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Features of statistical methods for forecasting the economic performance of an enterprise

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Abstract. The aim of the study. The purpose of the article is to improve the methodological provisions for the development of medium-term forecast of exports of raw materials for the manufacture of glue and finished products based on the trend of exports of domestic enterprises, which will help solve problems of adapting statistical analysis methods to real economic activities. Methodology. In the study of the state and trends of foreign trade of Ukraine in raw materials for the manufacture of glue and finished products with all countries used tabular-graphical method and systematic analysis; when developing a medium-term forecast - the method of extrapolation. Results. The application of statistical methods allowed to identify patterns and trends in foreign economic activity (FEA), and to determine the optimal directions for entry into the foreign market Bristol Eco Group Ltd. technological renewal of production, expanding relationships with customers and suppliers, finding new customers, increasing traditional products, and active renewal of their range, expansion of markets through penetration into the markets of the Republic of Moldova, Belarus, Uzbekistan and Azerbaijan. The following directions of development of Bristol Eco Group LLC were identified: according to the optimistic scenario: formation of the strategy of market expansion - penetration into the markets of the Republic of Moldova and Belarus; optimization of the product "portfolio" of the enterprise; development of an effective competitive strategy (diversification); sales promotion (promotion of goods based on the ratio of "price / quality"); according to the pessimistic scenario: either complete reorganization and reorganization of the enterprise, or its sale to the main competitor. Prospects for further research. It is determined that for the effective functioning of the company LLC "Bristol Eco Group", it is advisable to create a department of foreign economic activity, which will contribute to the deepening of trade relations with foreign partners and will provide an opportunity to improve its export potential.

Keywords: foreign economic activity of the enterprise, glue production, methods of

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statistical analysis, medium - term forecast.

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Особливості використання статистичних методів для прогнозування зовнішньоекономічної діяльності підприємства

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Анотація. Мета дослідження. Мета статті полягає в удосконаленні методичних положень щодо розробки середньострокового прогнозу експорту сировини для виготовлення клею та готової продукції на основі тренду динаміки експорту продукції вітчизняними підприємствами, що сприятиме вирішенню проблем щодо адаптації методів статистичного аналізу до реальних ситуацій економічної діяльності підприємств. Методологія. При дослідженні стану й тенденцій розвитку зовнішньої торгівлі України сировиною для виготовлення клею та готовою продукцією з усіма країнами використано таблично-графічний метод та системний аналіз; при розробці середньострокового прогнозу – метод екстраполяції. Результати. Застосування статистичних методів дозволило виявити закономірності та тенденції розвитку зовнішньоекономічної діяльності (ЗЕД), та визначити оптимальні напрями виходу на закордонний ринок ТОВ «Брістоль Еко Груп технологічне оновлення виробництва, розширення зв'язків з клієнтами і постачальниками, пошук нових замовників продукції, нарощування обсягів традиційної продукції, так і активне оновлення їх асортименту, розширення ринків збуту за рахунок проникнення на ринки Республіки Молдова, Білорусі, Узбекистану та Азербайджану. Було визначено такі напрями розвитку ТОВ «Брістоль Еко Груп»: за оптимістичним сценарієм: формування стратегії розширення ринку збуту – проникнення на ринки Республіки Молдова та Білорусі; оптимізація продуктового «портфелю» підприємства; розробка ефективної конкурентної стратегії (диверсифікація); стимулювання збуту (просування товару на основі співвідношення «ціна/якість»); за песимістичним сценарієм: або повна реорганізація та перепрофілювання підприємства, або його продаж основному конкуренту. Практичне значення дослідження полягає в тому, що основні висновки та пропозиції можуть бути використані вітчизняними підприємствами для формування ефективної системи управління зовнішньоекономічною діяльністю підприємства. Перспективи подальших досліджень. Визначено, що для ефективного функціонування підприємства ТОВ «Брістоль Еко Груп» доцільно створити відділ зовнішньоекономічної діяльності, що сприятиме поглибленню торгових відносин із іноземними партнерами та забезпечить можливість покращити управління його експортним потенціалом.

Ключові слова: зовнішньоекономічна діяльність підприємства, виготовлення клею, методи статистичного аналізу, середньостроковий прогноз.

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1. Introduction.

In modern conditions, an extremely intensive development of globalization processes, accelerated growth of global trade and other processes of international exchange, in which the global economy becomes more integrated and open, domestic enterprises are moving on foreign markets of goods, capital, labor. The adoption of a substantiated decision to access the foreign market needs a comprehensive objective, probable and timely statistical information and its qualitative analysis.

The application of statistical methods allows to identify patterns and trends in the development of foreign economic activity (FEA), to receive information in order to adopt substantiated decisions on the choice of optimal areas of entering the foreign market, to predict the possible development of events in the process of implementing managerial decisions, etc.

Formulation of the problem. However, there are a number of problems that require further development, in particular, the adaptation of the methods of statistical science to the analysis of real situations of economic activity of the enterprise.

2. Literature review.

Problems of strategic management of foreign economic activity of enterprises became the subject of research of such domestic scientists as: B. Dikan (2011), O. Dzhusov (2014), A. Dligach (2011), S. Kosenko (2011), T. Pichugin T. and co-author G. Zabrodskaya, L.Zabrodskaya, Neginova (2017), Shmalenko (2008) and others.

Statistical approaches and methods, their practical use in the process of analysis and processing of economic disclosed in scientific writings of famous domestic and foreign scientists. Most significant contribution in this direction made T. Baranova (2011), B. Kolesnik (2007), L. Novorozhnyia, S. Arzhenovsky (2017). A.

Opria (2010), O.Wheat (2013), T. Ryan (2011), Yu. Tsal-Tsalko (2013), etc.

3. Methods.

System analysis, table-graphic - in the study of state and trends in the development of foreign trade of Ukraine with raw materials for the manufacture of glue and finished products with all countries; Methods of extrapolation - in the development of a medium-term forecast.

4. Research objectives.

The goal is to improve the methodological provisions on the development of a medium-term forecast of the export of raw materials for the manufacture of glue and finished products based on the trend of the dynamics of exports of products by domestic enterprises.

5. Results and discussions.

Foreign economic activity of the enterprise is a sphere of economic activity related to international production, scientific and technical cooperation, export and import of products, output and functioning of the enterprise in the external market. Without sufficient information provision it is impossible to predict foreign economic activity.

Modern methods that are used in the application of the economy for the short - and medium-term perspective are conventionally combined in five groups: heuristic, logical, normative, mathematical (including statistical).

The heuristic method (or method of expert assessments) is that the basis of the forecast is generalized results of surveys of specialists. It is used if it does not have the ability to use formalized methods due to the lack of information on the basic laws of the management object.

Methods of logical modeling are used to predict the dynamics of qualitative changes in the object. They contribute to the detection of causal dependencies in its development, the transition of quantitative changes in

qualitative, allocation of fundamental development stages, etc.

Normative methods of forecasting are used in the development of long and medium-term forecasts. The essence of this approach is that certain quantitative or qualitative characteristics of the predicted object (phenomenon, process) are determined in perspective and possible directions (trajectory) of the movement to outlined purposes.

Thanks to the intensive development of the technical capabilities of computer technology and software products that provide modeling of complex processes that occur in the economy began to widely used statistical methods of modeling, which combine elements of mathematical theory and practice (mathematical statistics and methods of application analysis), and are implemented. With the help of special software (such "statistical" program packs, as statistica, BMDP, SPSS, SAS, STATGRAPHICS,

$$y_{i+L} = f(y_i, L)$$

(1)

where y_{i+L} – extrapolated level value; L – period of bias; y_i – the level adopted for the extrapolation base.

It should be noted that this methodological approach is most effective for predicting the medium-term perspective, beyond its deterioration in the quality of forecast ratings.

The object of research is Limited Liability Company "Bristol Eco Group", which is a manufacturer of glue for wallpaper. The demand for wallpaper adhesives depends on the demand for wallpapers, and the latter - from capital construction volumes. Annual sales of wallpaper glue in Ukraine are about 8-11 thousand tons (21-24 million UAH), 75-80% of all sales falls on imported products. Importers for wallpaper for wallpaper in

STATA, Minitab, etc.). The process of constructing mathematical models using methods of mathematical and statistical and application analysis is called statistical modeling, and obtaining a prediction with the help of a constructed statistical model - statistical forecasting.

Analysis of indicators and forecasting trends are made using a data analysis set (so-called analysis package) and Microsoft Office Excel functions

The forecast extrapolation is to identify in the baseline period of laws and relationships common in its limits. It happens: extrapolation of patterns of development (determines the patterns of trends and oscillations) and extrapolation of the causal mechanism of process formation. The forecast extrapolation is based on the modeling of the research object.

Changing trends occurs under the influence of factors, which in an explicit or implicit form affect the structure of the education system for a long time interval. The long-term tendency to change economic indicators is trend. Extrapolation in general form can be represented as a function:

Ukraine are such companies as: Henkel, Kiesel, Uzin, PUFAS, Stauf, Düfa, Jobi (Germany), Kiilto (Finland), Bostik Findley (France), Bona, Teraco (Sweden), Glidden, Franklin (USA), Mapei, Rinaldi (Italy), Atlas (Poland), DL Chemicals, Kim Tek, Dow Corning, Orac Decor (Belgium), Ceys (Spain), Kvadro (Czech Republic), Ge Bayer Silicones (Holland), etc.

Ukrainian manufacturers during 2015-2018 export raw materials for the manufacture of glue and finished products to countries such as: the Russian Federation (its share is 23-43%), the Republic of Moldova (share - 15-22%) and Uzbekistan (the share is 9 -12%). The share of exports of the commodity group "Finished glues and other glue preparations" in these countries is 50-68% (Table 1).

Table 1. Dynamics of export of raw materials for the manufacture of glue and finished products, indicating the main countries - counterparties (thousand dollars)

Country	2015		2016		2017		2018	
	Cost	Specific weight, %	Cost	Specific weight, %	Cost	Specific weight, %	Cost	Specific weight, %
Russian Federation	54	3,40	84	3,90	88	7,71	88	7,71
Republic of Moldova	31	5,27	58	4,45	07	7,43	07	7,43
Uzbekistan	71	1,30	66	,29	17	2,32	0	0
Azerbaijan	0	0	0	0	0	0	78	,89
Belarus	0	0	0	0	0	0	0	0
Other	56	9,97	208	7,64	012	7,46	73	4,03
Others	57	0,03	78	2,36	49	2,53	57	2,79

Source: Author's own calculations according to the State Statistics Service of Ukraine. URL: <http://www.ukrstat.gov.ua/>.

The main competitors of LLC "Bristol Eco Group" in the market for wallpaper adhesive is "Henkel Bautechnik Ukraine" and LLC "ECO-HIM-IF". LLC "Bristol Eco Group" implements a follower strategy because it holds a small market share (12.91%) and therefore adapts to the main competitor "Henkel Bautechnik Ukraine". But this does not mean that the company can not form a strategy of foreign economic activity. On the contrary, the capture of a small market share will strengthen the importance of a strategic selection, taking into account the possibilities and aspirations of LLC "Bristol Eco Group".

Globalization processes in commercial enterprises ensure maximizing profits due to the scale effect, which in turn needs to solve such tasks of foreign economic activity of the enterprise as: an increase in the share of the external market; minimization of risks and increase the efficiency of foreign economic activity; obtaining competitive advantages of

products in the external market; increase sales in external markets, etc.

In order to determine the main directions of export activity of LLC "Bristol Eco Group", a medium-term forecast for the export of raw materials for the manufacture of glue and finished products (executed on the basis of the trend of the dynamics of exports of products, see Table 1). The most priority directions of development of LLC "Bristol Eco Group" is a technological renewal of production, expansion of clients and suppliers, the search for new customers, increasing traditional products, and active updating their assortment, expanding markets by penetration into the republic's markets. Moldova, Belarus, Uzbekistan and Azerbaijan.

To predict the export of raw materials for the manufacture of glue and finished products based on the trend of product export dynamics, approximating functions (trend line) are used, which are most often used to describe various trends of time series (Table

2).

Table 2. Parameters of optimal approximating functions of exports of raw materials for the manufacture of glue and finished products

Countries	Kind of function (trend)	Formula for calculation	Determination coefficient
Russian Federation	polynomial	$y = 4,5952x^2 - 86,752x + 531,69$	$R^2 = 0,979$
Bulgaria	linear	$y = 41,283x + 184,03$	$R^2 = 0,9624$
Turkey	polynomial	$y = 0,7327x^2 + 7,9232x + 155,07$	$R^2 = 0,9598$
Republic of Moldova.	polynomial	$y = -1,3918x^2 + 18,484x + 99,095$	$R^2 = 0,5968$
Republic of Belarus	polynomial	$y = 1,6558x^2 - 10,658x + 125,19$	$R^2 = 0,6095$

Source: Developed by the author

Analytical smoothing includes two stages:

1) the choice of such a function of the time series (trend), which most corresponds to the nature of changes in this series;

2) evaluation of the parameters of an approximating function that is most adequate to the maximum value of the determination coefficient - the value of the validity of approximation R^2 , (the value of R^2 is a number from 0 to 1, which reflects the proximity of the trend line values to actual data; the trend line is most consistent with the values R^2 is close to 1). For each country, we choose the most acceptable trend model, and calculated R^2 determination coefficients.

6. Conclusions.

For organizational support for strategic changes in foreign economic activity, the

system of strategic management should have an appropriate provision system. Foreign management is carried out through the organization of the Department of Foreign Economic Activity, Development and Implementation of the Program of Activities and Control. At the enterprise LLC "Bristol Eco Group" Department of Foreign Department is absent, therefore, it is advisable to create a foreign trade department. His creation will provide high-quality management of foreign economic activity, which will contribute to the deepening of trade relations with foreign partners, the fulfillment of obligations to them and will enable to improve the management of the export potential of the enterprise and ensure the creation of competitive products.

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