

**Cheng-Few Lee • Alice C. Lee • John Lee**  
Editors

# Handbook of Quantitative Finance and Risk Management

4y Springer

# Contents

<b>Preface</b> .....	<i>v</i>
<b>Part I Overview of Quantitative Finance and Risk Management Research</b>	
<b>1 Theoretical Framework of Finance</b> .....	<b>3</b>
1.1 Introduction .....	3
1.2 Discounted Cash-Flow Valuation Theory .....	3
1.3 M and M Valuation Theory .....	6
1.4 Markowitz Portfolio Theory .....	10
1.5 Capital Asset Pricing Model .....	10
1.6 Arbitrage Pricing Theory .....	12
1.7 Option Valuation .....	14
1.8 Futures Valuation and Hedging .....	15
1.9 Conclusion .....	22
References .....	22
<b>2 Investment, Dividend, Financing, and Production Policies: Theory and Implications</b> .....	<b>23</b>
2.1 Introduction .....	23
2.2 Investment and Dividend Interactions: The Internal Versus External Financing Decision .....	23
2.3 Interactions Between Dividend and Financing Policies .....	25
2.4 Interactions Between Financing and Investment Decisions .....	28
2.5 Implications of Financing and Investment Interactions for Capital Budgeting .....	30
2.6 Implications of Different Policies on the Beta Coefficient .....	34
2.7 Conclusion .....	36
References .....	36
<b>Appendix 2A Stochastic Dominance and its Applications to Capital-Structure Analysis with Default Risk</b> .....	
2A.1 Introduction .....	38
2A.2 Concepts and Theorems of Stochastic Dominance .....	38
2A.3 Stochastic-Dominance Approach to Investigating the Capital-Structure Problem with Default Risk .....	39
2A.4 Summary .....	40

<b>3</b>	<b>Research Methods in Quantitative Finance and Risk Management</b>	<b>41</b>
3.1	Introduction	41
3.2	Statistics	41
3.3	Econometrics	43
3.4	Mathematics	46
3.5	Other Disciplines	48
3.6	Conclusion	49
	References	50

**Part II Portfolio Theory and Investment Analysis**

<b>4</b>	<b>Foundation of Portfolio Theory</b>	<b>53</b>
	Cheng-Few Lee, Alice C. Lee, and John Lee	
4.1	Introduction	53
4.2	Risk Classification and Measurement	53
4.3	Portfolio Analysis and Application	57
4.4	The Efficient Portfolio and Risk Diversification	60
4.5	Determination of Commercial Lending Rate	64
4.6	The Market Rate of Return and Market Risk Premium	66
4.7	Conclusion	68
	References	68
<b>5</b>	<b>Risk-Aversion, Capital Asset Allocation, and Markowitz Portfolio-Selection Model</b>	<b>69</b>
	Cheng-Few Lee, Joseph E. Finnerty, and Hong-Yi Chen	
5.1	Introduction	69
5.2	Measurement of Return and Risk	69
5.3	Utility Theory, Utility Functions, and Indifference Curves	71
5.4	Efficient Portfolios	77
5.5	Conclusion	91
	References	91
<b>6</b>	<b>Capital Asset Pricing Model and Beta Forecasting</b>	<b>93</b>
	Cheng-Few Lee, Joseph E. Finnerty, and Donald H. Wort	
6.1	Introduction	93
6.2	A Graphical Approach to the Derivation of the Capital Asset Pricing Model	93
6.3	Mathematical Approach to the Derivation of the Capital Asset Pricing Model	96
6.4	The Market Model and Risk Decomposition	97
6.5	Growth Rates, Accounting Betas, and Variance in EBIT	100
6.6	Some Applications and Implications of the Capital Asset Pricing Model	104
6.7	Conclusion	105
	References	105
	Appendix 6A Empirical Evidence for the Risk-Return Relationship	106
	Appendix 6B Anomalies in the Semi-strong Efficient-Market Hypothesis	109
<b>7</b>	<b>Index Models for Portfolio Selection</b>	<b>111</b>
	Cheng-Few Lee, Joseph E. Finnerty, and Donald H. Wort	
7.1	Introduction	111
7.2	The Single-Index Model	111
7.3	Multiple Indexes and the Multiple-Index Model	118
7.4	Conclusion	121
	References	122

Appendix 7 A A Linear-Programming Approach to Portfolio-Analysis Models . . . .	122
Appendix 7B Expected Return, Variance, and Covariance for a Multi-index Model. . . . .	123
<b>8 Performance-Measure Approaches for Selecting Optimum Portfolios . . . . .</b>	<b>125</b>
Cheng-Few Lee, Hong-Yi Chen, and Jessica Shin-Ying Mai	
8.1 Introduction. . . . .	125
8.2 Sharpe Performance-Measure Approach with Short Sales Allowed. . . . .	125
8.3 Treynor-Measure Approach with Short Sales Allowed. . . . .	128
8.4 Treynor-Measure Approach with Short Sales Not Allowed. . . . .	130
8.5 Impact of Short Sales on Optimal-Weight Determination. . . . .	132
8.6 Economic Rationale of the Treynor Performance-Measure Method. . . . .	132
8.7 Conclusion. . . . .	133
References. . . . .	133
Appendix 8A Derivation of Equation (8.6). . . . .	133
Appendix 8B Derivation of Equation (8.10). . . . .	134
Appendix 8C Derivation of Equation (8.15). . . . .	135
<b>9 The Creation and Control of Speculative Bubbles in a Laboratory Setting . . . .</b>	<b>137</b>
James S. Ang, Dean Diavatopoulos, and Thomas V. Schwarz	
9.1 Introduction. . . . .	137
9.2 Bubbles in the Asset Markets. . . . .	139
9.3 Experimental Design. . . . .	140
9.4 Results and Analysis. . . . .	145
9.5 Conclusions. . . . .	161
References. . . . .	163
<b>10 Portfolio Optimization Models and Mean-Variance Spanning Tests. . . . .</b>	<b>165</b>
Wei-Peng Chen, Huimin Chung, Keng-Yu Ho, and Tsui-Ling Hsu	
10.1 Introduction of Markowitz Portfolio-Selection Model. . . . .	165
10.2 Measurement of Return and Risk. . . . .	166
10.3 Efficient Portfolio. . . . .	166
10.4 Mean-Variance Spanning Test. . . . .	172
10.5 Alternative Computer Program to Calculate Efficient Frontier. . . . .	175
10.6 Conclusion. . . . .	182
References. . . . .	184
<b>11 Combining Fundamental Measures for Stock Selection. . . . .</b>	<b>185</b>
Kenton K. Yee	
11.1 Introduction. . . . .	185
11.2 Bayesian Triangulation. . . . .	187
11.3 Triangulation in Forensic Valuation. . . . .	189
11.4 Bayesian Triangulation in Asset Pricing Settings. . . . .	190
11.5 The Data Snooping Trap. . . . .	194
11.6 Using Guidance from Theory to Mitigate Data Snooping. . . . .	195
11.7 Avoiding Data-Snooping Pitfalls in Financial Statement Analysis. . . . .	197
11.8 Conclusion. . . . .	199
References. . . . .	200
Appendix 11A Proof of Theorem 11.1. . . . .	201
11A.I _ Generalization of Theorem 11.1. . . . .	201

<b>12</b>	<b>On Estimation Risk and Power Utility Portfolio Selection</b> . . . . .	203
	Robert R. Grauer and Frederick C. Shen	
12.1	Introduction. . . . .	203
12.2	Literature Review. . . . .	203
12.3	The Multiperiod Investment Model. . . . .	205
12.4	The Data . . . . .	206
12.5	Alternative Ways of Estimating the Joint Return Distribution. . . . .	206
12.6	Alternate Ways of Evaluating Investment Performance. . . . .	208
12.7	The Results. . . . .	210
12.8	Conclusion. . . . .	216
12.9	Addendum. . . . .	217
	References. . . . .	218
<b>13</b>	<b>International Portfolio Management: Theory and Method</b> . . . . .	221
	Wan-Jiun Paul Chiou and Cheng-Few Lee	
13.1	Introduction. . . . .	221
13.2	Overview of International Portfolio Management . . . . .	222
13.3	Literature Review. . . . .	226
13.4	Forming the Optimal Global Portfolio. . . . .	226
13.5	The Benefits of International Diversification Around the World. . . . .	227
13.6	The Optimal Portfolio Components. . . . .	229
13.7	Conclusion. . . . .	232
	References. . . . .	233
<b>14</b>	<b>The Le Chatelier Principle in the Markowitz Quadratic Programming Investment Model: A Case of World Equity Fund Market</b> . . . . .	235
	Chin W. Yang, Ken Hung, and Jing Cui	
14.1	Introduction. . . . .	235
14.2	Data and Methodology. . . . .	236
14.3	The Le Chatelier Principle in the Markowitz Investment Model. . . . .	236
14.4	An Application of the Le Chatelier Principle in the World Equity Market... .	237
14.5	Conclusion. . . . .	245
	References. . . . .	245
<b>15</b>	<b>Risk-Averse Portfolio Optimization via Stochastic Dominance Constraints....</b>	247
	Darinka Dentcheva and Andrzej Ruszczyrski	
15.1	Introduction. . . . .	247
15.2	The Portfolio Problem. . . . .	248
15.3	Stochastic Dominance. . . . .	249
15.4	The Dominance-Constrained Portfolio Problem . . . . .	252
15.5	Optimality and Duality. . . . .	254
15.6	Numerical Illustration. . . . .	256
15.7	Conclusions. . . . .	257
	References. . . . .	257
<b>16</b>	<b>Portfolio Analysis</b> . . . . .	259
	Jack Clark Francis	
16.1	Introduction . . . . .	259
16.2	Inputs for Portfolio Analysis. . . . .	259
16.3	The Security Analyst's Job. . . . .	259
16.4	Four Assumptions Underlying Portfolio Analysis. . . . .	260
16.5	Different Approaches to Diversification. . . . .	260
16.6	A Portfolio's Expected Return Formula. . . . .	261
16.7	The Quadratic Risk Formula for a Portfolio. . . . .	261
16.8	The Covariance Between Returns from Two Assets. . . . .	262

16.9	Portfolio Analysis of a Two-Asset Portfolio. . . . .	262
16.10	Mathematical Portfolio Analysis. . . . .	265
16.11	Calculus Minimization of Risk: A Three-Security Portfolio. . . . .	265
16.12	Conclusion. . . . .	266
	References. . . . .	266
<b>17</b>	<b>Portfolio Theory, CAPM and Performance Measures. . . . .</b>	<b>267</b>
	Luis Ferruz, Fernando Gomez-Bezares, and Man'a Vargas	
17.1	Portfolio Theory and CAPM: Foundations and Current Application. . . . .	267
17.2	Performance Measures Related to Portfolio Theory and the CAPM: Classic Indices, Derivative Indices, and New Approaches. . . . .	274
17.3	Empirical Analysis: Performance Rankings and Performance Persistence... .	277
17.4	Summary and Conclusions. . . . .	280
	References. . . . .	280
<b>18</b>	<b>Intertemporal Equilibrium Models, Portfolio Theory and the Capital Asset Pricing Model. . . . .</b>	<b>283</b>
	Stephen J. Brown	
18.1	Introduction. . . . .	283
18.2	Intertemporal Equilibrium Models. . . . .	283
18.3	Relationship to Observed Security Returns. . . . .	284
18.4	Intertemporal Equilibrium and the Capital Asset Pricing Model. . . . .	285
18.5	Hansen Jagannathan Bounds. . . . .	285
18.6	Are Stochastic Discount Factors Positive? . . . . .	286
18.7	Conclusion. . . . .	286
	References. . . . .	287
<b>19</b>	<b>Persistence, Predictability, and Portfolio Planning. . . . .</b>	<b>289</b>
	Michael J. Brennan and Yihong Xia	
19.1	Introduction. . . . .	289
19.2	Detecting and Exploiting Predictability. . . . .	290
19.3	Stock Price Variation and Variation in the Expected Returns. . . . .	296
19.4	Economic Significance of Predictability. . . . .	298
19.5	Forecasts of Equity Returns. . . . .	303
19.6	Conclusion. . . . .	314
	References. . . . .	314
	Appendix 19A The Optimal Strategy. . . . .	315
	Appendix 19B The Unconditional Strategy. . . . .	316
	Appendix 19C The Myopic Strategy. . . . .	317
	Appendix 19D The Optimal Buy-and-Hold Strategy. . . . .	317
<b>20</b>	<b>Portfolio Insurance Strategies: Review of Theory and Empirical Studies. . . . .</b>	<b>319</b>
	Lan-chih Ho, John Cadle, and Michael Theobald	
20.1	Introduction. . . . .	319
20.2	Theory of Alternative Portfolio Insurance Strategies. . . . .	319
20.3	Empirical Comparison of Alternative Portfolio Insurance Strategies. . . . .	324
20.4	Recent Market Developments. . . . .	329
20.5	Implications for Financial Market Stability. . . . .	331
20.6	Conclusion. . . . .	332
	References. . . . .	332

<b>21</b>	<b>Security Market Microstructure: The Analysis of a Non-Frictionless Market</b>	<b>333</b>
	Reto Francioni, Sonali Hazarika, Martin Reck, and Robert A. Schwartz	
21.1	Introduction	333
21.2	Microstructure's Challenge	334
21.3	The Perfectly Liquid Environment of CAPM	335
21.4	What Microstructure Analysis Has to Offer: Personal Reflections	339
21.5	From Theory to Application	344
21.6	Deutsche Borse: The Emergence of a Modern, Electronic Market	345
21.7	Conclusion: The Roadmap and the Road	347
	References	347
	Appendix 21A Risk Aversion and Risk Premium Measures	349
21A.1	Risk Aversion	349
21A.2	Risk Premiums	349
	Appendix 21B Designing Xetra	350
21B.1	Continuous Trading	350
21B.2	Call Auction Trading	351
21B.3	Electronic Trading for Less Liquid Stocks	351
21B.4	Xetra's Implementation and the Migration of Liquidity to Xetra Since 1997	352
 <b>Part III Options and Option Pricing Theory</b>		
<b>22</b>	<b>Options Strategies and Their Applications</b>	<b>355</b>
	Cheng Few Lee, John Lee, and Wei-Kang Shih	
22.1	Introduction	355
22.2	The Option Market and Related Definitions	355
22.3	Put-Call Parity	360
22.4	Risk-Return Characteristics of Options	363
22.5	Examples of Alternative Option Strategies	372
22.6	Conclusion	375
	References	375
<b>23</b>	<b>Option Pricing Theory and Firm Valuation</b>	<b>377</b>
	Cheng Few Lee, Joseph E. Finnerty, and Wei-Kang Shih	
23.1	Introduction	377
23.2	Basic Concepts of Options	377
23.3	Factors Affecting Option Value	380
23.4	Determining the Value of Options	384
23.5	Option Pricing Theory and Capital Structure	387
23.6	Warrants	390
23.7	Conclusion	391
	References	392
<b>24</b>	<b>Applications of the Binomial Distribution to Evaluate Call Options</b>	<b>393</b>
	Alice C. Lee, John Lee, and Jessica Shin-Ying Mai	
24.1	Introduction	393
24.2	What Is an Option?	393
24.3	The Simple Binomial Option Pricing Model	393
24.4	The Generalized Binomial Option Pricing Model	395
24.5	Conclusion	397
	References	397

<b>25</b>	<b>Multinomial Option Pricing Model</b>	399
	Cheng Few Lee and Jack C. Lee	
25.1	Introduction	399
25.2	Multinomial Option Pricing Model	399
25.3	A Lattice Framework for Option Pricing	402
25.4	Conclusion	406
	References	406
	Appendix 25A	406
<b>26</b>	<b>Two Alternative Binomial Option Pricing Model Approaches to Derive Black-Scholes Option Pricing Model</b>	409
	Cheng-Few Lee and Carl Shu-Ming Lin	
26.1	Introduction	409
26.2	The Two-State Option Pricing Model of Rendleman and Bartter	409
26.3	The Binomial Option Pricing Model of Cox, Ross, and Rubinstein	415
26.4	Comparison of the Two Approaches	417
26.5	Conclusion	418
	References	418
	Appendix 26A The Binomial Theorem	419
<b>27</b>	<b>Normal, Lognormal Distribution and Option Pricing Model</b>	421
	Cheng Few Lee, Jack C. Lee, and Alice C. Lee	
27.1	Introduction	421
27.2	The Normal Distribution	421
27.3	The Lognormal Distribution	422
27.4	The Lognormal Distribution and Its Relationship to the Normal Distribution	422
27.5	Multivariate Normal and Lognormal Distributions	423
27.6	The Normal Distribution as an Application to the Binomial and Poisson Distributions	425
27.7	Applications of the Lognormal Distribution in Option Pricing	426
27.8	Conclusion	428
	References	428
<b>28</b>	<b>Bivariate Option Pricing Models</b>	429
	Cheng Few Lee, Alice C. Lee, and John Lee	
28.1	Introduction	429
28.2	The Bivariate Normal Density Function	429
28.3	American Call Option and the Bivariate Normal CDF	430
28.4	Valuating American Options	431
28.5	Non-Dividend-Paying Stocks	433
28.6	Dividend-Paying Stocks	433
28.7	Conclusion	438
	References	438
<b>29</b>	<b>Displaced Log Normal and Lognormal American Option Pricing: A Comparison</b>	439
	Ren-Raw Chen and Cheng-Few Lee	
29.1	Introduction	439
29.2	The American Option Pricing Model Under the Lognormal Process	439
29.3	The Geske-Roll-Whaley Model	440
29.4	Conclusion	442
	References	442
	Appendix 29A	443



<b>30</b>	<b>Ito's Calculus and the Derivation of the Black-Scholes Option-Pricing Model</b>	<b>447</b>
	George Chalamandaris and A.G. Malliaris	
30.1	Introduction	447
30.2	The ITO Process and Financial Modeling	447
30.3	ITO'S Lemma	451
30.4	Stochastic Differential-Equation Approach to Stock-price Behavior	452
30.5	The Pricing of an Option	454
30.6	A Reexamination of Option Pricing	455
30.7	Extending the Risk-Neutral Argument: The Martingale Approach	458
30.8	Remarks on Option Pricing	463
30.9	Conclusion	465
	References	465
	Appendix 30A An Alternative Method To Derive the Black-Scholes Option-Pricing Model	466
30A.1	Assumptions and the Present Value of the Expected Terminal Option Price	466
30A.2	Present Value of the Partial Expectation of the Terminal Stock Price	467
30A.3	Present Value of the Exercise Price under Uncertainty	469
<b>31</b>	<b>Constant Elasticity of Variance Option Pricing Model: Integration and Detailed Derivation</b>	<b>471</b>
	Y.L. Hsu, T.I. Lin, and C.F. Lee	
31.1	Introduction	471
31.2	The CEV Diffusion and Its Transition Probability Density Function	471
31.3	Review of Noncentral Chi-Square Distribution	473
31.4	The Noncentral Chi-square Approach to Option Pricing Model	474
31.5	Conclusion	478
	References	478
	Appendix 31A Proof of Feller's Lemma	478
<b>32</b>	<b>Stochastic Volatility Option Pricing Models</b>	<b>481</b>
	Cheng Few Lee and Jack C. Lee	
32.1	Introduction	481
32.2	Nonclosed-Form Type of Option Pricing Model	481
32.3	Review of Characteristic Function	485
32.4	Closed-Form Type of Option Pricing Model	485
32.5	Conclusion	489
	References	489
	Appendix 32A The Market Price of the Risk	489
<b>33</b>	<b>Derivations and Applications of Greek Letters: Review and Integration</b>	<b>491</b>
	Hong-Yi Chen, Cheng-Few Lee, and Weikang Shih	
33.1	Introduction	491
33.2	Delta ( $\Delta$ )	491
33.3	Theta ( $\Theta$ )	494
33.4	Gamma ( $\Gamma$ )	496
33.5	Vega ( $\nu$ )	498
33.6	Rho ( $\rho$ )	500
33.7	Derivation of Sensitivity for Stock Options Respective with Exercise Price	501
33.8	Relationship Between Delta, Theta, and Gamma	502
33.9	Conclusion	503
	References	503

<b>34</b>	<b>A Further Analysis of the Convergence Rates and Patterns of the Binomial Models.</b>	505
	San-Lin Chung and Pai-Ta Shih	
34.1	Brief Review of the Binomial Models.	505
34.2	The Importance of Node Positioning for Monotonic Convergence.	506
34.3	The Flexibility of GCRR Model for Node Positioning	507
34.4	Numerical Results of Various GCRR Models.	507
34.5	Conclusion.	510
	References.	513
	Appendix 34A Extrapolation Formulas for Various GCRR Models.	513
<b>35</b>	<b>Estimating Implied Probabilities from Option Prices and the Underlying</b>	515
	Bruce Mizrach	
35.1	Introduction.	515
35.2	Black Scholes Baseline.	516
35.3	Empirical Departures from Black Scholes.	517
35.4	Beyond Black Scholes.	518
35.5	Histogram Estimators.	518
35.6	Tree Methods.	520
35.7	Local Volatility Functions.	522
35.8	PDF Approaches.	522
35.9	Inferences from the Mixture Model.	524
35.10	Jump Processes.	526
35.11	Conclusion.	528
	References.	528
<b>36</b>	<b>Are Tails Fat Enough to Explain Smile</b>	531
	Ren-Raw Chen, Oded Palmon, and John Wald	
36.1	Introduction.	531
36.2	Literature Review.	532
36.3	The Models.	533
36.4	Data and Empirical Results.	537
36.5	Conclusion.	541
	References.	541
	Appendix 36A.	542
	36A. 1 The Derivation of the Lognormal Model Under No Rebalancing ...	542
	36A.2 Continuous Rebalancing	543
	36A.3 Smoothing Techniques	543
	36A.4 Results of Sub-Sample Testing	544
<b>37</b>	<b>Option Pricing and Hedging Performance Under Stochastic Volatility and Stochastic Interest Rates</b>	547
	Gurdip Bakshi, Charles Cao, and Zhiwu Chen	
37.1	Introduction.	547
37.2	The Option Pricing Model.	549
37.3	Data Description.	556
37.4	Empirical Tests.	557
37.5	Conclusions.	571
	References.	571
	Appendix 37A.	572

<b>38</b>	<b>Application of the Characteristic Function in Financial Research</b> . . . . .	575
	H.W. Chuang, Y.L. Hsu, and C.F. Lee	
38.1	Introduction. . . . .	575
38.2	The Characteristic Functions. . . . .	575
38.3	CEV Option Pricing Model. . . . .	576
38.4	Options with Stochastic Volatility. . . . .	577
38.5	Conclusion. . . . .	581
	References. . . . .	581
<b>39</b>	<b>Asian Options</b> . . . . .	583
	Itzhak Venezia	
39.1	Introduction. . . . .	583
39.2	Valuation. . . . .	584
39.3	Conclusion. . . . .	586
	References. . . . .	586
<b>40</b>	<b>Numerical Valuation of Asian Options with Higher Moments in the Underlying Distribution</b> . . . . .	587
	Kehluh Wang and Ming-Feng Hsu	
40.1	Introduction. . . . .	587
40.2	Definitions and the Basic Binomial Model. . . . .	588
40.3	Edgeworth Binomial Model for Asian Option Valuation. . . . .	589
40.4	Upper Bound and Lower Bound for European Asian Options. . . . .	591
40.5	Upper Bound and Lower Bound for American Asian Options. . . . .	593
40.6	Numerical Examples. . . . .	594
40.7	Conclusion. . . . .	602
	References. . . . .	602
<b>41</b>	<b>The Valuation of Uncertain Income Streams and the Pricing of Options</b> . . . . .	605
	Mark Rubinstein	
41.1	Introduction. . . . .	605
41.2	Uncertain Income Streams: General Case. . . . .	606
41.3	Uncertain Income Streams: Special Case. . . . .	608
41.4	Options. . . . .	611
41.5	Conclusion. . . . .	613
	References. . . . .	613
	Appendix 41A The Bivariate Normal Density Function. . . . .	614
<b>42</b>	<b>Binomial OPM, Black-Scholes OPM and Their Relationship: Decision Tree and Microsoft Excel Approach</b> . . . . .	617
	John Lee	
42.1	Introduction. . . . .	617
42.2	Call and Put Options. . . . .	617
42.3	One Period Option Pricing Model. . . . .	618
42.4	Two-Period Option Pricing Model. . . . .	621
42.5	Using Microsoft Excel to Create the Binomial Option Trees. . . . .	622
42.6	Black-Scholes Option Pricing Model. . . . .	624
42.7	Relationship Between the Binomial OPM and the Black-Scholes OPM_____	625
42.8	Decision Tree Black-Scholes Calculation. . . . .	626
42.9	Conclusion. . . . .	626
	References. . . . .	627
	Appendix 42A Excel VBA Code: BinomialLOption Pricing Model. . . . .	627

**Part IV Risk Management**

<b>43</b>	<b>Combinatorial Methods for Constructing Credit Risk Ratings</b> . . . . .	639
	Alexander Kogan and Miguel A. Lejeune	
43.1	Introduction. . . . .	639
43.2	Logical Analysis of Data: An Overview. . . . .	641
43.3	Absolute Creditworthiness: Credit Risk Ratings of Financial Institutions . . .	643
43.4	Relative Creditworthiness: Country Risk Ratings. . . . .	648
43.5	Conclusions. . . . .	659
	References. . . . .	660
	Appendix 43A. . . . .	662
<b>44</b>	<b>The Structural Approach to Modeling Credit Risk</b> . . . . .	665
	Jing-zhi Huang	
44.1	Introduction. . . . .	665
44.2	Structural Credit Risk Models. . . . .	665
44.3	Empirical Evidence. . . . .	668
44.4	Conclusion. . . . .	671
	References. . . . .	671
<b>45</b>	<b>An Empirical Investigation of the Rationales for Integrated Risk-Management Behavior</b> . . . . .	675
	Michael S. Pagano	
45.1	Introduction. . . . .	675
45.2	Theories of Risk-Management, Previous Research, and Testable Hypotheses. . . . .	677
45.3	Data, Sample Selection, and Empirical Methodology. . . . .	685
45.4	Empirical Results. . . . .	689
45.5	Conclusion. . . . .	694
	References. . . . .	694
<b>46</b>	<b>Copula, Correlated Defaults, and Credit VaR</b> . . . . .	697
	Jow-Ran Chang and An-Chi Chen	
46.1	Introduction. . . . .	697
46.2	Methodology. . . . .	698
46.3	Experimental Results. . . . .	703
46.4	Conclusion. . . . .	710
	References. . . . .	711
<b>47</b>	<b>Unspanned Stochastic Volatilities and Interest Rate Derivatives Pricing</b> . . . .	713
	Feng Zhao	
47.1	Introduction. . . . .	713
47.2	Term Structure Models with Spanned Stochastic Volatility. . . . .	716
47.3	LIBOR Market Models with Stochastic Volatility and Jumps: Theory and Estimation. . . . .	723
47.4	Nonparametric Estimation of the Forward Density. . . . .	734
47.5	Conclusion. . . . .	746
	References. . . . .	746
	Appendix 47A The Derivation for QTSMs. . . . .	748
	Appendix 47B The Implementation of the Kalman Filter. . . . .	750
	Appendix 47C Derivation of the Characteristic Function. . . . .	751

**48 Catastrophic Losses and Alternative Risk Transfer Instruments** . . . . . 753  
Jin-Ping Lee and Min-Teh Yu  
48.1 Introduction. . . . . 753  
48.2 Catastrophe Bonds. . . . . 753  
48.3 Catastrophe Equity Puts. . . . . 757  
48.4 Catastrophe Derivatives. . . . . 760  
48.5 Reinsurance with CAT-Linked Securities. . . . . 763  
48.6 Conclusion. . . . . 764  
References. . . . . 766

**49 A Real Option Approach to the Comprehensive Analysis of Bank Consolidation Values** . . . . . 767  
Chuang-Chang Chang, Pei-Fang Hsieh, and Hung-Neng Lai  
49.1 Introduction. . . . . 767  
49.2 The Model. . . . . 768  
49.3 Case Study. . . . . 771  
49.4 Results. . . . . 775  
49.5 Conclusions. . . . . 777  
References. . . . . 777  
Appendix 49A The Correlations Between the Standard Wiener Process Generated from a Bank's Net Interest Income. . . . . 778  
Appendix 49B The Risk-Adjusted Processes. . . . . 778  
Appendix 49C The Discrete Version of the Risk-Adjusted Process. . . . . 778

**50 Dynamic Econometric Loss Model: A Default Study of US Subprime Markets** 779  
C.H. Ted Hong  
50.1 Introduction. . . . . 779  
50.2 Model Framework. . . . . 780  
50.3 Default Modeling. . . . . 782  
50.4 Prepayment Modeling. . . . . 792  
50.5 Delinquency Study. . . . . 797  
50.6 Conclusion. . . . . 800  
References. . . . . 802  
Appendix 50A Default and Prepayment Definition. . . . . 802  
Appendix 50B General Model Framework. . . . . 803  
Appendix 50C Default Specification. . . . . 803  
Appendix 50D Prepayment Specification. . . . . 805

**51 The Effect of Default Risk on Equity Liquidity: Evidence Based on the Panel Threshold Model** . . . . . 807  
Huimin Chung, Wei-Peng Chen, and Yu-Dan Chen  
51.1 Introduction. . . . . 807  
51.2 Data and Methodology. . . . . 808  
51.3 Empirical Results. . . . . 812  
51.4 Conclusion. . . . . 815  
References. . . . . 815  
Appendix 51A. . . . . 816

**52 Put Option Approach to Determine Bank Risk Premium** . . . . . 819  
Dar Yeh Hwang, Fu-Shuen Shie, and Wei-Hsiung Wu  
52.1 Introduction. . . . . 819  
52.2 Evaluating Insurer's Liability by Option Pricing Model: Merton (1977)\_\_\_\_\_ 820  
52.3 Extensionsof Merton (1977). . . . . 820  
52.4 Applications for Merton (1977). . . . . 823

52.5	Conclusion	825
	References	826
	Appendix 52A	826
	Appendix 52B	827
<b>53</b>	<b>Keiretsu Style Main Bank Relationships, R&amp;D Investment, Leverage, and Firm Value: Quantile Regression Approach</b>	829
	Hai-Chin Yu, Chih-Sean Chen, and Der-Tzon Hsieh	
53.1	Introduction	829
53.2	Literature Review	831
53.3	Data and Sample	831
53.4	Empirical Results and Analysis	836
53.5	Conclusions and Discussion	840
	References	841
<b>54</b>	<b>On the Feasibility of Laddering</b>	843
	Joshua Ronen and Bharat Sarath	
54.1	Introduction	843
54.2	The Model	845
54.3	Results	849
54.4	Conclusion	851
	References	851
<b>55</b>	<b>Stock Returns, Extreme Values, and Conditional Skewed Distribution</b>	853
	Thomas C. Chiang and Jiandong Li	
55.1	Introduction	853
55.2	The AGARCH Model Based on the EGB2 Distribution	854
55.3	Data	855
55.4	Empirical Evidence	856
55.5	Distributional Fit Test	859
55.6	The Implication of the EGB2 Distribution	859
55.7	Conclusion	861
	References	862
<b>56</b>	<b>Capital Structure in Asia and CEO Entrenchment</b>	863
	Kin Wai Lee and Gillian Hian Heng Yeo	
56.1	Introduction	863
56.2	Prior Research and Hypothesis	864
56.3	Data and Method	865
56.4	Results	867
56.5	Conclusion	871
	References	871
	Appendix 56A Variables Definition	872
<b>57</b>	<b>A Generalized Model for Optimum Futures Hedge Ratio</b>	873
	Cheng-Few Lee, Jang-Yi Lee, Kehluh Wang, and Yuan-Chung Sheu	
57.1	Introduction	873
57.2	GIG and GH Distributions	876
57.3	Futures Hedge Ratios	877
57.4	Estimation and Simulation	879
57.5	Conclusion	880
	References	880
	Appendix 57A	881

<b>58</b>	<b>The Sensitivity of Corporate Bond Volatility to Macroeconomic Announcements</b>	883
	Nikolay Kosturov and Duane Stock	
58.1	Introduction	883
58.2	Theory and Hypotheses	884
58.3	Data and Return Computations	886
58.4	Descriptive Statistics of Daily Excess Returns	886
58.5	OLS Regressions of Volatility and Excess Returns	897
58.6	Conditional Variance Models	899
58.7	Alternative GARCH Models	903
58.8	Conclusion	910
	References	912
	Appendix 58A	913
<b>59</b>	<b>Raw Material Convenience Yields and Business Cycle</b>	915
	Chang-Wen Duan and William T. Lin	
59.1	Introduction	915
59.2	Characteristics of Study Commodities	917
59.3	The Model	919
59.4	Data	921
59.5	Empirical Results	922
59.6	Conclusion	930
	References	931
<b>60</b>	<b>Alternative Methods to Determine Optimal Capital Structure: Theory and Application</b>	933
	Sheng-Syan Chen, Cheng-Few Lee, and Han-Hsing Lee	
60.1	Introduction	933
60.2	The Traditional Theory of Optimal Capital Structure	934
60.3	Optimal Capital Structure in the Contingent Claims Framework	936
60.4	Recent Development of Capital Structure Models	941
60.5	Application and Empirical Evidence of Capital Structure Models	948
60.6	Conclusion	950
	References	950
<b>61</b>	<b>Actuarial Mathematics and Its Applications in Quantitative Finance</b>	953
	Cho-Jieh Chen	
61.1	Introduction	953
61.2	Actuarial Discount and Accumulation Functions	953
61.3	Actuarial Mathematics of Insurance	955
61.4	Actuarial Mathematics of Annuity	958
61.5	Actuarial Premiums and Actuarial Reserves	959
61.6	Applications in Quantitative Finance	961
61.7	Conclusion	963
	References	963
<b>62</b>	<b>The Prediction of Default with Outliers: Robust Logistic Regression</b>	965
	Chung-Hua Shen, Yi-Kai Chen, and Bor-Yi Huang	
62.1	Introduction	965
62.2	Literature Review of Outliers in Conventional and in Logit Regression	966
62.3	Five Validation Tests	967
62.4	Source of Data and Empirical Model	969
62.5	Empirical Results	969
62.6	Conclusion	973
	References	976

63 Term Structure of Default-Free and Defaultable Securities: Theory and Empirical Evidence. . . . . 979  
Hai Lin and Chunchi Wu  
63.1 Introduction. . . . . 979  
63.2 Definitions and Notations. . . . . 980  
63.3 Bond Pricing in Dynamic Term Structure Model Framework. . . . . 980  
63.4 Dynamic Term Structure Models. . . . . 981  
63.5 Models of Defaultable Bonds. . . . . 988  
63.6 Interest Rate and Credit Default Swaps. . . . . 996  
63.7 Concluding Remarks. . . . . 1001  
References. . . . . 1001

64 Liquidity Risk and Arbitrage Pricing Theory. . . . . 1007  
Umut Cetin, Robert A. Jarrow, and Philip Protter  
64.1 Introduction. . . . . 1007  
64.2 The Model. . . . . 1009  
64.3 The Extended First Fundamental Theorem. . . . . 1011  
64.4 The Extended Second Fundamental Theorem. . . . . 1012  
64.5 Example (Extended Black-Scholes Economy). . . . . 1015  
64.6 Discontinuous Supply Curve Evolutions. . . . . 1016  
64.7 Conclusion. . . . . 1017  
References. . . . . 1017  
Appendix 64A. . . . . 1018

65 An Integrated Model of Debt Issuance, Refunding, and Maturity. . . . . 1025  
Manak C. Gupta and Alice C. Lee  
65.1 Introduction. . . . . 1025  
65.2 The Model. . . . . 1026  
65.3 Operationalizing the Model. . . . . 1029  
65.4 Numerical Illustration. . . . . 1032  
65.5 Conclusions. . . . . 1036  
References. . . . . 1037

Part V Theory, Methodology, and Applications

66 Business Models: Applications to Capital Budgeting, Equity Value, and Return Attribution. . . . . 1041  
Thomas S. Y. Ho and Sang Bin Lee  
66.1 Introduction. . . . . 1041  
66.2 The Model Assumptions. . . . . 1042  
66.3 Simulation Results of the Capital Budgeting Decisions. . . . . 1045  
66.4 Relative Valuation of Equity. . . . . 1048  
66.5 Equity Return Attribution. . . . . 1050  
66.6 Conclusion. . . . . 1051  
References. . . . . 1051  
Appendix 66A Derivation of the Risk Neutral Probability. . . . . 1052  
Appendix 66B The Model for the Fixed Operating Cost at Time T. . . . . 1052  
Appendix 66C The Valuation Model Using the Recombining Lattice. . . . . 1053  
Appendix 66D Input Data of the Model. . . . . 1054



<b>67</b>	<b>Dividends Versus Reinvestments in Continuous Time: A More General Model</b>	1055
	Ren-RAW Chen, Ben Logan, Oded Palmon, and Larry Shepp	
67.1	Introduction	1055
67.2	The Model	1055
67.3	The Solution	1057
67.4	Expected Bankruptcy Time	1058
67.5	Further Remarks	1059
67.6	Conclusion	1059
	References	1060
<b>68</b>	<b>Segmenting Financial Services Market: An Empirical Study of Statistical and Non-parametric Methods</b>	1061
	Kenneth Lawrence, Dinesh Pai, Ronald Klimberg, Stephen Kudbya, and Sheila Lawrence	
68.1	Introduction	1061
68.2	Methodology	1062
68.3	Evaluating the Classification Function	1064
68.4	Experimental Design	1065
68.5	Results	1065
68.6	Conclusions	1066
	References	1066
<b>69</b>	<b>Spurious Regression and Data Mining in Conditional Asset Pricing Models</b>	1067
	Wayne Ferson, Sergei Sarkissian, and Timothy Simin	
69.1	Introduction	1067
69.2	Spurious Regression and Data Mining in Predictive Regressions	1068
69.3	Spurious Regression, Data Mining, and Conditional Asset Pricing	1069
69.4	The Data	1069
69.5	The Models	1071
69.6	Results for Predictive Regressions	1073
69.7	Results for Conditional Asset Pricing Models	1080
69.8	Solutions to the Problems of Spurious Regression and Data Mining	1086
69.9	Robustness of the Asset Pricing Results	1087
69.10	Conclusions	1088
	References	1089
<b>70</b>	<b>Issues Related to the Errors-in-Variables Problems in Asset Pricing Tests</b>	1091
	Dongcheol Kim	
70.1	Introduction	1091
70.2	The Errors-in-Variables Problem	1092
70.3	A Correction for the Errors-in-Variables Bias	1094
70.4	Results	1099
70.5	Conclusions	1108
	References	1108
<b>71</b>	<b>McMC Estimation of Multiscale Stochastic Volatility Models</b>	1109
	German Molina, Chuan-Hsiang Han, and Jean-Pierre Fouque	
71.1	Introduction	1109
71.2	Multiscale Modeling and McMC Estimation	1110
71.3	Simulation Study	1113
71.4	Empirical Application: FX Data	1113
71.5	Implication on Derivatives Pricing and Hedging	1118

71.6	Conclusions	1118
	References	1119
	Appendix 71A Proof of Independent Factor Equivalence	1119
	Appendix 71B Full Conditionals	1120
<b>72</b>	<b>Regime Shifts and the Term Structure of Interest Rates</b>	<b>1121</b>
	Chien-Chung Nieh, Shu Wu, and Yong Zeng	
72.1	Introduction	1121
72.2	Regime-Switching and Short-Term Interest Rate	1122
72.3	Regime-Switching Term Structure Models in Discrete Time	1126
72.4	Regime-Switching Term Structure Models in Continuous Time	1128
72.5	Conclusion	1133
	References	1133
<b>73</b>	<b>ARM Processes and Their Modeling and Forecasting Methodology</b>	<b>1135</b>
	Benjamin Melamed	
73.1	Introduction	1135
73.2	Overview of ARM Processes	1136
73.3	The ARM Modeling Methodology	1139
73.4	The ARM Forecasting Methodology	1140
73.5	Example: ARM Modeling of an S&P 500 Time Series	1145
73.6	Summary	1148
	References	1149
<b>74</b>	<b>Alternative Econometric Methods for Information-based Equity-selling Mechanisms</b>	<b>1151</b>
	Lee Cheng-Few and Yi Lin Wu	
74.1	Introduction	1151
74.2	The Information Contents of Equity-Selling Mechanisms	1152
74.3	Alternative Econometric Methods for Information-Based Equity-Selling Mechanisms	1153
74.4	Conclusions	1161
	References	1162
<b>75</b>	<b>Implementation Problems and Solutions in Stochastic Volatility Models of the Heston Type</b>	<b>1165</b>
	Jia-Hau Guo and Mao-Wei Hung	
75.1	Introduction	1165
75.2	The Transform-Based Solution for Heston's Stochastic Volatility Model	1165
75.3	Solutions to the Discontinuity Problem of Heston's Formula	1168
75.4	Conclusion	1170
	References	1171
<b>76</b>	<b>Revisiting Volume vs. GARCH Effects Using Univariate and Bivariate GARCH Models: Evidence from U.S. Stock Markets</b>	<b>1173</b>
	Zhuo Qiao and Wing-Keung Wong	
76.1	Introduction	173
76.2	The Mixture of Distribution Hypothesis	175
76.3	Data and Methodology	175
76.4	Empirical Findings in NYSE	176
76.5	Conclusion	178
	References	179
	Appendix 76A	180

<b>77</b>	<b>Application of Fuzzy Set Theory to Finance Research: Method and Application</b> . . . . .	<b>1183</b>
	Shin-Yun Wang and Cheng Few Lee	
77.1	Introduction . . . . .	1183
77.2	Fuzzy Set . . . . .	1184
77.3	Applications of Fuzzy Set Theory . . . . .	1190
77.4	A Example of Fuzzy Binomial OPM . . . . .	1194
77.5	An Example of Real Options . . . . .	1196
77.6	Fuzzy Regression . . . . .	1197
77.7	Conclusion . . . . .	1198
	References . . . . .	1199
<b>78</b>	<b>Hedonic Regression Analysis in Real Estate Markets: A Primer</b> . . . . .	<b>1201</b>
	Ben J. Sopranzetti	
78.1	Introduction . . . . .	1201
78.2	The Theoretical Foundation . . . . .	1201
78.3	The Data . . . . .	1202
78.4	The Linear Model . . . . .	1202
78.5	Empirical Specification . . . . .	1203
78.6	The Semi-Log Model . . . . .	1204
78.7	The Box-Cox Model . . . . .	1205
78.8	Problems with Hedonic Modeling . . . . .	1205
78.9	Recent Developments . . . . .	1206
78.10	Conclusion . . . . .	1207
	References . . . . .	1207
<b>79</b>	<b>Numerical Solutions of Financial Partial Differential Equations</b> . . . . .	<b>1209</b>
	Gang Nathan Dong	
79.1	Introduction . . . . .	1209
79.2	The Model . . . . .	1209
79.3	Discretization . . . . .	1210
79.4	Finite Difference . . . . .	1210
79.5	Finite Volume . . . . .	1217
79.6	Finite Element . . . . .	1218
79.7	Empirical Result . . . . .	1219
79.8	Conclusion . . . . .	1220
	References . . . . .	1220
	Further Reading . . . . .	1221
<b>80</b>	<b>A Primer on the Implicit Financing Assumptions of Traditional Capital Budgeting Approaches</b> . . . . .	<b>1223</b>
	Ivan E. Brick and Daniel G. Weaver	
80.1	Introduction . . . . .	1223
80.2	Textbook Approaches to NPV . . . . .	1224
80.3	Theoretical Valuation of Cash Flows . . . . .	1226
80.4	An Example . . . . .	1228
80.5	Personal Tax and Miller Equilibrium . . . . .	1229
80.6	Conclusion . . . . .	1231
	References . . . . .	1232
<b>81</b>	<b>Determinants of Flows into U.S.-Based International Mutual Funds</b> . . . . .	<b>1235</b>
	Dilip K. Patro	
81.1	Introduction . . . . .	1235
81.2	Motivation and Hypotheses . . . . .	1236

81.3	Data	1237
81.4	Methodology and Empirical Results	1238
81.5	Conclusion	1247
	References	1253
	Appendix 81A Econometric Analysis of Panel Data	1253
<b>82</b>	<b>Predicting Bond Yields Using Defensive Forecasting</b>	<b>1257</b>
	Glenn Shafer and Samuel Ring	
82.1	Introduction	1257
82.2	Game-Theoretic Probability	1260
82.3	Defensive Forecasting	1265
82.4	Predicting Bond Yields	1269
82.5	Conclusion	1271
	References	1271
<b>83</b>	<b>Range Volatility Models and Their Applications in Finance</b>	<b>1273</b>
	Ray Yeutien Chou, Hengchih Chou, and Nathan Liu	
83.1	Introduction	1273
83.2	The Price Range Estimators	1274
83.3	The Range-Based Volatility Models	1276
83.4	The Realized Range Volatility	1278
83.5	The Financial Applications and Limitations of the Range Volatility	1279
83.6	Conclusion	1279
	References	1280
<b>84</b>	<b>Examining the Impact of the U.S. IT Stock Market on Other IT Stock Markets</b>	<b>1283</b>
	Zhuo Qiao, Venus Khim-Sen Liew, and Wing-Keung Wong	
84.1	Introduction	1283
84.2	Data and Methodology	1284
84.3	Empirical Results	1285
84.4	Conclusions	1289
	References	1289
	Appendix 84A	1290
<b>85</b>	<b>Application of Alternative ODE in Finance and Economics Research</b>	<b>1293</b>
	Cheng-Few Lee and Junmin Shi	
85.1	Introduction	1293
85.2	Ordinary Differential Equation	1294
85.3	Applications of ODE in Deterministic System	1295
85.4	Applications of ODE in Stochastic System	1297
85.5	Conclusion	1300
	References	1300
<b>86</b>	<b>Application of Simultaneous Equation in Finance Research</b>	<b>1301</b>
	Carl R. Chen and Cheng Few Lee	
86.1	Introduction	1301
86.2	Two-Stage and Three-Stage Least Squares Method	1302
86.3	Application of Simultaneous Equation in Finance Research	1305
86.4	Conclusion	1305
	References	1306

<b>87</b>	<b>The Fuzzy Set and Data Mining Applications in Accounting and Finance . . .</b>	<b>1307</b>
	Wikil Kwak, Yong Shi, and Cheng-Few Lee	
87.1	Introduction. . . . .	1307
87.2	A Fuzzy Approach to International Transfer Pricing . . . . .	1307
87.3	A Fuzzy Set Approach to Human Resource Allocation of a CPA Firm. . . .	1312
87.4	A Fuzzy Set Approach to Accounting Information System Selection. . . . .	1316
87.5	Fuzzy Set Formulation to Capital Budgeting. . . . .	1319
87.6	A Data Mining Approach to Firm Bankruptcy Predictions. . . . .	1324
87.7	Conclusion. . . . .	1329
	References. . . . .	1329
<b>88</b>	<b>Forecasting S&amp;P 100 Volatility: The Incremental Information Content of Implied Volatilities and High-Frequency Index Returns . . . . .</b>	<b>1333</b>
	Bevan J. Blair, Ser-Huang Poon, and Stephen J. Taylor	
88.1	Introduction. . . . .	1333
88.2	Data. . . . .	1334
88.3	Methodology for Forecasting Volatility. . . . .	1336
88.4	Results. . . . .	1338
88.5	Conclusion. . . . .	1343
	References. . . . .	1344
<b>89</b>	<b>Detecting Structural Instability in Financial Time Series. . . . .</b>	<b>1345</b>
	Derann Hsu	
89.1	Introduction. . . . .	1345
89.2	Genesis of the Literature. . . . .	1345
89.3	Problems of Multiple Change Points. . . . .	1347
89.4	Here Came the GARCH and Its Brethrens. . . . .	1348
89.5	Examples of Structural Shift Analysis in Financial Time Series. . . . .	1349
89.6	Implications of Structural Instability to Financial Theories and Practice . . . .	1352
89.7	Direction of Future Research and Developments. . . . .	1353
89.8	Epilogue. . . . .	1354
	References. . . . .	1354
<b>90</b>	<b>The Instrument Variable Approach to Correct for Endogeneity in Finance . . .</b>	<b>1357</b>
	Chia-Jane Wang	
90.1	Introduction. . . . .	1357
90.2	Endogeneity: The Statistical Issue. . . . .	1358
90.3	Instrumental Variables Approach to Endogeneity. . . . .	1358
90.4	Validity of Instrumental Variables. . . . .	1361
90.5	Identification and Inferences with Weak Instruments. . . . .	1364
90.6	Empirical Applications in Corporate Finance. . . . .	1366
90.7	Conclusion. . . . .	1368
	References. . . . .	1368
<b>91</b>	<b>Bayesian Inference of Financial Models Using MCMC Algorithms . . . . .</b>	<b>1371</b>
	Xianghua Liu, Liuling Li, and Hiroki Tsurumi	
91.1	Introduction. . . . .	1371
91.2	Bayesian Inference and MCMC Algorithms. . . . .	1371
91.3	CKLS Model with ARMA-GARCH Errors. . . . .	1374
91.4	Copula Model for FTSE100 and S&P500. . . . .	1376
91.5	Conclusion. . . . .	1379
	References. . . . .	1380

<b>92</b>	<b>On Capital Structure and Entry Deterrence</b> .....	1381
	Fathali Firoozi and Donald Lien	
92.1	Introduction .....	1381
92.2	The Setting .....	1382
92.3	Equilibrium .....	1384
92.4	Capital Structure and Entry Deterrence .....	1386
92.5	Conclusion .....	1388
	References .....	1389
<b>93</b>	<b>VAR Models: Estimation, Inferences, and Applications</b> .....	1391
	Yangru Wu and Xing Zhou	
93.1	Introduction .....	1391
93.2	A Brief Discussion of VAR Models .....	1391
93.3	Applications of VARs in Finance .....	1393
93.4	Conclusion .....	1397
	References .....	1397
<b>94</b>	<b>Signaling Models and Product Market Games in Finance: Do We Know What We Know?</b> .....	1399
	Kose John and Anant K. Sundaram	
94.1	Introduction .....	1399
94.2	Supermodularity: Definitions .....	1400
94.3	Supermodularity in Signaling Models .....	1400
94.4	Supermodularity in Product Market Games .....	1403
94.5	Empirical Evidence .....	1406
94.6	Conclusion .....	1407
	References .....	1407
<b>95</b>	<b>Estimation of Short- and Long-Term VaR for Long-Memory Stochastic Volatility Models</b> .....	1409
	Hwai-Chung Ho and Fang-I Liu	
95.1	Introduction .....	1409
95.2	Long Memory in Stochastic Volatility .....	1410
95.3	VaR Calculation .....	1411
95.4	Conclusions .....	1414
	References .....	1414
<b>96</b>	<b>Time Series Modeling and Forecasting of the Volatilities of Asset Returns</b> ....	1417
	Tze Leung Lai and Haipeng Xing	
96.1	Introduction .....	1417
96.2	Conditional Heteroskedasticity Models .....	1417
96.3	Regime-Switching, Change-Point and Spline-GARCH Models of Volatility .....	1421
96.4	Multivariate Volatility Models and Applications to Mean-Variance Portfolio Optimization .....	1424
96.5	Conclusion .....	1425
	References .....	1425
<b>97</b>	<b>Listing Effects and the Private Company Discount in Bank Acquisitions</b> . . .	1427
	Atul Gupta and Lalatendu Misra	
97.1	Introduction .....	1427
97.2	Why Acquiring Firms May Pay Less for Unlisted Targets .....	1428
97.3	Sample Characteristics .....	1430
97.4	Event Study Analysis .....	1431
97.5	Findings Based on Multiples .....	1433

97.6	Cross-Sectional Analysis. . . . .	1439
97.7	Conclusions. . . . .	1442
	References. . . . .	1443
<b>98</b>	<b>An ODE Approach for the Expected Discounted Penalty at Ruin in Jump Diffusion Model (Reprint). . . . .</b>	<b>1445</b>
	Yu-Ting Chen, Cheng-Few Lee, and Yuan-Chung Sheu	
98.1	Introduction. . . . .	1445
98.2	Integro-Differential Equation. . . . .	1446
98.3	Explicit Formula for $\psi$ - ODE Method. . . . .	1448
98.4	The Constant Vector $Q$ : Second Method. . . . .	1453
98.5	Conclusion. . . . .	1457
	References. . . . .	1458
	Appendix 98A Proofs. . . . .	1458
	Appendix 98B Toolbox for Phase-Type Distributions. . . . .	1462
	Appendix 98C First Order Derivative of $\psi$ at Zero. . . . .	1462
<b>99</b>	<b>Alternative Models for Estimating the Cost of Equity Capital for Property/Casualty Insurers. . . . .</b>	<b>1465</b>
	Alice C. Lee and J. David Cummins	
99.1	Introduction. . . . .	1465
99.2	Prior Work. . . . .	1466
99.3	Model-Specification and Estimation. . . . .	1467
99.4	Data Description and Cost of Equity Capital Estimates. . . . .	1470
99.5	Evaluations of Simulations and Estimates. . . . .	1476
99.6	Summary and Conclusion. . . . .	1480
	References. . . . .	1481
<b>100</b>	<b>Implementing a Multifactor Term Structure Model. . . . .</b>	<b>1483</b>
	Ren-RAW Chen and Louis O. Scott	
100.1	Introduction. . . . .	1483
100.2	A Multifactor Term Structure Model. . . . .	1483
100.3	Pricing Options in the Multifactor Model. . . . .	1485
100.4	Calibrating a Multifactor Model. . . . .	1487
100.5	Conclusion. . . . .	1488
	References. . . . .	1488
<b>101</b>	<b>Taking Positive Interest Rates Seriously. . . . .</b>	<b>1489</b>
	Enlin Pan and Liuren Wu	
101.1	Introduction. . . . .	1489
101.2	Background. . . . .	1490
101.3	The Model. . . . .	1491
101.4	The Hump-Shaped Forward Rate Curve. . . . .	1494
101.5	Fitting the US Treasury Yields and US Dollar Swap Rates. . . . .	1495
101.6	Extensions: Jumps in Interest Rates. . . . .	1498
101.7	Conclusion. . . . .	1500
	References. . . . .	1500
	Appendix 101A Factor Representation. . . . .	1501
	Appendix 101B Extended Kalman Filter and Quasilikelihood. . . . .	1502

<b>102 Positive Interest Rates and Yields: Additional Serious Considerations</b>	1503
Jonathan Ingersoll	
102.1 Introduction	1503
102.2 A Non-Zero Bound for Interest Rates	1503
102.3 The Cox-Ingersoll-Ross and Pan-Wu Term Structure Models	1504
102.4 Bubble-Free Prices	1506
102.5 Multivariate Affine Term-Structure Models with Zero Bounds on Yields	1511
102.6 Non-Affine Term Structures with Yields Bounded at Zero	1514
102.7 Non-Zero Bounds for Yields	1516
102.8 Conclusion	1517
References	1517
Appendix 102A	1517
102A.1 Derivation of the Probability and State price for $r_T = 0$ for the PW Model	1517
102A.2 Bond Price When $r_t = 0$ Is Accessible for Only the Risk-Neutral Process	1519
102A.3 Properties of the Affine Exponentially Smoothed Average Model	1520
102A.4 Properties of the Three-Halves Power Interest Rate Process	1521
<b>103 Functional Forms for Performance Evaluation: Evidence from Closed-End Country Funds</b>	1523
Cheng-Few Lee, Dilip K. Patro, and Bo Liu	
103.1 Introduction and Motivation	1523
103.2 Literature Review	1524
103.3 Model Estimation	1526
103.4 Data and Methodology	1527
103.5 Empirical Results	1534
103.6 Conclusion	1545
References	1553
<b>104 A Semimartingale BSDE Related to the Minimal Entropy Martingale Measure</b>	1555
Michael Mania, Marina Santacrose, and Revaz Tevzadze	
104.1 Introduction	1555
104.2 Some Basic Definitions, Conditions, and Auxiliary Facts	1556
104.3 Backward Semimartingale Equation for the Value Process	1558
104.4 Conclusions	1564
References	1565
<b>105 The Density Process of the Minimal Entropy Martingale Measure in a Stochastic Volatility Model with Jumps (Reprint)</b>	1567
Fred Espen Benth and Thilo Meyer-Brandis	
105.1 Introduction	1567
105.2 The Market	1568
105.3 The Minimal Entropy Martingale Measure	1569
105.4 The Density Process	1571
105.5 The Entropy Price of Derivatives and Integro-Partial Differential Equations	1573
105.6 Conclusions	1574
References	1575



<b>106 Arbitrage Detection from Stock Data: An Empirical Study</b>	1577
Cheng-Der Fuh and Szu-Yu Pai	
106.1 Introduction	1577
106.2 Arbitrage Detection: Volatility Change	1579
106.3 Arbitrage Detection: Mean Change	1583
106.4 Empirical Studies	1586
106.5 Conclusions and Further Researches	1590
References	1591
<b>107 Detecting Corporate Failure</b>	1593
Yanzhi Wang, Lin Lin, Hsien-Chang Kuo, and Jenifer Piesse	
107.1 Introduction	1593
107.2 The Possible Causes of Bankruptcy	1594
107.3 The Methods of Bankruptcy	1594
107.4 Prediction Model for Corporate Failure	1596
107.5 The Selection of Optimal Cutoff Point	1603
107.6 Recent Development	1604
107.7 Conclusion	1604
References	1604
<b>108 Genetic Programming for Option Pricing</b>	1607
N.K. Chidambaran	
108.1 Introduction	1607
108.2 Genetic Program Elements	1608
108.3 Black-Scholes Example	1611
108.4 Extensions	1613
108.5 Conclusion	1613
References	1614
<b>109 A Constant Elasticity of Variance (CEV) Family of Stock Price Distributions in Option Pricing, Review, and Integration</b>	1615
Ren-Raw Chen and Cheng-Few Lee	
109.1 Introduction	1615
109.2 The CEV Diffusion and Its Transition Density	1616
109.3 The CEV Option Pricing Models	1619
109.4 Computing the Non-Central Chi-Square Probabilities	1622
109.5 Conclusion	1623
Appendix 109A	1623
References	1625
<b>References</b>	1627
<b>Author Index</b>	1685
<b>Subject Index</b>	1709