Alan A. Powell · Christopher W. Murphy

Inside a Modern Macroeconometric Model

A Guide to the Murphy Model

Second, Revised and Enlarged Edition

With a contribution by Nicholas Conron

With 107 Figures and 90 Tables



Springer

CONTENTS

_

Model-Builder's Preface Model-Watcher's Preface		vii ix
	Part 1 — Setting the Scene	
Chapter 1	How to Use this Book	1
Chapter 2	DISTINGUISHING FEATURES OF MM	
2.1	Overview of MM's relationship to other macro models	5
	 (a) Size (b) Eclecticism (c) Relationship to macro and micro paradigms (d) Long-run properties (e) Specification testing 	5 5 6 9 9
2.2	Main economic features	9
	(a) Dornbusch Model attributes (b) Long-run optimizing behaviour in production (c) Feedback effects from assets	10 11 13
Chapter 3	PRINCIPAL MECHANISMS IN MM	
3.1	Introduction	15
3.2	The Mundell-Fleming model	15
	 (a) The MF model's equations (b) Monetary and fiscal policy under flexible exchange rates in the MF model 	15 19
3.3	Dornbusch's 1976 model	21
	 (a) Basic assumptions (b) Underlying structural model (c) Partially reduced form 	22 23 26
	a More on the underlying structural model — portfolio balance	30
	(e) Equilibrium exchange rate (f) Model consistent expectations	32 36
	(g) The effects of a monetary expansion under rational expectations	38
3.4	Insights from 1980s developments in open-economy macroeconomics	46
3.5	Synopsis of illustrative simulations with MM	48
	 (a) Monetary expansion (b) The NAIRU and the neoclassical long run (c) Fiscal policy and public debt feedback (d) Private consumption and foreign debt feedback (e) Non-Ricardian equivalence 	48 51 53 55 56

CHAPTER 3 (continued)

3.6 Ah	ighly stylized miniature model of balanced growth (HSM)	58
(a)	Main assumptions underlying HSM	58
(b)	Production function and resource endowment	63
(c)	Capital accumulation and the rate of return;	
	domestic inflation and exchange rate determination	63
(d)	Growth in capital stock, workforce, output and real wages	65
(e)	Intertemporal budget constraint	67
ſĴ	Balance of trade	70
(g)	Qualitative behaviour of HSM under parameter shifts	71
(h)	Growth rates of prices and of nominal and real magnitudes	
	in HSM and in MM	75
3.7 Cor	nclusions from this chapter	77

Part 2 - Structural Form of MM

Chapter 4	OVERVIEW OF PART TWO	
4.1 4.2 4.3	Introduction Notation Nomenclature for equations	79 81 81
4.4	Estimation methods, specification searches and hypothesis testing	82
	 (a) General considerations (b) Data sources (c) Computing (d) Estimation methods (e) Obtaining a preferred equation (f) Diagnostic testing 	82 83 83 84 84 84
4.5 4.6	Equation count and standard closure for simulations Brief account of solution method	86 88
Chapter 5	WAGE BEHAVIOUR	
5.1 5.2	Introduction Technological change – basic ideas	93 93
	(a) Numerical example (b) Easter-guagesting technical change	95 96

	(b) Factor-augmenting technical change	96
	(c) Efficiency units	96
5.3	The role of Harrod-neutral technical progress in MM	97
5.4	Notation – Variables in wage equation S03	104
5.5	Inflationary expectations augmented Phillips Curve	104
	- Steady state	106

107

--- Steady state 5.6 Estimated coefficients

Chapter 6 LABOUR FORCE PARTICIPATION

6.1	Introduction	109
6.2	Notation	109
6.3	Finding the underlying trend in the potential size of	
	the workforce	109
6.4	Labour supply equation S02	110
6.5	Estimated coefficients	112
6.6	Steady state	112
6.7	Encouraged/discouraged worker effect	113

Chapter 7	PRIVATE CONSUMPTION BEHAVIOUR	
7.1	Introduction and notation	117
7.2	Equilibrium consumption — equations S04A	117
7.3	Dunamic disequilibrium consumption equation S04	120
7.4	Steady state	121
7.5	Parameter Estimates	122
Objector O	PRIMITOR OF THE DESTAL DELCE OF LOUISING	
Chapter 8	BEHAVIOUR OF THE RENTAL PRICE OF HOUSING	
8.1	Introduction and notation	123
8.2	Allocation of consumption into housing rental services	
0.0	ana other	125
8.3	Dwelling relial price aynamics — within sample	100
0.4	- equation S01	128
0.4 0 5	Sleady state	130
0.J 0 C ·	Estimated coefficients	100
0.0	Estimated coefficients Pohenioural identity 102 consumption price index and	132
0.7	identity 101 definition of real consumption	199
		132
Chanter 9	PRODUCTION OF HOUSING RENTAL SERVICES	
chapter o	AND INVESTMENT IN DWELLINGS	
0.1		105
9.1	Introduction	135
9.2	Notation — Depresention interest growth and inflation rates	130
9.0	Notation — Coefficients	138
9.5	Production of housing rental services — identity 104	138
9.6	The natural real growth rate — identities I71 and I72	139
9.7	Dwelling investment — equation S05	141
	- Present value calculation	141
	 Expectations of investors in housing stock 	142
0.0	- Steady state	145
9.8	Estimated coefficients	140
99	- Estimated risk premium	147
9.9	Some wearnesses of the approach	147
Chapter 10	THE ENTERPRISE PRODUCTION BLOCK OF THE BUSINESS SECTOR	
10.1	Introduction	149
10.2	An overview of the production structure of the enterprise economy	150
10.3	Preliminaries on the CES/CET production technology	150
	— Input-output separability	150
10.4	Lengths of run in MM and in the enterprise production block	155
	(a) Introduction	155
	(b) Concepts of length of run	156
	Short (or Keynesian) run of MM as a whole	157
	— Medium (or classical) run of MM as a whole	157
	(a) The medium run of the enterprise production block	157
	(d) Parameter estimation of the medium-nun neo-	100
	classical sub-model	165
	(e) The long run of the enterprise production block	168
	(f) Role of the medium- and long-run closures of	
	the enterprise production block in generating the	
	long run of MM as a whole	171

•

•

Contents

xiii

Chapter 11	BUSINESS FIXED INVESTMENT	
11.1	Introduction and notation	175
11.2	Expected present value of the net revenue stream	178
11.3	Tobin's (average) q ratio	180
11.4	Stochustic aynamic indestment equation 515	101 183
11.5	Estimated coefficients	183
Chapter 12	BUSINESS SECTOR EMPLOYMENT	
- 12.1	Introduction and notation	185
12.2	Business sector employment equation S10	185
12.3	Steadu state	187
12.4	Estimates	188
Chapter 13	IMPORT SUPPLY AND DEMAND	
13.1	Introduction and notation	189
13.2	Import supply under the small country assumption	189
13.3	Import demand — introduction and notation	190
13.4	Equilibrium import demand equation	191
13.5	- Steady state	191
13.6	Estimates	192
13.7	Trade-weighted exchange rate index	194
Chapter 14	AGGREGATE EXPORT SUPPLY	
14.1	Introduction, notation and specification	197
14.2	Estimates	198
Chapter 15	DISAGGREGATION OF EXPORT SUPPLY	
15.1	Introduction; notation and specification for export	
	compositional equation S06; its steady state	199
15.2	Estimates	200
15.3	Supply of other exports	201
10.4	Supply of commonly exports Price index for aggregate exports	201
10.0		202
Chapter 16	OVERSEAS DEMAND FOR 'COMMODITY' EXPORTS	
16.1	Introduction and notation	203
16.2	Form of the demand equation	204
16.3	Steady state	204
16.4	Estimates	205
Chapter 17	INVENTORY INVESTMENT IN 'COMMODITY' EXPORTS	
17.1	Introduction and generic notation; form of the	207
172	Inventory investment in 'commodity' exports	207
11.2	(a) Notation for stochastic inventory equation S07	200
	and accumulation identity IO7	208
	(b) Export 'commoditu' inventory investment equation S07	209
	(c) Estimates	211
	(d) Steady state	212
Chapter 18	DEMAND FOR NON-'COMMODITY' EXPORTS	
18.1	Introduction and notation	213
18.2	Form of the demand and flexibility equations	214
18.3	Estimates	214
18.4	Sleady state	214

Chapter 19	DOMESTIC GOOD INVENTORY INVESTMENT	
- 19.1	Introduction and notation	215
19.2	Desired stock of non-farm inventories	215
19.3	Partial adjustment equation	216
19.4 19.5	Steady state	217
Chapter 20	PRICE DYNAMICS FOR THE DOMESTIC GOOD	
20.1	Introduction, notation and specification	219
20.2		220
20.2		220
Chapter 21	SALES OF THE DOMESTIC GOOD; MISCELLANEOUS IDENTITIES FOR INVESTMENT AND CAPITAL	
21.1	Introduction and notation for identities IO8, IO9, I13 and I44	223
21.2	Demand for, and sales of, the domestic good,	
	ana miscellaneous identities	224
	(a) Demand determination of output of the domestic agod in the very short run	224
	(b) Public-private split of business fixed investment	226
Chanter 22		
22 Chupler 22	Introduction	007
22.1	General government sector spending	228
22.3	The public sector deficit — identities I35–I38 and I45–I49	228
22.4	Public sector portfolio allocation	234
22.5	(a) The tax reaction function 148	236
	(b) Steady state	239
	(c) Calibration	240
Chapter 23	FINANCIAL MARKETS	
23.1	Introduction	241
23.2	Formation of interest rates — identities 131–133, 115–117–126	949
	(a) Notation for interest rate formation and uncovered	2-14
	interest parity	242
	(c) Inflation and inflationary expectations	242
	(d) Real 10-year bond rate	247
	(e) Long-run actual rate of return on business fixed capital	247
	(j) Depinitions of foreign short- and long-term interest rates	248
23.3	Uncovered interest parity — identity 127 Two key exchange rates	248
23.5	Money demand — equation S16	253
	(a) Specification and notation	253
02 6	(b) Estimates Balance of normante identity IE1	254
23.0		200
Chapter 24	NATIONAL-ACCOUNTING, STOCK-FLOW	
24 1	Introduction	259
24.2	National-accounting identities	259
24.3	Stock-flow Identities	260
24.4 24.5	Lead-lag Identities Three definitional identities	263
A 27.0		200
APPENDIC 0 1	List of variables in MM	065
2.1	List of coefficients and parameters in MM	205
2.3	Classification of MM equations	287
2.4	Consolidated equation list Concordance between original MM notation	291
2.0	for variables and notation used in Part 2	301

Contents

xv

,

Part 3 — Simulations with MM

Chapter 25	INTRODUCTION TO THE SIMULATIONS	
25.1	Preamble	303
25.2	Use of miniature models in Part 3	303
25.3	Guide to Chapters 26 and 27	305
Chapter 26	MONETARY SHOCKS	
26.1	Introduction and notation	307
26.2	Features shared with the Dornbusch model	309
26.3	Overshooting and undershooting exchange rates revisited	311
	(a) Inevitability of overshooting in DBM (b) Boosible sources of different explores rate helpeview in	311
	DBM and MM	312
	(c) Rigorous definition of undershooting and overshooting	
	exchange rates (d) Reporting simulation results for the exchange rate as deviations	314
	(a) MM's undershooting exchange rate	314
26.4	An extended Dornbusch model with inertia	317
	(a) Inertia in the IS curve	317
	(b) Solution sequence for the extended DBM (c) Form of the lag distribution for approach domand in the	318
	extended DBM	319
	(d) Factors responsible for inertia in aggregate demand in MM	321
	(e) Solutions of the extended DBM	321
26.5	Detailed analysis of MM responses to a monetary shock	326
	(a) Effects on the interest rate via the demand for money curve (b) Strateau for explaining the path of the exchange rate after	326
	the initial devaluation	328
	(c) Simplified price system for MM	328
	(a) Calibrating the simplified price system (e) Evolution short-term interest rate movements	332
	(f) Responses of dwelling investment and consumption	334
	(g) Responses of business fixed investment	338
26.6	D4M — a descriptive miniature Murphy Model for the	220
	(a) GNE, the price of the domestic good, and the	228
	interest and exchange rates	339
	(b) Calibrating D4M to MM	341
	(c) Completing the miniature model: the trade account and GDP (d) Extending the coverage of D4M: investment imports and	345
	employment	346
26.7	Summary	348
Chapter 27	A FISCAL SHOCK	
27.1	The nature of the shock and general introduction	351
27.2	Strategy for constructing a shock-specific miniature	353
27.3	Identifying important initial consequences of the fiscal shock	355
	(a) The initial jump in GNE	355
	 The jump in consumption 	356
	employment via labour market and wealth effects in	
	MM's consumption function	357
	Direct contributions to GNE of government spending	358
	(b) Frice behaviour in quarters 1 and 2 jollowing the shock — Regaining our bearings, I	358 363
27.4	Terminal conditions, I : Insights from HSM	364

|--|

	27.5	Terminal conditions, II: S3MM—A <u>s</u> tylized <u>s</u> teady- <u>s</u> tate Murphy Model	366
		(a) Introduction to S3MM	366
		(b) Sustainability of foreign debt	372
		(c) Effects of fiscal expansion in S3MM	375
		- Macro comparisons with MM	377
		— Increased public consumption	379
		 Increased public employment 	383
	07.0	- Regaining our bearings, II	384
	27.6	F3M—A fiscal <u>m</u> iniature <u>M</u> urphy <u>M</u> odel	385
		(a) Steady-state values for nominal GNE, the price of the	200
		(b) Calibration of F3M	387
	277	MM's dunamic response	387
	27	(a) Wealth foreign debt labour income and consumption	388
		 — Portfolio changes 	390
		(b) The real exchange rate and the trade account	391
		(c) Investment and GDP	392
		(d) Employment	394
	27.8	Summary	396
APPI	ENDIC	es to Part 3	
3.1		Parameter file for MM used in Part 3	397
32		Excel spreadsheet used to solve	
0.2		the Extended Dornbusch Model	399
3.3		Values of variables for calculating ratios	
		in MM's steady state	401

Part 4 — New Horizons

Chapter 28	MM2— A FULLY INTEGRATED MACRO-CGE MODEL	
28.1	Introduction	403
28.2	Structure of MM2	403
	(a) Aggregate level	406
	(b) Industry level	410
	(c) Commodity group level	413
	(d) MM2-Demographic and MM2-States	414
	(e) Econometric aspects	414
28.3	A monetary contraction—scenario and	
	monetary policy equation	414
28.4	Macro effects of a monetary contraction	416
28.5	Industry effects of a monetary contraction	420
	(a) Production	420
	(b) Business investment	422
	(c) Adjustment in the manufacturing sector	424
28.6	State effects of a monetary contraction	426
28.7	Summary of the simulations and concluding	
	policy perspective	428
28.8	Commercial availability of MM2 software	430

xvii

REFERENCES	431
AUTHOR AND PERSONAL NAMES INDEX	435
SUBJECT INDEX	437
TABLES	447
FIGURES	450
EXERCISES	454