CONTENTS

Preface

CHAPTER 1 Aims, Background, Innovations and Presentation

1. Introduction 1
2. Background and innovations 2
   2.1. Dynamics 4
      (a) Physical capital accumulation 4
      (b) Financial asset/liability accumulation 7
      (c) Lagged adjustment processes 9
   2.2. Closures of the MONASH model 9
      (a) Historical and decomposition closures 10
      (b) Forecasting and policy closures 15
3. Presentation of the book and access to MONASH 17
   3.1. Organization of chapters 18
   3.2. Reading strategy 19
   3.3 Twenty-one themes for investigation 19
      (a) The MONASH equations 19
      (b) Closures 19
      (c) Result interpretation: back-of-the-envelope calculations and GDP decomposition 20
      (d) Computational methods: the Johansen/Euler approach; initial solutions; homotopy variables; and the treatment of lags and leads 21
      (e) Divisia indexes 23
      (f) Measures of welfare 24
      (g) Input-output data 25
      (h) Other data 26
      (i) Data allocation and adjustment: outside versus inside 27
      (j) Phantom taxes 27
      (k) Basic prices, purchasers’ prices, margins and sales taxes 28
      (l) Exports 28
      (m) Imports 29
      (n) The current account deficit, foreign liabilities, national income, household disposable income and national wealth 29
      (o) The public sector budget 30
      (p) The labour market 31
      (q) Investment and capital accumulation 32
      (r) Technological changes and changes in consumer preferences 33
      (s) CGE add-ons: regions; occupations; sub-input-output commodities; income distribution; and adjustment costs 34
      (t) Analysis of adjustment costs 34
## Contents

- Difference between GDP paths in alternative simulations 108

### CHAPTER 3  An Overview of the Mathematical Structure of MONASH and the Solution Algorithm

10. Introduction 111
11. Overview of the mathematical structure of MONASH and introduction to the Johansen/Euler solution method 112
12. The input-output database and the initial solution 116
   12.1. Structure of the input-output database 116
   12.2. How do we obtain the input-output database for year t and how does it provide an initial solution? 122
13. Evaluation of the coefficients in linear systems such as (11.2) and (11.12) 126

### CHAPTER 4  The theoretical structure of the MONASH model represented in TABLO language

14. Introduction 131
15. Overview of the GEMPACK computations for the MONASH model 131
16. Notes on TABLO syntax and vocabulary, and on conventions observed in the TABLO representation of MONASH 134
17. Overview of the structure of the TABLO representation of MONASH 135
   17.1. Data files 135
   17.2. Sets and subsets 136
   17.3. Coefficients 136
   17.4. Read statements 138
   17.5. Formulas 138
   17.6. Variables 141
   17.7. Update statements 141
   17.8. Equations 143
   17.9. Display and Write statements 144
18. TABLO representation of the MONASH model 146
   18.1 Files 146
   18.2 Sets and subsets 146
      18.2a Set declarations listed alphabetically 146
      18.2b Subset declarations listed alphabetically 148
   18.3 Coefficient declarations listed alphabetically 148
   18.4 Read instructions for coefficients listed alphabetically 163
   18.5 Formulas in thematic groups 168
      18.5a Default shares, binary dummies and miscellaneous scalar parameters 168
      18.5b Correction to initial IO data to eliminate phantom taxes 168
      18.5c MAKE shares and joint production coefficients 169
      18.5d Tax flows and purchasers' values of commodity flows 169
Contents

foreign-currency price indexes 209
18.8g Other demands for commodities 210
18.8h Margins usage of commodities 210
18.8i Supply equals demand for domestic and imported commodities 211
18.8j Zero pure profits in production, importing, exporting and distribution, and equations for total technical change by industry 211
18.8k Indirect taxes 213
18.8l Macro variables 217
18.8m Capital stocks, investment and the inverse logistic 222
18.8n Expected and actual rates of return 223
18.8o Miscellaneous equations to facilitate historical and forecast simulations 225
18.8p Equations to assist in policy simulations 232
18.8q The government accounts 234
18.8r Equations to facilitate decomposition simulations: definitions of Gross National Product, net foreign liabilities and consumption/savings propensities 237
18.8s The balance of payments and Australia's foreign assets and liabilities 238
18.8t Household disposable income, household saving and national saving 245
18.9 Displays and Writes 245

CHAPTER 5 Explanation of the MONASH equations represented in TABLO code 247

19. Introduction 247
19.1 Stylized version of the MONASH model 250
19.2 A trial closure of the stylized version of MONASH 258
20. Composition of Outputs and Inputs 259
20.1. Overview of production technology 259
20.2. Outputs of commodities (subsection 18.8a in the TABLO code) 263
20.3. The composition of each industry’s intermediate inputs (subsection 18.8b in the TABLO code) 267
20.4. Demands by industries for primary factors (subsection 18.8c in the TABLO code) 273
21. Demands for inputs to capital creation and the asset price of units of capital (subsection 18.8d in the TABLO code) 278
22. Demands for commodities by households (subsection 18.8e in the TABLO code) 280
23. Demands for exports, export aggregates and foreign-currency
price indexes (subsection 18.8f in the TABLO code) 284
24. Other demands for commodities (subsection 18.8g in the TABLO code) 289
25. Demands for margin services (subsection 18.8h in the TABLO code) 290
26. Supply equals demand for domestic and imported commodities (subsection 18.8i in the TABLO code) 291
27. Zero pure profits in production, importing, exporting and distribution, and total technical change by industry (subsection 18.8j in the TABLO code) 292
28. Genuine and phantom indirect taxes (subsections 18.8k and 18.5b in the TABLO code) 297
28.1. Collections of indirect taxes, specification of indirect tax rates, and division of tax collections between genuine and phantom 298
28.2. Eliminating phantom tax flows from the input-output database 303
29. Definitions of macro variables (subsection 18.8l in the TABLO code) 305
30. Capital stocks, investment and rates of return 312
30.1. Capital stocks, investment and the inverse-logistic relationship (subsection 18.8m in the TABLO code) 313
30.2. Actual and expected rates of return under static and forward-looking expectations (subsection 18.8n in the TABLO code) 320
31. Equations for facilitating historical and forecast simulations (subsection 18.8o in the TABLO code) 332
32. Equations for facilitating policy simulations (subsection 18.8p in the TABLO code) 351
33. The government accounts (subsection 18.8q in the TABLO code) 367
34. Equations and computational strategy for facilitating decomposition simulations 373
34.1. Gross national product, net foreign liabilities, consumption/savings propensities and national wealth (subsection 18.8r in the TABLO code) 373
34.2. Computational strategy for decomposition simulations 379
35. The balance of payments (subsection 18.8s in the TABLO code) 381
36. Household disposable income, household saving and national saving (subsection 18.8t in the TABLO code) 393
37. Appendix: the derivation of equations determining the commodity composition of output from joint-product industries, discussed in subsection 20.2 394
38. Appendix: the derivation of the equation (E_x1csi) determining the domestic/import mix in intermediate inputs, discussed in subsection 20.3 397
39. Appendix: the derivation of the equations in subsection 18.8c determining industry demands for primary factors, discussed in
### Contents

40. Appendix: the derivation of equations for household demands, discussed in section 22  
40.1. Derivation of $E_{x3}$ and interpretation of the taste-change variables $a3com$  
40.2. Derivation of $E_{x3cs}$ and interpretation of the taste-change variables $a3cs$ and $twist_{src}$  
40.3. Derivation of $E_{p3}$  
41. Appendix: the theory underlying the export demand equations ($E_{x4\_TRADEXP}$), discussed in section 23  
42. Appendix: zero pure profits in production; the definition of technical change by industry; the GDP identity; and the income-side definition of the percentage change in real GDP  
42.1. Derivation of $E_{z}$ for joint-production industries  
42.2. Derivation of $E_{z}$ for unique-product industries  
42.3. Derivation of the GDP identity both in levels and percentage changes  
42.4. Demonstration that gdprealinc equals gdpreal  
43. Appendix: the levels representation of price and quantity indexes in MONASH  
43.1. Recapitulation: the levels and deviations versions of MONASH, and solution by numerical integration  
43.2. The mathematics of the levels representations of the MONASH price and quantity indexes  
43.3. Interpretation of the MONASH price and quantity indexes  
44. Appendix: the TABLO implementation of the algorithm for handling forward-looking expectations of rates of return

### Chapter 6 Developing the MONASH closures

45. Introduction  
46. The decomposition closure (third column of Table 45.1)  
47. Developing the historical closure (fourth column of Table 45.1)  
48. Developing the forecast closure (second column of Table 45.1)  
49. Developing the policy closure (first column of Table 45.1)  
50. MONASH closures: concluding remarks

### Chapter 7 Extensions, progress, funding and the future

51. Introduction  
52. Generating results for sub-national regions  
53. Generating results for detailed occupations  
54. Generating output results at a sub-input-output level  
55. Generating distributional results: the real incomes of many
Contents

types of households 512
56. Quantifying labour market adjustment costs 515
   56.1. An index of Labour Market Adjustment Costs 515
   56.2. Application of the Labour Input Loss Index 522
57. Progress, funding and the future 525
   57.1. Progress in MONASH on the ORANI agenda 525
   57.2. Other progress 529
   57.3. Funding and the future 531

REFERENCES 535