

Contents

Part I Principles

1	Interest Rates and Financial Derivatives	3
1.1	Interest Rates and Deterministic Cash Flows	3
1.1.1	Deterministic Cash Flows	4
1.1.2	Arbitrage-Free Cash Flows	5
1.2	Derivatives and No-Arbitrage Pricing	14
1.2.1	The Lognormal Model	20
1.2.2	Implied Forward Probabilities	23
1.3	Notes and Comments	28
1.4	Exercises	29
2	Convex Optimization	33
2.1	Basic Convex Optimization	33
2.2	More General Convex Optimization	36
2.3	Notes and Comments	38
3	Quadratic Hedging Principles	39
3.1	Conditional Expectations and Linear Regression	40
3.1.1	Examples	43
3.1.2	Proofs of Propositions	44
3.2	Hedging with Futures	46
3.3	Hedging of Insurance Liabilities	52
3.4	Hedging of a Digital Option with Call Options	59
3.5	Delta Hedging	62
3.5.1	Dynamic Hedging of a Call Option	66
3.6	Immunization of Cash Flows	68
3.6.1	Immunization and Principal Component Analysis	74
3.7	Notes and Comments	80
3.8	Exercises	80

4 Quadratic Investment Principles	85
4.1 Quadratic Investments Without a Risk-Free Asset	87
4.2 Quadratic Investments with a Risk-Free Asset	92
4.2.1 The Trade-Off Problem	92
4.2.2 Maximization of Expectation and Minimization of Variance	96
4.2.3 Evaluating the Methods on Simulated Data	99
4.2.4 Different Borrowing and Lending Rates	104
4.3 Investments in the Presence of Liabilities	106
4.4 Large Portfolios	112
4.5 Problems with Mean–Variance Analysis	117
4.6 Notes and Comments	122
4.7 Exercises	122
5 Utility-Based Investment Principles	127
5.1 Maximization of Expected Utility	128
5.2 A Horse Race Example	138
5.3 The Optimal Derivative Position	144
5.3.1 Examples with Lognormal Distributions	147
5.3.2 Investments in the Presence of Liabilities	150
5.4 Notes and Comments	154
5.5 Exercises	155
6 Risk Measurement Principles	159
6.1 Risk Measurement	159
6.2 Value-at-Risk	165
6.3 Expected Shortfall	178
6.4 Risk Measures Based on Utility Functions	187
6.5 Spectral Risk Measures	188
6.6 Notes and Comments	191
6.7 Exercises	192

Part II Methods

7 Empirical Methods	197
7.1 Sample Preparation	198
7.2 Empirical Distributions	200
7.3 Empirical Quantiles	204
7.4 Empirical VaR and ES	210
7.5 Confidence Intervals	214
7.5.1 Exact Confidence Intervals for Quantiles	214
7.5.2 Confidence Intervals Using the Nonparametric Bootstrap	216
7.6 Bootstrapping in Nonlife Insurance	220
7.6.1 Claims Reserve Prediction Via the Chain Ladder	220
7.7 Notes and Comments	225
7.8 Exercises	226

8 Parametric Models and Their Tails	231
8.1 Model Selection and Parameter Estimation	232
8.1.1 Examples of Parametric Distributions	233
8.1.2 Quantile–Quantile Plots	236
8.1.3 Maximum-Likelihood Estimation	237
8.1.4 Least-Squares Estimation	243
8.1.5 Parametric Bootstrap	246
8.1.6 Constructing Parametric Families with q – q Plots	248
8.2 Extreme Values and Tail Probabilities	253
8.2.1 Heavy Tails and Diversification	254
8.2.2 Peaks Over Threshold Method	265
8.3 Notes and Comments	269
8.4 Exercises	270
9 Multivariate Models	273
9.1 Spherical Distributions	274
9.2 Elliptical Distributions	277
9.2.1 Goodness of Fit of an Elliptical Model	279
9.2.2 Asymptotic Dependence and Rank Correlation	282
9.2.3 Linearization and Elliptical Distributions	285
9.3 Applications of Elliptical Distributions in Risk Management	291
9.3.1 Risk Aggregation with Elliptical Distributions	291
9.3.2 Solvency of an Insurance Company	293
9.3.3 Hedging of a Call Option When the Volatility Is Stochastic ..	295
9.3.4 Betting on Changes in Volatility	298
9.3.5 Portfolio Optimization with Elliptical Distributions	299
9.4 Copulas	301
9.4.1 Misconceptions of Correlation and Dependence	311
9.5 Models for Large Portfolios	320
9.5.1 Beta Mixture Model	322
9.6 Notes and Comments	325
9.7 Exercises	325
References	331
Index	333

Risk and Portfolio Analysis

Principles and Methods

Hult, H.; Lindskog, F.; Hammarlid, O.; Rehn, C.J.

2012, XIV, 338 p., Hardcover

ISBN: 978-1-4614-4102-1