
Thorsten Hens • Marc Oliver Rieger

Financial Economics

A Concise Introduction to Classical
and Behavioral Finance

Second Edition

 Springer

Contents

Part I Foundations

1	Introduction	3
1.1	An Introduction to This Book	3
1.2	An Introduction to Financial Economics	4
1.2.1	Trade and Valuation in Financial Markets	5
1.2.2	No Arbitrage and No Excess Returns	7
1.2.3	Market Efficiency	9
1.2.4	Equilibrium	9
1.2.5	Aggregation and Comparative Statics	10
1.2.6	Time Scale of Investment Decisions	10
1.2.7	Behavioral Finance	11
1.3	An Introduction to the Research Methods	12
2	Decision Theory	15
2.1	Fundamental Concepts	16
2.2	Expected Utility Theory	20
2.2.1	Origins of Expected Utility Theory	20
2.2.2	Axiomatic Definition	28
2.2.3	Which Utility Functions Are “Suitable”?	36
2.2.4	Measuring the Utility Function	43
2.3	Mean-Variance Theory	46
2.3.1	Definition and Fundamental Properties	46
2.3.2	Success and Limitation	48
2.4	Prospect Theory	52
2.4.1	Origins of Behavioral Decision Theory	53
2.4.2	Original Prospect Theory	56
2.4.3	Cumulative Prospect Theory	60
2.4.4	Choice of Value and Weighting Function	67
2.4.5	Continuity in Decision Theories	71
2.4.6	Other Extensions of Prospect Theory	73
2.5	Connecting EUT, Mean-Variance Theory and PT	75
2.6	Ambiguity and Uncertainty	80

2.7	Time Discounting	82
2.8	Summary	85
Part II Financial Markets		
3	Two-Period Model: Mean-Variance Approach	93
3.1	Geometric Intuition for the CAPM	94
3.1.1	Diversification	94
3.1.2	Efficient Frontier	97
3.1.3	Optimal Portfolio of Risky Assets with a Riskless Security	97
3.1.4	Mathematical Analysis of the Minimum-Variance Opportunity Set	98
3.1.5	Two-Fund Separation Theorem	103
3.1.6	Computing the Tangent Portfolio	104
3.2	Market Equilibrium	105
3.2.1	Capital Asset Pricing Model	106
3.2.2	Application: Market Neutral Strategies	107
3.2.3	Empirical Validity of the CAPM	108
3.3	Heterogeneous Beliefs and the Alpha	108
3.3.1	Definition of the Alpha	110
3.3.2	CAPM with Heterogeneous Beliefs	115
3.3.3	Zero Sum Game	118
3.3.4	Active or Passive?	123
3.4	Alternative Betas and Higher Moment Betas	125
3.4.1	Alternative Betas	126
3.4.2	Higher Moment Betas	127
3.4.3	Deriving a Behavioral CAPM	130
3.5	Summary	134
4	Two-Period Model: State-Preference Approach	139
4.1	Basic Two-Period Model	140
4.1.1	Asset Classes	140
4.1.2	Returns	141
4.1.3	Investors	145
4.1.4	Complete and Incomplete Markets	150
4.1.5	What Do Agents Trade?	150
4.2	No-Arbitrage Condition	151
4.2.1	Introduction	151
4.2.2	Fundamental Theorem of Asset Prices	153
4.2.3	Pricing of Derivatives	158
4.2.4	Limits to Arbitrage	161
4.3	Financial Markets Equilibria	166
4.3.1	General Risk-Return Tradeoff	167
4.3.2	Consumption Based CAPM	168

4.3.3	Definition of Financial Markets Equilibria	169
4.3.4	Intertemporal Trade	174
4.4	Special Cases: CAPM, APT and Behavioral CAPM	176
4.4.1	Deriving the CAPM by ‘Brutal Force of Computations’	177
4.4.2	Deriving the CAPM from the Likelihood Ratio Process	180
4.4.3	Arbitrage Pricing Theory (APT)	182
4.4.4	Deriving the APT in the CAPM with Background Risk	182
4.4.5	Behavioral CAPM	184
4.5	Pareto Efficiency	185
4.6	Aggregation	188
4.6.1	Anything Goes and the Limitations of Aggregation	188
4.6.2	A Model for Aggregation of Heterogeneous Beliefs, Risk- and Time Preferences	195
4.6.3	Empirical Properties of the Representative Agent	196
4.7	Dynamics and Stability of Equilibria	201
4.8	Summary	207
5	Multiple-Periods Model	211
5.1	The General Equilibrium Model	211
5.2	Complete and Incomplete Markets	216
5.3	Term Structure of Interest	218
5.3.1	Term Structure Without Risk	219
5.3.2	Term Structure with Risk	223
5.4	Arbitrage in the Multi-period Model	225
5.4.1	Fundamental Theorem of Asset Pricing	225
5.4.2	Consequences of No-Arbitrage	227
5.4.3	Applications to Option Pricing	228
5.4.4	Stock Prices as Discounted Expected Payoffs	229
5.4.5	Equivalent Formulations of the No-Arbitrage Principle	231
5.4.6	Ponzi Schemes and Bubbles	232
5.5	Pareto Efficiency	236
5.5.1	First Welfare Theorem	236
5.5.2	Aggregation	238
5.6	Dynamics of Price Expectations	238
5.6.1	What Is Momentum?	238
5.6.2	Dynamical Model of Chartists and Fundamentalists	240
5.7	Survival of the Fittest on Wall Street	245
5.7.1	Market Selection Hypothesis with Rational Expectations ...	245
5.7.2	Evolutionary Portfolio Theory	246
5.7.3	Evolutionary Portfolio Model	247
5.7.4	The Unique Survivor: λ^*	251

Part III Advanced Topics

6	Theory of the Firm	257
6.1	Basic Model	257
6.1.1	Households and Firms	257
6.1.2	Financial Market	258
6.1.3	Financial Economy with Production	260
6.1.4	Budget Restriction/Households' Decisions and Firms' Decisions	261
6.2	Modigliani-Miller Theorem	265
6.2.1	The Modigliani-Miller Theorem with Non-incorporated Companies	265
6.2.2	The Modigliani-Miller Theorem with Incorporated Companies	267
6.2.3	When Does the Modigliani-Miller Theorem Not Hold?	268
6.3	Firm's Decision Rules	269
6.3.1	Fisher Separation Theorem	269
6.3.2	The Theorem of Drèze	273
6.4	Summary	276
7	Information Asymmetries on Financial Markets	277
7.1	Information Revealed by Prices	278
7.2	Information Revealed by Trade	280
7.3	Moral Hazard	282
7.4	Adverse Selection	283
7.5	Summary	285
8	Time-Continuous Model	287
8.1	A Rough Path to the Black-Scholes Formula	288
8.2	Brownian Motion and Itô Processes	291
8.3	A Rigorous Path to the Black-Scholes Formula	294
8.3.1	Derivation of the Black-Scholes Formula for Call Options	295
8.3.2	Put-Call Parity	298
8.4	Exotic Options and the Monte Carlo Method	298
8.4.1	Barrier Option	299
8.4.2	Asian Option	299
8.4.3	Fixed-Strike Average	299
8.4.4	Variance Swap	299
8.4.5	Rainbow Option	299
8.5	Connections to the Multi-period Model	301
8.6	Time-Continuity and the Mutual Fund Theorem	306
8.7	Market Equilibria in Continuous Time	309
8.8	Limitations of the Black-Scholes Model and Extensions	312
8.8.1	Volatility Smile and Other Unfriendly Effects	313

8.8.2	Not Normal: Alternatives to Normally Distributed Returns	314
8.8.3	Jumping Up and Down: Lévy Processes	318
8.8.4	Drifting Away: Heston and GARCH Models	321
8.9	Summary	324
A	Mathematics	327
A.1	Linear Algebra	327
A.1.1	Vectors	327
A.1.2	Matrices	328
A.1.3	Linear Maps	329
A.1.4	Subspaces, Dimension and Hyperplanes	329
A.1.5	Convex Sets and the Separation Theorem	330
A.2	Basic Notions of Statistics	331
A.2.1	Mean and Expected Value	331
A.2.2	Variance	331
A.2.3	Normal Distribution	332
A.2.4	Covariance and Correlation	332
A.2.5	Skewness and Higher Order Moments	333
A.3	Basics in Topology	334
A.3.1	Open Sets	334
A.3.2	Convergence and Metrics	335
A.4	How to Use Probability Measures	336
A.5	Calculus, Fourier Transformations and Partial Differential Equations	340
A.6	General Axioms for Expected Utility Theory	344
B	Solutions to Tests	347
	References	349
	Index	357