



## **Methodological Approaches of Scenario Modeling and Forecasting of Development of Agricultural Sector of the Russian Economy under Conditions of Foreign Policy and Conjunctural Changes (with the Republic of Tatarstan as an Example)**

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### **ABSTRACT**

The subject of the research includes peculiarities and regularities of the reaction of the agricultural sector of the Russian economy on the changing conditions of the economic management formed by the pressure of sanctions on the national economy. The object of the research includes the agricultural sector of the Russian economy (with the Republic of Tatarstan as an example). The authors particularly consider such aspects as the dependence between the dynamics of the production level of agricultural products of the Republic of Tatarstan on the dynamics of the index related to the economic activity of the region. On this basis the forecasting model of the development of agriculture in the Republic of Tatarstan is developed taking into account various scenarios of sanctions pressure on the national economy of the Russian Federation. Special attention is paid to the issues related to the analysis of the development of the agricultural sector of the republic economy in the short-term perspective in order to define its perspective competitiveness and stability of development.

**Keywords:** Regional Agricultural Sector, Expectations of Economic Agents, Economic Activity, Sanctions Pressure, Scenario Modeling of the Agriculture Development

**JEL Classifications:** Q13, Q14, Q17, Q18, F42, F47

### **1. THEORETICAL ASPECTS OF RESEARCH (INTRODUCTION)**

Today's conditions of economic management are characterized by a deep level of integration and inter-penetration of national economic systems. In its turn, it defines the order of coordinating and functioning economic relations that are formed as a result of the impact of not only internal but also external "impulses" on them. For example, the latter are formed as a result of overcoming trade barriers in interstate relations, or *vice versa* introduced limitations related to external resources and markets. The increase in constraint of relations with the Russian Federation

with a specific part of the world community that has been taking place over the recent months affixes special actuality to the considered processes of "external" impulses generation. It generates a number of serious risks expressed in the system of institutional and conjunctural limitations that directly or indirectly influence the development of the agricultural sector of the national economy.

Thus, instability of the development of external economic integration processes observed in recent years defines the necessity to develop new concepts and views to modeling forecasting models adapted to new conditions of economic management (Granberg and Mikheeva, 2009). Traditional models

that mainly take into account balanced methods are not always able to take into account the volatile nature of the development of the environment that generates a number of limitations of the economic development. The approach based on forecasting the dynamics of the development of indicators that estimate economic agents' expectations can act as one of the variants to solve the set task on developing the models adapted to changes in foreign policy and conjunctural changes. To a large extent, the latter are formed as a result of generating so called external impulses that correct conjunctural and institutional conditions of economic management. Taking into account that the agents' expectations and economic activity of regions are closely correlated, in future indicators of this hypothesis will be taken into account when developing forecasting models.

Researching "the nature" of external "impulses" occurrence, depth and level of consequences that arise as a result of their impact on national and regional economic systems require a detailed study. More than that, it is important that macroeconomic consequences expressed in changes of the volumes and dynamics of gross domestic product are based on structural changes in various types of economic activity. In its turn, it defines the character and structure of the development of regional economic systems. Each of them is unique in relation to the replenishment structure.

Thus, studying processes of external "impulses" impact on regional economic systems must be based on a comprehensive analysis of their sector development.

In this work external "impulses" will include sanctions of specific parties of the international community expressed for example in limiting export, access to financial markets, transfer of the latest technologies, etc.

It is necessary to note that external sanctions introduced in relation to the Russian economy affected almost all its sectors of economic activity, including of course the agricultural production. Herewith, in spite of strengthening a number of competitive advantages formed in 2014-2015 as a result of limiting a number of import supplies of the agricultural production (as a tool of counter sanctions), the agricultural sector of the Russian economy faced a number of tasks whose solution will define further perspectives and tendencies of its development. For example, it is necessary to refer the following perspectives and tendencies to the principle ones:

- Limiting access to "cheap" money (including due to the refusal of many banks to restructure old debts); it results in limiting resources related to the formation of the turnover funds of agricultural enterprises,
- Devaluation processes result in the growth of prices for a number of imported means of production and subjects of labor of agricultural products.

Thus, in fact Russian agricultural enterprises faced a new organizational environment of functioning that considerably limits not only their investment but also operational activity.

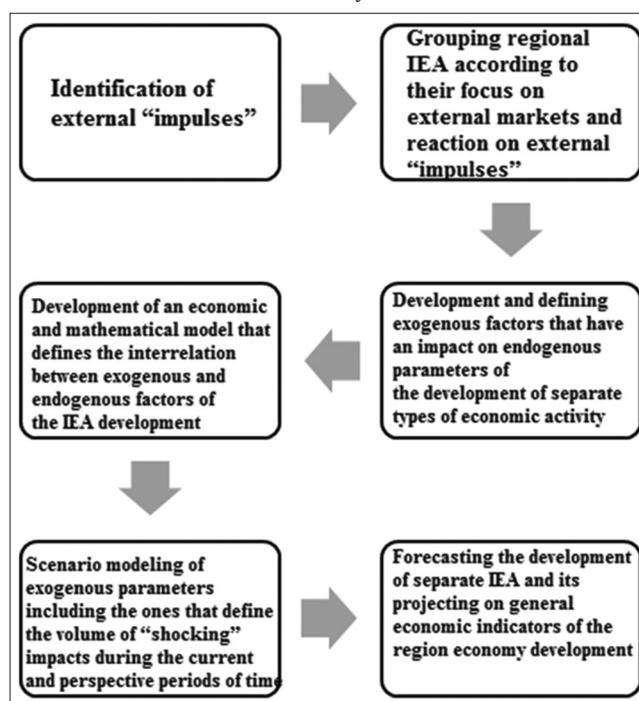
Based on the above, it is reasonable to develop mechanisms of modeling and forecasting the development of regional types of

economic activity adapted to changing external and conjunctural conditions of economic management. Due to this, the authors have developed a structural and logical scheme of modeling the impact of external "stimuli" on the development of regional international economic activities (IEA) including, of course, agriculture (Figure 1).

## 2. CONCEPT OF DEVELOPING FACTOR MODEL TO DEVELOP REGIONAL ECONOMIC SYSTEMS BASED ON MODELING ECONOMIC AGENTS' EXPECTATIONS (METHODS)

It is important to consider in details the list of indicators that define the aggregate of exogenous parameters of the development of regional sectors of economy. It is necessary to note at once that a lot of factors affect qualitative indicators of the development of separate types of economic activity. For example, dynamics of tempos of the growth of the world and national economy, investment activity in the considered sector of economy, changes in the price environment for the manufactured products, etc., can be referred to them. Along with this, including a great number of predicators can cause a number of certain problems (The complex information and analytical report "Economic and social situation of the Republic of Tatarstan for January-December 2013). Based on this, it is proposed to make a model on the basis of the limited number of exogenous factors that first of all characterize the dynamics of economic agents' expectations as the most important indicator of economic development. In addition, strengthening the proposed argumentation, it is possible to note that the considered

**Figure 1:** Structural and logical scheme of modeling the impact of external "impulses" on the development of regional types of economic activity



aggregation of indicators is closely correlated to the economic agents' expectations. That's why the initial equation excluded the considered factors in order to avoid equivocal results.

Thus, when selecting the functional form of econometric model of external "impulses" impact on the development of regional economic systems and their separate types of economic activity, we excluded a number of factors from independent factors in the equation and motivated this step with two basic aspects:

1. Possible additional factors have a derivate nature from the factors we use in the model.
2. The use of additional factors can lead to a problem of endogeneity that causes the shift of coefficients estimation in empiric models.

The logic of selecting the indicator that characterizes economic agents' expectations for the developed model of external "impulses" impact on the development of agricultural sector of the Russian economy is as follows. Expectations are a central core of defining perspective plans of the development worked out in the corporate sector. Any actions of economic agents that lead to correcting the volumes of the manufactured or shipped products result from their expectations, first of all. If economic agents' expectations are adaptive, to a great extent current volumes of products manufacture and supply will be defined by the previous values of their growth tempos (Safiullin, 2011). Expectations were modeled on the basis of the indicator that estimates the economic activity of the region.

Herewith, the authors propose to use the composite index of the economic activity of the region as an indicator that allows to follow the state of economic activity on a regular monthly basis. Economic activity is interpreted as a comprehensive and dynamic characteristic of the estimation objects that reflects the efficiency of using material, labor, financial and other resources according to all areas of activity and characterizes the quality of management, sufficiency of capital and possibility of economic growth.

The methodology of defining the index of the economic activity of the region applied in this research is based on applying the factor approach, i.e., revealing a set of factors that influence the level of social and economic development of the region. Under this approach the analyzed factors are firstly combined in sub-indexes that make up a sum of the range of weight-average estimations according to the analyzed components. Based on this system of indicators that characterize certain types of activity and index method, the integral (composite) or consolidated index – "Index of Economic Activity of the Region (IEAR)" is calculated. It defines the general level of economic activity of the estimation object. The methodology of estimating the IEAR is presented in previous works of the author's team (Safiullin et al., 2014 Safiullin et al., 2015).

Taking into account that IEAR is made on the basis of the conjunctural changes on external and internal markets, it is possible to state with a great degree of certainty that the developed model of the impact of external "impulses" on the development of regional economic systems analyzes the interrelations between external and internal markets of the manufactured products.

### **3. DEVELOPMENT OF MECHANISMS RELATED TO SCENARIO MODELING AND FORECASTING OF REGIONAL TYPES OF ECONOMIC ACTIVITY TAKING INTO ACCOUNT THE IMPACT OF EXTERNAL MACRO-ECONOMIC "IMPULSES" ON NATIONAL ECONOMY (DISCUSSION)**

The work sets a task to approbate methodological principles of accounting the impact of external "impulses" on the development of agricultural sector of the Russian economy (though the example of a certain region – the Republic of Tatarstan), and on their basis to define the level of its aptitude to external "impulses."

Criteria for developing an economic and mathematical model were selected from the available statistical base. The system of indicators does not contain expert indicators or indicators based on the results of inquiries of economic entities.

Thus, the hypothesis we use is based on the approach that reveals the interrelation between the dynamics of the agriculture growth and its tempos in previous periods as well as tempos related to growing values of the IEAR as the main indicator that reflects the economic agents' expectations.

Herewith, to our mind, it is extremely important and informative to estimate coefficients in case of the factor that estimates economic agents' expectations. So, if we calculate the data of the value in terms of the range of separate types of economic activity of the region, it is possible to define the level of their reaction on external "impulses" with a high level of probability. Thereby it is virtually possible to define the level of competitiveness and stability of development of both the types of economic activity under study and the region as a whole, and forecast their further development taking into account shocking impulses in the external environment that are formed currently and in the future (Gafurov et al., 2012).

This article shows estimation calculations of parameters of econometric models that define the interrelation between the dynamics of growth of the volumes of manufacturing agricultural products in the Republic of Tatarstan and economic agents' expectations.

So, the results of calculations show that there is a relation that reflects the dependence of tempos of the growth of manufacturing agricultural products in the Republic of Tatarstan on the dynamics of changes of economic activity indexes. It means that the agricultural sector of the economy of the Republic of Tatarstan demonstrates the features of sensibility to the foreign policy environment that changes. Thus, it is possible to confirm that the dynamics of stable development of agriculture considerably depends on external "impulses" that generate the structure and character of economic agents' expectations.

The developed algorithm is related to analyzing the impact of external "impulses" on the development of dynamics of manufacturing

agricultural products. It allows to carry out scenario modeling and forecasting of tempos of their growth depending on the environment that is formed on external markets, and that to a large extent defines the conditions of economic management on the internal market.

In order to do it, we will firstly forecast the scenario of the development of exogenous variables of the equation, and also develop the methodological approach to forecasting dynamics of external impulses.

The equation developed before includes two variables. Herewith, one of them is a lag one. It does not provide any corrections in actual values of the previous periods. Forecasting of exogenous variables includes the development of scenarios related to the development of economic activity of the region taking into account conjunctural changes and shocking impulses that are formed.

The work considers two scenarios:

1. Pessimistic:

Further development of the sanctions spiral by a number of countries in relation to institutional and economic parameters of the development of Russia.

2. Optimistic:

The difference of this scenario from the first one lies in a gradual decrease in the level of tension in relation to Russia with a specific group of Western countries that sanctioned a number of economic restrictions.

Forecasting the dynamics of external shocks as a consequence of maintaining or strengthening the sanctions pressure on the national political and economic landscape includes the correction of the pathway related to the development of economic activity in the region as a result of changing basic IEAR sub-indexes that define this pathway.

When developing the forecast of dynamics related to economic activity of the region characterized by high dependence on external conjunctural changes, scenario modeling was based on the parameter of economic activity decrease by 0.8% per quarter. It corresponds to the dynamics of economic activity index in 2014 – the beginning of 2015, and is rather adequate reaction (The complex information and analytical report “Economic and social situation of the Republic of Tatarstan for January-December 2013,” The complex information and analytical report “Economic and social situation of the Republic of Tatarstan for January-December 2014,” The complex information and analytical report “Economic and social situation of the Republic of Tatarstan for January-August 2015).”

Figure 2 shows a general form of forecasting the dynamics of index of economic activity in the Republic of Tatarstan for 2015-2016.

We described possible scenarios in terms of forecasting the dynamics of exogenous variables taking into account “shocking” external impulses. Now we will turn to the developed econometric model in order to develop forecasting of the dynamics of the exogenous variable development. First of all, its dynamics is

defined by the estimations of the developed model and dynamics of exogenous shocks.

Figure 3 shows forecasting of the dynamics of the production of the agricultural sector of economy of the Republic of Tatarstan for two scenarios that are considered.

#### 4. CONCLUSION

The research results demonstrate that in the short-term perspective the impact of “external” shocks will not considerably affect agricultural sector of economy of the Republic of Tatarstan (pathways of dynamics of volumes of manufacturing agricultural products in the Republic of Tatarstan are internally close) (Table 1). Taking into account that the value of the coefficient that estimates the reaction of volumes of production in agriculture as a result of correcting economic activity is not large (0.04), the impact of shocking impulses has an insignificant impact on the production indicators of the considered type of economic activity.

At the same time the pressure by a number of world community members on the economic development of Russia in the form of sanctions has a more considerable impact within the considered area of forecasting. It neutralizes and even suppresses positive effects for the considered type of economic activity from

Figure 2: Scenarios of dynamics related to developing economic activity of the republic of Tatarstan

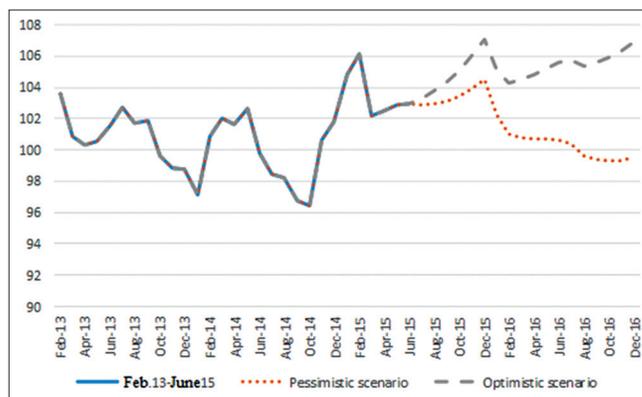
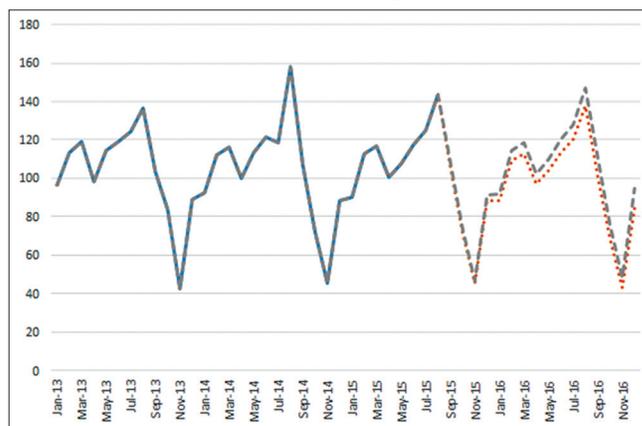


Figure 3: Forecasting the Development of Volumes of Agricultural Products Manufacture in the Republic of Tatarstan



**Table 1: Characteristics of parameters related to statistical significance of econometric equations that estimate dependence of dynamics related to volumes of manufacturing agricultural products of the republic of tatarstan on dynamics related to index of economic activity of the region**

Territory	Y – crossing	t-statistical (P=0.05)	P (lag value)	t-statistical (P=0.05)	IDA (lag value)	t-statistical (P=0.05)
Republic of Tatarstan	94.56	2.02	2.21	1.98	0.04	2.58

where P is the tempos of growth of manufacturing agricultural products in the republic of Tatarstan (graduated series), IDA is the tempos of growth of the composite IEAR

implementing procedures of counter sanctions pressure (Smirnov, 2010). Herewith, in the short-term perspective these shocks do not lead to considerable corrections of the volumes of production of agricultural enterprises of the Republic of Tatarstan (Gafurov et al., 2012; Safiullin et al., 2011).

As a conclusion, it is necessary to note that the developed methodological approach allows to estimate the level of reaction of separate types of economic activity on the impact on regional and national economic systems by shocking “impulses.” Herewith, values of coefficients denote the elasticity of the studied endogenic parameters as a result of the current and perspective corrections of economic agents’ expectations. To a large extent, they can show the level of sensibility of various types of economic activity to various types of impact. Thereby, it is possible to judge about the current and perspective levels of competitiveness of not only regional sector types of activity but also the whole region in general.

Thus, the developed methodological apparatus allows to forecast economic development of separate regional sectors of economy taking into account the impact of external “impulses” on them. It forms a stable basis for the development of sector programs of development and allotment of production forces taking into account the perspectives of their development and competitiveness in the system of external policy and conjunctural changes.

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## REFERENCES

- Gafurov, I.R., Safiullin, M.R., Safiullin, A.R. (2012), The Analysis of Competitiveness Structural Gaps in the Production of Petrochemical Cluster in the Republic of Tatarstan. Kazan: Kazan University.
- Granberg, A.G., Mikheeva, N.N. (2009), Influence of the global crisis on the strategy of the spatial social and economic development in the Russian Federation. *Economics and Sociology*, 4, 69-101.
- Safiullin, A.R. (2011), Competitive advantages (territorial sectorial level). Germany: Lap Lambert Academic Publishing GmbH & Co. KG.
- Safiullin, L.N., Safiullin, A.R., Khaziakhmetov, B.Z. (2011), Structural Study of Competitiveness in the Republic of Tatarstan (Monography). Kazan: Kazan University Press.
- Safiullin, M.R., Elshin, L.A., Prygunova, M.I. (2014), Impact of the shock “pushes” on the development of the industrial sector in the region (on the example of the Republic of Tatarstan). *Economic Herald of the Republic of Tatarstan*, 4, 5-11.
- Safiullin, M.R., Elshin, L.A., Prygunova, M.I. (2015), Assessment of the sustainable development prospects and competitiveness of industrial production of a region under external shock “impulses”: The case of the republic of Tatarstan. *Procedia Economics and Finance*, 24, 574-582. DOI: 10.1016/S2212-5671(15)00638-3.
- Smirnov, S.V. (2010), System of the advancing indicators for Russia. *Economic Magazine HSE*, 1, 23-42.
- The Complex Information and Analytical Report “Economic and Social Situation of the Republic of Tatarstan for January-December, 2013, (2013).
- The Complex Information and Analytical Report “Economic and Social Situation of the Republic of Tatarstan for January-December, 2014, (2014).
- The Complex Information and Analytical Report “Economic and Social Situation of the Republic of Tatarstan for January-August, 2015, (2015).