Contents

Notational Conventions, Symbols, and Abbreviations		
1.	Introduction and Overview	1
	1.1. Equilibrium relationships and the long run	2
	1.2. Stationarity and equilibrium relationships	4
	1.3. Equilibrium and the specification of dynamic models	5
	1.4. Estimation of long-run relationships and testing for order	
	of integration and co-integration	8
	1.5. Preliminary concepts and definitions	10
	1.6. Data representation and transformations	28
	1.7. Examples: typical ARMA processes	32
	1.8. Empirical time series: money, prices, output, and interest	L
	rates	40
	1.9. Outline of later chapters	42
	Appendix	43
2.	Linear Transformations, Error Correction, and the Long	
	Run in Dynamic Regression	46
	2.1. Transformations of a simple model	48
	2.2. The error-correction model	50
	2.3. An example	52
	2.4. Bårdsen and Bewley transformations	53
	2.5. Equivalence of estimates from different transformations	55
	2.6. Homogeneity and the ECM as a linear transformation	
	of the ADL	60
	2.7. Variances of estimates of long-run multipliers	61
	2.8. Expectational variables and the interpretation of	
	long-run solutions	64
2	Departies of Integrated Processes	69
3.	Properties of Integrated Processes	70
	3.1. Spurious regression 3.2. Trends and random walks	81
	3.2. Trenas and random walks 3.3. Some statistical features of integrated processes	84
	3.4. Asymptotic theory for integrated processes	86
	3.5. Using Wiener distribution theory	91
		95
	3.6. Near-integrated processes))

4.	Testing for a Unit Root	99
	4.1. Similar tests and exogenous regressors in the DGP	104
	4.2. General dynamic models for the process of interest	106
	4.3. Non-parametric tests for a unit root	108
	4.4. Tests on more than one parameter	113
	4.5. Further extensions	119
	4.6. Asymptotic distributions of test statistics	123
5.	Co-integration	136
	5.1. An example	137
	5.2. Polynomial matrices	140
	5.3. Integration and co-integration: formal definitions and	
	theorems	145
	5.4. Significance of alternative representations	153
	5.5. Alternative representations of co-integrated variables:	
	two examples	153
	5.6. Engle-Granger two-step procedure	157
6.	Regression with Integrated Variables	162
	6.1. Unbalanced regressions and orthogonality tests	164
	6.2. Dynamic regressions	168
	6.3. Functional forms and transformations	192
	Appendix: Vector Brownian Motion	200
7.	Co-integration in Individual Equations	204
	7.1. Estimating a single co-integrating vector	205
	7.2. Tests for co-integration in a single equation	206
	7.3. Response surfaces for critical values	211
	7.4. Finite-sample biases in OLS estimates	214
	7.5. Powers of single-equation co-integration tests	230
	7.6. An empirical illustration	236
	7.7. Fully modified estimation	239
	7.8. A fully modified least-squares estimator	240
	7.9. Dynamic specification	242
	7.10. Examples	244
	Appendix: Covariance Matrices	252
8.	Co-integration in Systems of Equations	255
	8.1. Co-integration and error correction	257
	8.2. Estimating co-integrating vectors in systems	261
	8.3. Inference about the co-integration space	266
	8.4. An empirical illustration	268
	8.5. Extensions	271

viii

Contents	ix
8.6. A second example of the Johansen maximum likelihood	
approach	292
8.7. Asymptotic distributions of estimators of co-integrating	
vectors in I(1) systems	293
9. Conclusion	299
9.1. Summary	299
9.2. The invariance of co-integrating vectors	300
9.3. Invariance of co-integration under seasonal adjustment	301
9.4. Structured time-series models and co-integration	303
9.5. Recent research on integration and co-integration	304
9.6. Reinterpreting econometrics time-series problems	307
References	311
Acknowledgements for Quoted Extracts	321
Author Index	323
Subject Index	325