# MODERN PORTFOLIO THEORY AND INVESTMENT ANALYSIS

FIGHTH FDITION

INTERNATIONAL STUDENT VERSION

## EDWIN J. ELTON

Leonard N. Stern School of Business New York University

### MARTIN J. GRUBER

Leonard N. Stern School of Business New York University

### STEPHEN J. BROWN

Leonard N. Stern School of Business New York University

WILLIAM N. GOETZMANN
Yale University



# Contents

	About the Authors <b>vii</b> Preface <b>ix</b>	
Part 1	INTRODUCTION	1
Chapter 1	INTRODUCTION  Outline of the Book 2  The Economic Theory of Choice: An Illustration Under Certainty 4  Conclusion 8  Multiple Assets and Risk 8  Questions and Problems 9  Bibliography 10	2
Chapter 2	FINANCIAL MARKETS Trading Mechanics 11 Margin 14 Markets 18 Trade Types and Costs 25 Conclusion 27 Bibliography 27	11
Chapter 3	FINANCIAL SECURITIES  Types of Marketable Financial Securities 28  The Return Characteristics of Alternative Security Types 36  Stock Market Indexes 38  Bond Market Indexes 39  Conclusion 40	28
Part 2	PORTFOLIO ANALYSIS	41
Section 1	MEAN VARIANCE PORTFOLIO THEORY	43
Chapter 4	THE CHARACTERISTICS OF THE OPPORTUNITY SET UNDER RISK  Determining the Average Outcome 45  A Measure of Dispersion 46  Variance of Combinations of Assets 49  Characteristics of Portfolios in General 51  Two Concluding Examples 61  Conclusion 64	44

	Questions and Problems <b>64</b> Bibliography <b>66</b>	
Chapter 5	DELINEATING EFFICIENT PORTFOLIOS  Combinations of Two Risky Assets Revisited: Short Sales Not Allowed The Shape of the Portfolio Possibilities Curve 77  The Efficient Frontier with Riskless Lending and Borrowing 84  Examples and Applications 88  Three Examples 93  Conclusion 96  Questions and Problems 96  Bibliography 97	68 68
Chapter 6	TECHNIQUES FOR CALCULATING THE EFFICIENT FRONTIER  Short Sales Allowed with Riskless Lending and Borrowing 100 Short Sales Allowed: No Riskless Lending and Borrowing 104 Riskless Lending and Borrowing with Short Sales Not Allowed 104 No Short Selling and No Riskless Lending and Borrowing 105 The Incorporation of Additional Constraints 106 An Example 107 Conclusion 110 Appendix A: An Alternative Definition of Short Sales 110 Appendix B: Determining the Derivative 111 Appendix C: Solving Systems of Simultaneous Equations 115 Appendix D: A General Solution 118 Appendix E: Quadratic Programming and Kuhn-Tucker Conditions 1 Questions and Problems 125 Bibliography 126	99 22
Section 2	SIMPLIFYING THE PORTFOLIO SELECTION PROCESS	129
Chapter 7	THE CORRELATION STRUCTURE OF SECURITY RETURNS: THE SINGLE-INDEX MODEL The Inputs to Portfolio Analysis 131 Single-Index Models: An Overview 132 Characteristics of the Single-Index Model 137 Estimating Beta 139 The Market Model 152 An Example 153 Questions and Problems 154 Bibliography 156	130
Chapter 8	THE CORRELATION STRUCTURE OF SECURITY RETURNS: MULTI-INDEX MODELS AND GROUPING TECHNIQUES  Multi-Index Models 160  Average Correlation Models 166  Mixed Models 167  Fundamental Multi-Index Models 167  Conclusion 173  Appendix A: Procedure for Reducing Any Multi-Index Model to a Multi-Index Model with Orthogonal Indexes 173  Appendix B: Mean Return, Variance, and Covariance of a Multi-Index Model 174  Questions and Problems 176  Bibliography 177	159

Chapter 9	SIMPLE TECHNIQUES FOR DETERMINING THE EFFICIENT FRONTIER	180
	The Single-Index Model 181 Security Selection with a Purchasable Index 192 The Constant Correlation Model 193 Other Return Structures 196 An Example 196 Conclusion 197 Appendix A: Single-Index Model—Short Sales Allowed 198 Appendix B: Constant Correlation Coefficient—Short Sales Allowed 200 Appendix C: Single-Index Model with Short Sales Not Allowed 201 Appendix D: Constant Correlation Coefficient—Short Sales Not Allowed 203 Appendix E: Single-Index Model, Short Sales Allowed, and a Market Asset 205 Questions and Problems 205 Bibliography 206	
Chapter 10	INTERNATIONAL DIVERSIFICATION	208
Α	The World Portfolio 208 Calculating the Return on Foreign Investments 210 The Risk of Foreign Securities 212 Returns from International Diversification 217 The Effect of Exchange Risk 218 Return Expectations and Portfolio Performance 219 Other Evidence on Internationally Diversified Portfolios 222 Models for Managing International Portfolios 226 Conclusion 229 Questions and Problems 229 Bibliography 231	(
Section 3	SELECTING THE OPTIMUM PORTFOLIO	235
Chapter 11	ESTIMATING EXPECTED RETURNS	236
chapte. Tr	Aggregate Asset Allocation <b>236</b> Forecasting Individual Security Returns <b>240</b> Portfolio Analysis with Discrete Data <b>242</b> Bibliography <b>244</b>	230
Chapter 12	how to select among the portfolios in the opportunity set	245
	Choosing Directly 245 An Introduction to Prefrerence Functions 246 Risk Tolerance Functions 249 Safety First 251 Maximizing the Geometric Mean Return 257 Value at Risk (VaR) 259 Utility and the Equity Risk Premium 260 Optimal Investment Strategies with Investor Liabilities 262 Liabilities and Safety-First Portfolio Selection 266 Simulations in Portfolio Choice 266 Conclusion 272 Appendix: The Economic Properties of Utility Functions 272 Relative Risk Aversion and Wealth 274 Ouestions and Problems 274 Bibliography 275	

Part 3	MODELS OF EQUILIBRIUM IN THE CAPITAL MARKETS	279
Chapter 13	THE STANDARD CAPITAL ASSET PRICING MODEL	280
	The Assumptions Underlying the Standard Capital Asset Pricing Model (CAPM) 280 The Capital Asset Pricing Model 281 Prices and the CAPM 290 Conclusion 292 Appendix: Appropriateness of the Single-Period Asset Pricing Model 294 Questions and Problems 298 Bibliography 299	
Chapter 14	ALTERNATIVE FORMS OF CAPITAL ASSET PRICING MODELS	301
	Short Sales Disallowed 302 Modifications of Riskless Lending and Borrowing 302 Personal Taxes 312 Nonmarketable Assets 314 Heterogeneous Expectations 316 Non-Price-Taking Behavior 317 Multiperiod CAPM 317 The Consumption-Oriented CAPM 318 Inflation Risk and Equilibrium 319 The Multi-Beta CAPM 319 Conclusion 320 Appendix: Derivation of the General Equilibrium with Taxes 321 Questions and Problems 323 Bibliography 324	
Chapter 15	EMPIRICAL TESTS OF FORMS OF THE CAPM	330
	The Models—Ex-Ante Expectations and Ex-Post Tests 330 Empirical Tests of the CAPM 331 Testing Some Alternative Forms of the CAPM Model 345 Testing the Post-Tax Form of the CAPM Model 345 Some Reservations about Traditional Tests of General Equilibrium Relationships and Some New Research 349 Conclusion 351 Appendix: Random Errors in Beta and Bias in the Parameters of the CAPM 352 Questions and Problems 353 Bibliography 354	
Chapter 16	THE ARBITRAGE PRICING MODEL AND—ITS EMPIRICAL	
	RELEVANCE  APT—What Is It? 358  Estimating and Testing APT 363  APT and CAPM 375  Recapitulation 376  Conclusion 385  Appendix A: A Simple Example of Factor Analysis 385.  Appendix B: Specification of the APT with an Unobserved Market Factor 386  Questions and Problems 387  Bibliography 388	358

	CON	VT	Εſ	V	TS
--	-----	----	----	---	----

V	/1	

.

Part 4	SECURITY ANALYSIS AND PORTFOLIO THEORY	395
Chapter 17	EFFICIENT MARKETS	396
·	Some Background 398 Tests of Return Predictability 400 Announcement and Price Return 416 Methodology of Event Studies 416 Strong-Form Efficiency 422 Market Rationality 425 Conclusion 427 Questions and Problems 427 Bibliography 427	
Chapter 18	BEHAVIORAL FINANCE, INVESTOR DECISION MAKING, AND ASSET PRICES	438
	Prospect Theory and Decision Making Under Uncertainty Biases From Laboratory Experiments 441 Summary of Investor Behavior 444 Behavioral Finance and Asset Pricing Theory 445 Bibliography 452	
Chapter 19	VALUATION MODELS	455
-	Discounted Cash Flow Models 456 Cross-Sectional Regression Analysis 468 An Ongoing System 472 Conclusion 477 Questions and Problems 477 Bibliography 478	
Chapter 20	EARNINGS ESTIMATION	482
·	The Elusive Number Called Earnings 482 The Importance of Earnings 485 Characteristics of Earnings and Earnings Forecasts 488 Conclusion 495 Ouestions and Problems 496 Bibliography 496	
Chapter 21	INTEREST RATE THEORY AND THE PRICING OF BONDS	498
	An Introduction to Debt Securities 499 The Many Definitions of Rates 501 Bond Prices and Spot Rates 508 Determining Spot Rates 510 The Determinants of Bond Prices 512 Conclusion 528 Appendix A: Special Considerations in Bond Pricing 528 Appendix B: Estimating Spot Rates 528 Appendix C: Calculating Bond Equivalent Yield and Effective Annual Yield 531 Ouestions and Problems 531 Bibliography 532	
Chapter 22	THE MANAGEMENT OF BOND PORTFOLIOS	536
	Duration <b>536</b> Protecting Against Term Structure Shifts <b>544</b> Bond Portfolio Management of Yearly Returns <b>548</b> Swaps <b>557</b>	

xviii

Index

711

	Appendix A: Duration Measures <b>559</b> Appendix B: Exact Matching Programs <b>563</b> Appendix C: Bond-Swapping Techniques <b>565</b> Appendix D: Convexity <b>566</b> Questions and Problems <b>567</b> Bibliography <b>568</b>	
Chapter 23	valuation and uses of options	571
	Types of Options 571 Some Basic Characteristics of Option Values 577 Valuation Models 582 Artificial or Homemade Options 593 Uses of Options 594 Conclusion 597 Appendix A: Derivation of the Binomial Formula 597 Appendix B: Derivation of the Black-Scholes Formula 600 Ouestions and Problems 602 Bibliography 603	-
Chapter 24	the valuation and uses of financial futures	609
	Description of Financial Futures 609 Valuation of Financial Futures 613 The Uses of Financial Futures 619 Nonfinancial Futures and Commodity Funds 623 Questions and Problems 624 Bibliography 624	
Part 5	EVALUATING THE INVESTMENT PROCESS	627
Chapter 25	EVALUATION OF PORTFOLIO PERFORMANCE	628
	Evaluation Techniques 629 A Manipulation-Proof Performance Measure 644 Decomposition of Overall Evaluation 645 Multi-Index, APT, and Performance Evaluation 655 Mutual Fund Performance 661 Conclusion 674 Questions and Problems 674 Bibliography 675	
Chapter 26	EVALUATION OF SECURITY ANALYSIS	680
	Why the Emphasis on Earnings? 681 The Evaluation of Earnings Forecasts 682 Evaluating the Valuation Process 689 Conclusion 692 Questions and Problems 693 Bibliography 693	
Chapter 27	PORTFOLIO MANAGEMENT REVISITED	695
	Managing Stock Portfolios 696 Active Management 699 Passive Versus Active 700 International Diversification 701 Bond Management 701 Bond and Stock Investment with a Liability Stream 704 Bibliography 709	