

Intermediate Financial Theory

Third Edition

Jean-Pierre Danthine

Swiss National Bank

Bundesplatz 1

Bern, Switzerland

John B Donaldson

Columbia Business School

New York, NY



AMSTERDAM • BOSTON • HEIDELBERG • LONDON
NEW YORK • OXFORD • PARIS • SAN DIEGO
SAN FRANCISCO • SINGAPORE • SYDNEY • TOKYO

Academic Press is an imprint of Elsevier



Contents

Preface xv

PART I INTRODUCTION

Chapter 1: On the Role of Financial Markets and Institutions **3**

- 1.1 Finance: The Time Dimension 3
- 1.2 Desynchronization: The Risk Dimension 6
- 1.3 The Screening and Monitoring Functions of the Financial System 7
- 1.4 The Financial System and Economic Growth 8
- 1.5 Financial Markets and Social Welfare 12
- 1.6 Financial Intermediation and the Business Cycle 18
- 1.7 Financial Crises 19
- 1.8 Conclusion 22

References 23

Complementary Readings 24

Appendix: Introduction to General Equilibrium Theory 24

- Pareto Optimal Allocations 25
- Competitive Equilibrium 27

Chapter 2: The Challenges of Asset Pricing: A Road Map **31**

- 2.1 The Main Question of Financial Theory 31
- 2.2 Discounting Risky Cash Flows: Various Lines of Attack 33
- 2.3 Two Main Perspectives: Equilibrium versus Arbitrage 35
- 2.4 Decomposing Risk Premia 37
- 2.5 Models and Stylized Facts 39
 - 2.5.1 The Equity Premium 40
 - 2.5.2 The Value Premium 42
 - 2.5.3 The Term Structure 43

2.6	Asset Pricing Is Not All of Finance!	44
2.6.1	Corporate Finance	44
2.6.2	Capital Structure	45
2.6.3	Taxes and Capital Structure	46
2.6.4	Capital Structure and Agency Costs	48
2.6.5	The Pecking Order Theory of Investment Financing	49
2.7	Banks	49
2.8	Conclusions	51
	References	51

PART II THE DEMAND FOR FINANCIAL ASSETS

Chapter 3: Making Choices in Risky Situations	55	
3.1	Introduction	55
3.2	Choosing Among Risky Prospects: Preliminaries	56
3.3	A Prerequisite: Choice Theory Under Certainty	61
3.4	Choice Theory Under Uncertainty: An Introduction	63
3.5	The Expected Utility Theorem	66
3.6	How Restrictive Is Expected Utility Theory? The Allais Paradox	72
3.7	Behavioral Finance	75
3.7.1	Framing	76
3.7.2	Prospect Theory	78
3.7.3	Overconfidence	84
3.8	Conclusions	85
	References	85
Chapter 4: Measuring Risk and Risk Aversion	87	
4.1	Introduction	87
4.2	Measuring Risk Aversion	87
4.3	Interpreting the Measures of Risk Aversion	90
4.3.1	Absolute Risk Aversion and the Odds of a Bet	90
4.3.2	Relative Risk Aversion in Relation to the Odds of a Bet	92
4.3.3	Risk Neutral Investors	93
4.4	Risk Premium and Certainty Equivalence	94
4.5	Assessing the Degree of Relative Risk Aversion	97
4.6	The Concept of Stochastic Dominance	98
4.7	Mean Preserving Spreads	102
4.8	An Unsettling Observation About Expected Utility	105

4.9 Applications: Leverage and Risk.....	106
4.9.1 An Example.....	108
4.9.2 Is Leverage a Good Thing?.....	109
4.9.3 An Application to Executive Compensation.....	111
4.10 Conclusions.....	112
References.....	113
Appendix: Proof of Theorem 4.2.....	113
Chapter 5: Risk Aversion and Investment Decisions, Part 1	115
5.1 Introduction.....	115
5.2 Risk Aversion and Portfolio Allocation: Risk-Free Versus Risky Assets.....	116
5.2.1 The Canonical Portfolio Problem.....	116
5.2.2 Illustration and Examples.....	117
5.3 Portfolio Composition, Risk Aversion, and Wealth	118
5.4 Special Case of Risk-Neutral Investors	121
5.5 Risk Aversion and Risky Portfolio Composition	122
5.6 Risk Aversion and Savings Behavior	124
5.6.1 Savings and the Riskiness of Returns.....	124
5.6.2 Illustrating Prudence	128
5.6.3 The Joint Saving–Portfolio Problem	129
5.7 Generalizing the VNM-Expected Utility Representation	130
5.7.1 Preferences for the Timing of Uncertainty Resolution	131
5.7.2 Preferences That Guarantee Time-Consistent Planning	133
5.7.3 Separating Risk and Time Preferences.....	137
5.8 Conclusions.....	139
References.....	140
Chapter 6: Risk Aversion and Investment Decisions, Part II: Modern Portfolio Theory.....	143
6.1 Introduction.....	144
6.2 More About Utility Functions and Return Distributions.....	144
6.3 Refining the Normality-of>Returns Assumption	149
6.4 Description of the Opportunity Set in the Mean–Variance Space: The Gains from Diversification and the Efficient Frontier	152
6.5 The Optimal Portfolio: A Separation Theorem.....	158
6.6 Stochastic Dominance and Diversification	159
6.7 Conclusions.....	165
References.....	166

Appendix 6.1: Indifference Curves Under Quadratic Utility or Normally Distributed Returns.....	166
Part I.....	166
Part II.....	167
Proof of the Convexity of Indifference Curves.....	170
Appendix 6.2: The Shape of the Efficient Frontier; Two Assets; Alternative Hypotheses.....	171
Perfect Positive Correlation (Figure 6.3).....	171
Imperfectly Correlated Assets (Figure 6.4).....	171
Perfect Negative Correlation (Figure 6.5).....	172
One Riskless and One Risky Asset (Figure 6.6).....	172
Appendix 6.3: Constructing the Efficient Frontier.....	173
The Basic Portfolio Problem.....	173
Generalizations.....	174
Nonnegativity Constraints.....	174
Composition Constraints.....	175
Adjusting the Data (Modifying the Means).....	176
Constraints on the Number of Securities in the Portfolio.....	177

Chapter 7: Risk Aversion and Investment Decisions, Part III: Challenges to Implementation.....	181
7.1 Introduction.....	181
7.2 The Consequences of Parameter Uncertainty.....	183
7.3 Trends and Cycles in Stock Market Return Data.....	187
7.3.1 Trends in International Stock Market Cross-Correlations.....	188
7.3.2 Asset Correlations in Cyclical Periods of High Volatility.....	190
7.3.3 The Financial Crisis.....	191
7.4 Equally Weighted Portfolios.....	193
7.5 Are Stocks Less Risky for Long Investment Horizons?.....	195
7.5.1 Long- and Short-Run Equity Riskiness: Historical Patterns.....	195
7.5.2 Intertemporal Stock Return Behavior Through Time: The Random Walk Model.....	197
7.5.3 Are Stocks Less Risky in the Long Run? A Predictive Perspective.....	201
7.6 Conclusions.....	203
References.....	204
Appendix 7.1.....	205

PART III EQUILIBRIUM PRICING

Chapter 8: The Capital Asset Pricing Model	209
8.1 Introduction.....	209
8.2 The Traditional Approach to the CAPM	210
8.3 Valuing Risky Cash Flows with the CAPM	214
8.4 The Mathematics of the Portfolio Frontier: Many Risky Assets and No Risk-Free Asset.....	217
8.5 Characterizing Efficient Portfolios (No Risk-Free Assets).....	222
8.6 Background for Deriving the Zero-Beta CAPM: Notion of a Zero-Covariance Portfolio	224
8.7 The Zero-Beta CAPM	227
8.8 The Standard CAPM	229
8.9 An Empirical Assessment of the CAPM.....	231
8.9.1 Fama and MacBeth (1973).....	232
8.9.2 Banz (1981) and the “Size Effect”	234
8.9.3 Fama and French (1992)	234
8.9.4 Volatility Anomalies	235
8.10 Conclusions.....	239
References	240
Appendix 8.1: Proof of the CAPM Relationship.....	241
Appendix 8.2: The Mathematics of the Portfolio Frontier: An Example.....	242
Appendix 8.3: Diagrammatic Representation of the Fama–MacBeth Two-Step Procedure	245
 Chapter 9: Arrow–Debreu Pricing, Part I	 247
9.1 Introduction.....	247
9.2 Setting: An Arrow–Debreu Economy	248
9.3 Competitive Equilibrium and Pareto Optimality Illustrated	250
9.4 Pareto Optimality and Risk Sharing	257
9.5 Implementing PO Allocations: On the Possibility of Market Failure.....	260
9.6 Risk-Neutral Valuations	263
9.7 Conclusions.....	266
References	267
 Chapter 10: The Consumption Capital Asset Pricing Model	 269
10.1 Introduction.....	270
10.2 The Representative Agent Hypothesis and its Notion of Equilibrium.....	270

10.2.1	An Infinitely Lived Representative Agent.....	270
10.2.2	On the Concept of a “No-Trade” Equilibrium.....	271
10.3	An Exchange (Endowment) Economy.....	275
10.3.1	The Model.....	275
10.3.2	Interpreting the Exchange Equilibrium.....	278
10.3.3	The Formal CCAPM.....	281
10.4	Pricing Arrow–Debreu State-Contingent Claims with the CCAPM.....	281
10.4.1	The CCAPM and Risk-Neutral Valuation.....	285
10.5	Testing the CCAPM: The Equity Premium Puzzle.....	286
10.6	Testing the CCAPM: Hansen–Jagannathan Bounds.....	293
10.7	The SDF in Greater Generality.....	295
10.8	Some Extensions.....	297
10.8.1	Reviewing the Diagnosis.....	297
10.8.2	Adding a Disaster State.....	299
10.8.3	Habit Formation.....	302
10.8.4	The CCAPM with Epstein–Zin Utility.....	303
10.8.5	Beyond a Representative Agent and Rational Expectations.....	313
10.9	Conclusions.....	317
	References.....	317
	Appendix 10.1: Solving the CCAPM with Growth.....	319
	Appendix 10.2: Some Properties of the Lognormal Distribution.....	320

PART IV ARBITRAGE PRICING

Chapter 11: Arrow–Debreu Pricing, Part II.....	325	
11.1	Introduction.....	325
11.2	Market Completeness and Complex Securities.....	326
11.3	Constructing State-Contingent Claims Prices in a Risk-Free World: Deriving the Term Structure.....	330
11.4	The Value Additivity Theorem.....	335
11.5	Using Options to Complete the Market: An Abstract Setting.....	337
11.6	Synthesizing State-Contingent Claims: A First Approximation.....	343
11.7	Recovering Arrow–Debreu Prices from Options Prices: A Generalization.....	345
11.8	Arrow–Debreu Pricing in a Multiperiod Setting.....	352
11.9	Conclusions.....	357
	References.....	358
	Appendix 11.1: Forward Prices and Forward Rates.....	358

Chapter 12: The Martingale Measure: Part I	361
12.1 Introduction.....	361
12.2 The Setting and the Intuition.....	362
12.3 Notation, Definitions, and Basic Results.....	364
12.4 Uniqueness.....	369
12.5 Incompleteness.....	372
12.6 Equilibrium and No Arbitrage Opportunities.....	375
12.7 Application: Maximizing the Expected Utility of Terminal Wealth.....	377
12.7.1 Portfolio Investment and Risk-Neutral Probabilities.....	377
12.7.2 Solving the Portfolio Problem.....	380
12.7.3 A Numerical Example.....	381
12.8 Conclusions.....	383
References.....	384
Appendix 12.1: Finding the Stock and Bond Economy That Is Directly Analogous to the Arrow–Debreu Economy in Which Only State Claims Are Traded.....	384
Appendix 12.2: Proof of the Second Part of Proposition 12.6.....	386
 Chapter 13: The Martingale Measure: Part II	 387
13.1 Introduction.....	387
13.2 Discrete Time Infinite Horizon Economies: A CCAPM Setting.....	388
13.3 Risk-Neutral Pricing in the CCAPM.....	390
13.4 The Binomial Model of Derivatives Valuation.....	397
13.5 Continuous Time: An Introduction to the Black–Scholes Formula.....	407
13.6 Dybvig’s Evaluation of Dynamic Trading Strategies.....	410
13.7 Conclusions.....	414
References.....	414
Appendix 13.1: Risk-Neutral Valuation When Discounting at the Term Structure of Multiperiod Discount Bond.....	414
 Chapter 14: The Arbitrage Pricing Theory	 417
14.1 Introduction.....	417
14.2 Factor Models: A First Illustration.....	419
14.2.1 Using the Market Model.....	420
14.3 A Second Illustration: Multifactor Models, and the CAPM.....	421
14.4 The APT: A Formal Statement.....	424
14.5 Macroeconomic Factor Models.....	426

14.6	Models with Factor-Mimicking Portfolios.....	428
14.6.1	The Size and Value Factors of Fama and French (1993).....	428
14.6.2	Momentum Portfolios	434
14.7	Advantage of the APT for Stock or Portfolio Selection.....	436
14.8	Conclusions.....	437
	References.....	437
	Appendix A.14.1: A Graphical Interpretation of the APT.....	438
	Statement and Proof of the APT	439
	The CAPM and the APT.....	441
	Appendix 14.2: Capital Budgeting.....	441
Chapter 15: An Intuitive Overview of Continuous Time Finance.....		443
15.1	Introduction.....	443
15.2	Random Walks and Brownian Motion.....	444
15.3	More General Continuous Time Processes	448
15.4	A Continuous Time Model of Stock Price Behavior	449
15.5	Simulation and European Call Pricing.....	451
15.5.1	Ito processes	451
15.5.2	Binomial Model.....	453
15.6	Solving Stochastic Differential Equations: A First Approach	454
15.6.1	The Behavior of Stochastic Differentials.....	454
15.6.2	Ito’s Lemma.....	456
15.6.3	The Black–Scholes Formula	457
15.7	A Second Approach: Martingale Methods.....	459
15.8	Applications	460
15.8.1	The Consumption–Savings Problem.....	460
15.8.2	An Application to Portfolio Analysis	461
15.8.3	The Consumption CAPM in Continuous Time.....	466
15.9	Final Comments	467
	References.....	467
Chapter 16: Portfolio Management in the Long Run.....		469
16.1	Introduction.....	469
16.2	The Myopic Solution.....	472
16.3	Variations in the Risk-Free Rate	478
16.3.1	The Budget Constraint	479
16.3.2	The Optimality Equation.....	481
16.3.3	Optimal Portfolio Allocations	482

16.3.4	The Nature of the Risk-Free Asset	484
16.3.5	The Role of Bonds in Investor Portfolios	485
16.4	The Long-Run Behavior of Stock Returns.....	486
16.4.1	Solving for Optimal Portfolio Proportions in a Mean Reversion Environment.....	489
16.4.2	Strategic Asset Allocation.....	491
16.4.3	The Role of Stocks in Investor Portfolios	492
16.5	Background Risk: The Implications of Labor Income for Portfolio Choice.....	492
16.6	An Important Caveat	501
16.7	Another Background Risk: Real Estate	501
16.8	Conclusions.....	504
	References	505
Chapter 17: Financial Structure and Firm Valuation in Incomplete Markets.....		507
17.1	Introduction.....	507
17.1.1	What Securities Should a Firm Issue if the Value of the Firm is to be Maximized?	508
17.1.2	What Securities Should a Firm Issue if it is to Grow as Rapidly as Possible?.....	508
17.2	Financial Structure and Firm Valuation.....	508
17.2.1	Financial Structure F_1	510
17.2.2	Financial Structure F_2	512
17.3	Arrow–Debreu and Modigliani–Miller	514
17.4	On the Role of Short Selling	516
17.5	Financing and Growth.....	518
17.5.1	No Contingent Claims Markets	519
17.5.2	Contingent Claims Trading	519
17.5.3	Incomplete Markets.....	521
17.5.4	Complete Contingent Claims	522
17.6	Conclusions.....	524
	References	524
	Appendix: Details of the Solution of the Contingent Claims Trade Case of Section 17.5	525
Chapter 18: Financial Equilibrium with Differential Information		527
18.1	Introduction.....	527
18.2	On the Possibility of an Upward-Sloping Demand Curve.....	529
18.3	An Illustration of the Concept of REE: Homogeneous Information.....	530

18.4 Fully Revealing REE: An Example	535
18.5 The Efficient Market Hypothesis.....	539
References	542
Appendix: Bayesian Updating with the Normal Distribution.....	542
Index	545

*For additional material, please see the following companion sites for the book:
<http://booksite.elsevier.com/9780123865496/> and http://textbooks.elsevier.com/web/product_details.aspx?isbn=9780123865496*