

# Contents

<i>List of tables</i>	xvi
<i>List of figures</i>	xvii
1 Introduction	1
1.1 Historical background	3
1.2 Alternative modelling approaches	4
1.3 The long-run modelling approach	6
1.4 The organisation of the book	9
2 Macroeconometric modelling: Alternative approaches	13
2.1 Large-scale simultaneous equation models	13
2.2 Unrestricted and structural VARs	16
2.2.1 Unrestricted VARs	16
2.2.2 Structural VARs	18
2.3 Dynamic stochastic general equilibrium models	19
2.4 The structural cointegrating VAR approach	23
2.4.1 Comparisons with the alternative approaches	24
3 National and global structural macroeconometric modelling	33
3.1 Identification in a dynamic structural vector error correction model	34
3.1.1 Identifying long-run relationships	36
3.1.2 Identifying short-run structural parameters and shocks	37
3.1.3 A modelling strategy	39
3.2 Specifying the dynamic structure of a macroeconomic model	41
3.2.1 Dynamics of DSGE models	41
3.2.2 Dynamics of adjustment cost models	46
3.2.3 Identification of short-run dynamics based on 'tentative' theory on contemporaneous relations	48
3.2.4 Measuring the effects of monetary policy	51

## Contents

---

3.2.5	Identification using 'tentative' theory on long-run relations	54
3.3	National macroeconomic modelling in a global context	56
3.3.1	VARX models: VAR models with weakly exogenous variables	57
3.3.2	Developing satellite or sectoral models	59
3.4	Global vector autoregressive (GVAR) models	62
4	An economic theory of the long run	67
4.1	Production technology and output determination	68
4.2	Arbitrage conditions	71
4.3	Accounting identities and stock-flow relations	74
4.4	Long-run solvency requirements	75
4.4.1	Liquidity (real money balances)	78
4.4.2	Imports and exports	78
4.5	Econometric formulation of the model	81
5	An economic theory of the short run	87
5.1	Modelling monetary policy	89
5.1.1	The monetary authority's decision problem	89
5.1.2	The derivation of the base rate	92
5.1.3	The structural interest rate equation	96
5.2	Alternative model specifications	98
5.2.1	Forecast-inflation targeting	98
5.2.2	Choice of targets and their desired levels	99
6	Econometric methods: A review	105
6.1	Augmented VAR or VARX models	107
6.1.1	The structural VARX model	107
6.1.2	The reduced form VARX model	109
6.1.3	Impulse response analysis	110
6.2	Cointegrating VAR models	117
6.2.1	Treatment of the deterministic components	118
6.2.2	Trace and maximum eigenvalue tests of cointegration	122
6.2.3	Identifying long-run relationships in a cointegrating VAR	123
6.2.4	Estimation of the short-run parameters of the conditional VEC model	128
6.2.5	Analysis of stability of the cointegrated system	129
6.2.6	Impulse response analysis in cointegrating VARs	132

6.3	The cointegrated VAR model with $I(1)$ exogenous variables	135
6.4	Small sample properties of test statistics	140
6.5	Empirical distribution of impulse response functions and persistence profiles	141
7	Probability forecasting: Concepts and analysis	145
7.1	Probability forecasting	145
7.1.1	Probability forecasts in a simple univariate AR(1) model	147
7.2	Modelling forecast uncertainties	153
7.2.1	Future and parameter uncertainties	153
7.2.2	Model uncertainty: Combining probability forecasts	157
7.2.3	Bayesian model averaging	158
7.2.4	Pooling of forecasts	159
7.3	Computation of probability forecasts: Some practical issues	161
7.3.1	Computation of probability forecasts using analytic methods	163
7.3.2	Computation of probability forecasts based on VAR models by stochastic simulation	164
7.3.3	Generating simulated errors	166
7.4	Estimation and forecasting with conditional models	168
8	The UK macroeconomy	171
8.1	Domestic and foreign output	173
8.2	Domestic and foreign prices	178
8.3	Exchange rates	187
8.4	Domestic and foreign interest rates	189
8.5	Real money balances relative to income	193
9	A long-run structural model of the UK	197
9.1	The different stages of estimation and testing	198
9.2	Unit root properties of the core variables	200
9.3	Testing and estimating of the long-run relations	204
9.3.1	Small sample properties of the tests of restrictions on the cointegrating vectors	208
9.4	The vector error correction model	209
9.4.1	The long-run estimates	209
9.4.2	Error correction specifications	212

## Contents

---

9.4.3	Comparing the core model with benchmark univariate models	218
9.5	An alternative model specification	221
10	Impulse response and trend/cycle properties of the UK model	225
10.1	Identification of monetary policy shocks	227
10.2	Estimates of impulse response functions	231
10.2.1	Effects of an oil price shock	232
10.2.2	Effects of a foreign output equation shock	236
10.2.3	Effects of a foreign interest rate equation shock	239
10.2.4	Effects of a monetary policy shock	242
10.3	Trend/cycle decomposition in cointegrating VARs	248
10.3.1	Relationship of GRW and BN decompositions	250
10.3.2	Computation of the GRW decomposition	252
10.3.3	An application to the UK model	254
10.4	Concluding remarks	260
11	Probability event forecasting with the UK model	263
11.1	An updated version of the core model	264
11.1.1	Estimation results and in-sample diagnostics	265
11.1.2	Model uncertainty	266
11.1.3	Evaluation and comparisons of probability forecasts	269
11.2	Probability forecasts of inflation and output growth	274
11.2.1	Point and interval forecasts	275
11.2.2	Predictive distribution functions	278
11.2.3	Event probability forecasts	280
11.3	A postscript	286
11.4	Concluding remarks	286
12	Global modelling and other applications	289
12.1	Recent applications of the structural cointegrating VAR approach	289
12.2	Regional interdependencies and credit risk modelling	292
12.3	A monthly version of the core model	297
12.4	Probability forecasting and measuring financial distress in the UK	303
12.4.1	A satellite model of the UK financial sector	303
12.4.2	UK financial distress in the early 1990s and early 2000s	305
12.5	Directions for future research	306



13 Concluding remarks	309
Appendices	
A Derivation of the interest rate rule	315
A.1 The relationship between policy instruments and targets	316
A.2 Deriving the monetary authority's reaction function	318
A.3 Inflation targeting and the base rate reaction function	319
A.4 Reaction functions and targeting future values of variables	320
B Invariance properties of the impulse responses with respect to monetary policy shocks	323
C Data for the UK model	327
C.1 Definitions and sources of the core model variables	327
D <i>Gauss</i> programs and result files	333
D.1 General comments on the <i>Gauss</i> programs	334
D.2 Impulse response and persistence profile programs	334
D.3 Programs for computing probability forecasts	337
D.3.1 Programs for computing out-of-sample probability event forecasts	338
D.3.2 Programs for computing in-sample probability event forecast evaluation	339
D.4 Program for computing the decomposition of trends in cointegrating VARs	342
Bibliography	343
Index	363