

Preface	xiii
Acknowledgments	xix
About the Author	xxiii

PART 1 PRELIMINARIES

1 Introduction to Macroeconomics 4

- 1.1 What Is Macroeconomics? 5
- 1.2 How Macroeconomics Studies Key Questions 9
- 1.3 An Overview of the Book 11
 - The Long Run 11
 - The Short Run 12
 - Issues for the Future 13

Summary	14
Key Concepts	14
Review Questions	15
Exercises	15
Worked Exercise	17

2 Measuring the Macroeconomy 18

- 2.1 Introduction 19
- 2.2 Measuring the State of the Economy 19
 - Production = Expenditure = Income 20
 - The Expenditure Approach to GDP 21
 - The Income Approach to GDP 24
 - The Production Approach to GDP 26
 - What Is Included in GDP and What's Not? 26

- 2.3 Measuring Changes over Time 29
 - A Simple Example: Where Real GDP Doesn't Change 30
 - A Second Example: Where Real GDP Changes 31
 - Quantity Indexes: Laspeyres, Paasche, and Chain Weighting 32
 - Price Indexes and Inflation 33
 - Using Chain-Weighted Data 33
- 2.4 Comparing Economic Performance across Countries 36

Summary	38
Key Concepts	38
Review Questions	39
Exercises	39
Worked Exercise	41

PART 2 THE LONG RUN

3 An Overview of Long-Run Economic Growth 44

- 3.1 Introduction 45
- 3.2 Growth over the Very Long Run 45
- 3.3 Modern Economic Growth 47
 - The Definition of Economic Growth 47
 - A Population Growth Example 49
 - The Rule of 70 and the Ratio Scale 50
 - U.S. GDP on a Ratio Scale 52
 - Calculating Growth Rates 53
- 3.4 Modern Growth around the World 54
 - A Broad Sample of Countries 55
- 3.5 Some Useful Properties of Growth Rates 58

3.6 The Costs of Economic Growth 61

3.7 A Long-Run Roadmap 61

3.8 Additional Resources 62

Summary 63

Growth Rules 64

Key Concepts 64

Review Questions 64

Exercises 64

Worked Exercises 68

4 A Model of Production 70

4.1 Introduction 71

4.2 A Model of Production 72

Setting Up the Model 72

Allocating Resources 73

Solving the Model: General Equilibrium 76

Interpreting the Solution 78

4.3 Analyzing the Production Model 81

Comparing Models with Data 81

The Empirical Fit of the Production Model 82

Productivity Differences: Improving the
Fit of the Model 86

4.4 Understanding TFP Differences 90

Human Capital 90

Technology 91

Institutions 91

Misallocation 93

4.5 Evaluating the Production Model 95

Summary 96

Key Concepts 97

Review Questions 97

Exercises 98

Worked Exercises 100

5 The Solow Growth Model 102

5.1 Introduction 103

5.2 Setting Up the Model 104

Production 104

Capital Accumulation 104

Labor 106

Investment 106

The Model Summarized 107

5.3 Prices and the Real Interest Rate 108

5.4 Solving the Solow Model 109

Using the Solow Diagram 110

Output and Consumption in the
Solow Diagram 111

Solving Mathematically for the Steady State 112

5.5 Looking at Data through the Lens
of the Solow Model 113

The Capital-Output Ratio 113

Differences in Y/L 114

5.6 Understanding the Steady State 115

5.7 Economic Growth in the Solow Model 116

Meanwhile, Back on the Family Farm 117

5.8 Some Economic Experiments 118

An Increase in the Investment Rate 118

A Rise in the Depreciation Rate 120

Experiments on Your Own 121

5.9 The Principle of Transition Dynamics 123

Understanding Differences in Growth Rates 124

5.10 Strengths and Weaknesses of the
Solow Model 127

Summary 128

Key Concepts 129

Review Questions 129

Exercises 129

Worked Exercises 133

6 Growth and Ideas 137

6.1 Introduction 138

6.2 The Economics of Ideas 139

Ideas 139

Nonrivalry 140

Increasing Returns 141

Problems with Pure Competition 143

6.3 The Romer Model 146

Solving the Romer Model 148

Why Is There Growth in the Romer Model? 150

Balanced Growth 151

Experiments in the Romer Model 152

Growth Effects versus Level Effects 154

Recapping Romer 155

6.4 Combining Solow and Romer:
Overview 156

- 6.5 Growth Accounting 157
- 6.6 Concluding Our Study of Long-Run Growth 159
- 6.7 A Postscript on Solow and Romer 161
- 6.8 Additional Resources 162
 - Summary 162
 - Key Concepts 163
 - Review Questions 163
 - Exercises 164
 - Worked Exercises 166
- 6.9 APPENDIX: Combining Solow and Romer (Algebraically) 168
 - Setting Up the Combined Model 168
 - Solving the Combined Model 168
 - Long-Run Growth 169
 - Output per Person 170
 - Transition Dynamics 171
 - More Exercises 173

7 The Labor Market, Wages, and Unemployment 175

- 7.1 Introduction 176
- 7.2 The U.S. Labor Market 176
 - The Dynamics of the Labor Market 179
- 7.3 Supply and Demand 180
 - A Change in Labor Supply 181
 - A Change in Labor Demand 182
 - Wage Rigidity 183
 - Different Kinds of Unemployment 185
- 7.4 The Bathtub Model of Unemployment 185
- 7.5 Labor Markets around the World 187
 - Hours of Work 190
- 7.6 How Much Is Your Human Capital Worth? 191
 - Present Discounted Value 191
 - Your Human Capital 192
- 7.7 The Rising Return to Education 193
 - Summary 199
 - Key Concepts 199
 - Review Questions 199
 - Exercises 200
 - Worked Exercises 202

8 Inflation 205

- 8.1 Introduction 206
- 8.2 The Quantity Theory of Money 209
 - Measures of the Money Supply 209
 - The Quantity Equation 211
 - The Classical Dichotomy, Constant Velocity, and the Central Bank 211
 - The Quantity Theory for the Price Level 212
 - The Quantity Theory for Inflation 213
 - Revisiting the Classical Dichotomy 215
- 8.3 Real and Nominal Interest Rates 216
- 8.4 Costs of Inflation 218
- 8.5 The Fiscal Causes of High Inflation 221
 - The Inflation Tax 221
 - Central Bank Independence 222
- 8.6 The Great Inflation of the 1970s 225
 - Summary 225
 - Key Concepts 226
 - Review Questions 226
 - Exercises 227
 - Worked Exercises 230

PART 3 THE SHORT RUN

9 An Introduction to the Short Run 234

- 9.1 Introduction 235
- 9.2 The Long Run, the Short Run, and Shocks 236
 - Trends and Fluctuations 236
 - Short-Run Output in the United States 238
 - Measuring Potential Output 241
 - The Inflation Rate 243
- 9.3 The Short-Run Model 243
 - A Graph of the Short-Run Model 244
 - How the Short-Run Model Works 245
 - The Empirical Fit of the Phillips Curve 246
 - Summary 247
- 9.4 Okun's Law: Output and Unemployment 247

9.5 Filling in the Details 250

- Summary 250
- Key Concepts 251
- Review Questions 251
- Exercises 252
- Worked Exercise 254

10 The Great Recession: A First Look 255

- 10.1 Introduction 256
- 10.2 Recent Shocks to the Macroeconomy 257
 - Housing Prices 257
 - The Global Saving Glut 258
 - Subprime Lending and the Rise in Interest Rates 259
 - The Financial Turmoil of 2007–2009 260
 - Oil Prices 263
- 10.3 Macroeconomic Outcomes 264
 - A Comparison to Previous Recessions 264
 - Inflation 267
 - The Rest of the World 269
- 10.4 Some Fundamentals of Financial Economics 270
 - Balance Sheets 271
 - Leverage 272
 - Bank Runs and Liquidity Crises 273
 - Financial Wrap-Up 274
- 10.5 Going Forward 274
 - Summary 275
 - Key Concepts 275
 - Review Questions 276
 - Exercises 276

11 The IS Curve 278

- 11.1 Introduction 279
- 11.2 Setting Up the Economy 280
 - Consumption and Friends 281
 - The Investment Equation 281
- 11.3 Deriving the IS Curve 283

11.4 Using the IS Curve 285

- The Basic IS Curve 285
- The Effect of a Change in the Interest Rate 286
- An Aggregate Demand Shock 287
- A Shock to Potential Output 289
- Other Experiments 290

11.5 Microfoundations of the IS Curve 290

- Consumption 290
- Multiplier Effects 293
- Investment 294
- Government Purchases 295
- Net Exports 301

11.6 Conclusion 301

- Summary 302
- Key Concepts 302
- Review Questions 303
- Exercises 303
- Worked Exercises 306

12 Monetary Policy and the Phillips Curve 309

- 12.1 Introduction 310
- 12.2 The MP Curve: Monetary Policy and Interest Rates 311
 - From Nominal to Real Interest Rates 313
 - The IS-MP Diagram 314
 - Example: The End of a Housing Bubble 315
- 12.3 The Phillips Curve 318
 - Price Shocks and the Phillips Curve 321
 - Cost-Push and Demand-Pull Inflation 323
- 12.4 Using the Short-Run Model 324
 - The Volcker Disinflation 325
 - The Great Inflation of the 1970s 327
 - The Short-Run Model in a Nutshell 329
- 12.5 Microfoundations: Understanding Sticky Inflation 330
 - The Classical Dichotomy in the Short Run 330
- 12.6 Microfoundations: How Central Banks Control Nominal Interest Rates 333
 - Changing the Interest Rate 335
 - Why i_t instead of M_t ? 335
- 12.7 Inside the Federal Reserve 338
 - Conventional Monetary Policy 338
 - Open-Market Operations: How the Fed Controls the Money Supply 339

12.8 Conclusion 340

Summary 340

Key Concepts 341

Review Questions 341

Exercises 342

Worked Exercises 344

13 Stabilization Policy and the AS/AD Framework 347

13.1 Introduction 348

13.2 Monetary Policy Rules and Aggregate Demand 349

The AD Curve 350

Moving along the AD Curve 351

Shifts of the AD Curve 352

13.3 The Aggregate Supply Curve 352

13.4 The AS/AD Framework 353

The Steady State 354

The AS/AD Graph 354

13.5 Macroeconomic Events in the AS/AD Framework 355

Event #1: An Inflation Shock 355

Event #2: Disinflation 359

Event #3: A Positive AD Shock 361

Further Thoughts on Aggregate Demand Shocks 364

13.6 Empirical Evidence 365

Predicting the Fed Funds Rate 365

Inflation-Output Loops 366

13.7 Modern Monetary Policy 369

More Sophisticated Monetary Policy Rules 371

Rules versus Discretion 371

The Paradox of Policy and Rational Expectations 372

Managing Expectations in the AS/AD Model 373

Inflation Targeting 375

13.8 Conclusion 376

Summary 377

Key Concepts 378

Review Questions 378

Exercises 379

Worked Exercises 382

14 The Great Recession and the Short-Run Model 385

14.1 Introduction 386

14.2 Financial Considerations in the Short-Run Model 387

Financial Frictions 387

Financial Frictions in the IS/MP Framework 388

Financial Frictions in the AS/AD Framework 390

The Dangers of Deflation 392

14.3 Policy Responses to the Financial Crisis 395

The Taylor Rule and Monetary Policy 395

The Money Supply 397

The Fed's Balance Sheet 398

The Troubled Asset Relief Program 402

Fiscal Stimulus 403

The European Debt Crisis 403

Financial Reform 403

14.4 The Aftermath of the Great Recession 406

Secular Stagnation 406

A Productivity Slowdown? 406

14.5 Conclusion 408

Summary 409

Key Concepts 410

Review Questions 410

Exercises 411

Worked Exercise 413

15 DSGE Models: The Frontier of Business Cycle Research 415

15.1 Introduction 416

15.2 A Brief History of DSGE Models 417

From Real Business Cycles to DSGE 418

Endogenous Variables 419

Shocks 419

Features 419

Mathematics and DSGE Models 420

- 15.3 **A Stylized Approach to DSGE** 421
 - Labor Demand 421
 - Labor Supply 422
 - Equilibrium in the Labor Market 423
- 15.4 **Using the Stylized DSGE Model** 424
 - A Negative TFP Shock 424
 - A Rise in Taxes Paid by Firms 425
 - A Rise in Government Purchases 426
 - Introducing Monetary Policy and Unemployment: Sticky Wages 428
 - Monetary Policy and Sticky Prices 430
 - Lessons from the Labor Market in DSGE Models 431
- 15.5 **Quantitative DSGE Models** 431
 - Impulse Response Functions 432
 - A Total Factor Productivity Shock 434
 - A Shock to Government Purchases 436
 - A Financial Friction Shock 437
- 15.6 **Conclusion** 438
 - Summary 438
 - Key Concepts 439
 - Review Questions 439
 - Exercises 440
 - Worked Exercise 442
- 15.7 **APPENDIX: Deriving the Labor Supply Curve** 444

PART 4 APPLICATIONS AND MICROFOUNDATIONS

16 Consumption 448

- 16.1 **Introduction** 449
- 16.2 **The Neoclassical Consumption Model** 449
 - The Intertemporal Budget Constraint 449
 - Utility 450
 - Choosing Consumption to Maximize Utility 451
 - Solving the Euler Equation: Log Utility 453
 - Solving for c_{today} and c_{future} : Log Utility and $\beta = 1$ 454
 - The Effect of a Rise in R on Consumption 455
- 16.3 **Lessons from the Neoclassical Model** 455
 - The Permanent-Income Hypothesis 455
 - Ricardian Equivalence 457

- Borrowing Constraints 457
- Consumption as a Random Walk 458
- Precautionary Saving 459
- 16.4 **Empirical Evidence on Consumption** 460
 - Evidence from Individual Households 460
 - Aggregate Evidence 462
 - Summary 465
 - Key Concepts 466
 - Review Questions 466
 - Exercises 466
 - Worked Exercise 469

17 Investment 470

- 17.1 **Introduction** 471
- 17.2 **How Do Firms Make Investment Decisions?** 472
 - Reasoning with an Arbitrage Equation 472
 - The User Cost of Capital 473
 - Example: Investment and the Corporate Income Tax 474
 - From Desired Capital to Investment 478
- 17.3 **The Stock Market and Financial Investment** 479
 - The Arbitrage Equation and the Price of a Stock 480
 - P/E Ratios and Bubbles? 482
 - Efficient Markets 483
- 17.4 **Components of Private Investment** 486
 - Residential Investment 487
 - Inventory Investment 488

- Summary 490
- Key Concepts 491
- Review Questions 491
- Exercises 491
- Worked Exercises 494

18 The Government and the Macroeconomy 496

- 18.1 **Introduction** 497
- 18.2 **U.S. Government Spending and Revenue** 497
 - Spending and Revenue over Time 498
 - The Debt-GDP Ratio 499

- 18.3 International Evidence on Spending and Debt 501
- 18.4 The Government Budget Constraint 502
 - The Intertemporal Budget Constraint 503
- 18.5 How Much Can the Government Borrow? 505
 - Economic Growth and the Debt-GDP Ratio 505
 - High Inflation and Default 506
 - Generational Accounting 507
 - Deficits and Investment* 507
- 18.6 The Fiscal Problem of the Twenty-First Century 509
 - The Problem 510
 - Possible Solutions 513
- 18.7 Conclusion 515
 - Summary 516
 - Key Concepts 516
 - Review Questions 516
 - Exercises 517
 - Worked Exercise 518

19 International Trade 520

- 19.1 Introduction 521
- 19.2 Some Basic Facts about Trade 522
- 19.3 A Basic Reason for Trade 524
- 19.4 Trade across Time 525
- 19.5 Trade with Production 527
 - Autarky 528
 - Free Trade 530
 - Lessons from the Apple: Computer Example 531
- 19.6 Trade in Inputs 532
 - Moving Capital versus Moving Labor 533
- 19.7 The Costs of Trade 534
- 19.8 The Trade Deficit and Foreign Debt 537
 - Trade and Growth around the World 537
 - The Twin Deficits 538
 - Net Foreign Assets and Foreign Debt 540
- 19.9 Conclusion 541
 - Summary 542
 - Key Concepts 543
 - Review Questions 543

- Exercises 543
- Worked Exercise 545

20 Exchange Rates and International Finance 547

- 20.1 Introduction 548
- 20.2 Exchange Rates in the Long Run 548
 - The Nominal Exchange Rate 548
 - The Law of One Price 549
 - The Real Exchange Rate 552
 - Summary 553
- 20.3 Exchange Rates in the Short Run 555
 - The Nominal Exchange Rate 555
 - The Real Exchange Rate 556
- 20.4 Fixed Exchange Rates 557
- 20.5 The Open Economy in the Short-Run Model 558
 - The New IS Curve 559
 - Event #1: Tightening Domestic Monetary Policy and the IS Curve 560
 - Event #2: A Change in Foreign Interest Rates 561
- 20.6 Exchange Rate Regimes 562
- 20.7 The Policy Trilemma 564
 - Which Side of the Triangle to Choose? 567
 - The Future of Exchange Rate Regimes 570
- 20.8 The Euro Crisis 572
 - The Crisis of 2011–2013 575
 - Long-Term Competitiveness 576
- Summary 577
- Key Concepts 578
- Review Questions 579
- Exercises 579
- Worked Exercises 581

21 Parting Thoughts 583

- 21.1 What We've Learned 584
- 21.2 Significant Remaining Questions 586
- 21.3 Conclusion 589

- Glossary 590
- Index 605