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ECONOMETRIC ANALYSIS OF EVALUATION OF INVESTMENT PROJECTS IMPLEMENTED IN THE REPUBLIC OF KARAKALPAKSTAN

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Abstract:

In the article, an econometric analysis of the evaluation of investment projects was carried out, in which the impact of the investments made within the framework of the projects currently being implemented in the Republic of Karakalpakstan on the gross regional product was analyzed. For this purpose, first of all, the research works conducted by foreign and CIS scientists in this field were studied, and process change models were created using the econometric modeling methodology in our research. Proposals and recommendations for effective implementation of investment projects and their evaluation are described using the results of the analysis.

Keywords: investment project, capital investment, efficiency, correlation, regression, Fisher criterion.

INTRODUCTION.

The modern world economy is characterized by the dynamism of existing conditions, instability, increased competition, the speed of development of scientific and technical progress, and the development of innovation. In this regard, the introduction of information systems and technologies to the economy is especially important, and in 2018, the USA spent 1.3 trillion dollars on ICT development. dollars, in China - 499 million dollars, in Belarus, foreign direct investment in ICT alone amounted to 1.5 billion dollars. According to the calculations of experts of the analytical company International Data Corporation, the cost of ICT worldwide will grow by 3.8% annually and will reach 4.8 trillion by 2023. is a dollar[1].

In the conditions of current globalization, rapidly developing high technologies, including information technologies and systems, contribute to the facilitation of human activities in all areas of the economy, requiring a proper assessment of the effectiveness of investment projects. The modern world economy is characterized by the dynamism of existing conditions, instability, increased competition, the speed of development of scientific and technical progress, and the development of innovation. In this regard, the introduction of information systems and technologies to the economy is especially important, and in 2018, the USA spent 1.3 trillion dollars on ICT development. dollars, in China - 499 million dollars, in Belarus, foreign direct investment in ICT alone amounted to 1.5 billion dollars.According to the calculations of experts of the analytical company International Data Corporation, the cost of ICT worldwide will grow by 3.8% annually and will reach 4.8 trillion by 2023. is a dollar[2]. In the conditions of current globalization, rapidly developing high technologies, including information technologies and systems, contribute to the facilitation of human activities in all areas of the economy, requiring a proper assessment of the effectiveness of investment projects.

In order to develop the economy of the Republic of Uzbekistan in 2021, 210,195.1 billion will be allocated to enterprises and organizations of all forms of ownership. Soums or 13.3 percent more capital investments were used compared to 2020. Based on the 26th goal of the decree "On the development strategy of the new Uzbekistan for 2022-2026" [3], on the effective use of investments and the increase of export volumes, on the basis of the "bottom-up" principle, to establish a new system, until 2026 Foreign and implementing the strategy of attracting local investments, attracting investments equal to 14 billion US dollars in energy, transport, healthcare, education, ecology, communal services, water management and other sectors on the basis of public-private partnership.

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These tasks are important in carrying out an active investment policy aimed at the implementation of investment projects for the modernization of production, technical and technological updating, development of production and social infrastructure, improving the methodology of econometric modeling of the direction of economic inter-sector investments, developing models for determining investment effectiveness and risk levels. becomes important.

LITERATURE REVIEW.

J.J.Buckley[4], Y.C.Chui, and S.P.Chan[5], D.Kuchta[6], R.P.Mohanty, R.Agarwal[7], L.Dimova., P.Sevastianova[8], S.Mohamed Alison K McCowan[9], P. Samuelson, G.Alexander, D.Bailey[10], W.Sharp, G.Alexander, D.Bailey[11], Lawrence D.Gitman, Michael D.Johnk[12], C.R.McConnell, and S.L.Brew[13], H.William[14], J.Tinbergen[15] conducted research.

In the CIS countries, E.V.Mikhailova[16], N.D.Guskova, I.N.Kravovskaya, Yu.Yu.Slushkina, V.I.Makolev[17], O.S.Sukharev, S.V.Shmanev, A.M.Kuryanov[18] and V.V.Mishchenko[19], V.Z.Chernyak[20], M.V.Kangro[21] theoretical aspects of investment flow management, including the development of industry who have worked on the problems of investment attraction.

The models proposed by these scientists do not take into account the risk limits of investments, algorithms for determining the effectiveness of investment projects, and the possibilities of using information technologies and systems. However, the system of econometric and economic-mathematical models, the algorithm, along with the above-mentioned cases, it is important to study the current state of the national economy and future directions of development, the conditions of modernization and technical-technological re-equipment of enterprises in a theoretical and methodological way, and determine its importance in the development of the industry. is, which expresses the relevance of the chosen topic.

DATA AND METHODOLOGY.

In the research work, we first perform economic, comparative and logical analyzes within the scope of the topic. After that, in order to perform an econometric analysis on the selected factors, first of all, the direction of the correlation of x and y and the linear coefficient of the pair correlation are as follows:

$$r_{xy} = b\frac{\sigma_x}{\sigma_y} \quad (1)$$

is calculated using a formula, and through this it is determined whether the factors are correctly selected and how and to what extent they are connected. After that, the coefficient of determination of how the factors affect the resulting factor:

$$R^2 = r_{xy}^2 \quad (2)$$

It is determined by performing calculations using formula (2). After that, the parameters of the regression equation (model reflecting the process) of the selected factors (arbitrary variables) and the resulting factors are as follows:

$$b = \frac{\overline{y \cdot x} - \bar{y} \cdot \bar{x}}{\sigma_x^2}; \qquad a = \bar{y} - b \cdot \bar{x} \quad (3)$$

determined by formulas. It should be noted that the selected factors can be linear or non-linear depending on the measurement units. The model to be obtained in our study is non-linear, we logarithm all the factors to form the regression equation and the resulting

$$lny = lna + b \cdot lnx \quad (4)$$

A process of exponentiation is carried out by logarithmizing both sides of this level model equation:

$$Y = C + b \cdot x \quad (5)$$

Here $Y = lny,\ X = lnx,\quad C = lna.$

Using the actual values of x*i*, the resulting value of the regression equation is determined. Average approximation error – we find the value of Ā and check the equation with the first quality criterion.

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$$\bar{A} = \frac{1}{n}\sum_{i=1}^{n} A_i = \frac{1}{n}\sum_{i=1}^{n} \left|\frac{y_i - \hat{y}_i}{y_i}\right| \cdot 100\%$$

(6)

The mean error of approximation of the regression equation determined by this method was checked, and in our study this error was reliably selected up to 8.0%. After that, the significance of the parameters of the equation is compared by t-Student's test for each parameter in the case of df=n-k-1 when ∝=0.01 or ∝=0.05 according to the $t_{emp} > t_{tabl}$ condition. It can also be determined on a computer using СТЬЮДРАСПОБР(0.05;df). Empirical value of t-Student's test with the following formulas:

$$t_{emp} = |X - Y \cdot Sd| \quad \text{бу ерда } Sd = \sqrt{S_x^2 + S_y^2}$$

(7)

can be calculated. In addition, the significance of the determined equation is checked by the following formula using Fisher's F-criterion R^2 coefficient of determination:

$$F_{emp} = \frac{R^2}{1-r^2}(n-2)$$

(7)

The true value of this Fisher's F-criterion is checked with the critical values given in the table under the condition $F_{emp} > F_{tabl}$, and the obtained value, the random character of the determined relationship and the statistical insignificance of the parameters of the equation indicate the need to accept the hypothesis H0 about the density of the relationship. The value of the F-statistic within regression calculations can also be used to calculate the value of Fisher's criterion using computer technology F.OBR(0.05; k1; k2) using these built-in functions. Also, this equation is checked for the existence of a first-order autoregressive process in the random errors of the autocorrelation. To test the null hypothesis that the autocorrelation coefficient is zero, it is determined using the Durbin-Watson test. An equation that meets all quality criteria can be put into practice, finding it adequate. Using this adequate model, the next process is continued.

RESULTS AND DISCUSSION

Currently, the development of investment activities of the regions, the effective implementation of investment projects requires sufficient analysis in this regard. Investment projects can be analyzed using different models. Recently, interest in the method of econometric modeling, which consists of the quantitative expression of laws with the help of econometric models, has increased in the economy. Through these methods, it is possible to analyze the influencing factors during the development of investment projects and their entire life cycle. It is also worth emphasizing the importance of forecasting by using this method in the investment design process.

Investment demand is of great importance in the implementation of investment activities. Investment demand can be understood as the demand of investors for means to restore and increase their capital. The profitability level and bank interest rates are considered as the main factors for determining the investment demand. It goes without saying that if the expected rate of return is high, the investment will increase. The bank interest rate is the amount paid by the investor to obtain capital, and the demand for investment is inversely proportional to the bank interest rate. From this proportionality, it can be understood that bank interest rates will decrease and investment volume will increase.

It should be noted that when determining the investment demand index, more attention should be paid to other factors affecting investment activity than economic factors. In this regard, economic efficiency factors are determined separately for each problem to be solved. They differ from each other according to their technical and economic characteristics for each branch of the economy, for each sub-system of enterprise management. All diversity of efficiency factors in the enterprise can be classified according to a number of criteria.

Today, it is worth emphasizing the special role of information technologies and systems in increasing the economic efficiency of investments within the state and organizations. The following factors that determine the economic efficiency of information systems can be noted:

- obtaining more accurate, complete, timely and objective information about all processes, aspects and elements of production in the enterprise, increasing systematic labor productivity;
- increasing labor productivity in production, increasing the intensity of use of equipment, reducing losses due to damage and its failure;

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- high-quality technical and economic analysis, continuous accounting and control of the enterprise's work results, coordination and improvement of services, facilities (Fig. 1).

Figure 1. Classification of efficiency factors in the enterprise according to criteria [1]

[1] Муаллиф ишланмаси

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In addition, the following factors can be cited that determine the economic efficiency of information systems:

- optimization of plans, increasing the quality of optimal movement of transport, increasing the flexibility of production and the effectiveness of interaction, cooperation of systems;
- rational use of material resources, reduction of losses, support of basic production funds, improvement of product quality and reduction of waste;
- improvement of working conditions, reduction of staff turnover, increase of work comfort and composition, efficiency of workers and production activity, improvement of environment;
- continuous collection, transmission, processing of a large amount of data by a small number of employees, freeing employees from performing the same and time-consuming work;
- factors such as acceleration and rationalization of document circulation, reduction of planning and reporting periods, improvement of their quality, timely delivery of products can be noted.

Today, the development of investment activities of the regions, the effective implementation of investment projects, requires sufficient analysis in this regard. Investment projects can be analyzed using different models. Recently, interest in the method of econometric modeling, which consists of the quantitative expression of laws with the help of econometric models, has increased in the economy. Through these methods, it is possible to analyze the influencing factors during the development of investment projects and their entire life cycle. It is also worth emphasizing the importance of forecasting by using this method in the investment design process.

From an economic point of view, the source of income, profit, efficiency is some resources available for use. Any efficiency factor only creates conditions for obtaining a useful result. It will be possible to receive a real income when a reserve of resources is available or formed. Therefore, during the research, along with the main factors affecting the implementation of investment activities, it is appropriate to conduct an analysis of the effectiveness of the implementation of certain investment projects in certain regions. As a result of carrying out an economic analysis of the implementation of investment projects, it is possible to determine the influence of the factors affecting the investment to a certain extent. In this sense, in order to determine the implementation of investment projects in the Republic of Karakalpakstan and its impact on the economy, the goal of the research is to study the econometric analysis of the factors affecting the gross regional product based on structural changes.

For this purpose, from the statistical data of the years 2009-2020, the factors of the Gross Territorial Product of the Republic of Karakalpakstan - Investments in investment projects affecting the change of GDP - ILI, employment of the population in the economy of the Republic of Karakalpakstan - AIB and the level of literacy of the population - ASD were selected. First, the general correlation coefficients of the selected factors with respect to the specific and resulting factor are determined (Table 2).

Table 2

Correlation coefficient of factors affecting the change in the volume of the gross regional product of the Republic of Karakalpakstan

	YHM	ILI	AIB	ASD
YHM	1			
ILI	0,883339	1		
AIB	0,901513	0,664467	1	
ASD	0,945217	0,786658	0,794294	1

It can be seen from the table that all factors, including investments in investment projects– ILI($r_{YHM,ILI} = 0{,}88334$), employment of the population in the economy – AIB($r_{YHM,AIB} = 0{,}9015$) and population literacy rate - ASD ($r_{YHM,ASD} = 0{,}9452$) are closely related. If we pay attention to the levels of connection between the selected factors, the correlation coefficient between them ($r_{x1,x2} < 0{,}8$) indicates the absence of multicollinearity and the continuation of the process.

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Analyzing trends in the volume of gross regional product of the Republic of Karakalpakstan using exponential, graded, logarithmic, exponential, binomial and linear functions shows that the linear function is a more accurate representation of real practice. However, since the selected factors have different measurement units, logarithms of factor indicators are used to form a non-linear equation and it is checked based on quality criteria (Table 3).

Table 3
Regression equation and coefficients of the factors affecting the change in the gross regional product of the Republic of Karakalpakstan

Dependent Variable: LNYHM
Method: Least Squares
Date: 08/21/21 Time: 08:44
Sample: 2009 2020
Included observations: 12

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNILI	0.012792	0.055793	0.229284	0.0044
LNAIB	1.864095	0.991629	1.879831	0.0169
LNASD	15.27996	1.157637	13.19926	0.0000
C	-113.2686	7.350319	-15.41003	0.0000
R-squared	0.994959	Mean dependent var		8.732704
Adjusted R-squared	0.993068	S.D. dependent var		0.876104
S.E. of regression	0.072941	Akaike info criterion		-2.137137
Sum squared resid	0.042563	Schwarz criterion		-1.975501
Log likelihood	16.82282	Hannan-Quinn criter.		-2.196980
F-statistic	526.3164	Durbin-Watson stat		2.118962
Prob(F-statistic)	0.000000			

Based on the values of the coefficients given in the table, the following equation is created:

LnYHM=0,013LnILI+1,1861LnAIB+15,3LnASD-113,26864 (1)

Determined regression equation (1) for significance a=0.05; when k1=8 and k2=3, F_{jad}=8.85 and F_{his}=526.3, this regression equation is significant, and its adequacy follows from the fact that DW=2.12 and the absence of autocorrelation. If we pay attention to the significance of the parameters of the mentioned regression equation according to the t-statistic criteria, with α=0.05 and df=8, only the literacy level of the population - ASD (t_{ASD}=13.2>t_{Jad}=2,306) is significant, and the other parameters significance should be checked with retrospective quality criteria MAPE (Mean Absolute Percentage Error) and TIC (Tayl inequality coefficient - an alternative measure of Tayl forecast accuracy) (Fig. 4).

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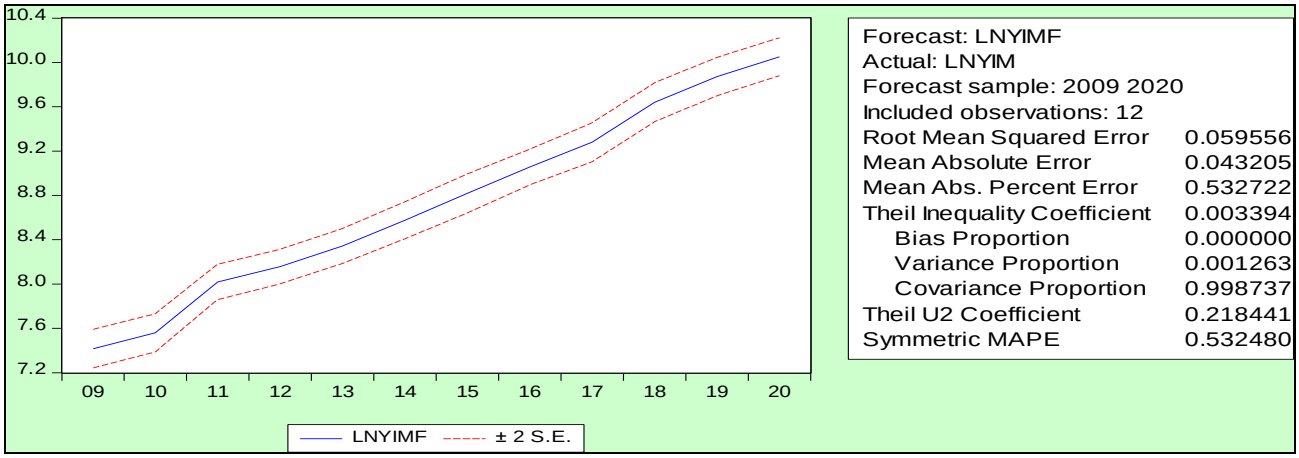

Figure 4. 1-Result of retrospective quality criteria regression parameters

Based on the data presented in Figure 3, it can be noted that MAPE=0.533, which in turn means that MAPE=0.533<10% has high forecast accuracy and TIC=0.0034<1. importance arises. In order to simplify the mathematical rules and calculation processes and to achieve the accuracy of the results, the regression equation 1 created above is potentiated and the following equation is created according to it:

$$YHM = \frac{ILI^{0,013} * AIB^{1,186} * ASD^{15,3}}{e^{113,26864}} \quad (1^*)$$

Now, if we give an economic explanation to the 1*-regression equation, if at present 1 bln. if investment is made, the gross regional product of the Republic of Karakalpakstan will increase by 0.046 billion. it was determined that it will increase to soum. If employment in the economy is increased by 1%, the volume of the gross regional product is increased by 0.83%, and if the literacy rate of the population in the region is increased by 1000 people, 2.18 bln. it was determined that there is a possibility of additional increase to soum. It should be noted that it is appropriate to pay special attention to employment and literacy in the economy from all three selected factors.

CONCLUSION

Investment decisions and the implementation of investment activities play a very important role in the development of the economy and its integration into the world community. The stability of the economy of our republic and its separate regions is connected with the investment policy, and it has a special place in the social and economic development of our country in reducing mutual economic differences and inconsistencies between regions. This, in turn, creates a basis for the effective use of all available resources in the regions and the structural improvement of the regional economy based on the rational use of these opportunities. The gradualness of the reforms made it possible for the investment policy of our country to undergo certain structural changes in the national economy, which in turn had a positive effect on the formation of market relations and created the necessary conditions for economic stability.

In conclusion, it was determined that in the conditions of Karakalpakstan, special attention should be paid to the implementation of scientific and technical developments in addition to the attraction of investment projects. It is also recommended to develop measures for the implementation of scientific and technical developments in the region. As a result of this, it would create a unique investment environment in the Republic and in the world on the way to economic growth by opening wider aspects of the region's vast potential.

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