

ANALYSIS OF ECONOMIC DATA

by

Gary Koop

University of Glasgow

JOHN WILEY & SONS, LTD

Chichester • New York • Weinheim • Brisbane • Singapore • Toronto

Contents

Preface		xi
Chapter 1 Introduction		1
Organization of the book		3
Useful background		4
Chapter 2 Basic data handling		5
Types of economic data		5
Obtaining data		9
Working with data: graphical methods		12
Working with data: descriptive statistics		18
Chapter summary		20
Appendix: Advanced descriptive statistics		20
Endnotes		22
Chapter 3 Correlation		23
Understanding correlation		23
Understanding correlation through verbal reasoning		24
Understanding why variables are correlated		28
Understanding correlation through XY-plots		30
Correlation between several variables		33
Chapter summary		34
Appendix: Mathematical details		35
Endnotes		35
Chapter 4 An introduction to simple regression		37
Regression as a best fitting line		38

	Interpreting OLS estimates	42
	Fitted values and R^2 : measuring the fit of a regression model	45
	Nonlinearity in regression	49
	Chapter summary	53
	Appendix: Mathematical details	53
	Endnotes	55
Chapter 5	Statistical aspects of regression	57
	Which factors affect the accuracy of the estimate /??	58
	Calculating a confidence interval for β	61
	Testing whether $\beta = 0$	67
	Hypothesis testing involving R^2 : the F-statistic	72
	Chapter summary	74
	Appendix: Using statistical tables for testing whether $\beta = 0$	75
	Endnotes	77
Chapter 6	Multiple regression	79
	Regression as a best fitting line	80
	Ordinary least squares estimation of the multiple regression model	81
	Statistical aspects of multiple regression	81
	Interpreting OLS estimates	82
	Pitfalls of using simple regression in a multiple regression context	85
	Omitted variables bias	87
	Multicollinearity	88
	Chapter summary	94
	Appendix: Mathematical interpretation of regression coefficients	94
	Endnotes	95
Chapter 7	Regression with dummy variables	97
	Simple regression with a dummy variable	99
	Multiple regression with dummy variables	100
	Multiple regression both dummy and non-dummy explanatory variables	102
	Interacting dummy and non-dummy variables	105
	What if the dependent variable is a dummy?	107
	Chapter summary	108
	Endnote	108
Chapter 8	Regression with time lags: distributed lag models	109
	Aside on lagged variables	111
	Aside on notation	113

Selection of lag order	116
Chapter summary	119
Appendix: Other distributed lag models	119
Endnotes	121

Chapter 9 Univariate time series analysis 123

The autocorrelation function	126
The autoregressive model for univariate time series	130
Nonstationary versus stationary time series	133
Extensions of the AR(1) model	134
Testing in the AR($>$) with deterministic trend model	139
Chapter summary	143
Appendix: Mathematical intuition for the AR(1) model	144
Endnotes	145

Chapter 10 Regression with time series variables 147

Time series regression when X and Y are stationary	148
Time series regression when Y and X have unit roots: spurious regression	152
Time series regression when Y and X have unit roots: cointegration	153
Time series regression when Y and X are cointegrated: the error correction model	159
Time series regression when Y and X have unit roots but are not cointegrated	163
Chapter summary	164
Endnotes	165

Chapter 11 Applications of time series methods in macroeconomics and finance 167

Volatility in asset prices	167
Granger causality	174
Vector autoregressions	181
Chapter summary	193
Appendix: Hypothesis tests involving more than one coefficient	193
Endnotes	197

Chapter 12 Limitations and extensions 199

Problems that occur when the dependent variable has particular forms	200
Problems that occur when the errors have particular forms	201
Problems that call for the use of multiple equation models	204

Chapter summary	208
Endnotes	208
Appendix A Writing an empirical project	211
Description of a typical empirical project	211
General considerations	213
Project topics	214
Appendix B Data directory	217
Index	221