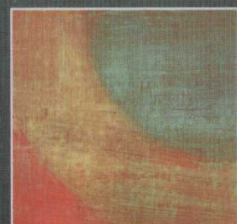
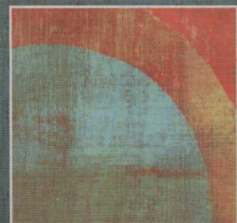


Macroeconomic Theory



Jean-Pascal Bénassy

Macroeconomic Theory

Jean-Pascal Bénassy



OXFORD
UNIVERSITY PRESS

2011

OXFORD

UNIVERSITY PRESS

Oxford University Press, Inc., publishes works that further
Oxford University's objective of excellence
in research, scholarship, and education.

Oxford New York
Auckland Cape Town Dar es Salaam Hong Kong Karachi
Kuala Lumpur Madrid Melbourne Mexico City Nairobi
New Delhi Shanghai Taipei Toronto

With offices in
Argentina Austria Brazil Chile Czech Republic France Greece
Guatemala Hungary Italy Japan Poland Portugal Singapore
South Korea Switzerland Thailand Turkey Ukraine Vietnam

Copyright © 2011 by Jean-Pascal Bénassy

Published by Oxford University Press, Inc.
198 Madison Avenue, New York, New York 10016
www.oup.com

Oxford is a registered trademark of Oxford University Press

All rights reserved. No part of this publication may be reproduced,
stored in a retrieval system, or transmitted, in any form or by any means,
electronic, mechanical, photocopying, recording, or otherwise,
without the prior permission of Oxford University Press.

Library of Congress Cataloging-in-Publication Data

Bénassy, Jean-Pascal.
Macroeconomic theory / Jean-Pascal Bénassy.
p. cm.
Includes bibliographical references and index.
ISBN 978-0-19-538771-1
1. Macroeconomics. I. Title.
HB172.5.B44 2010
339—dc22 2009046111

9 8 7 6 5 4 3 2

Printed in the United States of America
on acid-free paper

Macroeconomic Theory

Introduction

The Object of the Book

This book is meant to a primer in macroeconomics for graduate students. To make it reader-friendly to first-year students, the first two chapters provide a summary of the concepts that should already be mastered. The next eighteen chapters progressively develop the central concepts of modern macroeconomics, with the aim of being as comprehensive as possible,¹ while offering, for each topic, the models that will deliver the results in the most simple manner.

While writing this book, I have sought to achieve two main goals. The first one has been to present, whenever possible, models with explicit and rigorous microeconomic foundations, however simple they may be. Indeed, the evolution of macroeconomics in the last decades has been characterized by an inexorable move away from ad hoc models and toward models with such foundations. This has been a highly valuable development. So I have endeavoured to show in the most simple and pedagogical way the enormous progress that has been achieved in this regard.²

1. One domain, though, is not represented in this book, international macroeconomics. But this is a whole field in itself, which deserves a textbook of its own.

2. Although my personal preference is clearly toward microfounded models, I believe one should not be dogmatic about this issue. There are some ad-hoc models that are just too elegant and insightful to be ignored, so that I have resolutely included a number of them in this book.

My second goal has been to give for each topic the simplest possible formalization. Over the years, the field of economics has become increasingly technical. This is a positive development, which has allowed us to push forward the frontiers of the domain. This has sometimes led to a tendency to write overcomplicated models. I have tried to show, by way of many examples, that one can tackle conceptually difficult issues with simple models. Moreover these models come with explicit solutions, which is the most effective way to convey the basic economic intuitions.

Organization of the Book

Each chapter covers a specific topic, using a homogeneous set of models. It contains a “main body,” which represents the central elements to be taught, as well as a few appendixes.

Basically, it is not necessary, in a first reading, to go through the appendixes to have a full understanding of the main text. Some appendixes are more technical than the main body of the chapter, whereas some others, although nontechnical, have a slightly different emphasis. These appendixes should be seen as optional additional teaching material that each professor may (or may not) teach, depending on personal preferences.

As evidenced in its title, this book is centered on macroeconomic theory, and its primary purpose is to teach the concepts and instruments of macroeconomic analysis. Some chapters have a few numbers designed to give some sense of magnitude. These are not intended to represent any significant empirical contribution and should obviously be supplemented by proper empirical references in reading lists.

At the end of each chapter are a few problems that hopefully represent some interesting developments of the material in the chapter. Solutions are posted on the Web site www.oup.com/us/MacroeconomicTheorySolutions.

Finally, to make the book fully self-contained, there is a mathematical appendix that gives the necessary mathematical results. This should be seen more as a set of cooking recipes than a rigorous mathematical treatise.

An Overview of the Book

The first two chapters give a quick panorama of the main models used in undergraduate teaching and of the state of macroeconomics at the outset of the 1970s.

Chapter 1 studies growth theory using the famous Solow-Swan model. It shows how growth results from two sources: capital accumulation (part of which may be human capital accumulation) and technical progress. At this

stage technical progress is exogenous, and the equations giving capital accumulation are also given exogenously.

Chapter 2 studies the traditional models of output, employment, and inflation determination in the Keynesian tradition. We describe successively the IS-LM model, the AD-AS model and the Phillips curve. We also describe the famous debate on stabilization in the Keynesian mode, which prompted the relative decline of Keynesian ideas and the move toward more microfounded macroeconomic models.

The next four chapters describe four fundamental building blocks of the modern approach to macroeconomics.

Chapter 3 describes the concept of rational expectations (RE), somehow an extension to stochastic environments of the idea of perfect foresight. This has become the natural benchmark for expectations, because before RE many results were simply due to expectational errors. As it turns out, rational expectations introduce a number of hitherto unknown questions, and we study successively issues of stability, solution multiplicity, learning, and signal extraction.

Chapter 4 studies various deterministic models with infinite horizons where all decisions are taken by maximizing agents. Such models with stochastic shocks, and under the name of “dynamic stochastic general equilibrium models”, have become the workhorse of modern macroeconomics. Since these models are intrinsically complex, we start here with simple deterministic versions. These differ essentially by the “demographics” of consumers. We begin with a model with a single infinitely lived consumer. We then move to “overlapping generations” where new households, each with a finite life, are born every period, and these generations overlap during part of their lives. We finally study a synthetic model where agents are infinitely lived, but new ones are born each period.

Chapter 5 studies rigorous models of nonclearing markets and imperfect competition, a necessary step towards giving microfoundations to models of Keynesian inspiration. We first give a simple description of the concepts describing price and quantity decisions in a nonclearing markets framework. We then give a simple macroeconomic example of price and quantity determination under various assumptions of price and wage rigidity. We finally show that the response to stochastic shocks and the associated correlations between various variables depend very much on the rigidities assumed.

Chapter 6 is concerned with the introduction of uncertainty at the individual and general equilibrium level. It starts with the problem of individual choice in uncertain environments, describes expected utility theory and presents a few measures of risk aversion. It then presents a few models of general equilibrium. We review the so-called complete markets and

incomplete markets models and show how the concepts developed apply, in particular, to the pricing of financial assets. We finally introduce the concept of “nonexpected utility,” which allows us to disentangle the notions of risk and substitutability.

The next three chapters study various models of growth with explicit microfoundations.

Chapter 7 studies the famous Ramsey model. Ramsey (1928), decades ahead of his time, described a rigorous model of growth where an infinitely lived maximizing consumer arbitrages at every instant of time between consuming and investing capital. The Ramsey model is in many respects a benchmark, which displays properties like intertemporal efficiency, or Ricardian equivalence.

Chapter 8 studies models of growth where the demographic structure is that of overlapping generations (OLG). We begin with an extensive study of the simplest model, due to Diamond (1965), where the agents live two periods. This allows us to show that a number of properties of the benchmark Ramsey model do not survive the change in the demographic assumptions. Market equilibria can be inefficient, fiscal policy matters. We also investigate the important issue of pensions.

Chapter 9 studies endogenous growth. Until this chapter the main explanation of growth, technical progress, was taken as exogenous. Endogenous growth theory makes technical progress the result of conscious profit-maximizing activities by individuals or firms. We start with a first model where productivity growth results from returns to diversity in production and the desire of agents to secure rents through creating new diversified products. We then move to a model where research and development increases directly productivity. We also investigate the issue of the so-called scale effects.

Chapter 10 presents the first models of fluctuations using the methodology of “dynamic stochastic general equilibrium” (DSGE) models, that is, models of general intertemporal equilibrium where the economy is subject to various shocks, such as technology shocks. To introduce difficulties progressively, this chapter considers “real” (i.e., nonmonetary) economies, where moreover all markets are assumed to clear in the Walrasian mode. These were the first models introduced in this line of research and for that reason were called “real business cycles.” We investigate notably the allocation of consumption and investment in the cycle, asset pricing, and the role of intertemporal substitution in labor supply. This chapter also studies two alternative representations of competitive business cycles: sunspots, where shocks extraneous to the system nevertheless influence economic activity, and endogenous business cycles, where the economy is intrinsically unstable and deterministic cyclical trajectories arise.

Chapter 11 introduces money. Until this chapter we considered “real” economies where exchange is carried through some kind of unspecified barter. Although this simplification is acceptable to study topics such as long-run growth trends, it is clearly inadequate for short-run fluctuations. Introducing money is not such an easy task. Monetary exchange is a restriction on possible trades, and money is an asset that is strictly dominated in rates of return. So we indicate a number of formalizations that allow us to sustain the existence of monetary exchange. We then show that many traditional formalizations of money actually lead to puzzles and paradoxes, and we show some ways to overcome them. We finally describe a model that somehow synthesizes Ramsey, OLG, and money.

Chapter 12 introduces money into the model of fluctuations described in chapter 10. We first show that introduction of money per se is not a cause for extra fluctuations, as nominal variables can adjust fully to nominal money shocks. The same result is obtained for imperfect competition. We finally introduce imperfect information in the tradition of Lucas’s (1972) seminal article and show that misperception of various shocks can give a role to monetary shocks in fluctuations.

Chapter 13 studies dynamic stochastic general equilibrium models with nonclearing markets and imperfect competition. Although dynamic models with market clearing (whether with perfect or imperfect competition) can potentially produce fluctuations in response to demand shocks, these seem to be of insufficient magnitude and persistence when one comes to numerical evaluations. So a successful answer to these problems has been to introduce various forms of nominal price or wage rigidities into the system. In this chapter we introduce several formalizations of such rigidities, and it turns out that several of them allow to obtain substantial and persistent responses to nominal shocks. As in the previous chapters our inquiry is conducted via explicitly solved models, which allow to have a clearer grasp of the mechanisms at work.

Chapter 14 studies in a more “partial equilibrium” framework a number of important topics that would have led to a less elegant exposition in the full general equilibrium framework of chapters 7 to 13. We start with consumption, and study successively consumption smoothing, the case of certainty equivalence, precautionary savings. We then move to investment, and describe the rationale and working out of the most standard investment model involving installation costs. We also show how to obtain an “accelerator” in an imperfectly competitive framework. We then consider an often ignored topic, that of inventories. We first show how storability of a good will induce firms not to ration customers, the usual assumption in macroeconomics. We also show that, although production smoothing is one of the functions of inventories, volatility of production may nevertheless be

higher than that of sales. We finally relate inventories and production to price making in an imperfect competition framework. Last in this chapter we study credit, which had been left implicit in the previous developments, and we show how credit rationing may arise from imperfect information reasons (adverse selection or moral hazard).

We then have two chapters devoted to the issue of unemployment. Chapter 15 describes, in a unified one-period model, a number of basic models of unemployment. We first describe the three traditional models of interaction between firms and trade unions (monopoly union, efficient bargaining, right to manage), and then the theories of insiders-outsiders, efficiency wages and various forms of implicit contracts.

Chapter 16 puts the unemployment problem in a more dynamic and intertemporal framework, emphasizing flows in and out of unemployment. After describing the general framework, we give a dynamic version of the efficiency wage model seen in the previous chapter. We then describe a workhorse of recent dynamic analysis of unemployment, the matching function.

Chapters 17 to 19 study a number of central issues and debates concerning monetary and fiscal policy. Chapter 17 presents the “public finance” approach to policy, whose central purpose is to minimize distortions associated with the financing of public spending. We start with two classic examples, the Friedman rule and tax smoothing. We then move to one of the pillars of this approach, Ramsey taxation. We then apply these principles to the issue of optimally combining money creation and regular taxes to finance government spending.

Chapter 18 studies stabilization policies, that is, the optimal government reactions to shocks on the economy. We give two important examples of optimal policy in microfounded models. We begin with a model of optimal seigniorage under uncertainty, which links the issues of stabilization and public finance in a Walrasian framework. We then move to a non-Walrasian setting and study the famous “policy effectiveness” debate initiated by Sargent and Wallace in 1975. We find that adequate policies circumvent the ineffectiveness argument. We then study another type of potential economic instability, which can be created by government policy itself. In the same 1975 article, Sargent and Wallace showed that nominal interest rate pegging would create indeterminacy in prices. A similar problem occurs with the more recent “Taylor rules.” We reexamine the issue in a microfounded model and find that a revival of the old Pigou effect allows us to find simple rules guaranteeing global determinacy.

Chapter 19 studies the problem of time consistency, which arises in many aspects, fiscal and monetary, of policy making. In a nutshell, that problem arises whenever a policy decided, say, at time 0 for a time t posterior to 0,

is not optimal anymore when time t has come. We first give a very simple characterization of that problem and then move to examples pertaining to both fiscal policy and monetary policy. We finally give a number of solutions to solve that credibility problem.

Chapter 20 relates macroeconomics to political economy, that is, the study of decision making when decisions are taken not by a single individual but by politicians representing highly heterogeneous interests. We first describe Arrow's "impossibility theorem." We then show that adequate restrictions to preferences can lead to a solution, describe the famous median voter theorem, and apply it to the problem of redistribution. That theorem predicts that all politicians will have similar platforms, which is not realistic, so we describe a model of "probabilistic voting," which predicts different platforms for different politicians. We also show how the possibility of alternating between politicians with different goals may lead to government deficits in circumstances where political stability would lead to balanced budgets.

Finally, a mathematical appendix gives in a simple and self-contained manner a number of results and recipes that are useful for a number of developments in the main text.

Acknowledgments

While writing this book I have incurred an enormous debt toward Jean-Olivier Hairault, Jean-Pierre Laffargue, François Langot, and Alexander Meyer-Gohde. Their insightful comments on earlier versions of this book brought many improvements to the manuscript. I nevertheless retain all responsibility for any remaining deficiencies.

Contents

Introduction	xii
The Object of the Book	xii
Organization of the Book	xiii
An Overview of the Book	xiii
Acknowledgments	xviii
1 Growth	3
1.1 Introduction	3
1.2 The Solow-Swan Model	4
1.3 Short-run Equilibrium and Dynamics	6
1.4 The Golden Rule	9
1.5 Technical Progress and Growth	11
1.6 Convergence	12
1.7 A Model with Two Accumulated Factors	16
Appendix 1.1: The CES Production Function	18
Appendix 1.2: Embodied Technical Progress	20
Problems	22
2 Output, Inflation, and Stabilization	24
2.1 Introduction	24
2.2 The Basic Keynesian Models	25
2.3 The Phillips Curve	29

2.4	Phillips Curve Dynamics	31
2.5	Expectations and Policy Effectiveness	34
	Appendix 2.1: The Baumol-Tobin Demand for Money	38
	Appendix 2.2: Indexation	39
	Appendix 2.3: Imperfect Information and the Choice of Economic Instruments	41
	Problems	43
3	Rational Expectations	45
3.1	Introduction	45
3.2	Rational Expectations: A Simple Definition	46
3.3	The Muth Model	47
3.4	Rational Expectations and Policy Effectiveness	49
3.5	Expectations and Stability: The Cagan Model	50
3.6	Solutions to a Stochastic Dynamic Equation	54
3.7	Learning and Rational Expectations	57
	Appendix 3.1: Signal Extraction and Adaptive Expectations Problems	60
		62
4	Intertemporal Equilibria with Optimizing Agents	65
4.1	Introduction	65
4.2	A Ramsey Model with Exogenous Incomes	66
4.3	An Overlapping Generations Model	70
4.4	Overlapping Generations and Money	76
4.5	A Ramsey-OLG Model	78
	Appendix 4.1: A Basic Dynamic Equation	81
	Problems	83
5	Nonclearing Markets and Imperfect Competition	85
5.1	Introduction	85
5.2	Walrasian Theory: The Missing Parts	86
5.3	Nonclearing Markets and Imperfect Competition	87
5.4	A Macroeconomic Example	97
5.5	Shocks and Correlations	108
	Appendix 5.1: Quantity Signals: An Example	111
	Appendix 5.2: Alternative Rigidities	113
	Problems	114
6	Uncertainty and Financial Assets	118
6.1	Introduction	118
6.2	Choice under Uncertainty and Risk Aversion	119

6.3	Equilibrium with Complete Markets	121
6.4	Complete versus Incomplete Markets	125
6.5	Asset Pricing: A Benchmark Case	127
6.6	The Risk-free Rate and the Risk Premium	129
6.7	Risk Aversion and Substitutability	132
	Appendix 6.1: Incomplete Markets and the Risk-free Rate Puzzle	135
	Appendix 6.2: Arrow-Debreu Equilibria with Several Physical Goods	139
	Problems	142
7	The Ramsey Model	145
7.1	Introduction	145
7.2	The Ramsey Model	146
7.3	Market Equilibrium	147
7.4	Efficiency	151
7.5	Ricardian Equivalence	152
7.6	Government Spending and Dynamics	154
7.7	Exogenous Technical Progress	155
7.8	The Ramsey Model in Discrete Time	155
	Appendix 7.1: Government Spending with Distortionary Taxation	156
	Problems	159
8	Overlapping Generations	161
8.1	Introduction	161
8.2	The Diamond Model	162
8.3	Market Equilibrium	163
8.4	Optimality	166
8.5	Pensions	169
8.6	Debt Dynamics	174
	Problems	177
9	Endogenous Growth	180
9.1	Introduction	180
9.2	The AK Model	181
9.3	Technical Progress and Endogenous Growth	183
9.4	The Romer Model	184
9.5	Endogenous Productivity Increases	190
9.6	A Model Without Scale Effects	194
	Appendix 9.1: Capital and Transitional Dynamics	195
	Appendix 9.2: Stochastic Productivity Increases	198
	Problems	201

10 Competitive Business Cycles	205
10.1 Introduction	205
10.2 The DSGE Methodology	207
10.3 A Particular Case	209
10.4 Depreciation and Propagation	211
10.5 Intertemporal Substitution and Labor Fluctuations	213
10.6 Asset Pricing	215
10.7 Sunspots	217
10.8 Endogenous Cycles	220
Appendix 10.1: Employment Lotteries	224
Appendix 10.2: Output and Capital in the Cycle	227
Problems	231
11 Money	235
11.1 Introduction	235
11.2 Why Money?	236
11.3 The Fragility of OLG Money	240
11.4 Money in the Utility Function	242
11.5 Cash in Advance	245
11.6 Puzzles and Paradoxes	247
11.7 A Non-Ricardian Solution	251
11.8 A Ramsey-OLG Monetary Model	255
Appendix 11.1: Money as a Medium of Exchange: An Informational Argument	259
Appendix 11.2: Proportional Money Transfers	262
Appendix 11.3: The Weil Model	263
Problems	267
12 Money and Cycles	270
12.1 Introduction	270
12.2 A Simple Monetary Model	271
12.3 Imperfect Competition	275
12.4 Signal Extraction and Nominal Price Stickiness	277
Appendix 12.1: The Full Information Equilibrium	284
Appendix 12.2: The Imperfect Information Equilibrium	285
Problems	287
13 Nominal Rigidities and Fluctuations	291
13.1 Introduction	291
13.2 Early Models	292

13.3 Nominal Rigidities and Correlations	298
13.4 Three Models of Nominal Rigidities	301
13.5 A DSGE Model with Sticky Prices	308
13.6 The DSGE Model: Properties and Extensions	312
Appendix 13.1: Menu Costs	316
Appendix 13.2: Real and Nominal Rigidities	318
Appendix 13.3: Impulse Response Functions and Propagation	320
Appendix 13.4: Disinflation	322
Appendix 13.5: Price Dynamics	329
Problems	333
14 Consumption, Investment, Inventories, and Credit	337
14.1 Introduction	337
14.2 Consumption	338
14.3 Investment	343
14.4 Inventories	349
14.5 Credit	354
Appendix 14.1: An Imperfect Competition Accelerator	359
Appendix 14.2: Inventories	361
Problems	365
15 Unemployment: Basic Models	369
15.1 Introduction	369
15.2 A Simple Framework	370
15.3 Three Classic Trade Union Models	372
15.4 Insiders and Outsiders	377
15.5 Efficiency Wages	380
15.6 Implicit Contracts	385
Appendix 15.1: Centralization and Unemployment	389
Problems	394
16 A Dynamic View of Unemployment	397
16.1 Introduction	397
16.2 A Simple Dynamic Framework	398
16.3 A Few Dynamic Relations	399
16.4 The Shirking Model	401
16.5 Matching in the Labor Market	404
Problems	410
17 Policy: The Public Finance Approach	413
17.1 Introduction	413

17.2 Issues in Policy Design	414
17.3 The Friedman Rule	415
17.4 Tax Smoothing	418
17.5 Optimal Ramsey Taxation	421
17.6 Optimal Seigniorage	423
Appendix 17.1: The Cost of Distortionary Taxation	425
Appendix 17.2: Optimal Seigniorage in an OLG Model	429
Problems	431
18 Stabilization Policies	434
18.1 Introduction	434
18.2 Optimal Monetary and Fiscal Financing	436
18.3 Government Information and the Policy Effectiveness Debate	439
18.4 Interest Rate Rules and Determinacy	445
Appendix 18.1: Model Uncertainty and Stabilization	450
Appendix 18.2: Instrument Instability	451
Appendix 18.3: The Ineffectiveness Argument: A Simple Model	454
Appendix 18.4: Fiscal Policy and Determinacy	456
Appendix 18.5: The Pigou Effect and Global Determinacy	459
Problems	463
19 Dynamic Consistency and Credibility	466
19.1 Introduction	466
19.2 The Dynamic Consistency Intuition	467
19.3 Capital Taxation and Dynamic Consistency	468
19.4 Monetary Policy and Credibility	470
19.5 Solutions to the Credibility Problem	474
Appendix 19.1: Reputation and Credibility	478
Problems	481
20 Political Economy	483
20.1 Introduction	483
20.2 Arrow's Impossibility Theorem	484
20.3 The Median Voter	486
20.4 Voting and Redistribution	489
20.5 The Political Economy of Budget Deficits	491
20.6 Platform Heterogeneity	493
Appendix 20.1: The Political Economy of Deficits	496
Problems	500