
Description:
The modern financial industry has been required to deal with large and diverse portfolios in a variety of asset classes often with limited market data available. Financial Signal Processing and Machine Learning unifies a number of recent advances made in signal processing and machine learning for the design and management of investment portfolios and financial engineering. This book bridges the gap between these disciplines, offering the latest information on key topics including characterizing statistical dependence and correlation in high dimensions, constructing effective and robust risk measures, and their use in portfolio optimization and rebalancing. The book focuses on signal processing approaches to model return, momentum, and mean reversion, addressing theoretical and implementation aspects. It highlights the connections between portfolio theory, sparse learning and compressed sensing, sparse eigen–portfolios, robust optimization, non–Gaussian data–driven risk measures, graphical models, causal analysis through temporal–causal modeling, and large–scale copula–based approaches.

Key features:
- Highlights signal processing and machine learning as key approaches to quantitative finance.
- Offers advanced mathematical tools for high–dimensional portfolio construction, monitoring, and post–trade analysis problems.
- Presents portfolio theory, sparse learning and compressed sensing, sparsity methods for investment portfolios. including eigen–portfolios, model return, momentum, mean reversion and non–Gaussian data–driven risk measures with real–world applications of these techniques.
- Includes contributions from leading researchers and practitioners in both the signal and information processing communities, and the quantitative finance community.

Contents:
List of Contributors xiii
Preface xv
1 Overview 1
Ali N. Akansu, Sanjeev R. Kulkarni, and Dmitry Malioutov
1.1 Introduction 1
1.2 A Bird’s–Eye View of Finance 2
1.2.1 Trading and Exchanges 4
1.2.2 Technical Themes in the Book 5
1.3 Overview of the Chapters 6
1.3.1 Chapter 2: "Sparse Markowitz Portfolios" by Christine De Mol 6
1.3.2 Chapter 3: "Mean–Reverting Portfolios: Tradeoffs between Sparsity and Volatility" by Marco Cuturi and Alexandre d’Aspremont 7
1.3.3 Chapter 4: "Temporal Causal Modeling" by Prabhanjan Kambadur, Aurelie C. Lozano, and Ronny Luss 7
1.3.4 Chapter 5: "Explicit Kernel and Sparsity of Eigen Subspace for the AR(1) Process" by Mustafa U. Torun, Onur Yilmaz and Ali N. Akansu 7
1.3.5 Chapter 6: "Approaches to High–Dimensional Covariance and Precision Matrix Estimation" by Jianqing Fan, Yuan Liao, and Han Liu 7
3.3.1 Minimizing Predictability 29
3.3.2 Minimizing the Portmanteau Statistic 29
3.3.3 Minimizing the Crossing Statistic 29
3.4 Semidefinite Relaxations and Sparse Components 30
3.4.1 A Semidefinite Programming Approach to Basket Estimation 30
3.4.2 Predictability 30
3.4.3 Portmanteau 31
3.4.4 Crossing Stats 31
3.5 Numerical Experiments 32
3.5.1 Historical Data 32
3.5.2 Mean–reverting Basket Estimators 33
3.5.3 Jurek and Yang (2007) Trading Strategy 33
3.5.4 Transaction Costs 33
3.5.5 Experimental Setup 36
3.5.6 Results 36
3.6 Conclusion 39

References 39

4 Temporal Causal Modeling 41
Prabhanjan Kambadur, Aurelie C. Lozano, and Ronny Luss
4.1 Introduction 41
4.2 TCM 46
4.2.1 Granger Causality and Temporal Causal Modeling 46
4.2.2 Grouped Temporal Causal Modeling Method 47
4.2.3 Synthetic Experiments 49
4.3 Causal Strength Modeling 51
4.4 Quantile TCM (Q–TCM) 52
4.4.1 Modifying Group OMP for Quantile Loss 52
4.4.2 Experiments 53
4.5 TCM with Regime Change Identification 55
4.5.1 Model 56
4.5.2 Algorithm 58
4.5.3 Synthetic Experiments 60
6.3.1 Column–wise Precision Matrix Estimation 110
6.3.2 The Need for Tuning–insensitive Procedures 111
6.3.3 TIGER: A Tuning–insensitive Approach for Optimal Precision Matrix Estimation 112
6.3.4 Computation 114
6.3.5 Theoretical Properties of TIGER 114
6.3.6 Applications to Modeling Stock Returns 115
6.3.7 Applications to Genomic Network 118
6.4 Financial Applications 119
6.4.1 Estimating Risks of Large Portfolios 119
6.4.2 Large Panel Test of Factor Pricing Models 121
6.5 Statistical Inference in Panel Data Models 126
6.5.1 Efficient Estimation in Pure Factor Models 126
6.5.2 Panel Data Model with Interactive Effects 127
6.5.3 Numerical Illustrations 130
6.6 Conclusions 131

References 131

7 Stochastic Volatility 135
Matthew Lorig and Ronnie Sircar
7.1 Introduction 135
7.2 Asymptotic Regimes and Approximations 141
7.2.1 Contract Asymptotics 142
7.2.2 Model Asymptotics 142
7.2.3 Implied Volatility Asymptotics 143
7.2.4 Tractable Models 145
7.2.5 Model Coefficient Polynomial Expansions 146
7.2.6 Small "Vol of Vol" Expansion 152
7.2.7 Separation of Timescales Approach 152
7.2.8 Comparison of the Expansion Schemes 154
7.3 Merton Problem with Stochastic Volatility: Model Coefficient Polynomial Expansions 155
7.3.1 Models and Dynamic Programming Equation 155
10.2.1 Classification 242
10.2.2 Regression 246
10.3 SVMs as CVaR Minimizations 247
10.3.1 SVMs as CVaR Minimizations with Homogeneous Loss 247
10.3.2 SVMs as CVaR Minimizations with Nonhomogeneous Loss 251
10.3.3 Refining the Property 253
10.4 Duality 256
10.4.1 Binary Classification 256
10.4.2 Geometric Interpretation of SVM 257
10.4.3 Geometric Interpretation of the Range of for SVC 258
10.4.4 Regression 259
10.4.5 One-class Classification and SVDD 259
10.5 Extensions to Robust Optimization Modelings 259
10.5.1 Distributionally Robust Formulation 259
10.5.2 Measurement-wise Robust Formulation 261
10.6 Literature Review 262
10.6.1 CVaR as a Risk Measure 263
10.6.2 From CVaR Minimization to SVM 263
10.6.3 From SVM to CVaR Minimization 263
10.6.4 Beyond CVaR 263

References 264

11 Regression Models in Risk Management 266
Stan Uryasev

11.1 Introduction 267
11.2 Error and Deviation Measures 268
11.3 Risk Envelopes and Risk Identifiers 271
11.3.1 Examples of Deviation Measures D, Corresponding Risk Envelopes Q, and Sets of Risk Identifiers QD(X) 272
11.4 Error Decomposition in Regression 273
11.5 Least-Squares Linear Regression 275
11.6 Median Regression 277
11.7 Quantile Regression and Mixed Quantile Regression 281
11.8 Special Types of Linear Regression 283
Fax Order Form
To place an order via fax simply print this form, fill in the information below and fax the completed form to 646-607-1907 (from USA) or +353-1-481-1716 (from Rest of World). If you have any questions please visit http://www.researchandmarkets.com/contact/

Order Information
Please verify that the product information is correct.

Web Address: http://www.researchandmarkets.com/reports/3630928/
Office Code: SCBRK8F3

Product Format
Please select the product format and quantity you require:

| Quantity | Hard Copy (Hard Back): | USD 107 + USD 29 Shipping/Handling |

* Shipping/Handling is only charged once per order.

Contact Information
Please enter all the information below in BLOCK CAPITALS

Title: Mr ☐  Mrs ☐  Dr ☐  Miss ☐  Ms ☐  Prof ☐
First Name: ___________________________  Last Name: ___________________________
Email Address: * ___________________________
Job Title: ___________________________
Organisation: ___________________________
Address: ___________________________
City: ___________________________
Postal / Zip Code: ___________________________
Country: ___________________________
Phone Number: ___________________________
Fax Number: ___________________________

* Please refrain from using free email accounts when ordering (e.g. Yahoo, Hotmail, AOL)
Payment Information

Please indicate the payment method you would like to use by selecting the appropriate box.

☐ Pay by credit card: You will receive an email with a link to a secure webpage to enter your credit card details.

☐ Pay by check: Please post the check, accompanied by this form, to:
Research and Markets,
Guinness Center,
Taylors Lane,
Dublin 8,
Ireland.

☐ Pay by wire transfer: Please transfer funds to:
Account number 833 130 83
Sort code 98-53-30
Swift code ULSBIE2D
IBAN number IE78ULSB98533083313083
Bank Address Ulster Bank,
27-35 Main Street,
Blackrock,
Co. Dublin,
Ireland.

If you have a Marketing Code please enter it below:

Marketing Code: ______________________________

Please note that by ordering from Research and Markets you are agreeing to our Terms and Conditions at http://www.researchandmarkets.com/info/terms.asp

Please fax this form to:
(646) 607-1907 or (646) 964-6609 - From USA
+353-1-481-1716 or +353-1-653-1571 - From Rest of World