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THE NONLINEAR MODEL OF BEHAVIOR OF TWO COMPETITIVE FIRMS

Summary

The practical task of economics lies in applying the methods of substantiating its decisions. For economics, the main method is the modeling of economic phenomena and processes and, above all, mathematical modeling, which has been stipulated by the presence of stable quantitative patterns and the possibility of a formalized description of many economic processes.

The economic-mathematical model contains a system of equations of linear and nonlinear units that promote a mathematical description of economic processes and phenomena, consists of a set of variables and parameters and serves to study these processes and control them. Dynamic models of the economy describe it in development, as well as provide a detailed description of technological methods of production. Mathematical description of dynamic models is carried out with the use of a system of differential equations (in models with continuous time), difference equations (in models with discrete time), as well as systems of algebraic equations. It is important that the investigation of various economic issues has led to the development of the mathematical apparatus. In linear algebra, productive matrices are caused by the studies of intersectoral balance, whereas mathematical programming arose in the course of researching the optimal plan for the distribution of limited resources. In a similar way, there emerged the theory of economic indices and econometrics, the theory of production functions and the theory of consumption, the theory of general economic balance and social welfare, the theory of optimal economic growth.

The paper under studies deals with the dynamic economic behavior of two competing objects, whose mathematical model is a nonlinear nonlocal problem for a system of ordinary differential equations with variable coefficients and argument deviation. The dynamic mathematical model is based on the assumption that the volume of output of both firms is determined by such factors on which output depends linearly. The model under discussion includes nonlinear factors, which describe the level of distrust of the competitors and depend on the time of observations and production volumes in previous moments, because the latter significantly affect the production activities of the firm. Such mathematical models are called time-delayed models.

Keywords: mathematical model, dynamics, volume of output, time-delayed models, competing firms.

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