this letter has been sent, a second, more demanding letter is sent.
Telephone calls	If letters prove unsuccessful, a telephone call may be made to the customer to request immediate payment. If the customer has a reasonable excuse, arrangements may be made to extend the payment period. A call from the seller's attorney may be used.
Personal visits	This technique is much more common at the consumer credit level, but it may also be effectively employed by industrial suppliers. Sending a local salesperson or a collection person to confront the customer can be very effective. Payment may be made on the spot.
Collection agencies	A firm can turn uncollectible accounts over to a collection agency or an attorney for collection. The fees for this service are typically quite high; the firm may receive less than 50¢ on the dollar from accounts collected in this way.
Legal action	Legal action is the most stringent step, an alternative to the use of a collection agency. Not only is direct legal action expensive, but it may force the debtor into bankruptcy without guaranteeing the ultimate receipt of the overdue amount.

[a]The techniques are listed in the order in which they are typically followed in the collection process.

Common Collection Techniques

Firms use a number of collection techniques, ranging from letters to legal action. As an account becomes more and more overdue, the collection effort becomes more intense. Table 14.4 lists and describes several common techniques in the order that firms would typically implement them in the collection process.

→ REVIEW QUESTIONS MyLab Finance Solutions

14–11 What is the role of the five C's of credit in the credit selection activity?

14–12 Explain why credit scoring is typically applied to consumer credit decisions rather than to mercantile credit decisions.

14–13 What are the basic tradeoffs in a tightening of credit standards?

14–14 Why are the risks involved in international credit management more complex than those associated with purely domestic credit sales?

14–15 Why do a firm's regular credit terms typically conform to those of its industry?

14–16 Why should a firm actively monitor the accounts receivable of its credit customers? How are the average collection period and an aging schedule used for credit monitoring?

LG 6

14.5 Management of Receipts and Disbursements

The third component of the cash conversion cycle, the average payment period, also has two parts: (1) the time from purchase of goods on account until the firm mails its payment and (2) the receipt, processing, and collection time required by the firm's suppliers. The receipt, processing, and collection time for the firm, both from its customers and to its suppliers, is the focus of receipts and disbursements management.

FLOAT

float
Funds that have been sent by the payer but are not yet usable funds to the payee.

mail float
The time delay between when payment is placed in the mail and when it is received.

processing float
The time between receipt of a payment and its deposit into the firm's account.

clearing float
The time between deposit of a payment and when spendable funds become available to the firm.

Float refers to funds that have been sent by the payer but are not yet usable funds to the payee. Float is important in the cash conversion cycle because its presence lengthens both the firm's average collection period and its average payment period. However, the goal of the firm should be to shorten its average collection period and lengthen its average payment period. Both can be accomplished by managing float.

Float has three component parts:

1. **Mail float** is the time delay between when payment is placed in the mail and when it is received.
2. **Processing float** is the time between receipt of the payment and its deposit into the firm's account.
3. **Clearing float** is the time between deposit of the payment and when spendable funds become available to the firm. This component of float is attributable to the time required for a check to clear the banking system.

Some common techniques for managing the component parts of float to speed up collections and slow down payments are described here.

SPEEDING UP COLLECTIONS

Speeding up collections reduces customer collection float time and thus reduces the firm's average collection period, which decreases the investment the firm must make in its cash conversion cycle. In our earlier examples, MAX Company had annual sales of $10 million and 8 days of total collection float (receipt, processing, and collection time). If MAX can reduce its float time by 3 days, it will reduce its investment in the cash conversion cycle by $82,192 [$10,000,000 × (3 ÷ 365)].

lockbox system
A collection procedure in which customers mail payments to a post office box that is emptied regularly by the firm's bank, which processes the payments and deposits them in the firm's account. This system speeds up collection time by reducing processing time as well as mail and clearing time.

One technique for speeding up collections is a lockbox system. A **lockbox system** works as follows: Rather than mailing payments to the company, customers mail payments to a post office box. The firm's bank empties the post office box regularly, processes each payment, and deposits the payments in the firm's account. The bank sends (or transmits electronically) deposit slips, along with payment enclosures, to the firm so it can properly credit customers' accounts. Lockboxes are geographically dispersed to match the locations of the firm's customers. A lockbox system affects all three components of float. Lockboxes reduce mail time and often clearing time by being near the firm's customers. Lockboxes reduce processing time to nearly zero because the bank deposits payments before the firm processes them. Obviously, a lockbox system reduces collection float time, but not without a cost; therefore, a firm must perform an economic analysis to determine whether to implement a lockbox system.

MATTER OF FACT

U.S.P.S. Problems Create Opportunities for Banks

For decades, the United States Postal Service has been struggling financially. In 2012, the USPS announced that to cut costs it would dramatically reduce the number of mail-processing facilities that it operated. For companies, this change meant an increase in mail float. For Fifth Third Bank, it was an opportunity. The bank announced a new remote lockbox capture program in which business-to-business payments would be retrieved at local post offices around the country. Next, Fifth Third would make electronic images of those payments, and the images would be processed at the bank's Cincinnati processing hub. Fifth Third promised customers that it would reduce mail float and speed up the collection process for its clients.

Large firms with geographically dispersed customers are the primary users of lockbox systems. However, a firm does not have to be large to benefit from a lockbox. Smaller firms can also benefit, primarily from transferring the processing of payments to the bank.

SLOWING DOWN PAYMENTS

Float is also a component of the firm's average payment period. In this case, the float is in favor of the firm. The firm may benefit by increasing all three components of its payment float. One popular technique for increasing payment float is **controlled disbursing,** which involves the strategic use of mailing points and bank accounts to lengthen mail float and clearing float, respectively. Firms must use this approach carefully, though, because longer payment periods may strain supplier relations.

controlled disbursing
The strategic use of mailing points and bank accounts to lengthen mail float and clearing float, respectively.

In summary, a reasonable overall policy for float management is (1) to collect payments as quickly as possible because once the payment is in the mail the funds belong to the firm and (2) to delay making payment to suppliers because once the payment is mailed the funds belong to the supplier.

CASH CONCENTRATION

Cash concentration is the process used by the firm to bring lockbox and other deposits together into one bank, often called the *concentration bank*. Cash concentration has three main advantages. First, it creates a large pool of funds for use in making short-term cash investments. Because there is a fixed-cost component in the transaction cost associated with such investments, investing a single pool of funds reduces the firm's transaction costs. The larger investment pool also allows the firm to choose from a greater variety of short-term investment vehicles. Second, concentrating the firm's cash in one account improves the tracking and internal control of the firm's cash. Third, having one concentration bank enables the firm to implement payment strategies that reduce idle cash balances. Of course, a downside is that pooling all of a firm's cash at one bank could create a major problem if that institution were to fail.

cash concentration
The process used by the firm to bring lockbox and other deposits together into one bank, often called the *concentration bank*.

A variety of mechanisms are available for transferring cash from the lockbox bank and other collecting banks to the concentration bank. One mechanism is a **depository transfer check (DTC),** which is an unsigned check drawn on one of the firm's bank accounts and deposited in another. For cash concentration, a DTC is drawn on each lockbox or other collecting bank account and deposited in the concentration bank account. Once the DTC has cleared the bank on which it is drawn (which may take several days), the transfer of funds is completed. Most firms currently provide deposit information by telephone to the concentration bank, which then prepares and deposits into its account the DTC drawn on the lockbox or other collecting bank account.

depository transfer check (DTC)
An unsigned check drawn on one of a firm's bank accounts and deposited in another.

A second mechanism is an **ACH (automated clearinghouse) transfer,** which is a preauthorized electronic withdrawal from the payer's account. A computerized clearing facility (called the *automated clearinghouse,* or *ACH*) makes a paperless transfer of funds between the payer and payee banks. An ACH settles accounts among participating banks. Individual accounts are settled by respective bank balance adjustments. ACH transfers clear in 1 day. For cash

ACH (automated clearinghouse) transfer
Preauthorized electronic withdrawal from the payer's account and deposit into the payee's account via a settlement among banks by the automated clearinghouse, or ACH.

concentration, an ACH transfer is made from each lockbox bank or other collecting bank to the concentration bank. An ACH transfer can be thought of as an electronic DTC, but because the ACH transfer clears in 1 day, it provides benefits over a DTC; however, both banks in the ACH transfer must be members of the clearinghouse.

wire transfer
An electronic communication that, via bookkeeping entries, removes funds from the payer's bank and deposits them in the payee's bank.

A third cash concentration mechanism is a **wire transfer.** A wire transfer is an electronic communication that, via bookkeeping entries, removes funds from the payer's bank and deposits them in the payee's bank. Wire transfers can eliminate mail and clearing float and may reduce processing float as well. For cash concentration, the firm moves funds using a wire transfer from each lockbox or other collecting account to its concentration account. Wire transfers are a substitute for DTC and ACH transfers, but they are more expensive.

Firms must balance the costs and benefits of concentrating cash to determine the type and timing of transfers from its lockbox and other collecting accounts to its concentration account. The transfer mechanism selected should be the most profitable one. (The profit per period of any transfer mechanism equals earnings on the increased availability of funds minus the cost of the transfer system.)

ZERO-BALANCE ACCOUNTS

zero-balance account (ZBA)
A disbursement account that always has an end-of-day balance of zero because the firm deposits money to cover checks drawn on the account only as they are presented for payment each day.

Zero-balance accounts (**ZBAs**) are disbursement accounts that always have an end-of-day balance of zero. The purpose is to eliminate nonearning cash balances in corporate checking accounts. A ZBA works well as a disbursement account under a cash concentration system.

ZBAs work as follows: Once all a given day's checks are presented for payment from the firm's ZBA, the bank notifies the firm of the total amount of checks, and the firm transfers funds into the account to cover the amount of that day's checks. This transfer leaves an end-of-day balance of $0 (zero dollars). The ZBA enables the firm to keep all its operating cash in an interest-earning account, thereby eliminating idle cash balances. Thus, a firm that used a ZBA in conjunction with a cash concentration system would need two accounts. The firm would concentrate its cash from the lockboxes and other collecting banks into an interest-earning account and would write checks against its ZBA. The firm would cover the exact dollar amount of checks presented against the ZBA with transfers from the interest-earning account, leaving the end-of-day balance in the ZBA at $0.

A ZBA is a disbursement-management tool. As we discussed earlier, the firm would prefer to maximize its payment float. However, some cash managers believe that actively attempting to increase float time on payments is unethical. A ZBA enables the firm to maximize the use of float on each check without altering the float time of payments to its suppliers. Keeping all the firm's cash in an interest-earning account enables the firm to maximize earnings on its cash balances by capturing the full float time on each check it writes.

PERSONAL FINANCE EXAMPLE 14.10 Megan Laurie, a 25-year-old nurse, works at a hospital that pays her every 2 weeks by direct deposit into her checking account, which pays no interest and has no minimum balance requirement. She

takes home about $1,800 every 2 weeks, or about $3,600 per month. She maintains a checking account balance of around $1,500. Whenever it exceeds that amount, she transfers the excess into her savings account, which currently pays 1.0% annual interest. She currently has a savings account balance of $17,000 and estimates that she transfers about $600 per month from her checking account into her savings account.

Megan pays her bills immediately when she receives them. Her monthly bills average about $1,900, and her monthly cash outlays for food and gas total about $900. An analysis of Megan's bill payments indicates that on average she pays her bills 8 days early. Megan could also invest money in a mutual fund that invests in short-term, low-risk investments paying 2.0% annual interest. Megan is interested in learning how she might better manage her cash balances.

Megan talks with her sister, who has had a finance course, and they come up with three ways for Megan to better manage her cash balance:

1. **Invest current balances.** Megan can transfer her current savings account balances into the low-risk mutual fund, thereby increasing the rate of interest earned from 1.0% to about 2.0%. On her current $17,000 balance, she will immediately increase her annual interest earnings by about $170 [(0.02 − 0.01) × $17,000].
2. **Invest monthly surpluses.** Megan can transfer monthly the $600 from her checking account to the mutual fund, thereby increasing the annual earnings on each monthly transfer by about $6 [(0.02 − 0.01) × $600], which for the 12 transfers would generate additional annual earnings of about $72 (12 months × $6).
3. **Slow down payments.** Rather than paying her bills immediately on receipt, Megan can pay her bills nearer their due date. By doing so, she can gain 8 days of disbursement float each month, or 96 days per year (8 days per month × 12 months), on an average of $1,900 of bills. Assuming that she can earn 2.0% annual interest on the $1,900, slowing down her payments would save about $10 annually [(96 ÷ 365) × 0.02 × $1,900].

On the basis of these three recommendations, Megan would increase her annual earnings by a total of about $252 ($170 + $72 + $10).

INVESTING IN MARKETABLE SECURITIES

Marketable securities are short-term, interest-earning, money market instruments that can easily be converted into cash. Marketable securities are part of the firm's liquid assets. The firm uses them to earn a return on temporarily idle funds. To be truly marketable, a security must have (1) a ready market to minimize the amount of time required to convert it into cash and (2) safety of principal, which means that it experiences little or no loss in value over time.

The securities most commonly held as part of the firm's marketable-securities portfolio are divided into two groups: (1) government issues, which have relatively low yields as a consequence of their low risk; and (2) nongovernment issues, which have slightly higher yields than government issues with similar maturities because of the slightly higher risk associated with them. Table 14.5 summarizes the key features of popular marketable securities.

TABLE 14.5 Features of Marketable Securities

Security	Issuer	Description	Initial maturity	Risk and return
Government issues				
Treasury bills	U.S. Treasury	Issued weekly at auction; sold at a discount; strong secondary market	4, 13, and 26 weeks	Lowest, virtually risk-free
Treasury notes	U.S. Treasury	Stated interest rate; interest paid semiannually; strong secondary market	1–10 years	Low, but higher than U.S. Treasury bills
Treasury bonds	U.S. Treasury	Stated interest rate; interest paid semiannually; strong secondary market	11–30 years	Less than corporate bonds, but higher than U.S. Treasury bills and notes
Federal agency issues	Agencies of federal government	Not an obligation of U.S. Treasury; strong secondary market	9 months to 30 years	Slightly higher than U.S. Treasury issues
Nongovernment issues				
Negotiable certificates of deposit (CDs)	Commercial banks	Represent specific cash deposits in commercial banks; amounts and maturities tailored to investor needs; large denominations; good secondary market	1 month to 3 years	Higher than U.S. Treasury issues and comparable to commercial paper
Commercial paper	Corporation with a high credit standing	Unsecured note of issuer; large denominations	3–270 days	Higher than U.S. Treasury issues and comparable to negotiable CDs
Banker's acceptances	Banks	Results from a bank guarantee of a business transaction; sold at discount from maturity value	30–180 days	About the same as negotiable CDs and commercial paper but higher than U.S. Treasury issues
Eurodollar deposits	Foreign banks	Deposits of currency not native to the country in which the bank is located; large denominations; active secondary market	1 day to 3 years	High, due to less regulation of depository banks and some foreign exchange risk
Money market mutual funds	Professional portfolio management companies	Professionally managed portfolios of marketable securities; provide instant liquidity	None—depends on wishes of investor	Vary, but generally higher than U.S. Treasury issues and comparable to negotiable CDs and commercial paper
Repurchase agreements	Bank or securities dealer	Bank or securities dealer sells specific securities to firm and agrees to repurchase them at a specific price and time	Customized to purchaser's needs	Generally slightly below that associated with the outright purchase of the security

→ REVIEW QUESTIONS MyLab Finance Solutions

14–17 What is float, and what are its three components?

14–18 What are the firm's objectives with regard to collection float and to payment float?

14–19 What are the three main advantages of cash concentration?

14–20 What are three mechanisms of cash concentration? What is the objective of using a zero-balance account (ZBA) in a cash concentration system?

14–21 What two characteristics make a security marketable? Why are the yields on nongovernment marketable securities generally higher than the yields on government issues with similar maturities?

SUMMARY

FOCUS ON VALUE

It is important for a firm to maintain a reasonable level of net working capital. To do so, it must balance the high profit and high risk associated with low levels of current assets and high levels of current liabilities against the low profit and low risk that result from high levels of current assets and low levels of current liabilities. A strategy that achieves a reasonable balance between profits and risk should positively contribute to the firm's value.

Similarly, the firm should manage its cash conversion cycle by turning inventory quickly; collecting accounts receivable quickly; managing mail, processing, and clearing time; and paying accounts payable slowly. These strategies should enable the firm to manage its current accounts efficiently and to minimize the amount of resources invested in operating assets.

The financial manager can manage inventory, accounts receivable, and cash receipts to minimize the firm's operating cycle investment, thereby reducing the amount of resources needed to support its business. Using these strategies, as well as managing accounts payable and cash disbursements to shorten the cash conversion cycle, should minimize the additional funds needed to support the firm's resource requirements. Active management of the firm's net working capital and current assets should positively contribute to the firm's goal of **maximizing its stock price.**

REVIEW OF LEARNING GOALS

LG 1 **Understand working capital management, net working capital, and the related tradeoff between profitability and risk.** Working capital (or short-term financial) management focuses on managing each of the firm's current assets (inventory, accounts receivable, cash, and marketable securities) and current liabilities (accounts payable, accruals, and notes payable) in a manner that positively contributes to the firm's value. Net working capital is the difference between current assets and current liabilities. Risk, in the context of short-term financial decisions, is the probability that a firm will be unable to pay its bills as they come due. Assuming a constant level of total assets, the higher a firm's ratio of current assets to total assets, the less profitable the firm and the less risky it is. The converse is also true. With constant total assets, the higher a firm's ratio of current liabilities to total assets, the more profitable and the more risky the firm is. The converse of this statement is also true.

LG2 **Describe the cash conversion cycle, its funding requirements, and the key strategies for managing it.** The cash conversion cycle has three components: (1) average age of inventory, (2) average collection period, and (3) average payment period. The length of the cash conversion cycle determines the amount of time resources are tied up in the firm's day-to-day operations. The firm's investment in short-term assets often consists of both permanent and seasonal funding requirements. The seasonal requirements can be financed using either an aggressive (low-cost, high-risk) financing strategy or a conservative (high-cost, low-risk) financing strategy. The firm's funding decision for its cash conversion cycle ultimately depends on management's disposition toward risk and the strength of the firm's banking relationships. To minimize its reliance on negotiated liabilities, the financial manager seeks to (1) turn over inventory as quickly as possible; (2) collect accounts receivable as quickly as possible; (3) manage mail, processing, and clearing time; and (4) pay accounts payable as slowly as possible. Use of these strategies should minimize the length of the cash conversion cycle.

LG3 **Discuss inventory management: differing views, common techniques, and international concerns.** The viewpoints of marketing, manufacturing, and purchasing managers about the appropriate levels of inventory tend to cause higher inventories than those deemed appropriate by the financial manager. Four techniques for effectively managing inventory are (1) the ABC system, (2) the economic order quantity (EOQ) model, (3) the just-in-time (JIT) system, and (4) computerized systems for resource control: MRP, MRP II, and ERP. International inventory managers place greater emphasis on making sure that sufficient quantities of inventory are delivered where and when needed, and in the right condition, than on ordering the economically optimal quantities.

LG4 **Explain the credit selection process and the quantitative procedure for evaluating changes in credit standards.** Credit selection techniques determine which customers' creditworthiness is consistent with the firm's credit standards. Two common credit selection techniques are the five C's of credit and credit scoring. Changes in credit standards can be evaluated mathematically by assessing the effects of a proposed change on profits from sales, the cost of accounts receivable investment, and bad-debt costs.

LG5 **Review the procedures for quantitatively considering early payment discount changes, other aspects of credit terms, and credit monitoring.** Changes in credit terms—the discount, the discount period, and the credit period—can be quantified similarly to changes in credit standards. Credit monitoring, the ongoing review of accounts receivable, frequently involves use of the average collection period and an aging schedule.

LG6 **Understand the management of receipts and disbursements, including float, speeding up collections, slowing down payments, cash concentration, zero-balance accounts, and investing in marketable securities.** Float refers to funds that have been sent by the payer but are not yet usable funds to the payee. The components of float are mail time, processing time, and clearing time. Float occurs in both the average collection period and the average payment period. One technique for speeding up collections is a lockbox system. A popular technique for slowing payments is controlled disbursing.

The goal for managing operating cash is to balance the opportunity cost of nonearning balances against the transaction cost of temporary investments. Firms commonly use depository transfer checks (DTCs), ACH transfers, and wire transfers to transfer lockbox receipts to their concentration banks quickly. Zero-balance accounts (ZBAs) can be used to eliminate nonearning cash balances in corporate checking accounts. Marketable securities are short-term, interest-earning, money market instruments used by the firm to earn a return on temporarily idle funds. They may be government or nongovernment issues.

SELF-TEST PROBLEMS (Solutions in Appendix)

LG 2

ST14–1 **Cash conversion cycle** Hurkin Manufacturing Company pays accounts payable on the 10th day after purchase. The average collection period is 30 days, and the average age of inventory is 40 days. The firm currently has annual sales of about $18 million and purchases of $14 million. The firm is considering a plan that would stretch its accounts payable by 20 days. If the firm pays 6% per year for its resource investment, what annual savings can it realize by this plan? Assume a 360-day year.

LG 3

ST14–2 **EOQ analysis** Thompson Paint Company uses 60,000 gallons of pigment per year. The cost of ordering pigment is $200 per order, and the cost of carrying the pigment in inventory is $1 per gallon per year. The firm uses pigment at a constant rate every day throughout the year.

a. Calculate the EOQ.

b. Assuming that it takes 20 days to receive an order once it has been placed, determine the reorder point in terms of gallons of pigment. (*Note:* Use a 365-day year.)

LG 4

ST14–3 **Relaxing credit standards** Regency Rug Repair Company is trying to decide whether it should relax its credit standards. The firm repairs 72,000 rugs per year at an average price of $32 each. Bad-debt expenses are 1% of sales, the average collection period is 40 days, and the variable cost per unit is $28. Regency expects that if it does relax its credit standards, the average collection period will increase to 48 days and that bad debts will increase to $1\frac{1}{2}$% of sales. Sales will increase by 4,000 repairs per year. If the firm has a required rate of return on equal-risk investments of 7%, what recommendation would you give the firm? Use your analysis to justify your answer. (*Note:* Use a 365-day year.)

WARM-UP EXERCISES Select problems are available in MyLab Finance.

LG 2

E14–1 Everdeen Inc. has a 90-day operating cycle. If its average age of inventory is 35 days, how long is its average collection period? If its average payment period is 30 days, what is its cash conversion cycle? Place all this information on a timeline similar to Figure 14.2.

LG 2

E14–2 Rajasthani Umbrella is a seasonal business that sells umbrellas. At the peak of its rainy selling season, the firm has INR 2,500,000 in cash, INR 3,600,000 in inventory, INR 400,000 in accounts receivable, and INR 350,000 in accounts payable. During the slow dry season, the firm holds INR 800,000 in cash, INR 1,000,000 in inventory, INR 200,000 in accounts receivable, and INR 150,000 in accounts payable. Calculate Rajasthani Umbrella's minimum and peak funding requirements.

LG 3

E14–3 Cohen Industrial Products uses 2,100 switch assemblies per month and then reorders another 2,100. The carrying cost per switch assembly is $20 per year, and the fixed order cost is $300. The plant operates 250 days in a year and maintains a minimum inventory level of 2 days' worth of switch assemblies. Assuming that the lead time to receive orders is 3 days, calculate the economic order quantity (EOQ) and the reorder point.

LG 4

E14–4 Forrester Fashions has annual credit sales of 250,000 units with an average collection period of 70 days. The company has a per-unit variable cost of $20 and a per-unit sale price of $30. Bad debts currently are 5% of sales. The firm estimates that a proposed relaxation of credit standards would not affect its 70-day average collection period but would increase bad debts to 7.5% of sales, which would rise to 300,000 units per year. Forrester requires a 12% return on investments. Show all necessary calculations needed to evaluate Forrester's proposed relaxation of credit standards.

LG 5

E14–5 Klein's Tools is considering offering a discount to speed up the collection of accounts receivable. Currently, the firm has an average collection period of 65 days, annual sales are 35,000 units, the per-unit price is $40, and the per-unit variable cost is $29. A 2% discount is being considered. Klein's Tools estimates that 80% of its customers will take the 2% discount. If sales are expected to rise to 37,000 units per year and the firm has a 15% required rate of return, what minimum average collection period is necessary to approve the discount plan?

PROBLEMS

Select problems are available in MyLab Finance. The MyLab icon indicates problems in Excel format available in MyLab Finance.

LG 2

P14–1 **Cash conversion cycle** Metal Supplies is concerned about its cash management. On average, the day's sales in inventory (duration of inventory on shelf) is 90 days. Accounts receivable are collected in 90 days, while accounts payable are paid in 60 days. Metal Supplies has annual sales of $14 million; cost of goods sold total $9.5 million and purchases are $5 million. (*Note:* Use a 365-day year.)

a. Calculate Metal Supplies' operating cycle.
b. What is Metal Supplies' cash conversion cycle?
c. Calculate the amount of resources needed to support Metal Supplies' cash conversion cycle.
d. Discuss how Metal Supplies might be able to reduce its cash conversion cycle.

LG 2

P14–2 **Changing cash conversion cycle** The Furniture Corporation turns over its inventory 7 times a year, has an average collection period of 45 days, and has an average

payment period of 30 days. It has annual sales of $5 million and cost of goods sold of $1.8 million.

a. What is the firm's operating cycle and cash conversion cycle?

b. Calculate the dollar value of inventory held by the firm.

c. Suppose the firm could reduce the average age of its inventory from 73 days to 63 days. By how much would it reduce its dollar investment in working capital?

LG 2

P14–3 Multiple changes in cash conversion cycle Antonio is an analyst at Barrilla Group. The firm turns over its inventory 5 times each year. It has an average collection period of 50 days and an average payment period of 20 days. The firm's annual sales are €12 million. Assume there is no difference in the investment per euro of sales in inventory, receivables, and payables, and assume a 365-day year.

a. Calculate the firm's cash conversion cycle, its daily cash operating expenditure, and the amount of resources needed to support its cash conversion cycle.

b. Find the firm's cash conversion cycle and resource investment requirement if it makes the following changes simultaneously.

(1) Shortens the average age of inventory by 10 days.

(2) Speeds the collection of accounts receivable by an average of 15 days.

(3) Extends the average payment period by 5 days.

c. If the firm pays 15% for its resource investment, by how much, if anything, could it increase its annual profit as a result of changes in part **b**?

d. If the annual cost of achieving the profit in part **c** is €50,000, what action should Antonio recommend to Barrilla Why?

LG 2 MyLab

P14–4 Aggressive versus conservative seasonal funding strategy Dynabase Tool has forecast its total funds requirements for the coming year as shown in the following table.

Month	Amount	Month	Amount
January	$2,000,000	July	$12,000,000
February	2,000,000	August	14,000,000
March	2,000,000	September	9,000,000
April	4,000,000	October	5,000,000
May	6,000,000	November	4,000,000
June	9,000,000	December	3,000,000

a. Divide the firm's monthly funds requirement into (1) a permanent component and (2) a seasonal component, and find the monthly average for each of these components.

b. Describe the amount of long-term and short-term financing used to meet the total funds requirement under (1) an aggressive funding strategy and (2) a conservative funding strategy. Assume that, under the aggressive strategy, long-term funds finance permanent needs and short-term funds are used to finance seasonal needs.

c. Assuming that short-term funds cost 5% annually and that the cost of long-term funds is 10% annually, use the averages found in part **a** to calculate the total cost of each of the strategies described in part **b.** Assume that the firm can earn 3% on any excess cash balances.

d. Discuss the profitability–risk tradeoffs associated with the aggressive strategy and those associated with the conservative strategy.

LG 3 MyLab

P14–5 EOQ analysis Enviro Exhaust Company purchases 1,200,000 units per year of a component with a purchase price of $50. The fixed cost is $15 per order, and the carrying cost is 30% of the purchase price.

a. Calculate the EOQ based on the data given.
b. Calculate the EOQ if the order cost is zero. What is the implication to the firm if there is a decrease in the order cost?

LG 3

P14–6 EOQ, reorder point, and safety stock Outdoor Living Manufacturers uses 1,000 units of a product per year. Its fixed cost is $28 per order, while the carrying cost is $5 per unit per year. The lead time is 5 days and, therefore, the firm keeps 7 days' usage in inventory as safety stock. (*Note:* Use a 365-day year where required.)
a. Calculate the EOQ and the average inventory.
b. How many orders will Outdoor Living Manufacturers place during one year?
c. When should Outdoor Living Manufacturers place its orders?
d. Suppose Outdoor Living Manufacturers does not keep safety stock. Explain the changes, if any, which will occur in (1) order cost, (2) carrying cost, (3) total inventory cost, (4) reorder point, and (5) EOQ.

Personal Finance Problem

LG 3

P14–7 Marginal costs Alessandro is a successful soccer player. He is considering buying a new Porsche. There are two options available: the new Porsche Panamera and the Porsche Boxter. Whichever model he chooses he plans to drive it for a period of around 4 years and then sell it. Assume that the trade-in value of both cars is the same at the end of the 4-year period.

The two models have many differences, and Alessandro needs to make a financial comparison. The price at the car dealer in Torino of the Boxter is €48,000 and of the Panamera is €60,000. Alessandro believes that the difference of €12,000 to be the marginal cost difference between the two cars. However, his friend, who is an economist, tells him to look into more data before making a decision. Assume that the prevailing discount rate for both cars is 3% annually. Other information on this purchase is shown in the following table.

Item	Boxter	Panamera
Price	€48,000	€60,000
Engine (liters)	4	4.8
Cylinders	6	8
Depreciation over 4 years	€25,000	€32,000
Finance charges over entire 4-year period*	€ 6,183	€ 7,900
Insurance over 4 years	€ 8,500	€ 9,600
Taxes and fees over 4 years	€ 2,220	€ 4,000
Maintenance/repairs over 4 years	€ 3,300	€ 3,300
Average fuel economy (l/100 km)	5	9
Ownership period in years	4	4
Kilometers driven per year over 4 years	8,000	8,000
Cost per liter of diesel over 4-year ownership	€ 1.2	€ 1.2

**The finance charges are the difference between the total principal and interest paid over the 4-year period less the actual cost of the Porsche.*

a. Calculate the total "true" cost for each car over the 4-year ownership period.
b. Calculate the total fuel cost for each car over the 4-year ownership period.
c. What is the marginal fuel cost from purchasing the Panamera?
d. What is the marginal cost of purchasing the Panamera?
e. What is the total marginal cost associated with purchasing the Panamera? How does that compare with the €12,000 that Alessandro calculated?

LG 4

P14–8 Accounts receivable changes without bad debts Clear Glass Company sells glass containers. It reported total sales of $1,580,000, with 60% of the sales on credit. It takes 60 days to collect accounts receivable. The selling price is $20 per container, while the variable cost is $15 per container. The board is currently investigating a change in the collection of accounts receivable that is expected to result in a 20% increase in credit sales and a 10% increase in the average collection period. No change in bad debt is expected. The firm's opportunity cost on its investment in accounts receivable is 12%. (*Note:* Use a 365-day year.)

a. Calculate the additional profit contribution from sales if the change in collecting accounts receivable is implemented.
b. Calculate the marginal investment in accounts receivable that will result from the change.
c. Calculate the cost of the marginal investment in accounts receivable.
d. Would you recommend the firm implement the proposed change?

LG 4

P14–9 Accounts receivable changes with bad debts Germanos Group is evaluating an accounts receivable change that would increase bad debts from 5% to 10% of sales. Sales are currently 100,000 units of batteries, the selling price €25 per unit, and the variable cost per unit is €15. As a result of the proposed change, sales are forecast to increase by 20,000 units.

a. What are bad debts in euros currently and after the proposed change?
b. Calculate the cost of the marginal bad debts for Germanos.
c. Ignoring the additional profit contribution for the increased sales, if the proposed change saves €50,000 and causes no change in the average investment in accounts receivable, would you recommend it? Explain.
d. Considering all changes in costs and benefits, should the change be made? Explain.
e. Compare and discuss your answers in parts **c** and **d.**

LG 4

P14–10 Relaxation of credit standards Farmers World, a firm specializing in fertilizers, is evaluating a proposal to relax the credit standards to increase sales. The implementation of this plan is expected to increase sales by 10% from 15,500 to 17,050 units in the following year. The average collection period will increase from 30 to 45 days, and bad debts are expected to increase from 2% to 5% of sales. The selling price per bag is $15, and the variable cost per bag is $12. The required rate of return on equal-risk investments is 22%. Should the proposed plan be implemented? Explain. (*Note:* Assume a 365-day year.)

LG 5

P14–11 Initiating a cash discount Pebbles & Stone Enterprises currently sells on credit only and does not offer any discounts. In an attempt to increase sales, the board is considering offering a 5% discount for payment within 15 days. Currently, the average collection period is 60 days, sales are 30,000 units, selling price is $40 per unit, and variable cost per unit is $32. If the discount is implemented, it is expected that sales will increase to 38,000 units that 80% of sales will take the discount, and the average collection period will fall to 30 days. The firm's required rate of return is 20%. Should the proposed discount be offered? (*Note:* Use a 365-day year.)

LG 5

P14–12 **Shortening the credit period** Mix and Brix Suppliers is contemplating shortening its credit period from 45 to 30 days. Based on an analysis, it is estimated that this change will reduce the average collection period from 50 to 45 days, and the bad debts are expected to decrease from 2% to 1% of sales. Currently, sales are 30,000 units, but it is believed that sales will decline to 26,500 units as a result of the proposed change. The selling price per unit is $35 and variable cost per unit is $29. The firm's required rate of return is 20%. Should the company shorten its credit period? Explain. (*Note:* Assume a 365-day year.)

LG 5

P14–13 **Lengthening the credit period** Kitchen Enterprises is evaluating a proposal to lengthen its credit period from 30 to 45 days. All customers will continue to pay on the net date. Currently, credit sales are $650,000 and variable costs are $455,000. The selling price is $20 per unit. The proposal is expected to lead to credit sales of $710,000. However, bad debts are expected to increase from 1% to 2% of sales. The required rate of return on equal-risk investments is 16.5%. (*Note:* Assume a 365-day year.)

a. Calculate the additional profit contribution from sales if the proposal is implemented.
b. Calculate the cost of the marginal investment in accounts receivable.
c. Calculate the cost of the marginal bad debts.
d. Should the proposal be implemented? Explain.

LG 6

P14–14 **Float.** Uneblej.com is an online retail company, which operates in Albania. It has daily cash receipts of L150,000. Its CFO is analyzing the time it takes for the collection of the customers' payment to clear the banking system. From the analysis it appears that it takes 2 days for the online payment to be processed before it is transferred to the bank. Then it takes another 3 days for the bank to process the payment and make it available to Uneblej.com.

a. How much collection float (in days) does the company currently have?
b. If its opportunity cost is 10%, would it be economically advisable for the company to pay an annual fee of L18,000 to reduce collection float by 3 days? Explain.
c. What would the company's opportunity cost have to be to make the L18,000 fee worthwhile?

LG 6

P14–15 **Lockbox system** Aditya Birla Retail Limited, an Indian retail company, is considering a lockbox system that can shorten its accounts receivable collection by 1 day. Credit sales are INR 550,000,000 per year, billed on a continuous basis. The firm has other equally risky investments that earn a return of 14%. The cost of the lockbox system is INR 90,000 per year (*Note:* Assume a 365-day year.)

a. What amount of cash will be made available for other uses under the lockbox system?
b. What net benefit (cost) will the firm realize if it adopts the system? Should the company adopt it?

LG 6

P14–16 **Zero-balance account** Alumina Ltd. is considering establishing a zero-balance account. The company currently maintains an average of A$1,380,000 in its disbursement account. As compensation to the bank of maintaining the zero-balance account, the company will have to pay a monthly fee of A$100 and maintain an A$1,000,000 non-interest-earning deposit in the bank. The company currently has no other deposit in the bank. Evaluate the proposed zero-balance account, and make a recommendation to the firm, assuming a 10% opportunity cost.

Personal Finance Problem

LG6

P14–17 **Management of cash balance** Alexis Morris, an assistant manager at a local department store, gets paid every 2 weeks by direct deposit into her checking account. This account pays no interest and has no minimum balance requirement. Her monthly income is $4,200. Alexis has a "target" cash balance of around $1,200, and whenever it exceeds that amount, she transfers the excess into her savings account, which currently pays 2.0% annual interest. Her current savings balance is $15,000, and Alexis estimates that she transfers about $500 per month from her checking account into her savings account. Alexis doesn't waste any time in paying her bills, and her monthly bills average about $2,000. Her monthly cash outlay for food, gas, and other sundry items totals about $850. Reviewing her payment habits indicates that on average she pays her bills 9 days early. At this time, most marketable securities are yielding about 4.75% annual interest.

Show how Alexis can better manage her cash balance.

a. What can Alexis do regarding the handling of her current balances?
b. What do you suggest that she do with her monthly surpluses?
c. What do you suggest Alexis do about the manner in which she pays her bills?
d. Can Alexis grow her earnings by better managing her cash balances? Show your work.

LG6

P14–18 **ETHICS PROBLEM** A group of angry shareholders has placed a corporate resolution before all shareholders at a company's annual stockholders' meeting. The resolution demands that the company stretch its accounts payable because these shareholders have determined that all the company's competitors do so, and the firm operates in a highly competitive industry. How could management at the annual stockholders' meeting defend the firm's practice of paying suppliers on time?

SPREADSHEET EXERCISE

The current balance in accounts receivable for Eboy Corporation is $443,000. This level was achieved with annual (365 days) credit sales of $3,544,000. The firm offers its customers credit terms of net 30. However, in an effort to help its cash flow position and to follow the actions of its rivals, the firm is considering changing its credit terms from net 30 to 2/10 net 30. The objective is to speed up the receivable collections and thereby improve the firm's cash flows. Eboy would like to increase its accounts receivable turnover to 12.0.

The firm works with a raw material whose current annual usage is 1,450 units. Each finished product requires one unit of this raw material at a variable cost of $2,600 per unit and sells for $4,200 on terms of net 30. It is estimated that 70% of the firm's customers will take the 2% discount and that, with the discount, sales of the finished product will increase by 50 units per year. The firm's opportunity cost of funds invested in accounts receivable is 12.5%.

In analyzing the investment in accounts receivable, use the variable cost of the product sold instead of the sale price because the variable cost is a better indicator of the firm's investment.

TO DO

Create a spreadsheet similar to Table 14.3 to analyze whether the firm should initiate the proposed discount. What is your advice? Make sure that you calculate the following:

a. Additional profit contribution from sales.
b. Average investment in accounts receivable at present (without the early payment discount).
c. Average investment in accounts receivable with the proposed discount.
d. Reduction in investment in accounts receivable.
e. Cost savings from reduced investment in accounts receivable.
f. Cost of the discount.
g. Net profit (loss) from initiation of proposed discount.

CHAPTER 15

Current Liabilities Management

LEARNING GOALS

- **LG 1** Review accounts payable, the key components of credit terms, and the procedures for analyzing those terms.
- **LG 2** Understand the effects of stretching accounts payable on their cost and the use of accruals.
- **LG 3** Describe interest rates and the basic types of unsecured bank sources of short-term loans.
- **LG 4** Discuss the basic features of commercial paper and the key aspects of international short-term loans.
- **LG 5** Explain the characteristics of secured short-term loans and the use of accounts receivable as short-term-loan collateral.
- **LG 6** Describe the various ways in which inventory can be used as short-term-loan collateral.

MyLab Finance Chapter Introduction Video

WHY THIS CHAPTER MATTERS TO YOU

In your *professional* life

ACCOUNTING You need to understand how to analyze supplier credit terms to decide whether the firm should take or give up discounts for early payment; you also need to understand the various types of short-term loans, both unsecured and secured, that you will be required to record and report.

INFORMATION SYSTEMS You need to understand what data the firm will need to process accounts payable, track accruals, and meet bank loans and other short-term debt obligations in a timely manner.

MANAGEMENT You need to know the sources of short-term loans so that, if short-term financing is needed, you will understand its availability and cost.

MARKETING You need to understand how accounts receivable and inventory can be used as loan collateral; the procedures used by the firm to secure short-term loans with such collateral could affect customer relationships.

OPERATIONS You need to understand the use of accounts payable as a form of short-term financing and the effect on one's suppliers of stretching payables; you also need to understand the process by which a firm uses inventory as collateral.

In your *personal* life

Managing current liabilities is an important part of your financial strategy. It takes discipline to avoid viewing cash and credit purchases equally. You need to borrow for a purpose, not convenience. You also need to repay credit purchases in a timely fashion. Excessive use of short-term credit, particularly with credit cards, can create personal liquidity problems and, at the extreme, personal bankruptcy.

LG1 LG2

15.1 Spontaneous Liabilities

spontaneous liabilities
Financing that arises from the normal course of business; the two major short-term sources of such liabilities are accounts payable and accruals.

Spontaneous liabilities arise from the normal course of business. For example, when a retailer orders goods for inventory, the manufacturer of those goods usually does not demand immediate payment but instead extends a short-term loan to the retailer that appears on the retailer's balance sheet under accounts payable. The more goods the retailer orders, the greater will be the accounts payable balance. Also in response to increasing sales, the firm's accruals increase as wages and taxes rise because of greater labor requirements and the higher taxes on the firm's increased earnings. No explicit cost is normally attached to either of these current liabilities (i.e., they do not bear interest), although they do have certain implicit costs. In addition, both are forms of **unsecured short-term financing,** short-term financing obtained without pledging specific assets as collateral. The firm should take advantage of these "interest-free" sources of unsecured short-term financing whenever possible.

unsecured short-term financing
Short-term financing obtained without pledging specific assets as collateral.

ACCOUNTS PAYABLE MANAGEMENT

Accounts payable are the major source of unsecured short-term financing for business firms. They result from transactions in which the firm purchases merchandise without signing a formal note to show the firm's liability to the seller. The firm in effect agrees to pay the supplier the amount required in accordance with credit terms normally stated on the supplier's invoice. We present the discussion of accounts payable here from the viewpoint of the purchaser.

Role in the Cash Conversion Cycle

The average payment period is the final component of the *cash conversion cycle* introduced in Chapter 14. The average payment period has two parts: (1) the time from the purchase of raw materials until the firm mails the payment and (2) payment float time (the time it takes after the firm mails its payment until the supplier has withdrawn spendable funds from the firm's account). In Chapter 14, we discussed issues related to payment float time. Here we discuss the firm's management of the time that elapses between its purchase of raw materials and its mailing payment to the supplier. This activity is **accounts payable management**.

accounts payable management
Management by the firm of the time that elapses between its purchase of raw materials and its mailing payment to the supplier.

When the seller of goods charges no interest and offers no discount to the buyer for early payment, the buyer's goal is to pay as slowly as possible without damaging its credit rating or its relationship with the supplier. In other words, firms should pay their accounts payable on the last day possible, given the supplier's stated credit terms. For example, if the terms are net 30, the firm should pay no sooner than 30 days from the *beginning of the credit period,* which is typically either the *date of invoice* or the *end of the month (EOM)* in which the firm made the purchase. This timing allows for the maximum use of an interest-free loan from the supplier and will not damage the firm's credit rating (because the firm pays within the stated credit terms). In addition, some firms offer an explicit or implicit "grace period" that extends a few days beyond the stated payment date. If taking advantage of that grace period does no harm to the buyer's relationship with the seller, the buyer will typically take advantage of the grace period.

EXAMPLE 15.1

In 2016, Brown-Forman Corporation (BF), manufacturer of alcoholic beverage brands such as Jack Daniels, had annual revenue of $4.011 billion, cost of goods sold of $1.867 billion, and purchases of $1.347 billion. BF had an average age of inventory (AAI) of 206 days, an average collection period (ACP) of 51 days, and an average payment period (APP) of 141 days. Thus, the cash conversion cycle for BF was 116 days (206 + 51 − 141).

The resources BF had invested in this cash conversion cycle (assuming a 365-day year) were

Inventory	= $1.867 billion × (206 ÷ 365)	=	$1.054 billion
+ Accounts receivable	= $4.011 billion × (51 ÷ 365)	=	$0.559 billion
− Accounts payable	= $1.347 billion × (141 ÷ 365)	=	$0.52 billion
	= Resources invested	=	$1.093 billion

Based on BF's APP and average accounts payable, the daily accounts payable generated by BF is about $3.69 million ($0.52 billion ÷ 141). If BF were to increase its average payment period by 5 days, its accounts payable would increase by about $18.452 million (5 × $3.69 million). As a result, BF's cash conversion cycle would decrease by 5 days, and the firm would reduce its investment in operations by $18.452 million. If this action did not damage BF's credit rating, it would be in the company's best interest.

Analyzing Credit Terms

The credit terms offered to a firm by its suppliers enable it to delay payments for its purchases. Because the supplier's cost of having its money tied up in merchandise after it is sold is probably reflected in the purchase price, the purchaser is already indirectly paying for this benefit. Sometimes a supplier will offer a discount for early payment. In that case, the purchaser should carefully analyze credit terms to determine the best time to repay the supplier. The purchaser must weigh the benefits of paying the supplier as late as possible against the costs of passing up the discount for early payment.

Taking the Discount If a firm intends to take an early payment discount, it should pay on the last day of the discount period. There is no added benefit from paying earlier than that date.

EXAMPLE 15.2

Lawrence Industries, operator of a small chain of video stores, purchased $1,000 worth of merchandise on February 27 from a supplier extending terms of 2/10 net 30 EOM. If the firm takes the discount, it must pay $980 [$1,000 − (0.02 × $1,000)] by March 10, thereby saving $20.

Giving Up the Discount If the firm chooses to give up the discount, it should pay on the final day of the credit period, or at the end of the grace period. Giving up a discount carries an implicit cost. The **cost of giving up an early payment discount** is the implied rate of interest paid to delay payment of an account payable for an additional number of days. In other words, when a firm gives up a discount, it pays a higher cost for the goods that it orders. The higher cost the firm pays is like interest on a loan, and the length of this loan is the number of additional days that the purchaser can delay payment to the seller. A simple

cost of giving up an early payment discount
The implied rate of interest paid to delay payment of an account payable for an additional number of days.

example illustrates this cost. The example assumes that payment will be made on the last possible day (either the final day of the discount period or the final day of the credit period).

EXAMPLE 15.3

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In Example 15.2, we saw that Lawrence Industries could take the discount on its February 27 purchase by paying $980 on March 10. If Lawrence gives up the discount, it can pay on March 30. To keep its money for an extra 20 days, the firm must pay an extra $20, or $1,000 rather than $980. In other words, if the firm pays on March 30, it will pay $980 (what it could have paid on March 10) plus $20. The extra $20 is like interest on a loan, and in this case the $980 is like the loan principal. Lawrence Industries owes $980 to its supplier on March 10, but the supplier is willing to accept $980 plus $20 in interest on March 30. Figure 15.1 shows the payment options that are open to the company.

To calculate the implied interest rate associated with giving up the discount, we simply treat $980 as the loan principal, $20 as the interest, and 20 days (the time from March 10 to March 30) as the term of the loan. The interest rate that Lawrence pays by giving up the discount is 2.04% ($20 ÷ $980). Keep in mind that the 2.04% interest rate applies to a 20-day loan. To calculate an annualized interest rate, we multiply the interest rate on this transaction times the number of 20-day periods during a year. The general expression for calculating the annual percentage cost of giving up an early payment discount is[1]

$$\text{Cost of giving up early payment discount} = \frac{CD}{100\% - CD} \times \frac{365}{N} \tag{15.1}$$

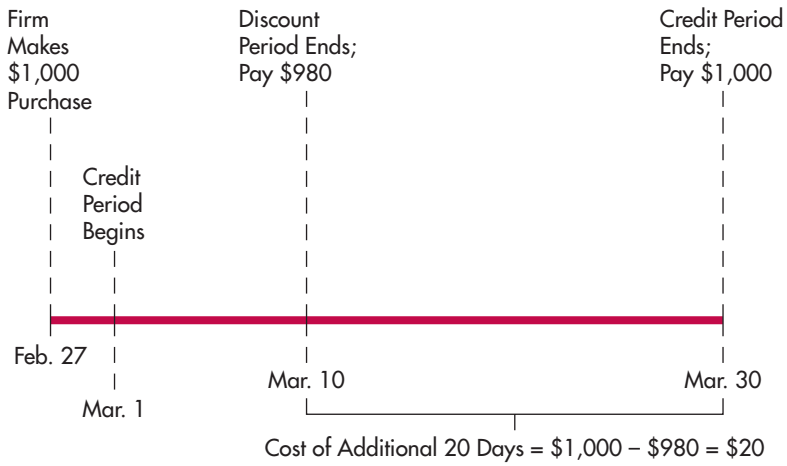
Where

CD = stated discount in percentage terms

N = number of days that payment can be delayed by giving up the discount

FIGURE 15.1

Payment Options
Payment options for Lawrence Industries



1. Equation 15.1 and the related discussions are based on the assumption that only one discount is offered. In the event that the supplier offers multiple discounts, the cost of giving up the discount must be calculated for each alternative. Furthermore, the interest rate calculation in Equation 15.1 is a simple-interest calculation.

Substituting the values for *CD* (2%) and N (20 days) into Equation 15.1 results in an annualized cost of giving up the early payment discount of 37.24%

$$37.24\% = \frac{2\%}{100\% - 2\%} \times \frac{365}{20}$$

A simple way to *approximate* the cost of giving up a discount is to use the stated discount percentage, CD, in place of the first term of Equation 15.1:

$$\text{Approximate early payment of giving up early payment discount} = CD \times \frac{365}{N} \quad (15.2)$$

The smaller the discount, the closer the approximation to the actual cost of giving it up. Using this approximation, the cost of giving up the discount for Lawrence Industries is 36.5% [2% × (365 ÷ 20)].

Using the Cost of Giving Up an Early Payment Discount in Decision Making The financial manager must determine whether it is advisable to take a discount. A primary consideration influencing this decision is the cost of other short-term sources of funding. When a firm can obtain financing from a bank or other institution at a lower cost than the implicit interest rate offered by its suppliers, the firm is better off borrowing from the bank and taking the discount offered by the supplier.

EXAMPLE 15.4

Mason Products, a large building-supply company, has four possible suppliers, each offering different credit terms. Otherwise, their products and services are identical. Table 15.1 presents the credit terms offered by suppliers A, B, C, and D and the cost of giving up the discounts in each transaction based on the approximation method (Equation 15.2). The cost of giving up the discount from supplier A is approximately 36.5%; from supplier B, 4.9%; from supplier C, 21.9%; and from supplier D, 29.2%.

If the firm needs short-term funds, which it can borrow from its bank at an interest rate of 6%, and if the firm views each of the suppliers separately, which (if any) of the suppliers' discounts will the firm give up? In dealing with supplier A, the firm takes the discount, because the cost of giving it up is 36.5%, and then borrows the funds it requires from its bank at 6% interest. With supplier B, the firm would do better to give up the discount, because the cost of this action is less than the cost of borrowing money from the bank (4.9% versus 6%). With either supplier C or supplier D, the firm should take the discount, because in both cases the cost of giving up the discount is greater than the 6% cost of borrowing from the bank.

TABLE 15.1 Early-Payment Discounts and Associated Costs for Mason Products

Supplier	Credit terms	Approximate cost of giving up a cash discount
A	2/10 net 30 EOM	36.5%
B	1/10 net 85 EOM	4.9
C	3/20 net 70 EOM	21.9
D	4/10 net 60 EOM	29.2

The example shows that the cost of giving up a discount is relevant when we are comparing a single supplier's credit terms to the cost of borrowing from a bank or other short-term lender. However, not all firms follow the practice suggested here. For example, some firms, particularly small firms and poorly managed firms, routinely give up all discounts because they either lack alternative sources of unsecured short-term financing or fail to recognize the implicit costs of their actions.

Effects of Stretching Accounts Payable

stretching accounts payable
Paying bills as late as possible without damaging the firm's credit rating.

Firms sometimes attempt to reduce the implicit costs they pay on accounts payable by **stretching accounts payable,** that is, paying bills as late as possible without damaging their credit rating. Such a strategy can reduce the cost of giving up an early payment discount.

EXAMPLE 15.5

Lawrence Industries was extended credit terms of 2/10 net 30 EOM. The cost of giving up the discount, assuming payment on the last day of the credit period, was approximately 36.5% [2% × (365 ÷ 20)]. If the firm were able to stretch its account payable to 70 days without damaging its credit rating, the approximate cost of giving up the discount would be just 12.2% [2% × (365 ÷ 60)]. Stretching accounts payable reduces the implicit cost of giving up a discount.

Although stretching accounts payable may be financially attractive, it raises an important ethical issue: It may cause the firm to violate the agreement it entered into with its supplier when it purchased merchandise. Clearly, a supplier would not look kindly on a customer that regularly and purposely postponed paying for purchases.

PERSONAL FINANCE EXAMPLE 15.6

Jack and Mary Nobel, a young married couple, are in the process of purchasing a 55-inch OLED TV at a cost of $1,900. The electronics dealer currently has a special financing plan that would allow them to either (1) put $200 down and finance the balance of $1,700 at 3% annual interest over 24 months, resulting in payments of $73 per month; or (2) receive an immediate $150 cash rebate, thereby paying only $1,750 cash. The Nobels, who have saved enough to pay cash for the TV, can currently earn 5% annual interest on their savings. They wish to determine whether borrowing or paying cash is the better payment option for the TV.

The upfront outlay for the financing alternative is the $200 down payment, whereas the Nobels will pay out $1,750 up front under the cash purchase alternative. So, the cash purchase will require an initial outlay that is $1,550 ($1,750 − $200) greater than under the financing alternative. Assuming they can earn a simple interest rate of 5% on savings, the cash purchase will cause the Nobels to give up an opportunity to earn $155 (2 years × 0.05 × $1,550) over the 2 years.

If they choose the financing alternative, the $1,550 would grow to $1,705 ($1,550 + $155) at the end of 2 years. But under the financing alternative, the Nobels will pay out a total of $1,752 (24 months × $73 per month) over the 2-year loan term. The cost of the financing alternative can be viewed as $1,752, and the cost of the cash payment (including forgone interest earnings) would be $1,705. Because it is less expensive, *the Nobels should pay cash for the TV*. The lower cost of the cash alternative is largely the result of the $150 cash rebate.

ACCRUALS

accruals
Liabilities for services received for which payment has yet to be made.

The second spontaneous source of short-term business financing is accruals. **Accruals** are liabilities for services received for which payment has yet to be made. The most common items accrued by a firm are wages and taxes. Firms have little flexibility in manipulating the timing of payments made to the government. However, firms can manipulate accrual of wages to some extent by delaying payment of wages, thereby receiving an interest-free loan from employees who receive payment sometime after they have performed the work. Note that state or federal law or union regulations often govern the pay period for employees who earn an hourly rate. However, in other cases, firms have discretion over the frequency of wage payments.

EXAMPLE 15.7

Tenney Company, a large janitorial service company, currently pays its employees at the end of each work week. The weekly payroll totals $400,000. If the firm were to extend the pay period by paying its employees 1 week later throughout an entire year, the employees would in effect be lending the firm $400,000 for a year. If the firm could earn 10% annually on invested funds, such a strategy would be worth $40,000 per year ($0.10 \times \$400{,}000$).

→ REVIEW QUESTIONS MyLab Finance Solutions

15–1 What are the two major sources of spontaneous short-term financing for a firm? How do their balances behave relative to the firm's sales?

15–2 Is there a cost associated with taking an early payment discount? Is there any cost associated with giving up a discount? How do borrowing costs affect the decision to take or forego an early payment discount?

15–3 What is "stretching accounts payable"? What effect does this action have on the cost of giving up a discount?

LG3 LG4

15.2 Unsecured Sources of Short-Term Loans

Businesses obtain unsecured short-term loans from two major sources, banks and sales of commercial paper. Unlike the spontaneous sources of unsecured short-term financing, bank loans and commercial paper carry an explicit interest rate (rather than the implicit rate tied to early payment discounts). Bank loans are more widespread because banks lend to firms of all sizes; only large firms can issue commercial paper. Bank loans offer additional benefits to shareholders beyond the capital they provide to firms. In addition, firms can use international loans to finance international transactions.

BANK LOANS

short-term, self-liquidating loan
An unsecured short-term loan in which the use to which the borrowed money is put provides the mechanism through which the loan is repaid.

Banks are a major source of unsecured short-term loans to businesses. The major type of loan made by banks to businesses is the **short-term, self-liquidating loan.** These loans are intended merely to carry the firm through seasonal peaks in financing needs that are due primarily to buildups of inventory and accounts receivable. As the firm converts inventories and receivables into cash, it generates the funds needed to retire these loans. In other words, the use to which the borrowed money is put provides the mechanism through which the loan is repaid, hence the term *self-liquidating*.

Banks lend unsecured, short-term funds in three basic ways: through single-payment notes, through lines of credit, and through revolving credit agreements. Before we look at these types of loans, we examine loan interest rates.

Loan Interest Rates

The interest rate on a bank loan can be a fixed or a floating rate, and the interest rate is often based on a market benchmark rate such as the prime rate, the federal funds rate, or the London Interbank Offered Rate. The **prime rate of interest** (**prime rate**) is an interest rate charged by leading U.S. banks on business loans to creditworthy borrowers. The **federal funds rate** is the rate at which U.S. financial institutions make overnight loans to each other. The **London Interbank Offered Rate** (**LIBOR**) is a rate at which banks around the world make short-term loans to each other, and as an international interest rate benchmark, LIBOR may be associated with loans in different currencies at different maturities. The LIBOR rate most often used as a benchmark in commercial loans is the 3-month LIBOR in U.S. dollars.

prime rate of interest (prime rate)
An interest rate charged by leading U.S. banks on business loans to creditworthy borrowers.

federal funds rate
The rate at which U.S. banks make overnight loans to each other.

London Interbank Offered Rate (LIBOR)
The rate at which international banks make short-term loans to each other. There are many different LIBOR rates corresponding to different currencies and maturities.

These benchmark interest rates fluctuate with changing supply-and-demand relationships for short-term funds. Banks generally determine the rate they offer to a borrower by adding a risk premium or "spread" to the benchmark rate. The magnitude of the spread depends on the borrower's risk profile—banks charge higher spreads on loans to borrowers that are more likely to have difficulty paying back what they owe. The size of the spread also depends on overall market conditions. Spreads tend to widen during economic recessions, and they narrow during expansions. For example, during the recession that lasted from December 2007 to June 2009, the average spread on commercial loans was 2.74% above the federal funds rate. The period 1996 to 1999 saw the most rapid 4-year growth spurt in the U.S. economy since the mid 1980s, and during that stretch the spread on commercial loans averaged just 1.80% above federal funds. More recently, the spread averaged 2.34% in 2016 and 2017.

Fixed- and Floating-Rate Loans Loans can have either fixed or floating interest rates. On a **fixed-rate loan,** the rate of interest is set at or above the prime rate (or some other benchmark interest rate) on the date of the loan and remains at that fixed rate until maturity. On a **floating-rate loan,** the spread above the benchmark rate is fixed initially, but the loan interest rate varies or "floats," as the benchmark rate varies. Floating-rate loans may have provisions that allow the interest rate to vary at any time that the benchmark rate changes, or the loan rate may change only at fixed increments such as quarterly or yearly, and only then in response to a change in the benchmark rate. Generally, the spread will be lower on a floating-rate loan than on a fixed-rate loan of equivalent risk because the lender bears less risk with a floating-rate loan. Most business loans are floating-rate loans.

fixed-rate loan
A loan with a rate of interest that is determined at a set increment above the prime rate and remains unvarying until maturity.

floating-rate loan
A loan with a rate of interest initially set at an increment above the prime rate and allowed to "float," or vary, above prime *as the prime rate varies* until maturity.

Method of Computing Interest Once the *nominal (or stated) annual rate* is established, the method of computing interest is determined. Interest may be due either when a loan matures or in advance. If interest is due at maturity, the *effective (or true) annual rate*—the actual rate of interest paid—for a 1-year loan is equal to

$$\frac{\text{Interest}}{\text{Amount borrowed}} \tag{15.3}$$

Most bank loans to businesses require the interest payment at maturity.

When the borrower pays interest *in advance,* the bank deducts the interest payment from the loan principal, so that the borrower actually receives less money than the loan's face value (and less than the borrower must repay). Loans on which borrowers pay interest in advance are called **discount loans.** The effective annual rate for a 1-year discount loan is calculated as

discount loan
Loan on which interest is paid in advance by being deducted from the amount borrowed.

$$\frac{\text{Interest}}{\text{Amount borrowed} - \text{Interest}} \tag{15.4}$$

Paying interest in advance raises the effective annual rate above the stated annual rate.

EXAMPLE 15.8

Wooster Company, a manufacturer of athletic apparel, wants to borrow $10,000 for 1 year at a stated annual interest rate of 10%. If Wooster pays the interest on the loan at maturity, the firm will pay $1,000 ($0.10 \times \$10{,}000$) for the use of the $10,000 for the year. At the end of the year, Wooster will write a check to the lender for $11,000, consisting of the $1,000 interest as well as the return of the $10,000 principal. Substituting into Equation 15.3 reveals that the effective annual rate is therefore

$$\frac{\$1{,}000}{\$10{,}000} = 10.0\%$$

If Wooster borrows the money at the same 10% stated annual rate, but it pays the interest in advance, the firm still pays $1,000 in interest, but it receives only $9,000 ($10,000 − $1,000). The effective annual rate in this case is

$$\frac{\$1{,}000}{\$10{,}000 - \$1{,}000} = \frac{\$1{,}000}{\$9{,}000} = 11.1\%$$

At the end of the year, Wooster writes a check to the lender for $10,000, having "paid" the $1,000 in interest up front by borrowing just $9,000. Paying interest in advance thus makes the effective annual rate (11.1%) greater than the stated annual rate (10.0%).

Single-Payment Notes

single-payment note
A short-term, one-time loan made to a borrower who needs funds for a specific purpose for a short period.

A creditworthy business borrower can obtain a **single-payment note** from a commercial bank. This type of loan is usually a one-time loan made to a borrower who needs funds for a specific purpose for a short period. The resulting instrument is a note, signed by the borrower, which states the terms of the loan, including the length of the loan and the interest rate. This type of short-term note generally has a maturity of 30 days to 9 months or more. The interest charged is usually tied in some way to the prime rate or another benchmark interest rate.

EXAMPLE 15.9

Gordon Manufacturing, a producer of rotary mower blades, recently borrowed $100,000 from each of two banks, bank A and bank B. The loans were incurred on the same day, when the prime rate of interest was 4.25%. Each loan involved

a 90-day note with interest due in 90 days. The interest rate was set at 1.50% above the prime rate on bank A's fixed-rate note. Over the 90-day period, the rate of interest on this note will remain at 5.75% (4.25% prime rate + 1.50% increment) regardless of fluctuations in the prime rate. The total interest cost on this loan is \$1,417.81 [\$100,000 × (5.75% × 90 ÷ 365)], which means that the 90-day rate on this loan is about 1.42% (\$1,417.81 ÷ \$100,000).

Assuming that the loan from bank A is rolled over each 90 days throughout the year under the same terms and circumstances, we can find its effective annual interest rate, or *EAR*, by using Equation 5.10. Because the loan costs 1.42% for 90 days, it is necessary to compound (1 + 0.0142) for 4.06 periods in the year (i.e., 365 ÷ 90) and then subtract 1:

$$\begin{aligned} EAR &= (1 + 0.0142)^{4.06} - 1 \\ &= 1.0589 - 1 = 0.0589 = \underline{\underline{5.89\%}} \end{aligned}$$

The effective annual rate of interest on the fixed-rate, 90-day note is 5.89%.

Bank B set the interest rate at 1% above the prime rate on its floating-rate note. The rate charged over the 90 days will vary directly with the prime rate. Initially, the rate will be 5.25% (4.25% + 1%), but when the prime rate changes, so will the rate of interest on the note. For instance, if after 30 days the prime rate rises to 4.5% and after another 30 days it drops back to 4.25%, the firm will be paying 0.432% for the first 30 days (5.25% × 30 ÷ 365), 0.452% for the next 30 days (5.5% × 30 ÷ 365), and 0.432% for the last 30 days (5.25% × 30 ÷ 365). Its total interest cost will be \$1,315 [\$100,000 × (0.432% + 0.452% + 0.432%)], resulting in a 90-day rate of about 1.32% (\$1,315 ÷ \$100,000).

Again, assuming the loan is rolled over each 90 days throughout the year under the same terms and circumstances, its effective annual rate is 5.47%:

$$\begin{aligned} EAR &= (1 + 0.0132)^{4.06} - 1 \\ &= 1.0547 - 1 = 0.0547 = \underline{\underline{5.47\%}} \end{aligned}$$

Clearly, in this case the floating-rate loan would have been less expensive than the fixed-rate loan as indicated by its lower effective annual rate.

PERSONAL FINANCE EXAMPLE 15.10 Megan Schwartz has been approved by Clinton National Bank for a 180-day loan of \$30,000 that will allow her to make the down payment and close the loan on her new condo. She needs the funds to bridge the time until the sale of her current condo, from which she expects to receive \$42,000.

Clinton National offered Megan the following two financing options for the \$30,000 loan: (1) a fixed-rate loan at 2% above the prime rate or (2) a variable-rate loan at 1% above the prime rate. Currently, the prime rate of interest is 5%, and the consensus forecast of a group of mortgage economists for changes in the prime rate over the next 180 days is as follows:

60 days from today the prime rate will rise by 1.0%.

90 days from today the prime rate will rise another 0.5%.

150 days from today the prime rate will drop by 1.0%.

Using the forecast prime rate changes, Megan wishes to determine the lowest interest-cost loan for the next 6 months.

Fixed-Rate Loan: Total interest cost over 180 days

$$= \$30{,}000 \times (0.05 + 0.02) \times (180 \div 365)$$
$$= \$30{,}000 \times 0.03452 \approx \underline{\underline{\$1{,}036}}$$

Variable-Rate Loan: The applicable interest rate would begin at 6% (5% + 1%) and remain there for 60 days. Then the applicable rate would rise to 7% (6% + 1%) for the next 30 days and then to 7.5% (6.5% + 0.5%) for the next 60 days. Finally, the applicable rate would drop to 6.5% (7.5% − 1%) for the final 30 days.

Total interest cost over 180 days

$$= \$30{,}000 \times [(0.06 \times 60 \div 365) + (0.07 \times 30 \div 365) + (0.075 \times 60 \div 365) + (0.065 \times 30 \div 365)]$$
$$= \$30{,}000 \times (0.00986 + 0.00575 + 0.01233 + 0.00534)$$
$$= \$30{,}000 \times 0.03328 \approx \underline{\underline{\$988}}$$

The estimated total interest cost on the variable-rate loan of $988 is less than the total interest cost of $1,036 on the fixed-rate loan, so Megan might be tempted to take the variable-rate loan. However, the estimated interest cost on that loan depends on the interest rate forecast. Megan's actual interest cost could be higher or lower than $988 if she takes out the variable-rate loan, whereas the $1,036 interest cost from the fixed-rate loan is locked in. Megan has to decide whether the expected $48 ($1,036 − $988) savings in interest cost over the 180 days is worth the risk of accepting the variable rate loan.

Lines of Credit

line of credit
An agreement between a commercial bank and a business specifying the amount of unsecured short-term borrowing the bank will make available to the firm over a given period of time.

A **line of credit** is an agreement between a commercial bank and a business, specifying the amount of unsecured short-term borrowing the bank will make available to the firm over a given period. It is similar to the agreement under which issuers of bank credit cards, such as MasterCard, Visa, and Discover, extend preapproved credit to cardholders. A line-of-credit agreement is typically made for a period of 1 year and often places certain constraints on the borrower. It is not a guaranteed loan; rather, it indicates that if the bank has sufficient funds available, it will allow the firm to borrow up to a certain amount of money. The amount of a line of credit is the maximum amount the firm can borrow from the bank at any point in time during the year.

When applying for a line of credit, the borrower may be required to submit such documents as its cash budget, pro forma income statement and balance sheet, and recent audited financial statements. If the bank finds the customer acceptable, it will extend the line of credit. The major attraction of a line of credit from the bank's point of view is that it eliminates the need to examine the creditworthiness of a customer each time it borrows money within the year.

Interest Rates The interest rate on a line of credit is normally a floating rate: the prime rate plus a premium. If the prime rate changes, the interest rate charged on new as well as outstanding borrowing automatically changes. The amount a borrower is charged in excess of the prime rate depends on creditworthiness. The more creditworthy the borrower, the lower the premium (interest increment) above prime and vice versa.

operating-change restrictions
Contractual restrictions that a bank may impose on a firm's financial condition or operations as part of a line-of-credit agreement.

Operating-Change Restrictions In a line-of-credit agreement, a bank may impose **operating-change restrictions,** which give it the right to revoke the line if any major changes occur in the firm's financial condition or operations. The bank usually requires the firm to submit up-to-date, and preferably audited, financial statements for periodic review. In addition, the firm must inform the bank about shifts in key managerial personnel or in the firm's operations before changes take place. Such changes may affect the future success and debt-paying ability of the firm and thus could alter its credit status. If the bank does not agree with the proposed changes and the firm makes them anyway, the bank has the right to revoke the line of credit.

compensating balance
A required checking account balance equal to a certain percentage of the amount borrowed from a bank under a line-of-credit or revolving credit agreement.

Compensating Balances To ensure that the borrower will be a "good customer," many short-term unsecured bank loans—single-payment notes and lines of credit—require the borrower to maintain, in a checking account, a **compensating balance** equal to a certain percentage of the amount borrowed. Banks frequently require compensating balances of 10% to 20%. A compensating balance not only forces the borrower to be a good customer of the bank but may also raise the interest cost to the borrower.

EXAMPLE 15.11

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Estrada Graphics, a graphic design firm, has borrowed $1 million under a line-of-credit agreement. It must pay a stated interest rate of 8% and maintain, in its checking account, a compensating balance equal to 20% of the amount borrowed, or $200,000. Thus, it actually receives the use of only $800,000. To use that amount for a year, the firm pays interest of $80,000 ($0.08 \times \$1{,}000{,}000$). The effective annual rate on the funds is therefore 10% ($\$80{,}000 \div \$800{,}000$), which is 2% more than the stated rate of 8%.

If the firm normally maintains a balance of $200,000 or more in its checking account, the effective annual rate equals the stated annual rate of 8% because none of the $1 million borrowed is needed to satisfy the compensating-balance requirement. If the firm normally maintains a $100,000 balance in its checking account, only an additional $100,000 will have to be tied up, leaving it with $900,000 of usable funds. The effective annual rate in this case would be 8.89% ($\$80{,}000 \div \$900{,}000$). Thus, a compensating balance raises the cost of borrowing only if it is larger than the firm's normal cash balance.

annual cleanup
The requirement that for a certain number of days during the year borrowers under a line of credit carry a zero loan balance (i.e., owe the bank nothing).

Annual Cleanups To ensure that firms use money lent under a line-of-credit agreement to finance seasonal needs, many banks require an **annual cleanup.** In these cases, the borrower must have a loan balance of zero—that is, owe the bank nothing—for a certain number of days during the year. Insisting that the borrower carry a zero loan balance for a certain period ensures that short-term loans do not turn into long-term loans.

All the characteristics of a line-of-credit agreement are negotiable to some extent. Today, banks bid competitively to attract large, well-known firms. A prospective borrower should attempt to negotiate a line of credit with the most favorable interest rate, for an optimal amount of funds, and with a minimum of restrictions. Borrowers today frequently pay fees to lenders instead of maintaining deposit balances as compensation for loans and other services. The lender attempts to get a return commensurate with the risk it takes when lending to the borrower. Negotiations should produce a line of credit that is suitable to both borrower and lender.

Revolving Credit Agreements

revolving credit agreement
A line of credit *guaranteed* to a borrower by a commercial bank regardless of the scarcity of money.

commitment fee
The fee that is normally charged on a *revolving credit agreement;* it often applies to the *average unused portion* of the borrower's credit line.

A **revolving credit agreement** is nothing more than a guaranteed line of credit. It is guaranteed in the sense that the commercial bank promises to make available a certain amount of money to the borrower regardless of the scarcity of money. The interest rate and other requirements of a revolving credit agreement are similar to those for a line of credit. It is not uncommon for a revolving credit agreement to cover a period greater than 1 year.[2] Because the bank guarantees the availability of funds, it normally charges a **commitment fee** on a revolving credit agreement. This fee often applies to the average unused balance of the borrower's credit line. It is normally about 0.5% of the average unused portion of the line.

EXAMPLE 15.12

REH Company, a major real estate developer, has a $2 million revolving credit agreement with its bank. Its average borrowing under the agreement for the past year was $1.5 million. The bank charges a commitment fee of 0.5% on the average unused balance. Because the average unused portion of the committed funds was $500,000 ($2 million − $1.5 million), the commitment fee for the year was $2,500 (0.005 × $500,000). Of course, REH also had to pay interest on the actual $1.5 million borrowed under the agreement. Assuming that REH paid $112,500 interest on the $1.5 million borrowed, the effective cost of the agreement was 7.67% [($112,500 + $2,500) ÷ $1,500,000]. Although more expensive than a line of credit, a revolving credit agreement can be less risky from the borrower's viewpoint because the availability of funds is guaranteed.

COMMERCIAL PAPER

commercial paper
A form of financing consisting of short-term, unsecured promissory notes issued by firms with a high credit standing.

Commercial paper is a short-term, unsecured promissory note issued by a firm with a high credit standing. Generally, only large, financially sound firms issue commercial paper. Like bonds, commercial paper issues are often rated by rating agencies, and to attain a high rating (and a low interest rate), many commercial paper issues have a "back up" line of credit from a commercial bank. Most commercial paper issues have maturities ranging from 3 to 270 days. Although there is no set denomination, firms usually issue commercial paper in multiples of $100,000 or more. Finance companies issue a large portion of the commercial paper today; manufacturing firms account for a smaller portion. Businesses purchase commercial paper to provide an interest-earning reserve of liquidity. For further information on recent use of commercial paper, see the *Focus on Practice* box.

Interest on Commercial Paper

Commercial paper sells at a discount from its par, or face value. The size of the discount and the length of time to maturity determine the interest rate paid by the issuer of commercial paper, as illustrated by the following example.

2. Many authors classify the revolving credit agreement as a form of intermediate-term financing, defined as having a maturity of 1 to 7 years, but we do not use the intermediate-term financing classification; only short-term and long-term classifications are made. Because many revolving credit agreements cover more than 1 year, they can be classified as a form of long-term financing; however, they are discussed here because of their similarity to line-of-credit agreements.

FOCUS ON PRACTICE *in practice*

The Ebb and Flow of Commercial Paper

The difficult economic and credit environment in the post–September 11 era, combined with historically low interest rates and a deep desire by corporate issuers to reduce exposure to refinancing risk, had a depressing effect on commercial paper volumes from 2001 through 2003. According to the Federal Reserve, U.S. nonfinancial commercial paper declined 68% over the 3-year period, from $315.8 billion outstanding at the beginning of 2001 to $101.4 billion by December 2003. In addition to lower volume, credit quality of commercial paper declined over the same period, with the ratio of downgrades outpacing upgrades 17 to 1 in 2002.

In 2004, signs emerged that the volume and rating contraction in commercial paper was finally coming to an end. The most encouraging of them was the pickup in economic growth, which spurs the need for short-term debt to finance corporate working capital. Although commercial paper is typically used to fund working capital, it is often boosted by a sudden surge of borrowing activity for other strategic activities, such as mergers and acquisitions and long-term capital investments. According to Federal Reserve Board data, at the end of July 2004, total U.S. commercial paper outstanding was $1.33 trillion.

By 2006, commercial paper surged to $1.98 trillion, an increase of 21.5% over 2005 levels. However, after peaking at $2.22 trillion, the tide changed in response to the credit crisis that began in August 2007. According to Federal Reserve data, as of October 1, 2008, the commercial paper market had contracted to $1.6 trillion, a reduction of nearly 28%, and new issues virtually dried up for several weeks. With much of the commercial paper outstanding at the start of the credit crisis coming up for renewal, the Federal Reserve began operating the Commercial Paper Funding Facility (CPFF) on October 27, 2008. The CPFF was intended to provide a liquidity backstop to U.S. issuers of commercial paper and, thereby, increase the availability of credit in short-term capital markets. CPFF allowed for the Federal Reserve Bank of New York to finance the purchase of highly rated unsecured and asset-backed commercial paper from eligible issuers.

Even with the CPFF up and running, companies that were worried about their ability to roll over their outstanding commercial paper every few weeks turned to long-term debt to meet their liquidity needs. Merrill Lynch & Co. and Bloomberg data showed that to manage short-term liability risk, companies were paying as much as $75 million in additional annual interest to swap long-term debt for $1 billion of 30-day commercial paper.

With the recession in the rearview mirror and short-term credit markets working again, the CPFF was closed on February 1, 2010. But 7 years later, the commercial paper market was still far smaller than it had been before the financial crisis. In February 2017, the Federal Reserve reported that the total amount of commercial paper outstanding was only $950 billion, less than half the size of the market in 2007, before the crisis.

▶ *What factors contribute to an expansion of the commercial paper market? What factors cause a contraction in the commercial paper market?*

EXAMPLE 15.13

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Bertram Corporation, a large shipbuilder, has just issued $1 million worth of commercial paper that has a 90-day maturity and sells for $995,000. At the end of 90 days, the purchaser of this paper will receive $1 million for its $995,000 investment. The interest paid on the financing is therefore $5,000 on a principal of $995,000. The 90-day interest rate on the paper is 0.502% ($5,000 ÷ $995,000). Assuming that the paper is rolled over each 90 days throughout the year (i.e., 365 ÷ 90 = 4.06 times per year), the effective annual rate for Bertram's commercial paper, found by using Equation 5.10, is 2.054% $[(1 + 0.00502)^{4.06} - 1]$.

An interesting characteristic of commercial paper is that its interest cost is normally below the prime rate. In other words, firms are able to raise funds more cheaply by selling commercial paper than by borrowing from a commercial bank (although commercial banks sometimes offer very large borrowers loans at a rate

that is below prime). The reason is that many suppliers of short-term funds do not have the option, as banks do, of making low-risk business loans at the prime rate. They can invest safely only in marketable securities such as Treasury bills and commercial paper.

Although the stated interest cost of borrowing through the sale of commercial paper is normally lower than the prime rate, the overall cost of commercial paper may not be less than that of a bank loan. Additional costs include various fees and flotation costs. Also, even if it is slightly more expensive to borrow from a commercial bank, it may at times be advisable to do so to establish a good working relationship with a bank. This strategy increases the chances that when money is tight, firms can obtain funds promptly and at a reasonable interest rate.

MATTER OF FACT

Lending Limits

Commercial banks are legally prohibited from lending amounts in excess of 15% (plus an additional 10% for loans secured by readily marketable collateral) of the bank's unimpaired capital and surplus to any one borrower. This restriction is intended to protect depositors by forcing the commercial bank to spread its risk across a number of borrowers. In addition, smaller commercial banks do not have many opportunities to lend to large, high-quality business borrowers.

INTERNATIONAL LOANS

In some ways, arranging short-term financing for international trade is no different from financing purely domestic operations. In both cases, producers must finance production and inventory and then continue to finance accounts receivable before collecting any cash payments from sales. In other ways, however, the short-term financing of international sales and purchases is fundamentally different from that of strictly domestic trade.

International Transactions

The important difference between international and domestic transactions is that payments are often made or received in a foreign currency. Not only must a U.S. company pay the costs of doing business in the foreign exchange market, but it also is exposed to exchange rate risk. A U.S.-based company that exports goods and has accounts receivable denominated in a foreign currency faces the risk that the U.S. dollar will appreciate in value relative to the foreign currency. The risk to a U.S. importer with foreign-currency-denominated accounts payable is that the dollar will depreciate. Although exchange rate risk can often be hedged by using currency forward, futures, or options markets, doing so is costly and is not possible for all foreign currencies.

Typical international transactions are large and have long maturity dates. Therefore, companies involved in international trade generally have to finance larger dollar amounts for longer time periods than companies that operate domestically. Furthermore, because foreign companies are rarely well known in the United States, some financial institutions are reluctant to lend to U.S. exporters or importers, particularly smaller firms.

Financing International Trade

letter of credit
A letter written by a company's bank to the company's foreign supplier, stating that the bank guarantees payment of an invoiced amount if all the underlying agreements are met.

Several specialized techniques have evolved for financing international trade. Perhaps the most important financing vehicle is the **letter of credit,** a letter written by a company's bank to the company's foreign supplier, stating that the bank guarantees payment of an invoiced amount if all the underlying agreements are met. The letter of credit essentially substitutes the bank's reputation and creditworthiness for that of its commercial customer. A U.S. exporter is more willing to sell goods to a foreign buyer if the transaction is covered by a letter of credit issued by a well-known bank in the buyer's home country.

Firms that do business in foreign countries on an ongoing basis often finance their operations, at least in part, in the local market. A company that has an assembly plant in Mexico, for example, might choose to finance its purchases of Mexican goods and services with peso funds borrowed from a Mexican bank. This practice not only minimizes exchange rate risk but also improves the company's business ties to the host community. Multinational companies, however, sometimes finance their international transactions through dollar-denominated loans from international banks. The Eurocurrency loan markets allow creditworthy borrowers to obtain financing on attractive terms.

Transactions Between Subsidiaries

Much international trade involves transactions between corporate subsidiaries. A U.S. company might, for example, manufacture one part in an Asian plant and another part in the United States, assemble the product in Brazil, and sell it in Europe. The shipment of goods back and forth between subsidiaries creates accounts receivable and accounts payable, but the parent company has considerable discretion about how and when payments are made. In particular, the parent company can minimize foreign exchange fees and other transaction costs by "netting" what affiliates owe each other and paying only the net amount due rather than having both subsidiaries pay each other the gross amounts due.

→ REVIEW QUESTIONS MyLab Finance Solutions

15–4 How is the prime rate of interest relevant to the cost of short-term bank borrowing? What is a floating-rate loan?

15–5 How does the effective annual rate differ between a loan requiring interest payments at maturity and another, similar loan requiring interest in advance?

15–6 What are the basic terms and characteristics of a single-payment note? How is the effective annual rate on such a note found?

15–7 What is a line of credit? Describe each of the following features that are often included in these agreements: (**a**) operating-change restrictions, (**b**) compensating balance, and (**c**) annual cleanup.

15–8 What is a revolving credit agreement? How does this arrangement differ from the line-of-credit agreement? What is a commitment fee?

15–9 How do firms use commercial paper to raise short-term funds? Who can issue commercial paper? Who buys commercial paper?

15–10 What is the important difference between international and domestic transactions? How is a letter of credit used in financing international trade transactions? How is "netting" used in transactions between subsidiaries?

LG5 LG6

15.3 Secured Sources of Short-Term Loans

secured short-term financing
Short-term financing (loan) that has specific assets pledged as collateral.

security agreement
The agreement between the borrower and the lender that specifies the collateral held against a secured loan.

When a firm has exhausted its sources of unsecured short-term financing, it may be able to obtain additional short-term loans on a secured basis. **Secured short-term financing** has specific assets pledged as collateral. The collateral commonly takes the form of an asset, such as accounts receivable or inventory. The lender obtains a security interest in the collateral through the execution of a **security agreement** with the borrower that specifies the collateral held against the loan. In addition, the terms of the loan against which the security is held form part of the security agreement. A copy of the security agreement is filed in a public office within the state, usually a county or state court. Filing provides subsequent lenders with information about which assets of a prospective borrower are unavailable for use as collateral. The filing requirement protects the lender by legally establishing the lender's security interest.

CHARACTERISTICS OF SECURED SHORT-TERM LOANS

Although many people believe that holding collateral as security reduces the risk that a loan will default, lenders do not usually view loans in this way. Lenders recognize that holding collateral can reduce losses if the borrower defaults, but the presence of collateral has no impact on default risk. A lender requires collateral to ensure recovery of some portion of the loan in default. What the lender wants above all, however, is repayment as scheduled. In general, lenders prefer to make less risky loans at lower rates of interest than to find themselves in a position requiring liquidation of collateral.

Collateral and Terms

Lenders of secured short-term funds prefer collateral that has a duration closely matched to the term of the loan. Current assets are the most desirable short-term-loan collateral because they can normally be converted into cash much sooner than fixed assets. Thus, the short-term lender of secured funds generally accepts only liquid current assets as collateral.

percentage advance
The percentage of the book value of the collateral that constitutes the principal of a secured loan.

Typically, the lender determines the desirable **percentage advance** to make against the collateral. This percentage advance constitutes the principal of the secured loan and is normally between 30% and 100% of the book value of the collateral. It varies according to the type and liquidity of collateral.

Other things being equal, for an individual firm the interest rate charged on secured short-term loans is typically lower than the rate on unsecured short-term loans. Lenders require the riskiest borrowers to provide collateral and pay higher interest rates. The riskiest borrowers that only have access to secured lending often pay higher interest rates than the typical less risky, unsecured borrower. In addition, negotiating and administering secured loans is more costly for the lender than negotiating and administering unsecured loans. The lender therefore normally requires added compensation in the form of a service charge, a yet higher interest rate, or both.

Institutions Extending Secured Short-Term Loans

The primary sources of secured short-term loans to businesses are commercial banks and commercial finance companies. Both institutions deal in short-term loans secured primarily by accounts receivable and inventory. We have already described

commercial finance companies
Lending institutions that make *only* secured loans—both short-term and long-term—to businesses.

the operations of commercial banks. **Commercial finance companies** are lending institutions that make only secured loans—both short-term and long-term—to businesses. Unlike banks, finance companies are not permitted to hold deposits.

If its unsecured and secured short-term borrowing power from the commercial bank is exhausted, a borrower may turn to the commercial finance company for additional secured borrowing. Because the finance company generally ends up with higher-risk borrowers, its interest charges on secured short-term loans are usually higher than those of commercial banks. The leading U.S. commercial finance companies include the CIT Group and General Electric Corporate Financial Services.

USE OF ACCOUNTS RECEIVABLE AS COLLATERAL

Two commonly used means of obtaining short-term financing with accounts receivable are *pledging accounts receivable* and *factoring accounts receivable*. Actually, only a pledge of accounts receivable creates a secured short-term loan; factoring really entails the sale of accounts receivable at a discount. Although factoring is not actually a form of secured short-term borrowing, it does involve the use of accounts receivable to obtain needed short-term funds.

Pledging Accounts Receivable

pledge of accounts receivable
The use of a firm's accounts receivable as security, or collateral, to obtain a short-term loan.

A **pledge of accounts receivable** is often used to secure a short-term loan. Because accounts receivable are normally quite liquid, they are an attractive form of short-term-loan collateral.

The Pledging Process When a firm requests a loan against accounts receivable, the lender first evaluates the firm's accounts receivable to determine their desirability as collateral. The lender makes a list of the acceptable accounts, along with the billing dates and amounts. If the borrowing firm requests a loan for a fixed amount, the lender needs to select only enough accounts to secure the funds requested. If the borrower wants the maximum loan available, the lender evaluates all the accounts to select the maximum amount of acceptable collateral.

After selecting the acceptable accounts, the lender normally adjusts the dollar value of these accounts for expected returns on sales and other allowances. If a customer whose account has been pledged returns merchandise or receives some type of allowance, such as an early payment discount for early payment, the amount of the collateral is automatically reduced. For protection from such occurrences, the lender normally reduces the value of the acceptable collateral by a fixed percentage.

lien
A publicly disclosed legal claim on loan collateral.

non-notification basis
The basis on which a borrower, having pledged an account receivable, continues to collect the account payments without notifying the account customer.

notification basis
The basis on which an account customer whose account has been pledged (or factored) is notified to remit payment directly to the lender (or factor).

Next, the lender must determine the percentage to be advanced against the collateral. The lender evaluates the quality of the acceptable receivables and the expected cost of their liquidation. This percentage represents the principal of the loan and typically ranges between 50% and 90% of the face value of acceptable accounts receivable. To protect its interest in the collateral, the lender files a **lien,** which is a publicly disclosed legal claim on the collateral.

Notification Pledges of accounts receivable are normally made on a **non-notification basis,** meaning that a customer whose account has been pledged as collateral is not notified. Under the non-notification arrangement, the borrower still collects the pledged account receivable, and the lender trusts the borrower to remit these payments as they are received. If a pledge of accounts receivable is made on a **notification basis,** the customer is notified to remit payment directly to the lender.

MATTER OF FACT

Receivables Trading

Founded in 2007, the Receivables Exchange is an online marketplace where organizations such as hedge funds and commercial banks looking for short-term investments can bid on receivables pledged by large companies from a wide range of industries. Companies that need cash put their receivables up for auction on the Receivables Exchange, and investors bid on them. In its first few years of operation, the Receivables Exchange provided funding of more than $1 billion to companies selling their receivables. The Receivables Exchange attracted the attention of the NYSE Euronext, which purchased a minority stake in the company in 2011, and eventually the exchange was rebranded as LiquidX. Auction-based trading in receivables is still a niche business and in the aggregate does not provide a large volume of financing for businesses.

Pledging Cost The stated cost of a pledge of accounts receivable is normally 1% to 4% above the prime rate. In addition to the stated interest rate, a service charge of up to 3% may be levied by the lender to cover its administrative costs. Clearly, pledges of accounts receivable are a high-cost source of short-term financing.

Factoring Accounts Receivable

factoring accounts receivable
The outright sale of accounts receivable at a discount to a *factor* or other financial institution.

factor
A financial institution that specializes in purchasing accounts receivable from businesses.

nonrecourse basis
The basis on which accounts receivable are sold to a factor with the understanding that the factor accepts all credit risks on the purchased accounts.

Factoring accounts receivable involves selling them outright, at a discount, to a financial institution. A **factor** is a financial institution that specializes in purchasing accounts receivable from businesses. Although it is not the same as obtaining a short-term loan, factoring accounts receivable is similar to borrowing with accounts receivable as collateral.

Factoring Agreement A factoring agreement normally states the exact conditions and procedures for the purchase of an account. The factor, like a lender against a pledge of accounts receivable, chooses accounts for purchase, selecting only those that appear to be acceptable credit risks. Where factoring occurs on a continuing basis, the factor will actually make the firm's credit decisions because this will guarantee the acceptability of accounts. Factoring is normally done on a *notification basis,* and the factor receives payment of the account directly from the customer. In addition, most sales of accounts receivable to a factor are made on a **nonrecourse basis,** meaning that the factor agrees to accept all credit risks. Thus, if a purchased account turns out to be uncollectible, the factor must absorb the loss.

MATTER OF FACT

Quasi Factoring

The use of credit cards such as MasterCard, Visa, and Discover by consumers has some similarity to factoring because the vendor that accepts the card is reimbursed at a discount for purchases made with the card. The difference between factoring and credit cards is that cards are nothing more than a line of credit extended by the issuer, which charges the vendors a fee for accepting the cards. In factoring, the factor does not analyze credit until after the sale has been made; in many cases (except when factoring is done on a continuing basis), the initial credit decision is the responsibility of the vendor, not the factor that purchases the account.

Typically, the factor is not required to pay the firm until the account is collected or until the last day of the credit period, whichever occurs first. The factor sets up an account similar to a bank deposit account for each customer. As payment is received or as due dates arrive, the factor deposits money into the seller's account, from which the seller is free to make withdrawals as needed.

In many cases, if the firm leaves the money in the account, a surplus will exist on which the factor will pay interest. In other instances, the factor may make advances to the firm against uncollected accounts that are not yet due. These advances represent a negative balance in the firm's account, on which interest is charged.

Factoring Cost Factoring costs include commissions, interest levied on advances, and interest earned on surpluses. The factor deposits in the firm's account the book value of the collected or due accounts purchased by the factor, less the commissions. The commissions are typically stated as a 1% to 3% discount from the book value of factored accounts receivable. The interest levied on advances is generally a few percentage points above the prime rate. It is levied on the actual amount advanced. The interest paid on surpluses is generally between 0.2% and 0.5% per month.

Although its costs may seem high, factoring has certain advantages that make it attractive to many firms. One is the ability it gives the firm to turn accounts receivable immediately into cash without having to worry about repayment. Another advantage is that it ensures a known pattern of cash flows. In addition, if factoring is undertaken on a continuing basis, the firm can eliminate or scale back its credit and collection departments.

USE OF INVENTORY AS COLLATERAL

Inventory is generally second to accounts receivable in desirability as short-term loan collateral. Inventory normally has a market value greater than its book value, which is used to establish its value as collateral. A lender whose loan is secured with inventory will probably be able to sell that inventory for at least book value if the borrower defaults on its obligations.

The most important characteristic of inventory being evaluated as loan collateral is marketability. A warehouse of perishable items, such as fresh peaches, may be quite marketable, but if the cost of storing and selling the peaches is high, they may not be desirable collateral. Specialized items, such as moon-roving vehicles, are also not desirable collateral because finding a buyer for them could be difficult. When evaluating inventory as possible loan collateral, the lender looks for items with very stable market prices that have ready markets and that lack undesirable physical properties.

Floating Inventory Liens

floating inventory lien
A secured short-term loan against inventory under which the lender's claim is on the borrower's inventory in general.

A lender may be willing to secure a loan under a **floating inventory lien,** which is a claim on inventory in general. This arrangement is most attractive when the firm has a stable level of inventory that consists of a diversified group of relatively inexpensive merchandise. Inventories of items such as auto tires, screws and bolts, and shoes are candidates for floating-lien loans. Because it is difficult for a lender to verify the presence of the inventory, the lender generally advances less than 50% of the book value of the average inventory. The interest charge on

a floating lien is 3% to 5% above the prime rate. Commercial banks often require floating liens as extra security on what would otherwise be an unsecured loan. Floating-lien inventory loans may also be available from commercial finance companies.

Trust Receipt Inventory Loans

trust receipt inventory loan
A secured short-term loan against inventory under which the lender advances 80% to 100% of the cost of the borrower's relatively expensive inventory items in exchange for the borrower's promise to repay the lender, with accrued interest, immediately after the sale of each item of collateral.

A **trust receipt inventory loan** often can be made against relatively expensive automotive, consumer durable, and industrial goods that can be identified by serial number. Under this agreement, the borrower keeps the inventory, and the lender may advance 80% to 100% of its cost. The lender files a *lien* on all the items financed. The borrower is free to sell the merchandise but is trusted to remit the amount lent, along with accrued interest, to the lender immediately after the sale. The lender then releases the lien on the item. The lender makes periodic checks of the borrower's inventory to make sure the required collateral remains in the hands of the borrower. The interest charge to the borrower is normally 2% or more above the prime rate.

Trust receipt loans are often made by manufacturers' wholly owned financing subsidiaries, known as captive finance companies, to their customers. Captive finance companies are especially popular in industries that manufacture consumer durable goods because they provide the manufacturer with a useful sales tool. For example, Ford Motor Credit Company, the financing subsidiary of Ford Motor Company, grants these types of loans to its dealers. Trust receipt loans are also available through commercial banks and commercial finance companies.

Warehouse Receipt Loans

warehouse receipt loan
A secured short-term loan against inventory under which the lender receives control of the pledged inventory collateral, which is stored by a designated warehousing company on the lender's behalf.

A **warehouse receipt loan** is an arrangement whereby the lender, which may be a commercial bank or finance company, receives control of the pledged inventory collateral, which is stored by a designated agent on the lender's behalf. After selecting acceptable collateral, the lender hires a warehousing company to act as its agent and take possession of the inventory.

Two types of warehousing arrangements are possible. A *terminal warehouse* is a central warehouse used to store the merchandise of various customers. The lender normally uses such a warehouse when the inventory is easily transported and can be delivered to the warehouse relatively inexpensively. Under a *field warehouse* arrangement, the lender hires a field-warehousing company to set up a warehouse on the borrower's premises or to lease part of the borrower's warehouse to store the pledged collateral. Regardless of the type of warehouse, the warehousing company places a guard over the inventory. Only on written approval of the lender can the warehousing company release any portion of the secured inventory.

The actual lending agreement specifically states the requirements for the release of inventory. As with other secured loans, the lender accepts only collateral that it believes to be readily marketable and advances only a portion—generally 75% to 90%—of the collateral's value. The specific costs of warehouse receipt loans are generally higher than those of any other secured lending arrangements because of the need to hire and pay a warehousing company to guard and supervise the collateral. The basic interest charged on warehouse receipt loans is higher than that charged on unsecured loans, generally ranging from 3% to 5%

above the prime rate. In addition to the interest charge, the borrower must absorb the costs of warehousing by paying the warehouse fee, which is generally between 1% and 3% of the amount of the loan. The borrower is normally also required to pay the insurance costs on the warehoused merchandise.

→ REVIEW QUESTIONS MyLab Finance Solutions

15–11 Are secured short-term loans viewed as more risky or less risky than unsecured short-term loans? Why?

15–12 In general, what interest rates and fees are levied on secured short-term loans? Why are these rates generally higher than the rates on unsecured short-term loans?

15–13 Describe and compare the basic features of the following methods of using accounts receivable to obtain short-term financing: (**a**) pledging accounts receivable and (**b**) factoring accounts receivable. Be sure to mention the institutions that offer each of them.

15–14 For the following methods of using inventory as short-term loan collateral, describe the basic features of each, and compare their use: (**a**) floating lien, (**b**) trust receipt loan, and (**c**) warehouse receipt loan.

SUMMARY

FOCUS ON VALUE

Current liabilities represent an important and generally inexpensive source of financing for a firm. The level of short-term (current liabilities) financing used by a firm affects its profitability and risk. Accounts payable and accruals are spontaneous liabilities that should be carefully managed because they represent free financing (in the absence of discounts for early payments). Notes payable, which represent negotiated short-term financing, should be obtained at the lowest cost under the best possible terms. Large, well-known firms can obtain unsecured short-term financing through the sale of commercial paper. On a secured basis, the firm can obtain loans from banks or commercial finance companies, using either accounts receivable or inventory as collateral.

The financial manager must obtain the right quantity and form of current liabilities financing to provide the lowest-cost funds with the least risk. Such a strategy should positively contribute to the firm's goal of **maximizing the stock price.**

REVIEW OF LEARNING GOALS

LG 1 **Review accounts payable, the key components of credit terms, and the procedures for analyzing those terms.** The major spontaneous source of short-term financing is accounts payable. They are the primary source of short-term funds. Credit terms may differ with respect to the credit period, early payment discount, discount period, and beginning of the credit period. Discounts should be given up only when a firm in need of short-term funds must pay an interest rate on borrowing that is greater than the cost of giving up the discount.

LG2 **Understand the effects of stretching accounts payable on their cost and the use of accruals.** Stretching accounts payable can lower the cost of giving up an early payment discount. Accruals, which result primarily from wage and tax obligations, are virtually free.

LG3 **Describe interest rates and the basic types of unsecured bank sources of short-term loans.** Banks are the major source of unsecured short-term loans to businesses. The interest rate on these loans is tied to the prime rate of interest or another benchmark rate by a risk premium and may be fixed or floating. It should be evaluated by using the effective annual rate. Whether interest is paid when the loan matures or in advance affects the rate. Bank loans may take the form of a single-payment note, a line of credit, or a revolving credit agreement.

LG4 **Discuss the basic features of commercial paper and the key aspects of international short-term loans.** Commercial paper is an unsecured IOU issued by firms with a high credit standing. International sales and purchases expose firms to exchange rate risk. Such transactions are larger and of longer maturity than domestic transactions, and they can be financed by using a letter of credit, by borrowing in the local market, or through dollar-denominated loans from international banks. On transactions between subsidiaries, "netting" can be used to minimize foreign exchange fees and other transaction costs.

LG5 **Explain the characteristics of secured short-term loans and the use of accounts receivable as short-term-loan collateral.** Secured short-term loans are those for which the lender requires collateral, which are usually current assets such as accounts receivable or inventory. Only a percentage of the book value of acceptable collateral is advanced by the lender. These loans are more expensive than unsecured loans. Commercial banks and commercial finance companies make secured short-term loans. Both pledging and factoring involve the use of accounts receivable to obtain needed short-term funds.

LG6 **Describe the various ways in which inventory can be used as short-term-loan collateral.** Inventory can be used as short-term-loan collateral under a floating lien, a trust receipt arrangement, or a warehouse receipt loan.

SELF-TEST PROBLEM (Solutions in Appendix)

LG1 LG2 ST15–1 **Early payment discount decisions** The credit terms for each of three suppliers are shown in the following table. (*Note:* Assume a 365-day year.)

Supplier	Credit terms
X	1/10 net 55 EOM
Y	2/10 net 30 EOM
Z	2/20 net 60 EOM

a. Determine the approximate cost of giving up the early payment discount from each supplier.
b. Assuming that the firm needs short-term financing, indicate whether it would be better to give up the discount or take the discount and borrow from a bank at 15% annual interest. Evaluate each supplier separately using your findings in part **a.**
c. Now assume that the firm could stretch its accounts payable (net period only) by 20 days from supplier Z. What impact, if any, would that have on your answer in part **b** relative to this supplier?

WARM-UP EXERCISES

Select problems are available in MyLab Finance.

LG 1 **E15–1** Dream Cakes bought some baking ingredients costing $12,500 on credit. The credit terms are 2.5/5 net 30 EOM. If Dream Cakes pays the invoice within 5 days after the purchase, how much should it pay? What is the approximate cost of giving up the discount, when it pays 30 days after the invoice date?

LG 2 **E15–2** Cleaner's Inc. is switching to paying employees every 2 weeks rather than weekly and will therefore "skip" 1 week's pay. The firm has 25 employees who work a 60-hour week and earn an average wage of $12.50 per hour. Using a 10% rate of interest, how much will this change save the firm annually?

LG 3 **E15–3** Jasmine Scents has been given two competing offers for short-term financing. Both offers are for borrowing $15,000 for 1 year. The first offer is a discount loan at 8%, and the second offer is for interest to be paid at maturity at a stated interest rate of 9%. Calculate the effective annual rates for each loan, and indicate which loan offers the better terms.

LG 3 **E15–4** Diamantis Masoutis S.A., a Greek supermarket chain, borrowed €250,000 under a line-of-credit agreement. Although the company normally maintains a checking account balance of €15,000 in the lending bank, this credit line requires a 10% compensating balance. The stated interest rate on the borrowed funds is 8%. What is the effective annual rate of interest on the line of credit?

LG 4 **E15–5** Horizon Telecom sold $300,000 worth of 120-day commercial paper for $298,000. What is the dollar amount of interest paid on the commercial paper? What is the effective 120-day rate on the paper?

PROBLEMS

Select problems are available in MyLab Finance. The MyLab icon indicates problems in Excel format available in MyLab Finance.

LG 1 **P15–1** **Payment dates** On March 25, the following invoices were issued for a $500 purchase on credit. Indicate the meaning of each credit term.
a. 2/10 net 30 date of invoice.
b. 2/10 net 40 EOM.
c. 2/10 net 20 EOM.
d. 2/10 net 60 date of invoice.

LG 1 MyLab

P15–2 **Cost of giving up early payment discounts** Determine the cost of giving up the discount under each of the following terms of sale. (*Note:* Assume a 365-day year.)

a. 2/10 net 30.
b. 1/10 net 30.
c. 1/10 net 45.
d. 3/10 net 90.
e. 1/10 net 60.
f. 3/10 net 30.
g. 4/10 net 180.

LG 1

P15–3 **Credit terms** Wendy Interior Design received four invoices with different credit terms. The manager needs to determine when the invoices, all dated March 25, need to be paid to avoid late-payment charges. A summary of the invoice credit terms are presented in the following table. (*Note:* Assume a 365-day year.)

Cash discount	Cash discount period	Credit period	Beginning of credit period
2.0%	15 days	30 days	date of invoice
1.5	10	60	end of month
3.0	7	45	date of invoice
3.5	15	30	end of month

a. Write the shorthand expression of credit terms for each set in the table.
b. For each set of credit terms, calculate the number of days until full payment is due.
c. For each set of credit terms, calculate the cost of giving up the cash discount.
d. If the firm's cost of short-term financing is 12%, should Wendy Interior Design give up the cash discount for each of the invoice credit terms presented in the table? Explain.

LG 1

P15–4 **Cash discount versus loan** The Wood Connection decides to offer cash discounts to its regular credit customers, provided that the credit customers have a proven track record of on-time payment. The Wood Connection is offering Monkey Suppliers a discount on its credit purchases. The credit term offered is 2/10 net 60. Should Monkey Suppliers take the discount if a short-term loan can be obtained at 9%? (*Note:* Assume a 365-day year.)

Personal Finance Problem

LG 2

P15–5 **Borrow or pay cash for an asset** Antonio is considering renovating his apartment in Milan. He visits Meridiani and looks at different bedroom furniture sets. The bedroom sets are generally very expensive, and even though he has the cash to pay for one, he is thinking about getting a loan and not exhaust all his savings.

The bedroom set Antonio selects costs €10,000, and Meridiani offers a financing plan that would allow Antonio to either (1) put 20% down and finance

the balance at 6% annual interest compounded monthly over 60 months or (2) receive an immediate €500 cash rabate.

Antonio currently earns 2% annual interest rate compounded yearly on his savings in a bank.

a. Calculate the cash down payment for the loan.
b. Calculate the monthly payment on the available loan (Hint: Treat the current loan as an annuity and solve for the monthly payment.)
c. Calculate the net cash outlay under the cash purchase option.
d. Given the interest rate on his savings, what will Antonio give up (opportunity cost) over the 5 years if he pays cash?
e. What is the cost of the cash alternative at the end of 5 years?
f. Should Antonio choose the financing or the cash alternative?

LG1 LG2

P15–6 **Cash discount decisions** Brembo, an Italian automotive braking-systems supplier, has three alternative carbon ceramic suppliers, all of which offer different terms. Except for the different credit terms, their products are identical. The credit terms offered by these suppliers are shown in the following table. (*Note:* Assume a 365-day year.)

Supplier	2017
SGL Carbon	1/15 net 60 EOM
Nordex	2/20 net 90 EOM
Hexcel	2/10 net 90 EOM

a. Calculate the approximate cost of giving up the cash discount from each supplier.
b. If the firm needs short-term funds, which are currently available from Banca Mediolanum at 9%, and if each of the suppliers is viewed separately, which of the suppliers' cash discounts should the firm give up? Explain why.
c. Now assume the firm could stretch by 20 days the accounts payable (net periods only) from the supplier, Nordex. What impact, if any, would that have on your answer in part **b** relative to this supplier?

LG2

P15–7 **Changing payment cycle** On accepting the position of chief executive officer and chairman of Muse Inc., Dominic Howard changed the firm's weekly payday from Monday afternoon to the following Friday afternoon. The firm's weekly payroll was $100 million, and the cost of short-term funds was 5%. If the effect of this change was to delay check clearing by 1 week, what annual savings, if any, were realized?

LG2

P15–8 **Spontaneous sources of funds, accruals** After consultation with its employees, Sunshine Company decides to switch the employee pay period to biweekly instead of weekly. Sunshine's weekly payroll is $925,000. The annual cost of funds is 12%. Will it be beneficial for Sunshine Company to change the pay period? Explain your answer.

LG 3

P15–9 **Cost of bank loan** The Floral Boutique approached two banks to obtain a $10,000 bank loan. Bank A will give a 120-day loan at an annual interest rate of 12% and Bank B will give a 90-day loan at 15%. (*Note:* Assume a 365-day year.)

a. Based on the amount of interest to be paid, which bank loan should The Floral Boutique choose?

b. Compare the 120-day and 90-day rates on the loans by finding the effective annual rate for each loan. Assume each loan is rolled over throughout the year under the same terms and circumstances.

c. Based on the effective annual rate for each loan, which bank loan should The Floral Boutique choose?

Personal Finance Problem

LG 3

P15–10 **Unsecured sources of short-term loans** Lindsey Shaw requires a short-term loan of $55,000 to buy a new house. She will also use a portion of the money for renovations to the house. A bank is willing to lend it for a 180-day period. Her bank manager discusses two loan proposals with her. She has to decide whether to choose a fixed-rate loan at 2% above prime or a variable-rate loan at 1% above prime.

The prime rate of interest is 6%. A group of economists predict the following: Sixty days from today, the prime rate will increase by 0.25%; 90 days from today, it will increase by another 0.5%; and 180 days from today, the prime rate will drop by 1.5%. (*Note:* Use a 365-day year.)

a. Calculate Lindsey's total interest cost over 180 days for a fixed-rate loan.

b. Calculate her total interest cost over 180 days for a variable-rate loan.

c. Which loan should Lindsey choose? Explain your answer.

LG 3

P15–11 **Effective annual rate** Assume Credins Bank made a €10 million, 1-year discount loan at 7% interest, requiring a compensating balance equal to 10% of the face value of the loan. Determine the effective annual rate associated with this loan. (*Note:* Assume that the firm currently maintains €0 on deposit in Credins Bank.)

LG 3

P15–12 **Compensating balances and effective annual rates** Charlton Enterprises negotiated a line of credit at the bank that requires it to pay 12.5% interest on its borrowing. The firm is required to maintain a compensating balance equal to 10% of the amount borrowed. The firm borrowed $500,000 during the year.

a. Calculate the effective annual rate on the firm's borrowing if the firm normally maintains no deposit balances at the bank.

b. Calculate the effective annual rate on the firm's borrowing if the firm normally maintains a deposit balance of $45,000 at the bank.

c. Calculate the effective annual rate on the firm's borrowing if the firm normally maintains a deposit balance of $145,000 at the bank.

d. What is the change in the effective annual rate when the deposit balances increase?

LG 3

P15–13 **Compensating balance versus discount loan** Automotive Accessories needs to borrow $135,000 for 6 months for renovations. It is considering two financing options: Bank Helping Hand offers an 8% annual rate subject to a 10% compensating balance. Bank Friendly Financer offers the funds as a discount loan with an annual rate of 8%. Automotive Accessories maintains no deposit balances in either bank, and repayment will be a single lump sum at maturity.

a. What is the effective annual rate of interest on each loan?

b. What can Automotive Accessories do to reduce the interest rates on these loans?

LG 3

P15–14 Integrative: Comparison of loan terms Cumberland Furniture wishes to establish a prearranged borrowing agreement with a local commercial bank. The bank's terms for a line of credit are 3.30% over the prime rate, and each year the borrowing must be reduced to zero for a 30-day period. For an equivalent revolving credit agreement, the rate is 2.80% over prime with a commitment fee of 0.50% on the average unused balance. With both loans, the required compensating balance is equal to 20% of the amount borrowed. (*Note:* Cumberland currently maintains $0 on deposit at the bank.) The prime rate is currently 8%. Both agreements have $4 million borrowing limits. The firm expects on average to borrow $2 million during the year no matter which loan agreement it decides to use.

a. What is the effective annual rate under the line of credit?

b. What is the effective annual rate under the revolving credit agreement? (*Hint:* Compute the ratio of the dollars that the firm will pay in interest and commitment fees to the dollars that the firm will effectively have use of.)

c. If the firm does expect to borrow an average of half the amount available, which arrangement would you recommend for the borrower? Explain why.

LG 4

P15–15 Cost of commercial paper Bejeweled Enterprises has received initial proceeds of $984,000 from issuing 120-day commercial paper with a face value of $1 million. The commercial paper is rolled over every 120 days throughout the year. (*Note:* Use a 365-day year.)

a. Calculate the effective annual rate the firm will pay for financing with commercial paper.

b. Suppose a brokerage fee of $8,427 was paid from the initial proceeds. Calculate the effective annual rate the firm will pay for financing with commercial paper.

LG 5

P15–16 Accounts receivable as collateral Lifestyle International, a wholesales company in India, is looking to get a loan using its accounts receivable as collateral. The firm's credit extension is net-30-day credit. The amounts that are owed Lifestyle by its main clients, the average for each account, and the average payment period from each client are shown in the following table.

Customer	Account receivable (INR, ₹)	Average age of account	Average payment period of customer
Titan Company	300,000	30 days	35 days
Shoppers Stop	420,000	25	50
United Colors of Benetton India	100,000	40	60
Future Retail	80,000	30	35
Puma Sports India	55,000	27	40
Marks and Spencer Reliance India	22,000	55	50
Kewel Kiran Clothing	150,000	60	65
Aditya Birla Retail	220,000	25	30
Provogue India Ltd.	44,000	35	40
Pantaloons Retail	85,000	20	30
Reliance Retail	50,000	65	70

a. If the bank accepts all accounts that can be collected in 40 days or less as long as the customer has a history of paying within 40 days, which accounts will be acceptable? What is the total amount of accounts receivable collateral? (*Note:* Accounts receivable that have an average age greater than the customer's average payments period are also excluded.)

b. In addition to the conditions in part **a,** the bank recognizes that 8% of credit sales will be lost to returns and allowances. Also the bank will lend only 85% of the acceptable collateral (after adjusting for returns and allowances). What level of funds would be made available through this lending source?

LG 5

P15–17 Accounts receivable as collateral Clothing Unlimited decided to apply for a $100,000 loan from its local bank. Clothing Unlimited will provide accounts receivable as collateral. The bank's policy states that accounts normally paid within 30 days of the end of the credit period may be accepted as collateral. However, the age of the account is not allowed to exceed the customer's average payment period. The accounts receivable, average age of accounts, and average payment period of customers are summarized in the table below. Clothing Unlimited offers credit terms of net 30 days.

Customer	Account receivable	Average age of account	Average payment period of customer
A	$5,000	20 days	30 days
B	18,000	40	45
C	9,500	60	35
D	14,000	18	25
E	8,750	52	45
F	4,500	14	20
G	1,500	10	15
H	20,000	20	45

a. What is the amount of collateral that meets the bank's policy?

b. To encourage more business, the bank reduces its collateral by 10%. Calculate the amount of accounts receivable now available as collateral.

c. How much will Clothing Unlimited be able to borrow if the bank is willing to advance 80% against the firm's acceptable collateral?

LG 3 LG 5

P15–18 Accounts receivable as collateral, cost of borrowing Maximum Bank has analyzed the accounts receivable of Scientific Software, Inc. The bank has chosen eight accounts totaling $134,000 that it will accept as collateral. The bank's terms include a lending rate set at prime plus 3% and a 2% commission charge. The prime rate currently is 8.5%.

a. The bank will adjust the accounts by 10% for returns and allowances. It then will lend up to 85% of the adjusted acceptable collateral. What is the maximum amount that the bank will lend to Scientific Software?

b. What is Scientific Software's effective annual rate of interest if it borrows $100,000 for 12 months? For 6 months? For 3 months? (*Note:* Assume a 365-day year and a prime rate that remains at 8.5% during the life of the loan.)

LG 5

P15–19 **Factoring** Heidelberg Cement factors the accounts of Titan Cement. All five factored accounts are shown in the following table, with the amount factored, the date due, and the status on November 30. Indicate the amounts that Heidelberg Cement should have remitted to Titan as of November 30 and the dates of those remittances. Assume that the factor's commission is 3% is deducted as part of determining the amount of the remittance.

Account	Amount	Date due	Status on November 30
A	€800,000	November 30	Collected on November 18
B	198,420	November 30	Uncollected
C	90,000	December 31	Collected on November 30
D	50,000	November 30	Collected on November 28
E	30,000	November 15	Uncollected

LG 1 LG 6

P15–20 **Inventory financing** Heidelberg Cement faces a liquidity crisis: It needs a loan of €1,000,000 for 2 months. Having no source of additional unsecured borrowing, the firm must find a secured short-term lender. The firms' accounts receivable are quite low, but its inventory is considered liquid and reasonably good collateral. The book value of inventory is €2,000,000 of which €1,500,000 is finished goods. (*Note*: Assume a 365-day year.)

(1) Deutsche Bank can make a €1,000,000 trust receipt loan against the finished goods inventory. The annual interest rate on the loan is 6% on the outstanding loan balance plus a 0.25% administration fee levied against the initial loan. Because it will be liquidated as inventory is sold, the average amount owed over the month is expected to be €750,000.

(2) Erste Bank will lend €1,000,000 against a floating lien on the book value of inventory for the 2-month period at an annual interest rate of 7%.

(3) Raiffeisen Bank will lend €1,000,000 against a warehouse receipt on the finished goods inventory and charge 8% annual interest on the outstanding loan balance. Because the loan will be liquidated as inventory is sold, the average loan balance is expected to be €700,000.

a. Calculate the euro cost of each of the proposed plans for obtaining an initial loan amount of €1,000,000.

b. Which bank do you recommend to get the loan from and why?

c. If the firm had made a purchase of €1,000,000 for which it had been given terms of 2/10 net 60, would it increase the firm's profitability to give up the discount and not borrow as recommended in part **b**? Explain your answer.

LG 2

P15–21 **ETHICS PROBLEM** Rancco Inc. reported total sales of $73 million last year, including $13 million in revenue (labor, sales to tax-exempt entities) exempt from sales tax. The company collects sales tax at a rate of 5%. In reviewing its information as part of its loan application, you notice that Rancco's sales tax payments show a total of $2 million in payments over the same time period. What are your conclusions regarding the financial statements that you are reviewing? How might you verify any discrepancies?

SPREADSHEET EXERCISE

Your company is considering manufacturing protective cases for a popular new smartphone. Management decides to borrow $200,000 from each of two banks, First American and First Citizen. On the day that you visit both banks, the quoted prime interest rate is 7%. Each loan is similar in that each involves a 60-day note, with interest to be paid at the end of 60 days.

The interest rate was set at 2% above the prime rate on First American's fixed-rate note. Over the 60-day period, the rate of interest on this note will remain at the 2% premium over the prime rate regardless of fluctuations in the prime rate.

First Citizen sets its interest rate at 1.5% above the prime rate on its floating-rate note. The rate charged over the 60 days will vary directly with the prime rate.

TO DO

Create a spreadsheet to calculate and analyze the following for the First American loan:

a. Calculate the total dollar interest cost on the loan. Assume a 365-day year.
b. Calculate the 60-day rate on the loan.
c. Assume that the loan is rolled over each 60 days throughout the year under identical conditions and terms. Calculate the effective annual rate of interest on the fixed-rate, 60-day First American note.

Next, create a spreadsheet to calculate the following for the First Citizen loan:

d. Calculate the initial interest rate.
e. Assuming that the prime rate immediately jumps to 7.5% and after 30 days it drops to 7.25%, calculate the interest rate for the first 30 days and the second 30 days of the loan.
f. Calculate the total dollar interest cost.
g. Calculate the 60-day rate of interest.
h. Assume that the loan is rolled over each 60 days throughout the year under the same conditions and terms. Calculate the effective annual rate of interest.
i. Which loan would you choose, and why?

MyLab Finance Visit www.pearson.com/mylab/finance for **Chapter Case: *Selecting Kanton Company's Financing Strategy and Unsecured Short-Term Borrowing Arrangement,*** Group Exercises, and numerous online resources.

Appendix Solutions to Self-Test Problems

Chapter 1

ST1–1

Accounting view (accrual basis)		Financial view (cash basis)	
Worldwide Rugs income statement for the year ended 12/31		**Worldwide Rugs cash flow statement for the year ended 12/31**	
Sales revenue	$3,000,000	Cash inflow	$2,550,000
Less: Costs	2,500,000	Less: Cash outflow	2,500,000
Net profit	$ 500,000	Net cash flow	$ 50,000

a. $3,000,000 − $2,500,000 = $500,000

b. Yes, from an accounting perspective Worldwide Rug was profitable. It generated a 20% profit ($500,000/$2,500,000 = 0.20) on its investment.

c. The company collected 85% of its receivables in cash, so its cash inflow was $3,000,000 × 85% = $2,550,000. Net cash flow was therefore $2,550,000 − $2,500,000 = $50,000.

d. It generated a positive cash flow, but it only represents a 2% cash return on investment ($50,000/$2,500,000 = 0.02), and it may not be enough to cover operating costs incurred during the year.

e. Given the risk associated with importing and Worldwide Rug's ability to collect on its accounts receivables, a 2% cash return on investment before expenses seems unlikely to lead to long-term success. Without adequate cash inflows to meet its obligations, the firm will not survive, regardless of its level of profits.

Chapter 2

ST2–1

a. The current bid/ask spread is $0.02, the difference between $57.33 and $57.31.

b. If your sell order is routed to Nasdaq, then you will pay one-half of the bid/ask spread plus the brokerage commission. Total transactions costs will be (1/2 × $0.02 × 1,500) + $34.99 = $49.99.

c. In this case the Nasdaq dealer is taking herself out of the transaction by executing both orders at the midpoint of the bid/ask spread. So you will not have to pay one half of the bid/ask spread for every share you sell, but instead you will only pay the brokerage commission.

Total Transaction Costs = Brokerage Commission = $34.99

d. The market value of your trade is the number of shares traded (1,500) times the midpoint of the bid/ask spread ($57.32) or $85,980.

Chapter 3

ST3–1

Ratio	Too high	Too low
Current ratio = current assets/current liabilities	May indicate that the firm is holding excessive cash, accounts receivable, or inventory.	May indicate poor ability to satisfy short-term obligations.
Inventory turnover = CGS/inventory	May indicate lower level of inventory, which may cause stockouts and lost sales.	May indicate poor inventory management, excessive or obsolete inventory, or low sales compared to competition.
Times interest earned = earnings before interest and taxes/interest	May indicate overly conservative capital structure, i.e., unwillingness to use borrowed funds even if doing so increases shareholder value.	May indicate poor ability to pay contractual interest payments.
Gross profit margin = gross profits/sales	Indicates the low cost of merchandise sold relative to the sales price; might indicate a strong competitive position in the market, as long as price is not high enough to discourage sales.	Indicates the high cost of the merchandise sold relative to the sales price; may indicate that the firm's competitive position in its market is not particularly strong.
Return on total assets = profits after taxes/total assets	A high value is almost unambiguously a good thing, except perhaps if it indicates that the firm is not investing sufficiently in new assets to take advantage of attractive investment opportunities.	Indicates ineffective management in generating profits with the available assets.
Price/earnings (P/E) ratio = market price per share of common stock/earnings per share	Investors may have priced in a very high estimate of the firm's future growth or they may have underestimated the firm's risk.	Investors lack confidence in the firm's future outcomes or believe that the firm has an excessive level of risk.

ST3–2

O'Keefe Industries
Balance Sheet
December 31, 2019

Assets		Liabilities and stockholders' equity	
Cash	$ 32,720	Accounts payable	$ 120,000
Marketable securities	25,000	Notes payable	160,000[e]
Accounts receivable	197,280[a]	Accruals	20,000
Inventories	225,000[b]	Total current liabilities	$ 300,000[d]
Total current assets	$ 480,000	Long-term debt	$ 600,000[f]
Net fixed assets	$1,020,000[c]	Stockholders' equity	$ 600,000
Total assets	$1,500,000	Total liabilities and stockholders' equity	$1,500,000

[a]Average collection period (ACP) = 40 days
ACP = Accounts receivable/Average sales per day
40 = Accounts receivable/($1,800,000/365)
40 = Accounts receivable/$4,932
$197,280 = Accounts receivable

[b]Inventory turnover = 6.0
Inventory turnover = Cost of goods sold/Inventory
6.0 = [Sales × (1 − Gross profit margin)]/Inventory
6.0 = [$1,800,000 × (1 − 0.25)]/Inventory
$225,000 = Inventory

[c]Total asset turnover = 1.20
Total asset turnover = Sales/Total assets
1.20 = $1,800,000/Total assets
$1,500,000 = Total assets
Total assets = Current assets + Net fixed assets
$1,500,000 = $480,000 + Net fixed assets
$1,020,000 = Net fixed assets

[d]Current ratio = 1.60
Current ratio = Current assets/Current liabilities
1.60 = $480,000/Current liabilities
$300,000 = Current liabilities

[e]Notes Payable = Total current liabilities − Accounts payable − Accruals
= $300,000 − $120,000 − $20,000
= $160,000

[f]Debt ratio = 0.60
Debt ratio = Total liabilities/Total assets
0.60 = Total liabilities/$1,500,000
$900,000 = Total liabilities
Total liabilities = Current liabilities + Long-term debt
$900,000 = $300,000 + Long-term debt
$600,000 = Long-term debt

Chapter 4

ST4–1 **a.** Depreciation schedule:

Year	Cost[a] (1)	Percentages (from Table 4.2) (2)	Depreciation [(1)×(2)] (3)
1	$150,000	20%	$ 30,000
2	150,000	32	48,000
3	150,000	19	28,500
4	150,000	12	18,000
5	150,000	12	18,000
6	150,000	5	7,500
	Totals	100%	$150,000

[a]$140,000 asset cost + $10,000 installation cost.

b. Operating cash flow:

Year	EBIT (1)	NOPAT [(1) × (1 − 0.21)] (2)	Depreciation (3)	Operating cash flows [(2) + (3)] (4)
1	$160,000	$126,400	$30,000	$156,400
2	160,000	126,400	48,000	174,400
3	160,000	126,400	28,500	154,900
4	160,000	126,400	18,000	144,400
5	160,000	126,400	18,000	144,400
6	160,000	126,400	7,500	133,900

c. Change in net fixed assets in year 6 = $0 − $7,500 = −$7,500

NFAI in year 6 = −$7,500 + $7,500 = $0

Change in current assets in year 6 = $110,000 − $90,000 = $20,000

Change in (Accounts payable + Accruals) in year 6 = ($45,000 + $7,000) − ($40,000 + $8,000) = $52,000 − $48,000 = $4,000

NCAI in year 6 = $20,000 − $4,000 = $16,000

For year 6

FCF = OCF − NFAI − NCAI

= $133,900* − $0 − $16,000 = $\underline{\underline{117,900}}$

*From part **b,** column 4 value for year 6.

d. In part **b,** we can see that, in each of the 6 years, the operating cash flow is positive, which means that the firm is generating cash that it could use to invest in fixed assets or working capital, or it could distribute some of the cash flow to investors by paying interest or dividends. The free cash flow (FCF) calculated in part **c** for year 6 represents the cash flow available to investors—providers of debt and equity—after covering all operating needs and paying for net fixed asset investment (NFAI) and net current asset investment (NCAI) that occurred during the year.

ST4–2 a.

Carroll Company Cash Budget April–June						Accounts receivable at end of June	
	February	March	April	May	June	July	August
Forecast sales	**$500**	**$600**	**$400**	**$ 200**	**$ 200**		
Cash sales (0.30)	$150	$180	$120	$ 60	$ 60		
Collections of A/R							
Lagged 1 month [(0.7 × 0.7) = 0.49]		245	294	196	98	$ 98	
Lagged 2 months [(0.3 × 0.7) = 0.21]			105	126	84	42	$42
						$140 + $42 = $182	
Total cash receipts			$519	$ 382	$ 242		
Less: Total cash disbursements			600	500	200		
Net cash flow			−$ 81	−$ 118	$ 42		
Add: Beginning cash			115	34	− 84		
Ending cash			$ 34	−$ 84	−$ 42		
Less: Minimum cash balance			25	25	25		
Required total financing (notes payable)			—	$ 109	$ 67		
Excess cash balance (marketable securities)			$ 9	—	—		

b. Carroll Company would need a maximum of $109 in financing over the 3-month period.

c.

Account	Amount	Source of amount
Cash	$ 25	Minimum cash balance—June
Notes payable	67	Required total financing—June
Marketable securities	0	Excess cash balance—June
Accounts receivable	182	Calculation at right of cash budget statement

ST4–3 a.

Euro Designs, Inc., Pro Forma Income Statement for the Year Ended December 31, 2020	
Sales revenue (given)	$3,900,000
Less: Cost of goods sold (0.55)[a]	2,145,000
Gross profits	$1,755,000
Less: Operating expenses (0.12)[b]	468,000
Operating profits	$1,287,000
Less: Interest expense (given)	325,000
Net profits before taxes	$ 962,000
Less: Taxes (0.21 × $962,000)	202,020
Net profits after taxes	$ 759,980
Less: Cash dividends (given)	320,000
To retained earnings	$ 439,980

[a]From 2019: CGS/Sales = $1,925,000/$3,500,000 = 0.55.
[b]From 2019: Oper. Exp./Sales = $420,000/$3,500,000 = 0.12.

b. The percent-of-sales method may underestimate actual 2020 pro forma income by assuming that all costs are variable. If the firm has fixed costs, which by definition would not increase with increasing sales, the 2020 pro forma income would probably be underestimated.

Chapter 5

ST5–1 **a.** *Bank A:*

$FV_3 = \$10{,}000 \times (1 + 0.04)^3 = \$10{,}000 \times 1.125 = \underline{\$11{,}250}$

(Calculator solution = \$11,248.64)

Bank B:

$FV_3 = \$10{,}000 \times (1 + 0.04/2)^6 = \$10{,}000 \times 1.126 = \underline{\$11{,}260}$

(Calculator solution = \$11,261.62)

Bank C:

$FV_3 = \$10{,}000 \times (1 + 0.04/4)^{12} = \$10{,}000 \times 1.127 = \underline{\$11{,}270}$

(Calculator solution = \$11,268.25)

b. *Bank A:*

$\text{EAR} = (1 + 0.04/1)^1 - 1 = (1 + 0.04)^1 - 1 = 1.04 - 1 = 0.04 = \underline{4}\%$

Bank B:

$\text{EAR} = (1 + 0.04/2)^2 - 1 = (1 + 0.02)^2 - 1$
$= 1.0404 - 1 = 0.0404 = \underline{4.04}\%$

Bank C:

$\text{EAR} = (1 + 0.04/4)^4 - 1 = (1 + 0.01)^4 - 1 = 1.0406 - 1$
$= 0.0406 = \underline{4.06}\%$

c. Ms. Martin should deal with Bank C: The quarterly compounding of interest at the given 4% annual nominal rate results in the highest future value as a result of the corresponding highest effective annual rate.

d. *Bank D:*

$FV_3 = \$10{,}000 \times e^{0.04 \times 3} = \$10{,}000 \times e^{0.12}$
$= \$10{,}000 \times 1.127497 = \underline{\$11{,}274.97}$

This alternative is better than Bank C; it results in a higher future value because of the use of continuous compounding, which with otherwise identical cash flows always results in the highest future value of any compounding period.

ST5–2 **a.** On the surface, annuity Y looks more attractive than annuity X because it provides \$1,000 more each year than does annuity X. Of course, X being an annuity due means that the \$9,000 would be received at the beginning of each year, unlike the \$10,000 at the end of each year, and this fact makes annuity X more appealing than it otherwise would be.

b. *Annuity X:*

$FV_6 = \$9{,}000 \times \{[(1 + 0.15)^6 - 1]/0.15\} \times (1 + 0.15)$
$= \$9{,}000 \times 8.754 \times 1.15 = \underline{\$90{,}603.90}$

(Calculator solution = \$90,601.19)

Annuity Y:

$FV_6 = \$10{,}000 \times \{[(1 + 0.15)^6 - 1]/0.15\}$

$= \$10{,}000 \times 8.754 = \underline{\$87{,}540.00}$

(Calculator solution = \$87,537.38)

c. Annuity X is more attractive because its future value at the end of year 6, FV_6, of \$90,603.90 is greater than annuity Y's end-of-year-6 future value, FV_6, of \$87,540.00. The subjective assessment in part **a** was incorrect. The benefit of receiving annuity X's cash inflows at the beginning of each year appears to have outweighed the fact that annuity Y's annual cash inflow, which occurs at the end of each year, is \$1,000 larger (\$10,000 vs. \$9,000) than annuity X's. Notice that in each year the cash flow provided by Y is 11.11% greater than the cash flow provided by X. That is, (10,000 − 9,000)/9,000 = 0.1111. Because Ramesh can earn 15% on his investments, he would rather have \$9,000 at the start of each year and earn 15% on that as opposed to getting 11.11% more at the end of each year. If the return that Ramesh could earn on investments was less than 11.11%, he would prefer annuity Y. If the return that Ramesh could earn on investments was equal to 11.11%, he would be indifferent to the two annuities. That's easy to see because if Ramesh received \$9,000 at the start of each year and invested that at 11.11%, by the end of each year the payment that he received would have grown to \$10,000, which would just duplicate the payment that he could receive from annuity Y.

ST5–3 *Alternative A:*

Cash flow stream:

$PV_5 = \$700/0.09 \times [1 - 1/(1 + 0.09)^5]$

$= \$700/0.09 \times 0.350 = \underline{\$2{,}723}$

(Calculator solution = \$2,722.76)

Single amount: \$2,825

Alternative B:

Cash flow stream:

Year (n)	Present value calculation	Present value
1	$\$1{,}100/(1 + 0.09) =$	\$1,009.17
2	$\$ 900/(1 + 0.09)^2 =$	\$ 757.51
3	$\$ 700/(1 + 0.09)^3 =$	\$ 540.53
4	$\$ 500/(1 + 0.09)^4 =$	\$ 354.21
5	$\$ 300/(1 + 0.09)^5 =$	\$ 194.98
	Present value	\$2,856.40

(Calculator solution = \$2,856.41)

Single amount: \$2,800

Conclusion: Alternative B in the form of a cash flow stream is preferred because its present value of \$2,856.40 is greater than the other three values.

ST5–4

$$CF = \$8{,}000/\{[(1 + 0.07)^{5} - 1]/0.07\}$$
$$CF = \$8{,}000/5.751$$
$$CF = \$1{,}391.06$$

(Calculator solution = $1,391.13)

Judi should deposit $1,391.06 at the end of each of the 5 years to meet her goal of accumulating $8,000 at the end of the fifth year.

Chapter 6

ST6–1 **a.** $B_0 = I/r_d \times [1 - 1/(1 + r_d)^{n}] + M \times 1/(1 + r_d)^{n}$

$I = 0.08 \times \$1{,}000 = \$80$

$M = \$1{,}000$

$n = 12$ yrs

1. $r_d = 7\%$

$$B_0 = \$80/0.07 \times [1 - 1/(1 + 0.07)^{12}] + \$1{,}000 \times 1/(1 + 0.07)^{12}$$
$$= (\$1{,}142.86 \times 0.556) + (\$1{,}000 \times 0.444)$$
$$= \$635.43 + \$444.00 = \underline{\$1{,}079.43}$$

(Calculator solution = $1,079.43)

2. $r_d = 8\%$

$$B_0 = \$80/0.08 \times [1 - 1/(1 + 0.08)^{12}] + \$1{,}000 \times 1/(1 + 0.08)^{12}$$
$$= (\$1{,}000 \times 0.603) + (\$1{,}000 \times 0.397)$$
$$= \$603.00 + \$397.00 = \underline{\$1{,}000.00}$$

(Calculator solution = $1,000.00)

3. $r_d = 10\%$

$$B_0 = \$80/0.10 \times [1 - 1/(1 + 0.10)^{12}] + \$1{,}000 \times 1/(1 + 0.10)^{12}$$
$$= (\$800 \times 0.681) + (\$1{,}000 \times 0.319)$$
$$= \$544.80 + \$319.00 = \underline{\$863.80}$$

(Calculator solution = $863.73)

b. 1. $r_d = 7\%$, $B_0 = \$1{,}079.43$; sells at a *premium*

2. $r_d = 8\%$, $B_0 = \$1{,}000.00$; sells at its *par value*

3. $r_d = 10\%$, $B_0 = \$863.80$; sells at a *discount*

c. $B_0 = (I/2)/r_d \times [1 - 1/(1 + r_d/2)^{2n}] + M \times 1/(1 + r_d/2)^{2n}$

$$= (\$80/2)/(0.10/2) \times [1 - 1/(1 + 0.10/2)^{24}]$$
$$+ \$1{,}000 \times 1/(1 + 0.10/2)^{24}$$
$$= \$800 \times 0.690 + \$1{,}000 \times 0.310$$
$$= \$552.00 + \$310.00 = \underline{\$862.00}$$

(Calculator solution = $862.01)

ST6–2 **a.** $B_0 = \$1{,}026.57$

$C = 0.065 \times \$1{,}000 = \$65$

$$\text{Current yield} = \frac{\text{annual interest}}{\text{current price}} = \frac{\$65}{\$1{,}026.57} = 6.33\%$$

b. We know the bond sells for a premium, which means its YTM must be lower than its 6.5% coupon rate. We could use a trial-and-error approach to determine the bond's YTM. For example, if we plug 6% in for r in Equation 6.5, the bond price is $1,054.14. That is a little above the bond's true market price, so we must raise the discount rate a bit. If you try 6.25%, you'll find that the bond price equals $1,026.57, the current market price, so 6.25% is the YTM. Of course you can also find 6.25% using a calculator or Excel.

c. The YTM of 6.25% is below both the bond's 6.5% coupon interest rate and its current yield of 6.33% calculated in part **a** because the bond's market value of $1,026.57 is above its $1,000 par value. Whenever a bond's market value is above its par value (it sells at a *premium*), its YTM and current yield will be below its coupon interest rate; when a bond sells at *par,* the YTM and current yield will equal its coupon interest rate; and when the bond sells for less than par (at a *discount*), its YTM and current yield will be greater than its coupon interest rate. Observe also that the current yield measures the bond's coupon payment relative to its current price. When the bond sells at a premium, its YTM will be below its current yield because the YTM also takes into account that the bondholder will receive just $1,000 back at maturity, which represents a loss relative to the bond's current market price. In other words, the YTM is measuring both the value of the coupon payment that the investor receives (just like the current yield does) and the "loss" that the bondholder endures when the bond matures.

Chapter 7

ST7–1 $D_0 = \$1.80$

$r_s = 12\%$

a. *Zero growth:*

$D_0 = D_1 = \$1.80$

$$P_0 = \frac{D_1}{r} = \frac{\$1.80}{0.12} = \underline{\underline{\$15}}$$

b. *Constant growth,* $g = 5\%$:

$D_1 = D_0 \times (1 + g) = \$1.80 \times (1 + 0.05) = \$1.89$

$$P_0 = \frac{D_1}{r_s - g} = \frac{\$1.89}{0.12 - 0.05} = \frac{\$1.89}{0.07} = \underline{\underline{\$27}}$$

c. *Variable growth*, $N = 3$, $g_1 = 5\%$ for years 1 to 3 and $g_2 = 4\%$ for years 4 to ∞:

$$D_1 = D_0 \times (1 + g_1)^1 = \$1.80 \times (1 + 0.05)^1 = \$1.89/\text{share}$$
$$D_2 = D_0 \times (1 + g_1)^2 = \$1.80 \times (1 + 0.05)^2 = \$1.98/\text{share}$$
$$D_3 = D_0 \times (1 + g_1)^3 = \$1.80 \times (1 + 0.05)^3 = \$2.08/\text{share}$$
$$D_4 = D_3 \times (1 + g_1) = \$2.08 \times (1 + 0.04) = \$2.16/\text{share}$$

$$P_0 = \sum_{t=1}^{N} \frac{D_0 \times (1 + g_1)^t}{(1 + r)^t} + \left(\frac{1}{(1 + r_s)^N} \times \frac{D_{N+1}}{r - g_2} \right)$$

First find the present value of the first 3 dividends.

$$\sum_{t=1}^{3} \frac{D_t}{(1 + r)^t} = \frac{1.89}{(1 + 0.12)^1} + \frac{1.98}{(1 + 0.12)^2} + \frac{2.08}{(1 + 0.12)^3}$$
$$= \$1.69 + \$1.58 + \$1.48 = \$4.75$$

Next find the present value of all dividends that arrive in year 4 and beyond.

$$\left[\frac{1}{(1 + r)^N} \times \frac{D_{N+1}}{r - g_2} \right] = \frac{1}{(1 + 0.12)^3} \times \frac{\$2.16}{0.12 - 0.04} = 0.712 \times \$27 = \$19.22$$

$$P_0 = \$4.75 + \$19.22 = \$23.97$$

ST7–2 **a.** **Step 1:** Present value in 2023 of free cash flows that arrives from 2024 to infinity:

$$FCF_{2024} = \$1{,}500{,}000 \times (1 + 0.04)$$
$$= \$1{,}560{,}000$$
$$\text{Present value in 2023 of } FCF_{2024 \to \infty} = \frac{\$1{,}560{,}000}{0.10 - 0.04} = \frac{\$1{,}560{,}000}{0.06}$$
$$= \underline{\underline{\$26{,}000{,}000}}$$

Step 2: Add the value found in Step 1 to the 2023 FCF.

Total $FCF_{2023} = \$1{,}500{,}000 + \$26{,}000{,}000 = \underline{\underline{\$27{,}500{,}000}}$

Step 3: Find the sum of the present values of the FCFs for 2020 through 2023 to determine company value, *VC*.

Year (t)	Present value calculation	Present value in 2019 of FCF_t
2020	$\$ 800{,}000/(1 + 0.10) =$	$\$ 727{,}272.73$
2021	$\$ 1{,}200{,}000/(1 + 0.10)^2 =$	$\$ 991{,}735.54$
2022	$\$ 1{,}400{,}000/(1 + 0.10)^3 =$	$\$ 1{,}051{,}840.72$
2023	$\$27{,}500{,}000/(1 + 0.10)^4 =$	$\underline{\$18{,}782{,}870.02}$
	Value of entire company, $V_C =$	$\underline{\underline{\$21{,}553{,}719.01}}$

(Calculator solution = \$21,553,719.01)

b. Common Stock value, $V_S = V_C - V_D - V_P$

$V_C = \$21{,}553{,}719.01$ (calculated in part **a**)

$V_D = \$12{,}500{,}000$ (given)

$V_P = \$0$ (given)

$V_S = \$21{,}553{,}719.01 - \$12{,}500{,}000 - \$0 = \underline{\underline{\$9{,}053{,}719.01}}$

(Calculator solution = \$9,053,719.01)

c. Price per share $= \dfrac{\$9{,}053{,}719.01}{500{,}000} = \underline{\underline{\$18.11}}$/share

(Calculator solution = \$18.11/share)

Chapter 8

ST8–1 **a.** Expected return, $\bar{r} = \dfrac{\sum \text{Returns}}{3}$

$$\bar{r}_A = \frac{12\% + 14\% + 16\%}{3} = \frac{42\%}{3} = \underline{\underline{14\%}}$$

$$\bar{r}_B = \frac{16\% + 14\% + 12\%}{3} = \frac{42\%}{3} = \underline{\underline{14\%}}$$

$$\bar{r}_C = \frac{12\% + 14\% + 16\%}{3} = \frac{42\%}{3} = \underline{\underline{14\%}}$$

b. Standard deviation, $\sigma_r = \sqrt{\dfrac{\sum_{j=1}^{3}(r_i - \bar{r})^2}{3-1}}$

$$\sigma_{r_A} = \sqrt{\frac{(12\% - 14\%)^2 + (14\% - 14\%)^2 + (16\% - 14\%)^2}{3-1}}$$

$$= \sqrt{\frac{4\%^2 + 0\%^2 + 4\%^2}{2}} = \sqrt{\frac{8\%^2}{2}} = \underline{\underline{2\%}}$$

$$\sigma_{r_B} = \sqrt{\frac{(16\% - 14\%)^2 + (14\% - 14\%)^2 + (12\% - 14\%)^2}{3-1}}$$

$$= \sqrt{\frac{4\%^2 + 0\%^2 + 4\%^2}{2}} = \sqrt{\frac{8\%^2}{2}} = \underline{\underline{2\%}}$$

$$\sigma_{r_C} = \sqrt{\frac{(12\% - 14\%)^2 + (14\% - 14\%)^2 + (16\% - 14\%)^2}{3-1}}$$

$$= \sqrt{\frac{4\%^2 + 0\%^2 + 4\%^2}{2}} = \sqrt{\frac{8\%^2}{2}} = \underline{\underline{2\%}}$$

c.

	Annual expected returns	
Year	Portfolio AB	Portfolio AC
2019	$(0.50 \times 12\%) + (0.50 \times 16\%) = 14\%$	$(0.50 \times 12\%) + (0.50 \times 12\%) = 12\%$
2020	$(0.50 \times 14\%) + (0.50 \times 14\%) = 14\%$	$(0.50 \times 14\%) + (0.50 \times 14\%) = 14\%$
2021	$(0.50 \times 16\%) + (0.50 \times 12\%) = 14\%$	$(0.50 \times 16\%) + (0.50 \times 16\%) = 16\%$

Over the 3-year period:

$$\bar{r}_{AB} = \frac{14\% + 14\% + 14\%}{3} = \frac{42\%}{3} = \underline{\underline{14\%}}$$

$$\bar{r}_{AC} = \frac{12\% + 14\% + 16\%}{3} = \frac{42\%}{3} = \underline{\underline{14\%}}$$

d. AB is perfectly negatively correlated.

AC is perfectly positively correlated.

e. Standard deviation of the portfolios:

$$\sigma_{r_{AB}} = \sqrt{\frac{(14\% - 14\%)^2 + (14\% - 14\%)^2 + (14\% - 14\%)^2}{3 - 1}}$$

$$= \sqrt{\frac{(0\%^2 + 0\%^2 + 0\%^2)}{2}} = \sqrt{\frac{0\%^2}{2}} = \underline{0}\%$$

$$\sigma_{r_{AC}} = \sqrt{\frac{(12\% - 14\%)^2 + (14\% - 14\%)^2 + (16\% - 14\%)^2}{3 - 1}}$$

$$= \sqrt{\frac{4\%^2 + 0\%^2 + 4\%^2}{2}} = \sqrt{\frac{8\%^2}{2}} = \underline{2}\%$$

f. Portfolio AB is preferred because it provides the same return (14%) as AC but with less risk [$(\sigma_{r_{AB}} = 0\%) < (\sigma_{r_{AC}} = 2\%)$]. Assets are perfectly negatively correlated eliminating all standard deviation (volatility).

ST8–2 **a.** When the market return increases by 10%, the investment's return would be expected to increase by 15% $(1.50 \times 10\%)$. When the market return decreases by 10%, the investment's return would be expected to decrease by 15% $[1.50 \times (-10\%)]$.

b. $r_j = R_F + [\beta_j \times (r_m - R_F)]$

$= 3\% + [1.50 \times (10\% - 3\%)] = 13.5\%$

c. No, if you believe that the investment will earn a return of 11%, you should reject it because based on its risk the required return is 13.5%.

d. $r_j = 3\% + [1.50 \times (7\% - 3\%)] = 9\%$

The investment would now be acceptable because its required return of 9% is now less than the 11% that you believe the investment will earn.

Chapter 9

ST9–1 **a.** Cost of debt, r_d (using approximation formula)

$$r_d = \frac{I + \dfrac{\$1{,}000 - N_d}{n}}{\dfrac{N_d + \$1{,}000}{2}}$$

$I = 0.10 \times \$1{,}000 = \$100$

$N_d = \$1{,}000 - \$30 \text{ discount} - \$20 \text{ flotation cost} = \$950$

$n = 10 \text{ years}$

$$r_d = \frac{\$100 + \dfrac{\$1{,}000 - \$950}{10}}{\dfrac{\$950 + \$1{,}000}{2}} = \frac{\$100 + \$5}{\$975} = 10.8\%$$

(Calculator solution = 10.84%)

after-tax cost = $r_d \times (1 - T)$

$T = 0.21$

after-tax cost = $10.8\% \times (1 - 0.21) = \underline{8.5}\%$

Cost of preferred stock, r_p

$$r_p = \frac{D_p}{N_p}$$

$D_p = 0.11 \times \$100 = \$11$

$N_p = \$100 - \$4$ flotation cost $= \$96$

$$r_p = \frac{\$11}{\$96} = \underline{11.5}\%$$

Cost of retained earnings, r_r

$$r_r = r_s = \frac{D_1}{P_0} + g$$

$$= \frac{\$6}{\$80} + 6.0\% = 7.5\% + 6.0\% = \underline{13.5}\%$$

Cost of new common stock, r_n

$$r_n = \frac{D_1}{N_n} + g$$

$D_1 = \$6$

$N_n = \$80 - \$4$ underpricing $- \$4$ flotation cost $= \$72$

$g = 6.0\%$

$$r_n = \frac{\$6}{\$72} + 6.0\% = 8.3\% + 6.0\% = \underline{14.3}\%$$

b. Recognize that the firm has $225,000 in retained earnings to use. If they use that money first, and if equity constitutes 45% of total capital (the weight given in the table), then the firm can raise up to $500,000 ($225,000/0.45) without issuing new stock. Therefore, if the company plans to raise less than $500,000, the WACC for the money raised will be based on the cost of retained earnings (i.e., the required return on the firm's stock).

Source of capital	Weight (1)	Cost (2)	Weighted cost [(1) × (2)] (3)
Long-term debt	0.40	8.5%	3.4%
Preferred stock	0.15	11.5	1.7
Common stock equity	0.45	13.5	6.1
Totals	1.00		11.2%

Weighted average cost of capital = 11.2%

Now if the company wants to raise more than $500,000, it must issue new common stock, which has a higher cost than retained earnings.

Source of capital	Weight (1)	Cost (2)	Weighted cost [(1) × (2)] (3)
Long-term debt	0.40	8.5%	3.4%
Preferred stock	0.15	11.5	1.7
Common stock equity	0.45	14.3	6.4
Totals	1.00		11.5%

Weighted average cost of capital = 11.5%

c.

Investment opportunity	Internal rate of return (IRR)	Initial investment	Cumulative investment
D	16.5%	$200,000	$ 200,000
C	12.9	150,000	350,000
E	11.8	450,000	800,000
A	11.2	100,000	900,000
G	10.5	300,000	1,200,000
F	10.1	600,000	1,800,000
B	9.7	500,000	2,300,000

Projects D, C, and E should be accepted because their respective IRRs exceed the WACC. They will require $800,000 of total new financing.

Chapter 10

ST10–1 **a.** Payback period:

Project M: $\frac{\$40{,}000}{\$14{,}000} = 2.86$ years

Project N:

Year (t)	Cash inflows (CF_t)	Cumulative cash inflows
1	$23,000	$23,000
2	12,000	35,000
3	10,000	45,000
4	9,000	54,000

$$2 + \frac{\$10{,}000 - \$5{,}000}{\$9{,}000} = 2.5 \text{ years}$$

b. Net present value (NPV):

Project M: $\text{NPV} = \$14{,}000/0.09 \times [1 - 1/(1 + 0.09)^4] - \$40{,}000$

$= (\$155{,}555.56 \times 0.2916) - \$40{,}000$

$= \$45{,}360 - \$40{,}000 = \underline{\underline{\$5{,}360}}$

(Calculator solution = $5,356.08)

Project N:

Year (t)	Present value	Present values
1	$\$23{,}000/(1 + 0.09) =$	$ 21,100.92
2	$\$12{,}000/(1 + 0.09)^2 =$	$ 10,100.16
3	$\$10{,}000/(1 + 0.09)^3 =$	$ 7,721.83
4	$ 9,000/(1 + 0.09)^4 =	$ 6,375.83
	Present value of cash inflows	$ 45,298.74
	− Initial investment	$ 40,000.00
	Net present value (NPV)	$ 5,298.74

(Calculator solution = $5,298.74)

c. Internal rate of return (IRR):

Project M: $\text{NPV} = 0 = \$14{,}000/\text{IRR} \times [1 - 1/(1 + \text{IRR})^4] - \$40{,}000$

Because a 9% discount rate results in a positive NPV of $5,536.08, the IRR must be greater than 9%. At 10% the NPV is $4,378. At 12% the NPV is $2,523. Continuing to increase the discount rate, we find that at 15% the NPV is −$30, so the IRR must be just barely below 15%. Using Excel or a calculator reveals that the IRR is 14.96%.

Project M: $\text{NPV} = \$14{,}000/0.15 \times [1 - 1/(1 + 0.15)^4] - \$40{,}000$

$= (\$93{,}333.33 \times 0.42825) - \$40{,}000$

$= \$39{,}970.00 - \$40{,}000 = -\$30$

$\text{IRR} \approx \underline{\underline{15\%}}$

(Calculator solution = 14.96%)

Project N: $\text{NPV} = 0 = 23{,}000/(1 + \text{IRR}) + 12{,}000/(1 + \text{IRR})^2 + 10{,}000/(1 + \text{IRR})^3 + 9{,}000/(1 + \text{IRR})^4 - 40{,}000$

Because a 9% discount rate results in a positive NPV of $5,298.74, the IRR must be greater than 9%. Again we can use trial-and-error to try to find the IRR, or we can use a calculator or Excel. Doing the latter reveals that the

IRR is 16.19%. You can get close to a zero NPV if, using the trial-and-error approach, you try a discount rate of 16%.

$$\begin{aligned}\text{Project N: NPV} &= \$23{,}000/(1+0.16) + \$12{,}000/(1+0.16)^2 \\ &\quad + \$10{,}000/(1+0.16)^3 + \$9{,}000/(1+0.16)^4 - \$40{,}000 \\ &= \$19{,}827.59 + \$8{,}917.95 + \$6{,}406.58 + \$4{,}970.62 - \$40{,}000 \\ &= \$122.74\end{aligned}$$

Because the NPV is a small positive number when the discount rate is 16%, we know that the IRR is just a bit higher than 16%.

(Calculator solution = 16.19%)

d.

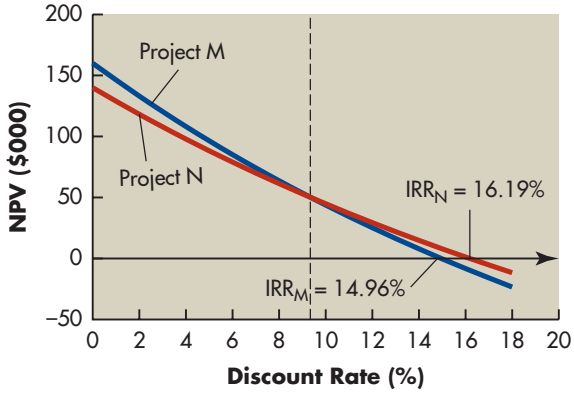
	Project	
	M	N
Payback period	2.86 years	2.5 years
NPV	$5,356.08	$5,298,74
IRR	14.96%	16.19%

Project M has a higher NPV, but project N has a faster payback and a higher IRR. Thus, the techniques do not agree on which project is best. However, in general when these measures conflict, it is best to go with the higher NPV, which in this case is Project M.

e. Net present value profiles:

	NPV	
Discount Rate	Project M	Project N
0%	$16,000	$14,000
2	13,308	11,821
4	10,818	9,793
6	8,511	7,903
8	6,370	6,138
10	4,378	4,487
12	2,523	2,940
14	792	1,487

From the NPV profile, you can see that Project M has a higher NPV when the discount rate is below 10%, but project N has a higher NPV at discount rates of 10% and above. More precise calculations would show that the two NPV profiles cross (i.e., the two projects have the same NPV) when the discount rate is about 9.34%. Project N's NPV is less sensitive to the discount rate (i.e., its NPV falls more slowly when the discount rate rises compared to the NPV of Project M) because it provides a great deal of cash in year 1, whereas Project M's cash flow is spread out evenly over time.



Chapter 11

ST11–1 **a.**

$$\text{Book value} = \text{Installed cost} - \text{Accumulated depreciation}$$
$$\text{Installed cost} = \$50{,}000$$
$$\text{Accumulated depreciation} = \$50{,}000 \times (0.20 + 0.32 + 0.19 + 0.12)$$
$$= \$50{,}000 \times 0.83 = \$41{,}500$$
$$\text{Book value} = \$50{,}000 - \$41{,}500 = \underline{\$8{,}500}$$

b. Taxes on sale of old equipment:

$$\text{Gain on sale} = \text{Sale price} - \text{Book value}$$
$$= \$55{,}000 - \$8{,}500 = \$46{,}500$$
$$\text{Taxes} = 0.40 \times \$46{,}500 = \underline{\$18{,}600}$$

c. Initial investment:

Installed cost of new equipment	
Cost of new equipment	$75,000
+ Installation costs	5,000
Total installed cost—new	$80,000
− After-tax proceeds from sale of old equipment	
Proceeds from sale of old equipment	55,000
− Taxes on sale of old equipment	18,600
Total after-tax proceeds—old	$36,400
+ Change in net working capital	15,000
Initial investment	$58,600

ST11–2 **a.** Initial investment:

Installed cost of new machine	
Cost of new machine	$140,000
+ Installation costs	10,000
Total installed cost—new (depreciable value)	$150,000
− After-tax proceeds from sale of old machine	
Proceeds from sale of old machine	42,000
− Taxes on sale of old machine[1]	9,120
Total after-tax proceeds—old	$ 32,880
+ Change in net working capital[2]	20,000
Initial investment	$137,120

[1]Book value of old machine = $40,000 − (0.20 + 0.32) × $40,000
= $40,000 − (0.52 × $40,000)
= $40,000 − $20,800 = $19,200
Gain on sale = $42,000 − $19,200 = $22,800
Taxes = 0.40 × $22,800 = $9,120

[2]Change in net working capital = $10,000 + $25,000 − $15,000
= $35,000 − $15,000 = $20,000

b. Incremental operating cash inflows:

Calculation of Depreciation Expense

Year	Cost (1)	Applicable MACRS depreciation percentages (from Table 4.2) (2)	Depreciation [(1) × (2)] (3)
With new machine			
1	$150,000	33%	$ 49,500
2	150,000	45	67,500
3	150,000	15	22,500
4	150,000	7	10,500
		Totals 100%	$150,000
With old machine			
1	$ 40,000	19% (year-3 depreciation)	$ 7,600
2	40,000	12 (year-4 depreciation)	4,800
3	40,000	12 (year-5 depreciation)	4,800
4	40,000	5 (year-6 depreciation)	2,000
			Total $19,200[a]

[a]The total of $19,200 represents the book value of the old machine at the end of the second year, which was calculated in part **a.**

Calculation of Operating Cash Inflows

	Year 1	2	3	4
With new machine				
Earnings before depr., int., and taxes[a]	$120,000	$130,000	$130,000	$ 0
− Depreciation[b]	49,500	67,500	22,500	10,500
Earnings before int. and taxes	$ 70,500	$ 62,500	$107,500	−$10,500
− Taxes (rate, T=40%)	28,200	25,000	43,000	−4,200
Net operating profit after taxes	$ 42,300	$ 37,500	$ 64,500	−$ 6,300
+ Depreciation[b]	49,500	67,500	22,500	10,500
Operating cash inflows	$ 91,800	$105,000	$ 87,000	$ 4,200
With old machine				
Earnings before depr., int., and taxes[a]	$ 70,000	$ 70,000	$ 70,000	$ 0
− Depreciation[c]	7,600	4,800	4,800	2,000
Earnings before int. and taxes	$ 62,400	$ 65,200	$ 65,200	−$ 2,000
− Taxes (rate, T=40%)	24,960	26,080	26,080	−800
Net operating profit after taxes	$ 37,440	$ 39,120	$ 39,120	−$ 1,200
+ Depreciation[c]	7,600	4,800	4,800	2,000
Operating cash inflows	$ 45,040	$ 43,920	$ 43,920	$ 800

[a]Given in the problem.

[b]From column 3 of the preceding table, top.

[c]From column 3 of the preceding table, bottom.

Calculation of Incremental Operating Cash Inflows

	Operating cash inflows		
Year	New machine[a] (1)	Old machine[a] (2)	Incremental (relevant) [(1) − (2)] (3)
1	$ 91,800	$45,040	$46,760
2	105,000	43,920	61,080
3	87,000	43,920	43,080
4	4,200	800	3,400

[a]From the final row for the respective machine in the preceding table.

c. Terminal cash flow (end of year 3):

After-tax proceeds from sale of new machine	
Proceeds from sale of new machine	$35,000
Taxes on sale of new machine[3]	9,800
Total after-tax proceeds—new	$25,200
− After-tax proceeds from sale of old machine	
Proceeds from sale of old machine	0
− Tax on sale of old machine[4]	−800
Total after-tax proceeds—old	$ 800
+ Change in net working capital	20,000
Terminal cash flow	$44,400

[3]Book value of new machine at end of year 3

$= \$150{,}000 - [(0.33 + 0.45 + 0.15) \times \$150{,}000] = \$150{,}000 - (0.93 \times \$150{,}000)$

$= \$150{,}000 - \$139{,}500 = \$10{,}500$

Tax on sale $= 0.40 \times (\$35{,}000 \text{ sale price} - \$10{,}500 \text{ book value})$

$= 0.40 \times \$24{,}500 = \$9{,}800$

[4]Book value of old machine at end of year 3

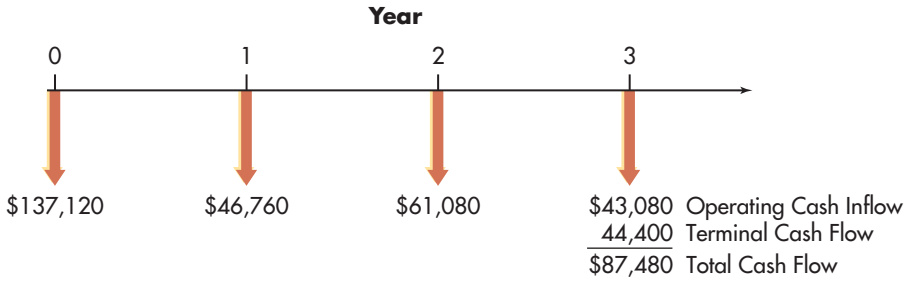
$= \$40{,}000 - [(0.20 + 0.32 + 0.19 + 0.12 + 0.12) \times \$40{,}000] = \$40{,}000 - (0.95 \times \$40{,}000)$

$= \$40{,}000 - \$38{,}000 = \$2{,}000$

Tax on sale $= 0.40 \times (\$0 \text{ sale price} - \$2{,}000 \text{ book value})$

$= 0.40 \times -\$2{,}000 = -\$800$ (i.e., $800 tax saving)

d.



Note: The year-4 incremental operating cash inflow of $3,400 is not directly included; it is instead reflected in the book values used to calculate the taxes on sale of the machines at the end of year 3 and is therefore part of the terminal cash flow.

ST11–3 **a.** Net present value (NPV) using a 10% cost of capital:

Project A: $NPV = \$7{,}000/0.10 \times [1 - 1/(1 + 0.10)^3] - \$15{,}000$

$= (\$70{,}000.00 \times 0.249) - \$15{,}000$

$= \$17{,}430.00 - \$15{,}000 = \underline{\$2{,}430}$

(Calculator solution = $2,407.96)

Project B:

$NPV = \$10{,}000/0.10 \times [1 - 1/(1 + 0.10)^3] - \$20{,}000$

$= (\$100{,}000.00 \times 0.249) - \$20{,}000$

$= \$24{,}900.00 - \$20{,}000 = \underline{\$4{,}900}$*

(Calculator solution = $4,868.52)

*Preferred project, because higher NPV.

b. Net present value (NPV) using the risk-adjusted discount rate (*RADR*) for project A of 9% and for project B of 16%.

Project A:

$NPV = \$7{,}000/0.09 \times [1 - 1/(1 + 0.09)^3] - \$15{,}000$

$= (\$77{,}777.78 \times 0.228) - \$15{,}000$

$= \$17{,}733.33 - \$15{,}000 = \underline{\$2{,}733.33}$*

(Calculator solution = $2,719.06)

Project B:

$NPV = \$10{,}000/0.16 \times [1 - 1/(1 + 0.16)^3] - \$20{,}000$

$= (\$62{,}500.00 \times 0.359) - \$20{,}000$

$= \$22{,}437.50 - \$20{,}000 = \underline{\$2{,}437.50}$

(Calculator solution = $2,458.90)

*Preferred project, because higher NPV.

c. When the differences in risk were ignored in part **a,** project B was preferred over project A, but when the higher risk of project B is incorporated into the analysis using risk-adjusted discount rates in part **b,** *project A is preferred over project B*. Clearly, project A should be implemented.

Chapter 12

ST12–1 **a.** $Q = \dfrac{FC}{P - VC}$

$= \dfrac{\$250{,}000}{\$7.50 - \$3.00} = \dfrac{\$250{,}000}{\$4.50} = \underline{55{,}556}$ units

b.

		+ 20%	
Sales (in units)	100,000		120,000
Sales revenue (units × $7.50/unit)	$750,000		$900,000
Less: Variable operating costs (units × $3.00/unit)	300,000		360,000
Less: Fixed operating costs	250,000		250,000
Earnings before interest and taxes (EBIT)	$200,000		$290,000
		+ 45%	
Less: Interest	80,000		80,000
Net profits before taxes	$120,000		$210,000
Less: Taxes ($T = 0.40$)	48,000		84,000
Net profits after taxes	$ 72,000		$126,000
Less: Preferred dividends (8,000 shares × $5.00/share)	40,000		40,000
Earnings available for common	$ 32,000		$ 86,000
Earnings per share (EPS)	$32,000/20,000 = $1.60/share		$86,000/20,000 = $4.30/share
		+ 169%	

c. $$\text{DOL} = \frac{\%\text{ change in EBIT}}{\%\text{ change in sales}} = \frac{+45\%}{+20\%} = \underline{\underline{2.25}}$$

d. $$\text{DFL} = \frac{\%\text{ change in EPS}}{\%\text{ change in EBIT}} = \frac{+169\%}{+45\%} = \underline{\underline{3.76}}$$

e. $$\text{DTL} = \text{DOL} \times \text{DFL}$$
$$= 2.25 \times 3.76 = \underline{\underline{8.46}}$$

Using the other DTL formula:

$$\text{DTL} = \frac{\%\text{ change in EPS}}{\%\text{ change in sales}}$$

$$8.46 = \frac{\%\text{ change in EPS}}{50\%}$$

$$\%\text{ change in EPS} = 8.46 \times 0.50 = 4.23 = \underline{\underline{+423}}\%$$

ST12–2

Data summary for alternative plans

Source of capital	Plan A (bond)	Plan B (stock)
Long-term debt	$60,000 at 12% annual interest	$50,000 at 12% annual interest
Annual interest =	0.12 × $60,000 = $7,200	0.12 × $50,000 = $6,000
Common stock	10,000 shares	11,000 shares

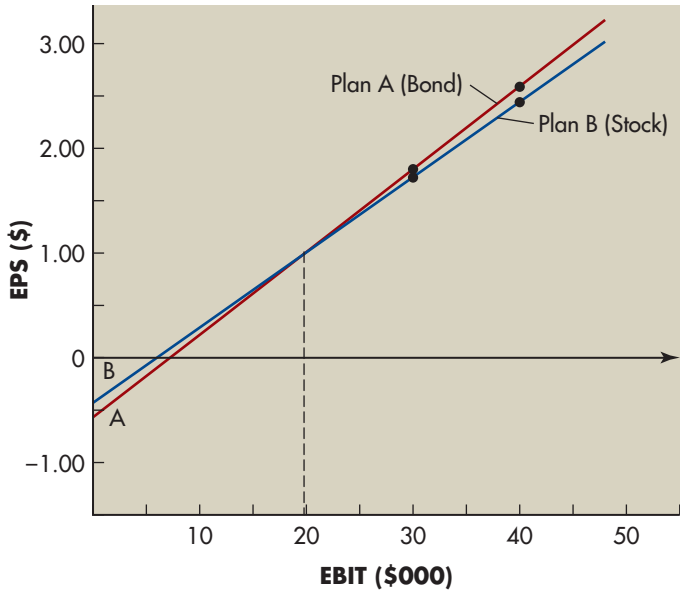
a.

	Plan A (bond)		Plan B (stock)	
EBIT[a]	$30,000	$40,000	$30,000	$40,000
Less: Interest	7,200	7,200	6,000	6,000
Net profits before taxes	$22,800	$32,800	$24,000	$34,000
Less: Taxes ($T = 0.21$)	4,788	6,888	5,040	7,140
Net profits after taxes	$18,012	$25,912	$18,960	$26,860
EPS (10,000 shares)	$1.80	$2.59		
(11,000 shares)			$1.72	$2.44

[a]Values were arbitrarily selected; other values could have been used.

	Coordinates	
	EBIT	
	$30,000	$40,000
Financing plan	Earnings per share (EPS)	
A (Bond)	$1.80	$2.59
B (Stock)	1.72	2.44

b.



c. The bond plan (Plan A) becomes superior to the stock plan (Plan B) at *around $20,000* of EBIT, as represented by the dashed vertical line in the figure in part **b.** (*Note:* The actual point is $19,200, which was determined algebraically by using the technique described in footnote 18.)

ST12–3 **a.**

Capital structure debt ratio	Expected EPS (1)	Required return, r_s (2)	Estimated share value [(1) ÷ (2)] (3)
0%	$3.12	0.13	$24.00
10	3.90	0.15	26.00
20	4.80	0.16	30.00
30	5.44	0.17	32.00
40	5.51	0.19	29.00
50	5.00	0.20	25.00
60	4.40	0.22	20.00

b. Using the table in part **a:**

1. Maximization of EPS: *40% debt ratio,* EPS = $5.51/share (see column 1).
2. Maximization of share value: *30% debt ratio,* share value = $32.00 (see column 3).

c. Recommend *30% debt ratio* because it results in the maximum share value and is therefore consistent with the firm's goal of owner wealth maximization.

Chapter 13

ST13–1 **a.** $$\text{Earnings per share (EPS)} = \frac{\$2{,}000{,}000 \text{ earnings available}}{500{,}000 \text{ shares of common outstanding}} = \underline{\underline{\$4.00}}/\text{share}$$

$$\text{Price/earnings (P/E) ratio} = \frac{\$60 \text{ market price}}{\$4.00 \text{ EPS}} = \underline{\underline{15}}$$

b. Proposed dividends = 500,000 shares × $2 per share = $1,000,000

$$\text{Shares that can be repurchased} = \frac{\$1{,}000{,}000}{\$62} = \underline{\underline{16{,}129}} \text{ shares}$$

c. *After proposed repurchase:*

Shares outstanding = 500,000 − 16,129 = 483,871

$$\text{EPS} = \frac{\$2{,}000{,}000}{483{,}871} = \underline{\underline{\$4.13}}/\text{share}$$

d. Market price = $4.13/share × 15 = $\underline{\underline{\$61.95}}$/share

e. The earnings per share (EPS) are higher after the repurchase because there are fewer shares of stock outstanding (483,871 shares versus 500,000 shares) to divide up the firm's $2,000,000 of available earnings.

f. In both cases, the stockholders would receive $2 per share: a $2 cash dividend in the dividend case or an approximately $2 increase in share price ($60.00 per share to $61.95 per share) in the repurchase case. [*Note:* The difference of $0.05 per share ($2.00 − $1.95) is due to rounding.]

Chapter 14

ST14–1

Basic data		
Time component	**Current**	**Proposed**
Average payment period (APP)	10 days	30 days
Average collection period (ACP)	30 days	30 days
Average age of inventory (AAI)	40 days	40 days

$$\text{Cash conversion cycle (CCC)} = \text{AAI} + \text{ACP} - \text{APP}$$
$$\text{CCC}_{\text{current}} = 40 \text{ days} + 30 \text{ days} - 10 \text{ days} = 60 \text{ days}$$
$$\text{CCC}_{\text{proposed}} = 40 \text{ days} + 30 \text{ days} - 30 \text{ days} = \underline{40} \text{ days}$$
$$\text{Reduction in CCC} \quad \underline{\underline{20}} \text{ days}$$

$$\text{Old accounts payable} = 10 \text{ days} \times (\$14{,}000{,}000 \div 360 \text{ days}) = \$388{,}889$$
$$\text{New accounts payable} = 30 \text{ days} \times (\$14{,}000{,}000 \div 360 \text{ days}) = \$1{,}166{,}667$$

Change in accounts payable = \$1,166,667 − \$388,889 = \$777,778

Because accounts payable has increased, the amount represents a decrease in net working capital.

Reduction in resource investment = \$777,778

Annual profit increase = 0.06 × \$777,778 = \$46,667

ST14–2 **a.** *Data:*

$S = 60{,}000$ gallons

$O = \$200$ per order

$C = \$1$ per gallon per year

Calculation:

$$EOQ = \sqrt{\frac{2 \times S \times O}{C}}$$
$$= \sqrt{\frac{2 \times 60{,}000 \times \$200}{\$1}}$$
$$= \sqrt{24{,}000{,}000}$$
$$= \underline{\underline{4{,}899}} \text{ gallons}$$

b. *Data:*

Lead time = 20 days

Daily usage = 60,000 gallons/365 days
= 164.38 gallons/day

Calculation:

Reorder point = lead time in days × daily usage
= 20 days × 164.38 gallons/day
= $\underline{\underline{3{,}287.6}}$ gallons

ST14–3 Tabular calculation of the effects of relaxing credit standards on Regency Rug Repair Company:

Additional profit contribution from sales		
[4,000 rugs × ($32 avg. sale price − $28 var. cost)]		$ 16,000
Cost of marginal investment in accounts receivable		
Average investment under proposed plan:		
$\frac{(\$28 \times 76{,}000 \text{ rugs})}{365/48} = \frac{\$2{,}128{,}000}{7.6}$	$280,000	
Average investment under present plan:		
$\frac{(\$28 \times 76{,}000 \text{ rugs})}{365/40} = \frac{\$2{,}016{,}000}{9.1}$	221,538	
Marginal investment in A/R	$ 58,462	
Cost of marginal investment in A/R (0.07 × $58,462)		−$ 4,092
Cost of marginal bad debts		
Bad debts under proposed plan		
(0.015 × $32 × 76,000 rugs)	$ 36,480	
Bad debts under present plan		
(0.010 × $32 × 72,000 rugs)	23,040	
Cost of marginal bad debts		−$ 13,440
Net loss from implementation of proposed plan		−$ 1,532

Recommendation: Because a net loss of $1,532 is expected to result from relaxing credit standards, *the proposed plan should not be implemented.*

Chapter 15

ST15–1 a.

Supplier	Approximate cost of giving up cash discount
X	1% × [365/(55 − 10)] = 1% × 365/45 = 1% × 8.1 = 8.1%
Y	2% × [365/(30 − 10)] = 2% × 365/20 = 2% × 18.25 = 36.5%
Z	2% × [365/(60 − 20)] = 2% × 365/40 = 2% × 9.125 = 18.25%

b.

Supplier	Recommendation
X	8.1% cost of giving up discount < 15% interest cost from bank; therefore, *give up discount.*
Y	36.5% cost of giving up discount > 15% interest cost from bank; therefore, *take discount and borrow from bank.*
Z	18.25% cost of giving up discount > 15% interest cost from bank; therefore, *take discount and borrow from bank.*

c. Stretching accounts payable for supplier Z would change the cost of giving up the cash discount to

$$2\% \times [365/(60 + 20 - 20)]) = 2\% \times 365/60 = 2\% \times 6.1 = \underline{12.2}\%$$

In this case, in light of the 15% interest cost from the bank, the recommended strategy in part **b** would be to *give up the discount* because the 12.2% cost of giving up the discount would be less than the 15% interest cost from the bank.

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Glossary

ABC inventory system
Inventory management technique that divides inventory into three groups—A, B, and C, in descending order of importance and level of monitoring—on the basis of the dollar investment in each. (Chapter 14)

ability to repay debt coverage ratios
Ratios that measure a firm's ability to make required debt payments and to pay other fixed charges such as lease payments. (Chapter 3)

accept–reject approach
The evaluation of capital expenditure proposals to determine whether they meet the firm's minimum acceptance criterion. (Chapter 10)

accounts payable management
Management by the firm of the time that elapses between its purchase of raw materials and its mailing payment to the supplier. (Chapter 15)

accrual basis
In preparation of financial statements, recognizes revenue at the time of sale and recognizes expenses when they are incurred. (Chapter 1)

accruals
Liabilities for services received for which payment has yet to be made. (Chapter 15)

ACH (automated clearinghouse) transfer
Preauthorized electronic withdrawal from the payer's account and deposit into the payee's account via a settlement among banks by the automated clearinghouse, or ACH. (Chapter 14)

activist investors
Investors who specialize in influencing management. (Chapter 1)

activity ratios
Measure the speed with which various accounts are converted into sales or cash, or inflows or outflows. (Chapter 3)

after-tax proceeds from the sale of the old asset
The difference between the old asset's sale proceeds and any applicable tax liability or refund related to its sale. (Chapter 11)

agency costs
The costs that shareholders bear due to managers' pursuit of their own interests. (Chapter 1)

aggressive funding strategy
A funding strategy under which the firm funds its seasonal requirements with short-term debt and its permanent requirements with long-term debt or equity. (Chapter 14)

aging schedule
A credit-monitoring technique that breaks down accounts receivable into groups on the basis of their time of origin; it indicates the percentages of the total accounts receivable balance that have been outstanding for specified periods of time. (Chapter 14)

American depositary receipts (ADRs)
Securities, backed by *American depositary shares (ADSs),* that permit U.S. investors to hold shares of non-U.S. companies and trade them in U.S. markets. (Chapter 7)

American depositary shares (ADSs)
Dollar-denominated receipts for the stocks of foreign companies that are held by a U.S. financial institution overseas. (Chapter 7)

angel financing
Private equity financing provided to a young firm by a wealthy individual investing his or her own money. (Chapter 2)

angel investors (angels)
Wealthy individual investors who make their own investment decisions and are willing to invest in promising startups in exchange for a portion of the firm's equity. (Chapter 2)

annual cleanup
The requirement that for a certain number of days during the year borrowers under a line of credit carry a zero loan balance (i.e., owe the bank nothing). (Chapter 15)

annual percentage rate (APR)
The nominal annual rate of interest, found by multiplying the periodic rate by the number of periods in one year, that must be disclosed to consumers on credit cards and loans as a result of "truth-in-lending laws." (Chapter 5)

annual percentage yield (APY)
The effective annual rate of interest that must be disclosed to consumers by banks on their savings products as a result of "truth-in-savings laws." (Chapter 5)

annualized net present value (ANPV) approach
An approach to evaluating unequal-lived projects that converts the net present value of unequal-lived, mutually exclusive projects into an equivalent annual amount (in NPV terms). (Chapter 11)

annuity
A stream of equal periodic cash flows over a specified time period. These cash flows can be inflows or outflows of funds. (Chapter 5)

annuity due
An annuity for which the cash flow occurs at the beginning of each period. (Chapter 5)

articles of partnership
The written contract used to formally establish a business partnership. (Chapter 1)

ask price
The lowest price a seller in the market is willing to accept for a security. (Chapter 2)

asymmetric information
The situation in which managers of a firm have more information about operations and future prospects than do investors. (Chapter 12)

authorized shares
Shares of common stock that a firm's corporate charter allows it to issue. (Chapter 7)

average age of inventory
Average number of days' sales in inventory. (Chapter 3)

average collection period
The average amount of time needed to collect accounts receivable. (Chapter 3)

average payment period
The average amount of time needed to pay accounts payable. (Chapter 3)

average tax rate
Calculated by dividing taxes paid by taxable income. (Chapter 1)

balance sheet
Summary statement of the firm's financial position at a given point in time. (Chapter 3)

bar chart
The simplest type of probability distribution; shows only a limited number of outcomes and associated probabilities for a given event. (Chapter 8)

behavioral finance
A growing body of research that focuses on investor behavior and its impact on investment decisions and stock prices. Advocates are commonly referred to as "behaviorists." (Chapter 7)

benchmarking
A type of *cross-sectional analysis* in which the firm's ratio values are compared with those of a key competitor or with a group of competitors that it wishes to emulate. (Chapter 3)

beta coefficient (β)
A relative measure of nondiversifiable risk. An *index* of the degree of movement of an asset's return in response to a change in the *market return*. (Chapter 8)

bid price
The highest price a buyer in the market is willing to pay for a security. (Chapter 2)

bid/ask spread
The difference between the bid and ask prices. (Chapter 2)

bird-in-the-hand argument
The belief, in support of dividend relevance theory, that investors see current dividends as less risky than future dividends or capital gains. (Chapter 13)

board of directors
Group elected by the firm's stockholders and typically responsible for approving strategic goals and plans, setting general policy, guiding corporate affairs, and approving major expenditures. (Chapter 1)

bond
Long-term debt instrument used by business and government to raise large sums of money, generally from a diverse group of lenders. (Chapter 2)

bond indenture
A legal document that specifies both the rights of the bondholders and the duties of the issuing corporation. (Chapter 6)

book value
The asset's value on the firm's balance sheet as determined by accounting principles. The difference between what an asset cost (including installation costs) and the accumulated depreciation on the asset. (Chapter 11)

book value per share
The amount per share of common stock that would be received if all of the firm's assets were *sold for their exact book (accounting) value* and the proceeds remaining after paying all liabilities (including preferred stock) were divided among the common stockholders. (Chapter 7)

breakeven analysis
Used to indicate the level of operations necessary to cover all costs and to evaluate the profitability associated with various levels of sales; also called *cost-volume-profit analysis*. (Chapter 12)

breakeven cash inflow
The minimum level of cash inflow necessary for a project to be acceptable, that is, NPV $>$ \$0. (Chapter 11)

broker market
The securities exchanges on which the two sides of a transaction, the buyer and seller, are brought together to trade securities. (Chapter 2)

business ethics
Standards of conduct or moral judgment that apply to persons engaged in commerce. (Chapter 1)

call feature
A feature included in nearly all corporate bond issues that gives the issuer the opportunity to repurchase bonds at a stated call price prior to maturity. (Chapter 6)

call premium
The amount by which a bond's call price exceeds its par value. (Chapter 6)

call price
The stated price at which a bond may be repurchased, by use of a call feature, prior to maturity. (Chapter 6)

callable feature (preferred stock)
A feature of *callable preferred stock* that allows the issuer to retire the shares within a certain period of time and at a specified price. (Chapter 7)

capital
The money that firms raise to finance their activities. (Chapter 1)

capital
A firm's long-term sources of financing, which include both debt and equity. (Chapter 9)

capital asset pricing model (CAPM)
The classic theory that links risk and return for all assets. (Chapter 8)

capital asset pricing model (CAPM)
Describes the relationship between the required return, r_s, and the nondiversifiable risk of the firm as measured by the beta coefficient, β. (Chapter 9)

capital budgeting
A technique that helps managers decide which projects create the most value for shareholders. (Chapter 1)

capital budgeting
The process of evaluating and selecting long-term investments that contribute to the firm's goal of maximizing owners' wealth. (Chapter 10)

capital budgeting process
Consists of five distinct but interrelated steps: *proposal generation, review and analysis, decision making, implementation,* and *follow-up*. (Chapter 10)

capital expenditure
An outlay of funds by the firm that the firm expects to produce benefits over a period of time *greater than* 1 year. (Chapter 10)

capital gain
Income earned by selling an asset for more than it cost. (Chapter 1)

capital market
A market that enables suppliers and demanders of long-term funds to make transactions. (Chapter 2)

capital rationing
The financial situation in which a firm has only a fixed number of dollars available for capital expenditures and numerous projects compete for these dollars. (Chapter 10)

capital structure
The mix of debt and equity financing that a firm employs. (Chapter 9)

capital structure
The mix of long-term debt and equity maintained by a firm. (Chapter 12)

carrying costs
The variable costs per unit of holding an item in inventory for a specific period of time. (Chapter 14)

cash basis
Recognizes revenues and expenses only with respect to actual inflows and outflows of cash. (Chapter 1)

cash budget (cash forecast)
A statement of the firm's planned inflows and outflows of cash that managers use to estimate its short-term cash requirements. (Chapter 4)

cash concentration
The process used by the firm to bring lockbox and other deposits together into one bank, often called the *concentration bank*. (Chapter 14)

cash conversion cycle (CCC)
The length of time between when a firm pays cash for raw materials and when it receives cash from collecting receivables. (Chapter 14)

cash flow from financing activities
Cash flows that result from debt and equity financing transactions; includes incurrence and repayment of debt, cash inflows from the sale of stock, and cash outflows to repurchase stock or pay cash dividends. (Chapter 4)

cash flow from investment activities
Cash flows associated with purchase and sale of both fixed assets and equity investments in other firms. (Chapter 4)

cash flow from operating activities
Cash flows directly related to sale and production of the firm's products and services. (Chapter 4)

catering theory
A theory that says firms cater to the preferences of investors, initiating or increasing dividend payments during periods in which high-dividend stocks are particularly appealing to investors. (Chapter 13)

change in net working capital
The difference between a change in current assets and a change in current liabilities. (Chapter 11)

clearing float
The time between deposit of a payment and when spendable funds become available to the firm. (Chapter 14)

clientele effect
The argument that different payout policies attract different types of investors but still do not change the value of the firm. (Chapter 13)

closely owned (stock)
The common stock of a firm is owned by an individual or a small group of investors (such as a family); they are usually privately owned companies. (Chapter 7)

coefficient of variation (CV)
A measure of relative dispersion that is useful in comparing the risks of assets with differing expected returns. (Chapter 12)

collateral
A specific asset against which bondholders have a claim in the event that a borrower defaults on a bond. (Chapter 6)

commercial banks
Institutions that provide savers with a secure place to invest their funds and that offer loans to individual and business borrowers. (Chapter 2)

commercial finance companies
Lending institutions that make *only* secured loans—both short-term and long-term—to businesses. (Chapter 15)

commercial paper
A form of financing consisting of short-term, unsecured promissory notes issued by firms with a high credit standing. (Chapter 15)

commitment fee
The fee that is normally charged on a *revolving credit agreement;* it often applies to the *average unused portion* of the borrower's credit line. (Chapter 15)

common stock
A unit of ownership, or equity, in a corporation. (Chapter 2)

common-size income statement
An income statement in which each item is expressed as a percentage of sales. (Chapter 3)

compensating balance
A required checking account balance equal to a certain percentage of the amount borrowed from a bank under a line-of-credit or revolving credit agreement. (Chapter 15)

compound interest
Interest that is earned on a given deposit and has become part of the principal at the end of a specified period. (Chapter 5)

conflicting rankings
Conflicts in the ranking given a project by NPV and IRR, resulting from *differences in the magnitude and timing of cash flows*. (Chapter 10)

conservative funding strategy
A funding strategy under which the firm funds both its seasonal and its permanent requirements with long-term debt or equity. (Chapter 14)

constant-growth dividend model
A widely cited dividend valuation approach that assumes dividends will grow at a constant rate, but a rate less than the required return. (Chapter 7)

constant-growth valuation (Gordon growth) model
A model that calculates the value of common stock as the present value of an infinite dividend stream that grows at a constant rate. (Chapter 9)

constant-payout-ratio dividend policy
A dividend policy based on the payment of a certain percentage of earnings to owners in each dividend period. (Chapter 13)

continuous compounding
Compounding of interest, literally, all the time. Equivalent to compounding interest an infinite number of times per year. (Chapter 5)

continuous probability distribution
A probability distribution showing all the possible outcomes and associated probabilities for a given event. (Chapter 8)

controlled disbursing
The strategic use of mailing points and bank accounts to lengthen mail float and clearing float, respectively. (Chapter 14)

controller
The firm's chief accountant, who is responsible for the firm's accounting activities, such as corporate accounting, tax management, financial accounting, and cost accounting. (Chapter 1)

conversion feature
A feature of convertible bonds that allows bondholders to change each bond into a stated number of shares of common stock. (Chapter 6)

conversion feature
An option that is included as part of a bond or a preferred stock issue and allows its holder to change the security into a stated number of shares of common stock. (Chapter 6)

corporate bond
A long-term debt instrument indicating that a corporation has borrowed a certain amount of money and promises to repay it in the future under clearly defined terms. (Chapter 6)

corporate governance
The rules, processes, and laws by which companies are operated, controlled, and regulated. (Chapter 1)

corporation
A legal business entity with rights and duties similar to those of individuals but with a legal identity distinct from its owners. (Chapter 1)

correlation
A statistical measure of the relationship between any two series of numbers. (Chapter 8)

correlation coefficient
A measure of the degree of correlation between two series. (Chapter 8)

cost of capital
Represents the firm's cost of financing and is the minimum rate of return that a project must earn to increase the firm's value. (Chapter 9)

cost of common stock equity
The costs associated with using common stock equity financing. The cost of common stock equity is equal to the required return on the firm's common stock in the absence of flotation costs. Thus, the cost of common stock equity is the same as the cost of retained earnings, but the cost of issuing new common equity is higher. (Chapter 9)

cost of giving up a cash discount
The implied rate of interest paid to delay payment of an account payable for an additional number of days. (Chapter 15)

cost of giving up an early payment discount
The implied rate of interest paid to delay payment of an account payable for an additional number of days. (Chapter 15)

cost of long-term debt
The financing cost associated with new funds raised through long-term borrowing. (Chapter 9)

cost of the new asset
The cash outflow necessary to acquire a new asset. (Chapter 11)

cost of a new issue of common stock, r_n
The cost of common stock, net of underpricing and associated flotation costs. (Chapter 9)

cost of preferred stock, r_p
The ratio of the preferred stock dividend to the firm's net proceeds from the sale of preferred stock. (Chapter 9)

cost of retained earnings, r_r
The cost of using retained earnings as a financing source. The cost of retained earnings is equal to the required return on a firm's common stock, r_s. (Chapter 9)

coupon rate
The percentage of a bond's par value that will be paid annually, typically in two equal semiannual payments, as interest. (Chapter 6)

credit monitoring
The ongoing review of a firm's accounts receivable to determine whether customers are paying according to the stated credit terms. (Chapter 14)

credit period
The number of days after the beginning of the credit period until full payment of the account is due. (Chapter 14)

credit scoring
A credit selection method commonly used with high-volume/small-dollar credit requests; relies on a credit score determined by applying statistically derived weights to a credit applicant's scores on key financial and credit characteristics. (Chapter 14)

credit standards
The firm's minimum requirements for extending credit to a customer. (Chapter 14)

credit terms
The terms of sale for customers who have been extended credit by the firm. (Chapter 14)

cross-sectional analysis
Comparison of different firms' financial ratios at the same point in time; involves comparing the firm's ratios with those of other firms in its industry or with industry averages. (Chapter 3)

cumulative (preferred stock)
Preferred stock for which all passed (unpaid) dividends in arrears, along with the current dividend, must be paid before dividends can be paid to common stockholders. (Chapter 7)

current assets
Short-term assets, expected to be converted into cash within 1 year. (Chapter 3)

current liabilities
Short-term liabilities, expected to be paid within 1 year. (Chapter 3)

current rate (translation) method
Technique used by U.S.–based companies to translate their foreign-currency-denominated assets and liabilities into U.S. dollars, for consolidation with the parent company's financial statements, using the year-end (current) exchange rate. (Chapter 3)

current ratio
A measure of liquidity calculated by dividing the firm's current assets by its current liabilities. (Chapter 3)

current yield
A measure of a bond's cash return for the year; calculated by dividing the bond's annual interest payment by its current price. (Chapter 6)

date of record (dividends)
Set by the firm's directors, the date on which all persons whose names are recorded as stockholders receive a declared dividend at a specified future time. (Chapter 13)

dealer market
The market in which the buyer and seller are not brought together directly but instead have their orders executed by securities dealers who "make markets" in the given security. (Chapter 2)

debt
Includes all borrowing incurred by a firm, including bonds, and is repaid according to a fixed schedule of payments. (Chapter 7)

debt ratio
Measures the proportion of total assets financed by the firm's creditors. (Chapter 3)

debt-to-equity ratio
Measures the relative proportion of total liabilities and common stock equity used to finance the firm's total assets. (Chapter 3)

deflation
A general trend of falling prices. (Chapter 6)

degree of financial leverage (DFL)
The numerical measure of the firm's financial leverage. (Chapter 12)

degree of indebtedness
Ratios that measure the amount of debt relative to other significant balance sheet amounts. (Chapter 3)

degree of operating leverage (DOL)
The numerical measure of the firm's operating leverage. (Chapter 12)

degree of total leverage (DTL)
The numerical measure of the firm's total leverage. (Chapter 12)

depository transfer check (DTC)
An unsigned check drawn on one of a firm's bank accounts and deposited in another. (Chapter 14)

depreciable life
Time period over which an asset is depreciated. (Chapter 4)

depreciation
A portion of the costs of fixed assets charged against annual revenues over time. (Chapter 4)

dilution of earnings
A reduction in each previous shareholder's fractional claim on the firm's earnings resulting from the sale of new common shares. (Chapter 7)

dilution of ownership
A reduction in each previous shareholder's fractional ownership resulting from the sale of new common shares. (Chapter 7)

director of internal audit
Leads a team charged with making sure that all business units follow internal policies and comply with government regulations. (Chapter 1)

director of investor relations
The conduit of information between the firm and the investment community. (Chapter 1)

director of risk management
Works with the treasurer to manage risks that the firm faces related to movements in exchange rates, commodity prices, and interest rates. (Chapter 1)

discount
The amount by which a bond sells below its par value. (Chapter 6)

discount loan
Loan on which interest is paid in advance by being deducted from the amount borrowed. (Chapter 15)

discounting cash flows
The process of finding present values; the inverse of compounding interest. (Chapter 5)

diversifiable risk
The portion of an asset's risk that is attributable to firm-specific, random causes; can be eliminated through diversification. Also called *unsystematic risk*. (Chapter 8)

dividend irrelevance theory
Miller and Modigliani's theory that, in a perfect world, the firm's value is determined solely by the earning power and risk of its assets (investments) and that the manner in which it splits its earnings stream between dividends and internally retained (and reinvested) funds does not affect this value. (Chapter 13)

dividend payout ratio
Indicates the percentage of each dollar earned that a firm distributes to the owners in the form of cash. It is calculated by dividing the firm's cash dividend per share by its earnings per share. (Chapter 13)

dividend per share (DPS)
The dollar amount of cash distributed during the period on behalf of each outstanding share of common stock. (Chapter 3)

dividend policy
The plan of action to be followed whenever the firm makes a dividend decision. (Chapter 13)

dividend reinvestment plans (DRIPs)
Plans that enable stockholders to use dividends received on the firm's stock to acquire additional shares—even fractional shares—at little or no transaction cost. (Chapter 13)

dividend relevance theory
The theory, advanced by Gordon and Lintner, that there is a direct relationship between a firm's dividend policy and its market value. (Chapter 13)

dividends
Periodic distributions of cash to the stockholders of a firm. (Chapter 1)

double taxation
A situation facing corporations in which income from the business is taxed twice—once at the business level and once at the individual level when cash is distributed to shareholders. (Chapter 1)

DuPont formula
Multiplies the firm's *net profit margin* by its *total asset turnover* to calculate the firm's *return on total assets (ROA)*. (Chapter 3)

DuPont system of analysis
System used to dissect the firm's financial statements and to assess its financial condition. (Chapter 3)

Dutch auction share repurchase
A repurchase method in which the firm specifies how many shares it wants to buy back and a range of prices at which it is willing to repurchase shares. Investors specify how many shares they will sell at each price in the range, and the firm determines the minimum price required to repurchase its target number of shares. All investors who tender receive the same price. (Chapter 13)

early payment discount
A percentage deduction from the purchase price; available to the credit customer that pays its account within a specified time. (Chapter 14)

early payment discount period
The number of days after the beginning of the credit period during which the discount is available. (Chapter 14)

earnings per share (EPS)
The amount earned during the period on behalf of each outstanding share of stock, calculated by dividing the period's total earnings available for the firm's stockholders by the number of shares of stock outstanding. (Chapter 1)

EBIT–EPS approach
An approach for selecting the capital structure that maximizes earnings per share (EPS) over the expected range of earnings before interest and taxes (EBIT). (Chapter 12)

economic order quantity (EOQ) model
Inventory management technique for determining an item's optimal order size, which is the size that minimizes the total of its order costs and carrying costs. (Chapter 14)

effective (true) annual rate (EAR)
The annual rate of interest actually paid or earned. (Chapter 5)

efficient market
A market that establishes correct prices for the securities that firms sell and allocates funds to their most productive uses. (Chapter 2)

efficient market hypothesis (EMH)
Theory describing the behavior of a market in which (1) securities are in equilibrium, (2) security prices fully reflect all available information and react swiftly to new information, and (3) stocks are fully and fairly priced, so investors need not waste time looking for mispriced securities. (Chapter 2)

efficient portfolio
A portfolio that maximizes return for a given level of risk. (Chapter 8)

ending cash
The sum of the firm's beginning cash and its net cash flow for the period. (Chapter 4)

enterprise resource planning (ERP)
A computerized system that electronically integrates external information about the firm's suppliers and customers with the firm's departmental data so that information on all available resources—human and material—can be instantly obtained in a fashion that eliminates production delays and controls costs. (Chapter 14)

equipment trust certificates
See Table 6.4. (Chapter 6)

equity
Funds provided by the firm's owners (investors or stockholders) that are repaid subject to the firm's performance. (Chapter 7)

Eurobond
A bond issued by an international borrower and sold to investors in countries with currencies other than the currency in which the bond is denominated. (Chapter 6)

Eurobond market
The market in which corporations and governments typically issue bonds denominated in dollars and sell them to investors located outside the United States. (Chapter 2)

Eurocurrency market
International equivalent of the domestic money market. (Chapter 2)

ex dividend
A period usually beginning 2 *business days* prior to the date of record, during which a stock is sold without the right to receive the current dividend. (Chapter 13)

excess cash balance
The (excess) amount available for investment by the firm if the period's ending cash is greater than the desired minimum cash balance; assumed to be invested in marketable securities. (Chapter 4)

excess earnings accumulation tax
The tax the IRS levies on retained earnings above $250,000 for most businesses when it determines that the firm has accumulated an excess of earnings to allow owners to delay paying ordinary income taxes on dividends received. (Chapter 13)

expectations theory
The theory that the yield curve reflects investor expectations about future interest rates; an expectation of rising interest rates results in an upward-sloping yield curve, and an expectation of declining rates results in a downward-sloping yield curve. (Chapter 6)

expected return
The return that an asset is expected to generate in the future, composed of a risk-free rate plus a risk premium. (Chapter 8)

external financing required ("plug" figure)
Under the judgmental approach for developing a pro forma balance sheet, the amount of external financing needed to bring the statement into balance. It can be either a positive or a negative value. (Chapter 4)

external forecast
A sales forecast based on the relationships observed between the firm's sales and certain key external economic indicators. (Chapter 4)

extra dividend
An additional dividend optionally paid by the firm when earnings are higher than normal in a given period. (Chapter 13)

factor
A financial institution that specializes in purchasing accounts receivable from businesses. (Chapter 15)

factoring accounts receivable
The outright sale of accounts receivable at a discount to a *factor* or other financial institution. (Chapter 15)

Federal Deposit Insurance Corporation (FDIC)
An agency created by the Glass-Steagall Act that provides insurance for deposits at banks and monitors banks to ensure their safety and soundness. (Chapter 2)

federal funds rate
The rate at which U.S. banks make overnight loans to each other. (Chapter 15)

finance
The science and art of how individuals and firms raise, allocate, and invest money. (Chapter 1)

Financial Accounting Standards Board (FASB)
The accounting profession's rule-setting body, which authorizes generally accepted accounting principles (GAAP). (Chapter 3)

Financial Accounting Standards Board (FASB) Standard No. 52
Mandates that U.S.–based companies translate their foreign-currency-denominated assets and liabilities into U.S. dollars, for consolidation with the parent company's financial statements. This process is done by using the *current rate (translation) method*. (Chapter 3)

financial breakeven point
The level of EBIT necessary to just cover all *fixed financial costs;* the level of EBIT for which EPS = $0. (Chapter 12)

financial institution
An intermediary that channels the savings of individuals, businesses, and governments into loans or investments. (Chapter 2)

financial leverage
The magnification of risk and return through the use of fixed-cost financing, such as debt and preferred stock. (Chapter 3)

financial leverage
The use of *fixed financial costs* to magnify the effects of changes in earnings before interest and taxes on the firm's earnings per share. (Chapter 12)

financial leverage multiplier (FLM)
The ratio of the firm's total assets to its common stock equity. (Chapter 3)

financial markets
Forums in which suppliers of funds and demanders of funds can transact business directly. (Chapter 2)

financial planning process
Planning that begins with long-term, or strategic, financial plans that in turn guide the formulation of short-term, or operating, plans and budgets. (Chapter 4)

financing decisions
Decisions that determine how companies raise the money they need to pursue investment opportunities. (Chapter 1)

five C's of credit
The five key dimensions—character, capacity, capital, collateral, and conditions—used by credit analysts to provide a framework for in-depth credit analysis. (Chapter 14)

fixed-payment coverage ratio
Measures the firm's ability to meet all fixed-payment obligations. (Chapter 3)

fixed-rate loan
A loan with a rate of interest that is determined at a set increment above the prime rate and remains unvarying until maturity. (Chapter 15)

flat yield curve
A yield curve that indicates that interest rates do not vary much at different maturities. (Chapter 6)

float
Funds that have been sent by the payer but are not yet usable funds to the payee. (Chapter 14)

floating inventory lien
A secured short-term loan against inventory under which the lender's claim is on the borrower's inventory in general. (Chapter 15)

floating-rate loan
A loan with a rate of interest initially set at an increment above the prime rate and allowed to "float," or vary, above prime *as the prime rate varies* until maturity. (Chapter 15)

flotation costs
The total costs of issuing and selling a security. (Chapter 9)

foreign bond
A bond that is issued by a foreign corporation or government and is denominated in the investor's home currency and sold in the investor's home market. (Chapters 2 and 6)

foreign direct investment (FDI)
The transfer of capital, managerial, and technical assets to a foreign country. (Chapter 11)

foreign exchange manager
The manager responsible for managing and monitoring the firm's exposure to loss from currency fluctuations. (Chapter 1)

free cash flow (FCF)
The amount of cash flow available to investors (creditors and owners) after the firm has met all operating needs and paid for investments in net fixed assets and net current assets. (Chapter 4)

free cash flow valuation model
A model that determines the value of an entire company as the present value of its expected *free cash flows* discounted at the firm's *weighted average cost of capital,* which is its expected average future cost of funds over the long run. (Chapter 7)

future value
The value on some future date of money that you invest today. (Chapter 5)

generally accepted accounting principles (GAAP)
The practice and procedure guidelines used to prepare and maintain financial records and reports; authorized by the Financial Accounting Standards Board (FASB). (Chapter 3)

Glass-Steagall Act
An act of Congress in 1933 that created the Federal Deposit Insurance Corporation (FDIC) and separated the activities of commercial and investment banks. (Chapter 2)

Gordon growth dividend model
A common name for the *constant-growth dividend model* that is widely cited in dividend valuation. (Chapter 7)

Gramm-Leach-Bliley Act
An act that allows business combinations (i.e., mergers) between commercial banks, investment banks, and insurance companies and thus permits these institutions to compete in markets that prior regulations prohibited them from entering. (Chapter 2)

gross profit margin
Measures the percentage of each sales dollar remaining after the firm has paid for its goods. (Chapter 3)

income statement
Provides a financial summary of the firm's operating results during a specified period. (Chapter 3)

incremental cash flows
The additional after-tax cash flows—outflows or inflows—that will occur only if the investment is made. (Chapter 11)

independent projects
Projects whose cash flows are unrelated to (or independent of) one another; accepting or rejecting one project does not change the desirability of other projects. (Chapter 10)

individual investors
Investors who own relatively small quantities of shares to meet personal investment goals. (Chapter 1)

inflation
A rising trend in the prices of most goods and services. (Chapter 6)

informational content
The information provided by the dividends of a firm with respect to future earnings, which causes owners to bid up or down the price of the firm's stock. (Chapter 13)

initial investment
The incremental cash flows for a project at time zero. (Chapter 11)

initial public offering (IPO)
The first public sale of a firm's stock. (Chapter 2)

insolvent
Describes a firm that is unable to pay its bills as they come due. (Chapter 14)

installation costs
Any added costs that are necessary to place the new asset into operation. (Chapter 11)

installed cost of the new asset
The cost of the new asset plus its installation costs; equals the asset's depreciable value. (Chapter 11)

institutional investors
Investment professionals such as banks, insurance companies, mutual funds, and pension funds that are paid to manage and hold large quantities of securities on behalf of others. (Chapter 1)

interest rate
Usually applied to debt instruments such as bank loans or bonds; the compensation paid by the borrower of funds to the lender; from the borrower's point of view, the cost of borrowing funds. (Chapter 6)

interest rate risk
The chance that interest rates will change and thereby change the required return and bond value. Rising rates, which result in decreasing bond values, are of greatest concern. (Chapter 6)

intermediate cash inflows
Cash inflows received prior to the termination of a project. (Chapter 10)

internal forecast
A sales forecast based on a buildup, or consensus, of sales forecasts through the firm's own sales channels. (Chapter 4)

internal rate of return (IRR)
The discount rate that equates the NPV of an investment opportunity with $0 (because the present value of cash inflows equals the initial investment); it is the rate of return that the firm will earn if it invests in the project and receives the given cash inflows. (Chapter 10)

internal rate of return approach
An approach to capital rationing that involves graphing project IRRs in descending order against the total dollar investment to determine the group of acceptable projects. (Chapter 11)

international equity market
A market that allows corporations to sell blocks of shares to investors in a number of different countries simultaneously. (Chapter 2)

inventory turnover ratio
Measures the activity, or liquidity, of a firm's inventory. (Chapter 3)

inverted yield curve
A downward-sloping yield curve indicates that short-term interest rates are generally higher than long-term interest rates. (Chapter 6)

investment bank
Financial intermediary that specializes in selling new security issues and advising firms with regard to major financial transactions. (Chapter 2)

investment banks
Institutions that assist companies in raising capital, advise firms on major transactions such as mergers or financial restructurings, and engage in trading and market-making activities. (Chapter 2)

investment decisions
Decisions that focus on how a company will spend its financial resources on long-term projects that ultimately determine whether the firm successfully creates value for its owners. (Chapter 1)

investment opportunities schedule (IOS)
The graph that plots project IRRs in descending order against the total dollar investment. (Chapter 11)

IPO market price
The final trading price on the first day in the secondary market. (Chapter 2)

IPO offer price
The price at which the issuing firm sells its securities. (Chapter 2)

IPO underpricing
The percentage change from the final IPO offer price to the IPO market price, which is the final trading price on the first day in the secondary market; this is also called the IPO initial return. (Chapter 2)

issued shares
Shares of common stock that have been put into circulation; the sum of *outstanding shares* and *treasury stock*. (Chapter 7)

judgmental approach
A simplified approach for preparing the pro forma balance sheet under which the firm estimates the values of certain balance sheet accounts and uses its external financing as a balancing, or "plug," figure. (Chapter 4)

just-in-time (JIT) system
Inventory management technique that minimizes inventory investment by having materials arrive at exactly the time they are needed for production. (Chapter 14)

letter of credit
A letter written by a company's bank to the company's foreign supplier, stating that the bank guarantees payment of an invoiced amount if all the underlying agreements are met. (Chapter 15)

letter to stockholders
Typically, the first element of the annual stockholders' report and the primary communication from management. (Chapter 3)

leverage
Refers to the effects that fixed costs have on the returns that shareholders earn; higher leverage generally results in higher but more volatile returns. (Chapter 12)

lien
A publicly disclosed legal claim on loan collateral. (Chapter 15)

limited liability
A legal provision that limits stockholders' liability for a corporation's debt to the amount they initially invested in the firm by purchasing stock. (Chapter 1)

line of credit
An agreement between a commercial bank and a business specifying the amount of unsecured short-term borrowing the bank will make available to the firm over a given period of time. (Chapter 15)

liquidation value per share
The *actual amount* per share of common stock that would be received if all the firm's assets were *sold for their market value,* liabilities (including preferred stock) were paid, and any remaining money were divided among the common stockholders. (Chapter 7)

liquidity
The ability to quickly buy or sell a security without having an impact on the security's price. (Chapter 2)

liquidity
A firm's ability to satisfy its short-term obligations *as they come due.* (Chapter 3)

liquidity preference
A general tendency for investors to prefer short-term (i.e., more liquid) securities. (Chapter 6)

liquidity preference theory
Theory suggesting that long-term rates are generally higher than short-term rates (hence, the yield curve is upward sloping) because investors perceive short-term investments as more liquid and less risky than long-term investments. Borrowers must offer higher rates on long-term bonds to entice investors away from their preferred short-term securities. (Chapter 6)

loan amortization
The determination of the equal periodic loan payments necessary to provide a lender with a specified interest return and to repay the loan principal over a specified period. (Chapter 5)

loan amortization schedule
A schedule of equal payments to repay a loan. It shows the allocation of each loan payment to interest and principal. (Chapter 5)

lockbox system
A collection procedure in which customers mail payments to a post office box that is emptied regularly by the firm's bank, which processes the payments and deposits them in the firm's account. This system speeds up collection time by reducing processing time as well as mail and clearing time. (Chapter 14)

London Interbank Offered Rate (LIBOR)
The rate at which international banks make short-term loans to each other. There are many different LIBOR rates corresponding to different currencies and maturities. (Chapter 15)

long-term debt
Debt for which payment is not due in the current year. (Chapter 3)

long-term (strategic) financial plans
Plans that lay out a company's financial actions and the anticipated impact of those actions over periods ranging from 2 to 10 years. (Chapter 4)

low-regular-and-extra dividend policy
A dividend policy based on paying a low regular dividend, supplemented by an additional ("extra") dividend when earnings are higher than normal in a given period. (Chapter 13)

MACRS recovery period
The appropriate depreciable life of an asset as determined by MACRS under pre-2018 tax law. (Chapter 4)

mail float
The time delay between when payment is placed in the mail and when it is received. (Chapter 14)

managerial finance
Concerns the duties of the financial manager in a business. (Chapter 1)

manufacturing resource planning II (MRP II)
An extension of MRP that uses a sophisticated computerized system to integrate data from numerous areas such as finance, accounting, marketing, engineering, and manufacturing and generate production plans as well as numerous financial and management reports. (Chapter 14)

marginal cost–benefit analysis
Economic principle that states that financial decisions should be made and actions taken only when the marginal benefits exceed the marginal costs. (Chapter 1)

marginal tax rate
The tax rate that applies to the next dollar of income earned. (Chapter 1)

market capitalization
The total market value of a publicly traded firm's outstanding stock. Calculated as the market price times the number of shares of stock outstanding. (Chapter 2)

market makers
Securities dealers who "make markets" by offering to buy or sell certain securities at stated prices. (Chapter 2)

market order
An order to either buy or sell a security at the prevailing market prices. (Chapter 2)

market price
The price of the firm's shares as determined by the interaction of buyers and sellers in the secondary market. (Chapter 2)

market ratios
Relate a firm's market value, as measured by its current share price, to certain accounting values. (Chapter 3)

market return
The return on the market portfolio of all traded securities. (Chapter 8)

market segmentation theory
Theory suggesting that the market for loans is segmented on the basis of maturity and that the supply of and demand for loans within each segment determine its prevailing interest rate; the slope of the yield curve is determined by the general relationship between the prevailing rates in each market segment. (Chapter 6)

market value weights
Weights that use market values to measure the proportion of each type of capital in the firm's financial structure. (Chapter 9)

market/book (M/B) ratio
Provides an assessment of how investors view the firm's performance. Firms expected to earn high returns relative to their risk typically sell at higher M/B multiples. (Chapter 3)

marketable securities
Short-term debt instruments, such as U.S. Treasury bills, commercial paper, and negotiable certificates of deposit issued by government, business, and financial institutions, respectively. (Chapter 2)

materials requirement planning (MRP) system
Inventory management technique that applies EOQ concepts and a computer to compare production needs to available inventory balances and determine when orders should be placed for various items on a product's bill of materials. (Chapter 14)

mixed stream
A stream of unequal periodic cash flows that reflect no particular pattern. (Chapter 5)

modified accelerated cost recovery system (MACRS)
System used to determine the depreciation of assets for tax purposes under pre-2018 tax law. (Chapter 4)

modified DuPont formula
Relates the firm's *return on total assets (ROA)* to its *return on equity (ROE)* using the *financial leverage multiplier (FLM)*. (Chapter 3)

money market
A market where investors trade highly liquid securities with maturities of 1 year or less. (Chapter 2)

mortgage-backed securities
Securities that represent claims on the cash flows generated by a pool of mortgages. (Chapter 2)

multiple IRRs
More than one IRR resulting from a capital budgeting project with a *nonconventional cash flow pattern;* the maximum number of IRRs for a project is equal to the number of sign changes in its cash flows. (Chapter 10)

municipal bond
A bond issued by a state or local government body. (Chapter 6)

mutually exclusive projects
Projects that compete with one another so that the acceptance of one eliminates from further consideration all other projects that serve a similar function. (Chapter 10)

Nasdaq market
An all-electronic trading platform used to execute securities trades. (Chapter 2)

negatively correlated
Describes two series that move in opposite directions. (Chapter 8)

net cash flow
The mathematical difference between the firm's cash receipts and its cash disbursements in each period. (Chapter 4)

net cash flows
The net (or sum) of incremental after-tax cash flows over a project's life. (Chapter 11)

net operating profits after taxes (NOPAT)
A firm's earnings before interest and after taxes, EBIT $\times$ $(1 - T)$. (Chapter 4)

net present value (NPV)
A capital budgeting technique that measures an investment's value by calculating the present value of its cash inflows and outflows. (Chapter 10)

net present value approach
An approach to capital rationing that is based on the use of present values to determine the group of projects that will maximize owners' wealth. (Chapter 11)

net present value profile
Graph that depicts a project's NPVs calculated at discount rates. (Chapter 10)

net proceeds
Funds actually received by the firm from the sale of a security. (Chapter 9)

net profit margin
Measures the percentage of each sales dollar remaining after all costs and expenses, *including* interest, taxes, and preferred stock dividends, have been deducted. (Chapter 3)

net working capital
The difference between the firm's current assets and its current liabilities. (Chapter 11)

no-par preferred stock
Preferred stock with no stated face value but with a stated annual dollar dividend. (Chapter 7)

nominal (stated) annual rate
Contractual annual rate of interest charged by a lender or promised by a borrower. (Chapter 5)

nominal rate of interest
The actual rate of interest charged by the supplier of funds and paid by the demander. (Chapter 6)

non-notification basis
The basis on which a borrower, having pledged an account receivable, continues to collect the account payments without notifying the account customer. (Chapter 15)

noncash charge
An expense that is deducted on the income statement but does not involve the actual outlay of cash during the period; includes depreciation, amortization, and depletion. (Chapter 4)

noncumulative (preferred stock)
Preferred stock for which passed (unpaid) dividends do not accumulate. (Chapter 7)

nondiversifiable risk
The relevant portion of an asset's risk attributable to market factors that affect all firms; cannot be eliminated through diversification. Also called *systematic risk*. (Chapter 8)

nonrecourse basis
The basis on which accounts receivable are sold to a factor with the understanding that the factor accepts all credit risks on the purchased accounts. (Chapter 15)

nonvoting common stock
Common stock that carries no voting rights; issued when the firm wishes to raise capital through the sale of common stock but does not want to give up its voting control. (Chapter 7)

normal probability distribution
A symmetrical probability distribution whose shape resembles a "bell-shaped" curve. (Chapter 8)

normal yield curve
An upward-sloping yield curve indicates that long-term interest rates are generally higher than short-term interest rates. (Chapter 6)

notes to the financial statements
Explanatory notes keyed to relevant accounts in the statements; they provide detailed information on the accounting policies, procedures, calculations, and transactions underlying entries in the financial statements. (Chapter 3)

notification basis
The basis on which an account customer whose account has been pledged (or factored) is notified to remit payment directly to the lender (or factor). (Chapter 15)

open-market share repurchase
A share repurchase program in which firms simply buy back some of their outstanding shares on the open market. (Chapter 13)

operating breakeven point
The level of sales necessary to cover all *operating costs;* the point at which EBIT = $0. (Chapter 12)

operating cash flow (OCF)
The cash flow a firm generates from its normal operations; calculated as net operating profits after taxes (NOPAT) plus depreciation. (Chapter 4)

operating cash flows
The net incremental after-tax cash flows occurring each period during the project's life. (Chapter 11)

operating cycle (OC)
The time from the beginning of the production process to collection of cash from the sale of the finished product. (Chapter 14)

operating expenditure
An outlay of funds by the firm resulting in benefits received *within* 1 year. (Chapter 10)

operating leverage
The use of *fixed operating costs* to magnify the effects of changes in sales on the firm's earnings before interest and taxes. (Chapter 12)

operating profit margin
Measures the percentage of each sales dollar remaining after all costs and expenses *other than* interest, taxes, and preferred stock dividends are deducted; the "pure profits" earned on each sales dollar. (Chapter 3)

operating-change restrictions
Contractual restrictions that a bank may impose on a firm's financial condition or operations as part of a line-of-credit agreement. (Chapter 15)

opportunity costs
Cash flows that could have been realized from the best alternative use of an owned asset. (Chapter 11)

optimal capital structure
The capital structure at which the weighted average cost of capital is minimized, thereby maximizing the firm's value. (Chapter 12)

order costs
The fixed clerical costs of placing and receiving an inventory order. (Chapter 14)

ordinary annuity
An annuity for which the cash flow occurs at the end of each period. (Chapter 5)

ordinary income
Income earned by a business through the sale of goods or services. (Chapter 1)

originating investment bank
The investment bank initially hired by the issuing firm, it brings other investment banks in as partners to form an underwriting syndicate. (Chapter 2)

outstanding shares
Issued shares of common stock held by investors, including both private and public investors. (Chapter 7)

over-the-counter (OTC) market
Market where smaller, unlisted securities are traded. (Chapter 2)

paid-in capital in excess of par
The amount of proceeds in excess of the par value received from the original sale of common stock. (Chapter 3)

par value, face value, principal
The amount of money the borrower must repay at maturity, and the value on which periodic interest payments are based. (Chapter 6)

par-value common stock
An arbitrary value that is established for legal purposes in the firm's corporate charter and that can be used to find the total number of shares outstanding by dividing it into the book value of common stock. (Chapter 7)

par-value preferred stock
Preferred stock with a stated face value that is used with the specified dividend percentage to determine the annual dollar dividend. (Chapter 7)

partnership
A business owned by two or more people and operated for profit. (Chapter 1)

payback period
The time it takes an investment to generate cash inflows sufficient to recoup the initial outlay required to make the investment. (Chapter 10)

payment date
Set by the firm's directors, the actual date on which the firm mails the dividend payment to the holders of record. (Chapter 13)

payout policy
Decisions that a firm makes regarding whether to distribute cash to shareholders, how much cash to distribute, and the means by which cash should be distributed. (Chapter 13)

pecking order theory
A hierarchy of financing that begins with retained earnings, which is followed by debt financing and finally external equity financing. (Chapter 12)

percent-of-sales method
A simple method for developing the pro forma income statement; it forecasts sales and then expresses the various income statement items as percentages of projected sales. (Chapter 4)

percentage advance
The percentage of the book value of the collateral that constitutes the principal of a secured loan. (Chapter 15)

perfectly negatively correlated
Describes two *negatively correlated* series that have a *correlation coefficient* of –1. (Chapter 8)

perfectly positively correlated
Describes two *positively correlated* series that have a *correlation coefficient* of +1. (Chapter 8)

permanent funding requirement
A constant investment in operating assets resulting from constant sales over time. (Chapter 14)

perpetuity
An annuity with an infinite life, providing continual annual cash flow. (Chapter 5)

pledge of accounts receivable
The use of a firm's accounts receivable as security, or collateral, to obtain a short-term loan. (Chapter 15)

political risk
Risk that arises from the possibility that a host government will take actions harmful to foreign investors or that political turmoil will endanger investments. (Chapter 8)

portfolio
A collection or group of assets. (Chapter 8)

positively correlated
Describes two series that move in the same direction. (Chapter 8)

preemptive right
Allows common stockholders to maintain their proportionate ownership in the corporation when new shares are issued, thus protecting them from dilution of ownership. (Chapter 7)

preferred stock
A special form of ownership having a fixed periodic dividend that must be paid prior to payment of any dividends to common stockholders. (Chapter 2)

premium
The amount by which a bond sells above its par value. (Chapter 6)

present value
The value in today's dollars of some future cash flow. (Chapter 5)

president or chief executive officer (CEO)
Corporate official responsible for managing the firm's day-to-day operations and carrying out the policies established by the board of directors. (Chapter 1)

price/earnings (P/E) ratio
Measures the amount that investors are willing to pay for each dollar of a firm's earnings; the higher the P/E ratio, the greater the investor confidence. (Chapter 3)

price/earnings multiple approach
A popular technique used to estimate the firm's share value; calculated by multiplying the firm's expected earnings per share (EPS) by the average price/earnings (P/E) ratio for the industry. (Chapter 7)

primary market
Financial market in which securities are initially issued; the only market in which the issuer is directly involved in the transaction. (Chapter 2)

prime rate of interest (prime rate)
An interest rate charged by leading U.S. banks on business loans to creditworthy borrowers. (Chapter 15)

principal
The amount of money on which interest is paid. (Chapter 5)

principal–agent problem
A problem that arises because the owners of a firm and its managers are not the same people and the agent does not act in the interest of the principal. (Chapter 1)

private equity
External equity financing that is raised via a private placement, typically by private early-stage firms with attractive growth prospects. (Chapter 2)

private placement
The sale of a new security directly to an investor or group of investors. (Chapter 2)

privately owned (stock)
The common stock of a firm is owned by private investors; this stock is not publicly traded. (Chapter 7)

pro forma statements
Projected, or forecast, income statements and balance sheets. (Chapter 4)

probability
The *chance* that a given outcome will occur. (Chapter 8)

probability distribution
A model that relates probabilities to the associated outcomes. (Chapter 8)

proceeds from the sale of old asset
The before-tax cash inflow net of any removal costs that results from the sale of the old asset and is normally subject to some type of tax treatment. (Chapter 11)

processing float
The time between receipt of a payment and its deposit into the firm's account. (Chapter 14)

prospectus
A portion of a security registration statement that describes the key aspects of the issue, the issuer, and its management and financial position. (Chapter 2)

proxy battle
The attempt by a nonmanagement group to gain control of the management of a firm by soliciting a sufficient number of proxy votes. (Chapter 7)

proxy statement
A statement transferring the votes of a stockholder to another party. (Chapter 7)

Public Company Accounting Oversight Board (PCAOB)
A not-for-profit corporation established by the Sarbanes-Oxley Act of 2002 to protect the interests of investors and further the public interest in the preparation of informative, fair, and independent audit reports. (Chapter 3)

public offering
The sale of either bonds or stocks to the general public. (Chapter 2)

publicly owned (stock)
The common stock of a firm is owned by public investors; this stock is publicly traded. (Chapter 7)

pure economic profit
A profit above and beyond the normal competitive rate of return in a line of business. (Chapter 10)

putable bonds
See Table 6.5. (Chapter 6)

quarterly compounding
Compounding of interest over four periods within the year. (Chapter 5)

quick (acid-test) ratio
A measure of liquidity calculated by dividing the firm's current assets less inventory by its current liabilities. (Chapter 3)

range
A measure of an asset's risk, which is found by subtracting the return associated with the pessimistic (worst) outcome from the return associated with the optimistic (best) outcome. (Chapter 8)

ranking approach
The ranking of capital expenditure projects on the basis of some predetermined measure, such as how much value the project creates for shareholders. (Chapter 10)

ratio analysis
Involves methods of calculating and interpreting financial ratios to analyze and monitor the firm's performance. (Chapter 3)

real options
Opportunities that are embedded in capital projects and that enable managers to alter their cash flows and risk in a way that affects project acceptability (NPV). Also called *strategic options*. (Chapter 11)

real rate of interest
The rate of return on an investment measured not in dollars but in the increase in purchasing power that the investment provides. The real rate of interest measures the rate of increase in purchasing power. (Chapter 6)

recaptured depreciation
The portion of an asset's sale price that is above its book value and below its initial purchase price. (Chapter 11)

red herring
A preliminary prospectus made available to prospective investors during the waiting period between the registration statement's filing with the SEC and its approval. (Chapter 2)

regular dividend policy
A dividend policy based on the payment of a fixed-dollar dividend in each period. (Chapter 13)

reorder point
The point at which to reorder inventory, expressed as days of lead time × daily usage. (Chapter 14)

required return
Usually applied to equity instruments such as common stock; the cost of funds obtained by selling an ownership interest. (Chapter 6)

required total financing
Amount of funds needed by the firm if the ending cash for the period is less than the desired minimum cash balance; typically represented by notes payable. (Chapter 4)

residual theory of dividends
A school of thought suggesting that the dividend paid by a firm should be viewed as a *residual,* that is, the amount left over after all acceptable investment opportunities have been undertaken. (Chapter 13)

restricted stock
Shares of stock paid out as part of a compensation package that do not fully transfer from the company to the employee until certain conditions are met. (Chapter 1)

restrictive covenants
Provisions in a bond indenture that place operating and financial constraints on the borrower. (Chapter 6)

retained earnings
The cumulative total of all earnings, net of dividends, that have been retained and reinvested in the firm since its inception. (Chapter 3)

return on equity (ROE)
Measures the return earned on the common stockholders' investment in the firm. (Chapter 3)

return on total assets (ROA)
Measures the overall effectiveness of management in generating profits with its available assets; also called the *return on investment (ROI)*. (Chapter 3)

reverse stock split
A method used to raise the market price of a firm's stock by exchanging a certain number of outstanding shares for one new share. (Chapter 13)

revolving credit agreement
A line of credit *guaranteed* to a borrower by a commercial bank regardless of the scarcity of money. (Chapter 15)

rights
Financial instruments that allow stockholders to purchase additional shares at a price below the market price, in direct proportion to their fractional ownership. (Chapter 7)

risk
The chance that actual outcomes may differ from those expected. (Chapter 1)

risk
A measure of the uncertainty surrounding the return that an investment will earn. (Chapter 8)

risk (in capital budgeting)
The uncertainty surrounding the cash flows that a project will generate or, more formally, the degree of variability of cash flows. (Chapter 11)

risk averse
Requiring compensation to bear risk. (Chapter 1)

risk averse
The attitude toward risk in which investors require an increased expected return as compensation for an increase in risk. (Chapter 8)

risk neutral
The attitude toward risk in which investors choose the investment with the higher expected return regardless of its risk. (Chapter 8)

risk seeking
The attitude toward risk in which investors prefer investments with greater risk, perhaps even if they have lower expected returns. (Chapter 8)

risk-adjusted discount rate (RADR)
The rate of return that must be earned on a given project to compensate the firm's owners adequately,

that is, to maintain or improve the firm's share price. (Chapter 11)

risk-free rate of return (R_F)
The required return on a *risk-free asset,* typically a 3-month *U.S. Treasury bill.* (Chapter 8)

safety stock
Extra inventory that is held to prevent stockouts of important items. (Chapter 14)

sales forecast
The prediction of the firm's sales over a given period, based on external and/or internal data; used as the key input to the short-term financial planning process. (Chapter 4)

Sarbanes-Oxley Act of 2002 (SOX)
An act aimed at eliminating corporate disclosure and conflict of interest problems. Contains provisions concerning corporate financial disclosures and the relationships among corporations, analysts, auditors, attorneys, directors, officers, and shareholders. (Chapter 1)

scenario analysis
An approach for assessing risk that uses several possible alternative outcomes (scenarios) to obtain a sense of the variability among returns. (Chapter 8)

seasonal funding requirement
An investment in operating assets that varies over time as a result of cyclical sales. (Chapter 14)

secondary market
Financial market in which preowned securities (those that are not new issues) are traded. (Chapter 2)

secured bond
A bond backed by some form of collateral. (Chapter 6)

secured short-term financing
Short-term financing (loan) that has specific assets pledged as collateral. (Chapter 15)

Securities Act of 1933
An act that regulates the sale of securities to the public via the primary market. (Chapter 2)

Securities and Exchange Commission (SEC)
The primary government agency responsible for enforcing federal securities laws. (Chapter 2)

Securities and Exchange Commission (SEC)
Federal regulatory body that governs the sale and listing of securities. (Chapter 3)

Securities Exchange Act of 1934
An act that regulates the trading of securities such as stocks and bonds in the secondary market. (Chapter 2)

securities exchanges
Organizations that provide the marketplace in which firms can raise funds through the sale of new securities and purchasers can resell securities. (Chapter 2)

securitization
The process of pooling mortgages or other types of loans and then selling claims or securities against that pool in the secondary market. (Chapter 2)

security agreement
The agreement between the borrower and the lender that specifies the collateral held against a secured loan. (Chapter 15)

security market line (SML)
The depiction of the *capital asset pricing model (CAPM)* as a graph that reflects the required return in the marketplace for each level of nondiversifiable risk (beta). (Chapter 8)

selling group
A large number of brokerage firms that join the originating investment bank(s); each accepts responsibility for selling a certain portion of a new security issue on a commission basis. (Chapter 2)

semiannual compounding
Compounding of interest over two periods within the year. (Chapter 5)

shadow banking system
A group of institutions that engage in lending activities, much like traditional banks, but that do not accept deposits and therefore are not subject to the same regulations as traditional banks. (Chapter 2)

short-term (operating) financial plans
Plans that specify short-term financial actions and the anticipated impact of those actions. (Chapter 4)

short-term, self-liquidating loan
An unsecured short-term loan in which the use to which the borrowed money is put provides the mechanism through which the loan is repaid. (Chapter 15)

signal
A financing action by management that is believed to reflect its view of the firm's stock value; generally, debt financing is viewed as a *positive signal* that management believes the stock is "undervalued," and a stock issue is viewed as a *negative signal* that management believes the stock is "overvalued." (Chapter 12)

simple interest
Interest that is earned only on an investment's original principal and not on interest that accumulates over time. (Chapter 5)

simulation
A statistics-based behavioral approach that applies predetermined probability distributions and random numbers to estimate risky outcomes. (Chapter 11)

single-payment note
A short-term, one-time loan made to a borrower who needs funds for a specific purpose for a short period. (Chapter 15)

sinking-fund requirement
A restrictive provision often included in a bond indenture, providing for the systematic retirement of bonds prior to their maturity. (Chapter 6)

small (ordinary) stock dividend
A stock dividend representing less than 20% to 25% of the common stock outstanding when the dividend is declared. (Chapter 13)

sole proprietorship
A business owned by one person and operated for his or her own profit. (Chapter 1)

spontaneous liabilities
Financing that arises from the normal course of business; the two major short-term sources of such liabilities are accounts payable and accruals. (Chapter 15)

stakeholders
Groups such as employees, customers, suppliers, creditors, and others who have a direct economic link to the firm but are not owners. (Chapter 1)

standard debt provisions
Provisions in a bond indenture specifying certain record-keeping and general business practices that the bond issuer must follow; normally, they do not place a burden on a financially sound business. (Chapter 6)

standard deviation (σ)
The most common statistical indicator of an asset's risk; it measures the dispersion around the average. (Chapter 8)

statement of cash flows
Provides a summary of the firm's operating, investment, and financing cash flows and reconciles them with changes in its cash and marketable securities during the period. (Chapter 3)

statement of retained earnings
Reconciles the net income earned during a given year, and any cash dividends paid, with the change in retained earnings between the start and the end of that year. An abbreviated form of the *statement of stockholders' equity*. (Chapter 3)

statement of stockholders' equity
Shows all equity account transactions that occurred during a given year. (Chapter 3)

stock
A security that represents an ownership interest in a corporation. (Chapter 1)

stock dividend
The payment, to existing owners, of a dividend in the form of stock. (Chapter 13)

stock options
Securities that allow managers to buy shares of stock at a fixed price. (Chapter 1)

stock purchase warrants
Instruments that give their holders the right to purchase a certain number of shares of the issuer's common stock at a specified price over a certain period of time. (Chapter 6)

stock purchase warrants
Instruments that give their holders the right to purchase a certain number of shares of the issuer's common stock at a specified price over a certain period of time. (Chapter 6)

stock split
A method commonly used to lower the market price of a firm's stock by increasing the number of shares belonging to each shareholder. (Chapter 13)

stockholders
The owners of a corporation, whose ownership, or *equity*, takes the form of common stock or, less frequently, preferred stock. (Chapter 1)

stockholders' report
Annual report that publicly owned corporations must provide to stockholders; it summarizes and documents the firm's financial activities during the past year. (Chapter 3)

stretching accounts payable
Paying bills as late as possible without damaging the firm's credit rating. (Chapter 15)

subordination
In a bond indenture, the stipulation that subsequent creditors agree to wait until all claims of the senior debt are satisfied. (Chapter 6)

subprime mortgages
Mortgage loans made to borrowers with lower incomes and poorer credit histories as compared to "prime" borrowers. (Chapter 2)

sunk costs
Cash outlays that have already been made (past outlays) and cannot be recovered, whether or not the firm follows through and makes an investment. (Chapter 11)

supervoting shares
Stock that carries with it multiple votes per share rather than the single vote per share typically given on regular shares of common stock. (Chapter 7)

target capital structure
The mix of debt and equity financing that a firm desires over the long term. The target capital structure should reflect the optimal mix of debt and equity for a particular firm. (Chapter 9)

target dividend-payout ratio
A dividend policy under which the firm attempts to pay out a certain percentage of earnings as a stated dollar dividend and adjusts that dividend toward a target payout as proven earnings increases occur. (Chapter 13)

Tax Cuts and Jobs Act of 2017
Cut personal tax rates, instituted a 21% flat corporate tax, and imposed some limits on interest deductibility, the use of operating losses to reduce taxes in other years, and dividends received by corporations.

tax on the sale of the old asset
Tax that depends on the relationship between the old asset's sale price and book value and on existing government tax rules. (Chapter 11)

tender offer share repurchase
A repurchase program in which a firm offers to repurchase a fixed number of shares, usually at a premium relative to the market value, and shareholders decide whether or not they want to sell back their shares at that price. (Chapter 13)

term structure of interest rates
The relationship between the maturity and rate of return for bonds with similar levels of risk. (Chapter 6)

terminal cash flows
The net after-tax cash flow occurring in the final year of the project. (Chapter 11)

time-series analysis
Evaluation of the firm's financial performance over time using financial ratio analysis. (Chapter 3)

timeline
A horizontal line on which time zero appears at the left and future periods appear from left to right; used to depict investment cash flows. (Chapter 5)

times interest earned ratio
Measures the firm's ability to make interest payments; also called the *interest coverage ratio*. (Chapter 3)

tombstone
The list of underwriting syndicate banks, presented in such a way to indicate a syndicate member's level of involvement, located at the bottom of the IPO prospectus cover page. (Chapter 2)

total asset turnover
Indicates the efficiency with which the firm uses its assets to generate sales. (Chapter 3)

total cash disbursements
All outlays of cash by the firm during a given financial period. (Chapter 4)

total cash receipts
All of a firm's inflows of cash during a given financial period. (Chapter 4)

total cost of inventory
The sum of order costs and carrying costs of inventory. (Chapter 14)

total leverage
The use of *fixed costs, both operating and financial,* to magnify the effects of changes in sales on the firm's earnings per share. (Chapter 12)

total proceeds
The total amount of proceeds for all shares sold in the IPO. Calculated as the IPO offer price times the number of IPO shares issued. (Chapter 2)

total rate of return
The total gain or loss experienced on an investment expressed as a percentage of the investment's value; calculated by dividing the asset's cash distributions during the period, plus change in value, by its beginning-of-period value. (Chapter 8)

total risk
The combination of a security's *nondiversifiable risk* and *diversifiable risk*. (Chapter 8)

treasurer
A key financial manager, who manages the firm's cash, oversees its pension plans, and manages key risks. (Chapter 1)

treasury stock
Issued shares of stock held by the firm; often they have been repurchased by the firm. (Chapter 7)

trust receipt inventory loan
A secured short-term loan against inventory under which the lender advances 80% to 100% of the cost of the borrower's expensive inventory items in exchange for the borrower's promise to repay the loan immediately after the sale of each item of collateral. (Chapter 15)

trustee
A paid individual, corporation, or commercial bank trust department that acts as the third party to a bond indenture and can take specified actions on behalf of the bondholders if the terms of the indenture are violated. (Chapter 6)

two-bin method
Unsophisticated inventory-monitoring technique that is typically applied to C group items and involves reordering inventory when one of two bins is empty. (Chapter 14)

U.S. Treasury bills (T-bills)
Short-term IOUs issued by the U.S. Treasury; c onsidered the *risk-free asset*. (Chapter 8)

uncorrelated
Describes two series that lack any interaction and therefore have a *correlation coefficient* of zero. (Chapter 8)

underwriting
The role of the investment bank in bearing the risk of reselling, at a profit, the securities purchased from an issuing corporation at an agreed-on price. (Chapter 2)

underwriting syndicate
A group of other banks formed by the originating investment bank to share the financial risk associated with underwriting new securities. (Chapter 2)

unlimited funds
The financial situation in which a firm is able to accept all independent projects that provide an acceptable return. (Chapter 10)

unlimited liability
The condition of a sole proprietorship (or general partnership), giving creditors the right to make claims against the owner's personal assets to recover debts owed by the business. (Chapter 1)

Unsecured bond
A bond backed only by the borrower's ability to repay the debt. (Chapter 6)

unsecured short-term financing
Short-term financing obtained without pledging specific assets as collateral. (Chapter 15)

valuation
The process that links risk and return to determine the worth of an asset. (Chapter 6)

variable-growth dividend model
A dividend valuation approach that allows for a change in the dividend growth rate. (Chapter 7)

venture capital
Equity financing provided by a firm that specializes in financing young, rapidly growing firms. Venture capital firms raise pools of money from outside investors which they then use to purchase equity stakes in small private companies. (Chapter 2)

venture capitalists (VCs)
Formal business entities that take in private equity capital from many individual investors, often institutional investors such as endowments and pension funds or individuals of high net worth, and make private equity investment decisions on their behalf. (Chapter 2)

warehouse receipt loan
A secured short-term loan against inventory under which the lender receives control of the pledged inventory collateral, which is stored by a designated warehousing company on the lender's behalf. (Chapter 15)

weighted average cost of capital (WACC)
A weighted average of a firm's cost of debt and equity financing, where the weights reflect the percentage of each type of financing used by the firm. (Chapter 9)

widely owned (stock)
The common stock of a firm is owned by many unrelated individual and institutional investors. (Chapter 7)

wire transfer
An electronic communication that, via bookkeeping entries, removes funds from the payer's bank and deposits them in the payee's bank. (Chapter 14)

working capital
The portion of the firm's assets used in day-to-day transactions. The primary elements of working capital circulate from one form or another in the ordinary course of business. (Chapter 14)

working capital decisions
Decisions that refer to the management of a firm's short-term resources. (Chapter 1)

working capital (or short-term financial) management
Management of current assets and current liabilities. (Chapter 14)

yield curve
A graphic depiction of the term structure of interest rates. (Chapter 6)

yield to maturity (YTM)
Compound annual rate of return earned on a debt security purchased on a given day and held to maturity. An estimate of the market's required return on a particular bond. (Chapter 6)

zero-balance account (ZBA)
A disbursement account that always has an end-of-day balance of zero because the firm deposits money to cover checks drawn on the account only as they are presented for payment each day. (Chapter 14)

zero-growth dividend model
An approach to dividend valuation that assumes a constant, nongrowing dividend stream. (Chapter 7)

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Index

Note: Boldface page numbers indicate pages where terms are defined.

C

D

Q

R

W

X

Y

Z

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FREQUENTLY USED SYMBOLS AND ABBREVIATIONS

AAI	Average Age of Inventory
ACH	Automated Clearinghouse
ACP	Average Collection Period
ANPV	Annualized Net Present Value
A/P	Accounts Payable
APP	Average Payment Period
APR	Annual Percentage Rate
APY	Annual Percentage Yield
A/R	Accounts Receivable
β_j	Beta Coefficient or Index of Nondiversifiable Risk for Asset *j*
β_p	Portfolio Beta
B_0	Value of a Bond
C	Carrying Cost per Unit per Period
CAPM	Capital Asset Pricing Model
CCC	Cash Conversion Cycle
CD	Stated Cash Discount in Percentage Terms
CF_0	Initial Investment
CF_t	Cash Flow in Period *t*
CV	Coefficient of Variation
D_p	Preferred Stock Dividend
D_t	• Per-Share Dividend Expected at the End of Year *t* • Depreciation Expense in Year *t*
DFL	Degree of Financial Leverage
DIP	Debtor in Possession
DOL	Degree of Operating Leverage
DPS	Dividends per Share
DTC	Depository Transfer Check
DTL	Degree of Total Leverage
e	Exponential Function = 2.7183
E	Exercise Price of the Warrant
EAR	Effective Annual Rate
EBIT	Earnings Before Interest and Taxes
EBITDA	Earnings Before Interest, Taxes, Depreciation, and Amortization
EOM	End of the Month
EOQ	Economic Order Quantity
EPS	Earnings per Share
ERP	Enterprise Resource Planning
EU	European Union
EVA	Economic Value Added
FC	Fixed Operating Cost
FCF	Free Cash Flow
FDI	Foreign Direct Investment
FLM	Financial Leverage Multiplier
FV	Future Value
GAAP	Generally accepted accounting principles
GATT	General Agreement on Tariffs and Trade
g	Growth Rate
I	Interest Payment
i	Expected Inflation Rate
IPO	Initial Public Offering
IRR	Internal Rate of Return
JIT	Just-In-Time System
LBO	Leveraged Buyout
m	Number of times per year interest is compounded
M	Bond's Par Value
M/B	Market/Book Ratio
MACRS	Modified Accelerated Cost Recovery System
MNC	Multinational Company
MP	Market Price per Share
MPR	Market Price Ratio of Exchange
MRP	Materials Requirement Planning
n	• Number of Outcomes Considered • Number of Periods—Typically, Years • Years to Maturity
N	• Number of Days Payment Can Be Delayed by Giving up the Cash Discount • Number of Shares of Common Stock Obtainable With One Warrant
N_d	Net Proceeds from the Sale of Debt (Bond)

FREQUENTLY USED SYMBOLS AND ABBREVIATIONS (CONTINUED)

N_n	Net Proceeds from the Sale of New Common Stock
N_p	Net Proceeds from the Sale of Preferred Stock
NAFTA	North American Free Trade Agreement
NCAI	Net Current Asset Investment
NFAI	Net Fixed Asset Investment
NOPAT	Net operating profits after taxes
NPV	Net Present Value
O	Order Cost Per Order
OC	Operating Cycle
OCF	Operating Cash Flow
P	Price (value) of asset
P_0	Value of Common Stock
PD	Preferred Stock Dividend
P/E	Price/Earnings Ratio
PI	Profitability Index
PMT	Amount of Payment
Pr	Probability
PV	Present Value
Q	• Order Quantity in Units • Sales Quantity in Units
r	• Actual, Expected ($\bar{r}$), or Required Rate of Return • Annual Rate of Interest • Cost of Capital
r^*	Real Rate of Interest
r_{wacc}	Weighted Average Cost of Capital
r_d	• Required Return on Bond • Before-Tax Cost of Debt
r_j	Required Return on Asset j
r_m	• Market Return • Return on the Market Portfolio of Assets
r_p	• Cost of Preferred Stock • Portfolio Return
r_r	Cost of Retained Earnings
r_s	• Required Return on Common Stock • Cost of Common Stock Equity
R_F	Risk-Free Rate of Interest
RADR	Risk-Adjusted Discount Rate
RE	Ratio of Exchange
ROA	Return on Total Assets
ROE	Return on Common Equity
S	• Usage in Units per Period • Sales in Dollars
SML	Security Market Line
t	Time
T	Firm's Marginal Tax Rate
TVW	Theoretical Value of a Warrant
V	• Value of an Asset or Firm • Venture Capital
V_C	Value of Entire Company
V_D	Value of All Debt
V_P	Value of Preferred Stock
V_S	Value of Common Stock
VC	Variable Operating Cost per Unit
w_j	• Proportion of the Portfolio's Total Dollar Value Represented by Asset j • Proportion of a Specific Source of Financing j in the Firm's Capital Structure
WACC	Weighted Average Cost of Capital
WTO	World Trade Organization
YTM	Yield to Maturity
ZBA	Zero Balance Account
σ	Standard Deviation
Σ	Summation Sign

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