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Investments, 12e

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INVESTMENTS

TWELFTH EDITION

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Table of Contents

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INVESTMENTS

TWELFTH EDITION

McGraw Hill

The McGraw-Hill Education Series in Finance, Insurance, and Real Estate

Financial Management

Block, Hirt, and Danielsen
Foundations of Financial Management
Seventeenth Edition

Brealey, Myers, and Allen
Principles of Corporate Finance
Thirteenth Edition

Brealey, Myers, and Allen
Principles of Corporate Finance,
Concise
Second Edition

Brealey, Myers, and Marcus
Fundamentals of Corporate Finance
Tenth Edition

Brooks
FinGame Online 5.0

Bruner, Eades, and Schill
Case Studies in Finance: Managing for
Corporate Value Creation
Eighth Edition

Cornett, Adair, and Nofsinger
Finance: Applications and Theory
Fifth Edition

Cornett, Adair, and Nofsinger
M: Finance
Fourth Edition

DeMello
Cases in Finance
Third Edition

Grinblatt (editor)
Stephen A. Ross, Mentor: Influence through
Generations

Grinblatt and Titman
Financial Markets and Corporate Strategy
Second Edition

Higgins
Analysis for Financial Management
Twelfth Edition

Ross, Westerfield, Jaffe, and Jordan
Corporate Finance
Twelfth Edition

Ross, Westerfield, Jaffe, and Jordan
Corporate Finance: Core Principles and
Applications
Sixth Edition

Ross, Westerfield, and Jordan
Essentials of Corporate Finance
Tenth Edition

Ross, Westerfield, and Jordan
Fundamentals of Corporate Finance
Twelfth Edition

Shefrin
Behavioral Corporate Finance: Decisions
That Create Value
Second Edition

Investments

Bodie, Kane, and Marcus
Essentials of Investments
Eleventh Edition

Bodie, Kane, and Marcus
Investments
Twelfth Edition

Hirt and Block
Fundamentals of Investment Management
Tenth Edition

Jordan, Miller, and Dolvin
Fundamentals of Investments: Valuation and
Management
Ninth Edition

Stewart, Piros, and Heisler
Running Money: Professional Portfolio
Management
First Edition

Sundaram and Das
Derivatives: Principles and Practice
Second Edition

Financial Institutions and Markets

Rose and Hudgins
Bank Management and Financial Services
Ninth Edition

Rose and Marquis
Financial Institutions and Markets
Eleventh Edition

Saunders and Cornett
Financial Institutions Management:
A Risk Management Approach
Saunders Edition

Saunders and Cornett
Financial Markets and Institutions
Seventh Edition

International Finance

Eun and Resnick
International Financial Management
Eighth Edition

Real Estate

Brueggeman and Fisher
Real Estate Finance and Investments
Sixteenth Edition

Ling and Archer
Real Estate Principles: A Value Approach
Sixth Edition

Financial Planning and Insurance

Allen, Melone, Rosenbloom,
and Mahoney
Retirement Plans: 401(k)s, IRAs, and Other
Deferred Compensation Approaches
Twelfth Edition

Altfest
Personal Financial Planning
Second Edition

Harrington and Niehaus
Risk Management and Insurance
Second Edition

Kapoor, Dlabay, Hughes, and Hart
Focus on Personal Finance: An Active
Approach to Help You Achieve Financial
Literacy
Sixth Edition

Kapoor, Dlabay, Hughes, and Hart
Personal Finance
Thirteenth Edition

Walker and Walker
Personal Finance: Building Your Future
Second Edition

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Brief Contents

Brief Contents

Contents

Contents

Contents

Contents

Preface

The past three decades witnessed rapid and profound change in the investments industry as well as a financial crisis of historic magnitude. The vast expansion of financial markets during this period was due in part to innovations in securitization and credit enhancement that gave birth to new trading strategies. These strategies were in turn made feasible by developments in communication and information technology, as well as by advances in the theory of investments.

Yet the financial crisis also was rooted in the cracks of these developments. Many of the innovations in security design facilitated high leverage and an exaggerated notion of the efficacy of risk transfer strategies. This engendered complacency about risk that was coupled with relaxation of regulation as well as reduced transparency, masking the precarious condition of many big players in the system. Of necessity, our text has evolved along with financial markets and their influence on world events.

Investments, Twelfth Edition, is intended primarily as a textbook for courses in investment analysis. Our guiding principle has been to present the material in a framework that is organized by a central core of consistent fundamental principles. We attempt to strip away unnecessary mathematical and technical detail, and we have concentrated on providing the intuition that may guide students and practitioners as they confront new ideas and challenges in their professional lives.

This text will introduce you to major issues currently of concern to all investors. It can give you the skills to assess watershed current issues and debates covered by both the popular media and more-specialized finance journals. Whether you plan to become an investment professional, or simply a sophisticated individual investor, you will find these skills essential, especially in today's rapidly evolving environment.

Our primary goal is to present material of practical value, but all three of us are active researchers in financial economics and find virtually all of the material in this book to be of great intellectual interest. The capital asset pricing model, the arbitrage pricing model, the efficient markets hypothesis, the option-pricing model, and the other centerpieces of modern financial research are as much intellectually engaging subjects as they are of immense practical importance for the sophisticated investor.

In our effort to link theory to practice, we also have attempted to make our approach consistent with that of the CFA Institute. In addition to fostering research in finance, the CFA Institute administers an education and certification program to candidates seeking designation as a Chartered Financial Analyst (CFA). The CFA curriculum represents the consensus of a committee of distinguished scholars and practitioners regarding the core of knowledge required by the investment professional.

Many features of this text make it consistent with and relevant to the CFA curriculum. Questions adapted from past CFA exams appear at the end of nearly every chapter, and references are listed at the end of the book. Chapter 3 includes excerpts from the "Code of Ethics and Standards of Professional Conduct" of the CFA Institute. Chapter 28, which discusses investors and the investment process, presents the CFA Institute's framework for systematically relating investor objectives and constraints to ultimate investment policy. End-of-chapter problems also include questions from test-prep leader Kaplan Schweser.

In the Twelfth Edition, we have continued our systematic presentation of Excel spreadsheets that will allow you to explore concepts more deeply. These spreadsheets, available in Connect and on the student resources site (**www.mhhe.com/Bodie12e**), provide a taste of the sophisticated analytic tools available to professional investors.

UNDERLYING PHILOSOPHY

While the financial environment is constantly evolving, many basic *principles* remain important. We believe that

fundamental principles should organize and motivate all study and that attention to these few central ideas can simplify the study of otherwise difficult material. These principles are crucial to understanding the securities traded in financial markets and in understanding new securities that will be introduced in the future, as well as their effects on global markets. For this reason, we have made this book thematic, meaning we never offer rules of thumb without reference to the central tenets of the modern approach to finance.

The common theme unifying this book is that *security markets are nearly efficient,* meaning most securities are usually priced appropriately given their risk and return attributes. Free lunches are rarely found in markets as competitive as the financial market. This simple observation is, nevertheless, remarkably powerful in its implications for the design of investment strategies; as a result, our discussions of strategy are always guided by the implications of the efficient markets hypothesis. While the degree of market efficiency is, and always will be, a matter of debate (in fact we devote a full chapter to the behavioral challenge to the efficient market hypothesis), we hope our discussions throughout the book convey a good dose of healthy skepticism concerning much conventional wisdom.

Distinctive Themes

Investments is organized around several important themes:

1. The central theme is the **near-informational-efficiency of well-developed security markets,** such as those in the United States, and the general awareness that competitive markets do not offer "free lunches" to participants.

   A second theme is the **risk–return trade-off.** This too is a no-free-lunch notion, holding that in competitive security markets, higher expected returns come only at a price: the need to bear greater investment risk. However, this notion leaves several questions unanswered. How should one measure the risk of an asset? What should be the quantitative trade-off between risk (properly measured) and expected return? The approach we present to these issues is known as *modern portfolio theory,* which is another organizing principle of this book. Modern portfolio theory focuses on the techniques and implications of *efficient diversification,* and we devote considerable attention to the effect of diversification on portfolio risk as well as the implications of efficient diversification for the proper measurement of risk and the risk–return relationship.

2. This text places great emphasis on **asset allocation.** We prefer this emphasis for two important reasons. First, it corresponds to the procedure that most individuals actually follow. Typically, you start with all of your money in a bank account, only then considering how much to invest in something riskier that might offer a higher expected return. The logical step at this point is to consider risky asset classes, such as stocks, bonds, or real estate. This is an asset allocation decision. Second, asset allocation is the primary determinant of the risk–return profile of the investment portfolio, and so it deserves primary attention in a study of investment policy.

3. This text offers a **broad and deep treatment of futures, options, and other derivative security markets.** These markets have become both crucial and integral to the financial universe. Your only choice is to become conversant in these markets—whether you are to be a finance professional or simply a sophisticated individual investor.

NEW IN THE TWELFTH EDITION

The following is a guide to changes in the Twelfth Edition. This is not an exhaustive road map, but instead is meant to provide an overview of substantial additions and changes to coverage from the last edition of the text.

Chapter 1 The Investment Environment
This chapter now addresses Fintech and cryptocurrency.

Chapter 2 Asset Classes and Financial Instruments
We have updated the material on the LIBOR scandal and proposed replacements for the LIBOR rate that may be implemented in the next few years.

Chapter 3 How Securities Are Traded
This chapter has been updated for developments in market microstructure, including the replacement of specialists by designated market makers.

Chapter 5 Risk, Return, and the Historical Record
This chapter has been extensively reorganized and substantially streamlined. The material on interest rates and the discussion of historical evidence on the risk–return relation have both been unified.

Chapter 7 Efficient Diversification
The discussion of risk sharing, risk pooling, and time diversification has been extensively rewritten with a greater emphasis on intuition.

Chapter 9 The Capital Asset Pricing Model
We have added more discussion of extensions to the CAPM, in particular, the implications of labor and other nonfinancial income for the risk–return trade-off.

Chapter 10 Arbitrage Pricing Theory and Multifactor Models of Risk and Return

The chapter now contains an explicit illustration of the estimation and implementation of a multifactor security market line. It also contains a new section on smart betas.

Chapter 11 The Efficient Market Hypothesis

We have added material on recently uncovered market anomalies, for example, related to volatility, accruals, growth, and profitability.

Chapter 12 Behavioral Finance and Technical Analysis

We have updated and expanded the material on the range of behavioral biases that seem to characterize investor decision making.

Chapter 13 Empirical Evidence on Security Returns

We have added a discussion of the debate concerning characteristics versus factor sensitivities as determinants of expected return.

Chapter 18 Equity Valuation Models

This chapter includes more examples and discussion of growth opportunities. It also now includes a discussion of Shiller's CAPE (cyclically-adjusted P/E ratio).

Chapter 24 Portfolio Performance Evaluation

We have revamped the derivation and motivation of the M-square and T-square measures, which attempt to restate the Sharpe and Treynor measures in terms of more easily interpreted units. We also extend the discussion of selection bias in interpreting published investment performance.

Chapter 26 Hedge Funds

This chapter has been updated to include more material on high-frequency hedge fund strategies.

Chapter 28 Investment Policy and the Framework of the CFA Institute

We have added material on online retirement planners and have expanded and better organized the material on the objectives and constraints facing a wide variety of investors.

ORGANIZATION AND CONTENT

The text is composed of seven sections that are fairly independent and may be studied in a variety of sequences. Because there is enough material in the book for a two-semester course, clearly a one-semester course will require the instructor to decide which parts to include.

Part One is introductory and contains important institutional material focusing on the financial environment. We discuss the major players in the financial markets, provide an overview of the types of securities traded in those markets, and explain how and where securities are traded. We also discuss in depth mutual funds and other investment companies, which have become an increasingly important means of investing for individual investors. Perhaps most important, we address how financial markets can influence all aspects of the global economy, as in 2008.

The material presented in Part One should make it possible for instructors to assign term projects early in the course. These projects might require the student to analyze in detail a particular group of securities. Many instructors like to involve their students in some sort of investment game, and the material in these chapters will facilitate this process.

Parts Two and Three contain the core of modern portfolio theory. Chapter 5 is a general discussion of risk and return, making the general point that historical returns on broad asset classes are consistent with a risk–return trade-off and examining the distribution of stock returns. We focus more closely in Chapter 6 on how to describe investors' risk preferences and how they bear on asset allocation. In the next two chapters, we turn to portfolio optimization (Chapter 7) and its implementation using index models (Chapter 8).

After our treatment of modern portfolio theory in Part Two, we investigate in Part Three the implications of that theory for the equilibrium structure of expected rates of return on risky assets. Chapter 9 treats the capital asset pricing model and Chapter 10 covers multifactor descriptions of risk and the arbitrage pricing theory. Chapter 11 covers the efficient market hypothesis, including its rationale as well as evidence that supports the hypothesis and challenges it. Chapter 12 is devoted to the behavioral critique of market rationality. Finally, we conclude Part Three with Chapter 13 on empirical evidence on security pricing. This chapter contains evidence concerning the risk–return relationship, as well as liquidity effects on asset pricing.

Part Four is the first of three parts on security valuation. This part treats fixed-income securities—bond pricing (Chapter 14), term structure relationships (Chapter 15), and interest-rate risk management (Chapter 16). **Parts Five and Six** deal with equity securities and derivative securities. For a course emphasizing security analysis and excluding portfolio theory, one may proceed directly from Part One to Part Four with no loss in continuity.

Finally, **Part Seven** considers several topics important for portfolio managers, including performance evaluation, international diversification, active management, and practical issues in the process of portfolio management. This part also contains a chapter on hedge funds.

Distinctive Features

This book contains several features designed to make it easy for students to understand, absorb, and apply the concepts and techniques presented.

CONCEPT CHECKS

A unique feature of this book! These self-test questions and problems found in the body of the text enable the students to determine whether they've understood the preceding material. Detailed solutions are provided at the end of each chapter.

> ✓ Concept Check **9.2**
>
> Data from the last nine decades for the broad U.S. equity market yield the following statistics: average excess return, 8.3%; standard deviation, 20.1%.
>
> a. To the extent that these averages approximated investor expectations for the period, what must have been the average coefficient of risk aversion?
>
> b. If the coefficient of risk aversion were actually 3.5, what risk premium would have been consistent with the market's historical standard deviation?

> **Example 18.2** The Constant-Growth DDM
>
> High Flyer Industries has just paid its annual dividend of $3 per share. The dividend is expected to grow at a constant rate of 8% indefinitely. The beta of High Flyer stock is 1.0, the risk-free rate is 6%, and the market risk premium is 8%. What is the intrinsic value of the stock? What would be your estimate of intrinsic value if you believed that the stock was riskier, with a beta of 1.25?
>
> Because a $3 dividend has just been paid and the growth rate of dividends is 8%, the forecast for the year-end dividend is $3 × 1.08 = $3.24. The market capitalization rate (using the CAPM) is 6% + 1.0 × 8% = 14%. Therefore , the value of the stock is
>
> $$V_0 = \frac{D_1}{k-g} = \frac{\$3.24}{.14 - .08} = \$54$$
>
> If the stock is perceived to be riskier, its value must be lower. At the higher beta, the market capitalization rate is 6% + 1.25 × 8% = 16%, and the stock is worth only
>
> $$\frac{\$3.24}{.16 - .08} = \$40.50$$

NUMBERED EXAMPLES

are integrated throughout chapters. Using the worked-out solutions to these examples as models, students can learn how to solve specific problems step-by-step as well as gain insight into general principles by seeing how they are applied to answer concrete questions.

WORDS FROM THE STREET BOXES

Short articles and financial coverage adapted from business periodicals, such as *The Wall Street Journal,* are included in boxes throughout the text. The articles are chosen for real-world relevance and clarity of presentation.

> **WORDS FROM THE STREET**
>
> ### What Level of Risk Is Right for You?
>
> No risk, no reward. Most people intuitively understand that they have to bear some risk to achieve an acceptable return on their investment portfolios.
>
> But how much risk is right for you? If your investments turn sour, you may put at jeopardy your ability to retire, to pay for your kid's college education, or to weather an unexpected need for cash. These worst-case scenarios focus our attention on how to manage our exposure to uncertainty.
>
> Assessing—and quantifying—risk aversion is, to put it mildly, difficult. It requires confronting at least these two big questions.
>
> First, how much investment risk can you afford to take? If you have a steady high-paying job, for example, you have greater ability to withstand investment losses. Conversely, if you are close to retirement, you have less ability to adjust your lifestyle in response to bad investment outcomes.
>
> Second, you need to think about your personality and decide how much risk you can tolerate. At what point will you be unable to sleep at night?
>
> To help clients quantify their risk aversion, many financial firms have designed quizzes to help people determine whether they are conservative, moderate, or aggressive investors. These quizzes try to get at clients' attitudes toward risk and their capacity to absorb investment losses.
>
> Here is a sample of the sort of questions that can shed light on an investor's risk tolerance.
>
> **MEASURING YOUR RISK TOLERANCE**
>
> Circle the letter that corresponds to your answer.
>
> 1. The stock market fell by more than 30% in 2008. If you had been holding a substantial stock investment in that year, which of the following would you have done?
>   a. Sold off the remainder of your investment before it had the chance to fall further.
>   b. Stayed the course with neither redemptions nor purchases.
>   c. Bought more stock, reasoning that the market is now cheaper and therefore offers better deals.
> 2. The value of one of the funds in your 401(k) plan (your primary source of retirement savings) increased 30% last year. What will you do?
>
> 4. At the end of the month, you find yourself:
>   a. Short of cash and impatiently waiting for your next paycheck.
>   b. Not overspending your salary, but not saving very much.
>   c. With a comfortable surplus of funds to put into your savings account.
> 5. You are 30 years old and enrolling in your company's retirement plan, and you need to allocate your contributions across 3 funds: a money market account, a bond fund, and a stock fund. Which of these allocations sounds best to you?
>   a. Invest everything in a safe money-market fund.
>   b. Split your money evenly between the bond fund and stock fund.
>   c. Put everything into the stock fund, reasoning that by the time you retire, the year-to-year fluctuations in stock, returns will have evened out.
> 6. You are a contestant on *Let's Make a Deal*, and have just won $1,000. But you can exchange the winnings for two random payoffs. One is a coin flip with a payoff of $2,500 if the coin comes up heads. The other is a flip of two coins with a payoff of $6,000 if both coins come up heads. What will you do?
>   a. Keep the $1,000 in cash.
>   b. Choose the single coin toss.
>   c. Choose the double coin toss.
> 7. Suppose you have the opportunity to invest in a start-up firm. If the firm is successful, you will multiply your investment by a factor of ten. But if it fails, you will lose everything. You think the odds of success are around 20%. How much would you be willing to invest in the start-up?
>   a. Nothing
>   b. 2 months' salary
>   c. 6 months' salary
> 8. Now imagine that to buy into the start-up you will need to borrow money. Would you be willing to take out a $10,000 loan to make the investment?

EXCEL APPLICATIONS

The Twelfth Edition features Excel Spreadsheet Applications with Excel questions. A sample spreadsheet is presented in the text with an interactive version available in Connect and on the student resources site at **www.mhhe.com/Bodie12e.**

eXcel APPLICATIONS: Two–Security Model

The accompanying spreadsheet can be used to analyze the return and risk of a portfolio of two risky assets. The model calculates expected return and volatility for varying weights of each security as well as the optimal risky and minimum-variance portfolios. Graphs are automatically generated for various model inputs. The model allows you to specify a target rate of return and solves for optimal complete portfolios composed of the risk-free asset and the optimal risky portfolio. The spreadsheet is constructed using the two-security return data (expressed as decimals, not percentages) from Table 7.1. This spreadsheet is available in Connect or through your course instructor.

Excel Question

1. Suppose your target expected rate of return is 11%.
   a. What is the lowest-volatility portfolio that provides that expected return?
   b. What is the standard deviation of that portfolio?
   c. What is the composition of that portfolio?

	A	B	C	D	E	F
	Asset Allocation Analysis: Risk and Return					
		Expected	Standard	Correlation		
		Return	Deviation	Coefficient	Covariance	
4	Security 1	0.08	0.12	0.3	0.0072	
5	Security 2	0.13	0.2			
6	T-Bill	0.05	0			
7						
8	Weight	Weight		Expected	Standard	Reward to
9	Security 1	Security 2		Return	Deviation	Volatility
	1	0		0.08000	0.12000	0.25000
	0.9	0.1		0.08500	0.11559	0.30281
	0.8	0.2		0.09000	0.11454	0.34922
	0.7	0.3		0.09500	0.11696	0.38474
14	0.6	0.4		0.10000	0.12264	0.40771

EXCEL EXHIBITS

Selected exhibits are set as Excel spreadsheets, and the accompanying files are available in Connect and on the student resources site at **www.mhhe.com/Bodie12e.**

	A	B	C	D	E	F	G
1			Time until		PV of CF		Column (C)
			Payment		(Discount rate =		times
		Period	(Years)	Cash Flow	5% per period)	Weight*	Column (F)
	A. 8% coupon bond	1	0.5	40	38.095	0.0395	0.0197
		2	1.0	40	36.281	0.0376	0.0376
		3	1.5	40	34.554	0.0358	0.0537
		4	2.0	1040	855.611	0.8871	1.7741
	Sum:				964.540	1.0000	1.8852
10	B. Zero-coupon	1	0.5	0	0.000	0.0000	0.0000
11		2	1.0	0	0.000	0.0000	0.0000
12		3	1.5	0	0.000	0.0000	0.0000
13		4	2.0	1000	822.702	1.0000	2.0000
14	Sum:				822.702	1.0000	2.0000
15							
16	Semiannual int rate:	0.05					
17							
18	*Weight = Present value of each payment (column E) divided by the bond price.						

Spreadsheet 16.1

Calculating the duration of two bonds
Column sums subject to rounding error.

PROBLEM SETS

PROBLEM SETS

1. The Fisher equation tells us that the real interest rate approximately equals the nominal rate minus the inflation rate. Suppose the inflation rate increases from 3% to 5%. Does the Fisher equation imply that this increase will result in a fall in the real rate of interest? Explain.

2. You've just stumbled on a new dataset that enables you to compute historical rates of return on U.S. stocks all the way back to 1880. What are the advantages and disadvantages in using these data to help estimate the expected rate of return on U.S. stocks over the coming year?

3. The Narnian stock market had a rate of return of 45% last year, but the inflation rate was 30%. What was the real rate of return to Narnian investors?

4. You have $5,000 to invest for the next year and are considering three alternatives:
   market fund with ... 30 days off ... yield of ...

We strongly believe that practice in solving problems is critical to understanding investments, so each chapter provides a good variety of problems. Select problems and algorithmic versions are assignable within Connect.

EXAM PREP QUESTIONS

Practice questions for the CFA® exams provided by Kaplan Schweser, A Global Leader in CFA® Education, are available in selected chapters for additional test practice. Look for the Kaplan Schweser logo. Learn more at **www.schweser.com.**

KAPLAN SCHWESER

5. Characterize each company in the previous problem as underpriced, overpriced, or properly priced.
6. What is the expected rate of return for a stock that has a beta of 1.0 if the expected return on the market is 15%?
   a. 15%.
   b. More than 15%.
   c. Cannot be determined without the risk-free rate.
7. Kaskin, Inc., stock has a beta of 1.2 and Quinn, Inc., stock has a beta of .6. Which of the following statements is *most* accurate?
   a. The expected rate of return will be higher for the stock of Kaskin, Inc., than that of Quinn, Inc.
   b. The stock of Kaskin, Inc., has more total risk than the stock of Quinn, Inc.
   c. The stock of Quinn, Inc., has more systematic risk than that of Kaskin, Inc.
8. You are a consultant to a large manufacturing corporation that is considering a project with the ... after-tax ... of dollars ...

CFA PROBLEMS

We provide several questions adapted for this text from past CFA examinations in applicable chapters. These questions represent the kinds of questions that professionals in the field believe are relevant to the "real world." Located at the back of the book is a listing of each CFA question and the level and year of the CFA exam it was included in for easy reference.

CFA® PROBLEMS

1. Given $100,000 to invest, what is the expected risk premium in dollars of investing in equities versus risk-free T-bills (U.S. Treasury bills) based on the following table?

Action	Probability	Expected Return
Invest in equities	0.6	$50,000
	0.4	−$30,000
Invest in risk-free T-bill	1.0	$ 5,000

2. Based on the scenarios below, what is the expected return for a portfolio with the following return profile?

	Bear Market	Normal Market	Bull Market
Probability	0.2	0.3	0.5
Rate of return	−25%	10%	24%

Use the following scenario analysis for Stocks X and Y to answer CFA Problems 3 through 5 (round to the nearest percent).

	Bear Market	Normal Market	Bull Market
Probability	0.2	0.5	0.3
Stock X	−20%	18%	50%
Stock Y	−15%	20%	10%

3. What are the expected rates of return for Stocks X and Y?

4. What are the standard deviations of returns on Stocks X and Y?

EXCEL PROBLEMS

Selected chapters contain problems, denoted by an icon, specifically linked to Excel templates that are available in Connect and on the student resource site at **www.mhhe.com/Bodie12e.**

$49.75	500	$50.25	100
49.50	800	51.50	100
49.25	500	54.75	300
49.00	200	58.25	100
48.50	600		

a. If a market buy order for 100 shares comes in, at what price will it be filled?
b. At what price would the next market buy order be filled?
c. If you were a security dealer, would you want to increase or decrease your inventory of this stock?

9. You are bullish on Telecom stock. The current market price is $50 per share, and you have $5,000 of your own to invest. You borrow an additional $5,000 from your broker at an interest rate of 8% per year and invest $10,000 in the stock.

a. What will be your rate of return if the price of Telecom stock goes up by 10% during the next year? The stock currently pays no dividends.
b. How far does the price of Telecom stock have to fall for you to get a margin call if the maintenance margin is 30%? Assume the price fall happens immediately.

eXcel
Please visit us at
www.mhhe.com/Bodie12e

10. You are bearish on Telecom and decide to sell short 100 shares at the current market price of $50 per share.

a. How much in cash or securities must you put into your brokerage account if the broker's initial margin requirement is 50% of the value of the short position?
b. How high can the price of the stock go before you get a margin call if the maintenance margin is 30% of the value of the short position?

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www.mhhe.com/Bodie12e

E-INVESTMENTS BOXES

These exercises provide students with simple activities to enhance their experience using the Internet. Easy-to-follow instructions and questions are presented so students can utilize what they have learned in class and apply it to today's data-driven world.

E-INVESTMENTS EXERCISES

The Federal Reserve Bank of St. Louis has information available on interest rates and economic conditions. Its *Monetary Trends* page (**https://research.stlouisfed.org/datatrends/mt/**) contains graphs and tables with information about current conditions in the capital markets. Find the most recent issue of *Monetary Trends* and answer these questions.

1. What is the professionals' consensus forecast for inflation for the next two years? (Use the *Federal Reserve Bank of Philadelphia* line on the graph for *Measures of Expected Inflation* to answer this.)
2. What do consumers expect to happen to inflation over the next two years? (Use the *University of Michigan* line on the graph to answer this.)
3. Have real interest rates increased, decreased, or remained the same over the last two years?
4. What has happened to short-term nominal interest rates over the last two years? What about long-term nominal interest rates?
5. How do recent U.S. inflation and long-term interest rates compare with those of the other countries listed?
6. What are the most recently available levels of 3-month and 10-year yields on Treasury securities?

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Acknowledgments

Throughout the development of this text, experienced instructors have provided critical feedback and suggestions for improvement. These individuals deserve a special thanks for their valuable insights and contributions. The following instructors played a vital role in the development of this and previous editions of *Investments:*

J. Amanda Adkisson
Texas A&M University

Sandro Andrade
University of Miami at Coral Gables

Tor-Erik Bakke
University of Wisconsin

Richard J. Bauer Jr.
St. Mary's University

Scott Besley
University of Florida

John Binder
University of Illinois at Chicago

Paul Bolster
Northwestern University

Phillip Braun
University of Chicago

Leo Chan
Delaware State University

Charles Chang
Cornell University

Kee Chaung
SUNY Buffalo

Ludwig Chincarini
Pomona College

Stephen Ciccone
University of New Hampshire

James Cotter
Wake Forest University

L. Michael Couvillion
Plymouth State University

Anna Craig
Emory University

Elton Daal
University of New Orleans

David C. Distad
University of California at Berkeley

Craig Dunbar
University of Western Ontario

David Durr
Murray State University

Bjorn Eaker
Duke University

John Earl
University of Richmond

Michael C. Ehrhardt
University of Tennessee at Knoxville

Venkat Eleswarapu
Southern Methodist University

David Ellis
Babson College

Andrew Ellul
Indiana University

John Farlin
Ohio Dominican University

John Fay
Santa Clara University

Greg Filbeck
University of Toledo

James Forjan
York College of Pennsylvania

David Gallagher
University of Technology, Sydney

Jeremy Goh
Washington University

Richard Grayson
Loyola College

John M. Griffin
Arizona State University

Weiyu Guo
University of Nebraska at Omaha

Mahmoud Haddad
Wayne State University

Greg Hallman
University of Texas at Austin

Robert G. Hansen
Dartmouth College

Joel Hasbrouck
New York University

Andrea Heuson
University of Miami

Eric Higgins
Drexel University

Shalom J. Hochman
University of Houston

Stephen Huffman
University of Wisconsin at Oshkosh

Eric Hughson
University of Colorado

Delroy Hunter
University of South Florida

A. James Ifflander
A. James Ifflander and Associates

Robert Jennings
Indiana University

George Jiang
University of Arizona

Richard D. Johnson
Colorado State University

Susan D. Jordan
University of Kentucky

Acknowledgments

xxxiii

Acknowledgments

Asset Classes and Financial Instruments

2

YOU LEARNED IN Chapter 1 that the process of building an investment portfolio usually begins by deciding how much money to allocate to broad classes of assets, such as safe money market securities or bank accounts, longer term bonds, stocks, or even asset classes like real estate or precious metals. This process is called *asset allocation*. Within each class the investor then selects specific assets from a more detailed menu. This is called *security selection*.

Each broad asset class contains many specific security types, and the many variations on a theme can be overwhelming. Our goal in this chapter is to introduce you to the important features of broad classes of securities. Toward this end, we organize our tour of financial instruments according to asset class.

Financial markets are traditionally segmented into **money markets** and **capital markets.** Money market instruments include short-term, marketable, liquid, low-risk debt securities. Money market instruments sometimes are called *cash equivalents,* or just *cash* for short. Capital markets, in contrast, include longer term and riskier securities. Securities in the capital market are much more diverse than those found within the money market. For this reason, we will subdivide the capital market into four segments: longer term bond markets, equity markets, and the derivative markets for options and futures.

We first describe money market instruments. We then move on to debt and equity securities. We explain the structure of various stock market indexes in this chapter because market benchmark portfolios play an important role in portfolio construction and evaluation. Finally, we survey the derivative security markets for options, futures, and swap contracts.

2.1　The Money Market

The money market consists of very short-term, highly marketable debt securities. Many of these securities trade in large denominations and so are out of the reach of individual investors. Money market funds, however, are easily accessible to small investors.

Treasury Bills

U.S. *Treasury bills* (T-bills, or just bills, for short) are the most marketable of all money market instruments. T-bills represent the simplest form of borrowing: The government raises money by selling bills to the public. Investors buy the bills at a discount from the stated maturity (equivalently, face) value. At maturity, the government pays the investor the face value of the bill. The difference between the purchase price and ultimate maturity value constitutes the investor's earnings.

T-bills are issued with initial maturities of 4, 13, 26, or 52 weeks. Individuals can purchase them directly, at auction, or on the secondary market from a government securities dealer. T-bills are highly liquid; that is, they are easily converted to cash and sold at low transaction cost and with not much price risk. Unlike most other money market instruments, which sell in minimum denominations of $100,000, T-bills sell in minimum denominations of only $100, although $10,000 denominations are far more common. Earnings on T-bills are exempt from state and local taxes, another characteristic distinguishing them from other money market instruments.

Figure 2.1 is a partial listing of T-bill rates. Rather than providing prices of each bill, the financial press reports yields based on those prices. You will see yields corresponding to both bid and ask prices. The **ask price** is the price you would have to pay to buy a T-bill from a securities dealer. The **bid price** is the slightly lower price you would receive if you wanted to sell a bill to a dealer. The **bid–ask spread** is the difference in these prices, which is the dealer's source of profit. (Notice in Figure 2.1 that the bid *yield* is higher than the ask yield. This is because prices and yields are inversely related.)

The first two yields in Figure 2.1 are reported using the *bank-discount method.* This means that the bill's discount from its maturity or face value is "annualized" based on a 360-day year, and then reported as a percentage of face value. For example, for the highlighted bill maturing on May 9, 2019, there are 126 days to maturity, and the yield under the column labeled "ASKED" is given as 2.378%. This means that a dealer was willing to sell the bill at a discount from face value of 2.378% × (126/360) = .8323%. So a bill with $10,000 face value could be purchased for $10,000 × (1 − .008323) = $9,916.77. Similarly, with a bid yield of 2.388%, a dealer would be willing to purchase the bill for $10,000 × (1 − .02388 × 126/360) = $9,916.42.

The bank discount method for computing yields has a long tradition, but it is flawed for at least two reasons. First, it assumes that the year has only 360 days. Second, it

TREASURY BILLS

MATURITY	DAYS TO MATUR	BID	ASKED	CHANGE	ASKED YIELD
15-Jan-2019	~o	°.°~~	°.°~	−0.018	°.°~~
19-Feb-2019	″	2.368	2.358	ˇ.˘°˘	2.398
9-May-2019	~o˘	2.388	2.378	−˘.˘~o	°.~~
18-Jul-2019	~~~	°.~~~	°.~~	−˘˘˘	°.°
5-Dec-2019	˘˘˘	2.415	2.405	−0.105	°.^

Figure 2.1 Treasury bill yields

computes the yield as a fraction of par value rather than of the price the investor paid to acquire the bill.[1] An investor who buys the bill for the ask price and holds it until maturity will see her investment grow over 126 days by a multiple of $10,000/$9,916.77 = 1.008393, for a gain of .8393%. Annualizing this gain using a 365-day year results in a yield of .8393% × 365/126 = 2.431%, which is the value reported in the last column under "ASKED YIELD." This last value is called the Treasury-bill's *bond-equivalent yield.*

Certificates of Deposit

A **certificate of deposit,** or CD, is a time deposit with a bank. Time deposits may not be withdrawn on demand. The bank pays interest and principal to the depositor only at maturity. CDs issued in denominations greater than $100,000 are usually negotiable, however; that is, they can be sold to another investor if the owner needs to cash in the certificate before it matures. Short-term CDs are highly marketable, although the market significantly thins out for maturities of 3 months or more. CDs are treated as bank deposits by the Federal Deposit Insurance Corporation, so they are insured for up to $250,000 in the event of a bank insolvency.

Commercial Paper

Large, well-known companies often issue their own short-term unsecured debt notes rather than borrow directly from banks. These notes are called **commercial paper.** Very often, commercial paper is backed by a bank line of credit, which gives the borrower access to cash that can be used (if needed) to pay off the paper at maturity.

Commercial paper maturities range up to 270 days, but most often, it is issued with a maturity of less than 1 or 2 months, usually in multiples of $100,000. Therefore, small investors can invest in commercial paper only indirectly, via money market mutual funds.

Commercial paper is considered to be a fairly safe asset because a firm's condition presumably can be monitored and predicted over a term as short as 1 month.

While most commercial paper is issued by nonfinancial firms, in the years leading up to the financial crisis, there was a sharp increase in *asset-backed commercial paper* issued by financial firms such as banks. This was short-term commercial paper typically used to raise funds for the issuing firm to invest in other assets, most notoriously, subprime mortgages. These assets were in turn used as collateral for the commercial paper—hence the label "asset backed." This practice led to many difficulties starting in the summer of 2007 when the subprime mortgagors began defaulting. The banks found themselves unable to issue new commercial paper to refinance their positions as the old paper matured.

Bankers' Acceptances

A **banker's acceptance** starts as an order to a bank by a bank's customer to pay a sum of money at a future date, typically within 6 months. At this stage, it is similar to a postdated check. When the bank endorses the order for payment as "accepted," it assumes responsibility for ultimate payment to the holder of the acceptance. At this point, the acceptance may be traded in secondary markets like any other claim on the bank. Bankers' acceptances

---

[1]Both of these "errors" were dictated by computational simplicity in precomputer days. It is easier to compute percentage discounts from a round number such as par value rather than purchase price. It is also easier to annualize using a 360-day year because 360 is an even multiple of so many numbers.

are considered very safe because traders can substitute the bank's credit standing for their own. They are used widely in foreign trade where the creditworthiness of one trader is unknown to the trading partner. Acceptances sell at a discount from the face value of the payment order, just as T-bills sell at a discount from face value.

Eurodollars

Eurodollars are dollar-denominated deposits at foreign banks or foreign branches of American banks. By locating outside the United States, these banks escape regulation by the Federal Reserve. Despite the tag "Euro," these accounts need not be in European banks, although that is where the practice of accepting dollar-denominated deposits outside the United States began.

Most Eurodollar deposits are for large sums, and most are time deposits of less than 6 months' maturity. A variation on the Eurodollar time deposit is the Eurodollar certificate of deposit, which resembles a domestic bank CD except that it is the liability of a non-U.S. branch of a bank, typically a London branch. Firms also issue Eurodollar bonds, which are dollar-denominated bonds outside the U.S., although bonds are not considered part of the money market because of their long maturities.

Repos and Reverses

Dealers in government securities use **repurchase agreements,** also called "repos" or "RPs," as a form of short-term, usually overnight, borrowing. The dealer sells government securities to an investor on an overnight basis, with an agreement to buy back those securities the next day at a slightly higher price. The increase in the price is the overnight interest. The dealer thus takes out a 1-day loan from the investor, and the securities serve as collateral.

A *term repo* is essentially an identical transaction, except that the term of the implicit loan can be 30 days or more. Repos are considered very safe in terms of credit risk because the loans are backed by the government securities. A *reverse repo* is the mirror image of a repo. Here, the dealer finds an investor holding government securities and buys them, agreeing to sell them back at a specified higher price on a future date.

Federal Funds

Just as most of us maintain deposits at banks, banks maintain deposits of their own at a Federal Reserve bank. Each member bank of the Federal Reserve System, or "the Fed," is required to maintain a minimum balance in a reserve account with the Fed. The required balance depends on the total deposits of the bank's customers. Funds in the bank's reserve account are called **federal funds,** or *fed funds.* At any time, some banks have more funds than required at the Fed. Other banks, primarily big banks in New York and other financial centers, tend to have a shortage. Banks with excess funds lend to those with a shortage. These loans, which are usually overnight transactions, are arranged at a rate of interest called the *federal funds rate.*

Although the fed funds market arose primarily as a way for banks to transfer balances to meet reserve requirements, today the market has evolved to the point that many large banks use federal funds in a straightforward way as one component of their total sources of funding. Therefore, the fed funds rate is simply the rate of interest on very-short-term loans among financial institutions. While most investors cannot participate in this market, the fed funds rate commands great interest as a key barometer of monetary policy.

Brokers' Calls

Individuals who buy stocks on margin borrow part of the funds to pay for the stocks from their broker. The broker in turn may borrow the funds from a bank, agreeing to repay the bank immediately (on call) if the bank requests it. The rate paid on such loans is usually about 1% higher than the rate on short-term T-bills.

The LIBOR Market

The **London Interbank Offer Rate (LIBOR)** is the premier short-term interest rate quoted in the European money market and serves as a reference rate for a wide range of transactions. It was designed to reflect the rate at which banks lend among themselves. While such interbank lending has declined substantially in recent years, particularly at longer maturities, LIBOR remains a crucial benchmark for many financial contracts. For example, a corporation might borrow at a rate equal to LIBOR plus two percentage points. Hundreds of trillions of dollars of loans, mortgages, and derivative contracts are tied to it.

LIBOR and similar rates called Euribor (European interbank offer rate) and Tibor (Tokyo interbank offer rate) are quoted in major currencies (for example, the U.S. dollar, the British pound, the yen, the euro) for terms ranging from overnight to several months. However, they are all based on surveys of rates reported by participating banks rather than actual transactions. With interbank lending recently sparse, and in light of a major scandal in the LIBOR market in 2012, the search for a replacement is on.

British regulators have proposed phasing out LIBOR by 2021. They propose a replacement rate called SONIA (Sterling Overnight Interbank Average Rate), which is an overnight interest rate at which actual transactions take place. U.S. regulators have proposed that U.S. dollar LIBOR be replaced by the rate on repurchase agreements on Treasury securities.

The 2012 scandal involving the fixing of LIBOR deeply shook these markets and highlighted the considerable shortcomings of survey-based benchmarks. The nearby box discusses those events.

Yields on Money Market Instruments

Although most money market securities are low risk, they are not risk-free. The securities of the money market promise yields greater than those on default-free T-bills, at least in part because of greater relative riskiness. In addition, many investors require more liquidity; thus, they will accept lower yields on securities such as T-bills that can be quickly and cheaply sold for cash. Figure 2.2 shows that federal funds, for example, consistently have offered a yield premium over T-bills. Moreover, that premium increased with economic crises such as the energy price shocks associated with the two OPEC disturbances, the stock market crash in 1987, the collapse of Long Term Capital Management in 1998, and the financial crisis of 2008–2009. If you look back to Figure 1.1 in Chapter 1, you'll see that the TED spread, the difference between the LIBOR rate and Treasury bills, also peaked during periods of financial stress.

Money Market Funds

Money market funds are mutual funds that invest in money market instruments. They are a major conduit for the funds invested in the money market: In early 2019, the total assets managed by these funds amounted to more than $3 trillion. While money market funds

The LIBOR Scandals

LIBOR was designed initially as a survey of interbank lending rates but soon became a key determinant of short-term interest rates with far-reaching significance. More than $500 trillion of derivative contracts have payoffs tied to it, and trillions of dollars of loans and bonds with floating interest rates linked to LIBOR are currently outstanding. LIBOR is quoted for loans in five currencies (U.S. dollar, yen, euro, British pound, and Swiss franc) and for seven maturities ranging from a day to a year, although 3 months is the most common.

However, LIBOR is not a rate at which actual transactions occur; instead, it is just a survey of "estimated" borrowing rates, and this has made it vulnerable to tampering. Several large banks are asked to report the rate at which they *believe* they can borrow in the interbank market. Outliers are trimmed from the sample of responses, and LIBOR is calculated as the average of the mid-range estimates.

Over time, several problems surfaced. First, it appeared that banks understated the rates at which they claimed they could borrow in an effort to make themselves look financially stronger. Other surveys that asked for estimates of the rates at which *other* banks could borrow resulted in higher values. Moreover, LIBOR did not seem to reflect current market conditions. A majority of LIBOR submissions were unchanged from day to day even when other interest rates fluctuated, and LIBOR spreads showed surprisingly low correlation with other measures of credit risk. Even worse, once the market came under scrutiny, it emerged that participating banks were colluding to manipulate their LIBOR submissions to enhance profits on their derivatives trades. Traders used e-mails and instant messages to tell each other whether they wanted to see higher or lower submissions. Members of this informal cartel essentially set up a "favor bank" to help each other move the survey average up or down depending on their trading positions.

To date, more than $6 billion of fines have been paid, among them Deutsche Bank ($2.5 billion), UBS ($1.5 billion), Royal Bank of Scotland ($1.1 billion), Rabobank ($1 billion), and SocGen ($600 million). But government fines may be only the beginning. A federal appeals court in 2016 ruled that private lawsuits involving antitrust violations may proceed. Customers who borrowed funds at an interest rate tied to LIBOR argue that they were harmed by the collusion of participating banks to coordinate rates.

Several reforms have been suggested and some have been implemented. The British Bankers Association, which until recently ran the LIBOR survey, yielded responsibility for LIBOR to British regulators. LIBOR quotes in less-active currencies and maturities, where collusion is easier, have been eliminated. More substantive proposals would replace the survey rates with ones based on actual, verifiable transactions—that is, real loans. British regulators have expressed their wish to phase out LIBOR by 2021. Two primary contenders to replace it are SONIA (Sterling Overnight Interbank Average Rate), an overnight interest rate in the U.K. market, and, for U.S. dollar rates, the rate on repurchase agreements on Treasury securities.

These proposals leave some important questions unanswered. If LIBOR is phased out, what will happen to LIBOR-based long-term contracts with maturities that extend beyond 2021? For example, LIBOR is the most common index for adjustable rate mortgages, most of which have maturities of 30 years. And because SONIA is only an overnight rate, what will replace the LIBOR benchmark for longer maturities?
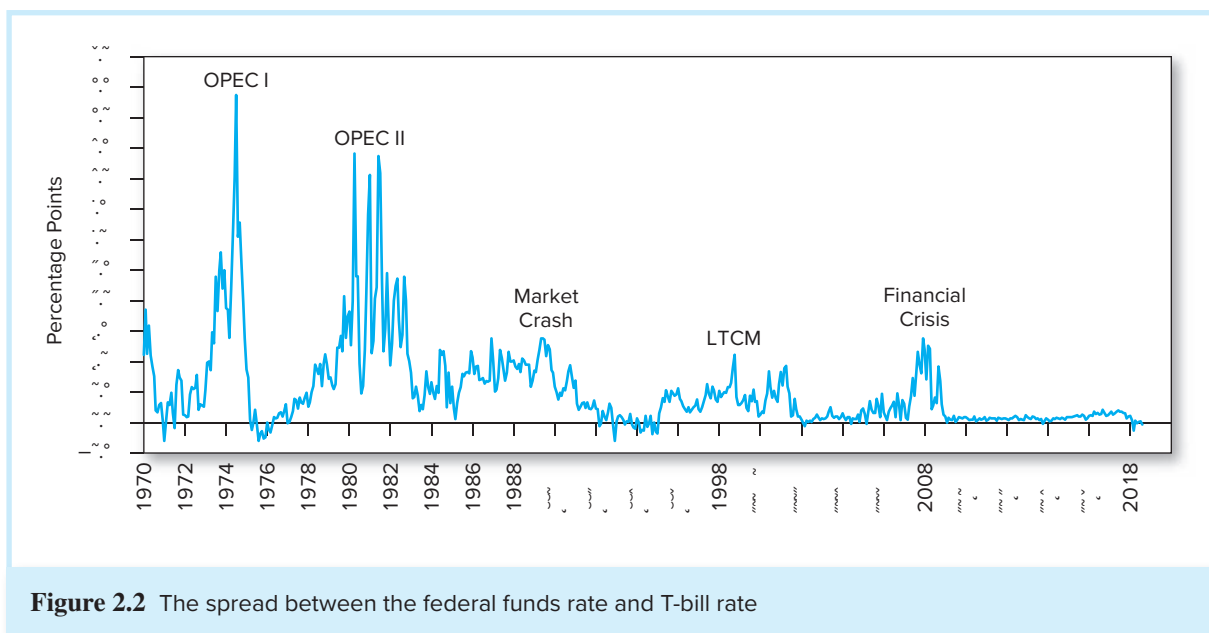
Figure 2.2 The spread between the federal funds rate and T-bill rate

Money Market Funds and the Credit Crisis of 2008

Money market funds are mutual funds that invest in the short-term debt instruments that comprise the money market. They are required to hold only short-maturity debt of the highest quality: The average maturity of their holdings must be maintained at less than 3 months. Because of this very conservative investment profile, money market funds typically experience extremely low price risk. Investors for their part usually acquire check-writing privileges with their funds and often use them as a close substitute for a bank account. This is feasible because the funds almost always maintain share value at $1.00 and pass along all investment earnings to their investors as interest.

Until 2008, only one fund had "broken the buck," that is, suffered losses large enough to force value per share below $1. But when Lehman Brothers filed for bankruptcy protection on September 15, 2008, several funds that had invested heavily in its commercial paper suffered large losses. The next day, the Reserve Primary Fund, the oldest money market fund, broke the buck when its value per share fell to only $.97.

The realization that money market funds were at risk in the credit crisis led to a wave of investor redemptions similar to a run on a bank. In response, the U.S. Treasury announced that it would make federal insurance available to money market funds willing to pay an insurance fee. This program would thus be similar to FDIC bank insurance. With the federal insurance in place, the outflows were quelled.

However, the turmoil in Wall Street's money market funds had already spilled over into "Main Street." Fearing further investor redemptions, money market funds became afraid to commit funds even over short periods, and their demand for commercial paper effectively dried up. Firms throughout the economy had come to depend on those markets as a major source of short-term finance to fund expenditures ranging from salaries to inventories. Further breakdown in the money markets would have had an immediate crippling effect on the broad economy.

To end the panic and stabilize the money markets, the federal government decided to guarantee investments in money market funds. The guarantee did, in fact, calm investors and end the run, but it put the government on the hook for a potential liability of up to $3 trillion—the assets held in money market funds at the time.

U.S. regulators have since approved a series of reforms to reduce the risks of runs on these funds. Institutional money market funds (those servicing institutions rather than private investors) are required to "float" the prices of their shares based on the value of their assets rather than maintain a fixed $1 value per share. This limits the incentive during a crisis for investors to compete to be the first to withdraw funds while share prices are maintained at a nonsustainable level of $1. In addition, funds will have the authority to either limit redemptions or impose redemption fees of up to 2% if a fund's assets fall by more than 30%. Finally, the rules call for enhanced transparency, with greater disclosure of asset values, portfolio composition, and liquidity.

usually pose extremely low risk to investors, the financial crisis constituted a traumatic shock to these markets. The nearby box discusses the fallout of the crisis.

Today, there is greater concern paid to credit risk in the money market, and as a result investors now distinguish between *prime* and *government* funds. Government funds hold short-term U.S. Treasury or agency securities. Prime funds also hold other money market instruments, for example, commercial paper or CDs. For this reason, they are considered slightly riskier, and offer higher yields. We return to these funds in Chapter 4.

2.2 The Bond Market

The bond market is composed of longer term borrowing or debt instruments than those that trade in the money market. This market includes Treasury notes and bonds, corporate bonds, municipal bonds, mortgage securities, and federal agency debt.

These instruments are sometimes said to comprise the *fixed-income capital market* because most of them promise either a fixed stream of income or a stream of income that is determined according to a specific formula. In practice, these formulas can result in a flow of income that is far from fixed. Therefore, the term *fixed income* is probably not fully appropriate. It is simpler and more straightforward to call these securities either debt instruments or bonds.

Treasury Notes and Bonds

The U.S. government borrows funds in large part by selling **Treasury notes** and **Treasury bonds.** T-notes are issued with maturities ranging up to 10 years, while bonds are issued with maturities ranging from 10 to 30 years. Both notes and bonds may be issued in increments of $100 but far more commonly trade in denominations of $1,000. Both notes and bonds make semiannual interest payments called *coupon payments,* a name derived from precomputer days, when investors would literally clip a coupon attached to the bond and present it to receive the interest payment.

Figure 2.3 is a listing of Treasury issues. The bid price of the highlighted bond, which matures in August 2029, is 132.7266. (This is the decimal version of $132\,93/128$. The minimum *tick size* or price increment in the Treasury-bond market, is generally $1/128$ of a point.) Although bonds are typically traded in denominations of $1,000 par value, prices are quoted as a percentage of par. Thus, the bid price should be interpreted as 132.7266% of par, or $1,327.266 for the $1,000 par value bond. Similarly, the ask price at which the bond could be purchased from a dealer is 132.7891% of par, or $1,327.891. The 1.1406% change means that the asked price on this day increased by 1.1406% of par value (equivalently, by $1\,18/128$ of a point) from the previous day's close. Finally, the yield to maturity based on the asked price is 2.575%.

The **yield to maturity** reported in the last column is calculated by determining the semiannual yield and then doubling it, rather than compounding it for two half-year periods. This use of a simple interest technique to annualize means that the yield is quoted on an annual percentage rate (APR) basis rather than as an effective annual yield. The APR method in this context is also called the *bond equivalent yield.* We discuss the yield to maturity in more detail in Part Four.

☑ Concept Check **2.1**

> What were the bid price, ask price, and yield to maturity of the 3% August 2048 Treasury bond displayed in Figure 2.3? What was its ask price the previous day?

LISTING OF TREASURY ISSUES					ASKED YIELD TO
MATURITY	COUPON	BID	ASKED	CHANGE	MATURITY
~°-Feb-؟ ‴	2.750	~‴ ‵‵~	~‴ ‵°~ 7	0.0078	؟ ° ˘
‴-Apr-؟ ˜	؟ °″	99.7500	99.765˘	″ ~~	؟ ° ˘
~°-May-؟ ^	1.750	97.4531	97.4688	0.4766	؟ ~ ˘
~°-Aug-؟ ؟	˘ ~°	132.7266	132.789˜	~ ~~	2.57°
~°-Feb-؟ ~~	˘ °″″	125.4688	~ ° °~~ ^	~ °~~	؟ ˘ 7
15-Aug-2048	^ ″″″	101.8984	~″~ ؟ 7	~ °~~	°؟ ؟

Figure 2.3 Listing of Treasury bonds and notes

Source: *The Wall Street Journal Online,* January 3, 2019.

Inflation-Protected Treasury Bonds

The natural place to start building an investment portfolio is at the least risky end of the spectrum. Around the world, governments of many countries, including the United States, have issued bonds that are linked to an index of the cost of living in order to provide their citizens with an effective way to hedge inflation risk.

In the United States, inflation-protected Treasury bonds are called TIPS (Treasury Inflation Protected Securities). The principal amount on these bonds is adjusted in proportion to increases in the Consumer Price Index. Therefore, they provide a constant stream of income in real (inflation-adjusted) dollars. Yields on TIPS bonds should be interpreted as real or inflation-adjusted interest rates. We return to TIPS bonds in more detail in Chapter 14.

Federal Agency Debt

Some government agencies issue their own securities to finance their activities. These agencies usually are formed to channel credit to a particular sector of the economy that Congress believes might not receive adequate credit through normal private sources.

The major mortgage-related agencies are the Federal Home Loan Bank (FHLB), the Federal National Mortgage Association (FNMA, or Fannie Mae), the Government National Mortgage Association (GNMA, or Ginnie Mae), and the Federal Home Loan Mortgage Corporation (FHLMC, or Freddie Mac). The FHLB borrows money by issuing securities and lends this money to savings and loan institutions to be lent in turn to individuals borrowing for home mortgages.

Although the debt of federal agencies was never explicitly insured by the federal government, it had long been assumed that the government would assist an agency nearing default. Those beliefs were validated when Fannie Mae and Freddie Mac encountered severe financial distress in September 2008. With both firms on the brink of insolvency, the government stepped in, put them both into conservatorship, and assigned the Federal Housing Finance Agency to run the firms; however, it did in fact agree to make good on the firm's bonds.

International Bonds

Many firms borrow abroad, and many investors buy bonds from foreign issuers. In addition to national capital markets, there is a thriving international capital market, largely centered in London.

A *Eurobond* is a bond denominated in a currency other than that of the country in which it is issued. For example, a dollar-denominated bond sold in Britain would be called a Eurodollar bond. Similarly, investors might speak of Euroyen bonds, yen-denominated bonds sold outside Japan. Because the European currency is called the euro, the term Eurobond may be confusing. It is best to think of them simply as international bonds.

In contrast to bonds that are issued in foreign currencies, many firms issue bonds in foreign countries but in the currency of the investor. For example, a Yankee bond is a dollar-denominated bond sold in the United States by a non-U.S. issuer. Similarly, Samurai bonds are yen-denominated bonds sold in Japan by non-Japanese issuers.

Municipal Bonds

Municipal bonds are issued by state and local governments. They are similar to Treasury and corporate bonds except that their interest income is exempt from federal income taxation. The interest income also is usually exempt from state and local taxation in the
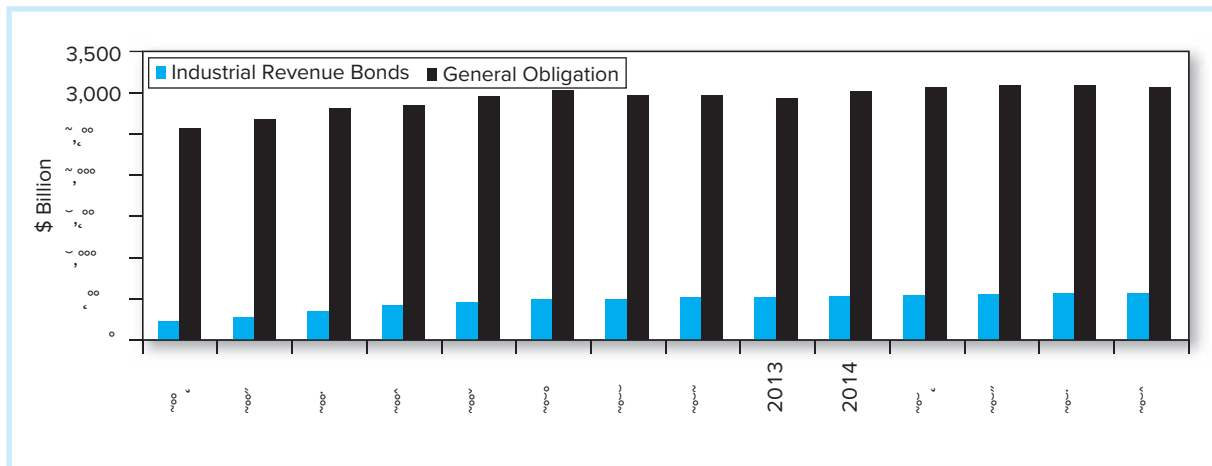
Figure 2.4 Tax-exempt debt outstanding

Source: *Flow of Funds Accounts of the United States,* Boards of Governors of the Federal Reserve System, September, 2018.

issuing state. Capital gains taxes, however, must be paid on "munis" when the bonds mature or if they are sold for more than the investor's purchase price.

General obligation bonds are backed by the "full faith and credit" (i.e., the taxing power) of the issuer, while *revenue bonds* are issued to finance particular projects and are backed either by the revenues from that project or by the particular municipal agency operating the project. Typical issuers of revenue bonds are airports, hospitals, and turnpike or port authorities. Obviously, revenue bonds are riskier in terms of default than general obligation bonds. Figure 2.4 plots outstanding amounts of both types of municipal securities.

An *industrial development bond* is a revenue bond that is issued to finance commercial enterprises, such as the construction of a factory that can be operated by a private firm. In effect, these private-purpose bonds give the firm access to the municipality's ability to borrow at tax-exempt rates, and the federal government limits the amount of these bonds that may be issued.[2]

Like Treasury bonds, municipal bonds vary widely in maturity. A good deal of the debt issued is in the form of short-term *tax anticipation notes,* which raise funds to pay for expenses before actual collection of taxes. Other municipal debt is long term and used to fund large capital investments. Maturities range up to 30 years.

The key feature of municipal bonds is their tax-exempt status. Because investors pay neither federal nor state taxes on the interest proceeds, they are willing to accept lower yields on these securities.

An investor choosing between taxable and tax-exempt bonds must compare after-tax returns on each bond. An exact comparison requires a computation of after-tax rates of return that explicitly accounts for taxes on income and realized capital gains. In practice, there is a simpler rule of thumb. If we let t denote the investor's combined federal plus local marginal tax bracket and r_{taxable} denote the total before-tax rate of return available

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[2]A warning, however: Although interest on industrial development bonds usually is exempt from federal tax, it can be subject to the alternative minimum tax if the bonds are used to finance projects of for-profit companies.

on taxable bonds, then $r_{taxable}(1 - t)$ is the after-tax rate available on those securities.[3] If this value exceeds the rate on municipal bonds, r_{muni}, the investor does better holding the taxable bonds. Otherwise, the tax-exempt municipals provide higher after-tax returns.

One way to compare bonds is to determine the interest rate on taxable bonds that would be necessary to provide an after-tax return equal to that of municipals. To derive this value, we set after-tax yields equal and solve for the **equivalent taxable yield** of the tax-exempt bond. This is the rate a taxable bond must offer to match the after-tax yield on the tax-free municipal.

$$r_{taxable}(1 - t) = r_{muni} \tag{2.1}$$

or

$$r_{taxable} = r_{muni}/(1 - t) \tag{2.2}$$

Thus, the equivalent taxable yield is simply the tax-free rate divided by $1 - t$. Table 2.1 presents equivalent taxable yields for several municipal yields and tax rates.

This table frequently appears in the marketing literature for tax-exempt mutual bond funds because it demonstrates to high-tax-bracket investors that municipal bonds offer highly attractive equivalent taxable yields. Each entry is calculated from Equation 2.2. If the equivalent taxable yield exceeds the actual yields offered on taxable bonds, the investor is better off after taxes holding municipal bonds. Notice that the equivalent taxable interest rate increases with the investor's tax bracket; the higher the bracket, the more valuable the tax-exempt feature of municipals. Thus, high-tax-bracket investors tend to hold municipals.

We also can use Equation 2.1 or 2.2 to find the tax bracket at which investors are indifferent between taxable and tax-exempt bonds. The cutoff tax bracket is given by solving Equation 2.2 for the tax bracket at which after-tax yields are equal. Doing so, we find that

$$\text{Cutoff tax bracket} = 1 - \frac{r_{muni}}{r_{taxable}} \tag{2.3}$$

Thus, the yield ratio $r_{muni}/r_{taxable}$ is a key determinant of the attractiveness of municipal bonds. The higher the yield ratio, the lower the cutoff tax bracket, and the more individuals will prefer to hold municipal debt.

Figure 2.5 plots the ratio of 20-year municipal debt yields to the yield on Baa-rated corporate debt. The default risk of these corporate and municipal bonds may be comparable,

Marginal Tax Rate	Tax-Exempt Yield				
	1%	2%	3%	4%	5%
20%	1.25%	2.50%	3.75%	5.00%	6.25%
30	1.43	2.86	4.29	5.71	7.14
40	1.67	3.33	5.00	6.67	8.33
50	2.00	4.00	6.00	8.00	10.00

Table 2.1

Equivalent taxable yields corresponding to various tax-exempt yields

[3]The combined federal plus state tax rate depends on whether state taxes are deductible at the federal level. For individuals who take the standard deduction, state taxes do not affect federal taxes. Neither do state taxes affect the federal taxes of those who are already taking the $10,000 maximum deduction for state and local taxes. For these investors, the combined tax rate is simply the sum of the federal and state rates. For example, if your federal tax rate is 28% and your state tax rate is 5%, your combined tax rate would be 33%. However, if state taxes are (on the margin) deductible for federal taxes, then the combined tax rate reflects the fact that state taxes reduce taxable income at the federal level. These investors pay federal taxes on Interest $\times (1 - t_{state})$. Your after-tax income on each dollar of municipal interest would be $(1 - t_{federal}) \times (1 - t_{state})$. In our example, your after-tax proceeds on each dollar earned would be $(1 - .28) \times (1 - .05) = .684$, which implies a combined tax rate of $1 - .684 = .316$, or 31.6%.
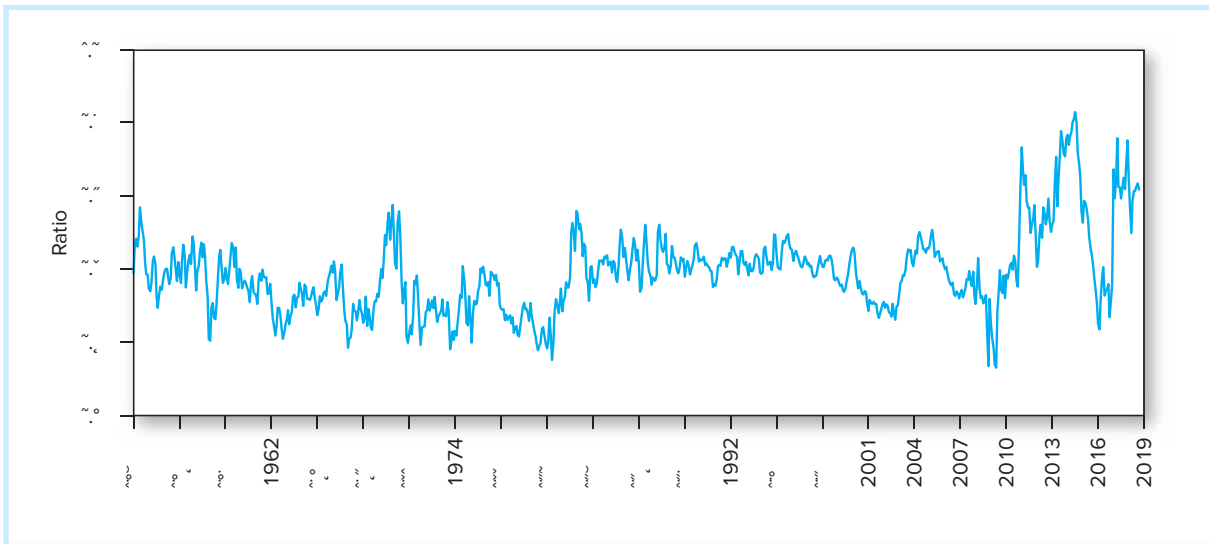
Figure 2.5 Ratio of yields on municipal debt to corporate Baa-rated debt

Source: Muni bond yields from **federalreserve.gov.**

but certainly will fluctuate over time. For example, the sharp run-up in the ratio beginning in 2011 probably reflects increased concern at the time about the precarious financial condition of several states and municipalities, leading to higher credit spreads on their bonds.

Example 2.1   Taxable versus Tax-Exempt Yields

Figure 2.5 shows that for most of the last 40 years, the ratio of tax-exempt to taxable yields fluctuated around .70. What does this imply about the cutoff tax bracket above which tax-exempt bonds provide higher after-tax yields? Equation 2.3 shows that an investor whose tax bracket (federal plus local) exceeds $1 - .70 = .30$, or 30%, will derive a greater after-tax yield from municipals. As we pointed out, however, it is difficult to control precisely for differences in the risks of these bonds, so the cutoff tax bracket must be taken as approximate.

✔ Concept Check **2.2**

Suppose your combined federal plus state tax bracket is 30%. Would you prefer to earn a 6% taxable return or a 4% tax-free return? What is the equivalent taxable yield of the 4% tax-free yield?

Corporate Bonds

Corporate bonds are the means by which private firms borrow money directly from the public. These bonds are similar in structure to Treasury issues—they typically pay semiannual coupons over their lives and return the face value to the bondholder at maturity. They differ most importantly from Treasury bonds because of default risk, and Chapter 14

discusses this issue in considerable detail. For now, we distinguish only among *secured bonds,* which have specific collateral backing them in the event of firm bankruptcy; unsecured bonds, called *debentures,* which have no collateral; and *subordinated debentures,* which have a lower priority claim to the firm's assets in the event of bankruptcy.

Corporate bonds sometimes come with options attached. *Callable bonds* give the firm the option to repurchase the bond from the holder at a stipulated call price. *Convertible bonds* give the bondholder the option to convert each bond into a stipulated number of shares of stock. These options are treated in more detail in Chapter 14.

Mortgage and Asset-Backed Securities

Using mortgage-backed securities, almost anyone can invest in a portfolio of mortgage loans, and these securities have become a major component of the fixed-income market. As described in Chapter 1, a *mortgage-backed security* is either an ownership claim in a pool of mortgages or an obligation that is secured by such a pool. Most pass-throughs have traditionally been comprised of *conforming mortgages,* which means that the loans must satisfy certain underwriting guidelines (standards for the creditworthiness of the borrower) before they may be purchased by Fannie Mae or Freddie Mac. In the years leading up to the financial crisis, however, a large amount of *subprime mortgages,* that is, riskier loans made to financially weaker borrowers, were bundled and sold by "private-label" issuers. Figure 2.6 shows that both agency and private-label mortgage-backed securities enjoyed explosive growth, at least until the crisis.

In an effort to make housing more affordable to low-income households, Fannie and Freddie had been encouraged to buy subprime mortgage securities. As we saw in Chapter 1, these loans turned out to be disastrous, with trillion-dollar losses spread among banks, hedge funds and other investors, and Freddie and Fannie, which lost billions of dollars on the subprime mortgage pools they had purchased. You can see from Figure 2.6 that starting in 2007, the market in private-label mortgage pass-throughs began to shrink rapidly.
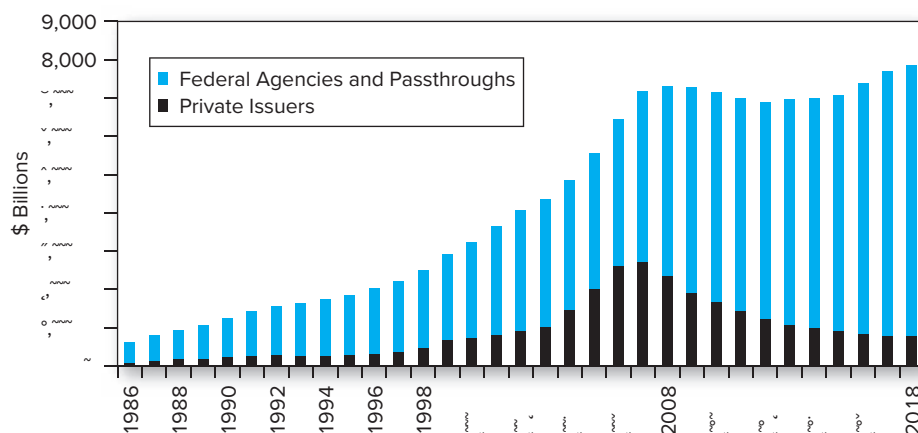
Figure 2.6 Mortgage-backed securities outstanding

Source: Securities Industry & Financial Markets Association, **www.sifma.org,** October, 2018.
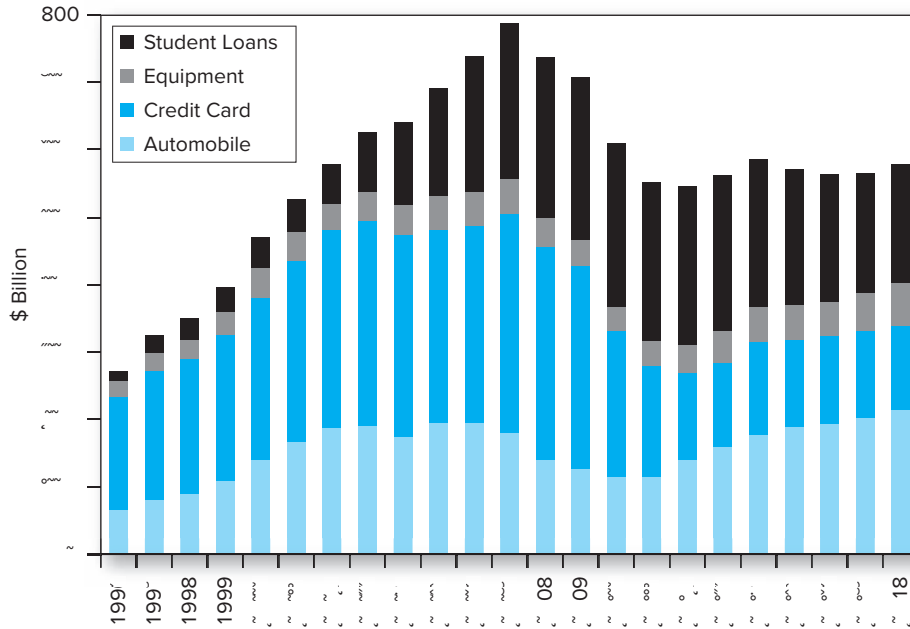
Figure 2.7 Asset-backed securities outstanding

Source: Securities Industry & Financial Markets Association, **www.sifma.org.**

Despite these troubles, few believe that securitization itself will cease, although practices in this market continue to be far more conservative than in previous years, particularly with respect to the credit standards that must be met by the ultimate borrower. Indeed, securitization has become an increasingly common staple of many credit markets. For example, car loans, student loans, home equity loans, credit card loans, and even debt of private firms now are commonly bundled into pass-through securities that can be traded in the capital market. Figure 2.7 documents the rapid growth of nonmortgage asset–backed securities, at least until 2007. After the financial crisis, the market contracted considerably, but the asset-backed market is still substantial.

2.3 Equity Securities

Common Stock as Ownership Shares

Common stocks, also known as *equity securities* or **equities,** represent ownership shares in a corporation. Each share of common stock entitles its owner to one vote on any matters of corporate governance that are put to a vote at the corporation's annual meeting and to a share in the financial benefits of ownership.[4]

The corporation is controlled by a board of directors elected by the shareholders. The board, which meets only a few times each year, selects managers who actually run the

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[4]Corporations occasionally issue two classes of common stock, one bearing the right to vote, the other not. Because of its restricted rights, the nonvoting stock might sell for a lower price.

firm on a day-to-day basis. Managers have the authority to make most business decisions without the board's specific approval. The board's mandate is to oversee the management to ensure that it acts in the best interests of shareholders.

The members of the board are elected at the annual meeting. Shareholders who do not attend the annual meeting can vote by *proxy,* empowering another party to vote in their name. Management usually solicits the proxies of shareholders and normally gets a vast majority of these proxy votes. Thus, management usually has considerable discretion to run the firm as it sees fit—without daily oversight from the equityholders who actually own the firm.

We noted in Chapter 1 that such separation of ownership and control can give rise to "agency problems," in which managers pursue goals not in the best interests of shareholders. However, several mechanisms alleviate these problems. Among these are compensation schemes that link the success of the manager to that of the firm; oversight by the board of directors as well as outsiders such as security analysts, creditors, or large institutional investors; the threat of a proxy contest in which unhappy shareholders attempt to replace the current management team; or the threat of a takeover by another firm.

The common stock of most large corporations can be bought or sold freely on one or more stock markets. A corporation whose stock is not publicly traded is said to be private. In most privately held corporations, the owners of the firm also take an active role in its management. Therefore, takeovers are generally not an issue.

Characteristics of Common Stock

The two most important characteristics of common stock as an investment are its **residual claim** and **limited liability** features.

Residual claim means that stockholders are the last in line of all those who have a claim on the assets and income of the corporation. In a liquidation of the firm's assets, the shareholders have a claim to what is left after all other claimants such as the tax authorities, employees, suppliers, bondholders, and other creditors have been paid. For a firm not in liquidation, shareholders have claim to the part of operating income left over after interest and taxes have been paid. Management can either pay this residual as cash dividends to shareholders or reinvest it in the business to increase the value of the shares.

Limited liability means that the most shareholders can lose in the event of failure of the corporation is their original investment. Unlike owners of unincorporated businesses, whose creditors can lay claim to the personal assets of the owner (house, car, furniture), corporate shareholders may at worst have worthless stock. They are not personally liable for the firm's obligations.

✅ Concept Check **2.3**

> a. If you buy 100 shares of IBM stock, to what are you entitled?
> b. What is the most money you can make on this investment over the next year?
> c. If you pay $115 per share , what is the most money you could lose over the year?

Stock Market Listings

Figure 2.8 presents key trading data for a small sample of stocks traded on the New York Stock Exchange. The NYSE is one of several markets in which investors may buy or sell shares of stock. We will examine these markets in detail in Chapter 3.

NAME	SYMBOL	CLOSE	NET CHG	VOLUME	52 WK HIGH	52 WK LOW	DIV	YIELD	P/E	YTD %CHG
Herbalife Nutrition	HLF	57.94	−1.39	1,149,773	60.41	34.16	~.~	^.~	~.~	−~.~
Herc Holdings	HRI	26.86	−.~	389,826	72.99	24.16	....	....	.~	.~
Heritage Insurance Holdings	HRTG	~.~	−.~	81,929	19.15	~.~	.~	1.65	~.~	−.~
Hersha Hospitality Trust Cl A	HT	16.59	−0.16	732,879	24.16	16.50	.~	6.75	...dd	−~.~
Hershey	HSY	106.24	.~	1,145,889	114.63	89.10	2.89	^.~	~.~	−.~
Hertz Global Holdings	HTZ	~.~	−.~	2,965,201	~.~	~.~	....	....	^.~	−^.~
Hess Corp.	HES	42.39	.~	5,969,511	~.~	35.59	.~	2.36	...dd	4.67
Hess Midstream Partners	HESM	~.~	.~	47,899	~.~	16.17	~.~	~.~	14.60	~.~
Hewlett Packard Enterprise	HPE	~.~	−.~	11,756,695	19.48	12.09	.~	.~	11.46	−.~

Figure 2.8 Listing of stocks traded on the New York Stock Exchange

Source: *WSJ Online,* January 4, 2019.

To interpret Figure 2.8, consider the highlighted listing for Hershey. The table provides the ticker symbol (HSY), the closing price of the stock ($106.24), and its change ($.80) from the previous trading day. About 1.1 million shares of Hershey traded on this day. The listing also provides the highest and lowest prices at which the stock has traded in the last 52 weeks. The 2.89 value in the Dividend column means that the last quarterly dividend payment was $.7225 per share, which is consistent with annual dividend payments of $.7225 × 4 = $2.89. This corresponds to an annual dividend yield (i.e., annual dividend per dollar paid for the stock) of $2.89/$106.24 = .0272, or 2.72%.

The dividend yield is only part of the return on a stock investment. It ignores prospective **capital gains** (i.e., price increases) or losses. Low-dividend firms presumably offer greater prospects for capital gains, or investors would not be willing to hold these stocks in their portfolios. If you scan Figure 2.8, you will see that dividend yields vary widely across companies.

The P/E ratio, or **price–earnings ratio,** is the ratio of the current stock price to last year's earnings per share. The P/E ratio tells us how much stock purchasers must pay per dollar of earnings that the firm generates. For Hershey, the ratio of price to earnings is 22.00. The P/E ratio also varies widely across firms. Where the dividend yield and P/E ratio are not reported in Figure 2.8, the firms have zero dividends, or zero or negative earnings. We shall have much to say about P/E ratios in Chapter 18. Finally, we see that Hershey's stock price has decreased by 0.88% since the beginning of the year.

Preferred Stock

Preferred stock has features similar to both equity and debt. Like a bond, it promises to pay a fixed amount of income each year. In this sense, preferred stock is similar to an infinite-maturity bond, that is, a perpetuity. It also resembles a bond in that it does not convey voting power regarding the management of the firm. Preferred stock is nevertheless an equity investment. The firm retains discretion to make the dividend payments to the preferred stockholders; it has no contractual obligation to pay those dividends. Instead, preferred dividends are usually *cumulative;* that is, unpaid dividends cumulate and must be paid in full before any dividends may be paid to holders of common stock. In contrast, the firm does have a contractual obligation to make the interest payments on the debt. Failure to make these payments sets off corporate bankruptcy proceedings.

Preferred stock also differs from bonds in terms of tax treatment. Because preferred stock payments are treated as dividends rather than interest, they are not tax-deductible expenses for the firm. This disadvantage is somewhat offset by the fact that corporations may exclude 50% of dividends received from domestic corporations when they compute taxable income. (Until 2018, the dividend exclusion was 70%.) Preferred stocks therefore make desirable fixed-income investments for some corporations.

Even though preferred stock ranks after bonds in terms of the priority of its claims to the assets of the firm in the event of corporate bankruptcy, it often sells at lower yields. Presumably, this reflects the value of the 50% dividend exclusion because the higher risk of preferred stock would tend to result in higher yields than those offered by bonds. Individual investors, who cannot use the tax exclusion, generally will find preferred stock yields unattractive relative to those on other assets.

Preferred stock is issued in variations similar to those of corporate bonds. It may be callable, in which case it is said to be *redeemable.* It also may be convertible into common stock at some specified conversion ratio. Adjustable-rate preferred stock is another variation that, like adjustable-rate bonds, ties the dividend to current market interest rates.

Depositary Receipts

American Depositary Receipts, or ADRs, are certificates traded in U.S. markets that represent ownership in shares of a foreign company. Each ADR may correspond to ownership of a fraction of a foreign share, one share, or several shares of the foreign corporation. ADRs were created to make it easier for foreign firms to satisfy U.S. security registration requirements. They are the most common way for U.S. investors to directly invest in and trade the shares of foreign corporations.

2.4   Stock and Bond Market Indexes

Stock Market Indexes

The daily performance of the Dow Jones Industrial Average is a staple portion of the evening news. Although the Dow is the best-known measure of the performance of the stock market, it is only one of several indicators, and far from the best. Other more broadly based indexes are computed and published daily. In addition, several indexes of bond market performance are widely available.

The ever-increasing role of international trade and investments has made indexes of foreign financial markets part of the general news as well. Thus, foreign stock exchange indexes such as the Nikkei Average of Tokyo and the Financial Times index of London are fast becoming household names.

Dow Jones Industrial Average

The Dow Jones Industrial Average (DJIA) of 30 large, "blue-chip" corporations has been computed since 1896. Its long history probably accounts for its preeminence in the public mind. (The average covered only 20 stocks until 1928.)

Originally, the DJIA was calculated as the average price of the stocks included in the index. Thus, one would add up the prices of the 30 stocks in the index and divide by 30. The percentage change in the DJIA would then be the percentage change in the average price of the 30 shares.

Therefore, the percentage change in the DJIA measures the return (excluding dividends) on a portfolio that invests one share in each of the 30 stocks in the index. The value of such a portfolio (holding one share of each stock in the index) is the sum of the 30 prices. Because the percentage change in the *average* of the 30 prices is the same as the percentage change in the *sum* of the 30 prices, the index and the portfolio have the same percentage change each day.

Because the Dow corresponds to a portfolio that holds one share of each component stock, the investment in each company in that portfolio is proportional to the company's share price. Therefore, the Dow is called a **price-weighted average.**

Example 2.2   Price-Weighted Average

Consider the data in Table 2.2 for a hypothetical two-stock version of the Dow Jones Average. Let's compare the changes in the value of the portfolio holding one share of each firm and the price-weighted index. Stock ABC starts at $25 a share and increases to $30. Stock XYZ starts at $100, but falls to $90.

Portfolio:	Initial value = $25 + $100 = $125
	Final value = $30 + $90 = $120
	Percentage change in portfolio value = −5/125 = −.04 = −4%
Index:	Initial index value = (25 + 100)/2 = 62.5
	Final index value = (30 + 90)/2 = 60
	Percentage change in index = −2.5/62.5 = −.04 = −4%

The portfolio and the index have identical 4% declines in value.

Notice that price-weighted averages give higher-priced shares more weight in determining performance of the index. For example, although ABC increased by 20%, while XYZ fell by only 10%, the index dropped in value. This is because the 20% increase in ABC represented a smaller price gain ($5 per share) than the 10% decrease in XYZ ($10 per share). The "Dow portfolio" has four times as much invested in XYZ as in ABC because XYZ's price is four times that of ABC. We conclude that a high-price stock can dominate a price-weighted average.

Table 2.2

Data to construct stock price indexes

Stock	Initial Price	Final Price	Shares (million)	Initial Value of Outstanding Stock ($ million)	Final Value of Outstanding Stock ($ million)
ABC	$ 25	$30	20	$500	$600
XYZ	100	90	1	100	90
Total				$600	$690

You might wonder why the DJIA is now (in early 2019) at a level of about 24,000 if it is supposed to be the average price of the 30 stocks in the index. The DJIA no longer equals the average price of the 30 stocks because the averaging procedure is adjusted whenever a stock splits or pays a stock dividend of more than 10%, or when one company in the group of 30 industrial firms is replaced by another. When these events occur, the divisor used to compute the "average price" is adjusted so as to leave the index unaffected by the event.

Example 2.3   Splits and Price-Weighted Averages

Suppose XYZ from Example 2.2 splits two for one so that its share price falls to $50. We would not want the average to fall, as that would incorrectly indicate a fall in the general level of market prices. Following a split, the divisor is reduced to a value that leaves the average unaffected.

We find the new divisor using the post-split price data from Table 2.3. The index value before the stock split = 125/2 = 62.5. We must find a new divisor, d, that leaves the index unchanged after XYZ splits and its price falls to $50. Therefore, we solve for d in the following equation:

$$\frac{\text{Price of ABC} + \text{Price of XYZ}}{d} = \frac{25 + 50}{d} = 62.5$$

which implies that the divisor must fall from its original value of 2.0 to a new value of 1.20.

Because the split changes the price of stock XYZ, it changes the relative weights of the two stocks in the price-weighted average. Therefore, the return of the index is also affected.

At period-end, ABC will sell for $30, while XYZ will sell for $45, representing the same negative 10% return it was assumed to earn in Table 2.2. The new value of the price-weighted average will be (30 + 45)/1.20 = 62.5, the same as its value at the start of the year; therefore, the rate of return is zero, rather than the −4% return that we calculated in the absence of a split.

The split reduces the relative weight of XYZ because its initial price is lower, and because XYZ is the poorer performing stock, the performance of the average is higher. We see that the implicit weighting scheme of a price-weighted average is somewhat arbitrary, being determined by the prices rather than by the outstanding market values (price per share times number of shares) of the shares in the average.

Stock	Initial Price	Final Price	Shares (million)	Initial Value of Outstanding Stock ($ million)	Final Value of Outstanding Stock ($ million)
ABC	$25	$30	20	$500	$600
XYZ	50	45	2	100	90
Total				$600	$690

Table 2.3

Data to construct stock price indexes after a stock split

In the same way that the divisor is updated for stock splits, if one firm is dropped from the average and another firm with a different price is added, the divisor has to be updated to leave the average unchanged by the substitution. By 2019, the divisor for the Dow Jones Industrial Average had fallen to a value of about .1475.

Because the Dow Jones averages are based on small numbers of firms, care must be taken to ensure that they are representative of the broad market. As a result, the composition of the average is changed every so often to reflect changes in the economy. Table 2.4 presents the composition of the Dow industrials in 1928 as well as its composition as of 2019. The table presents striking evidence of the changes in the U.S. economy in the last 90 years. Many of the "bluest of the blue chip" companies in 1928 no longer exist, and the industries that were the backbone of the economy in 1928 have given way to some that could not have been imagined at the time.

Dow Industrials in 1928	Current Dow Companies	Ticker Symbol	Industry	Year Added to Index
Wright Aeronautical	3M	MMM	Diversified industrials	1976
Allied Chemical	American Express	AXP	Consumer finance	1982
North American	Apple	AAPL	Electronic equipment	2015
Victor Talking Machine	Boeing	BA	Aerospace and defense	1987
International Nickel	Caterpillar	CAT	Construction	1991
International Harvester	Chevron	CVX	Oil and gas	2008
Westinghouse	Cisco Systems	CSCO	Computer equipment	2009
Texas Gulf Sulphur	Coca-Cola	KO	Beverages	1987
Texas Corp	Disney	DIS	Broadcasting and entertainment	1991
Standard Oil (NJ)	DowDuPont	DWDP	Chemicals	1935
General Electric	ExxonMobil	XOM	Oil and gas	1928
American Tobacco	Goldman Sachs	GS	Investment banking	2013
Sears Roebuck	Home Depot	HD	Home improvement retailers	1999
General Motors	Intel	INTC	Semiconductors	1999
Chrysler	IBM	IBM	Computer services	1979
Atlantic Refining	Johnson & Johnson	JNJ	Pharmaceuticals	1997
Paramount Publix	JPMorgan Chase	JPM	Banking	1991
Bethlehem Steel	McDonald's	MCD	Restaurants	1985
General Railway Signal	Merck	MRK	Pharmaceuticals	1979
Mack Trucks	Microsoft	MSFT	Software	1999
Union Carbide	Nike	NKE	Apparel	2013
American Smelting	Pfizer	PFE	Pharmaceuticals	2004
American Can	Procter & Gamble	PG	Household products	1932
Postum Inc	Travelers	TRV	Insurance	2009
Nash Motors	UnitedHealth Group	UNH	Health insurance	2012
American Sugar	United Technologies	UTX	Aerospace	1939
Goodrich	Verizon	VZ	Telecommunications	2004
Radio Corp	Visa	V	Electronic payments	2013
Woolworth	Walgreens Boots	WBA	Pharmaceuticals	2018
U.S. Steel	Walmart	WMT	Retailers	1997

Table 2.4

Companies included in the Dow Jones Industrial Average: 1928 and 2019

✅ Concept Check **2.4**

Suppose the price of XYZ in Table 2.2 increases to $110, while ABC falls to $20. Find the percentage change in the price-weighted average of these two stocks. Compare that to the percentage return of a portfolio holding one share in each company.

The Standard & Poor's 500 Index

The Standard & Poor's Composite 500 (S&P 500) stock index represents an improvement over the Dow Jones Averages in two ways. First, it is a more broadly based index of about 500 firms. Second, it is a **market-value-weighted index.** For firms XYZ and ABC in Example 2.2, the S&P 500 would give ABC five times the weight given to XYZ because the market value of its outstanding equity is five times larger, $500 million versus $100 million.

The S&P 500 is computed by calculating the total market value of the 500 firms in the index and the total market value of those firms on the previous day of trading. The percentage increase in the total market value from one day to the next represents the increase in the index. The rate of return of the index equals the rate of return that would be earned by an investor holding a portfolio of all 500 firms in the index in proportion to their market values, except that the index does not reflect dividends paid by those firms.

Actually, most indexes today use a modified version of market-value weights. Rather than weighting by total market value, they weight by the market value of *free float,* that is, by the value of shares that are freely tradable among investors. For example, this procedure does not count shares held by founding families or governments. These shares are effectively not available for investors to purchase. The distinction is more important in Japan and Europe, where a higher fraction of shares are held in such nontraded portfolios.

Example 2.4   Value-Weighted Indexes

To illustrate how value-weighted indexes are computed, look again at Table 2.2. The final value of all outstanding stock in our two-stock universe is $690 million. The initial value was $600 million. Therefore, if the initial level of a market-value-weighted index of stocks ABC and XYZ were set equal to an arbitrarily chosen starting value such as 100, the index value at year-end would be $100 \times (690/600) = 115$.   The increase in the index reflects the 15% return earned on a portfolio consisting of those two stocks held in proportion to outstanding market values.

Unlike the price-weighted index, the value-weighted index gives more weight to ABC. Whereas the price-weighted index fell because it was dominated by higher-price XYZ, the value-weighted index rises because it gives more weight to ABC, the stock with the higher total market value.

Note also from Tables 2.2 and 2.3 that market-value-weighted indexes are unaffected by stock splits. The total market value of the outstanding XYZ stock decreases from $100 million to $90 million regardless of the stock split, thereby rendering the split irrelevant to the performance of the index.

✅ Concept Check **2.5**

Reconsider companies XYZ and ABC from Concept Check 2.4. Calculate the percentage change in the market-value-weighted index. Compare that to the rate of return of a portfolio that holds $500 of ABC stock for every $100 of XYZ stock (i. e., an index portfolio).

A nice feature of both market-value-weighted and price-weighted indexes is that they reflect the returns to straightforward portfolio strategies. If you buy shares in each component firm in the index in proportion to its outstanding market value, your return will match that of the value-weighted index. Similarly, a price-weighted index tracks the returns on a portfolio comprised of an equal number of shares of each firm.

Investors can easily buy market indexes for their portfolios. One way is to purchase shares in mutual funds that hold shares in proportion to their representation in the S&P 500 or another index. These **index funds** earn a return equal to that of the index and so provide a low-cost passive investment strategy for equity investors. Another approach is to purchase an *exchange-traded fund,* or ETF, which is a portfolio of shares that can be bought or sold as a unit, just as one can buy or sell a single share of stock. Available ETFs range from portfolios that track extremely broad global market indexes all the way to narrow industry indexes. We discuss both mutual funds and ETFs in detail in Chapter 4.

Other U.S. Market-Value Indexes

The New York Stock Exchange publishes a market-value-weighted composite index of all NYSE-listed stocks, in addition to subindexes for industrial, utility, transportation, and financial stocks. NASDAQ computes a Composite index of more than 3,000 firms traded on the NASDAQ market. The NASDAQ 100 is a subset of the larger firms in the Composite Index, but it accounts for a large fraction of its total market capitalization.

The ultimate U.S. equity index so far computed is the Wilshire 5000 index of the market value of essentially all actively traded stocks in the U.S. At one point, it included more than 5,000 stocks, but today, there are only about 3,500 stocks in the index. A similar comprehensive index is published by CRSP (the Center for Research in Security Prices at the University of Chicago).

Equally Weighted Indexes

Market performance is sometimes measured by an equally weighted average of the returns of each stock in an index. Such an averaging technique, by placing equal weight on each return, corresponds to an implicit portfolio strategy that invests equal dollar values in each stock. This is in contrast to both price weighting (which requires equal numbers of shares of each stock) and market-value weighting (which requires investments in proportion to outstanding value).

Unlike price- or market-value-weighted indexes, equally weighted indexes do not correspond to buy-and-hold portfolio strategies. Suppose that you start with equal dollar investments in the two stocks of Table 2.2, ABC and XYZ. Because ABC increases in value by 20% over the year while XYZ decreases by 10%, your portfolio no longer is equally weighted. It is now more heavily invested in ABC. To reset the portfolio to equal weights, you would need to rebalance: Sell off some ABC stock and/or purchase more XYZ stock. Such rebalancing would be necessary to align the return on your portfolio with that on the equally weighted index.

Foreign and International Stock Market Indexes

Development in financial markets worldwide includes the construction of indexes for these markets. Among these are the Nikkei (Japan), FTSE (U.K.; pronounced "footsie"), DAX (Germany), Hang Seng (Hong Kong), and TSX (Canada).

Regional Indexes		Countries	
Developed Markets	Emerging Markets	Developed Markets	Emerging Markets
EAFE (Europe, Australia, Far East)	Emerging Markets (EM)	Australia	Brazil
Europe	EM Asia	Austria	Chile
European Monetary Union (EMU)	EM Eastern Europe	Belgium	China
Far East	EM Europe	Canada	Colombia
Kokusai (World excluding Japan)	EM Europe and Middle East	Denmark	Czech Republic
Nordic countries	EM Far East	Finland	Egypt
North America	EM Latin America	France	Greece
Pacific		Germany	Hungary
World		Hong Kong	India
World excluding U.S.		Ireland	Indonesia
		Israel	Korea
		Italy	Malaysia
		Japan	Mexico
		Netherlands	Peru
		New Zealand	Philippines
		Norway	Poland
		Portugal	Russia
		Singapore	South Africa
		Spain	Taiwan
		Sweden	Thailand
		Switzerland	Turkey
		U.K.	
		U.S.	

Table 2.5

Sample of MSCI stock indexes
Source: MSCI, **www.msci.com.**

A leader in the construction of international indexes has been MSCI (Morgan Stanley Capital International), which computes dozens of country indexes and several regional indexes. Table 2.5 presents many of the indexes computed by MSCI.

Bond Market Indicators

Just as stock market indexes provide guidance concerning the performance of the overall stock market, several bond market indicators measure the performance of various categories of bonds. The most well-known indexes are those of Merrill Lynch, Barclays, and the Citi Broad Investment Grade Bond Index. Figure 2.9 shows the components of the U.S. fixed-income market in 2018.

The major problem with bond market indexes is that rates of return on many bonds are difficult to compute because the infrequency with which the bonds trade makes reliable up-to-date prices difficult to obtain. In practice, some prices must be estimated from bond-valuation models. These "matrix" prices may differ from true market values.

Figure 2.9 The U.S. fixed-income market (values in $ billions)

Source: Securities Industry & Financial Markets Association, **www.sifma.org** October, 2018.
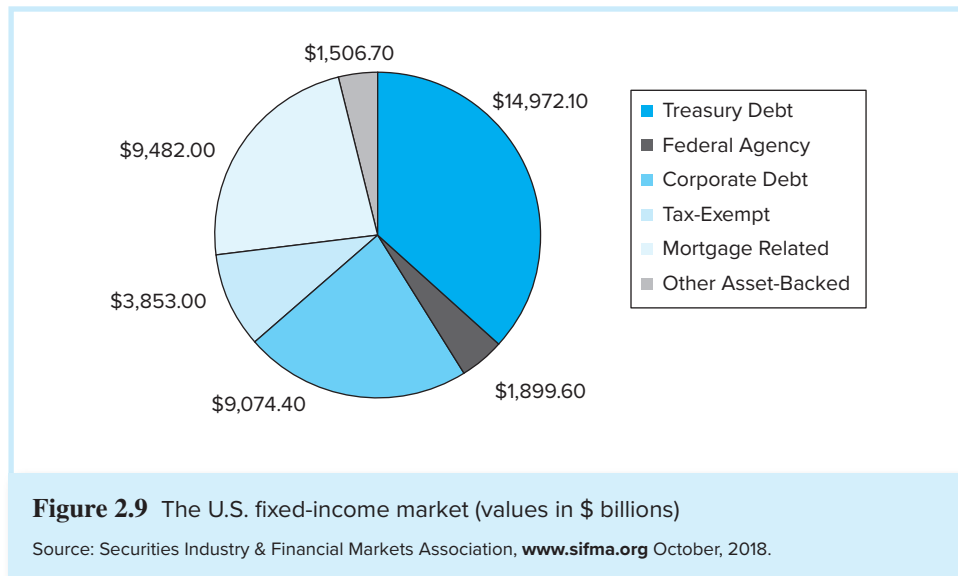
2.5   Derivative Markets

Futures, options, and related derivatives contracts provide payoffs that depend on the values of other variables such as commodity prices, bond and stock prices, interest rates, or market index values. For this reason, these instruments sometimes are called **derivative assets:** Their values *derive from* the values of other assets. These assets are also called **contingent claims** because their payoffs are contingent on the value of other values.

Options

A **call option** gives its holder the right to purchase an asset for a specified price, called the **exercise** or **strike price,** on or before a specified expiration date. For example, a January expiration call option on Microsoft stock with an exercise price of $100 entitles its owner to purchase Microsoft stock for a price of $100 at any time up to and including the expiration date. Each option contract is for the purchase of 100 shares. However, quotations are made on a per-share basis. The holder of the call need not exercise the option; it will be profitable to exercise only if the market value of the asset that may be purchased exceeds the exercise price.

When the market price exceeds the exercise price, the option holder may "call away" the asset for the exercise price and reap a payoff equal to the difference between the stock price and the exercise price. Otherwise, the option will be left unexercised. If not exercised before the expiration date of the contract, the option simply expires and no longer has value. Calls therefore provide greater profits when stock prices increase and thus represent bullish investment vehicles.

In contrast, a **put option** gives its holder the right to *sell* an asset for a specified exercise price on or before a specified expiration date. A January expiration put on Microsoft with an exercise price of $100 thus entitles its owner to sell Microsoft stock to the put writer at a price of $100 at any time before expiration in January, even if the market price of Microsoft is lower than $100. Whereas profits on call options increase when the asset price

Expiration	Strike	Call	Put
18-Jan-2019	95	7.65	0.98
18-Jan-2019	100	3.81	2.20
18-Jan-2019	105	1.45	4.79
8-Feb-2019	95	9.50	2.86
8-Feb-2019	100	5.60	3.92
8-Feb-2019	105	3.08	6.35

Table 2.6

Prices of stock options on Microsoft, January 2, 2019

Note: Microsoft stock on this day was $101.51.
Source: Compiled from data downloaded from Yahoo! Finance.

increases, profits on put options increase when the asset price falls. The put is exercised only if its holder can deliver an asset worth less than the exercise price in return for the exercise price.

Table 2.6 presents prices of Microsoft options on January 2, 2019. The price of Microsoft shares on this date was $101.51. The first two columns give the expiration date and exercise (or strike) price for each option. We have included listings for call and put options with exercise prices of $95, $100, and $105 per share and with expiration dates in January and February.

For example, the February 8 expiration call option to purchase one share of Microsoft at an exercise price of $100 last traded at $5.60. Each option *contract* (on 100 shares) therefore cost $560.

Notice that the prices of call options decrease as the exercise price increases. For example, the February expiration call with exercise price $105 costs only $3.08. This makes sense because the right to purchase a share at a higher price is less valuable. Conversely, put prices increase with the exercise price. The right to sell Microsoft at a price of $100 in February costs $3.92, while the right to sell at $105 costs $6.35.

Option prices also increase with time until expiration. Clearly, one would rather have the right to buy Microsoft for $100 at any time until February 8 rather than at any time until January 18. Not surprisingly, this shows up in a higher price for the longer expiration options. For example, the call with exercise price $100 expiring in February sells for $5.60 compared to only $3.81 for the January call.

✓ Concept Check **2.6**

What would be the profit or loss per share to an investor who bought the January 2019 expiration Microsoft call option with exercise price $105 if the stock price at the expiration date is $109? What about a purchaser of the put option with the same exercise price and expiration?

Futures Contracts

A **futures contract** calls for delivery of an asset (or, in some cases, its cash value) at a specified delivery or maturity date for an agreed-upon price, called the futures price, to be paid at contract maturity. The *long position* is held by the trader who commits to purchasing the asset on the delivery date. The trader who takes the *short position* commits to delivering the asset at contract maturity.

Table 2.7

Corn futures prices
on the Chicago
Mercantile Exchange,
January 3, 2019

Maturity	Last	Change	High	Low
Mar-19	3.8025	0.7500	3.8075	3.7975
May-19	3.8800	0.5000	3.8800	3.8750
Jul-19	3.9500	0.2500	3.9525	3.9450
Sep-19	3.9700	0.0000	3.9700	3.9650
Dec-19	4.0075	–0.5000	4.0100	4.0025
Mar-20	4.0975	0.0000	4.1000	4.0950

Source: **www.cmegroup.com**.

Table 2.7 presents corn futures contracts on the Chicago Mercantile Exchange on January 3, 2019. Each contract calls for delivery of 5,000 bushels of corn. The first entry is for the nearest term or "front" contract, with maturity in March 2019. The futures price for delivery in March was $3.8025 per bushel.

The trader holding the long position profits from price increases. Suppose that at contract maturity, corn is selling for $3.8225 per bushel. The long position trader who entered the contract on January 3 would pay the previously agreed-upon price of $3.80225 for each bushel of corn, which at contract maturity would be worth $3.8225.

Because each contract calls for delivery of 5,000 bushels, the profit to the long position would equal $5,000 \times (\$3.8225 - \$3.8025) = \$100$. Conversely, the short position must deliver 5,000 bushels for the previously agreed-upon futures price. The short position's loss equals the long position's profit.

The right to purchase the asset at an agreed-upon price, as opposed to the obligation, distinguishes call options from long positions in futures contracts. A futures contract *obliges* the long position to purchase the asset at the futures price; the call option, in contrast, *conveys the right* to purchase the asset at the exercise price. The purchase will be made only if it yields a profit.

Clearly, a holder of a call has a better position than the holder of a long position on a futures contract with a futures price equal to the option's exercise price. This advantage, of course, comes only at a price. Call options must be purchased; futures contracts are entered into without cost. The purchase price of an option is called the *premium*. It represents the compensation the purchaser of the call must pay for the ability to exercise the option only when it is profitable to do so. Similarly, the difference between a put option and a short futures position is the right, as opposed to the obligation, to sell an asset at an agreed-upon price.

SUMMARY

1. Money market securities are very-short-term debt obligations. They are usually highly marketable and have relatively low credit risk. Their low maturities and low credit risk ensure minimal capital gains or losses. These securities trade in large denominations, but they may be purchased indirectly through money market funds.

2. Much of U.S. government borrowing is in the form of Treasury bonds and notes. These are coupon-paying bonds usually issued at or near par value. Treasury notes and bonds are similar in design to coupon-paying corporate bonds.

3. Municipal bonds are distinguished largely by their tax-exempt status. Interest payments (but not capital gains) on these securities are exempt from federal income taxes. The equivalent taxable yield offered by a municipal bond equals $r_{muni}/(1 - t)$, where r_{muni} is the municipal yield and t is the investor's tax bracket.

4. Mortgage pass-through securities are pools of mortgages sold in one package. Owners of pass-throughs receive the principal and interest payments made by the borrowers. The originator that issued the mortgage merely services it and "passes through" the payments to the purchasers of the mortgage. A federal agency may guarantee the payments of interest and principal on

mortgages pooled into its pass-through securities, but these guarantees are absent in private-label pass-throughs.

5. Common stock is an ownership share in a corporation. Each share entitles its owner to one vote on matters of corporate governance and to a prorated share of the dividends paid to shareholders. Stock (equivalently, equity) owners are the residual claimants on the income earned by the firm.

6. Preferred stock usually pays fixed dividends for the life of the firm; it is a perpetuity. A firm's failure to pay the dividend due on preferred stock, however, does not precipitate corporate bankruptcy. Instead, unpaid dividends simply cumulate. Variants of preferred stock include convertible and adjustable-rate issues.

7. Many stock market indexes measure the performance of the overall market. The Dow Jones averages, the oldest and best-known indicators, are price-weighted indexes. Today, many broad-based, market-value-weighted indexes are computed daily. These include the Standard & Poor's 500 stock index, the NASDAQ index, the Wilshire 5000 index, and indexes of many non-U.S. stock markets.

8. A call option is a right to purchase an asset at a stipulated exercise price on or before an expiration date. A put option is the right to sell an asset at some exercise price. Calls increase in value while puts decrease in value as the price of the underlying asset increases.

9. A futures contract is an obligation to buy or sell an asset at a stipulated futures price on a maturity date. The long position, which commits to purchasing, gains if the asset value increases while the short position, which commits to delivering, loses.

KEY TERMS

money market
capital markets
ask price
bid price
bid–ask spread
certificate of deposit
commercial paper
banker's acceptance
Eurodollars
repurchase agreements
federal funds

London Interbank Offered Rate (LIBOR)
Treasury notes
Treasury bonds
yield to maturity
municipal bonds
equivalent taxable yield
equities
residual claim
limited liability
capital gains

price–earnings ratio
preferred stock
price-weighted average
market-value-weighted index
index funds
derivative assets (or contingent claims)
call option
exercise (or strike) price
put option
futures contract

KEY EQUATIONS

Equivalent taxable yield: $\frac{r_{muni}}{1-t}$, where r_{muni} is the rate on tax-free municipal debt and t is the federal plus state combined tax rate

Cutoff tax rate (for indifference to taxable versus tax-free bonds): $1 - \frac{r_{muni}}{r_{taxable}}$

PROBLEM SETS

1. In what ways is preferred stock like long-term debt? In what ways is it like equity?
2. Why are money market securities sometimes referred to as "cash equivalents"?
3. Which of the following *correctly* describes a repurchase agreement?
   a. The sale of a security with a commitment to repurchase the same security at a specified future date and a designated price.
   b. The sale of a security with a commitment to repurchase the same security at a future date left unspecified, at a designated price.
   c. The purchase of a security with a commitment to purchase more of the same security at a specified future date.

KAPLAN

SCHWESER

4. What would you expect to happen to the spread between yields on commercial paper and Treasury bills if the economy were to enter a steep recession?

5. What are the key differences between common stock, preferred stock, and corporate bonds?

6. Why are high-tax-bracket investors more inclined to invest in municipal bonds than low-bracket investors?

7. Turn back to Figure 2.3 and look at the Treasury bond maturing in August 2048.

    a. How much would you have to pay to purchase one of these bonds?
    b. What is its coupon rate?
    c. What is the yield to maturity of the bond?

8. Suppose investors can earn a return of 2% per 6 months on a Treasury note with 6 months remaining until maturity. What price would you expect a 6-month-maturity Treasury bill to sell for?

9. Find the after-tax return to a corporation that buys a share of preferred stock at $40, sells it at year-end at $40, and receives a $4 year-end dividend. The firm is in the 21% tax bracket.

10. Turn to Figure 2.8 and look at the listing for Herbalife.

    a. How many shares could you buy for $5,000?
    b. What would be your annual dividend income from those shares?
    c. What must be Herbalife's earnings per share?
    d. What was the firm's closing price on the day before the listing?

11. Consider the three stocks in the following table. P_t represents price at time t, and Q_t represents shares outstanding at time t. Stock C splits two for one in the last period.

	P_0	Q_0	P_1	Q_1	P_2	Q_2
A	90	100	95	100	95	100
B	50	200	45	200	45	200
C	100	200	110	200	55	400

    a. Calculate the rate of return on a price-weighted index of the three stocks for the first period $(t = 0$ to $t = 1)$.
    b. What must happen to the divisor for the price-weighted index in year 2?
    c. Calculate the rate of return for the second period $(t = 1$ to $t = 2)$.

12. Using the data in the previous problem, calculate the first-period rates of return on the following indexes of the three stocks:

    a. A market-value-weighted index.
    b. An equally weighted index.

13. An investor is in a 30% combined federal plus state tax bracket. If corporate bonds offer 6% yields, what yield must municipals offer for the investor to prefer them to corporate bonds?

14. Find the equivalent taxable yield of a short-term municipal bond with a yield of 4% for tax brackets of (a) zero, (b) 10%, (c) 20%, and (d) 30%.

15. What problems would confront a mutual fund trying to create an index fund tied to an equally weighted index of a broad stock market?

16. Which security should sell at a greater price?

    a. A 10-year Treasury bond with a 4% coupon rate versus a 10-year T-bond with a 5% coupon.
    b. A 3-month expiration call option with an exercise price of $40 versus a 3-month call on the same stock with an exercise price of $35.
    c. A put option on a stock selling at $50 or a put option on another stock selling at $60 (all other relevant features of the stocks and options may be assumed to be identical).

17. Look at the futures listings for the corn contract in Table 2.7. Suppose you buy one contract for March 2019 delivery. If the contract closes in March at a level of 4.06, what will your profit be?

18. Turn back to Table 2.6 and look at the Microsoft options. Suppose you buy a January expiration call option with exercise price $100.

    a. Suppose the stock price in January is $103. Will you exercise your call? What is the profit on your position?
    b. What if you had bought the January call with exercise price $95?
    c. What if you had bought a January put with exercise price $105?

19. Why do call options with exercise prices greater than the price of the underlying stock sell for positive prices?

20. Both a call and a put currently are traded on stock XYZ; both have strike prices of $50 and expirations of 6 months. What will be the profit to an investor who buys the call for $4 in the following scenarios for stock prices in 6 months? What will be the profit in each scenario to an investor who buys the put for $6?

    a. $40
    b. $45
    c. $50
    d. $55
    e. $60

21. Explain the difference between a put option and a short position in a futures contract.

22. Explain the difference between a call option and a long position in a futures contract.

1. A firm's preferred stock often sells at yields below its bonds because

    a. Preferred stock generally carries a higher agency rating.
    b. Owners of preferred stock have a prior claim on the firm's earnings.
    c. Owners of preferred stock have a prior claim on a firm's assets in the event of liquidation.
    d. Corporations owning stock may exclude from income taxes most of the dividend income they receive.

2. A municipal bond carries a coupon of 6.75% and is trading at par. What is the equivalent taxable yield to a taxpayer in a combined federal plus state 34% tax bracket?

3. Which is the *most risky* transaction to undertake in the stock index option markets if the stock market is expected to increase substantially after the transaction is completed?

    a. Write a call option.
    b. Write a put option.
    c. Buy a call option.
    d. Buy a put option.

4. Short-term municipal bonds currently offer yields of 4%, while comparable taxable bonds pay 5%. Which gives you the higher after-tax yield if your tax bracket is:

    a. Zero
    b. 10%
    c. 20%
    d. 30%

5. The coupon rate on a tax-exempt bond is 5.6%, and the rate on a taxable bond is 8%. Both bonds sell at par. At what tax bracket (marginal tax rate) would an investor be indifferent between the two bonds?

E-INVESTMENTS EXERCISES

1. You can get the Walt Disney Company's annual report (its 10-K) from the SEC's EDGAR site, **www.sec.gov/edgar/searchedgar/companysearch.html,** or you can find it using a simple Web search. Locate the company's Consolidated Balance Sheets and answer these questions:
   a. How much preferred stock is Disney authorized to issue? How much has been issued?
   b. How much common stock is Disney authorized to issue? How many shares are currently outstanding?
   c. Search for the term "Financing Activities." What is the total amount of borrowing listed for Disney? How much of this is medium-term notes?
   d. What other types of debt does Disney have outstanding?

2. Not all stock market indexes are created equal. Different methods are used to calculate various indexes, and different indexes will yield different assessments of "market performance." Using one of the following data sources, retrieve the stock price for five different firms on the first and last trading days of the previous month.
   www.nasdaq.com—Get a quote using the company's ticker symbol; then select *Interactive Charts* and specify one month. When the chart appears, click on a data point to display the underlying data.
   www.bloomberg.com—Go to the *Stocks* tab, and get a quote using the company's ticker symbol. Click on *View Full Chart.* Use the moving line to see the closing price today and one month ago.
   finance.yahoo.com—Get a quote; then click on *Historical Data* and specify a date range.
   a. Compute the monthly return on a price-weighted index of the five stocks.
   b. Compute the monthly return on a value-weighted index of the five stocks.
   c. Compare the two returns and explain their differences. Explain how you would interpret each measure.

✔ SOLUTIONS TO CONCEPT CHECKS

1. The bid price of the bond is 101.8984% of par, or $1,018.984. The ask price is 101.9297, or $1,019.297. This ask price corresponds to a yield of 2.902%. The ask price increased 1.5391 from its level yesterday, so the ask price then must have been 100.3906, or $1,003.906.

2. A 6% taxable return is equivalent to an after-tax return of $6(1 - .30) = 4.2\%$. Therefore, you would be better off in the taxable bond. The equivalent taxable yield of the tax-free bond is $4/(1 - .30) = 5.71\%$. So a taxable bond would have to pay a 5.71% yield to provide the same after-tax return as a tax-free bond offering a 4% yield.

3. a. You are entitled to a prorated share of IBM's dividend payments and to vote in any of IBM's stockholder meetings.
   b. Your potential gain is unlimited because the stock price has no upper bound.
   c. Your outlay was $115 \times 100 = \$11,500$. Because of limited liability, this is the most you can lose.

4. The price-weighted index increases from 62.5 [i.e., $(100 + 25)/2$] to 65 [i.e., $(110 + 20)/2$], a gain of 4%. An investment of one share in each company requires an outlay of $125 that would increase in value to $130, for a return of 4% (i.e., 5/125), which equals the return to the price-weighted index.

5. The market-value-weighted index return is calculated by computing the increase in the value of the stock portfolio. The portfolio of the two stocks starts with an initial value of $100 million + $500 million = $600 million and falls in value to $110 million + $400 million = $510 million, a loss of $90/600 = .15$, or 15%. The index portfolio return is a weighted average of the returns on each stock with weights of ⅙ on XYZ and ⅚ on ABC (weights proportional to relative investments). Because the return on XYZ is 10%, while that on ABC is −20%, the index portfolio return is $⅙ \times 10\% + ⅚ \times (-20\%) = -15\%$, equal to the return on the market-value-weighted index.

6. The payoff to the call option is $4 per share at expiration. The option cost is $1.45 per share. The dollar profit is therefore $2.55. The put option expires worthless. Therefore, the investor's loss is the cost of the put, or $4.79.