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## EVALUATING THE EFFECTIVENESS OF AN ENTERPRISE' EXPORT-IMPORT ACTIVITY

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The leading indicators of the economic development of the country are the advantage of exports of goods over imports, and the intensity of this development depends on the ratio of exports and imports for some time. Among modern concepts of measuring efficiency at the enterprise level more popular such as comprehensive data analysis, which features a large information base to describe efficiency, and hence the complexity of calculation (Abeysekera, 2020; Abolfazl Akhondzadeh, 2019; Khan, 2018; N. S. M. Ahmad et al., 2018); measuring the achievements of the service enterprise, which pays more attention to the types of enterprises in the field of service and services (Pavlyk, 2020); the concept of the achievement measurement model, which provides for the selection of key indicators for management and the process of continuous improvement of units (Huo et al., 2020; Yiu et al., 2020; Bublyk et al., 2017); the concept of the internal market Hewlett-Packard, which provides for the implementation of technology to assess the effectiveness of activities (Kasztełnik, 2020; Singh, 2019; Adeyinka et al., 2019; Al. K. Chakrawal et al., 2018).

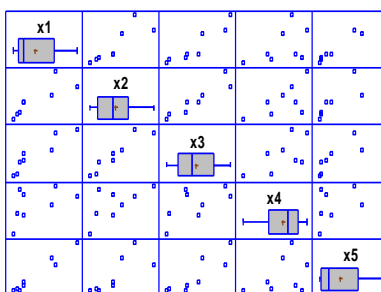
Analysis of these concepts shows the following: in almost all definitions, efficiency is a coefficient that characterizes the degree of return on investment; efficiency must have both quantitative certainty and qualitative; efficiency should be perceived as a vector that indicates the direction of development and growth of the enterprise; in the ratio of the components of the efficiency of the enterprise there are several approaches, namely: results and costs (efficiency), results and goals (feasibility), result and needs (profitability) (Tovmasyan et al, 2020; Vasylieva et al., 2018; Lyulyov et al, 2017).

Evaluation of the effectiveness of an export-import activity was made on the indicators of the large industrial enterprise PJSC «Turboatom» (Ukraine). Guided by the requirements for the criteria and analysis of well-known scientists and practitioners on economics and management of the enterprise showed the feasibility of considering a system of partial efficiency criteria in the following composition: export efficiency ratio ( $x_1$ ), import efficiency ratio ( $x_2$ ), overdue liabilities ratio ( $x_3$ ), the share of exports in the total sales of the enterprise ( $x_4$ ), the profitability of sales ( $x_5$ ) (Waluyo et al., 2016; Yarovenko et al., 2020; Ministry for Development of Economy, Trade and Agriculture in Ukraine). These indicators were

measured during the 2010 – 2018 years. To diagnose the effectiveness of export-import activities according to these criteria at the enterprise the value must be converted taking into account both the numerical characteristics of distribution laws and patterns of development of this activity (Fig. 1). There are many approaches to this procedure, namely standardization, normalization by various formulas. Given the obvious advantages of the modified logistics conversion function:

$$y_{ij} = \frac{1}{1 + e^{-\frac{x_{ij} - P_i}{q_i}}}, \quad (1)$$

where  $q_i$  – the value of the indicator  $x_{ij}$ , at which the conversion function takes a value not less than 0,95;  $P_i$  – the value of the indicator  $x_{ij}$ , at which the conversion function becomes 0,5 (Us et al, 2018). It should be noted here that the level of the converted values of the criterion depends on the establishment of  $q_i$  and  $P_i$ .



**Fig. 1. The Box and Whisker Plot for the indicators of the effectiveness of an export-import activity of PJSC "Turboatom"**

*Source: developed by the authors with Statgraphics Centurion tools*

Transformed values by the formula (1) can be compared with each other; are on a scale from 0 to 1; can be used in further mathematical calculations. An important function of diagnosing the effectiveness of export-import activities of the enterprise is to predict the development of its features and analysis of scenarios for this development.

To predict the features of the enterprise's export-import activities efficiency, its level and the level of structural dynamics, it is advisable to calculate models of growth curves, which are presented as a function of time, given that the influence of other factors is insignificant or indirectly taken into account due to time. The statistical quality of the constructed models of growth curves for the forecast is determined by the criteria of checking the quality of the constructed regression

models: the coefficient of determination ( $R^2$ ), the Fisher criterion ( $F$ ), the Darbin-Watson criterion ( $DW$ ). The existence of autocorrelation of residues can significantly distort the predictive values, so if the Darbin-Watson test confirms the existence of autocorrelation of residues in the model, such a model shouldn't be used to calculate the forecast. Using the statistical package Statgraphics Centurion, models for forecasting the values of the criteria of efficiency of export-import activity of the enterprise PJSC «Turboatom» were calculated on the basis of growth curves (Table 1).

**Table 1.**  
**Models and values of the forecast of criteria of export-import activity efficiency**

Forecasting models	Statistical criteria	Predictive values of criteria
$x_1 = \frac{1}{0,836 + 0,061 \ln t}$	$R^2 = 0,542, F = 8,28,$ $DW = 1,921$	1,024; 1,0179; 1,01245
$x_2 = \sqrt{1,318 - 0,142 \ln t}$	$R^2 = 0,986, F = 486,02,$ $DW = 2,021$	0,9957; 0,9889; 0,9827
$x_3 = \frac{1}{4,242 + 0,078t^2}$	$R^2 = 0,963, F = 184,42,$ $DW = 2,08$	0,0832; 0,0733; 0,0648
$x_4 = \exp^{-0,342 - 0,007t^2}$	$R^2 = 0,514, F = 7,39,$ $DW = 1,95$	0,3404; 0,2917; 0,2464
$x_5 = \frac{1}{-0,007 + 0,03t}$	$R^2 = 0,884, F = 52,93,$ $DW = 1,78$	36,4292; 36,1103; 35,8457

*Source: developed by the authors*

Statistical criteria indicate that the calculated models are suitable for forecasting the criteria. According to the forecast values of indicators of efficiency of export-import activity, we see the decreasing all values, and it is a bad tendency. The enterprise should urgently develop a program of action. Only a decrease in overdue liabilities is a good trend. One of the important diagnosis stages is the formation of reference values of diagnostic criteria and assessment and analysis of the state of the object based on the comparison of the achieved values of the criteria with the standards (Dove, 2020; Miller, 2019; Levchenko et al., 2018; Musa et al., 2017). If there are no legally proposed normative values of criteria, it's recommended to be based on optimal and predictive ones to form their relevant values.

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