Econometric Analysis of Panel Data

Fifth Edition

Badi H. Baltagi

WILEY

Contents

Preface **xi**

1 Introduction **1**
1.1 Panel Data: Some Examples 1
1.2 Why Should We Use Panel Data? Their Benefits and Limitations 6
Note 11

2 The One-way Error Component Regression Model **13**
2.1 Introduction 13
2.2 The One-way Fixed Effects Model 14
2.3 The One-way Random Effects Model 20
2.4 Maximum Likelihood Estimation 25
2.5 Prediction 26
2.6 Examples 27
2.7 Selected Applications 34
2.8 Computational Note 34
Notes 34
Problems 35

3 The Two-way Error Component Regression Model **39**
3.1 Introduction 39
3.2 The Two-way Fixed Effects Model 39
3.3 The Two-way Random Effects Model 42
3.4 Maximum Likelihood Estimation 47
3.5 Prediction 49
3.6 Examples 50
3.7 Computational Note 53
Notes 55
Problems 55

4 Test of Hypotheses with Panel Data **63**
4.1 Tests for Poolability 63
4.2 Tests for Individual and Time Effects 68
4.3 Hausman's Specification Test 76

4.4 Further Reading 86
Notes 88
Problems 88

5 Heteroskedasticity and Serial Correlation in the Error Component Model 91
5.1 Heteroskedasticity 91
5.2 Serial Correlation 96
5.3 Time-wise Autocorrelated and Cross-sectionally Heteroskedastic Panel Regression 115
5.4 Further Reading 119
Notes 119
Problems 120

6 Seemingly Unrelated Regressions with Error Components 123
6.1 The One-way Model 123
6.2 The Two-way Model 124
6.3 Applications and Extensions 125
Problems 127

7 Simultaneous Equations with Error Components 129
7.1 Single Equation Estimation 129
7.2 Empirical Example: Crime in North Carolina 132
7.3 System Estimation 138
7.4 The Hausman and Taylor Estimator 141
7.5 Empirical Example: Earnings Equation Using PSID Data 144
7.6 Further Reading 147
Notes 150
Problems 150

8 Dynamic Panel Data Models 155
8.1 Introduction 155
8.2 The Arellano and Bond Estimator 157
8.3 The Arellano and Bover Estimator 161
8.4 The Ahn and Schmidt Moment Conditions 164
8.5 The Blundell and Bond System GMM Estimator 167
8.6 The Keane and Runkle Estimator 168
8.7 Limited Information Maximum Likelihood 171
8.8 Further Developments 172
8.9 Empirical Examples 175
8.10 Selected Applications 179
8.11 Further Reading 182
Notes 183
Problems 183

9 Unbalanced Panel Data Models 187
9.1 Introduction 187
9.2 The Unbalanced One-way Error Component Model 187

9.3 Empirical Example: Hedonic Housing 194
9.4 The Unbalanced Two-way Error Component Model 197
9.5 Testing for Individual and Time Effects Using Unbalanced Panel Data 200
9.6 The Unbalanced Nested Error Component Model 203
Notes 208
Problems 209

10 Special Topics **213**
10.1 Measurement Error and Panel Data 213
10.2 Rotating Panels 216
10.3 Pseudo Panels 218
10.4 Short-run versus Long-run Estimates in Pooled Models 221
10.5 Heterogeneous Panels 222
10.6 Count Panel Data 228
Notes 235
Problems 235

11 Limited Dependent Variables and Panel Data **239**
11.1 Introduction 239
11.2 Fixed and Random Logit and Probit Models 239
11.3 Simulation Estimation of Limited Dependent Variable Models with Panel Data 247
11.4 Dynamic Panel Data Limited Dependent Variable Models 248
11.5 Selection Bias in Panel Data 254
11.6 Censored and Truncated Panel Data Models 258
11.7 Applications 263
11.8 Empirical Example: Nurses' Labour Supply 265
11.9 Further Reading 268
Notes 270
Problems 271

12 Nonstationary Panels **275**
12.1 Introduction 275
12.2 Panel Unit Roots Tests Assuming Cross-sectional Independence 277
12.3 Panel Unit Roots Tests Allowing for Cross-sectional Dependence 287
12.4 Spurious Regression in Panel Data 291
12.5 Panel Cointegration Tests 293
12.6 Estimation and Inference in Panel Cointegration Models 299
12.7 Empirical Examples 303
12.8 Further Reading 309
Notes 315
Problems 315

13 Spatial Panel Data Models **319**
13.1 Introduction 319
13.2 Spatial Error Component Regression Model 319

13.3 Spatial Lag Panel Data Regression Model 325
13.4 Forecasts using Panel Data with Spatial Error Correlation 329
13.5 Panel Unit Root Tests and Spatial Dependence 330
13.6 Panel Data Tests for Cross-sectional Dependence 332
13.7 Further Reading 336
Problems 337

References **339**

Appendix **361**

Index **363**