

CONTENTS

<i>List of figures</i>	xī
<i>List of tables</i>	xii
<i>Preface</i>	xiii
<i>Acknowledgments</i>	xv
1 Review of estimation and hypothesis tests	1
1.1 <i>The problem</i>	1
1.2 <i>Population and sample</i>	1
1.3 <i>Hypotheses</i>	2
1.4 <i>Test statistic and its sampling distribution</i>	2
1.5 <i>Type I and Type II errors</i>	4
1.6 <i>Significance level</i>	4
1.7 <i>p-value</i>	4
1.8 <i>Powerful tests</i>	5
1.9 <i>Properties of estimators</i>	8
1.10 <i>Summary</i>	9
<i>Review questions</i>	10
2 Simple linear regression models	12
2.1 <i>Introduction</i>	12
2.1.1 <i>A hypothetical example</i>	12
2.1.2 <i>Population regression line</i>	13
2.1.3 <i>Stochastic specification for individuals</i>	14
2.2 <i>Ordinary least squares estimation</i>	14
2.3 <i>Coefficient of determination (R^2)</i>	17
2.3.1 <i>Definition and interpretation of R^2</i>	17
2.3.2 <i>Application of R^2: Morck, Yeung and Yu (2000)</i>	18
2.3.3 <i>Application of R^2: Dechow (1994)</i>	19
2.4 <i>Hypothesis test</i>	20
2.4.1 <i>Testing $H_0: \beta_1 = 0$ vs. $H_1: \beta_1 \neq 0$</i>	20
2.4.2 <i>Testing $H_0: \beta_1 = c$ vs. $H_1: \beta_1 \neq c$ (c is a constant)</i>	22
2.5 <i>The model</i>	22
2.5.1 <i>Key assumptions</i>	22
2.5.2 <i>Gauss-Markov Theorem</i>	26
2.5.3 <i>Consistency of the OLS estimators</i>	26
2.5.4 <i>Remarks on model specification</i>	27

2.6	<i>Functional forms</i>	27
2.6.1	<i>Log-log linear models</i>	28
2.6.2	<i>Log-linear models</i>	30
2.7	<i>Effects of changing measurement units and levels</i>	31
2.7.1	<i>Changes of measurement units</i>	31
2.7.2	<i>Changes in the levels</i>	33
2.8	<i>Summary</i>	33
	<i>Review questions</i>	34
	<i>References</i>	38
	<i>Appendix 2 How to use EViews, SAS and R</i>	39

3 Multiple linear regression models

43

3.1	<i>The basic model</i>	43
3.2	<i>Ordinary least squares estimation</i>	45
3.2.1	<i>Obtaining the OLS estimates</i>	45
3.2.2	<i>Interpretation of regression coefficients</i>	46
3.3	<i>Estimation bias due to correlated-omitted variables</i>	47
3.4	<i>R² and the adjusted R²</i>	48
3.4.1	<i>Definition and interpretation of R²</i>	48
3.4.2	<i>Adjusted R²</i>	48
3.5	<i>Hypothesis test</i>	49
3.6	<i>Model selection</i>	50
3.6.1	<i>General-to-simple approach</i>	50
3.6.2	<i>A comment on hypothesis testing</i>	52
3.6.3	<i>Guidelines for model selection</i>	53
3.7	<i>Applications</i>	53
3.7.1	<i>Mitton (2002)</i>	53
3.7.2	<i>McAlister, Srinivasan and Kim (2007)</i>	55
3.7.3	<i>Collins, Pincus and Xie (1999)</i>	56
3.7.4	<i>Angrist and Pischke (2009, pp. 64–68)</i>	57
3.8	<i>Summary</i>	59
	<i>Review questions</i>	59
	<i>References</i>	64
	<i>Appendix 3A Hypothesis test using EViews and SAS</i>	65
	<i>Appendix 3B Geometric interpretation of the OLS regression equation</i>	67

4 Dummy explanatory variables

69

4.1	<i>Dummy variables for different intercepts</i>	69
4.1.1	<i>When there are two categories</i>	69
4.1.2	<i>When there are more than two categories</i>	72
4.1.3	<i>Interpretation when the dependent variable is in logarithm</i>	72
4.1.4	<i>Application: Mitton (2002)</i>	73
4.1.5	<i>Application: Hakes and Sauer (2006)</i>	74
4.2	<i>Dummy variables for different slopes</i>	77
4.2.1	<i>Use of a cross product with a dummy variable</i>	77
4.2.2	<i>Application: Basu (1997)</i>	79
4.3	<i>Structural stability of regression models</i>	80
4.3.1	<i>Test by splitting the sample (Chow test)</i>	80
4.3.2	<i>Test using dummy variables</i>	80

4.4	<i>Piecewise linear regression models</i>	81
4.4.1	<i>Using dummy variables</i>	81
4.4.2	<i>Using quantitative variables only</i>	81
4.4.3	<i>Morck, Shleifer and Vishny (1988)</i>	82
4.5	<i>Summary</i>	83
	<i>Review questions</i>	83
	<i>References</i>	86
	<i>Appendix 4 Dummy variables in EViews and SAS</i>	87
5	More on multiple regression analysis	89
5.1	<i>Multicollinearity</i>	89
5.1.1	<i>Consequences of multicollinearity</i>	91
5.1.2	<i>Solutions</i>	91
5.2	<i>Heteroscedasticity</i>	92
5.2.1	<i>Consequences of heteroscedasticity</i>	92
5.2.2	<i>Testing for heteroscedasticity</i>	92
5.2.3	<i>Application: Mitton (2002)</i>	93
5.3	<i>More on functional form</i>	94
5.3.1	<i>Quadratic function</i>	94
5.3.2	<i>Interaction terms</i>	94
5.4	<i>Applications</i>	96
5.4.1	<i>Bharadwaj, Tuli and Bonfrer (2011)</i>	96
5.4.2	<i>Ghosh and Moon (2005)</i>	98
5.4.3	<i>Arora and Vamvakidis (2005)</i>	99
5.5	<i>Summary</i>	100
	<i>Review questions</i>	100
	<i>References</i>	105
	<i>Appendix 5 Testing and correcting for heteroscedasticity</i>	106
6	Endogeneity and two-stage least squares estimation	109
6.1	<i>Measurement errors</i>	110
6.1.1	<i>Measurement errors in the dependent variable</i>	111
6.1.2	<i>Measurement errors in an explanatory variable</i>	111
6.2	<i>Specification errors</i>	113
6.2.1	<i>Omitted variables</i>	113
6.2.2	<i>Inclusion of irrelevant variables</i>	114
6.2.3	<i>A guideline for model selection</i>	114
6.3	<i>Two-stage least squares estimation</i>	115
6.4	<i>Generalized method of moments (GMM)</i>	117
6.4.1	<i>GMM vs. 2SLS</i>	118
6.5	<i>Tests for endogeneity</i>	118
6.5.1	<i>Ramsey (1969) test</i>	118
6.5.2	<i>Hausman (1978) test</i>	118
6.6	<i>Applications</i>	119
6.6.1	<i>Dechow, Sloan and Sweeney (1995)</i>	119
6.6.2	<i>Beaver, Lambert and Ryan (1987)</i>	121
6.6.3	<i>Himmelberg and Petersen (1994)</i>	122
6.7	<i>Summary</i>	122
	<i>Review questions</i>	123

References 127

Appendix 6A Estimation of 2SLS and GMM using EViews and SAS 129

Appendix 6B Hausman test for endogeneity using EViews and SAS 132

7 Models for panel data

135

7.1 *One big regression* 135

7.2 *Fixed effects model* 136

7.2.1 *Using time dummies (for b_i)* 136

7.2.2 *Using cross-section dummies (for a_i)* 137

7.2.3 *Applying transformations* 137

7.3 *Applications* 139

7.3.1 *Cornwell and Trumbull (1994)* 139

7.3.2 *Blackburn and Neumark (1992)* 141

7.3.3 *Garin-Munoz (2006)* 142

7.3.4 *Tuli, Bharadwaj and Kohli (2010)* 142

7.4 *Random effects* 145

7.5 *Fixed vs. random effects models* 147

7.6 *Summary* 147

Review questions 148

References 151

Appendix 7A Controlling for fixed effects using EViews and SAS 153

Appendix 7B Is it always possible to control for unit-specific effects? 155

8 Simultaneous equations models

157

8.1 *Model description* 157

8.2 *Estimation methods* 158

8.2.1 *Two-stage least squares (2SLS)* 158

8.2.2 *Three-stage least squares (3SLS)* 159

8.2.3 *Generalized method of moments (GMM)* 160

8.2.4 *Full-information maximum likelihood (FIML)* 160

8.3 *Identification problem* 160

8.4 *Applications* 162

8.4.1 *Cornwell and Trumbull (1994)* 162

8.4.2 *Beaver, McAnally and Stinson (1997)* 163

8.4.3 *Barton (2001)* 165

8.4.4 *Datta and Agarwal (2004)* 165

8.5 *Summary* 167

Review questions 167

References 169

Appendix 8 Estimation of simultaneous equations models using EViews and SAS 171

9 Vector autoregressive (VAR) models

173

9.1 *VAR models* 173

9.2 *Estimation of VAR models* 174

9.3 *Granger-causality test* 175

9.4 *Forecasting* 178

9.5 *Impulse-response analysis* 179

9.6 *Variance decomposition analysis* 181

9.7 *Applications* 183

9.7.1 *Stock and Watson (2001)* 183

9.7.2	Zhang, Fan, Tsai and Wei (2008)	186
9.7.3	Trusov, Bucklin and Pausels (2009)	187
9.8	Summary	191
	Review questions	191
	References	194
	Appendix 9 Estimation and analysis of VAR models using SAS	195

10 Autocorrelation and ARCH/GARCH

203

10.1	Autocorrelation	203
10.1.1	Consequences of autocorrelation	203
10.1.2	Test for autocorrelation	206
10.1.3	Estimation of autocorrelation	208
10.2	ARCH-type models	208
10.2.1	ARCH model	209
10.2.2	GARCH (Generalized ARCH) model	212
10.2.3	TGARCH (Threshold GARCH) model	214
10.2.4	EGARCH (Exponential GARCH) model	214
10.2.5	GARCH-M model	215
10.3	Applications	215
10.3.1	Wang, Salin and Leatham (2002)	215
10.3.2	Zhang, Fan, Tsai and Wei (2008)	216
10.3.3	Value at Risk (VaR)	218
10.4	Summary	219
	Review questions	220
	References	222
	Appendix 10A Test and estimation of autocorrelation using EViews and SAS	223
	Appendix 10B Test and estimation of ARCH/GARCH models using SAS	229

11 Unit root, cointegration and error correction model

230

11.1	Spurious regression	230
11.2	Stationary and nonstationary time series	232
11.3	Deterministic and stochastic trends	233
11.4	Unit root tests	234
11.4.1	Dickey-Fuller (DF) test	234
11.4.2	Augmented Dickey-Fuller (ADF) test	235
11.4.3	Example: unit root test using EViews	235
11.5	Cointegration	237
11.5.1	Tests for cointegration	237
11.5.2	Vector error correction models (VECMs)	237
11.5.3	Example: test and estimation of cointegration using EViews	238
11.6	Applications	242
11.6.1	Stock and Watson (1988)	242
11.6.2	Baillie and Selover (1987)	243
11.6.3	Granger (1988)	243
11.6.4	Dritsakis (2004)	245
11.6.5	Ghosh (1993)	247
11.7	Summary	247
	Review questions	247
	References	250

Appendix 11A Unit root test using SAS 252

Appendix 11B Johansen test for cointegration 254

Appendix 11C Vector error correction modeling (VECM): test and estimation using SAS 255

12 Qualitative and limited dependent variable models

262

12.1 *Linear probability model* 262

12.2 *Probit model* 263

12.2.1 *Interpretation of the coefficients* 264

12.2.2 *Measuring the goodness-of-fit* 266

12.3 *Logit model* 267

12.3.1 *Interpretation of the coefficients* 267

12.3.2 *Logit vs. probit* 269

12.3.3 *Adjustment for unequal sampling rates: Maddala (1991), Palepu (1986)* 269

12.4 *Tobit model* 270

12.4.1 *The Tobit model* 270

12.4.2 *Applications of the Tobit model* 271

12.4.3 *Estimation using EViews and SAS* 272

12.5 *Choice-based models* 273

12.5.1 *Self-selection model* 274

12.5.2 *Choice-based Tobit model* 276

12.5.3 *Estimation using SAS* 277

12.6 *Applications* 279

12.6.1 *Bushee (1998)* 279

12.6.2 *Leung, Daouk and Chen (2000)* 280

12.6.3 *Shumway (2001)* 281

12.6.4 *Robinson and Min (2002)* 281

12.6.5 *Leuz and Verrecchia (2000)* 284

12.7 *Summary* 286

Review questions 286

References 290

Appendix 12 Maximum likelihood estimation (MLE) 291