

THE FRANK J. FABOZZI SERIES

Financial Econometrics

From Basics to Advanced
Modeling Techniques

WILEY FINANCE

SSR = $(Y - X\beta)'(Y - X\beta)$
 $\beta = (X'X)^{-1}X'Y$
 $\beta'x_t = z_t = \beta' \left(\sum_{r=0}^{\infty} \Psi_r L^r \right) e_t + \beta'x_{t-1}$
 $V(\beta) = E((\beta - \beta)(\beta - \beta)') = \sigma^2(X'X)^{-1}$
 $\underline{Y}_i = \beta'_0 + \gamma(D_i + \beta'_1 z_{i-1} + \dots)$
 $x_t = (A_1 L + A_2 L^2 + \dots + A_p L^p)x_t + s_t + e_t$

Svetlozar T. Rachev, Stefan Mittnik, Frank J. Fabozzi, Sergio M. Focardi, Teo Jašić

Contents

Preface	xi
Abbreviations and Acronyms	xv
About the Authors	xix
CHAPTER 1	
Financial Econometrics: Scope and Methods	1
The Data Generating Process	3
Financial Econometrics at Work	7
Time Horizon of Models	10
Applications	12
Appendix: Investment Management Process	16
Concepts Explained in this Chapter (in order of presentation)	22
CHAPTER 2	
Review of Probability and Statistics	25
Concepts of Probability	25
Principles of Estimation	58
Bayesian Modeling	69
Appendix A: Information Structures	72
Appendix B: Filtration	74
Concepts Explained in this Chapter (in order of presentation)	75
CHAPTER 3	
Regression Analysis: Theory and Estimation	79
The Concept of Dependence	79
Regressions and Linear Models	85
Estimation of Linear Regressions	90
Sampling Distributions of Regressions	96
Determining the Explanatory Power of a Regression	97
Using Regression Analysis in Finance	99
Stepwise Regression	114
Nonnormality and Autocorrelation of the Residuals	121
Pitfalls of Regressions	123
Concepts Explained in this Chapter (in order of presentation)	125

CHAPTER 4

Selected Topics in Regression Analysis	127
Categorical and Dummy Variables in Regression Models	127
Constrained Least Squares	151
The Method of Moments and its Generalizations	163
Concepts Explained in this Chapter (in order of presentation)	167

CHAPTER 5

Regression Applications in Finance	169
Applications to the Investment Management Process	169
A Test of Strong-Form Pricing Efficiency	174
Tests of the CAPM	175
Using the CAPM to Evaluate Manager Performance: The Jensen Measure	179
Evidence for Multifactor Models	180
Benchmark Selection: Sharpe Benchmarks	184
Return-Based Style Analysis for Hedge Funds	186
Hedge Fund Survival	191
Bond Portfolio Applications	192
Concepts Explained in this Chapter (in order of presentation)	199

CHAPTER 6

Modeling Univariate Time Series	201
Difference Equations	201
Terminology and Definitions	207
Stationarity and Invertibility of ARMA Processes	214
Linear Processes	219
Identification Tools	223
Concepts Explained in this Chapter (in order of presentation)	239

CHAPTER 7

Approaches to ARIMA Modeling and Forecasting	241
Overview of Box-Jenkins Procedure	242
Identification of Degree of Differencing	244
Identification of Lag Orders	250
Model Estimation	253
Diagnostic Checking	262
Forecasting	271
Concepts Explained in this Chapter (in order of presentation)	277

CHAPTER 8

Autoregressive Conditional Heteroskedastic Models	279
ARCH Process	280
GARCH Process	284
Estimation of the GARCH Models	289
Stationary ARMA-GARCH Models	293

Lagrange Multiplier Test	294
Variants of the GARCH Model	298
GARCH Model with Student's t -Distributed Innovations	299
Multivariate GARCH Formulations	314
Appendix: Analysis of the Properties of the GARCH(1,1) Model	316
Concepts Explained in this Chapter (in order of presentation)	319
CHAPTER 9	
Vector Autoregressive Models I	321
VAR Models Defined	321
Stationary Autoregressive Distributed Lag Models	334
Vector Autoregressive Moving Average Models	335
Forecasting with VAR Models	338
Appendix: Eigenvectors and Eigenvalues	339
Concepts Explained in this Chapter (in order of presentation)	341
CHAPTER 10	
Vector Autoregressive Models II	343
Estimation of Stable VAR Models	343
Estimating the Number of Lags	357
Autocorrelation and Distributional Properties of Residuals	359
VAR Illustration	360
Concepts Explained in this Chapter (in order of presentation)	372
CHAPTER 11	
Cointegration and State Space Models	373
Cointegration	373
Error Correction Models	381
Theory and Methods of Estimation of Nonstationary VAR Models	385
State-Space Models	398
Concepts Explained in this Chapter (in order of presentation)	404
CHAPTER 12	
Robust Estimation	407
Robust Statistics	407
Robust Estimators of Regressions	417
Illustration: Robustness of the Corporate Bond Yield Spread Model	421
Concepts Explained in this Chapter (in order of presentation)	428
CHAPTER 13	
Principal Components Analysis and Factor Analysis	429
Factor Models	429
Principal Components Analysis	436
Factor Analysis	450

PCA and Factor Analysis Compared	461
Concepts Explained in this Chapter (in order of presentation)	464

CHAPTER 14

Heavy-Tailed and Stable Distributions in Financial Econometrics	465
Basic Facts and Definitions of Stable Distributions	468
Properties of Stable Distributions	475
Estimation of the Parameters of the Stable Distribution	479
Applications to German Stock Data	485
Appendix: Comparing Probability Distributions	487
Concepts Explained in this Chapter (in order of presentation)	494

CHAPTER 15

ARMA and ARCH Models with Infinite-Variance Innovations	495
Infinite Variance Autoregressive Processes	495
Stable GARCH Models	501
Estimation for the Stable GARCH Model	507
Prediction of Conditional Densities	513
Concepts Explained in this Chapter (in order of presentation)	516

APPENDIX

Monthly Returns for 20 Stocks: December 2000–November 2005	517
--	-----

INDEX