

Contents

Preface	xiii
1 Introduction	1
1.1 Dynamic General Equilibrium versus Traditional Macroeconomics	1
1.2 Traditional Macroeconomics	3
1.3 Dynamic General Equilibrium Macroeconomics	4
1.4 The Structure of This Book	10
2 The Centralized Economy	15
2.1 Introduction	15
2.2 The Basic Dynamic General Equilibrium Closed Economy	15
2.3 Golden Rule Solution	17
2.3.1 The Steady State	17
2.3.2 The Dynamics of the Golden Rule	20
2.4 Optimal Solution	20
2.4.1 Derivation of the Fundamental Euler Equation	20
2.4.2 Interpretation of the Euler Equation	22
2.4.3 The Intertemporal Production Possibility Frontier	23
2.4.4 Graphical Representation of the Solution	24
2.4.5 Static Equilibrium Solution	24
2.4.6 Dynamics of the Optimal Solution	26
2.4.7 Algebraic Analysis of the Saddlepath Dynamics	28
2.5 Real-Business-Cycle Dynamics	30
2.5.1 The Business Cycle	30
2.5.2 Permanent Technology Shocks	31
2.5.3 Temporary Technology Shocks	32
2.5.4 The Stability and Dynamics of the Golden Rule Revisited	32
2.6 Labor in the Basic Model	33
2.7 Investment	35
2.7.1 q -Theory	36
2.7.2 Time to Build	40
2.8 Conclusions	41
3 Economic Growth	43
3.1 Introduction	43
3.2 Modeling Economic Growth	44

3.3	The Solow–Swan Model of Growth	46
3.3.1	Theory	46
3.3.2	Growth and Economic Development	48
3.3.3	Balanced Growth	48
3.4	The Theory of Optimal Growth	49
3.4.1	Theory	49
3.4.2	Additional Remarks on Optimal Growth	53
3.5	Endogenous Growth	54
3.5.1	The AK Model of Endogenous Growth	55
3.5.2	Human Capital Models of Endogenous Growth	55
3.6	Conclusions	59
4	The Decentralized Economy	60
4.1	Introduction	60
4.2	Consumption	61
4.2.1	The Consumption Decision	61
4.2.2	The Intertemporal Budget Constraint	62
4.2.3	Interpreting the Euler Equation	63
4.2.4	The Consumption Function	65
4.2.5	Permanent and Temporary Shocks	67
4.3	Savings	70
4.4	Life-Cycle Theory	71
4.4.1	Implications of Life-Cycle Theory	71
4.4.2	Model of Perpetual Youth	73
4.5	Nondurable and Durable Consumption	74
4.6	Labor Supply	76
4.7	Firms	78
4.7.1	Labor Demand without Adjustment Costs	79
4.7.2	Labor Demand with Adjustment Costs	80
4.8	General Equilibrium in a Decentralized Economy	83
4.8.1	Consolidating the Household and Firm Budget Constraints	83
4.8.2	The Labor Market	85
4.8.3	The Goods Market	86
4.9	Comparison with the Centralized Model	87
4.10	Conclusions	89
5	Government: Expenditures and Public Finances	90
5.1	Introduction	90
5.2	The Government Budget Constraint	92
5.2.1	The Nominal Government Budget Constraint	92
5.2.2	The Real Government Budget Constraint	94
5.2.3	An Alternative Representation of the GBC	94
5.3	Financing Government Expenditures	95
5.3.1	Tax Finance	95
5.3.2	Bond Finance	97
5.3.3	Intertemporal Fiscal Policy	99
5.3.4	The Ricardian Equivalence Theorem	100
5.4	The Sustainability of the Fiscal Stance	102
5.4.1	Case 1: $[(1 + \pi)(1 + \gamma)]/(1 + R) > 1$ (Stable Case)	104
5.4.2	Case 2: $0 < [(1 + \pi)(1 + \gamma)]/(1 + R) < 1$ (Unstable Case)	106
5.4.3	Fiscal Rules	108
5.5	The Stability and Growth Pact	109
5.6	The Fiscal Theory of the Price Level	111

5.7	Optimizing Public Finances	112
5.7.1	Optimal Government Expenditures	113
5.7.2	Optimal Tax Rates	115
5.7.3	The Optimal Level of Debt	125
5.8	Conclusions	127
6	Fiscal Policy: Further Issues	129
6.1	Introduction	129
6.2	Time-Consistent and Time-Inconsistent Fiscal Policy	129
6.2.1	Lump-Sum Taxation	131
6.2.2	Taxes on Labor and Capital	134
6.2.3	Conclusions	139
6.3	The Overlapping-Generations Model	139
6.3.1	Introduction	139
6.3.2	The Basic Overlapping-Generations Model	140
6.3.3	Short-Run Dynamics and Long-Run Equilibrium	144
6.3.4	Comparison with the Representative-Agent Model	145
6.3.5	Fiscal Policy in the OLG Model: Pensions	146
6.3.6	Conclusions	151
7	The Open Economy	153
7.1	Introduction	153
7.2	The Optimal Solution for the Open Economy	154
7.2.1	The Open Economy's Resource Constraint	154
7.2.2	The Optimal Solution	157
7.2.3	Interpretation of the Solution	158
7.2.4	Long-Run Equilibrium	159
7.2.5	Shocks to the Current Account	161
7.3	Traded and Nontraded Goods	163
7.3.1	The Long-Run Solution	167
7.4	The Terms of Trade and the Real Exchange Rate	168
7.4.1	The Law of One Price	169
7.4.2	Purchasing Power Parity	169
7.4.3	Some Stylized Facts about the Terms of Trade and the Real Exchange Rate	170
7.5	Imperfect Substitutability of Tradeables	172
7.5.1	Pricing-to-Market, Local-Currency Pricing, and Producer-Currency Pricing	172
7.5.2	Imperfect Substitutability of Tradeables and Nontradeables	172
7.6	Current-Account Sustainability	176
7.6.1	Balance of Payments Sustainability	176
7.6.2	The Intertemporal Approach to the Current Account	182
7.7	Conclusions	183
8	The Monetary Economy	185
8.1	Introduction	185
8.2	A Brief History of Money and Its Role	186
8.3	The Nominal Household Budget Constraint	189
8.4	The Cash-in-Advance Model of Money Demand	190
8.5	Money in the Utility Function	192
8.6	Money as an Intermediate Good or the Shopping-Time Model	195
8.7	Transactions Costs	197
8.8	Cash and Credit Purchases	199

8.9	Some Empirical Evidence	202
8.10	Hyperinflation and Cagan's Money-Demand Model	204
8.11	The Optimal Rate of Inflation	206
	8.11.1 The Friedman Rule	206
	8.11.2 The General Equilibrium Solution	207
8.12	The Super-Neutrality of Money	211
8.13	Conclusions	214
9	Imperfectly Flexible Prices	216
9.1	Introduction	216
9.2	Some Stylized "Facts" about Prices and Wages	217
9.3	Price Setting under Imperfect Competition	220
	9.3.1 Theory of Pricing in Imperfect Competition	220
	9.3.2 Price Determination in the Macroeconomy with Imperfect Competition	222
	9.3.3 Pricing with Intermediate Goods	226
	9.3.4 Pricing in the Open Economy: Local and Producer-Currency Pricing	229
9.4	Price Stickiness	230
	9.4.1 Taylor Model of Overlapping Contracts	231
	9.4.2 The Calvo Model of Staggered Price Adjustment	233
	9.4.3 Optimal Dynamic Adjustment	234
	9.4.4 Price Level Dynamics	235
9.5	The New Keynesian Phillips Curve	237
	9.5.1 The New Keynesian Phillips Curve in an Open Economy	240
9.6	Conclusions	241
10	Unemployment	243
10.1	Introduction	243
10.2	Some Labor Market Data	244
10.3	Search Theory and Unemployment	246
	10.3.1 The Employment Matching Function	247
	10.3.2 Labor Demand	249
	10.3.3 Labor Supply	250
	10.3.4 Wage Bargaining	250
	10.3.5 Comment	251
10.4	Efficiency-Wage Theory	253
	10.4.1 Comment	257
10.5	Wage Stickiness and Unemployment	258
	10.5.1 Labor Demand	258
	10.5.2 Labor Supply	259
	10.5.3 The Equilibrium Solution	260
	10.5.4 Wage Determination	260
	10.5.5 Unemployment	261
	10.5.6 Comment	262
10.6	Unemployment and the Effectiveness of Fiscal and Monetary Policy	263
10.7	Conclusions	265
11	Asset Pricing and Macroeconomics	267
11.1	Introduction	267
11.2	Expected Utility and Risk	268
	11.2.1 Risk Aversion	268
	11.2.2 Risk Premium	269

11.3	Insurance Premium	270
11.4	No-Arbitrage and Market Efficiency	271
11.4.1	Arbitrage and No-Arbitrage	271
11.4.2	Market Efficiency	271
11.5	Asset Pricing and Contingent Claims	272
11.5.1	A Contingent Claim	273
11.5.2	The Price of an Asset	273
11.5.3	The Stochastic Discount-Factor Approach to Asset Pricing	273
11.5.4	Asset Returns	274
11.5.5	Risk-Free Return	274
11.5.6	The No-Arbitrage Relation	275
11.5.7	Risk-Neutral Valuation	275
11.6	General Equilibrium Asset Pricing	277
11.6.1	Using Contingent-Claims Analysis	277
11.6.2	Asset Pricing Using the Consumption-Based Capital-Asset-Pricing Model (C-CAPM)	279
11.7	Asset Allocation	286
11.7.1	The Capital-Asset-Pricing Model (CAPM)	289
11.7.2	Asset Substitutability and No-Arbitrage	290
11.8	Consumption under Uncertainty	290
11.9	Complete Markets	291
11.9.1	Risk Sharing and Complete Markets	292
11.9.2	Market Incompleteness	295
11.10	Conclusions	296
12	Financial Markets	298
12.1	Introduction	298
12.2	The Stock Market	299
12.2.1	The Present-Value Model	299
12.2.2	The General Equilibrium Model of Stock Prices	303
12.2.3	Comment	306
12.3	The Bond Market	306
12.3.1	The Term Structure of Interest Rates	307
12.3.2	The Term Premium	312
12.3.3	Macroeconomic Sources of Risk in the Term Structure	318
12.3.4	Estimating Future Inflation from the Yield Curve	321
12.3.5	Comment	322
12.3.6	Monetary Policy and the Term Structure	323
12.3.7	Comment	327
12.3.8	DSGE Models of the Term Structure	327
12.4	The FOREX Market	331
12.4.1	Uncovered and Covered Interest Parity	333
12.4.2	The General Equilibrium Model of FOREX	342
12.4.3	Comment	345
12.5	Conclusions	346
13	Nominal Exchange Rates	348
13.1	Introduction	348
13.2	International Monetary Arrangements 1873-2011	350
13.2.1	The Gold Standard System: 1873-1937	351
13.2.2	The Bretton Woods System: 1945-71	352
13.2.3	Floating Exchange Rates: 1973-2011	353

13.3	The Keynesian IS–LM–BP Model of the Exchange Rate	357
13.3.1	The IS–LM Model	358
13.3.2	The BP Equation	362
13.3.3	Fixed Exchange Rates: The Monetary Approach to the Balance of Payments	365
13.3.4	Exchange-Rate Determination with Imperfect Capital Substitutability	366
13.4	UIP and Exchange-Rate Determination	368
13.5	The Mundell–Fleming Model of the Exchange Rate	370
13.5.1	Theory	370
13.5.2	Monetary Policy	371
13.5.3	Fiscal Policy	372
13.6	The Monetary Model of the Exchange Rate	373
13.6.1	Theory	373
13.6.2	Monetary Policy	375
13.6.3	Fiscal Policy	378
13.7	The Dornbusch Model of the Exchange Rate	378
13.7.1	Theory	378
13.7.2	Monetary Policy	381
13.7.3	Fiscal Policy	383
13.7.4	Comparison of the Dornbusch and Monetary Models	385
13.8	The Monetary Model with Sticky Prices	386
13.9	The Obstfeld–Rogoff Redux Model	387
13.9.1	The Basic Redux Model with Flexible Prices	389
13.9.2	Log-Linear Approximation	394
13.9.3	The Small-Economy Version of the Redux Model with Sticky Prices	396
13.9.4	Comment	399
13.10	Conclusions	399
14	Monetary Policy	402
14.1	Introduction	402
14.2	Inflation and the Fisher Equation	407
14.3	The Keynesian Model of Inflation	409
14.3.1	Theory	409
14.3.2	Empirical Evidence	412
14.4	The New Keynesian Model of Inflation	413
14.4.1	Theory	413
14.4.2	The Effectiveness of Inflation Targeting in the New Keynesian Model	419
14.4.3	Inflation Targeting with a Flexible Exchange Rate	426
14.4.4	The Nominal Exchange Rate Under Inflation Targeting	430
14.4.5	Inflation Targeting and Supply Shocks	432
14.5	Optimal Inflation Targeting	434
14.5.1	Social Welfare and the Inflation Objective Function	434
14.5.2	Optimal Inflation Policy under Discretion	437
14.5.3	Optimal Inflation Policy under Commitment to a Rule	441
14.5.4	Intertemporal Optimization and Time-Consistent Inflation Targeting	442
14.5.5	Central Bank Preferences versus Public Preferences	445
14.6	Optimal Monetary Policy Using the New Keynesian Model	446
14.6.1	Using Discretion	446
14.6.2	Rules-Based Policy	448

14.7	Optimal Monetary and Fiscal Policy	450
14.8	Monetary Policy in the Eurozone	455
14.8.1	A New Keynesian Model of the Eurozone	457
14.8.2	Optimal Eurozone Monetary Policy	458
14.8.3	Individual Country Inflation	459
14.8.4	Eurozone Country Inflation Differentials	459
14.8.5	Is There Another Solution?	460
14.9	Conclusions	461
15	Banks, Financial Intermediation, and Unconventional Monetary Policy	464
15.1	Introduction	464
15.2	Some Lessons from the Financial Crisis	465
15.3	Financial Market Imperfections	467
15.3.1	Borrowing Constraints	467
15.3.2	Default	469
15.3.3	Imperfect Information	471
15.4	Modern Banking: A Brief History and Its Role in the Financial Crisis	474
15.5	Fractional Reserve Banking	478
15.6	The Theory of Bank Runs	478
15.6.1	Households and the Banks	479
15.6.2	The Interbank Market	481
15.6.3	Central Bank Intervention	483
15.6.4	Comment	485
15.7	A Theory of Unconventional Monetary Policy	487
15.7.1	Households	488
15.7.2	Financial Intermediaries	489
15.7.3	The Central Bank	489
15.7.4	Comment	490
15.8	A DSGE Model with Default	491
15.8.1	The Nonbank Private Sector	492
15.8.2	Banks	494
15.8.3	Government	496
15.8.4	Comment	497
15.9	Conclusions	499
16	Real Business Cycles, DSGE Models, and Economic Fluctuations	501
16.1	Introduction	501
16.2	The Methodology of RBC Analysis	502
16.2.1	The Steady-State Solution	505
16.2.2	Short-Run Dynamics	506
16.3	Empirical Methods	508
16.4	Empirical Evidence on the RBC Model	511
16.4.1	The Basic RBC Model	512
16.4.2	Extensions to the Basic RBC Model	514
16.4.3	The Open-Economy RBC Model	516
16.5	DSGE Models of the Monetary Economy	521
16.5.1	The Smets-Wouters Model	522
16.5.2	Empirical Results	526
16.6	Wedges, Frictions, and Economic Fluctuations	528
16.6.1	A Benchmark Model	528
16.6.2	Alternative Explanations of the Wedges	529
16.6.3	Frictions	531
16.6.4	Comment	533

16.7	The Identification of a New Keynesian Model	533
16.8	Some Reflections on the Choices Involved in Constructing a DSGE Model	534
16.9	Conclusions	536
17	Mathematical Appendix	538
17.1	Introduction	538
17.2	Dynamic Optimization	538
17.3	The Method of Lagrange Multipliers	540
17.3.1	Equality Constraints	540
17.3.2	Inequality Constraints	545
17.4	Continuous-Time Optimization	546
17.4.1	The Calculus of Variations	547
17.4.2	The Maximum Principle	548
17.5	Dynamic Programming	548
17.6	Stochastic Dynamic Optimization	552
17.7	Time Consistency and Time Inconsistency	554
17.8	The Linear Rational-Expectations Models	556
17.8.1	Rational Expectations	557
17.8.2	The First-Order Nonstochastic Equation	558
17.8.3	Whiteman's Solution Method for Linear Rational-Expectations Models	560
17.8.4	Systems of Rational-Expectations Equations	567
	References	575
	Index	589