METHOD OF CORRELATION AND REGRESSION ANALYSIS FOR FORECASTING BUSINESS DEVELOPMENT.

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Abstract*: this article discusses correlation and regression analysis as a method of predicting the economic development of an enterprise. Calculation of correlation coefficients allows to determine the closeness and direction of the relationship between the studied indicators. Regression analysis is a natural continuation of correlation analysis and consists in determining the analytical expression of the relationship between the resulting value and factor indicators.*

Key words*: correlation and regression analysis, forecasting, random variables, effective sign.*

Businesses widely use correlation and regression analysis to plan economic development. It is used to test forms of communication that establish quantitative relationships between random variables of the studied process. This method is used in socio-economic forecasting to construct conditional forecasts and forecasts based on the assessment of stable cause-and-effect relationships.

Correlation and regression analysis is a classic method of stochastic modeling of economic activity. It is used to study the relationship between indicators of economic activity, if the relationship between them is not strictly functional and is broken under the influence of extraneous, random factors. Using the method of correlation-regression analysis, correlation and regression models of economic activity are created, in which factors and efficiency indicators are determined [2]. Correlation analysis is used to measure the strength of the

relationship between different variables. It is also used to evaluate the factors that have the greatest influence on the effective attribute.

Regression analysis is necessary to determine the approximate values of the dependent variable (outcome characteristic) to select the form of the relationship and the type of model (U.R., 2021).

Correlation and regression analysis are widely used. Pair correlation is the most developed in theory and most often used in practice. It is used when studying the relationship between an effective sign and a factor characteristic. It is a one-factor correlation and regression analysis [3].

Let's show the use of correlation and regression analysis on the example of an enterprise producing "pure milky milk and milk products" in ***Taylak*** *district.*

*"**Pure milky milk and milk products**" enterprise is engaged in the implementation of works and services related to milk products, for example, yogurt, yogurt, cream, butter and other products.*

Using correlation and regression analysis, let's analyze the effect of income on the amount of working capital of a particular enterprise. The baseline data are shown in Table 1 below

Using the initial data presented in the table, we make a graph of the dependence of the effective characteristic Y on the X factor.

"pure milky milk and milk products"

business income and working capital

day	***Expense for milk and milky products. (x)***	***income,thousand,dol. (y)***
1	*0,20*	*0,22*
2	*0,22*	*0,24*
3	*0,24*	*0,26*
4	*0,26*	*0,28*
5	*0,28*	*0,30*
6	*0,30*	*0,32*
7	*0,32*	*0,34*
8	*0,34*	*0,36*

Table 1. The graph of the dependence of the amount of working capital on the amount of income

Taking into account the nature of changes in the data presented in the table and confirmed graphically, we chose a parabola of the second order, which has the following form:

$$Y_x = a + bx + cx^2$$

*a,b*and *c the values of the parameters are found by solving the system of equations:*

$$\begin{cases} na + b\sum x + c\sum x^2 = \sum y \\ a\sum x + b\sum x^2 + c\sum x^3 = \sum xy \\ a\sum x^2 + b\sum x^3 + c\sum x^4 = \sum x^2 y \end{cases}$$

There is: n is the number of observations.

We substitute the obtained values into the system of equations:

$$\begin{cases} 8a + 2{,}16b + 0.60c = 2{,}32 \\ 2{,}16a + 0{,}60b + 0{,}1711c = 0{,}5344 \\ 0{,}60a + 0{,}1711b + 0{,}0499c = 0{,}148256 \end{cases}$$

Using the determinant method, we found the parameters of the regression equation:

$$a=57,07$$
$$b=441,90$$
$$c=825,92$$

So the equation of the parabola is:

$$Y=825,92+441,90x+57,07x2$$

We put the corresponding values of X into this equation, the equalized values of working capital depending on the amount of income (Table 2)

The rank values of the final function Y:

n	X, thousand,dol.	Y, thousand,dol.	$Y^{x,}$ thousand,dol
1	$0,^{20}$	$0,^{22}$	$916,^{5828}$
2	$0,^{22}$	$0,^{24}$	$925,^{9002}$
3	$0,^{24}$	$0,^{26}$	$935,^{2632}$
4	$0,^{26}$	$0,^{28}$	$944,^{6719}$
5	$0,^{28}$	$0,^{30}$	$954,^{1263}$
6	$0,^{30}$	$0,^{32}$	$963,^{6263}$
7	$0,^{32}$	$0,^{34}$	$973,^{1720}$
8	0,34	0,36	982,7633

We calculate the correlation ratio to measure the closeness of the relationship between the factor and performance indicators to a non-linear relationship:

$$R=\sqrt{1-\frac{\sum(Y-\overline{Y}_X)^2}{\sum(Y-\overline{Y})^2}}=\sqrt{1-\frac{0.00318}{0.0168}}=0.9002 \quad (4)$$

The correlation ratio can take a value from 0 to 1. The closer its value is to unity, the closer the relationship between the studied phenomena is [7].

If the value of the correlation coefficient is equal to 0,96668, it means that the correlation between the factor and the resulting characteristic is strong. If income changes by 1%, the cost of working capital changes by 0,97%.

To evaluate the relationship model with a non-linear relationship, it is necessary to determine the detection index, which is equal to the square of the correlation ratio:

$$R^2=\mu^2 (5)$$

$$R^2=0,810714$$

We performed calculations using different model variants. The tendency of the amount of working capital to depend on the amount of income is best described by a polynomial function, since the determination index R^2 is the largest – 0,810714. This means that 81,0714% of the source data is subject to the selected model.

It follows that 81,0714% of the change in the value of working capital is due to the change in income. 18,9% depends on the influence of other factors.

To evaluate the quality of the built model, we calculate the average approximation error (A). It shows by what percentage the actual values of the Y indicator differ from the values calculated using the constructed model.

The average error of approximation is determined by the following formula:

The average error of approximation is determined by the following formula:

$$\overline{A}=\frac{\sum|Y_i-Y_x|/Y_i}{n}100\% \quad (6)$$

There are: $|Y_i-Y_x|$ *- deviation of the adjusted Y values from the actual valuesmodulo.*

$$\overline{A}\approx 4,95\%$$

The obtained value allows us to conclude that the quality of the built model is good, because the regression model is considered to be well adapted and, if the average error of approximation does not exceed 10%, describes the relationship between the factor and the performance indicator sufficiently accurately.

From the results of the created regression model, it can be concluded that we

Through this regression equation, we can analyze in advance how much profit the factory will make.

If we use this formula to determine, then this is a theoretical study

Others we can define for enterprises or factories and this is more convenient for us.

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