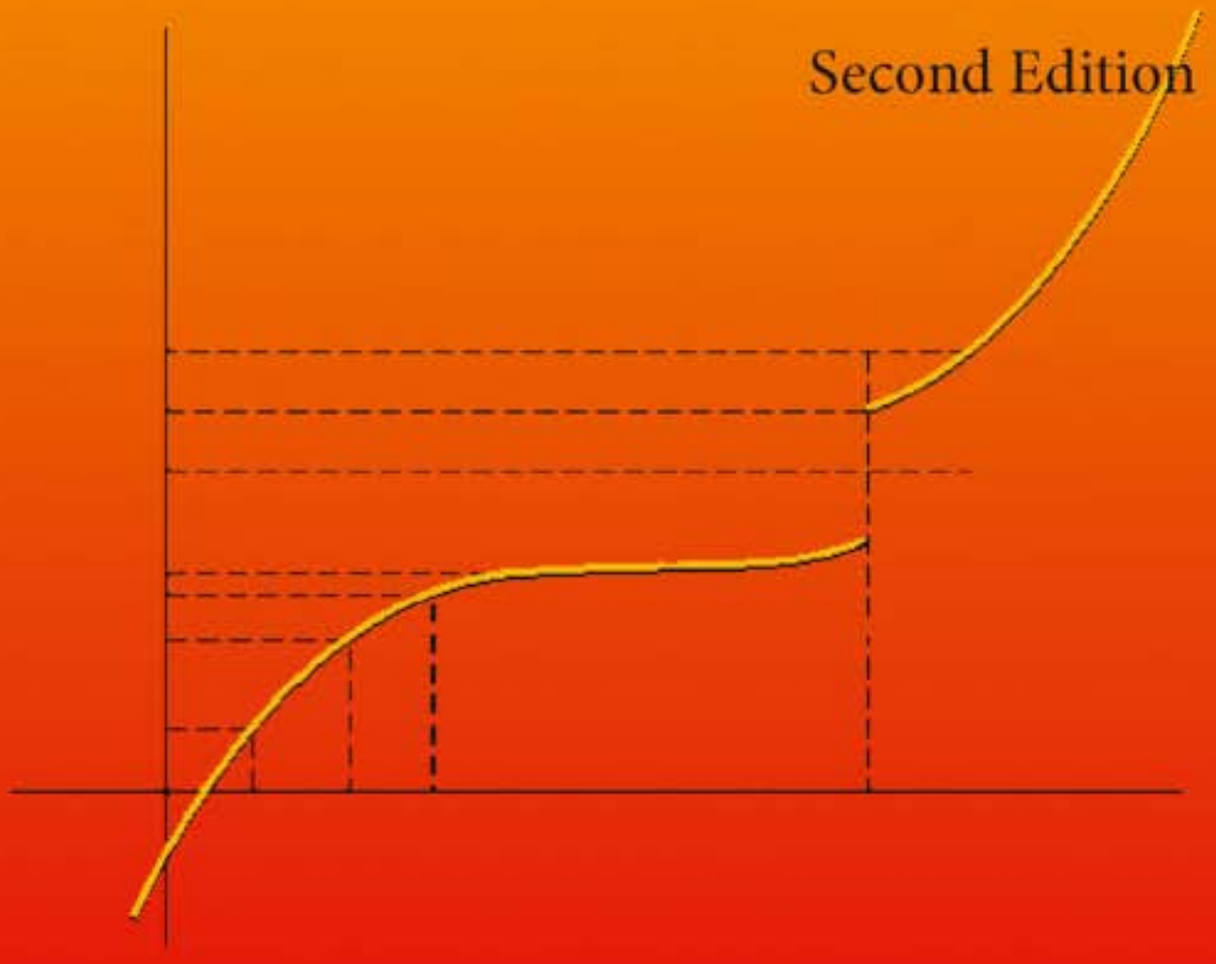
KAMRAN DADKHAH

Foundations of Mathematical and Computational Economics

Second Edition



Springer

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Kamran Dadkhah

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To Karen and my daughter, Lara

Preface

Mathematics is both a language of its own and a way of thinking; applying mathematics to economics reveals that mathematics is indeed inherent to economic life. The objective of this book is to teach mathematical knowledge and computational skills required for macro and microeconomic analysis, as well as econometrics. In addition, I hope it conveys a deeper understanding and appreciation of mathematics.

Examples in the following chapters are chosen from all areas of economics and econometrics. Some have very practical applications, such as determining monthly mortgage payments; others involve more abstract models, such as systems of dynamic equations. Some examples are familiar in the study of micro and macroeconomics; others involve less well-known and more recent models, such as real business cycle theory.

Increasingly, economists need to make complicated calculations. Systems of dynamic equations are used to forecast different economic variables several years into the future. Such systems are used to assess the effects of alternative policies, such as different methods of financing Social Security over a few decades. Also, many theories in microeconomics, industrial organization, and macroeconomics require modeling the behavior and interactions of many decision makers. These types of calculation require computational dexterity. Thus, this book provides an introduction to numerical methods, computation, and programming with Excel and Matlab. In addition, because of the increasing use of computer software such as Maple and Mathematica, sections are included to introduce the student to differentiation, integration, and solving difference and differential equations using Maple and to the concept of computer-aided mathematical proof.

The second edition differs from the first in several respects. Parts of the book are rearranged, some materials are deleted and some new topics and examples are added. In the first edition most computational examples used Matlab and some Excel. In the present edition, Excel and Matlab are given equal weights. These are done in the hope of making the book more reader friendly. Similarly, more use is made of the Maple program for solving non-numerical problems. Finally, many errors had crept into the first edition, which are corrected in the present edition. I am indebted to students in my math and stat classes for pointing out some of them.

I would like to thank Barbara Fess of Springer-Verlag for her support in preparing this new edition. I also would like to thank Saranya Baskar and her colleagues at Integra for their excellent work in producing the book.

As always, my greatest appreciation is to Karen Challberg, who during the entire project gave me support, encouragement, and love.

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