

Preface

The primary objective of this book is to advance the state of the art in specifying and fitting to data structural multi-sector dynamic macroeconomic models, and empirically implementing them. The fundamental construct upon which we build is the Ramsey model. A most attractive feature of this model is the insights it provides into the dynamics of an economy in transition to long-run equilibrium. With some exceptions, Ramsey models are highly aggregated – typically single sector models. However, interest often lies in understanding the forces of economic growth across multiple sectors of an economy and on how policy impacts likely play out over time. Such analyses call for more disaggregated models that can be fit to country or regional data. This book shows how to: (i) extend the basic model to multiple sectors, (ii) how to adapt the basic model to account for policy instruments, and (iii) fit the model to data, and obtain equilibrium values both forward and backward in time from the data points to which the model is initially fit.

Although extremely helpful in understanding economic growth and structure, theory alone is not sufficient; we also need to confront theory with data. Fitting growth models to data has been greatly facilitated by advances in numerical algorithms and computer technology. The ease of obtaining numerical solutions using procedures that are relatively robust across a broad range of model specifications is important because the differential equations of even the single sector, two factor, closed economy Ramsey model are essentially analytically intractable. The methods advanced here, and illustrated with numerical examples, are easily used in the classroom. Our experience suggests this material is accessible to advanced undergraduate and beginning graduate students, and easily managed by those working in agencies and bureaus familiar with general equilibrium concepts. An un-

derstanding of the subtleties of control theory and numerical algorithms is not required, but familiarity with a programming language such as Mathematica is essential. Over the past several years, we have had students choose a country, conduct a growth accounting exercise, formulate the country data into an elementary social accounting matrix format, fit a model to data, and then obtain a numerical solution using off-the-shelf software. We found that such assignments greatly strengthens students' grasp of theoretical concepts and helps them link these concepts to real economies. Grasping the theory and knowing how to implement the theory to obtain empirical insights into real problems provides them a form of human capital that they are unlikely to attain so easily in other ways.

The book is organized by first reviewing the fundamentals of duality theory of the consumer and firm, which is then used to review the standard two-sector, two-factor Heckscher-Ohlin-Samuelson model of a small open economy. Using duality theory, Chapter 3 introduces the two sector closed economy Ramsey model in a rather structured fashion, and concludes with an empirical example. Chapter 4 develops a three-sector, open economy model with a non-traded good sector. Chapters 5 and 6 extend the three-sector model in several directions: intermediate factors of production; capital stock composed of the output of all sectors of the economy; government consumption with taxes and lump-sum transfers from households. Chapter 7 concludes with a two country "world" model. In each chapter, the model presentation follows a similar pattern and builds off the structure of the previous chapter. Each modeling chapter concludes with an empirical example using the same data set. The book concludes with two chapters that discuss how the data are organized to facilitate the fitting of models to data, and the strategy used to facilitate the solution of each model's system of differential equations.



<http://www.springer.com/978-0-387-77357-5>

Multisector Growth Models

Theory and Application

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2010, XIV, 330 p., Hardcover

ISBN: 978-0-387-77357-5