

Foundations of International Macroeconomics

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Introduction

International macroeconomics is alive with great practical questions. What are the long-term implications of sustained United States current account deficits and Japanese current account surpluses? How do government budget deficits affect interest rates, trade balances, and exchange rates? Is increasing global capital market integration affecting the nature and international propagation of business cycles, and how is it changing the susceptibility of economies to sudden shifts in investor sentiment? What if Europe really goes ahead and adopts a single currency? Is there any tendency for the per capita incomes of developing countries to converge over time to industrial-country levels? How important is monetary policy, and what are the channels through which it affects the economy? These are issues that interest policy makers, business people, and researchers alike. It is no wonder that international macroeconomic issues command the attention of the world's financial press.

This book offers a framework and a general approach for thinking about international macroeconomics. We believe the framework is valuable from both the theoretical and practical perspectives. Central to it is the role of international asset markets in allowing countries to trade consumption goods over time by borrowing from and lending to each other. This *intertemporal approach* certainly illuminates the economics of current account imbalances. But it also discloses the intimate relationship between dynamic possibilities and international trade within periods -- trade of distinct commodities, of consumption indexed to uncertain contingencies, and so on. We do not pretend to have definitive answers to all the questions listed at the start of this introduction, but you should find the approach developed here useful for thinking about all of them.

First, a brief road map of the topics and questions covered in the various chapters (for more detail, see the table of contents). Chapters 1 through 7 of the book are all concerned with the "real" side of international macroeconomics. The models in Chapters 8 through 10 for the most part build closely on those of the preceding seven, but they bring money into the picture.

The first three chapters all assume one good on each date and view trade purely from an intertemporal perspective. Chapter 1 covers the many basic insights that can be developed in a simple two-period model with a single asset. Chapter 2 looks at implications of deterministic and stochastic economies with infinitely-lived representative consumers. Richer demographic assumptions are introduced in Chapter 3, which explores various overlapping-generations models. Throughout the book we focus often -- though far from exclusively -- on the case of a small country that takes the world interest rate (and possibly other external prices) as given by world markets. As the body of international trade theory amply demonstrates, this can be a powerful and illuminating simplifying assumption. We nonetheless systematically study global equilibrium models as well, both to show how world prices are determined and to understand more completely the routes by which various economic shocks are transmitted across national borders.

Chapters 4 through 6 extend and apply the basic approach to myriad new questions that cannot be addressed in a one-good, riskless-lending framework. In the fourth chapter, we introduce the possibility of several consumption goods on a given date, including nontraded goods (one of which could be leisure) and multiple tradable goods (so that the static terms of trade play a role). As we see, the theory illuminates some important facets of the long-term evolution of economic structure. We conclude Chapter 4 by studying the terms of trade within an intertemporal Ricardian model in which nontradability is determined endogenously by international transport costs.

Chapter 5 looks at the economic role of trade in risky assets, showing how models with uncertainty can be understood in terms of the fundamental principles covered in the previous four chapters. The chapter illustrates how international financial markets may dramatically affect the dynamics of the current account and the international transmission of business cycles. It also covers the essentials of international portfolio diversification and the empirical puzzles surrounding observed diversification patterns. One vital application of the models of this section is to international asset pricing, which we explore in depth.

International debt problems are frequently at the center of policy concerns. Chapter 6 shows how they can arise when there is sovereign risk. The chapter also looks at other realistic departures from the idealized complete markets world of Chapter 5, notably models where asymmetric information is the central distortion. The results of this chapter throw light both on the degree to which the international capital market can perform its potential role and on the nature of the instruments that will be traded.

A revival of economic growth theory has been one of the major developments in macroeconomics over the past decade. Chapter 7 surveys this literature. As is appropriate for a book focusing on international macroeconomics, however, we place a relatively heavy stress on open-economy issues and intercountry comparisons. Thus we highlight the role of cross-border capital mobility in economic convergence, the interplay between capital flows and market imperfections, and the growth effects of international

diversification under uncertainty.

In an earlier era, the function of money in trade and capital movements was considered the defining characteristic of international finance as a field (as opposed to now, when nonmonetary aspects of international exchange are viewed as at least as important for understanding macro issues). Chapter 8 introduces monetary models, and it does so in the simplest possible setting, one with fully flexible nominal prices. The chapter (which can be read before the first seven) highlights such classic or soon-to-be-classic subjects as seignorage, endogenous price-level instability, speculative exchange rate crises, target zones for exchange rates, and the pricing of risky nominal assets.

Chapter 9 introduces sticky-price monetary models, with an emphasis on empirical stylized facts and the workhorse Keynesian models. The conceptual framework that grew out of Keynes' *General Theory* (1936) furnished the dominant paradigm for more than a half century. The Keynesian mode of analysis started with the pioneering work of Metzler (1942a,b) and Machlup (1943), included Meade's (1951) brilliant and prescient synthesis, and culminated in the systematic incorporation of capital mobility by Fleming (1962) and Mundell (1963, 1964) and of forward-looking expectations by Dornbusch (1976). Chapter 9's coverage of Dornbusch's celebrated overshooting model of exchange rates builds intuition and illustrates some first implications of sticky prices. The chapter concludes with one of the most fruitful applications of the simple Keynesian framework, the strategic analysis of credibility in monetary policy.

Chapter 10 is our attempt to provide a dynamic sticky-price model that preserves the empirical wisdom embodied in the older Keynesian tradition without sacrificing the theoretical insights of modern dynamic macroeconomics. This chapter is difficult if taken in isolation, but once you have learned the building blocks developed in earlier chapters, the analysis should prove quite straightforward and, dare we hope, intuitive. One big payoff from marrying Keynesian price-setting assumptions to an intertemporal framework is an apparatus for the formal welfare analysis of macroeconomic policies. Such a welfare analysis is implicit in all the vast literature on policy and regime choice but, surprisingly, it is almost never done in open-economy macroeconomics at a level of rigor that would be acceptable to, say, public-finance or pure-trade theorists.

Now, some suggestions on how to use this book. We stress that it is by no means necessary to read the book in sequence. Even though the overarching goal of our approach has been to unify the material in different chapters, we have also gone to great lengths to make chapters reasonably self-contained. We do so in part by using appendixes and supplements for material that may be helpful in more than one chapter. We also repeat ourselves a bit in explaining how to solve certain problems. (Hopefully, most readers will find this occasional repetition more useful than tiresome. In any case, there is free disposal.)

Our goal throughout has been to make the book as easy as possible for the serious reader. We warn, however, that some material is intrinsically harder than the rest. The *starred* (*) sections include some of the most technically challenging subject matter, as well as topics that represent nonessential digressions. All starred sections can be skipped on a first reading without loss of continuity.

Another strategic choice was to use discrete-time models wherever possible. This approach should take some of the mystery out of many topics that have traditionally been taught using continuous time models (for example, growth theory). We use continuous time in a couple of instances where the resulting model is much more elegant and easier to comprehend than it would be in discrete time. (Speculative attacks on fixed exchange rates and target zones are the two main examples.)

We also take pains to solve dynamic maximization problems in the simplest and most intuitive way. Most of the time we use straightforward substitution to eliminate budget constraints, thereby turning constrained into unconstrained maximization problems. We forgo substitution mainly in instances, such as in our analysis of Tobin's q , where a Lagrangian approach yields more economic insight. The reader is not compelled to use our methods. Supplements to Chapter 2 and 8 summarize alternative dynamic optimization techniques.

Though we have written this book with second-year graduate students in mind, our approach is basic enough that the main body of material can easily be understood by first-year graduate macroeconomics students or advanced undergraduates. One might want to skip most or all of Chapters 4, 6, and 10 in such a course, since this material is more difficult and is more central to advanced international finance than to basic core macroeconomics. On the other hand, most of Chapter 5, which looks at global capital market integration under complete markets, probably *should* be part of the core macroeconomics curriculum, even if it isn't now at many schools. (Macro readers might skip the somewhat more advanced material on nontraded goods in section 5.5 though even this should be accessible.)

You won't have to read the book very long before you see that it is replete with empirical examples and boxes of a sort rather unconventional in advanced graduate texts. These digressions encompass a wide variety of concrete applications meant to illustrate and deepen understanding of material in the exposition's main body. Like the starred sections, this illustrative material can be skipped without loss of continuity. However, we view it as very important. Applications give substance to theoretical points, helping readers make the connection between an abstract model and the real-world question it is trying to capture. We

treat the reader as a skeptic, and we try to offer evidence that there is life to these mathematical representations of stylized economic actors. In the empirical Application@ sections and boxes we generally do not attempt to reach the technical standards of a paper in *Econometrica*. Rather, the examples are meant to *illustrate*, more than decisively to *prove*, a point. That said, we have generally tried to assemble the most compelling supporting evidence we know or were able to think of.

Finally, a word on notation. The choice of symbols is designed to minimize overlap across the various chapters, without going outside the Greek and Roman alphabets. But the lower and upper cases of those alphabets are finite, and in a book this size it was impossible entirely to avoid overlap. For example, the Greek letter α is now standard as the parameter in a Dixit-Stiglitz constant-elasticity-of-substitution utility function. But α is also traditionally used to denote factor shares in trade theory. We use β for that purpose instead, but β is standard for denoting money-supply growth in monetary theory. You get the idea. On the whole, we think we have been quite successful in avoiding notational ambiguity either within a chapter or within a group of chapters covering common ground. If chapters are far removed from each other and cover disparate material, we worry less. Throughout the first seven chapters, for example, k denotes per capita (or per worker) capital. In Chapters 8 through 10, capital no longer enters the picture, and so we do not refrain from giving k other minor roles. A symbol glossary explains the notation and lists how the different letters are used. We hope our conventions are clear enough that the reader will never have to consult it.

Timing of asset stocks is another issue. The problem could have been finessed entirely had we used a continuous-time assumption throughout, but to us, the greater clarity and simplicity of a discrete-time approach, as well as its broader applicability without advanced mathematics, seemed decisive advantages. In the growth literature, it is natural to denote by $K(t)$ the capital stock set aside in period $t - 1$ for use in period t production; this convention becomes particularly appealing once we start to look at capital-labor ratios $K(t)/L(t)$. But in the asset-pricing literature, the convention is to define $V(t)$ as the market price at time t of a claim to the firm's output for periods $t + 1$ and beyond. In a model of Solow-style "shmoo" capital this notation gives rise to the somewhat jarring (but correct) result that $V(t) = K(t+1)$, which we could write more appealingly as $V(t) = K(t)$ in continuous time. We wanted Chapter 7 on growth to flow naturally for those conversant with the literature, but we also wanted Chapter 5 on asset pricing to look familiar. Our compromise is to use the growth-literature convention for the timing of capital and riskless bonds (including government debt) and the asset-pricing convention for market asset prices. A similar issue arose in our dating convention for money, as we discuss in Chapter 8. Again, this should be clear enough that it does not cause confusion. If not, the notation supplement is available.

Open-economy macroeconomics is a fascinating subject. No one book, even a very long one, can cover every issue. Nor can any single treatment of a field so big hope to treat even the issues it does take up in comprehensive detail, capturing every nuance and contending viewpoint. We do hope, however, that this book conveys both the excitement of international macroeconomics and the unifying economic principles underlying many of its seemingly disparate aspects.