DISTRIBUTED LAGS IN PROBLEMS OF ECONOMIC DYNAMICS

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This paper examines the impact of the production and economic activities of the enterprise on the mechanism of market pricing. It is based on the assumption that the price of a product reaches its equilibrium value as a result of the balance between supply and demand, and the volume of goods (commodity weight) is determined by the correspondence between the demand price and the supply price. A mathematical model of the economic system is proposed, which describes the dynamics of the interaction between price and volume of production in the market of one product.

Mostly in economic theory, static models are considered. System dynamics manifests itself if the model takes into account delays (lag) either on the demand side or on the supply side. [1]. The independent variables in this model are the price of a unit of goods $p = p(t)$ and the volume of output $y = y(t)$ at a time point t. The volume of market $D(p, y, t)$ demand at the present moment depends on all previous supply values $S(p, y, \tau)$, $\tau \in [0, t]$. Similarly, the demand price $P_s(p, y, t)$ at a time point t depends on the previous values of the supply price $P_s(p, y, t)$, $\tau \in [0, t]$. When considering the state of the economic system in continuous time, we obtain a system of two integral equations for determining $p(t)$ and $y(t)$:

$$\begin{cases} D(p, y, t) = \int_0^t K_1(t, \tau) S(p, y, \tau) d\tau; \\ P_d(p, y, t) = \int_0^t K_1(t, \tau) P_s(p, y, \tau) d\tau. \end{cases} \quad (1)$$

In this system, the functions $K_1(t, \tau)$ and $K_2(t, \tau)$ are characteristics of the influence of the state of the system at previous moments of time for basic variables $p(t)$ and $y(t)$ at a time point t. Presenting D, S, P_d and P_s in an explicit form, it is possible to transform system (1) to a system of two integral equations of the Valterra type.

It should be emphasized that the use of a time-distributed delay in an economic model significantly expands the class of solution with the remaining uncertainty in the choice of specific values of the structural parameters of the model. The proposed model can be used for a qualitative analysis (by phase trajectories) of the development of the economic system at the level of an individual enterprise or industry, taking into account the influence of the global market for each type of product.

References (translated):

1. Voronin A., Lebedeva I., & Lebedev S. Dynamics of Formation of Transitional Prices on the Chain of Sequential Markets: Analytical Model // Economic of Development. – 2022. – Vol. 21(1). – P. 25-35.