

УДК 656

**ВОЗМОЖНОСТИ ПРИМЕНЕНИЯ ЭКОНОМИКО-СТАТИСТИЧЕСКИХ МОДЕЛЕЙ
ПРИ АНАЛИЗЕ ХОЗЯЙСТВЕННОЙ ДЕЯТЕЛЬНОСТИ
ТРАНСПОРТНЫХ ПРЕДПРИЯТИЙ**

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**POSSIBILITIES OF APPLYING ECONOMIC AND STATISTICAL MODELS IN THE
ANALYSIS OF ECONOMIC ACTIVITY OF TRANSPORT ENTERPRISES**

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Оцениваются возможности практического применения экономико-статистических моделей в анализе хозяйственной деятельности транспортных предприятий и их влияние на общую эффективность управления, включая оптимизацию ресурсного подхода и улучшение результатов прогнозирования.

Ключевые слова: *экономико-статистические модели, экономико-математические модели, хозяйственная деятельность, транспортные предприятия.*

The abstract: The possibilities of practical application of economic and statistical models in the analysis of economic activities of transport enterprises and their impact on the overall management efficiency, including optimization of the resource approach and improvement of forecasting results, are assessed.

Keywords: *economic and statistical models, economic and mathematical models, economic activity, transport enterprises.*

In the conditions of competition and dynamism of the transport services market, transport organizations must constantly optimize their activities and analyze the processes of the core business. High-quality and complete analysis of the production and economic activities of structural transport enterprises provides managers with information, based on which they can make decisions aimed at improving the core business, as well as auxiliary transport processes. This may relate to cost optimization, improving the quality of transport services provided, changing the structure of the organization or introducing new technologies (including the use of modern technical and technological solutions based on intelligent technologies). Modern challenges, such as globalization, digitalization and environmental requirements, make the use of relevant economic and mathematical models especially significant, allowing transport organizations to adapt to changing conditions and maintain competitiveness both in relation to domestic competitors and foreign carriers. The goal of econometric modeling is usually considered to be the analysis of the economic object (process) under study [1, p. 21]. Economic and statistical models are a fairly effective tool for studying economic processes in the modern world. They allow identifying relationships, assessing the influence of factors and predicting the development of the situation. In the transport sector, such models are widely used due to their versatility and ability to take into account many influencing factors - variables.

In modern economic conditions, the use of relevant high-tech solutions and intelligent products by Belarusian Railways increases the efficiency of freight transportation, reduces costs and improves service for shippers, consignees and passengers. Thus, when forecasting transportation volumes, models based on

time series analysis, regression analysis and machine learning are used, which allows taking into account macroeconomic factors and achieving greater accuracy of calculations. The use of such models includes:

Determining optimal routes taking into account traffic, road quality and seasonal changes, as well as optimizing the number of trips and their start times to reduce customer waiting times and reduce costs. Mathematical models and optimization algorithms are used for this.

Analysis of the financial and economic activities of a transport organization includes, first of all, an assessment of the efficiency of the rolling stock: econometric models help to study the workload of vehicles, determine the cost of their use and calculate the required number for various types and kinds of transportation. Also, with the help of appropriate economic and mathematical models, it becomes possible to calculate the terms of return on investment and the profitability of the introduction and use of new equipment. In the context of various types of transport, time series models are used to analyze the dynamics of freight turnover or passenger traffic, which is especially important when planning the loading of vehicles and optimizing the use of resources.

Optimization econometric models based on standard input-output models help find optimal solutions, such as minimizing fuel costs or delivery time, which directly affects the final performance indicators of the enterprise.

When constructing and further applying models, factor analysis as a tool allows you to identify hidden factors that affect the results of activities, and stochastic models take into account random fluctuations and uncertainty, which is especially important in an unstable market environment.

It is also important to note that in recent years, including in the transport sector, models based on machine learning and artificial intelligence methods have become increasingly widespread. They allow you to analyze large volumes of data, identify complex relationships and make more accurate forecasts. For example, neural networks can be used to forecast demand for transport services taking into account many factors, including weather conditions, social trends and economic indicators.

If we talk about consumer behavior in the market, it can be characterized using the so-called "demand model" [2, p. 10]. Therefore, one of the most important areas of application of economic and statistical models in the transport sector is the analysis of demand for transport services. Demand for transportation in general is determined by many factors, including household income, seasonality, fuel costs, infrastructure conditions, and competition. However, in practice, the set of influencing factors will vary depending on the type of transport and the transport enterprise or division in question.

Using regression models, it is possible to determine how various factors affect transportation volumes and forecast future demand. For example, multiple linear regression allows us to study the relationship between freight turnover as a resulting indicator and such influencing parameter factors as demand, tariffs, fuel costs, and seasonal fluctuations, formalizing them accordingly. The model is formulated as an equation, where freight turnover acts as a dependent variable, and the remaining factors are independent or influencing. Having determined these parameters, it is possible to establish the most significant influence factor by factor and apply the obtained information to optimize the work of a transport enterprise or division. However, it is important to note that when compiling and further applying transport economic and mathematical models in analytical work at transport enterprises, it is necessary to verify the model, i.e. compare real and model data. Its purpose will be to check the estimated model for realism or to recognize the need for another model specification [3, p. 193]. In addition, cluster analysis methods can be used to analyze demand, which allow segmenting customers by various characteristics, such as frequency of use of services, preferences in choosing routes, or income level. This helps transport organizations develop more personalized offers and increase customer satisfaction with the comprehensive transport services provided.

It is also important to note that improving routing and logistics plays a key role for transport organizations engaged in transportation. The use of linear programming tools helps to determine the most efficient routes, taking into account time constraints, route length and available resources. If we talk about road transportation, dynamic routing systems have also been actively developing recently, which take into account current changes on the roads such as traffic jams, accidents or weather conditions. Such systems, which are intelligently adapted, use real-time data and allow for prompt route adjustments, which significantly increases the efficiency of transportation. In terms of forecasting financial results, analysis is a fundamental basis, without which it is impossible to make a high-quality forecast for the financial and economic performance of a transport division or enterprise. Time series models, such as ARIMA or ex-

ponential smoothing, are used for analytical forecasting of revenue, expenses and profits based on retrospective data. In addition, for more accurate forecasting, combined models can be used that combine time series methods with other approaches, such as regression analysis or machine learning. This allows for both historical data and the influence of external factors, such as changes in legislation or exchange rate fluctuations, to be taken into account. At the same time, the assessment of the effectiveness of investments, which can be considered as a component of the overall forecast of financial and economic activity, is another area where economic and statistical models are actively used. Transport organizations often need to invest in infrastructure, upgrade rolling stock, or introduce innovative technologies into service processes. Factor analysis and regression models help determine how these investments affect key performance indicators, such as profitability, productivity, and customer service: a regression model can be used to assess the impact of investments in updating the truck fleet on the volume of freight traffic and the profit of a transport company. Such assessments allow making informed decisions on the feasibility of investments and their expected return. Also, along with the above, methods of payback analysis and net present value can be used to assess the effectiveness of investments, which allow one to assess the financial benefit of investments in the long term.

It is also worth remembering that transport, like any other area of economic activity in the country, faces a number of risks, the management of which is the most important element of the functioning of transport organizations. The transport sector is exposed to various risks: changes in market conditions, accidents, supply disruptions and fuel price hikes. Thus, probabilistic models allow taking into account the uncertainty and risks associated with these circumstances and developing management strategies. For example, the Monte Carlo method can be used to assess the likelihood of various risks and their impact on the financial condition of the company. These models help develop plans to respond to adverse situations and reduce their negative impact. In addition, scenario analysis and stress testing methods based on economic and statistical models can also be used for risk management, which allow assessing how a division or organization will cope with extreme situations, such as a sharp increase in fuel prices or a global economic crisis. However, along with the listed advantages, the use of economic and statistical models in the transport sector has a number of limitations, the main one being the need for a large volume of high-quality information to build models: if there is insufficient data, the results of the analysis may not be accurate enough or simply incorrect. In addition to the above, it is worth noting that when formulating economic and statistical models, qualitative variables such as technological innovations or changes in customer behavior are often not taken into account, which can reduce their usefulness and effectiveness in the long term. It is also important to take into account that the creation and use of such models requires certain knowledge and skills, which can be a problem for small transport companies with limited resources. However, the advantages of economic and statistical models outweigh their disadvantages. First of all, they make it possible to quantitatively assess the impact of significant factors, predict the development of the situation and make informed management decisions. In the context of digitalization and growth of data volumes, the importance of economic and statistical methods will only grow, opening up new prospects for improving the efficiency of transport enterprises, since today economic and statistical models are a useful and relevant tool for analyzing and forecasting the activities of transport organizations. Therefore, in the future, we can expect further development of these methods to solve analytical problems in the transport complex, including integration with artificial intelligence technologies, which will allow creating even more accurate and adaptive models capable of taking into account complex relationships and quickly responding to changes in the environment, which can make the state's transport complex as a whole more sustainable in the context of global economic and technological challenges.

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