
Contents

Preface	1
0.1 Introduction	1
0.2 What is econometrics, and why study it?	1
0.3 Aims	1
0.4 Learning outcomes	2
0.5 How to make use of the textbook	3
0.6 How to make use of this subject guide	3
0.7 How to make use of the website	4
0.7.1 Slideshows	4
0.7.2 Data sets	4
0.8 Online study resources	5
0.8.1 The VLE	5
0.8.2 Making use of the Online Library	6
0.9 Prerequisite for studying this subject	6
0.10 Application of linear algebra to econometrics	7
0.11 The examination	7
0.12 Overview	9
0.13 Learning outcomes	10
0.14 Additional exercises	10
0.15 Answers to the starred exercises in the textbook	11
0.16 Answers to the additional exercises	22
1 Simple regression analysis	27
1.1 Overview	27
1.2 Learning outcomes	27
1.3 Additional exercises	28
1.4 Answers to the starred exercises in the textbook	30
1.5 Answers to the additional exercises	35
2 Properties of the regression coefficients and hypothesis testing	41
2.1 Overview	41

Contents

2.2	Learning outcomes	41
2.3	Further material	42
2.4	Additional exercises	43
2.5	Answers to the starred exercises in the textbook	48
2.6	Answers to the additional exercises	53
3	Multiple regression analysis	59
3.1	Overview	59
3.2	Learning outcomes	59
3.3	Additional exercises	60
3.4	Answers to the starred exercises in the textbook	63
3.5	Answers to the additional exercises	64
4	Transformations of variables	69
4.1	Overview	69
4.2	Learning outcomes	69
4.3	Further material	70
4.4	Additional exercises	72
4.5	Answers to the starred exercises in the textbook	74
4.6	Answers to the additional exercises	77
5	Dummy variables	85
5.1	Overview	85
5.2	Learning outcomes	85
5.3	Additional exercises	85
5.4	Answers to the starred exercises in the textbook	94
5.5	Answers to the additional exercises	100
6	Specification of regression variables	115
6.1	Overview	115
6.2	Learning outcomes	115
6.3	Additional exercises	116
6.4	Answers to the starred exercises in the textbook	123
6.5	Answers to the additional exercises	129
7	Heteroskedasticity	145
7.1	Overview	145
7.2	Learning outcomes	145

7.3	Additional exercises	145
7.4	Answers to the starred exercises in the textbook	152
7.5	Answers to the additional exercises	159
8	Stochastic regressors and measurement errors	169
8.1	Overview	169
8.2	Learning outcomes	169
8.3	Additional exercises	170
8.4	Answers to the starred exercises in the textbook	172
8.5	Answers to the additional exercises	180
9	Simultaneous equations estimation	185
9.1	Overview	185
9.2	Learning outcomes	185
9.3	Further material	186
9.4	Additional exercises	187
9.5	Answers to the starred exercises in the textbook	194
9.6	Answers to the additional exercises	199
10	Binary choice and limited dependent variable models, and maximum likelihood estimation	213
10.1	Overview	213
10.2	Learning outcomes	213
10.3	Further material	214
10.4	Additional exercises	219
10.5	Answers to the starred exercises in the textbook	225
10.6	Answers to the additional exercises	231
11	Models using time series data	239
11.1	Overview	239
11.2	Learning outcomes	239
11.3	Additional exercises	240
11.4	Answers to the starred exercises in the textbook	245
11.5	Answers to the additional exercises	250
12	Properties of regression models with time series data	261
12.1	Overview	261
12.2	Learning outcomes	261

Contents

12.3	Additional exercises	262
12.4	Answers to the starred exercises in the textbook	269
12.5	Answers to the additional exercises	273
13	Introduction to nonstationary time series	285
13.1	Overview	285
13.2	Learning outcomes	285
13.3	Further material	286
13.4	Additional exercises	287
13.5	Answers to the starred exercises in the textbook	291
13.6	Answers to the additional exercises	295
14	Introduction to panel data	299
14.1	Overview	299
14.2	Learning outcomes	299
14.3	Additional exercises	300
14.4	Answer to the starred exercise in the textbook	304
14.5	Answers to the additional exercises	306
15	Regression analysis with linear algebra primer	313
15.1	Overview	313
15.2	Notation	314
15.3	Test exercises	314
15.4	The multiple regression model	314
15.5	The intercept in a regression model	315
15.6	The OLS regression coefficients	316
15.7	Unbiasedness of the OLS regression coefficients	317
15.8	The variance-covariance matrix of the OLS regression coefficients	317
15.9	The Gauss–Markov theorem	319
15.10	Consistency of the OLS regression coefficients	319
15.11	Frisch–Waugh–Lovell theorem	320
15.12	Exact multicollinearity	323
15.13	Estimation of a linear combination of regression coefficients	324
15.14	Testing linear restrictions	325
15.15	Weighted least squares and heteroskedasticity	325
15.16	IV estimators and TSLS	327
15.17	Generalised least squares	329

15.18	Appendix A: Derivation of the normal equations	330
15.19	Appendix B: Demonstration that $\widehat{u}'\widehat{u}/(n - k)$ is an unbiased estimator of σ_u^2	332
15.20	Appendix C: Answers to the exercises	334
A	Syllabus for the EC2020 Elements of econometrics examination	341
A.1	Review: Random variables and sampling theory	341
A.2	Chapter 1 Simple regression analysis	341
A.3	Chapter 2 Properties of the regression coefficients	342
A.4	Chapter 3 Multiple regression analysis	342
A.5	Chapter 4 Transformation of variables	343
A.6	Chapter 5 Dummy variables	343
A.7	Chapter 6 Specification of regression variables	343
A.8	Chapter 7 Heteroskedasticity	343
A.9	Chapter 8 Stochastic regressors and measurement errors	344
A.10	Chapter 9 Simultaneous equations estimation	344
A.11	Chapter 10 Binary choice models and maximum likelihood estimation . .	344
A.12	Chapter 11 Models using time series data	345
A.13	Chapter 12 Autocorrelation	345
A.14	Chapter 13 Introduction to nonstationary processes	346
A.15	Chapter 14 Introduction to panel data models	346