Introductory Econometrics for Finance

THIRD EDITION

Chris Brooks

The ICMA Centre, Henley Business School, University of Reading



Contents

	List o	f figures	page xii	
	List of tables List of boxes		XV	
			xvii	
		f screenshots	xix	
		ce to the third edition	xxi	
		owledgements	XXV	
1	Introduction			
	1.1	What is econometrics?	2	
	1.2	Is financial econometrics different from 'economic		
		econometrics'?	2	
	1.3	Types of data	4	
	1.4	Returns in financial modelling	7	
	1.5	Steps involved in formulating an econometric model	11	
	1.6	Points to consider when reading articles in empirical		
		finance	12	
	1.7	A note on Bayesian versus classical statistics	13	
	1.8	An introduction to EViews	14	
	1.9	Further reading	24	
	1.10	Oudine of the remainder of this book	24	
2	Mathematical and statistical foundations			
	2.1	Functions	28	
	2.2	Differential calculus	37	
	2.3	Matrices	41	
	2.4	Probability and probability distributions	56	
	2.5	Descriptive statistics	61	
3	A brief overview of the classical linear regression model			
	3.1	What is a regression model?	75	
	3.2	Regression versus correlation	76	
	3.3	Simple regression	76	
	3.4	Some further terminology	84	
	3.5	Simple linear regression in EViews – estimation of an optimal		
		hedge ratio	86	

Contents

3.6	The assumptions underlying the classical linear regression	
	model	' 90
3.7	Properties of the OLS estimator	91
3.8	Precision and standard errors	93
3.9	An introduction to statistical inference	98
3.10	A special type of hypothesis test: the f-ratio	111
3.11	An example of a simple f-test of a theory in finance: can US	
	mutual funds beat the market?	113
3.12	Can UK unit trust managers beat the market?	115
3.13	The overreaction hypothesis and the UK stock market	116
3.14	The exact significance level	120
3.15	Hypothesis testing in EViews – example 1: hedging revisited	121
3.16	Hypothesis testing in EViews – example 2: the CAPM	123
	Appendix: Mathematical derivations of CLRM results	127
	er development and analysis of the classical linear	
0	ession model	134
4.1	Generalising the simple model to multiple linear regression	134
4.2	The constant term	135
4.3	How are the parameters (the elements of the f) vector) calculated	107
4 4	in the generalised case?	137
4.4	Testing multiple hypotheses: the F-test	139
4.5 4.6	Sample EViews output for multiple hypothesis tests	144 145
4.0 4.7	Multiple regression in EViews using an APT-style model	143
4.7 4.8	Data mining and the true size of the test Goodness of fit statistics	150
4.8 4.9	Hedonic pricing models	151
4.9	Tests of non-nested hypotheses	150
4.10	Quantile regression	161
4.11	Appendix 4.1: Mathematical derivations of CLRM results	168
	Appendix 4.1: Mathematical derivations of CERW results Appendix 4.2: A brief introduction to factor models and principal	108
	components analysis	170
	sical linear regression model assumptions and diagnostic tests	179
5.1	Introduction	179
5.2	Statistical distributions for diagnostic tests	180
5.3	Assumption 1: $E(u_t) = 0$	181
5.4	Assumption 2: $var(u_{,}) = \sqrt[n]{2} < oo$	181
5.5	Assumption 3: $cov(w,-, uj) = 0$ for $i \land j$	188
5.6	Assumption 4: the <i>x</i> , are non-stochastic	208
5.7	Assumption 5: the disturbances are normally distributed	209
5.8	Multicollinearity	217
5.9	Adopting the wrong functional form	220
5.10	Omission of an important variable	224
5.11	Inclusion of an irrelevant variable	225

	5.12	Parameter stability tests	226
	5.13	Measurement errors	235
	5.14	A strategy for constructing econometric models and a discussion	
		of model-building philosophies	238
	5.15	Determinants of sovereign credit ratings	240
6	Univ	ariate time series modelling and forecasting	251
	6.1	Introduction	251
	6.2	Some notation and concepts	252
	6.3	Moving average processes	256
	6.4	Autoregressive processes	259
	6.5	The partial autocorrelation function	266
	6.6	ARMA processes	268
	6.7	Building ARMA models: the Box—Jenkins approach	273
	6.8	Constructing ARMA models in EViews	276
	6.9	Examples of time series modelling in finance	281
	6.10	Exponential smoothing	283
	6.11	Forecasting in econometrics	285
	6.12	Forecasting using ARMA models in EViews	296
	6.13	Exponential smoothing models in EViews	299
7	Mult	ivariate models	305
	7.1	Motivations	305
	7.2	Simultaneous equations bias	307
	7.3	So how can simultaneous equations models be validly estimated?	308
	7.4	Can the original coefficients be retrieved from the 7rs?	309
	7.5	Simultaneous equations in finance	311
	7.6	A definition of exogeneity	312
	7.7	Triangular systems	314
	7.8	Estimation procedures for simultaneous equations systems	315
	7.9	An application of a simultaneous equations approach to modelling	
		bid-ask spreads and trading activity	318
	7.10	Simultaneous equations modelling using EViews	323
	7.11	Vector autoregressive models	326
	7.12	Does the VAR include contemporaneous terms?	332
	7.13	Block significance and causality tests	333
	7.14	VARs with exogenous variables	335
	7.15	Impulse responses and variance decompositions	336
	7.16	VAR model example: the interaction between property returns	
	- 1-	and the macroeconomy	338
	7.17	VAR estimation in EViews	344
8		elling long-run relationships in finance	353
	8.1	Stationarity and unit root testing	353
	8.2	Tests for unit roots in the presence of structural breaks	365

vii

	8.3	Testing for unit roots in EViews	369
	8.4	Cointegration	373
	8.5	Equilibrium correction or error correction models	375
	8.6	Testing for cointegration in regression: a residuals-based approach	376
	8.7	Methods of parameter estimation in cointegrated systems	377
	8.8	Lead-lag and long-term relationships between spot and futures	
		markets	380
	8.9	Testing for and estimating cointegrating systems using the	
		Johansen technique based on VARs	386
	8.10	Purchasing power parity	390
	8.11	Cointegration between international bond markets	391
	8.12	Testing the expectations hypothesis of the term structure of	
		interest rates	398
	8.13	Testing for cointegration and modelling cointegrated systems	
		using EViews	400
9	Mod	elling volatility and correlation	415
,	9.1	Motivations: an excursion into non-linearity land	415
	9.2	Models for volatility	420
	9.3	Historical volatility	420
	9.4	Implied volatility models	421
	9.5	Exponentially weighted moving average models	421
	9.6	Autoregressive volatility models	422
	9.7	Autoregressive conditionally heteroscedastic (ARCH) models	423
	9.8	Generalised ARCH (GARCH) models	428
	9.9	Estimation of ARCH/GARCH models	431
	9.10	Extensions to the basic GARCH model	439
	9.11	Asymmetric GARCH models	440
	9.12	The GJR model	440
	9.13	The EGARCH model	441
	9.14	GJR and EGARCH in EViews	441
	9.15	Tests for asymmetries in volatility	443
	9.16	GARCH-in-mean	445
	9.17	Uses of GARCH-type models including volatility forecasting	446
	9.18		
		non-linear models	452
	9.19	Volatility forecasting: some examples and results from the	
		literature	454
	9.20	Stochastic volatility models revisited	461
	9.21	Forecasting covariances and correlations	463
	9.22	6 6	A.C. A
	0.22	examples Simple coverience models	464
	9.23	Simple covariance models Multivariate GARCH models	466
	9.24		467
	9.25	Direct correlation models	471

- 9.26 Extensions to the basic multivariate GARCH model
- 9.27 A multivariate GARCH model for the CAPM with time-varying covariances
- 9.28 Estimating a time-varying hedge ratio for FTSE stock index returns
- 9.29 Multivariate stochastic volatility models
- 9.30 Estimating multivariate GARCH models using EViews Appendix: Parameter estimation using maximum likelihood

10 Switching models

- 10.1 Motivations
- 10.2 Seasonalities in financial markets: introduction and literature review
- 10.3 Modelling seasonality in financial data
- 10.4 Estimating simple piecewise linear functions
- 10.5 Markov switching models
- 10.6 A Markov switching model for the real exchange rate
- 10.7 A Markov switching model for the gilt—equity yield ratio
- 10.8 Estimating Markov switching models in EViews
- 10.9 Threshold autoregressive models
- 10.10 Estimation of threshold autoregressive models
- 10.11 Specification tests in the context of Markov switching and threshold autoregressive models: a cautionary note
- 10.12 A SETAR model for the French franc—German mark exchange rate
- 10.13 Threshold models and the dynamics of the FTSE 100 index and index futures markets
- 10.14 A note on regime switching models and forecasting accuracy

11 Panel data

- 11.1 Introduction what are panel techniques and why are they used?
- 11.2 What panel techniques are available?
- 11.3 The fixed effects model
- 11.4 Time-fixed effects models
- 11.5 Investigating banking competition using a fixed effects model
- 11.6 The random effects model
- 11.7 Panel data application to credit stability of banks in Central and Eastern Europe
- 11.8 Panel data with EViews
- 11.9 Panel unit root and cointegration tests
- 11.10 Further reading

12 Limited dependent variable models

- 12.1 Introduction and motivation
- 12.2 The linear probability model

Contents

12.4 Using a logit to test the pecking order hypothesis '563 12.5 The probit model 565 12.6 Choosing between the logit and probit models 565 12.8 Goodness of fit measures for linear dependent variable models 565 12.8 Goodness of fit measures for linear dependent variables 566 12.9 Multinomial linear dependent variables 568 12.10 The pecking order hypothesis revisited – the choice between financing methods 571 12.11 Order der gesponse linear dependent variables models 574 12.12. Are unsolicited credit ratings biased downwards? An ordered probit analysis 574 12.13 Censored and truncated dependent variables 579 12.14 Limited dependent variable models in EViews 583 Appendix: The maximum likelihood estimator for logit and probit models 591 13.1 Motivations 592 13.3 Variance reduction techniques 593 13.4 Bootstrapping 597 13.5 Random number generation 600 13.6 Disadvantages of the simulation approach to econometrics: deriving a set of critical values for a Dickey-Fuller test 603 <th></th> <th>12.3</th> <th>The logit model</th> <th>562</th>		12.3	The logit model	562
12.5 The probit model 565 12.6 Choosing between the logit and probit models 565 12.7 Estimation of limited dependent variable models 565 12.8 Goodness of fit measures for linear dependent variable models 567 12.9 Multinomial linear dependent variables 568 12.10 The pecking order hypothesis revisited – the choice between financing methods 571 12.11 Ordered response linear dependent variables models 574 574 12.12 Are unsolicited credit ratings biased downwards? An ordered probit analysis 574 12.13 Censored and truncated dependent variables 579 12.14 Limited dependent variable models in EViews 583 Appendix: The maximum likelihood estimator for logit and probit models 591 13.1 Motivations 592 13.3 Variance reduction techniques 593 13.4 Bootstrapping 597 13.5 Random number generation 600 13.6 Disadvantages of the simulation approach to econometrics or financial problem solving 601 13.7 An example of Monte Carlo simulation in econometrics: deriving a set of critical value			•	
12.6 Choosing between the logit and probit models 565 12.7 Estimation of limited dependent variable models 565 12.8 Goodness of fit measures for linear dependent 567 12.9 Multinomial linear dependent variables 568 12.10 The pecking order hypothesis revisited – the choice between financing methods 571 12.11 Ordered response linear dependent variables models 574 12.12 Are unsolicited credit ratings biased downwards? An ordered probit analysis 574 12.13 Censored and truncated dependent variables 583 Appendix: The maximum likelihood estimator for logit and probit models 591 13.1 Motivations 591 13.2 Monte Carlo simulations 592 13.3 Variance reduction techniques 593 13.4 Bootstrapping 597 13.5 Random number generation 600 13.6 Disadvantages of the simulation in econometrics: deriving a set of critical values for a Dickey-Fuller test 603 13.8 An example of how to simulate the price of a financial option 607 13.9 An example of bootstrapping to calculate capital risk requirements		12.5		565
12.7 Estimation of limited dependent variable models 565 12.8 Goodness of fit measures for linear dependent variable models 567 12.9 Multinomial linear dependent variables 568 12.10 The pecking order hypothesis revisited – the choice between financing methods 571 12.11 Ordered response linear dependent variables models 574 12.12 Are unsolicited credit ratings biased downwards? An ordered probit analysis 574 12.13 Censored and truncated dependent variables 579 12.14 Limited dependent variable models in EViews 583 Appendix: The maximum likelihood estimator for logit and probit models 591 13.1 Motivations 591 13.2 Monte Carlo simulations 592 13.3 Variance reduction techniques 593 13.4 Bootstrapping 597 13.5 Random number generation 600 13.6 Disadvantages of the simulation approach to econometric or financial problem solving 601 13.7 An example of how to simulate the price of a financial option 607 13.8 An example of bootstrapping to calculate capital risk requirements		12.6	Choosing between the logit and probit models	565
variable models56712.9Multinomial linear dependent variables56812.10The pecking order hypothesis revisited – the choice between financing methods57112.11Ordered response linear dependent variables models57412.12Are unsolicited credit ratings biased downwards? An ordered probit analysis57412.13Censored and truncated dependent variables57912.14Limited dependent variable models in EViews Appendix: The maximum likelihood estimator for logit and probit models58913Simulation methods59113.1Motivations59113.2Monte Carlo simulations59213.3Variance reduction techniques59313.4Bootstrapping59713.5Random number generation60013.6Disadvantages of the simulation approach to econometric or financial problem solving60113.7An example of Monte Carlo simulation in econometrics: deriving a set of critical values for a Dickey-Fuller test60313.8An example of how to simulate the price of a financial option60713.9An example of bootstrapping to calculate capital risk requirements61314Conducting empirical research or doing a project or dissertation in finance62614.1What is an empirical research project and what is it for?62614.1What is an empirical research project and what is it for?62614.2Selecting the topic62714.3Sponsored or independent resea		12.7		565
variable models56712.9Multinomial linear dependent variables56812.10The pecking order hypothesis revisited – the choice between financing methods57112.11Ordered response linear dependent variables models57412.12Are unsolicited credit ratings biased downwards? An ordered probit analysis57412.13Censored and truncated dependent variables57912.14Limited dependent variable models in EViews Appendix: The maximum likelihood estimator for logit and probit models58913Simulation methods59113.1Motivations59113.2Monte Carlo simulations59213.3Variance reduction techniques59313.4Bootstrapping59713.5Random number generation60013.6Disadvantages of the simulation approach to econometric or financial problem solving60113.7An example of Monte Carlo simulation in econometrics: deriving a set of critical values for a Dickey-Fuller test60313.8An example of how to simulate the price of a financial option60713.9An example of bootstrapping to calculate capital risk requirements61314Conducting empirical research or doing a project or dissertation in finance62614.1What is an empirical research project and what is it for?62614.1What is an empirical research project and what is it for?62614.2Selecting the topic62714.3Sponsored or independent resea		12.8	Goodness of fit measures for linear dependent	
12.10 The pecking order hypothesis revisited – the choice between financing methods 571 12.11 Ordered response linear dependent variables models 574 12.12 Are unsolicited credit ratings biased downwards? An ordered probit analysis 574 12.13 Censored and truncated dependent variables 579 12.14 Limited dependent variable models in EViews 583 Appendix: The maximum likelihood estimator for logit and probit models 591 13.1 Motivations 591 13.2 Monte Carlo simulations 592 13.3 Variance reduction techniques 593 13.4 Bootstrapping 597 13.5 Random number generation 600 13.6 Disadvantages of the simulation approach to econometric or financial problem solving 601 13.7 An example of Monte Carlo simulation in econometrics: deriving a set of critical values for a Dickey-Fuller test 603 13.8 An example of how to simulate the price of a financial option 607 13.9 An example of bootstrapping to calculate capital risk requirements 613 14 Conducting empirical research project and what is it for? 626 14.1				567
12.10 The pecking order hypothesis revisited – the choice between 571 12.11 Ordered response linear dependent variables models 571 12.12 Are unsolicited credit ratings biased downwards? An ordered probit analysis 574 12.13 Censored and truncated dependent variables 579 12.14 Limited dependent variable models in EViews 583 Appendix: The maximum likelihood estimator for logit and probit models 591 13.1 Motivations 591 13.2 Monte Carlo simulations 592 13.3 Variance reduction techniques 593 13.4 Bootstrapping 597 13.5 Random number generation 600 13.6 Disadvantages of the simulation approach to econometric or financial problem solving 601 13.7 An example of Monte Carlo simulation in econometrics: deriving a set of critical values for a Dickey-Fuller test 603 13.8 An example of how to simulate the price of a financial option 607 13.9 An example of bootstrapping to calculate capital risk requirements 613 14 Conducting empirical research or doing a project or dissertation in finance 626 14.1		12.9	Multinomial linear dependent variables	568
financing methods57112.11Ordered response linear dependent variables models57412.12Are unsolicited credit ratings biased downwards? An ordered probit analysis57412.13Censored and truncated dependent variables57912.14Limited dependent variable models in EViews Appendix: The maximum likelihood estimator for logit and probit models58913Simulation methods59113.1Motivations59113.2Monte Carlo simulations59213.3Variance reduction techniques59313.4Bootstrapping59713.5Random number generation60013.6Disadvantages of the simulation approach to econometric or financial problem solving60113.7An example of Monte Carlo simulation in econometrics: deriving a set of critical values for a Dickey-Fuller test60313.8An example of bootstrapping to calculate capital risk requirements61114Conducting empirical research or doing a project or dissertation in finance62614.1What is an empirical research project and what is it for?62614.1What is an empirical research?62914.3Sponsored or independent research?62914.4The research proposal63114.5Working papers and literature on the internet63114.6Getting the data63314.7Choice of computer software63414.8Methodology63414.9Event studies<		12.10	-	
12.11 Ordered response linear dependent variables models 574 12.12 Are unsolicited credit ratings biased downwards? An ordered probit analysis 574 12.13 Censored and truncated dependent variables 579 12.14 Limited dependent variable models in EViews 583 Appendix: The maximum likelihood estimator for logit and probit models 591 13.1 Motivations 591 13.2 Monte Carlo simulations 592 13.3 Variance reduction techniques 593 13.4 Bootstrapping 597 13.5 Random number generation 600 13.6 Disadvantages of the simulation approach to econometric or financial problem solving 601 13.7 An example of Monte Carlo simulation in econometrics: deriving a set of critical values for a Dickey-Fuller test 603 13.8 An example of how to simulate the price of a financial option 607 13.9 An example of bootstrapping to calculate capital risk requirements 626 14.1 What is an empirical research project and what is it for? 626 14.1 What is an empirical research? 629 14.4 The research proposal				571
12.12 Are unsolicited credit ratings biased downwards? An ordered probit analysis 574 12.13 Censored and truncated dependent variables 579 12.14 Limited dependent variable models in EViews 583 Appendix: The maximum likelihood estimator for logit and probit models 589 13 Simulation methods 591 13.1 Motivations 591 13.2 Monte Carlo simulations 592 13.3 Variance reduction techniques 593 13.4 Bootstrapping 597 13.5 Random number generation 600 13.6 Disadvantages of the simulation approach to econometric or financial problem solving 601 13.7 An example of Monte Carlo simulation in econometrics: deriving a set of critical values for a Dickey-Fuller test 603 13.8 An example of bootstrapping to calculate capital risk requirements 613 14 Conducting empirical research or doing a project or dissertation in finance 626 14.1 What is an empirical research project and what is it for? 626 14.2 Selecting the topic 627 14.3 Sponsored or independent research? 629		12.11	6	574
probit analysis57412.13Censored and truncated dependent variables57912.14Limited dependent variable models in EViews583Appendix: The maximum likelihood estimator for logit and probit models58913Simulation methods59113.1Motivations59113.2Monte Carlo simulations59213.3Variance reduction techniques59313.4Bootstrapping59713.5Random number generation60013.6Disadvantages of the simulation approach to econometric or financial problem solving60113.7An example of Monte Carlo simulation in econometrics: deriving a set of critical values for a Dickey-Fuller test60313.8An example of bootstrapping to calculate capital risk requirements60713.9An example of bootstrapping to calculate capital risk requirements61314Conducting empirical research or doing a project or dissertation in finance62614.1What is an empirical research project and what is it for?62614.3Sponsored or independent research?62914.4The research proposal63114.5Working papers and literature on the internet63114.6Getting the data63314.7Choice of computer software63414.8Methodology63414.9Event studies634		12.12		
12.13 Censored and truncated dependent variables 579 12.14 Limited dependent variable models in EViews 583 Appendix: The maximum likelihood estimator for logit and probit models 589 13 Simulation methods 591 13.1 Motivations 591 13.2 Monte Carlo simulations 592 13.3 Variance reduction techniques 593 13.4 Bootstrapping 597 13.5 Random number generation 600 13.6 Disadvantages of the simulation approach to econometric or financial problem solving 601 13.7 An example of Monte Carlo simulation in econometrics: deriving a set of critical values for a Dickey-Fuller test 603 13.8 An example of how to simulate the price of a financial option 607 13.9 An example of bootstrapping to calculate capital risk requirements 613 14 Conducting empirical research or doing a project or dissertation in finance 626 14.1 What is an empirical research project and what is it for? 626 14.2 Selecting the topic 627 14.3 Sponsored or independent research? 629 <t< td=""><td></td><td></td><td>5</td><td>574</td></t<>			5	574
12.14 Limited dependent variable models in EViews 583 Appendix: The maximum likelihood estimator for logit and probit models 589 13 Simulation methods 591 13.1 Motivations 592 13.2 Monte Carlo simulations 592 13.3 Variance reduction techniques 593 13.4 Bootstrapping 597 13.5 Random number generation 600 13.6 Disadvantages of the simulation approach to econometric or financial problem solving 601 13.7 An example of Monte Carlo simulation in econometrics: deriving a set of critical values for a Dickey-Fuller test 603 13.8 An example of how to simulate the price of a financial option 607 13.9 An example of bootstrapping to calculate capital risk requirements 613 14 Conducting empirical research or doing a project or dissertation in finance 626 14.1 What is an empirical research project and what is it for? 626 14.2 Selecting the topic 627 14.3 Sponsored or independent research? 629 14.4 The research proposal 631 14.5		12.13	Censored and truncated dependent variables	579
Appendix: The maximum likelihood estimator for logit and probit models 589 13 Simulation methods 591 13.1 Motivations 591 13.2 Monte Carlo simulations 592 13.3 Variance reduction techniques 593 13.4 Bootstrapping 597 13.5 Random number generation 600 13.6 Disadvantages of the simulation approach to econometric or financial problem solving 601 13.7 An example of Monte Carlo simulation in econometrics: deriving a set of critical values for a Dickey-Fuller test 603 13.8 An example of how to simulate the price of a financial option 607 13.9 An example of bootstrapping to calculate capital risk requirements 613 14 Conducting empirical research or doing a project or dissertation in finance 626 14.1 What is an empirical research project and what is it for? 626 14.3 Sponsored or independent research? 629 14.4 The research proposal 631 14.5 Working papers and literature on the internet 631 14.5 Working papers and literature on the internet 631 14.6 <td></td> <td>12.14</td> <td>-</td> <td>583</td>		12.14	-	583
13 Simulation methods 591 13.1 Motivations 591 13.2 Monte Carlo simulations 592 13.3 Variance reduction techniques 593 13.4 Bootstrapping 597 13.5 Random number generation 600 13.6 Disadvantages of the simulation approach to econometric or financial problem solving 601 13.7 An example of Monte Carlo simulation in econometrics: deriving a set of critical values for a Dickey-Fuller test 603 13.8 An example of how to simulate the price of a financial option 607 13.9 An example of bootstrapping to calculate capital risk requirements 613 14 Conducting empirical research or doing a project or dissertation in finance 626 14.1 What is an empirical research project and what is it for? 626 14.1 What is an empirical research? 629 14.4 The research proposal 631 14.5 Working papers and literature on the internet 631 14.6 Getting the data 633 14.7 Choice of computer software 634 14.8 Methodology 634 <td></td> <td></td> <td>-</td> <td></td>			-	
13.1Motivations59113.2Monte Carlo simulations59213.3Variance reduction techniques59313.4Bootstrapping59713.5Random number generation60013.6Disadvantages of the simulation approach to econometric or financial problem solving60113.7An example of Monte Carlo simulation in econometrics: deriving a set of critical values for a Dickey-Fuller test60313.8An example of how to simulate the price of a financial option60713.9An example of bootstrapping to calculate capital risk requirements61314Conducting empirical research or doing a project or dissertation in finance62614.1What is an empirical research project and what is it for?62614.3Sponsored or independent research?62914.4The research proposal63114.5Working papers and literature on the internet63114.6Getting the data63314.7Choice of computer software63414.8Methodology63414.9Event studies634			probit models	589
13.1Motivations59113.2Monte Carlo simulations59213.3Variance reduction techniques59313.4Bootstrapping59713.5Random number generation60013.6Disadvantages of the simulation approach to econometric or financial problem solving60113.7An example of Monte Carlo simulation in econometrics: deriving a set of critical values for a Dickey-Fuller test60313.8An example of how to simulate the price of a financial option60713.9An example of bootstrapping to calculate capital risk requirements61314Conducting empirical research or doing a project or dissertation in finance62614.1What is an empirical research project and what is it for?62614.3Sponsored or independent research?62914.4The research proposal63114.5Working papers and literature on the internet63114.6Getting the data63314.7Choice of computer software63414.8Methodology63414.9Event studies634				
13.2Monte Carlo simulations59213.3Variance reduction techniques59313.4Bootstrapping59713.5Random number generation60013.6Disadvantages of the simulation approach to econometric or financial problem solving60113.7An example of Monte Carlo simulation in econometrics: deriving a set of critical values for a Dickey-Fuller test60313.8An example of how to simulate the price of a financial option60713.9An example of bootstrapping to calculate capital risk requirements61314Conducting empirical research or doing a project or dissertation in finance62614.1What is an empirical research project and what is it for?62614.2Selecting the topic62714.3Sponsored or independent research?62914.4The research proposal63114.5Working papers and literature on the internet63114.6Getting the data63314.7Choice of computer software63414.8Methodology63414.9Event studies634	13	Simula	tion methods	
13.3Variance reduction techniques59313.4Bootstrapping59713.5Random number generation60013.6Disadvantages of the simulation approach to econometric or financial problem solving60113.7An example of Monte Carlo simulation in econometrics: deriving a set of critical values for a Dickey-Fuller test60313.8An example of how to simulate the price of a financial option60713.9An example of bootstrapping to calculate capital risk requirements61314Conducting empirical research or doing a project or dissertation in finance62614.1What is an empirical research project and what is it for?62614.2Selecting the topic62714.3Sponsored or independent research?62914.4The research proposal63114.5Working papers and literature on the internet63114.6Getting the data63314.7Choice of computer software63414.8Methodology63414.9Event studies634		13.1		
13.4Bootstrapping59713.5Random number generation60013.6Disadvantages of the simulation approach to econometric or financial problem solving60113.7An example of Monte Carlo simulation in econometrics: deriving a set of critical values for a Dickey-Fuller test60313.8An example of how to simulate the price of a financial option60713.9An example of bootstrapping to calculate capital risk requirements61314Conducting empirical research or doing a project or dissertation in finance62614.1What is an empirical research project and what is it for?62614.2Selecting the topic62714.3Sponsored or independent research?62914.4The research proposal63114.5Working papers and literature on the internet63114.6Getting the data63314.7Choice of computer software63414.8Methodology63414.9Event studies634		13.2	Monte Carlo simulations	592
13.5Random number generation60013.6Disadvantages of the simulation approach to econometric or financial problem solving60113.7An example of Monte Carlo simulation in econometrics: deriving a set of critical values for a Dickey-Fuller test60313.8An example of how to simulate the price of a financial option60713.9An example of bootstrapping to calculate capital risk requirements61314Conducting empirical research or doing a project or dissertation in finance62614.1What is an empirical research project and what is it for?62614.2Selecting the topic62714.3Sponsored or independent research?62914.4The research proposal63114.5Working papers and literature on the internet63114.6Getting the data63314.7Choice of computer software63414.8Methodology63414.9Event studies634		13.3	Variance reduction techniques	593
 13.6 Disadvantages of the simulation approach to econometric or financial problem solving 601 13.7 An example of Monte Carlo simulation in econometrics: deriving a set of critical values for a Dickey-Fuller test 603 13.8 An example of how to simulate the price of a financial option 607 13.9 An example of bootstrapping to calculate capital risk requirements 613 14 Conducting empirical research or doing a project or dissertation in finance 626 14.1 What is an empirical research project and what is it for? 626 14.2 Selecting the topic 627 14.3 Sponsored or independent research? 629 14.4 The research proposal 631 14.5 Working papers and literature on the internet 631 14.6 Getting the data 633 14.7 Choice of computer software 634 14.8 Methodology 634 14.9 Event studies 		13.4	Bootstrapping	597
financial problem solving60113.7An example of Monte Carlo simulation in econometrics: deriving a set of critical values for a Dickey-Fuller test60313.8An example of how to simulate the price of a financial option60713.9An example of bootstrapping to calculate capital risk requirements61314Conducting empirical research or doing a project or dissertation in finance62614.1What is an empirical research project and what is it for?62614.2Selecting the topic62714.3Sponsored or independent research?62914.4The research proposal63114.5Working papers and literature on the internet63114.6Getting the data63314.7Choice of computer software63414.8Methodology63414.9Event studies634		13.5	Random number generation	600
 13.7 An example of Monte Carlo simulation in econometrics: deriving a set of critical values for a Dickey-Fuller test 13.8 An example of how to simulate the price of a financial option 13.9 An example of bootstrapping to calculate capital risk requirements 14 Conducting empirical research or doing a project or dissertation in finance 14 Conducting empirical research project and what is it for? 14.1 What is an empirical research project and what is it for? 14.2 Selecting the topic 14.3 Sponsored or independent research? 14.5 Working papers and literature on the internet 14.6 Getting the data 14.7 Choice of computer software 14.8 Methodology 14.9 Event studies 		13.6	Disadvantages of the simulation approach to econometric or	
deriving a set of critical values for a Dickey-Fuller test60313.8An example of how to simulate the price of a financial option60713.9An example of bootstrapping to calculate capital risk requirements61314Conducting empirical research or doing a project or dissertation in finance62614.1What is an empirical research project and what is it for?62614.2Selecting the topic62714.3Sponsored or independent research?62914.4The research proposal63114.5Working papers and literature on the internet63314.7Choice of computer software63414.8Methodology63414.9Event studies634			financial problem solving	601
13.8An example of how to simulate the price of a financial option60713.9An example of bootstrapping to calculate capital risk requirements61314Conducting empirical research or doing a project or dissertation in finance62614.1What is an empirical research project and what is it for?62614.2Selecting the topic62714.3Sponsored or independent research?62914.4The research proposal63114.5Working papers and literature on the internet63114.6Getting the data63314.7Choice of computer software63414.8Methodology63414.9Event studies634		13.7	An example of Monte Carlo simulation in econometrics:	
option60713.9An example of bootstrapping to calculate capital risk requirements61314Conducting empirical research or doing a project or dissertation in finance62614.1What is an empirical research project and what is it for?62614.2Selecting the topic62714.3Sponsored or independent research?62914.4The research proposal63114.5Working papers and literature on the internet63114.6Getting the data63314.7Choice of computer software63414.8Methodology63414.9Event studies634			deriving a set of critical values for a Dickey-Fuller test	603
13.9An example of bootstrapping to calculate capital risk requirements61314Conducting empirical research or doing a project or dissertation in finance62614.1What is an empirical research project and what is it for?62614.2Selecting the topic62714.3Sponsored or independent research?62914.4The research proposal63114.5Working papers and literature on the internet63114.6Getting the data63314.7Choice of computer software63414.8Methodology63414.9Event studies634		13.8	An example of how to simulate the price of a financial	
requirements61314 Conducting empirical research or doing a project or dissertation in finance62614.1 What is an empirical research project and what is it for?62614.2 Selecting the topic62714.3 Sponsored or independent research?62914.4 The research proposal63114.5 Working papers and literature on the internet63114.6 Getting the data63314.7 Choice of computer software63414.8 Methodology63414.9 Event studies634			option	607
14Conducting empirical research or doing a project or dissertation in finance62614.1What is an empirical research project and what is it for?62614.2Selecting the topic62714.3Sponsored or independent research?62914.4The research proposal63114.5Working papers and literature on the internet63114.6Getting the data63314.7Choice of computer software63414.8Methodology63414.9Event studies634		13.9	An example of bootstrapping to calculate capital risk	
dissertation in finance62614.1What is an empirical research project and what is it for?62614.2Selecting the topic62714.3Sponsored or independent research?62914.4The research proposal63114.5Working papers and literature on the internet63114.6Getting the data63314.7Choice of computer software63414.8Methodology63414.9Event studies634			requirements	613
dissertation in finance62614.1What is an empirical research project and what is it for?62614.2Selecting the topic62714.3Sponsored or independent research?62914.4The research proposal63114.5Working papers and literature on the internet63114.6Getting the data63314.7Choice of computer software63414.8Methodology63414.9Event studies634	14	Condi	icting empirical research or doing a project or	
14.1What is an empirical research project and what is it for?62614.2Selecting the topic62714.3Sponsored or independent research?62914.4The research proposal63114.5Working papers and literature on the internet63114.6Getting the data63314.7Choice of computer software63414.8Methodology63414.9Event studies634				626
14.2Selecting the topic62714.3Sponsored or independent research?62914.4The research proposal63114.5Working papers and literature on the internet63114.6Getting the data63314.7Choice of computer software63414.8Methodology63414.9Event studies634				
14.3Sponsored or independent research?62914.4The research proposal63114.5Working papers and literature on the internet63114.6Getting the data63314.7Choice of computer software63414.8Methodology63414.9Event studies634				
14.4The research proposal63114.5Working papers and literature on the internet63114.6Getting the data63314.7Choice of computer software63414.8Methodology63414.9Event studies634				
14.5Working papers and literature on the internet63114.6Getting the data63314.7Choice of computer software63414.8Methodology63414.9Event studies634				
14.6Getting the data63314.7Choice of computer software63414.8Methodology63414.9Event studies634				
14.7Choice of computer software63414.8Methodology63414.9Event studies634				
14.8Methodology63414.9Event studies634				
14.9Event studies634				

x

Contents	0	xi

	14.11 How might the finished project look?14.12 Presentational issues	,	661 666
Appendix 1 Appendix2	Sources of data used in this book Tables of statistical distributions		667 668
	Glossary		680
	References		697
	Index		710