

Modeling Process in Various Industries

Kenjayev Ravshan Xudayberganovich, Zakirova Gavhar Botir qizi
Tashkent State transport University

Annotation: Simplified formal descriptions of various economic phenomena, called economic models, are used to study various economic phenomena. Examples of economic models are consumer choice models, firm models, economic growth models, equilibrium models in commodity and financial markets, and many others.

Key words: Economic, models, consumer, financial, markets, and many other, mathematical models.

Currently, economic science and practice are increasingly mastering the achievements of applied mathematics, turning them from a tool of scientific research into an important means of effectively solving complex economic problems.

Modern economic theory, both at the micro and macro levels, includes mathematical models and methods as a natural, necessary element. The use of mathematics in economics makes it possible to identify and formally describe the most important, essential connections of economic variables and objects, accurately and compactly state the provisions of economic theory, formulate its concepts and conclusions.

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The main stages of the modeling process in various branches of knowledge, including in economics, acquire their own specific features. Let's analyze the sequence and content of the stages of one cycle of economic and mathematical modeling.

1. Formulation of the economic problem and its qualitative analysis. This stage includes the identification of the most important features and properties of the simulated object and abstraction from the secondary ones; the study of the structure of the object and the main dependencies linking its elements; the formulation of hypotheses (at least preliminary) explaining the behavior and development of the object.
2. Construction of a mathematical model. This is the stage of formalization of an economic problem, its expression in the form of specific mathematical dependencies and relations (functions, equations, inequalities, etc.). Usually, the basic design (type) of a mathematical model is first determined, and then the details of this design are clarified (a specific list of variables and parameters, the form of connections).
3. Mathematical analysis of the model. The purpose of this stage is to clarify the general properties of the model. Purely mathematical research techniques are used here. The analytical study of the

model elucidates such questions as, for example, whether there is a solution, whether it is the only one, which variables (unknown) can be included in the solution, what will be the relationship between them, within what limits and depending on what initial conditions they change, what are the trends of their changes, etc. The analytical study of the model in comparison with the empirical (numerical) one has the advantage that the conclusions obtained remain valid for various specific values of the external and internal parameters of the model.

And yet, models of complex economic objects are very difficult to be analytically investigated. In cases when analytical methods fail to find out the general properties of the model, and simplifications of the model lead to unacceptable results, they switch to numerical research methods.

4. Preparation of initial information. Modeling imposes strict requirements on the information system. At the same time, the real possibilities of obtaining information limit the choice of models intended for practical use. At the same time, not only the fundamental possibility of preparing information (for a certain period of time) is taken into account, but also the costs of preparing the relevant information arrays. These costs should not exceed the effect of using additional information.

5. Numerical solution. This stage includes the development of algorithms for the numerical solution of the problem, the compilation of computer programs and direct calculations. The difficulties of this stage are primarily due to the large dimension of economic tasks, the need to process significant amounts of information.

A study conducted by numerical methods can significantly supplement the results of an analytical study, and for many models it is the only feasible one. The class of economic problems that can be solved by numerical methods is much broader than the class of problems available to analytical research.

6. Analysis of numerical results and their application. At this final stage of the cycle, the question arises about the correctness and completeness of the modeling results, about the degree of practical applicability of the latter.

Mathematical verification methods can reveal incorrect model constructions and thereby narrow the class of potentially correct models. Informal analysis of theoretical conclusions and numerical results obtained by means of the model, their comparison with the available knowledge and facts of reality also make it possible to detect the shortcomings of the formulation of the economic problem, the constructed mathematical model, its information and mathematical support.

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