INNOVATION MARKET ISSUE IN ECONOMY SYSTEM MODEL OF THE REPUBLIC OF TATARSTAN

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ABSTRACT
The paper proposes to use a modified system functional model of the market economy with the inclusion of the innovation market in it. The need for its development is conditioned by the fact that innovations are not separable today from the concept and the process of economic development, their impact is equated to the factors of production by authors. At the same time, a separate method of their influence accounting on the economic system is proposed - a modified system model of the market economy developed on the example of the Republic of Tatarstan economy. Thus the market of innovations fits into the model of the Republic of Tatarstan economy in connection with the classical markets of production factors: labor market, capital market and commodity market. This allowed us to discover the interdependence of the cost and quantity indicators of these markets, to describe these relationships in mathematical form and give a graphic representation of them. At the same time, both stable interdependencies and unstable and less stable ones were obtained, which makes it possible to rely on them when conclusions are drawn based on the results of the model development. The article shows the results of statistical data analysis and the system functional model of the market economy is developed with the inclusion of the innovation market of the Republic of Tatarstan. The result of the work is the author's comments and recommendations for the development of the Republic of Tatarstan state policy.

Keywords: economic policy, economic modeling, economy model, the functional model of the market economy, the market of production factors, innovations, innovation market.

INTRODUCTION

At present, in the conditions of world turbulence, the problems related to the forecasting of an economic system and the influence of innovative factors and factors of the developing IT market on it are becoming increasingly important. Nowadays, the domestic economic system is characterized by extreme heterogeneity of development levels in the context of individual regions, economic zones and economy sectors. Applied in-country average statistical values lead to a significant distortion of the obtained information and, thus, to possible errors in forecasting when critical decisions are made. In order to minimize such consequences, the authors attempted to search for the most stable quantitative proportions in the internal Russian territorial space. The approach is based on the macroeconomic mathematical model, called the system functional model of the market economy. The advantage of the approach is the study of each of the markets by the determination of their quantitative and qualitative characteristics mutual influence degree [1].

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The system of national reproduction is inseparable now from the mechanism of the innovation market, and innovations play an increasing role in the economic process. In this regard, it is extremely important to include the innovation market mechanism in the system functional model of the market economy, where it is represented by the number of innovative enterprises as a quantitative indicator and the volume of innovative product output as a cost indicator. The conclusions and the results of the work will be of interest to the expert scientific community, state authorities at the federal and regional levels implementing state policy in the areas of state planning and forecasting.

MATERIALS AND METHODS

Until recently, a systematic understanding of inter-market interaction in economic science, namely the mutual influence of the qualitative or quantitative parameters of one market on the corresponding parameters of another, was not presented clearly. Modern theories and approaches of management and forecasting are based on the methodology and the approaches developed by J.M. Keynes - he was the first one who introduced the concept of national income into the system of economic analysis [2]. This allowed him to prove that it is investments that affect the change of its volume and structure [3,4,6]. The model of the economy according to J.M. Keynes was developed in the income and expenditure model by J. Hicks - A. Hansen [9]. Despite more than significant contribution of these scientists to the study of economic management problems, there are certain limitations in these models that do not allow us to rely on them fully during the prediction of the Republic of Tatarstan mesoeconomics [5,7,8]. First of all, such limitations include a weak connection with other important economic systems and markets. For the same reasons, these theoretical models are difficult to use in mesoeconomics prediction. In order to solve the abovementioned limitations, the foundations of the systemic functional model of the market economy were proposed by the Doctor of Economic Sciences, Prof. M.R. Safiullin based on the basis of a variety of critical analysis approaches to the methodology of macroeconomic modeling (F. Kane, A. Marshall, J.M. Keynes, L. Walras, V. Pareto, J. Hicks, P. Samuelson, etc.) and the synthesis of different points of view on the processes of economic system functioning [9,12,13,14]. The principal difference of the proposed model is that when it is constructed, the author focuses not on the description and the modeling of the processes of classical markets of factor and production result operation (labor market, commodity market, capital market), but on the proportions of the so-called "intermarket interaction" [4].

The presented system functional model of the market economy operates with classical markets of production factors. However, the modern economic environment is characterized by extremely high turbulence, the emergence of new intermarket relationships that require a detailed consideration. As was noted earlier, the system of national reproduction is now inseparable from the mechanism of the innovation market, and innovations play an increasing role in the economic process [2,3]. The introduction of innovations in any aspect of the economic life of society gives rise to the expectation of their quick return, the achievement of a fair economic effect, and the increase of competitive advantages [7,8]. In this regard, we consider it is extremely relevant to include the mechanism of innovation market in the system of the market economy functional model. By the market of innovations, we mean that the interaction in this market is nothing but the innovations of different nature. Such a product as innovations is quite difficult to determine, which causes certain difficulties in the system of market indicator accounting. The object of exchange in the sphere of innovation activity can be the results of any stage of the innovation process implementation: fundamental research, applied research and development. The innovative market is organizational, i.e., both enterprises and various institutions act as providers and buyers. The economic entities in the sphere of innovation activity can act as the consumers of some innovations (of a lower level) and the suppliers of innovations of a higher level. At the same time, the quality of final innovative products and services is determined by the quality of innovation throughout the innovation chain [4].

In the system model of the market economy, the innovation market is represented by the number of innovative enterprises as a quantitative indicator and the volume of innovative product output as a value

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indicator.

During the calculation of the system functional model of market economy with the introduction of an innovation market, we obtained the following quadrants: the actual market of innovations; the influence of innovative product output volume on the value of fixed production assets; the influence of innovative product output volume on the price index; the impact of innovation product output volume on the number of people employed in the economy; the influence of innovative enterprise number on the cost of labor; the influence of innovative enterprise number on GRP; the influence of innovative enterprise number on an interest rate [10,11]. Thus, additional seven sectors are included in the nine-sector system functional model of the market economy.

RESULTS AND DISCUSSION

A number of conclusions can be drawn from the obtained system functional model of the market economy, including the market of innovations.

The innovation market is graphically presented in the following form:

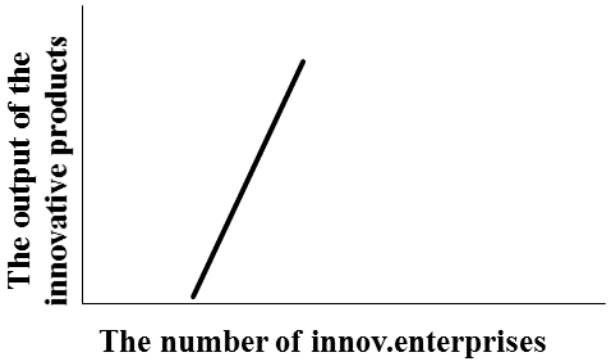

Fig. 1. The model of market of innovations

As can be seen from the graph, the innovation market is characterized by a high degree of dependence (R^2 = 0.716) on the output of innovative products and the number of innovative enterprises. In mathematical terms, this relationship can be represented in the following form:

$$y = 2.8048x - 230.4 \quad (1),$$

that: y– the output of the innovative products;

x –the number of innovative enterprises.

It can be noted that with the number of innovative enterprises increase, the output of innovative products also grows, which represents a wide range of possibilities in the regulation of the innovation market.

When the interdependence of fixed production assets cost and the volume of output of innovative products

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(11 quadrants) are analyzed, it can be noted that the dependence is stable ($R^2 = 0.92$) and has the following form:

$$y = 2E - 0.8x^{1.5772} \quad (2),$$

that: y- the output of the innovative products;

x- the value of basic production assets.

It should be noted that the growth of OPF value causes a steady growth in the output of innovative products, which allows to influence the output of innovative products by varying some aspects of OPF management (for example, depreciation policy). The graphically indicated relationship has the following form:

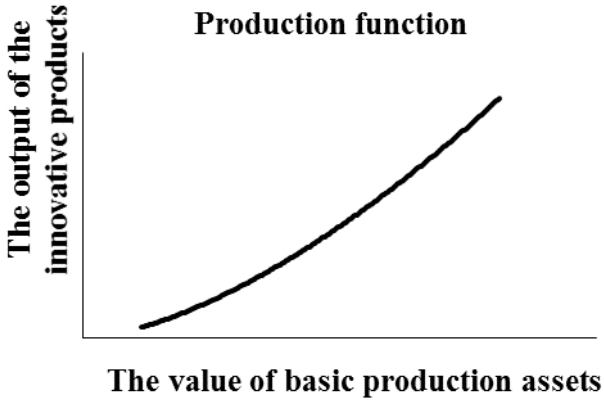

Fig. 2 The production function of the market innovations

The interdependence of innovative product output volume and the price index are shown graphically on Fig. 3.

Fig. 3. Influence price index on the output of the innovative products

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Mathematically, this interdependence can be displayed in the following form:

$$y = 1E + 15e^{-27.4x} \quad (3),$$

that: y- **t**he output of the innovative products;

x- price index.

This dependence is characterized by a high level of the approximation coefficient ($R^2 = 0.77$). Thus, it can be argued that the increase of the price index level leads to an imminent decline of innovative product output.

The interdependence of the number of employees and the volume of output of innovative products can be visually shown in the following form:

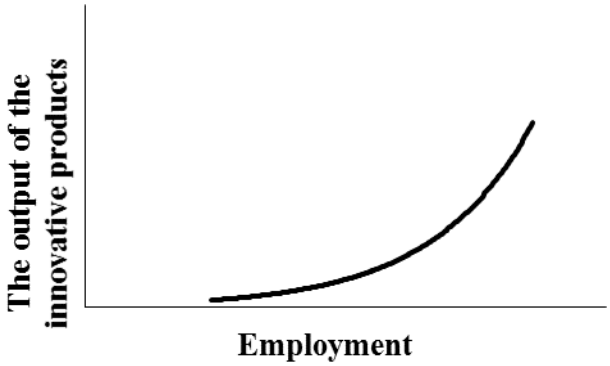

Fig. 4 Isoquants of production functions

In mathematical form this interdependence is described by the function of the following form:

$$y = 4E - 19e^{0.0263x} \quad (4),$$

that: y- the output of the innovative products;

x - employment.

With the growth of employed in the economy, the volume of innovative product output increases and vice versa. This dependence is very stable, as evidenced by the high approximation coefficient ($R^2 = 0.94$). Thus, it can be concluded that varying the level of employment in economy one can also influence the innovation nature of the products produced in the region.

Let's consider the mutual influence of innovative enterprise number and the size of wages. It was revealed that with the growth of innovative enterprise number, the level of wages also increases in the following mathematical dependence:

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$$y = 283.12x - 23519 \quad (5),$$

that: y - wage;

x - the number of innovative enterprises.

This process can be visualized as follows:

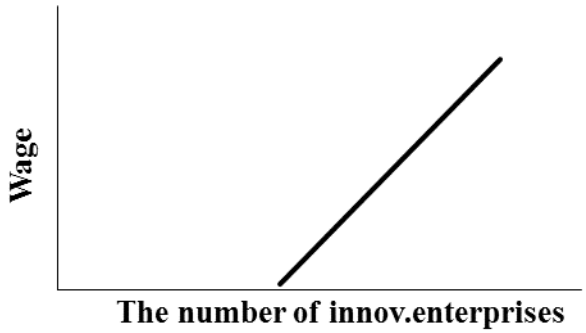

Fig. 5 The wages and the number of innovative enterprises

However, the value of the approximation coefficient here is relatively small ($R^2 = 0.69$), which does not allow to identify clear management tools in this combination.

A similar situation is observed in the analysis of the number of innovative enterprises and the volume of produced GRP interdependence:

$$y = 17174x - 1E + 06 \quad (6),$$

that: y - the output of products;

x - the number of innovative enterprises.

In the course of the study it was revealed that the growth of innovative enterprises number causes the increase of produced GRP volume. This process is visualized on Fig. 6. Note that this dependence is characterized by a relatively high value of the approximation coefficient ($R^2 = 0.72$). We assume that this dependence will allow us to formalize an additional instrument of influence on the state of Republic economy.

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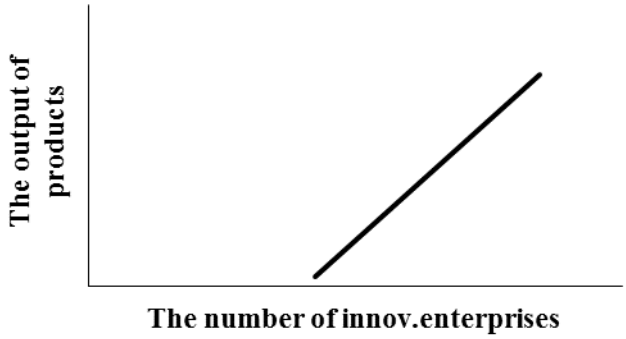

Fig. 6 Influence the number of innovative enterprises on the output of products

The interdependence of innovative enterprise number and the rate of interest is shown on Fig. 7.

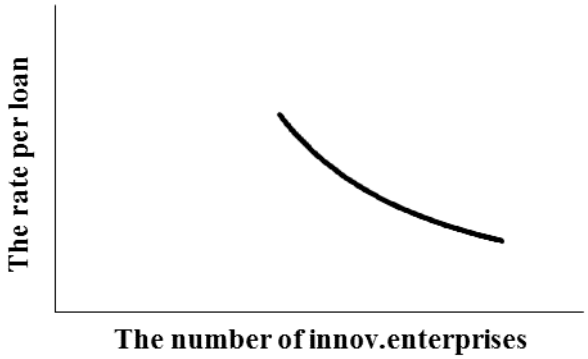

Fig. 7 Influence capital price of innovative enterprises

During the analysis of the number of innovative enterprise influence on the rate of interest, the interdependence was revealed, which is described by the power function of the following form:

$$y = 16457x^{-1.485} \quad (7),$$

that: y - the rate per loan;

x - the number of innovative enterprises.

The reduction of interest rate here is caused by the increase of innovative enterprise number, but this process is characterized by a relatively low level of the approximation coefficient ($R^2 = 0.44$).

CONCLUSIONS

The obtained results make it possible to draw the following conclusions. First of all, the interdependencies between the following indicators can be called sustainable ones:

- the volume of innovative product output and the cost of fixed production assets. With the increase of

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fixed production assets value, the volume of innovative product output grows, which allows us to speak of innovative returns growth from OPF;

- the volume of innovative product output and the level of inflation. With the growth of price level, the output of innovative products is reduced;

- the volume of innovative product output and the number of people employed in economy, which reflects the productivity of innovative work.

Secondly, the following interdependencies are not very stable:

- the market of innovations;

- the dependence of wages and the number of innovative enterprises.

The interdependence of capital cost and the number of innovative enterprises is unstable.

Thus, we can note stable interdependencies between the value of innovation market and low-resilient and unstable ones in terms of innovation market value.

SUMMARY

During the development of the systemic functional model of the market economy, a number of key interdependencies were identified, which make it possible to expand and refine the mechanism for the development of the republic economic policy. The obtained results of a functional model system building of a market economy open a number of tools to manage certain aspects of the Republic of Tatarstan economy.

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