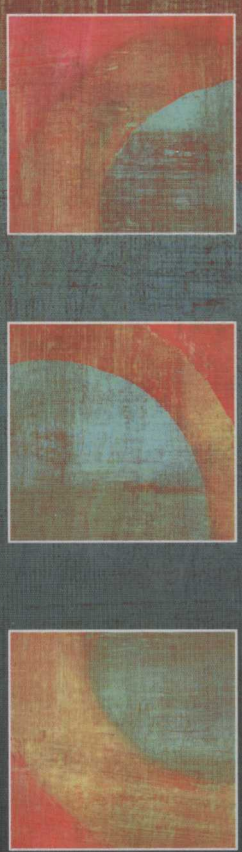
# Macroeconomic Theory



Jean-Pascal Bénassy

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# 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.



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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

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