
Preface to the Second Edition

Central Banks and Economic Offices advising governments increasingly rely on the use of dynamic, stochastic, general equilibrium growth models based on an optimizing behavior of the different agents in the economy, to obtain predictions on the effects of alternative economic policies on the main economic aggregates. This book was written to provide an understanding of theoretical concepts underlying such models, as well as the methods to obtain the numerical solutions that are needed to discuss the effects of alternative economic policies.

The book deals with modeling, simulation, and policy evaluation at an intermediate level. It was conceived to provide a comprehensive review of exogenous and endogenous, nonmonetary and monetary stochastic growth models. In all the models considered, agents solve dynamic optimization problems under uncertainty. They can be general equilibrium models where markets clear, or incorporate frictions in the form of price rigidity under monopolistic competition, as in the models pertaining to the New Keynesian Macroeconomics. All the models presented in the book assume the existence of a representative agent, with no heterogeneity.

Models of this type generally lack an analytical solution, and it has become customary in Macroeconomics to characterize their implications through the statistical properties of their numerical solutions, like correlation matrices among the main variables, estimated regressions, or impulse response functions. The contribution of the book is twofold: to present in a single volume a variety of models that are dispersed through the literature, and to provide procedures to obtain numerical solutions to the different models considered. The book does not discuss estimation methods, which have seen many recent developments, either from a frequentist or from a Bayesian approach, whose discussion would require a separate volume.

For each model, we present the structure of the economy, paying special attention to the information set of each agent, their objective functions, and the restrictions they face. Analytical equilibrium conditions are then obtained, and the approach to compute numerical solutions is carefully described. In some cases, an EXCEL spreadsheet is presented to compute a single solution realization, so that the reader can grasp the specific details of the numerical solution strategy. In all cases, a MATLAB file is used to compute an arbitrary number of solution realizations.

Numerical solutions are used to illustrate theoretical properties of each model as well as to discuss the effects of economic policy interventions. Along the different chapters, 'Numerical Exercise'-type sections are included to discuss the

characteristics of a given model or the effects of a particular policy. Programs to compute numerical solutions become relatively more complex as we move from exogenous to endogenous growth models and from nonmonetary to monetary models. The reader can take the opportunity to learn how to write this type of programs. No initial background on mathematical programming is needed.

We have received many comments from readers of the first edition, most of them from academic institutions, but also from some central banks. They generally point out the increasing relevance of the topics treated in the book, as reflected in many prestigious economic journals as well as in reports from Central Banks or international economic institutions like the OECD, FMI, or the World Bank. Users tend to believe that the presentation of the models and their solution methods is simple enough to allow them to address some policy questions in the models we discuss, as well as to advance in solving more complex models. Presenting the second edition of our book, we want to thank all of our readers for their confidence and their feedback.

The second edition corrects a few typographical errors of the first edition, which seem to appear no matter how many revisions were made before publication, and improves some notation. For technical reasons, the Internet address to the programs used in the book has changed. Excel spreadsheets and Matlab programs can now be downloaded from <https://www.ucm.es/fundamentos-analisis-economico2/growth-textbook>.

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Economic Growth

Theory and Numerical Solution Methods

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