

MATHEMATICAL MODELLING OF THE OPTIMAL MARKET OF COMPETING GOODS IN CONDITIONS OF DELIVERIES LAGS

Poddubny V.V., Romanovich O.V.

Tomsk State University, Russia, 634050, Tomsk, 36 Lenin av., TSU

vpoddubny@gmail.com

¹hjkm@ngs.ru

The dynamic mathematical model of the market of the competing goods is considered at linear dependence of a vector of goods demand from a vector of their prices in conditions of delay of goods deliveries on the market. The problem of optimization of strategy of goods deliveries onto the market at assumption of determinancy of demand is decided. The maximum profit of the seller from sale of each kind of the goods is accepted as criterion of an optimality of functioning of the market with taking into account influence of the prices of the competing goods onto demands on the goods of each kind.

Nonlinear restrictive difference equations (with restrictions of inequalities type) are received at assumptions that dynamics of the vector variables of conditions of the market (the prices of the goods, a consumer demand, sales volumes, not sold goods remainders) is of discrete time and depends from volumes of goods deliveries to the market. It is shown that conditionally maximum profit of the seller (at the fixed level of deliveries of the goods to the market) is expressed by continuous piecewise-smooth function of a vector of level of deliveries. The optimal (from the point of view of maximum of the seller profit) strategy of goods deliveries onto the market is found. This strategy takes into account a market condition (commodity deficiency, overstocking of the market or dynamic balance between supply and demand for each of the goods) in the current time moment and in the future moment onto which delivery will be predicted. It is shown that the seller can provide the highest profit only in a zone of dynamic balance of the market when the goods offer coincides with a consumer demand in some range of the prices. It is shown also that owing to delay of goods deliveries to the market the construction and the realization of optimal strategy of deliveries are possible only by means of the virtual market model which predicts the market condition for all moments of the interval of deliveries delay. The algorithm of construction and realization of optimal strategy of deliveries is offered. This model generalizes on a case of many competing goods a market model of goods of a single type [1].

Numerical modelling of functioning of the market of competing goods in conditions of the deliveries delay with the optimal deterministic strategy of deliveries has been done in both cases when demand for the goods was deterministic, and when it was with casual fluctuations.

References

1. Poddubny V. V, Romanovich O.V. The market with the fixed line of demand as optimal system // Trudy X international FAMET' 2011 conferences / O.Ju.Vorobyov (Ed.). – Krasnoyarsk: KSTEI, CFU, 2011. Pp. 318-323.