

# Preface

This book is devoted to the mathematical modeling of the dynamics of decentralized economic systems. The author became interested in this topic while analyzing government economic regulation methods in countries with predominantly centralized management. As it turned out, in such countries, a significant part of management decisions related to economics is made at the local level. This can be explained by the fact that—contrary to what the authorities might wish for—any modern economy, being a very complex system, cannot function in a satisfactory way under totally centralized management. The range of products being enormous and the network of production and consumption relations being extremely large, it is simply not possible to manage everything from a single control center. As a result, even in countries that employ totalitarian government methods, part of economic decisions are delegated to the level of industrial sectors or even to the level of enterprises.

On the other hand, the complete economic autonomy of economic agents is a key property of any market economy. In the modern world, this type of economy has been embraced by most countries, which allows them—despite a number of problems that remain unresolved—to further scientific and technological advances and improve the quality of life for their residents. At the same time, in the author's opinion, the impact of the decentralized management factor on economic dynamics is yet to receive due attention from the research community.

The field related to the use of mathematical methods for studying decentralized economic systems is extremely broad, but the author selected a relatively narrow subfield, one dedicated to the existence of and reaching balanced growth in models of systems that use Leontief technologies. A presentation of the results obtained while studying this subfield constitutes most of this book. However, the author remained somewhat unsatisfied with some of the assumptions made while building the models. An attempt was made to move the assumptions closer to the real economic world. In the resulting, modified models, some of the economic indicators showed an asymptotic tendency to cyclicity. This book also contains an analysis of the dynamics of these models.

It should be stressed that all the considered models are extremely simplified representations of real-world economic processes. Nevertheless, the obtained results

allow the author to put forward the following bold hypothesis: Decentralized systems should be considered from the perspective of cyclical dynamics rather than that of balanced growth.

As noted above, modern economic systems are extremely complex. However, the history of mathematical economics tells us that some of the aspects of economic life can be studied successfully provided that an appropriate mathematical model is developed. The author hopes that this book will help draw the attention of the research community to the important topic of using mathematical methods for studying the dynamics of decentralized economic systems.

It is presumed that the reader is familiar with basic matrix analysis methods. Nevertheless, the book includes a brief overview of the properties of nonnegative matrices, which can be referred to when reading the main chapters of the book.

This book will be of interest to professionals studying the dynamic models of economic systems. It may also be of help to senior undergraduate students and graduate students studying the application of mathematical methods in economics.

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