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ECONOMIC AND MATHEMATICAL MODELING IN THE ANALYSIS AND FORECASTING OF THE AUTOMOTIVE INDUSTRY IN UZBEKISTAN

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Abstract:

The use of economic-mathematical models of multifactor static analysis and forecasting is one of the most reliable tools for researching activities of an enterprise or industry as a whole, the study of the dynamics of the industry in the future.

Keywords: Automotive industry, economic and mathematical modeling, multifactor static analysis, forecasting, productivity of capital.

INTRODUCTION.

Uzbekistan is one of the first Central Asian countries to produce automobiles with localization on its territory. In the long term, the automobile industry has a good multiplicative effect on the country's economy and the development of other industries.

At the moment there are three head factories in the territory of the Republic of Uzbekistan:

- for the production of cars under the Chevrolet brand;
- buses and medium-duty trucks under the Isuzu brand, as well as;
- assembly production of heavy duty trucks under the "MAN" brand.

Uzbekistan's automotive industry, which was created from scratch during the years of independence, is both the pride of Uzbekistan and a big enough problem to cause numerous censures for insufficient competitiveness in foreign markets. In order to solve this problem the Concept of Development of the Automobile Industry of the Republic of Uzbekistan until 2025 has been developed. A wide range of measures to develop the industry have been envisaged. However, achieving the goals set in this direction may be difficult due to negative trends in the global automotive industry market.

According to a recent report published by AlixPartners, a U.S. consulting firm, a global automotive crisis is looming. In 2018, sales declines for the first time affected three major markets-China, the U.S. and Europe. In the world's leading market, China saw a drop in sales of 6% compared to 2017, in Germany - by 10%. In the first quarter of 2019 alone, global car sales fell by 5.5%, in Germany in the second quarter of this year - by 13.4%. Daimler, Volkswagen, General Motors and Ford saw particularly strong declines in sales.

Worldwide auto sales are projected to fall five percent in 2023. And less than 25 million cars could be sold in China, two million fewer than in 2018, a trend that will continue through 2023.

It's no exaggeration to say that the impact of the pandemic on Uzbekistan's auto industry has been relatively moderate. In 2020, automobile industry enterprises produced cars, trailers and semi-trailers worth 33,718.9 billion soums, while in 2016 they produced 4,112.3 billion soums, thus the production in nominal terms increased by 8 times.

At the same time, in 2016, the automotive industry accounted for 3.7% of the total industry and in 2020, the figure is 9.2%, which in turn indicates that the share of the automotive industry in the total industry increased by 5.5 percentage points from 2016 to 2020.

MATERIAL AND METHODS.

Multifactor mathematical models provide an opportunity to reveal certain regularities in the development of an economic object and to visualize the relationship between different technical and economic indicators of its functioning.

It is necessary to note that to increase

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accuracy of the calculations connected with economic and mathematical modeling of production efficiency at the enterprises of the motor industry, allows to use the multifactorial statistical models characterizing change of economic indicators under influence of defining factors.

Samarkand Automobile Plant JV LLC takes measures to implement the localization program by gradually mastering the production of certain units, parts and components at its facilities and at the enterprises of the country, searching for local materials, etc.

In order to satisfy consumers of Samarkand Automobile Plant JV LLC products: a network of authorized service stations for warranty service and technical repair of products has been created; provision of service organizations with spare parts has been established; training of specialists of service stations is conducted; a dealer network has been organized; feedback for improvement of product quality is carried out.

On December 30, 2019, as a result of investment project in further development of Samarkand Automobile Plant JV LLC and increase of production capacity up to 10000 units per year by 2021, Japanese partners made additional contribution to the Authorized capital of the company. Henceforth the shares of the founders are distributed in the following order: AT ASAKA-23.3%, AJ O'ZAVTOSANOAT-51.9%, ISUZU MOTORS LIMITED-12.4%, ITOCHU CORPORATION-12.4%.

When creating economic-mathematical models, statistical information was collected on JV LLC "Samarkand Automobile Plant" ("SamAvto"). The initial information covers the period from 2011 to 2021, as well as project tasks for 2022.

The standard program of linear regression analysis was used as a mathematical tool for the implementation of the static analysis.

The use of actual indicators reveals the real picture of the impact of a particular determinant on the outcome indicator.

RESULTS.

Statistical analysis of the data in creating multifactorial mathematical models was performed in several stages. At the first stage the factors that have the greatest impact on the value of the simulated indicator were selected.

Productivity model. Is the most general value indicator of the degree of use of fixed production assets and is defined as the ratio of annual output in wholesale prices to the average annual value of production fixed assets. It shows the amount of planned or actual production attributable to the cost unit of fixed assets and characterizes the level of use of all fixed assets of the enterprise. The productivity indicator is used to identify reserves of production, to compare the level of use of fixed assets of different enterprises producing the same products, to coordinate the production plan with the plan of capital construction, etc.

To determine the level of productivity of funds, corresponding to the actual conditions of each enterprise in a certain period of the planned, are increasingly used statistical methods and, above all, the methods of correlation and regression analysis. We built an economic-mathematical model of productivity of the enterprise. The response function in the model of return on investment depends on the more complete use of existing production capacity through the coefficient of production capacity utilization and more intensive operation of production equipment through the shift ratio determined as the ratio of the number of actually worked in the studied period of machine-shifts to the number of possible machine-days of the enterprise. The third factor-argument in the model of return on assets is the factor of technical progress in the form of costs for the introduction of new equipment. Thus, when constructing an economic and mathematical model of productivity, we considered:

y - productivity of funds, thousand sum

x1 - coefficient of utilization of productive capacity, %

x2 - shift factor

x3 - cost of introduction of new technology, million soums

Regression equation of productivity from the factors listed above has the following form in natural terms

$$y = 15.908 + 0.089\,x1 + 12.664\,x2 + 0.006\,x3$$

Let's represent the characteristic of indicators of the output regression equation:

$R=0.884$; $R2 = 0.781$; $tR = 21.821$; $F=34.633$

The multiple correlation coefficient R, evaluating total influence of all three selected factors, is high enough. This suggests that the total dispersion of the productivity of funds by 78% is determined by the variability of the factors taken into account in the presented model. The multiple correlation coefficient can be considered to be reliable enough in the model of productivity of capital assets, because the presented calculated value of F criterion significantly exceeds the table F (table) = 4,45 at p = 0,01. The reliability of the multiple correlation coefficient, determined by the

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Fisher criterion (F-criterion), characterizes the adequacy of the built model of return on assets. The confidence interval for the multiple correlation coefficient can be considered significant because the calculated value of tR - criterion is much higher than in the table (tR table=2,80) with the given confidence coefficient p=0,01. Significant confidence interval for the multiple correlation coefficient underlines the reliability of our selected information.

The coefficients ai (i=1,2,3) in the model of return on assets show how the value of Y increases when the corresponding xi is entrained by one. The presented model shows, that the increase of the coefficient of the use of production capacity by 1 % will increase the productivity of funds by 0,089 thousand sum. Increase in the coefficient of shifts by one will increase the productivity of funds by 12.664 thousand soums. Increase in the cost of introduction of new technology by 1 million soums. Increasing of cost of introduction of new technology by 1 mln. soums increases yield of assets by 0.06 thousand soums. Thus, the problem of increase of return of funds at the enterprise has actual importance.

Application of economic-mathematical models developed by us gives positive results not only when analyzing the state of the enterprise's work at present, but also when forecasting the main economic indicators in the process of prospective planning.

DISCUSSION.

Significant contribution to the study of economic and mathematical modeling was made by foreign economists: J. Hicks, P. Samuelson, V. Leontiev, V.K. Dmitriev and others. At research of development of economic-mathematical modeling in our country authors relied on works of economists and experts in this area, such as S.S.Gulyamov, T.Sh.Shadiev, S.A.Salimov, A.A.Almuradov and others.

At the same time, of the foreign scientists in the field of organization and management of road transport enterprises Z.I.Aksenov, V.P.Bychkov, N.K. Gorshenin, Y.H.Guketlev, I. Demjanovich, V.I.Tabakov, and L.B.Mirotin made their contribution. The scientists of our country, such as G.A.Samatov, M.A.Ikramov, T.Y.Kadyrov, M.N.Ravshanov, M.N.Irisbekova, M.B.Kalonov, G.A.Abdilakimov , E.A.Kamalova, Z.K.Usmanov, A.M.Merganov, R.G.Samatov conducted scientific researches in the field of organization of innovative and investment processes on the motor transport.

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The results of economic and mathematical models combined with the standard technique of multifactor forecasting allowed us to make the forecast of the most important indicators of the enterprise's work for the year 2025, i.e. for the medium-term perspective. The method of exponential smoothing was used as an apparatus of static extrapolation.

The results of the forecast calculations show how the economic indicators change, taking into account the influence of significant factors, taken into account in the regression equations given above.

Thus, Table 1 shows the results of the forecast for 2025 of the most important economic characteristics of the enterprise. The forecast calculations were made on the basis of the standard methodology of exponential smoothing of the mathematical apparatus of static extrapolation.

Thus, the multifactor prognostic models provide an opportunity to reveal certain regularities in the development of the economic object and visualize the relationship between the various technical and economic indicators of its functioning.

Table 1.
Dynamics of economic indicator of development of the enterprise LLC "SamAvto" in 2011-2025.

Indexes	Years			
	By results of automobile enterprise work			According to the forecast
	2011	2016	2021	2025
Efficiency, thousand soums	3,28	3,69	4,84	5,49

CONCLUSION.

Based on the developed models of the basic technical and economic indicators of the enterprise, the main reserves and sources of increasing these indicators can be identified. In order to achieve this goal, it is expedient to:

1.Additional capital investments and investments should be directed to the creation of new restructured enterprises.

2.Expand raw material base of the enterprise due to increase of total volume of production and release of export-oriented production.

3. To increase the capital productivity. The given model indicates that it will increase for the considered period taking into account the selected factors almost by 70 %.

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