

FREQUENTLY USED SYMBOLS AND TERMS

α	alpha coefficient, a measure of a portfolio's "value added" return.	k	required rate of return.
ABS	asset-backed securities.	£	pound (United Kingdom currency).
APT	arbitrage pricing theory.	NAV	net asset value.
AUM	assets under management.	OAS	option-adjusted spread.
β	beta coefficient, a measure of an asset's systematic riskiness.	P	price of a share of stock or put option; P_0 is the current price.
C	call option value.	P/BV	price/book value ratio.
CAPM	capital asset pricing model.	P/CF	price/cash flow ratio.
CAR	cumulative average residuals.	P/E	price/earnings ratio.
CF	cash flow; CF_t is cash flow in period t .	PPP	purchasing power parity.
CML	capital market line.	P/S	price/sales ratio.
Cov_{ij}	covariance of the returns between assets i and j .	PV	present value.
D	dividend per share of stock; D_t is dividend per share during period t .	PVIF	present value interest factor for a lump sum.
D_p	Macaulay duration measure of portfolio p .	PVIFA	present value interest factor for an annuity.
DDM	dividend discount model.	r_{ij}	correlation coefficient between assets i and j .
€	euro currency.	RFR	rate of return on a risk-free asset.
EBIT	earnings before interest and taxes.	ROA	return on assets.
EBITDA	earnings before interest, taxes, depreciation, and amortization.	ROE	return on equity.
EMH	efficient market hypothesis.	RR	fraction of a firm's earnings retained rather than paid out. It is equal to $(1 - D/E)$, where D/E is the ratio of dividends (D) to earnings (E).
EPS	earnings per share.	S_p	Sharpe ratio portfolio performance measure.
$E(R)$	expected return; $E(R_t)$ is the expected return during period t .	SMB	size ("small minus big") risk factor.
ETY	equivalent taxable yield.	SML	security market line.
F	futures or forward contract delivery price.	Σ	summation sign (capital sigma).
FV	future value.	σ	standard deviation (lowercase sigma).
FVIF	future value interest factor for a lump sum.	σ_{ij}	covariance between returns for security i and j .
FVIFA	future value interest factor for an annuity.	t	tax rate or time when used as a subscript (e.g., D_t is the dividend in a year t).
FX	foreign exchange.	T	time to expiration.
GM	geometric mean.	TE	tracking error.
g	growth rate in earnings, dividends, or stock prices.	V	value of an asset; V_i is the value of asset i .
h	hedge ratio.	W_i	proportion of portfolio invested in asset i .
HML	value-growth ("high minus low") risk factor.	WACC	weighted average cost of capital.
HPR	holding period return.	X	option of exercise price.
HPY	holding period yield.	¥	yen (Japanese currency).
I	rate of inflation. $E(I)$ is the expected rate of inflation.	YTC	yield to call.
IR_p	information ratio portfolio performance measure.	YTM	yield to maturity.
MBS	mortgage-backed securities.		



Fit your coursework into your hectic life.

Make the most of your time by learning your way. Access the resources you need to succeed wherever, whenever.

- Get more from your time online with an easy-to-follow five-step learning path.
- Stay focused with an all-in-one-place, integrated presentation of course content.
- Get the free MindTap Mobile App and learn wherever you are.

Break limitations. Create your own potential, and be unstoppable with MindTap.

MINDTAP. POWERED BY YOU.

cengage.com/mindtap



Reilly ■ Brown ■ Leeds

Investment Analysis & Portfolio Management



Eleventh Edition



Investment Analysis & Portfolio Management

ELEVENTH EDITION

FRANK K. REILLY

University of Notre Dame

KEITH C. BROWN

University of Texas at Austin

SANFORD J. LEEDS

University of Texas at Austin

 **CENGAGE**

Australia • Brazil • Mexico • Singapore • United Kingdom • United States

**Investment Analysis & Portfolio
Management, Eleventh Edition**
Frank K. Reilly, Keith C. Brown, and
Sanford J. Leeds

Executive Product Director: Mike Schenk
Sr. Product Team Manager: Joe Sabatino
Project Manager: Julie Dierig
Content Developer:
Erica Longenbach, MPS
Product Assistant: Renee Schnee
Sr. Marketing Manager: Nathan Anderson
Digital Content Specialist: Timothy Ross
Digital Production Project Manager:
Scott Fidler
Manufacturing Planner: Kevin Kluck
Intellectual Property Analyst: Ann
Hoffman
Intellectual Property Project Manager:
Erika Mugavin
Sr. Art Director: Michelle Kunkler
Cover Image Credit: Revers /
Shutterstock.com
Cover Designer: Whirligig Studio/Kristina
Mose-Libon
Internal Designer: Lou Ann Thesing
Production Management, and
Composition: Lumina Datamatics, Inc.

© 2019, 2012 Cengage Learning, Inc.

Unless otherwise noted, all content is © Cengage

ALL RIGHTS RESERVED. No part of this work covered by the copyright herein may be reproduced or distributed in any form or by any means, except as permitted by U.S. copyright law, without the prior written permission of the copyright owner.

For product information and technology assistance, contact us at
Cengage Customer & Sales Support, 1-800-354-9706.

For permission to use material from this text or product,
submit all requests online at **www.cengage.com/permissions.**

Further permissions questions can be emailed to
permissionrequest@cengage.com.

Library of Congress Control Number: 2018930283

ISBN-13: 978-1-305-26299-7

Cengage

20 Channel Center Street
Boston, MA 02210
USA

Cengage is a leading provider of customized learning solutions with employees residing in nearly 40 different countries and sales in more than 125 countries around the world. Find your local representative at **www.cengage.com.**

Cengage products are represented in Canada by
Nelson Education, Ltd.

To learn more about Cengage platform and services, visit
www.cengage.com.

To register or access your online learning solution or purchase materials for your course, visit **www.cengagebrain.com.**

*To my best friend & wife,
Therese,
and the greatest gifts and
sources of our happiness,
Frank K. III, Charlotte, and Lauren
Clarence R. II, Michelle, Sophie, and Cara
Therese B. and Denise Z.
Edgar B., Lisa, Kayleigh, Madison J. T., Francesca, and Alessandra
—F. K. R.*

*To Sheryl, Alexander, and Andrew, who make it all worthwhile
—K. C. B.*

*To Jenny, Jay, John, and Genet, who bring meaning and happiness to my life.
—S. J. L.*



Brief Contents

Preface	xi
Acknowledgments	xvii
About the Authors	xxi

PART 1 The Investment Background 1

CHAPTER 1	The Investment Setting	3
CHAPTER 2	Asset Allocation and Security Selection	33
CHAPTER 3	Organization and Functioning of Securities Markets	69
CHAPTER 4	Security Market Indexes and Index Funds	95

PART 2 Developments in Investment Theory 123

CHAPTER 5	Efficient Capital Markets, Behavioral Finance, and Technical Analysis	125
CHAPTER 6	An Introduction to Portfolio Management	171
CHAPTER 7	Asset Pricing Models	209

PART 3 Valuation and Management of Common Stocks 249

CHAPTER 8	Equity Valuation	251
CHAPTER 9	The Top-Down Approach to Market, Industry, and Company Analysis	295
CHAPTER 10	The Practice of Fundamental Investing	343
CHAPTER 11	Equity Portfolio Management Strategies	379

PART 4 Valuation and Management of Bonds 421

CHAPTER 12	Bond Fundamentals and Valuation	423
CHAPTER 13	Bond Analysis and Portfolio Management Strategies	465

PART 5 Derivative Security Analysis 517

CHAPTER 14	An Introduction to Derivative Markets and Securities	519
CHAPTER 15	Forward, Futures, and Swap Contracts	559
CHAPTER 16	Option Contracts	603

PART 6 Analysis and Evaluation of Asset Management 645

**CHAPTER 17 Professional Portfolio Management, Alternative Assets,
and Industry Ethics 647**

CHAPTER 18 Evaluation of Portfolio Performance 693

Appendix A The CFA[®] Charter 741

**Appendix B Code of Ethics and Standards of Professional
Conduct 743**

Appendix C Interest Tables 745

Appendix D Standard Normal Probabilities 749

Comprehensive References List 750

Glossary 762

Index 774

Contents

Preface	xi
Acknowledgments	xvii
About the Authors	xxi

PART 1 The Investment Background 1

CHAPTER 1

The Investment Setting	3
-------------------------------------	---

What Is an Investment? 3

Investment Defined 4

Measures of Return and Risk 5

Measures of Historical Rates of Return 5, Computing Mean Historical Returns 7, Calculating Expected Rates of Return 10, Measuring the Risk of Expected Rates of Return 12, Risk Measures for Historical Returns 14

Determinants of Required Rates of Return 14

The Real Risk-Free Rate 15, Factors Influencing the Nominal Risk-Free Rate (NRFR) 16, Risk Premium 18, Risk Premium and Portfolio Theory 20, Fundamental Risk versus Systematic Risk 21, Summary of Required Rate of Return 21

Relationship between Risk and Return 22

Movements along the SML 22, Changes in the Slope of the SML 23, Changes in Capital Market Conditions or Expected Inflation 24, Summary of Changes in the Required Rate of Return 26

Chapter 1 Appendix: Computation of Variance and Standard Deviation 30

CHAPTER 2

Asset Allocation and Security Selection	33
--	----

Individual Investor Life Cycle 34

The Preliminaries 34, Investment Strategies over an Investor's Lifetime 35, Life Cycle Investment Goals 36

The Portfolio Management Process 37

The Need for a Policy Statement 38

Understanding and Articulating Realistic Investor Goals 38, Standards for Evaluating Portfolio Performance 39, Other Benefits 39

Input to the Policy Statement 40

Investment Objectives 40, Investment Constraints 42

Constructing the Policy Statement 44

General Guidelines 44, Some Common Mistakes 44

The Importance of Asset Allocation 44

Investment Returns after Taxes and Inflation 46, Returns and Risks of Different Asset Classes 46, Asset Allocation Summary 48

The Case for Global Investments 49

Relative Size of U.S. Financial Markets 50, Rates of Return on U.S. and Foreign Securities 51, Risk of Diversified Country Investments 51

Historical Risk-Returns on Alternative Investments 56

World Portfolio Performance 56, Art and Antiques 59, Real Estate 60

Chapter 2 Appendix:

A. Covariance 67

B. Correlation 67

CHAPTER 3

Organization and Functioning of Securities Markets 69 |

What Is a Market? 70

Characteristics of a Good Market 70, Decimal Pricing 71, Organization of the Securities Market 71

Primary Capital Markets 72

Government Bond Issues 72, Municipal Bond Issues 72, Corporate Bond Issues 72, Corporate Stock Issues 73, Private Placements and Rule 144A 74

Secondary Financial Markets 74

Why Secondary Markets Are Important 75, Secondary Bond Markets 75, Financial Futures 75, Secondary Equity Markets 76, Exchange Market-Makers 78

Classification of U.S. Secondary Equity Markets 78

Primary Listing Markets 78, The Significant Transition of the U.S. Equity Markets 80

Alternative Types of Orders Available 85

Market Orders 85, Limit Orders 86, Special Orders 86, Margin Transactions 86, Short Sales 88, Exchange Merger Mania 90

CHAPTER 4

Security Market Indexes and Index Funds 95 |

Uses of Security Market Indexes 96

Differentiating Factors in Constructing Market Indexes 97

The Sample 97, Weighting Sample Members 97, Computational Procedure 97

Stock Market Indexes	97
Price-Weighted Index	98, Value-Weighted Index 99, Unweighted Index 101, Fundamental Weighted Index 102, Style Indexes 102, Global Equity Indexes 103
Bond Market Indexes	107
U.S. Investment-Grade Bond Indexes	109, High-Yield Bond Indexes 109, Global Government Bond Indexes 109
Composite Stock–Bond Indexes	109
Comparison of Indexes over Time	110
Correlations between Monthly Equity Price Changes	111, Correlations between Monthly Bond Index Returns 111
Investing in Security Market Indexes	112
Chapter 4 Appendix: Stock Market Indexes	119

PART 2 Developments in Investment Theory 123

CHAPTER 5

Efficient Capital Markets, Behavioral Finance, and Technical Analysis	125
Efficient Capital Markets	126
Why Should Capital Markets Be Efficient?	126, Alternative Efficient Market Hypotheses 127, Tests and Results of Efficient Market Hypotheses 128
Behavioral Finance	142
Explaining Biases	143, Fusion Investing 144
Implications of Efficient Capital Markets	144
Efficient Markets and Fundamental Analysis	144, Efficient Markets and Portfolio Management 146
Technical Analysis	148
Underlying Assumptions of Technical Analysis	149
Advantages of Technical Analysis	151
Challenges to Technical Analysis	152
Challenges to the Assumptions of Technical Analysis	152, Challenges to Specific Trading Rules 152
Technical Trading Rules and Indicators	153
Contrary-Opinion Rules	154, Follow the Smart Money 155, Momentum Indicators 156, Stock Price and Volume Techniques 157, Efficient Markets and Technical Analysis 163

CHAPTER 6

An Introduction to Portfolio Management	171
Some Background Assumptions	171
Risk Aversion	172, Definition of Risk 172
The Markowitz Portfolio Theory	172
Alternative Measures of Risk	173, Expected Rates of Return 173, Variance (Standard Deviation) of Returns for

an Individual Investment 174, Variance (Standard Deviation) of Returns for a Portfolio 175, Standard Deviation of a Portfolio 180, A Three-Asset Portfolio 187, Estimation Issues 188

The Efficient Frontier 189

The Efficient Frontier: An Example 189, The Efficient Frontier and Investor Utility 191

Capital Market Theory: An Overview 193

Background for Capital Market Theory 193, Developing the Capital Market Line 193, Risk, Diversification, and the Market Portfolio 197, Investing with the CML: An Example 200

Chapter 6 Appendix:

- A. Proof That Minimum Portfolio Variance Occurs with Equal Investment Weights When Securities Have Equal Variance 207
- B. Derivation of Investment Weights That Will Give Zero Variance When Correlation Equals -1.00 207

CHAPTER 7

Asset Pricing Models	209
The Capital Asset Pricing Model	209
A Conceptual Development of the CAPM	210, The Security Market Line 211
Empirical Tests of the CAPM	218
Stability of Beta	218, Relationship between Systematic Risk and Return 219, Additional Issues 219, Summary of Empirical Results for the CAPM 220
The Market Portfolio: Theory versus Practice	221
Arbitrage Pricing Theory	223
Using the APT	224, Security Valuation with the APT: An Example 226, Empirical Tests of the APT 228
Multifactor Models and Risk Estimation	229
Multifactor Models in Practice	230, Estimating Risk in a Multifactor Setting: Examples 235

PART 3 Valuation and Management of Common Stocks 249

CHAPTER 8

Equity Valuation	251
Important Distinctions	251
Fairly Valued, Overvalued, and Undervalued	251, Top-Down Approach versus Bottom-Up Approach 252
An Introduction to Discounted Cash Flow and Relative Valuation	254
The Foundations of Discounted Cash Flow Valuation	255, The Constant Growth Model 256, The No-Growth Model 259, Multistage (or Two-Stage) Growth Assumption 260

Discounted Cash Flow	261
Method #1: The Dividend Discount Model	261, Method #2: Free Cash Flow to Equity—The Improved DDM
Method #2: Free Cash Flow to Equity—The Improved DDM	265, Method #3: Discounted Cash Flow (FCFF)
Method #3: Discounted Cash Flow (FCFF)	272
Relative Valuation	279
Implementing Relative Valuation	280, Relative Valuation with CSCO
Advantages of Multiples	285, Disadvantages of Multiples
Disadvantages of Multiples	285
Ratio Analysis	285
Growth Rate of Sales	286, Gross Margins
Operating Margins	286, Net Margins
Accounts Receivable Turnover	287, Inventory Turnover
Net PP&E Turnover	287, Debt as a Percentage of Long-Term Capital
287, Changes in Reserve Accounts	288, Operating Earnings/GAAP Earnings
288	
The Quality of Financial Statements	288
Balance Sheet	288, Income Statement
289, Footnotes	289
Moving on to Chapter 9	289
Chapter 8 Appendix: Derivation of Constant-Growth Dividend Discount Model (DDM)	293
CHAPTER 9	
The Top-Down Approach to Market, Industry, and Company Analysis	295
Introduction to Market Analysis	296
Aggregate Market Analysis (Macroanalysis)	298
Leading, Coincident, and Lagging Indicators	299, Sentiment and Expectations Surveys
303, Interest Rates	303
Microvaluation Analysis	308
FCFE to Value the Market	309, Multiplier Approach
313, Shiller P/E Ratio	314, Macrovaluation and Microvaluation of World Markets
315	
Introduction to Industry Analysis: Why Industry Analysis Matters	316
Industry Analysis	318
The Business Cycle and Industry Sectors	318, Structural Economic Changes Impact the Industry (Noncyclical Factors)
319, Industry Life Cycle	320, Industry Competition
320	
Estimating Industry Rates of Return	322
Estimating the Cost of Capital	322, Sales Growth Estimates
324, Other Considerations	324
Global Industry Analysis	324
Company Analysis	325
Growth Companies and Growth Stocks	325, Defensive Companies and Stocks
326, Cyclical Companies and Stocks	326, Speculative Companies and Stocks
327, Value versus Growth Investing	327
Connecting Industry Analysis to Company Analysis	327
Firm Competitive Strategies	328, SWOT Analysis
330	
Calculating Intrinsic Value	330
Some Additional Insights on Valuation—For Individual Companies	330, Analyzing Growth Companies
331	
Lessons from Some Legends	335
Some Lessons from Lynch	335, Tenets of Warren Buffett
335, Tenets of Howard Marks	336
CHAPTER 10	
The Practice of Fundamental Investing	343
Initial Public Offerings	344
Why Go Public	344, The IPO Process
344, Underpricing	347, Market Stabilization
349, Reasons for Underpricing	349, Bookbuilt Offering versus Auction
351, Longer-Term Performance of IPOs	352
Buy-Side Analysts and Sell-Side Analysts	353
Sell-Side Analysts	353, Buy-Side Analysts
354, Financial Analyst Forecasting Literature	355, Snap Inc. IPO and Analysts
356	
Capital Allocation	357
The Seven Places That Capital Can Be Allocated	357, Dividends versus Repurchases
362, What Do Investors Want to See?	363
Corporate Governance	363
The Board of Directors	363, Anti-Takeover Provisions
364, Compensation	365
Creating a Stock Pitch	369
Air Lease Pitch	369, A Few Closing Points Concerning Stock Pitches
371	
Chapter 10 Appendix: Why Air Lease Should Soon Be Flying High	375
The Plane Truth	376
CHAPTER 11	
Equity Portfolio Management Strategies	379
Passive versus Active Management	380
An Overview of Passive Equity Portfolio Management Strategies	381
Index Portfolio Construction Techniques	382, Tracking Error and Index Portfolio Construction
382, Methods of Index Portfolio Investing	385
An Overview of Active Equity Portfolio Management Strategies	388
Fundamental Strategies	389, Technical Strategies
390, Factors, Attributes, and Anomalies	393, Forming Momentum-Based Stock Portfolios: Two Examples
396, Tax Efficiency and Active Equity Management	398, Active Share and Measuring the Level of Active Management
400	
Value versus Growth Investing: A Closer Look	401
An Overview of Style Analysis	406

Asset Allocation Strategies	410
Integrated Asset Allocation	410, Strategic Asset Allocation
412, Tactical Asset Allocation	413, Insured Asset
Allocation	413

PART 4 Valuation and Management of Bonds 421

CHAPTER 12

Bond Fundamentals and Valuation	423
--	-----

Basic Features of a Bond	424
---------------------------------	-----

Bond Characteristics	424
----------------------	-----

The Global Bond Market Structure	426
---	-----

Participating Issuers	426, Participating Investors	428,
Bond Ratings	428	

Survey of Bond Issues	430
------------------------------	-----

Domestic Government Bonds	430, Government Agency		
Issues	432, Municipal Bonds	433, Corporate Bonds	434,
Nontraditional Bond Coupon Structures	437, High-Yield		
Bonds	438, International Bonds	439	

Bond Yield Curves	441
--------------------------	-----

The Determinants of Bond Yields	441, Yield Curves and
the Term Structure of Interest Rates	443, Par versus Spot
Yield Curves	444, Yield Curves for Credit-Risky Bonds
446, Determining the Shape of the Term Structure	447

Bond Valuation	449
-----------------------	-----

Par versus Spot Bond Valuation	450, Bond Valuation and
Yields with Semiannual Coupons	451, Relationship
between Bond Yields, Coupon Rates, and Bond Prices	453, Bond Valuation between
Coupon Dates	455, Computing Other Bond Yield Measures
457	

CHAPTER 13

Bond Analysis and Portfolio Management Strategies	465
--	-----

Bond Analysis Tools	466
----------------------------	-----

Implied Forward Rates	466, Bond Duration	467, Bond
Convexity	471, Bonds with Embedded Options	474, Yield
Spread Analysis	475	

An Overview of Bond Portfolio Management: Performance, Style, and Strategy	477
---	-----

Passive Management Strategies	479
--------------------------------------	-----

Buy-and-Hold Strategy	480, Indexing Strategy	480, Bond
Indexing in Practice: An Example	481	

Active Management Strategies	482
-------------------------------------	-----

Interest Rate Anticipation	483, Credit Analysis	484,
Implementing an Active Bond Transaction	489, Active	
Global Bond Investing: An Example	489	

Core-Plus Management Strategies	492
--	-----

Matched-Funding Management Strategies	493
--	-----

Dedicated Portfolios	494, Immunization Strategies	495,
Horizon Matching	499	

Contingent and Structured Management Strategies	501
--	-----

Chapter 13 Appendix: Closed-Form Equation for Calculating Macaulay Duration	515
--	-----

PART 5 Derivative Security Analysis 517

CHAPTER 14

An Introduction to Derivative Markets and Securities	519
---	-----

Overview of Derivative Markets	520
---------------------------------------	-----

The Language and Structure of Forward and Futures	Markets	521, Interpreting Futures Price Quotations: An Example	522, The Language and Structure of
Option Markets	525, Interpreting Option Price Quotations: An Example	526	

Investing with Derivative Securities	528
---	-----

The Basic Nature of Derivative Investing	528, Basic Payoff and Profit Diagrams for Forward Contracts	531, Basic Payoff and Profit Diagrams for Call and Put Options	533,
Option Profit Diagrams: An Example	536		

The Relationship between Forward and Option Contracts	538
--	-----

Put-Call-Spot Parity	538, Put-Call Parity: An Example	540, Creating Synthetic Securities Using Put-Call Parity	541,
Adjusting Put-Call-Spot Parity for Dividends	542, Put-Call-Forward Parity	543	

An Introduction to the Use of Derivatives in Portfolio Management	545
--	-----

Restructuring Asset Portfolios with Forward Contracts	545, Protecting Portfolio Value with Put Options	547, An Alternative Way to Pay for a Protective Put	549
---	--	---	-----

CHAPTER 15

Forward, Futures, and Swap Contracts	559
---	-----

An Overview of Forward and Futures Trading	560
---	-----

Futures Contract Mechanics	560, Comparing Forward and Futures Contracts	564
----------------------------	--	-----

Hedging with Forwards and Futures	565
--	-----

Hedging and the Basis	565, Understanding Basis Risk	566,
Calculating the Optimal Hedge Ratio	566	

Forward and Futures Contracts: Basic Valuation Concepts	567
--	-----

Valuing Forwards and Futures	567, The Relationship between Spot and Forward Prices	569
------------------------------	---	-----

Financial Forwards and Futures: Applications and Strategies	570
--	-----

Interest Rate Forwards and Futures	570, Long-Term Interest Rate Futures	570, Short-Term Interest Rate
------------------------------------	--------------------------------------	-------------------------------

Futures 573, Stock Index Futures 576, Currency Forwards and Futures 580

OTC Forward Contracts 584

Interest Rate Contracts 584, Equity Index-Linked Swaps 590

Chapter 15 Appendix: Calculating Money Market Implied Forward Rates 600

CHAPTER 16

Option Contracts 603

An Overview of Option Markets and Contracts 604

Option Market Conventions 604, Price Quotations for Exchange-Traded Options 605

The Fundamentals of Option Valuation 609

The Basic Approach 609, Improving Forecast Accuracy 611, The Binomial Option Pricing Model 614, The Black-Scholes Valuation Model 616, Estimating Volatility 618, Problems with Black-Scholes Valuation 620

Option Valuation: Extensions 621

Valuing European-Style Put Options 621, Valuing Options on Dividend-Bearing Securities 622, Valuing American-Style Options 623

Option Trading Strategies 625

Protective Put Options 625, Covered Call Options 627, Straddles, Strips, and Straps 628, Strangles 629, Spreads 630, Range Forwards 633

Other Option Applications 634

Convertible Bonds 634, Credit Default Swaps 637

PART 6 Analysis and Evaluation of Asset Management 645

CHAPTER 17

Professional Portfolio Management, Alternative Assets, and Industry Ethics 647

The Asset Management Industry: Structure and Evolution 648

Private Management and Advisory Firms 651

Investment Strategy at a Private Money Management Firm 652

Organization and Management of Investment Companies 654

Valuing Investment Company Shares 654, Closed-End versus Open-End Investment Companies 654, Fund Management Fees 657, Investment Company Portfolio Objectives 657, Breakdown by Fund Characteristics 660, Global Investment Companies 662, Mutual Fund Organization and Strategy: An Example 662

Investing in Alternative Asset Classes 664

Hedge Funds 665, Characteristics of a Hedge Fund 666, Hedge Fund Strategies 667, Risk Arbitrage Investing: A Closer Look 669, Hedge Fund Performance 670, Private Equity 672

Ethics and Regulation in the Professional Asset Management Industry 679

Regulation in the Asset Management Industry 680, Standards for Ethical Behavior 681, Examples of Ethical Conflicts 683

What Do You Want from a Professional Asset Manager? 684

CHAPTER 18

Evaluation of Portfolio Performance 693

The Two Questions of Performance Measurement 694

Simple Performance Measurement Techniques 695

Peer Group Comparisons 696, Portfolio Drawdown 696

Risk-Adjusted Portfolio Performance Measures 698

Sharpe Portfolio Performance Measure 698, Treynor Portfolio Performance Measure 700, Jensen Portfolio Performance Measure 702, Information Ratio Performance Measure 703, Sortino Performance Measure 706, Summarizing the Risk-Adjusted Performance Measures 707

Application of Portfolio Performance Measures 709

Holdings-Based Portfolio Performance Measures 715

Grinblatt-Titman Performance Measure 715, Characteristic Selectivity Performance Measure 717

The Decomposition of Portfolio Returns 719

Performance Attribution Analysis 719, Fama Selectivity Performance Measure 722

Factors That Affect Use of Performance Measures 724

Demonstration of the Global Benchmark Problem 725, Implications of the Benchmark Problems 725, Required Characteristics of Benchmarks 726

Reporting Investment Performance 727

Time-Weighted and Money-Weighted Returns 727, Performance Presentation Standards 729

Appendix A The CFA® Charter 741

Appendix B Code of Ethics and Standards of Professional Conduct 743

Appendix C Interest Tables 745

Appendix D Standard Normal Probabilities 749

Comprehensive References List 750

Glossary 762

Index 774



Preface

The pleasure of authoring a textbook comes from writing about a subject that we enjoy and find exciting. As authors, we hope that we can pass on to the reader not only knowledge but also the excitement that we feel for the topic. In addition, writing about investments brings an added stimulant because the subject can affect the reader during his or her entire business career and beyond. We hope that what readers derive from this course will help them enjoy better lives through managing their financial resources properly.

The purpose of this book is to help you learn how to manage your money so you will derive the maximum benefit from what you earn. To accomplish this purpose, you need to learn about the many investment alternatives that are available today and, what is more important, to develop a way of analyzing and thinking about investments that will remain with you in the years ahead when new and different investment opportunities become available.

Because of its dual purpose, the book mixes description and theory. The descriptive material discusses available investment instruments and considers the purpose and operation of capital markets in the United States and around the world. The theoretical portion details how you should evaluate current investments and future opportunities to develop a portfolio of investments that will satisfy your risk–return objectives. We feel that this marriage of theory and practice in the exposition will serve you quite well in both your professional careers and personal lives as investors.

Preparing this 11th edition has been challenging for at least two reasons. First, we continue to experience rapid changes in the securities markets in terms of theory, new financial instruments, innovative trading practices, and the effects of significant macroeconomic disruptions and the numerous regulatory changes that inevitably follow. Second, capital markets are continuing to become very global in nature. Consequently, to ensure that you are prepared to function in a global environment, almost every chapter discusses how investment practice or theory is influenced by the globalization of investments and capital markets. This completely integrated treatment is meant to ensure that you develop a broad mindset on investments that will serve you well in the 21st century.

Intended Market

This text is addressed to both graduate and advanced undergraduate students who are looking for an in-depth discussion of investments and portfolio management. The presentation of the material is intended to be rigorous and empirical, without being overly quantitative. A proper discussion of the modern developments in investments and portfolio theory must be rigorous. The discussion of numerous empirical studies reflects the belief that it is essential for alternative investment theories to be exposed to the real world and be judged on the basis of how well they help us understand and explain reality.

Key Features of the 11th Edition

When planning the 11th edition of *Investment Analysis and Portfolio Management*, we wanted to retain its traditional strengths and capitalize on new developments in the investments area to make it the most comprehensive and accessible investments textbook available. To achieve that goal, we have made a number of modifications to this edition.

First and foremost, we have considerably streamlined our presentation of the material from previous editions. Most notably, we have been able to compress our treatment of these important topics into 18 chapters, compared to the 25 chapters contained in the 10th edition. Importantly, we have not removed any content that we consider vital to a thorough understanding of investment management; rather, we have condensed and rearranged our presentations in a more effective way. An example of this is the section on equity valuation and management, which previously spanned six separate chapters but now is contained in Chapters 8–11.

Second, the current edition maintains its unparalleled international coverage. Investing knows no borders, and although the total integration of domestic and global investment opportunities may seem to contradict the need for separate discussions of international issues, it in fact makes the need for specific information on non-U.S. markets, instruments, conventions, and techniques even more compelling.

Third, both technology and regulations have caused more significant changes during the past decade in the functioning and organization of global security markets than during the prior 50 years. Chapter 3 contains a detailed discussion of this evolution and the results for global markets, and Chapter 2 describes how specific security innovations and asset allocation practices have been affected by these changes.

Fourth, today's investing environment includes derivative securities not as exotic anomalies but as standard investment instruments. We felt that *Investment Analysis and Portfolio Management* must reflect that reality. Consequently, our three chapters on derivatives (Chapters 14–16) are written to provide the reader with an intuitive, clear discussion of the different instruments, their markets, valuation, trading strategies, and general use as risk management and return enhancement tools.

Finally, we have updated and expanded the set of questions and problems at the end of each chapter to provide more student practice on executing computations concerned with more sophisticated investment problems. These problems are also available in an interactive format through the online resource described below.

Major Content Changes in the 11th Edition

The text has been thoroughly updated for currency as well as condensed for the sake of brevity. In addition to these time-related revisions, we have also made the following specific changes to individual chapters:

Chapter 1 This introductory discussion has been revised and updated to reflect recent changes in financial market conditions that impact the investment setting.

Chapter 2 This chapter has been completely reworked to combine the discussions of the asset allocation process and the global security markets that had been spread over multiple chapters in previous editions. After establishing the importance of the asset allocation decision to all investors, we focus on the notion of global diversification and provide an updated study on the variety of investment instruments available for the use of global investors, including global index funds and country-specific exchange-traded funds (ETFs).

Chapter 3 Because of the continuing growth in trading volume handled by electronic communications networks (ECNs), this chapter continues to detail the significant changes in the market as well as the results of this new environment. This includes a discussion on the continuing changes on the NYSE during recent years. We also consider the rationale for the continuing consolidation of global exchanges across asset classes of stocks, bonds, and derivatives. In addition, we document recent mergers and discuss several proposed and failed mergers. Finally, we note that the corporate bond market continues to experience major changes in how and when trades are reported and the number of bond issues involved.

Chapter 4 This chapter contains a discussion of fundamental weighted stock and bond indexes that use sales and earnings to weight components rather than market value. Also included is an updated analysis of the relationship among indexes and the myriad ways that investors can actually commit their financial capital to capture the returns on various indexes.

Chapter 5 New studies that both support the efficient market hypothesis and provide new evidence of anomalies are examined in this chapter. There is also discussion of behavioral finance and how it explains many of the anomalies, as well as a consideration of technical analysis. Further, we discuss the implications of the recent changes in the cost of trading (considered in Chapter 3) on some of the empirical results of prior studies.

Chapter 6 The development of modern portfolio theory, starting with a discussion of the risk tolerance of the investor, has been considerably revised and updated in an effort to stress the conceptual nature of the portfolio formation process. An extensive example of global portfolio optimization has also been included. The chapter now concludes with an intuitive discussion of the transition from Markowitz portfolio analysis to capital market theory and the development of the capital market line (CML).

Chapter 7 This chapter has been extensively revised to consider the topic of how asset pricing models evolved conceptually and how they are used by investors in practice. We begin with an extensive discussion of the capital asset pricing model (CAPM) in a more intuitive way, including how this model represents a natural progression from modern portfolio theory. We then describe the theory and practice of using multifactor models of risk and expected return. The connection between the arbitrage pricing theory (APT) and empirical implementations of the APT continues to be stressed, both conceptually and with several revised examples using style classification data.

Chapter 8 This is the first of three entirely new chapters focusing on equity analysis and valuation. We begin with a discussion of how valuation theory is used in practice. We distinguish between valuing the equity portion of the firm (FCFE) and valuing the entire firm (FCFF). Importantly, we show how the sustainable growth formula can be used to estimate the percentage of earnings that can be considered to be free cash flow. In the section on relative valuation, we focus on fundamental multiples so that students will consider the underlying drivers of value.

Chapter 9 This chapter presents a study of the top-down approach to equity analysis and introduces new material designed to link monetary policy and interest rates to stock prices. Most importantly, we describe the importance of the real federal funds rate, the shape of the yield curve, and the risk premium for BBB bonds (versus Treasury bonds). Later in the chapter, we discuss how the Shiller P/E ratio (also known as the cyclically adjusted price-earnings [CAPE] ratio) is applied to the overall market.

Chapter 10 In this completely new chapter we discuss several topics that students need to understand if they intend to enter the asset management industry as a profession. We provide a detailed description of the IPO process, the difference between the buy-side and sell-side, and the importance of management's capital allocation function. The chapter ends with a discussion of how to design and deliver a persuasive stock pitch.

Chapter 11 This chapter contains an enhanced discussion of the relative merits of passive versus active management techniques for equity portfolio management, focusing on the important role of tracking error. Expanded material on forming risk factor-based equity portfolios has been introduced, along with additional analysis of other equity portfolio investment strategies, including fundamental and technical approaches, as well as a detailed description of equity style analysis.

Chapter 12 This is the first of two new chapters that describe the information, tools, and techniques necessary to analyze fixed-income securities and portfolios. We begin with a discussion of the myriad bond instruments available to global investors, including traditional fixed-coupon securities from sovereign and corporate issuers, securities issued by government-sponsored entities (GSEs), collateralized debt obligations (CDOs), and auction-rate securities. We then develop the intuition and mechanics for how bonds are valued under a variety of market conditions, as well as the relationship that must exist between bond prices and bond yields.

Chapter 13 We continue our development of the quantitative toolkit required of successful bond investors by developing the technical concepts of implied forward rates, duration, and convexity. In particular, we discuss the importance of the duration statistic as a measure of price volatility in terms of both designing and managing bond portfolios. The discussion at the end of the chapter on bond portfolio management strategies has been enhanced and revised to include comparisons of active and passive fixed-income strategies, as well as updated examples of how the bond immunization process functions.

Chapter 14 Expanded discussions of the fundamentals associated with using derivative securities (interpreting price quotations, basic payoff diagrams, basic strategies) are included in this chapter. We also provide updated examples of both basic and intermediate risk management applications using derivative positions, as well as new material on how these contracts trade in the marketplace.

Chapter 15 New and updated examples and applications are provided throughout the chapter, emphasizing the role that forward and futures contracts play in managing exposures to equity, fixed-income, and foreign exchange risk. Also included is an enhanced discussion of how futures and forward markets are structured and operate, as well as how swap contracts can be viewed as portfolios of forward agreements.

Chapter 16 Here we expand the discussion linking valuation and applications of call and put options in the context of investment management. The chapter contains both new and updated examples designed to illustrate how investors use options in practice as well as a discussion of the recent changes to options markets. We also include extensive discussions of two other ways that options can be structured into other financial arrangements: convertible bonds and credit default swaps.

Chapter 17 This chapter includes a revised and updated discussion of the organization and participants in the professional asset management industry. Of particular note is an extensive update of the structure and strategies employed by hedge funds as well as enhanced analysis of how private equity funds function. The discussion of ethics and regulation in the asset management industry that concludes the chapter has also been updated and expanded.

Chapter 18 An updated and considerably expanded application of the performance measurement techniques introduced throughout the chapter is provided, including new material regarding the calculation of both simple and risk-adjusted performance measures. The discussion emphasizes the two main questions of performance measurement, as well as how the concept of downside risk can be incorporated into the evaluation process and the examination of techniques that focus on the security holdings of a manager's portfolio rather than the returns that the portfolio generates.

Supplement Package

Preparation of the 11th edition provided the opportunity to enhance the supplement products offered to instructors and students who use *Investment Analysis and Portfolio*

Management. The result of this examination is a greatly improved package that provides more than just basic answers and solutions. We are indebted to the supplement writers who devoted their time, energy, and creativity to making this supplement package the best it has ever been.

Website

The text's Website, which can be accessed through <http://login.cengage.com>, includes up-to-date teaching and learning aids for instructors. The *Instructor's Manual*, *Test Bank*, and PowerPoint slides are available to instructors for download. If they choose to, instructors may post, on a *password-protected site only*, the PowerPoint presentation for their students.

Instructor's Manual

The *Instructor's Manual* contains a brief outline of each chapter's key concepts and equations, which can be easily copied and distributed to students as a reference tool.

Test Bank

The *Test Bank* includes an extensive set of new questions and problems and complete solutions to the testing material. The *Test Bank* is available through Cognero, an online, fully customizable version of the *Test Bank*, which provides instructors with all the tools they need to create, author/edit, and deliver multiple types of tests. Instructors can import questions directly from the *Test Bank*, create their own questions, or edit existing questions.

Solutions Manual

This manual contains all the answers to the end-of-chapter questions and solutions to end-of-chapter problems.

Lecture Presentation Software

A comprehensive set of PowerPoint slides is available. Corresponding with each chapter is a self-contained presentation that covers all the key concepts, equations, and examples within the chapter. The files can be used as is for an innovative, interactive class presentation. Instructors who have access to Microsoft PowerPoint can modify the slides in any way they wish, adding or deleting materials to match their needs.

MindTap: Empower Your Students

MindTap is a platform that propels students from memorization to mastery. It gives you complete control of your course, so you can provide engaging content, challenge every learner, and build student confidence. Customize interactive syllabi to emphasize priority topics, then add your own material or notes to the eBook as desired. This outcomes-driven application gives you the tools needed to empower students and boost both understanding and performance.

Access Everything You Need in One Place Cut down on prep with the preloaded and organized MindTap course materials. Teach more efficiently with interactive multimedia, assignments, quizzes, and more. Give your students the power to read, listen, and study on their phones, so they can learn on their terms.

Empower Students to Reach Their Potential Twelve distinct metrics give you actionable insights into student engagement. Identify topics troubling your entire class and instantly communicate with those struggling. Students can track their scores to stay motivated towards their goals. Together, you can be unstoppable.

Control Your Course—And Your Content Get the flexibility to reorder textbook chapters, add your own notes, and embed a variety of content including Open Educational Resources (OER).

Personalize course content to your students' needs. They can even read your notes, add their own, and highlight key text to aid their learning.

Get a Dedicated Team, Whenever You Need Them MindTap isn't just a tool; it's backed by a personalized team eager to support you. We can help set up your course and tailor it to your specific objectives, so you'll be ready to make an impact from day one. Know we'll be standing by to help you and your students until the final day of the term.



Acknowledgments

So many people have helped us in so many ways that we hesitate to list them, fearing that we may miss someone. Accepting this risk, we will begin with the University of Notre Dame and the University of Texas at Austin because of their direct support. We are fortunate to have had the following excellent reviewers for this edition as well as for earlier ones:

JOHN ALEXANDER
Clemson University

ROBERT ANGELL
East Carolina University

GEORGE ARAGON
Boston College

BRIAN BELT
University of Missouri-Kansas City

OMAR M. BENKATO
Ball State University

ARAND BHATTACHARYA
University of Cincinnati

CAROL BILLINGHAM
Central Michigan University

SUSAN BLOCK
University of California, Santa
Barbara

GERALD A. BLUM
Babson College

PAUL BOLSTER
Northeastern University

ROBERT E. BROOKS
University of Alabama

ROBERT J. BROWN
Harrisburg, Pennsylvania

BOLONG CAO
Ohio University

CHARLES Q. CAO
Pennsylvania State University

ATREYA CHAKRABORTY
University of Massachusetts
Boston

HSIU-LANG CHEN
University of Illinois at Chicago

DOSOUNG CHOI
Gachon University

ROBERT CLARK
Husson University

JOHN CLINEBELL
University of Northern Colorado

DONALD L. DAVIS
Golden Gate University

JAMES D'MELLO
Western Michigan University

EUGENE F. DRZYCIMSKI
University of Wisconsin-Oshkosh

WILLIAM DUKES
Texas Tech University

JOHN DUNKELBERG
Wake Forest University

ERIC EMORY
Sacred Heart University

THOMAS EYSELL
University of Missouri-St. Louis

HEBER FARNSWORTH
Rice University

JAMES FELLER
Middle Tennessee State University

EURICO FERREIRA
Clemson University

MICHAEL FERRI
John Carroll University

GREG FILBECK
Penn State Behrend

JOSEPH E. FINNERTY
University of Illinois

HARRY FRIEDMAN
New York University

R. H. GILMER
University of Mississippi

STEVEN GOLDSTEIN
University of South Carolina

STEVEN GOLDSTEIN
Robinson-Humphrey

KESHAV GUPTA
Oklahoma State University

SALLY A. HAMILTON
Santa Clara University

ERIC HIGGINS
Kansas State University

RONALD HOFFMEISTER
Arizona State University

SHELLY HOWTON
Villanova University

RON HUTCHINS
Eastern Michigan University

A. JAMES IFFLANDER
Arizona State University

STAN JACOBS
Central Washington University

KWANG JUN
Michigan State University

JAROSLAW KOMARYNSKY
Northern Illinois University

MALEK LASHGARI
University of Hartford

DANNY LITT UCLA	JONATHAN OHN Bloomsburg University	HAROLD STEVENSON Arizona State University
MILES LIVINGSTON University of Florida	HENRY OPPENHEIMER University of Rhode Island	LAWRENCE S. TAI Loyola Marymount College
CHRISTOPHER MA Texas Tech University	JOHN PEAVY Southern Methodist University	KISHORE TANDON The City University of New York, Baruch College
ANANTH MADHAVAN University of California Berkeley	GEORGE PHILIPPATOS University of Tennessee	DRAGON TANG University of Hong Kong
DAVINDER MALHOTRA Thomas Jefferson University	GEORGE PINCHES University of Missouri Kansas City	DONALD THOMPSON Georgia State University
STEVEN MANN University of South Carolina	ROSE PRASAD Central Michigan University	DAVID E. UPTON Virginia Commonwealth University
IQBAL MANSUR Widener University	LAURIE PRATHER University of Tennessee at Chattanooga	E. THEODORE VEIT Rollins College
ANDRAS MAROSI University of Alberta	GEORGE A. RACETTE University of Oregon	PREMAL VORA Penn State Harrisburg
LINDA MARTIN Arizona State University	MURLI RAJAN University of Scranton	BRUCE WARDREP East Carolina University
GEORGE MASON University of Hartford	NARENDAR V. RAO Northeastern Illinois University	RICHARD S. WARR North Carolina State University
JOHN MATHYS DePaul University	STEVE RICH Baylor University	ROBERT WEIGAND University of South Florida
MICHAEL MCBAIN Marquette University	BRUCE ROBIN Old Dominion University	RUSSELL R. WERMERS University of Maryland
DENNIS MCCONNELL University of Maine	JAMES ROSENFELD Emory University	ROLF WUBBELS New York University
JEANETTE MEDEWITZ University of Nebraska–Omaha	STANLEY D. RYALS Investment Counsel, Inc.	ELEANOR XU Seton Hall University
JACOB MICHAELSEN University of California, Santa Cruz	JIMMY SENTENZA Drake University	YEXIAO XU The University of Texas at Dallas
NICHOLAS MICHAS Northern Illinois University	SHEKAR SHETTY University of South Dakota	HONG YAN Shanghai Advanced Institute of Finance
THOMAS W. MILLER JR. University of Missouri–Columbia	FREDERIC SHIPLEY DePaul University	SHENG-PING YANG Gustavas Adolphus College
LALATENDU MISRA University of Texas at San Antonio	DOUGLAS SOUTHARD Virginia Polytechnic Institute	
MICHAEL MURRAY LaCrosse, Wisconsin		

We have received invaluable comments from academic associates, including Jim Gentry (University of Illinois), David Chapman (University of Virginia), Amy Lipton (St. Joseph's University), Donald Smith (Boston University), and David Wright (University of Wisconsin–Parkside). Our university colleagues have also been very helpful

over the years: Rob Batallio and Mike Hemler (University of Notre Dame); and Laura Starks, William Way, and Ken Wiles (University of Texas). Finally, we were once again blessed with bright, dedicated research assistants, such as Aaron Lin and Vincent Ng (Notre Dame) as well as Adam Winegar (University of Texas).

We are convinced that professors who want to write a book that is academically respectable and relevant, as well as realistic, require help from the “real world.” We have been fortunate to develop relationships with a number of individuals (including a growing number of former students) whom we consider our contacts with reality. The following individuals have graciously provided important insights and material:

BRENT ADAMS Kyle Capital	KENNETH FISHER Fisher Investments	MARK KRITZMAN Windham Capital Management
JAMES F. ARENS Trust Company of Oklahoma	H. GIFFORD FONG Gifford Fong Associates	MARTIN LEIBOWITZ Morgan Stanley
RICK ASHCROFT Robert W. Baird	MARTIN S. FRIDSON Lehmann, Livian, Fridson Advisors	DOUGLAS R. LEMPEREUR Franklin Templeton Investments
BRIAN BARES Bares Capital Management	M. CHRISTOPHER GARMAN Bank of America/Merrill Lynch	ROBERT LEVINE Nomura Securities
CHAD BAUMLER Nuance Investments	KHALID GHAYUR GPS Funds	GEORGE W. LONG LIM Advisors Ltd.
DAVID G. BOOTH Dimensional Fund Advisors, Inc.	BEN GIELE Gearpower Capital	SCOTT LUMMER Savant Investment Group
GARY BRINSON Brinson Foundation	WILLIAM J. HANK Moore Financial Corporation	JOHN MAGINN Maginn Associates
KEVIN CASEY Casey Capital	RICK HANS Fred’s Inc.	SCOTT MALPASS University of Notre Dame Endowment
STALEY CATES Southeastern Asset Management	LEA B. HANSEN Institute for Research of Public Policy	JACK MALVEY BNY Mellon Investment Management
DWIGHT D. CHURCHILL State Street Global Advisors	W. VAN HARLOW Fidelity Investments	DOMINIC MARSHALL Pacific Ridge Capital Partners
ABBY JOSEPH COHEN Goldman, Sachs	BRITT HARRIS University of Texas Investment Management Company	TODD MARTIN Timucuan Asset Management
ROBERT CONWAY Goldman, Sachs	CRAIG HESTER Luther King Capital Management	JOSEPH MCALINDEN McAlinden Research Partners
ROBERT J. DAVIS Highland Capital	JOANNE HILL CBOE Vest	RICHARD MCCABE Bank of America/Merrill Lynch
PHILIP DELANEY JR. Northern Trust Bank	BRANDON HOLCOMB Goldman, Sachs	MICHAEL MCCOWIN State of Wisconsin Investment Board
PAT DORSEY Dorsey Asset Management	JOHN W. JORDAN II The Jordan Company	MARK MCMEANS Brasada Capital
FRANK J. FABOZZI Journal of Portfolio Management	ANDREW KALOTAY Kalotay Associates	OLEG MELENTYEV Bank of America/Merrill Lynch
PHILIP FERGUSON Salient Partners	WARREN N. KOONTZ JR. Jennison Associates	

KENNETH MEYER
Lincoln Capital Management

JANET T. MILLER
Rowland and Company

BRIAN MOORE
U.S. Gypsum Corp.

SALVATOR MUOIO
SM Investors, LP

DAVID NELMS
Discover Financial Services

GEORGE NOYES
Hanover Strategic Management

WILL O'HARA
University of Texas

IAN ROSSA O'REILLY
Canadian Foundation for
Advancement of Investor Rights

ROBERT PARRINO
University of Texas

PHILIP J. PURCELL III
Continental Investors

JACK PYCIK
Consultant

RON RYAN
Asset Liability Management

ROBERT F. SEMMENS JR.
Semmens Private Investments

MICHAEL SHEARN
Time Value of Money L.P.

BRIAN SINGER
William Blair & Co.

CLAY SINGLETON
Rollins College

FRED H. SPEECE JR.
Speece, Thorson Capital Group

JAMES STORK
Pinnacle Financial Group

WARREN TENNANT
Abu Dhabi Investment Authority

KEVIN TERHAAR
Stairway Partners

JOHN THORTON
Stephens Investment Management
Group

STEPHAN TOMPSETT
Andeavor

JOSE RAMON VALENTE
Econsult

WILLIAM M. WADDEN
Wadden Enterprises

RICHARD S. WILSON
Consultant

ARNOLD WOOD
Martingale Asset Management

BRUCE ZIMMERMAN
Private Investor

We continue to benefit from the help and consideration of the dedicated people who have been associated with the CFA Institute: Tom Bowman, Whit Broome, Jeff Diermeier, Bob Johnson, and Katie Sherrerd. Professor Reilly would also like to thank his assistant, Rachel Karnafel, who had the unenviable task of keeping his office and his life in some sort of order during this project.

As always, our greatest gratitude is to our families—past, present, and future. Our parents gave us life and helped us understand love and how to give it. Most important are our wives who provide love, understanding, and support throughout the day and night. We thank God for our children and grandchildren who ensure that our lives are full of love, laughs, and excitement.

Frank K. Reilly
Notre Dame, Indiana

Keith C. Brown
Austin, Texas

Sanford J. Leeds
Austin, Texas

December 2017



About the Authors

Frank K. Reilly is the Bernard J. Hank Professor of Finance and former dean of the Mendoza College of Business at the University of Notre Dame. Holding degrees from the University of Notre Dame (BBA), Northwestern University (MBA), and the University of Chicago (PhD), Professor Reilly has taught at the University of Illinois, the University of Kansas, and the University of Wyoming in addition to the University of Notre Dame. He has several years of experience as a senior securities analyst, as well as experience in stock and bond trading. A chartered financial analyst (CFA), he has been a member of the Council of Examiners, the Council on Education and Research, the grading committee, and was chairman of the board of trustees of the Institute of Chartered Financial Analysts and chairman of the board of the Association of Investment Management and Research (AIMR; now the CFA Institute). Professor Reilly has been president of the Financial Management Association, the Midwest Business Administration Association, the Eastern Finance Association, the Academy of Financial Services, and the Midwest Finance Association. He is or has been on the board of directors of the First Interstate Bank of Wisconsin, Norwest Bank of Indiana, the Investment Analysts Society of Chicago, UBS Global Funds (chairman), Fort Dearborn Income Securities (chairman), Discover Bank, NIBCO, Inc., the International Board of Certified Financial Planners, Battery Park High Yield Bond Fund, Inc., Morgan Stanley Trust FSB, the CFA Institute Research Foundation (chairman), the Financial Analysts Seminar, the Board of Certified Safety Professionals, and the University Club at the University of Notre Dame.

As the author of more than 100 articles, monographs, and papers, his work has appeared in numerous publications including *Journal of Finance*, *Journal of Financial and Quantitative Analysis*, *Journal of Accounting Research*, *Financial Management*, *Financial Analysts Journal*, *Journal of Fixed Income*, and *Journal of Portfolio Management*. In addition to *Investment Analysis and Portfolio Management*, 10th ed., Professor Reilly is the coauthor of another textbook, *Investments*, 7th ed. (South-Western, 2006) with Edgar A. Norton. He is editor of *Readings and Issues in Investments*, *Ethics and the Investment Industry*, and *High Yield Bonds: Analysis and Risk Assessment*.

Professor Reilly was named on the list of *Outstanding Educators in America* and has received the University of Illinois Alumni Association Graduate Teaching Award, the Outstanding Educator Award from the MBA class at the University of Illinois, and the Outstanding Teacher Award from the MBA class and the senior class at Notre Dame. He also received from the CFA Institute both the C. Stewart Sheppard Award for his contribution to the educational mission of the Association and the Daniel J. Forrester III Leadership Award for Professional Ethics and Standards of Investment Practice. He also received the Hortense Friedman Award for Excellence from the CFA Society of Chicago and a Lifetime Achievement Award from the Midwest Finance Association. He was part of the inaugural group selected as a fellow of the Financial Management Association International. He is or has been a member of the editorial boards of *Financial Management*, *The Financial Review*, *International Review of Economics and Finance*, *Journal of Financial Education*, *Quarterly Review of Economics and Finance*, and the *European Journal of Finance*. He is included in *Who's Who in Finance and Industry*, *Who's Who in America*, *Who's Who in American Education*, and *Who's Who in the World*.

Keith C. Brown holds the position of University Distinguished Teaching Professor of Finance and Fayeze Sarofim Fellow at the McCombs School of Business, University of Texas. He received a BA in economics from San Diego State University, where he was a member of the Phi Beta Kappa, Phi Kappa Phi, and Omicron Delta Epsilon honor societies. He received his MS and PhD in financial economics from the Krannert Graduate School of Management at Purdue University. Since leaving school in 1981, he has specialized in teaching investment management, portfolio management and security analysis, capital markets, and derivatives courses at the undergraduate, MBA, and PhD levels, and he has received numerous awards for teaching innovation and excellence, including election to the university's prestigious Academy of Distinguished Teachers. In addition to his academic responsibilities, he has also served as president and chief executive officer of The MBA Investment Fund, LLC, a privately funded investment company managed by graduate students at the University of Texas.

Professor Brown has published more than 45 articles, monographs, chapters, and papers on topics ranging from asset pricing and investment strategy to financial risk management. His publications have appeared in such journals as *Journal of Finance*, *Journal of Financial Economics*, *Review of Financial Studies*, *Journal of Financial and Quantitative Analysis*, *Review of Economics and Statistics*, *Journal of Financial Markets*, *Financial Analysts Journal*, *Financial Management*, *Journal of Investment Management*, *Advances in Futures and Options Research*, *Journal of Fixed Income*, *Journal of Retirement*, *Journal of Applied Corporate Finance*, and *Journal of Portfolio Management*. In addition to coauthoring *Investment Analysis and Portfolio Management*, 11th edition, he is a coauthor of *Interest Rate and Currency Swaps: A Tutorial*, a textbook published through the CFA Institute. He received a Graham and Dodd Award from the Financial Analysts Federation as an author of one of the best articles published by *Financial Analysts Journal* in 1990, a Smith-Breeden Prize from the *Journal of Finance* in 1996, and a Harry M. Markowitz Special Distinction Award from *Journal of Investment Management* in 2016.

In August 1988, Professor Brown received the Chartered Financial Analyst designation from the CFA Institute, and he has served as a member of that organization's CFA Candidate Curriculum Committee and Education Committee and on the CFA Examination Grading staff. For five years, he was the research director of the Research Foundation of the CFA Institute, from which position he guided the development of the research portion of the organization's worldwide educational mission. For several years, he was also associate editor for *Financial Analysts Journal*, and he currently holds that position for *Journal of Investment Management* and *Journal of Behavioral Finance*. In other professional service, Professor Brown has been a regional director for the Financial Management Association and has served as the applied research track chairman for that organization's annual conference.

Professor Brown is the cofounder and senior partner of Fulcrum Financial Group, a portfolio management and investment advisory firm located in Austin, Texas, that currently oversees three fixed-income security portfolios. From May 1987 to August 1988, he was based in New York as a senior consultant to the Corporate Professional Development Department at Manufacturers Hanover Trust Company. He has lectured extensively throughout the world on investment and risk management topics in the executive development programs for such companies as Fidelity Investments, JP Morgan Chase, Commonfund, BMO Nesbitt Burns, Merrill Lynch, Chase Manhattan Bank, Chemical Bank, Lehman Brothers, Union Bank of Switzerland, Shearson, Chase Bank of Texas, The Beacon Group, Motorola, and Halliburton. He is an advisor to the boards of the Teachers Retirement System of Texas and the University of Texas Investment Management Company and has served on the Investment Committee of LBJ Family Wealth Advisors, Ltd.

Sanford J. Leeds is a distinguished senior lecturer at the McCombs School of Business, University of Texas. He graduated summa cum laude from the University of Alabama with a BS in

investment analysis. He has an MBA from The University of Texas Graduate School of Business, where he received the Dean's Award for Academic Excellence. He also has a JD from the University of Virginia, where he was on the editorial board of *The Virginia Tax Review*.

Professor Leeds has been a member of the McCombs faculty for 16 years. For 13 of those years, Professor Leeds also served as president of The MBA Investment Fund, LLC, a privately funded investment company managed by graduate students at the McCombs School. During his time on the faculty, he has taught a wide variety of classes, including Investment Theory and Practice, Portfolio Management, Capital Markets, Macroeconomics, Corporate Finance, and Advanced Corporate Finance. He has received numerous teaching awards, including three school wide awards: the Joe D. Beasley Teaching Award (for teaching in the graduate program), the CBA Foundation Advisory Council Award for Teaching Innovation, and the Jim Nolen Award for Excellence in Graduate Teaching. He has received recognition from his students with the "Outstanding MBA Professor Award" (selected by the full-time MBA students in multiple years, the Evening MBA students, and the Dallas MBA students) and the "Outstanding MSF Professor Award" (in multiple years). In 2015, he was selected (at the university level) to be a Provost Teaching Fellow and then served on the steering committee of that organization. He currently serves as a Senior Provost Fellow.

Professor Leeds received the Chartered Financial Analyst designation in 1998. He has served the CFA Institute as a grader, as a member of the Candidate Curriculum Committee, and as an editor of a candidate reading section. He is also a member of the Texas State Bar.

Prior to joining the faculty, Professor Leeds worked as an attorney and then as a money manager. After starting his career at a large law firm, he left to become a prosecutor. Then he attended business school and was one of four managers at a firm that had \$1.6 billion under management. In recent years, he has served on the investment committee of the Austin Community Foundation (a \$100 million endowment) and has also been the vice-chair of The Girls' School of Austin. He is frequently a speaker at industry conferences, normally discussing the economy and the markets.



PART **1**

The Investment Background

Chapter 1

The Investment Setting

Chapter 2

Asset Allocation and Security Selection

Chapter 3

Organization and Functioning of Securities Markets

Chapter 4

Security Market Indexes and Index Funds

The chapters in this section will provide a background for your study of investments by answering the following questions:

- Why do people invest?
- How do you measure the returns and risks for alternative investments?
- What factors should you consider when you make asset allocation decisions?
- What investments are available?
- How do securities markets function?
- How and why are securities markets in the United States and around the world changing?
- What are the major uses of security market indexes?
- How can you evaluate the market behavior of common stocks and bonds?
- What factors cause differences among stock and bond market indexes?

In the first chapter, we consider why an individual would invest, how to measure the rates of return and risk for alternative investments, and what factors determine an investor's required rate of return on an investment. The latter point will be important when we work to understand investor behavior, the markets for alternative securities, and the valuation of various investments.

Because the ultimate decision facing an investor is the makeup of his or her portfolio, Chapter 2 deals with the all-important asset allocation decision. As we will see, to minimize risk, investment theory asserts the need to diversify, which leads to a discussion of the specific steps in the portfolio management process and factors that influence the makeup of an investor's portfolio over his or her life cycle. We also begin our exploration of investments available for investors to select by making an overpowering case for investing globally rather than limiting choices to only U.S. securities. Building on this premise, we discuss several global investment instruments used in global markets. We conclude the chapter with a review of the historical returns and measures of risk for a number of different asset class groups.

In Chapter 3, we examine how markets work in general and then specifically focus on the purpose and function of primary and secondary bond and stock markets. During the past two decades, significant changes have occurred in the operation of the securities market, including a trend toward a global capital market, electronic trading markets, and substantial worldwide consolidation. After discussing these changes and the rapid development of new capital markets around the world, we speculate about how global markets will continue to consolidate and will increase available investment alternatives.

Investors, market analysts, and financial theorists generally gauge the behavior of securities markets by evaluating the return and risk implied by various market indexes and evaluate portfolio performance by comparing a portfolio's results to an appropriate benchmark. Because these indexes are used to make asset allocation decisions and then to evaluate portfolio performance, it is important to have a deep understanding of how they are constructed and the numerous alternatives available. Therefore, in Chapter 4, we examine and compare a number of stock market and bond market indexes available for the domestic and global markets.

This initial section provides the framework for you to understand various securities, how to allocate among alternative asset classes, the markets where these securities are bought and sold, the indexes that reflect their performance, and how you might manage a collection of investments in a portfolio using *index funds*, which are an investable form of the security index.

CHAPTER 1

The Investment Setting

After you read this chapter, you should be able to answer the following questions:

- Why do individuals invest?
- What is an investment?
- How do investors measure the rate of return on an investment?
- How do investors measure the risk related to alternative investments?
- What factors contribute to the rates of return that investors require on alternative investments?
- What macroeconomic and microeconomic factors contribute to changes in the required rates of return for investments?

This initial chapter discusses several topics that are basic to the subsequent chapters. We begin by defining the term *investment* and discussing the returns and risks related to investments. This leads to a presentation of how to measure the expected and historical rates of returns for an individual asset or a portfolio of assets. In addition, we consider how to measure risk not only for an individual investment but also for an investment that is part of a portfolio.

The third section of the chapter discusses the factors that determine the required rate of return for an individual investment. The factors discussed are those that contribute to an asset's *total* risk. Because most investors have a portfolio of investments, it is necessary to consider how to measure the risk of an asset when it is a part of a large portfolio of assets. The risk that prevails when an asset is part of a diversified portfolio is referred to as its *systematic risk*.

The final section deals with what causes *changes* in an asset's required rate of return over time. Notably, changes occur because of both macroeconomic events that affect all investment assets and microeconomic events that affect only the specific asset.

1.1 WHAT IS AN INVESTMENT?

For most of your life, you will be earning and spending money. Rarely, though, will your current money income exactly balance with your consumption desires. Sometimes, you may have more money than you want to spend; at other times, you may want to purchase more than you can afford based on your current income. These imbalances will lead you either to borrow or to save to maximize the long-run benefits from your income.

When current income exceeds current consumption desires, people tend to save the excess, and they can do any of several things with these savings. One possibility is to put the money under a mattress or bury it in the backyard until some future time when consumption desires

exceed current income. When they retrieve their savings from the mattress or backyard, they have the same amount they saved.

Another possibility is that they can give up the immediate possession of these savings for a future larger amount of money that will be available for future consumption. This trade-off of *present* consumption for a higher level of *future* consumption is the reason for saving. What you do with the savings to make them increase over time is *investment*.¹

Those who give up immediate possession of savings (that is, defer consumption) expect to receive in the future a greater amount than they gave up. Conversely, those who consume more than their current income (that is, borrow) must be willing to pay back in the future more than they borrowed.

The rate of exchange between *future consumption* (future dollars) and *current consumption* (current dollars) is the *pure rate of interest*. Both people's willingness to pay this difference for borrowed funds and their desire to receive a surplus on their savings (that is, some rate of return) give rise to an interest rate referred to as the *pure time value of money*. This interest rate is established in the capital market by a comparison of the supply of excess income available (savings) to be invested and the demand for excess consumption (borrowing) at a given time. If you can exchange \$100 of certain income today for \$104 of certain income one year from today, then the pure rate of exchange on a risk-free investment (that is, the time value of money) is said to be 4 percent ($104/100 - 1$).

The investor who gives up \$100 today expects to consume \$104 of goods and services in the future. This assumes that the general price level in the economy stays the same. This price stability has rarely been the case during the past several decades, when inflation rates have varied from 1.1 percent in 1986 to as much as 13.3 percent in 1979, with a geometric average of 4.2 percent a year from 1970 to 2016. If investors expect a change in prices, they will require a higher rate of return to compensate for it. For example, if an investor expects a rise in prices (that is, he or she expects inflation) at an annual rate of 2 percent during the period of investment, he or she will increase the required interest rate by 2 percent. In our example, the investor would require \$106 in the future to defer the \$100 of consumption during an inflationary period (that is, a 6 percent *nominal*, risk-free interest rate will be required instead of 4 percent).

Further, if the future payment from the investment is not certain (the borrower may not be able to pay off the loan when it is due), the investor will demand an interest rate that exceeds the nominal risk-free interest rate. The uncertainty of the payments from an investment is the *investment risk*. The additional return added to the nominal, risk-free interest rate is called a *risk premium*. In our previous example, the investor would require more than \$106 one year from today to compensate for the uncertainty. As an example, if the required amount were \$110, \$4 (4 percent) would be considered a risk premium.

1.1.1 Investment Defined

From our discussion, we can specify a formal definition of investment. Specifically, an **investment** is the current commitment of dollars for a period of time in order to derive future payments that will compensate the investor for (1) the time the funds are committed, (2) the expected rate of inflation during this time period, and (3) the uncertainty of the future payments. The "investor" can be an individual, a government, a pension fund, or a corporation. Similarly, this definition includes all types of investments, including investments by corporations in plant and equipment and investments by individuals in stocks, bonds, commodities, or real estate. This text emphasizes investments by individual investors. In all cases, the investor is trading a *known* dollar amount today for some *expected* future stream of payments that will be greater than the current dollar amount today.

¹In contrast, when current income is less than current consumption desires, people borrow to make up the difference. Although we will discuss borrowing on several occasions, the major emphasis of this text is how to invest savings.

At this point, we have answered the questions about why people invest and what they want from their investments. They invest to earn a return from savings due to their deferred consumption. They want a rate of return that compensates them for the time period of the investment, the expected rate of inflation, and the uncertainty of the future cash flows. This return, the investor's **required rate of return**, is discussed throughout this book. A central question of this book is how investors select investments that will give them their required rates of return.

The next section describes how to measure the expected or historical rate of return on an investment and also how to quantify the uncertainty (risk) of expected returns. You need to understand these techniques for measuring the rate of return and the uncertainty of these returns to evaluate the suitability of a particular investment. Although our emphasis will be on financial assets, such as bonds and stocks, we will refer to other assets, such as art and antiques. Chapter 2 discusses the range of financial assets and also considers some nonfinancial assets.

1.2 MEASURES OF RETURN AND RISK

The purpose of this book is to help you understand how to choose among alternative investment assets. This selection process requires that you estimate and evaluate the expected risk–return trade-offs for the alternative investments available. Therefore, you must understand how to measure the rate of return and the risk involved in an investment accurately. To meet this need, in this section we examine ways to quantify return and risk. The presentation will consider how to measure both *historical* and *expected* rates of return and risk.

We consider historical measures of return and risk because this book and other publications provide numerous examples of historical average rates of return and risk measures for various assets, and understanding these presentations is important. In addition, these historical results are often used by investors to estimate the *expected* rates of return and risk for an asset class.

The first measure is the historical rate of return on an individual investment over the time period the investment is held (that is, its holding period). Next, we consider how to measure the *average* historical rate of return for an individual investment over a number of time periods. The third subsection considers the average rate of return for a *portfolio* of investments.

Given the measures of historical rates of return, we will present the traditional measures of risk for a historical time series of returns (that is, the variance and standard deviation of the returns over the time period examined).

Following the presentation of measures of historical rates of return and risk, we turn to estimating the *expected* rate of return for an investment. Obviously, such an estimate contains a great deal of uncertainty, and we present measures of this uncertainty or risk.

1.2.1 Measures of Historical Rates of Return

When you are evaluating alternative investments for inclusion in your portfolio, you will often be comparing investments with widely different prices or lives. As an example, you might want to compare a \$10 stock that pays no dividends to a stock selling for \$150 that pays dividends of \$5 a year. To properly evaluate these two investments, you must accurately compare their historical rates of returns. A proper measurement of the rates of return is the purpose of this section.

When we invest, we defer current consumption in order to add to our wealth so that we can consume more in the future. Therefore, when we talk about a return on an investment, we are concerned with the *change in wealth* resulting from this investment. This change in wealth can be either due to cash inflows, such as interest or dividends, or caused by a change in the price of the asset (positive or negative).

If you commit \$200 to an investment at the beginning of the year and you get back \$220 at the end of the year, what is your return for the period? The period during which you own an investment is called its *holding period*, and the return for that period is the **holding period return (HPR)**. In this example, the HPR is 1.10, calculated as follows:

$$\begin{aligned}
 \text{1.1} \quad \text{HPR} &= \frac{\text{Ending Value of Investment}}{\text{Beginning Value of Investment}} \\
 &= \frac{\$220}{\$200} = 1.10
 \end{aligned}$$

This HPR value will always be zero or greater—that is, it can never be a negative value. A value greater than 1.0 reflects an increase in your wealth, which means that you received a positive rate of return during the period. A value less than 1.0 means that you suffered a decline in wealth, which indicates that you had a negative return during the period. An HPR of zero indicates that you lost all your money (wealth) invested in this asset.

Although HPR helps us express the change in value of an investment, investors generally evaluate returns in *percentage terms on an annual basis*. This conversion to annual percentage rates makes it easier to directly compare alternative investments that have markedly different characteristics. The first step in converting an HPR to an annual percentage rate is to derive a percentage return, referred to as the **holding period yield (HPY)**. The HPY is equal to the HPR minus 1.

$$\text{1.2} \quad \text{HPY} = \text{HPR} - 1$$

In our example:

$$\begin{aligned}
 \text{HPY} &= 1.10 - 1 = 0.10 \\
 &= 10\%
 \end{aligned}$$

To derive an *annual* HPY, you compute an **annual HPR** and subtract 1. Annual HPR is found by:

$$\text{1.3} \quad \text{Annual HPR} = \text{HPR}^{1/n}$$

where:

n = number of years the investment is held

Consider an investment that cost \$250 and is worth \$350 after being held for two years:

$$\begin{aligned}
 \text{HPR} &= \frac{\text{Ending Value of Investment}}{\text{Beginning Value of Investment}} = \frac{\$350}{\$250} \\
 &= 1.40 \\
 \text{Annual HPR} &= 1.40^{1/n} \\
 &= 1.40^{1/2} \\
 &= 1.1832 \\
 \text{Annual HPY} &= 1.1832 - 1 = 0.1832 \\
 &= 18.32\%
 \end{aligned}$$

If you experience a decline in your wealth value, the computation is as follows:

$$\begin{aligned}
 \text{HPR} &= \frac{\text{Ending Value}}{\text{Beginning Value}} = \frac{\$400}{\$500} = 0.80 \\
 \text{HPY} &= 0.80 - 1.00 = -0.20 = -20\%
 \end{aligned}$$

A multiple-year loss over two years would be computed as follows:

$$\begin{aligned} \text{HPR} &= \frac{\text{Ending Value}}{\text{Beginning Value}} = \frac{\$750}{\$1,000} = 0.75 \\ \text{Annual HPY} &= (0.75)^{1/n} = 0.75^{1/2} \\ &= 0.866 \\ \text{Annual HPY} &= 0.866 - 1.00 = -0.134 = -13.4\% \end{aligned}$$

In contrast, consider an investment of \$100 held for only six months that earned a return of \$12:

$$\begin{aligned} \text{HPR} &= \frac{\$112}{100} = 1.12 \quad (n = 0.5) \\ \text{Annual HPR} &= 1.12^{1/.5} \\ &= 1.12^2 \\ &= 1.2544 \\ \text{Annual HPY} &= 1.2544 - 1 = 0.2544 \\ &= 25.44\% \end{aligned}$$

Note that we made some implicit assumptions when converting the six-month HPY to an annual basis. This annualized holding period yield computation assumes a constant annual yield for each year. In the two-year investment, we assumed an 18.32 percent rate of return each year, compounded. In the partial year HPR that was annualized, we assumed that the return is compounded for the whole year. That is, we assumed that the rate of return earned during the first half of the year is likewise earned on the value at the end of the first six months. The 12 percent rate of return for the initial six months compounds to 25.44 percent for the full year.² Because of the uncertainty of being able to earn the same return in the future six months, institutions will typically *not* compound partial year results.

Remember one final point: The ending value of the investment can be the result of a positive or negative change in price for the investment alone (for example, a stock going from \$20 a share to \$22 a share), income from the investment alone, or a combination of price change and income. Ending value includes the value of everything related to the investment.

1.2.2 Computing Mean Historical Returns

Now that we have calculated the HPY for a single investment for a single year, we want to consider **mean rates of return** for a single investment and for a portfolio of investments. Over a number of years, a single investment will likely give high rates of return during some years and low rates of return, or possibly negative rates of return, during others. Your analysis should consider each of these returns, but you also want a summary figure that indicates this investment's typical experience, or the rate of return you might expect to receive if you owned this investment over an extended period of time. You can derive such a summary figure by computing the mean annual rate of return (its HPY) for this investment over some period of time.

Alternatively, you might want to evaluate a portfolio of investments that might include similar investments (for example, all stocks or all bonds) or a combination of investments (for example, stocks, bonds, and real estate). In this instance, you would calculate the mean rate of return for this portfolio of investments for an individual year or for a number of years.

²To check that you understand the calculations, determine the annual HPY for a three-year HPR of 1.50. (Answer: 14.47 percent.) Compute the annual HPY for a three-month HPR of 1.06. (Answer: 26.25 percent.)

Single Investment Given a set of annual rates of return (HPYs) for an individual investment, there are two summary measures of return performance. The first is the arithmetic mean return, the second is the geometric mean return. To find the **arithmetic mean (AM)**, the sum (Σ) of annual HPYs is divided by the number of years (n) as follows:

$$1.4 \quad \text{AM} = \Sigma\text{HPY}/n$$

where:

ΣHPY = sum of annual holding period yields

An alternative computation, the **geometric mean (GM)**, is the n th root of the product of the HPRs for n years minus one.

$$1.5 \quad \text{GM} = [\pi\text{HPR}]^{1/n} - 1$$

where:

π = product of the annual holding period returns as follows:

$$(\text{HPR}_1) \times (\text{HPR}_2) \dots (\text{HPR}_n)$$

To illustrate these alternatives, consider an investment with the following data:

Year	Beginning Value	Ending Value	HPR	HPY
1	100.0	115.0	1.15	0.15
2	115.0	138.0	1.20	0.20
3	138.0	110.4	0.80	-0.20

$$\begin{aligned} \text{AM} &= [(0.15) + (0.20) + (-0.20)]/3 \\ &= 0.15/3 \\ &= 0.05 = 5\% \end{aligned}$$

$$\begin{aligned} \text{GM} &= [(1.15) \times (1.20) \times (0.80)]^{1/3} - 1 \\ &= (1.104)^{1/3} - 1 \\ &= 1.03353 - 1 \\ &= 0.03353 = 3.353\% \end{aligned}$$

Investors are typically concerned with long-term performance when comparing alternative investments. GM is considered a superior measure of the long-term mean rate of return because it indicates *the compound annual rate of return* based on the ending value of the investment versus its beginning value.³ Specifically, using the prior example, if we compounded 3.353 percent for three years, $(1.03353)^3$, we would get an ending wealth value of 1.104.

Although the arithmetic average provides a good indication of the expected rate of return for an investment during a future individual year, it is biased upward if you are attempting to measure an asset's long-term performance. This is obvious for a volatile security. Consider, for example, a security that increases in price from \$50 to \$100 during year 1 and drops back to \$50 during year 2. The annual HPYs would be:

Year	Beginning Value	Ending Value	HPR	HPY
1	50	100	2.00	1.00
2	100	50	0.50	-0.50

³Note that the GM is the same whether you compute the geometric mean of the individual annual holding period yields or the annual HPY for a three-year period, comparing the ending value to the beginning value, as discussed earlier under annual HPY for a multiperiod case.

This would give an AM rate of return of:

$$\begin{aligned} [(1.00) + (-0.50)]/2 &= .50/2 \\ &= 0.25 = 25\% \end{aligned}$$

This investment brought no change in wealth and therefore no return, yet the AM rate of return is computed to be 25 percent.

The GM rate of return would be:

$$\begin{aligned} (2.00 \times 0.50)^{1/2} - 1 &= (1.00)^{1/2} - 1 \\ &= 1.00 - 1 = 0\% \end{aligned}$$

This answer of a 0 percent rate of return accurately measures the fact that there was no change in wealth from this investment over the two-year period.

When rates of return are the same for all years, the GM will be equal to the AM. If the rates of return vary over the years, the GM will always be lower than the AM. The difference between the two mean values will depend on the year-to-year changes in the rates of return. Larger annual changes in the rates of return—that is, more volatility—will result in a greater difference between the alternative mean values. We will point out examples of this in subsequent chapters.

An awareness of both methods of computing mean rates of return is important because most published accounts of long-run investment performance or descriptions of financial research will use both the AM and the GM as measures of average historical returns. We will also use both throughout this book with the understanding that the AM is best used as an expected value for an individual year, while the GM is the best measure of long-term performance since it measures the compound annual rate of return for the asset being measured.

A Portfolio of Investments The mean historical rate of return (HPY) for a portfolio of investments is measured as the weighted average of the HPYs for the individual investments in the portfolio, or the overall percent change in value of the original portfolio. The weights used in computing the averages are the relative *beginning* market values for each investment; this is referred to as *dollar-weighted* or *value-weighted* mean rate of return. This technique is demonstrated by the examples in Exhibit 1.1. As shown, the HPY is the same (9.5 percent) whether you compute the weighted average return using the beginning market value weights or if you compute the overall percent change in the total value of the portfolio.

Although the analysis of historical performance is useful, selecting investments for your portfolio requires you to predict the rates of return you *expect* to prevail. The next section

Exhibit 1.1 Computation of Holding Period Yield for a Portfolio

Investment	Number of Shares	Beginning Price	Beginning Market Value	Ending Price	Ending Market Value	HPR	HPY	Market Weight ^a	Weighted HPY
A	100,000	\$10	\$1,000,000	\$12	\$1,200,000	1.20	20%	0.05	0.01
B	200,000	20	4,000,000	21	4,200,000	1.05	5	0.20	0.01
C	500,000	30	15,000,000	33	16,500,000	1.10	10	0.75	0.075
Total			\$20,000,000		\$21,900,000				0.095

$$\text{HPR} = \frac{21,900,000}{20,000,000} = 1.095$$

$$\text{HPY} = 1.095 - 1 = 0.095$$

$$= 9.5\%$$

^aWeights are based on beginning values.