THE SYSTEM OF MODELS FOR ASSESSING THE DEVELOPMENT OF REGIONAL AGRICULTURE IN THE CONTEXT OF EXPANDING FOREIGN ECONOMIC RELATIONS

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Abstract:
For questions concerning the prediction of the development processes of territorial agrarian and industrial complex, the improvement of interregional food and raw materials ties to meet the needs for the products of this industry with minimal costs for its production, it is advisable to use a system of economic and mathematical optimization models, including models of competitive-import type and market equilibrium. The paper discusses a methodological approach to assessing the modeling processes of foreign economic activity of the agro-industrial complex. Clarified the set of methods and techniques and their role in building a predictive assessment of the formation of effective foreign trade relations. Particular attention is paid to the description of models that determine the formation of supply and demand for agricultural products.
Keywords: *agricultural production, model, system, market mechanism, foreign economic relations.*

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INTRODUCTION:

In the 21st century, it is difficult to overestimate the role of information for modern society. In this regard, there is a need for the typology of analysis methods with the allocation of the most significant qualitative and quantitative characteristics, which will allow to obtain a reliable assessment of the studied processes. Any economic system is a complex mechanism that is formed under the influence of a large number of factors. And the adequacy of the final assessment depends on the correctness of the choice of one or another criterion. In this regard, the paper proposes the formation of a methodological approach for modeling the processes of formation of the market mechanism in the agricultural sector in the context of expanding foreign economic relations. Modern methodological principles now allow us to most accurately determine the development trends of the processes under study. Modeling of foreign economic relations in the agro-industrial complex is based on the laws of the functioning of the systems, the mechanism of which is based on the methods of economic analysis, the substantive side of which is reflected by a set of various forms of knowledge, techniques related to the study of economic processes, assessment of companies' economic activities with export-import orientation, current trends in the formation of the system world economy, the rationale for determining the influence of various groups of factors.

MATERIAL AND METHODS:

Given the complexity of the development of this complex, it seems expedient to consider the development of the agro-industrial complex in the form of a system consisting of four blocks representing a set of modules comprehensively characterizing the activities of agro-industrial production. The first block determines the region's need for food, agricultural products and the possibility of the region. For the effective development of the business sector of this industry, it is necessary to have an organizational and functional model that includes the interaction of the main elements of the market mechanism. Model assessment of the state and further development should be based on the identification of typical patterns of the main components of the market mechanism. This is relevant in the conditions of financial instability and significant fluctuations in market conditions. As is known, the efficiency of economic activity in the field of agricultural production is determined by the streamlined distribution channels, which determines the need to study the magnitude of demand and the possibilities of Russian producers. As you know, the market is

designed to ensure the movement of goods from the manufacturer to the consumer, therefore, first of all, demand is determined by the amount of goods offered by the manufacturer, subject to minimal costs in production. At the same time it is necessary to fulfill the following system of conditions:

$$\begin{cases} Z_x^{\;n} \le V_x^{\;n+1} + Q_x^{\;\tau} \\ A_x^{\;n} \le P^{n-1} \end{cases}$$

In general, the interaction of supply and demand, prices and price change mechanisms can be represented by the following models.
Product offer can be expressed:
$P_x^{\;n} = X_x^{\;n} + q_x^{\;n-1};$
With the condition that the manufacturer does not make all manufactured products on the market on the n-th day, the proposal is determined by:
$P_x^{\;n} = X_x + Q_x^{\;n-1} - a_x^{\;n};$
Then the limit on cash and the volume of products unbearable to the market will be:

$$\begin{cases} 0 \le a_x \le X_x^{\;n+1} + q_x^{\;n+1} \\ \Sigma a_x^{\;n} + q_x^{\;n} \ge Z_x^{\;n+1} \end{cases}$$

The demand is presented to us as a dependence on the price of "today's" and "yesterday's":
$\qquad S_x^{\;n} = f\,(P_x^n; P^{n-1}_{\;x});$
$\qquad$ Let on the n-th day the difference between the supply and demand was
$\Delta Q^{\,(n)} = S_x^{(n)} - P_x^{(n)}$
if a $\Delta Q(n) < 0$, then the pricing mechanism can be represented as follows:

$$p_n = p_{(n-1)} * \frac{S_x^{\;(n-1)}}{P_x^{\;(n-1)}}$$

if a $\Delta Q(n) > 0$, then the price of today will consist of the following conditions:

$$p_n = p_{(n-1)} * \frac{P_x^{\;(n-1)}}{S_{x(n-1)}}$$

in the presence of inflationary processes, the price on the n-th day will be:

$$p_x^{\;n} = (p^{(n-1)} + \frac{p_x^{\;(n-1)} * I_f}{100},$$

where:
Z^n - sum of the cost of production of goods x;
V^{n+1} - projected volume of goods x;
$A_x^{\;n}$, - amount of money advanced by the owner for the production of goods x;
$A_x^{\;n-1}$ –amount of money advanced by the owner for the production of goods x at the end of the time interval n;

q_x^n – stock of goods x;
X_x^n – production of goods x;
q_x^{n-1} – commodity stocks "yesterday";
p_x^n – price of item x on the day of sale;
p_x^{n-1} –price of goods x "yesterday";
I_f - inflation rate;
$S_x^{(n-1)}$- yesterday's demand
$P_x^{(n-1)}$- yesterday's offer

This simulation model includes the influence of the price of today and yesterday. In our opinion, such a study of price provides a fairly objective assessment in the study of demand, since the interaction of supply and demand are not at the equilibrium point. Thus, the presented model characterizes the formation of demand under the influence of output variables, which in general form describe the economic side of this process. But as noted earlier, the functioning of the market and the stage of formation of consumer demand should be considered in parallel with effective demand, which is based on purchasing power per capita. The demand for basic foodstuffs (bread, milk) is relatively inelastic at prices. Calculations of cross-elasticity of demand have confirmed that in the conditions of transition to the market a certain consumption pattern has developed, which has changed little over the past five years. Negative values of cross-elasticity coefficients indicate that, for example, for such products as animal butter, vegetable oil and margarine, during this period there was almost no interchangeability. From the analysis of the elasticity coefficients of the proposal, it follows that in the long run, the proposal responds to prices. The decline in production, the contraction of the food industry is one of the manifestations of adaptation to new economic conditions. A particularly significant decline in production is observed in the fields of specialization. The second block reflects the connection of the region. It allows, depending on the status of the region (importing or exporting) to improve the existing inter-regional food relations.

RESULTS AND DISCUSSION:
In order to form a model for assessing the development of business processes, it is advisable to consider the market system of product movement, while I would like to point out the need to involve intermediaries, cooperation with which can have a positive impact on the efficiency of business financial and economic activities, the importance of interaction with which especially increases in the conditions of market relations independence subjects of the sales process (Figure 1).
For the analysis of export-import operations in agricultural products, it is advisable to use a system that combines many models, each of which reflects a certain aspect of development. Synthesis of various types, differing in the principles of construction, operation, nature of the information used, into a single system, where they complement each other, makes it possible to comprehensively predict trends and analyze options for improving the efficiency of inter-farm relations.
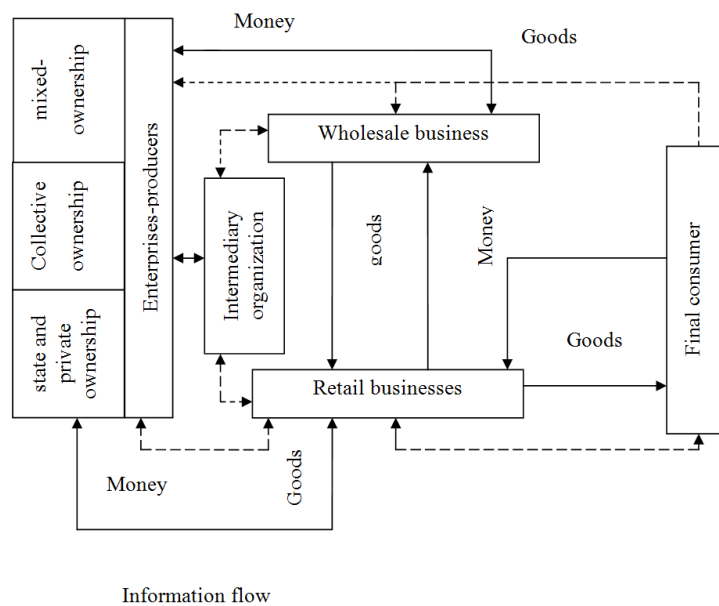

Figure 1: Market system of product distribution in the business sector

This approach can be implemented on the basis of a multilevel (hierarchical) principle. The use of this approach will allow to design models at each stage of the analysis. The choice of the number of levels and the nature of the tasks to be solved is predetermined by the stated research objectives. At the first level, an aggregated assessment of macroeconomic indicators of the reproduction process should be performed; on the second, a forecast is developed in the sectoral and regional perspectives, which predetermines the development trajectory depending on the prevailing conditions and the level of use of world resources; on the third - a vision is

held, aimed at developing the most rational economic policy to achieve the goals of sustainable economic development and the level of communications effectiveness. Figure 2 shows the models included in the system complex, which is designed to analyze and predict the development of foreign economic relations in the regional agro-industrial complex.

At the highest levels, models are used that allow an overall assessment of the global market environment. The model allows, taking into account the minimum number of inputs related to previous periods of time, to carry out prospective calculations of the values of these indicators.
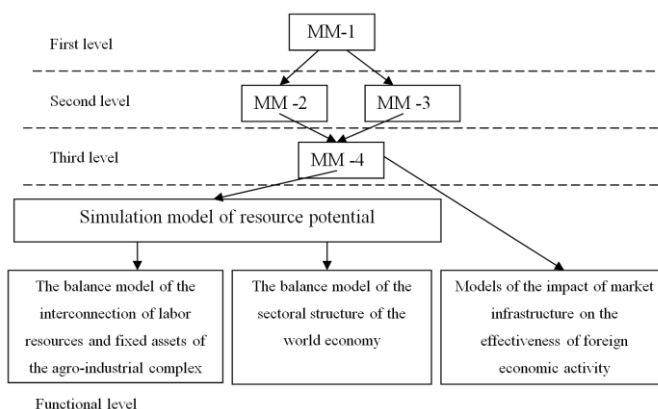

Figure 2: The hierarchical system of models for analyzing and predicting the processes of foreign economic activity in the regional AIC

The second level of the hierarchical system includes econometric models MM - 2, MM - 3. In the multi-sector model MM-2, the sectoral proportions of the forecast are reflected in the first place, for which indicators of the development of material production branches are used. These parameters are estimated in the context of various industries. The MM-3 multi-sectoral model is intended for a perspective assessment of the territorial proportions of economic development. This approach ensures the continuity of calculations between the parameters of the second level. The criteria of the third level of the system are the optimization statistical models MM-4. Their main purpose is regulatory forecasting of economic growth between the areas of production activities and regions in accordance with the selected parameters. At the functional level of the system, based on deterministic and econometric models, imitational disaggregated calculations are made of the most important elements of the economic potential of organizations or a particular region. The indicators are estimated using the parameters of this level, which correspond with each other and with their units.

CONCLUSION:
Thus, in the designed system of economic and mathematical modeling, individual models are linked by

direct and feedback. They form a single complete complex. Calculations throughout the system allow us to obtain the most complete information, compared with the analysis taken separately. However, models such as MM - 1, MM -2, MM-3 can be used by autonomous units and applied independently. The introduction of the work done in the practice of modeling was preceded by a check of the designed models for the adequacy of the economic processes in the region.

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