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Econometric Modeling of Investments Distribution (Republic of Uzbekistan)

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Resume: The article describes the role of investments in the economy and modeling of their distribution, the technique of computer-based implementation, as well as the results of implementation of the model of Uzbekistan and scientific conclusions and recommendations on econometric modeling.

Keywords: direct investment, strategy of movements, econometric and economic-mathematical models, divisional cases, linear scales.

Introduction

Important role in the world economy in the production of new techniques and technologies, the role of the international market, the attraction of investments into the economy and their effective utilization for the production of competitive and qualitative products. According to the United Nations, the total volume of direct inflows of foreign direct investment in the world has decreased from 1.47 trillion dollars in 2017 to 19% in 2018 and amounted to $ 1.2 trillion. 5% in Asian developing countries and 6% in African countries have increased investment flows "[UN., 2018]. This, in turn, requires the identification of risk factors in the methods of assessing the effectiveness of investment in the changing and uncertainty of the global market, and the proper allocation of investment between regions and economic sectors.

Nowadays, it is limited to full-fledged operation of the production process as a result of undue risk of exposure to investment in the world economy or uncertainty about the risks involved in the effective utilization of investment, such as predictability and development of scientifically sound measures, ensuring competitiveness - a thorough and comprehensive analysis of factors affecting investment efficiency and the quantitative link between them.

For the development of the economy of the Republic of Uzbekistan in 2017, enterprises and organizations of all forms of ownership will receive 60719.2 billion soums. Investments in fixed capital were used in the amount of UZS 107.1 bn or 107% compared to 2016. The Strategic Action Strategy for the Five Priorities of Development of the Republic of Uzbekistan in 2017-2021 ["People's Word". 2017] and the active involvement of foreign investments into the sectors and regions of the economy through the improvement of the investment climate, the efficient use of attracted foreign investments and loans. These tasks include carrying out an active investment policy aimed at the implementation of investment projects on modernization, technical and technological renewal of production, implementation of investment projects on development of production and social infrastructure, improving the methodology for econometric modeling of direction and distribution of inter-sectoral investments, determining investment efficiency, risk and risk levels models.

Literature Review

In recent years, fuzzy ANP or AHP approaches have been preferred than traditional ones for project selection problem (Mohanty et al., 2005), project coordinator for investment projects of the investment project's net current value and Income gauge indicators based on Undefined Financial Indicators on obtaining an evaluation indicator of Undetermined Investment Project, [L. Demova et al, 2006), In the decision-making on investments is also based on the theory of fuzzy sets [Mohamed et al., 2001], The limit laws of probability grind fine but they do not grind that exceeding fine [P.Samuelson, 1997], the complexity of the investment environment, the clear and compact listing and description of securities and current markets and new methods of investment management [Sharp U., Alexander, BaileJ, 2010], RO's approach to evaluating agile investments under uncertainty is combined with the simplicity and practicality of an Excel-based spreadsheet tool, so that the structure can be easily incorporated into existing planning processes or the development of DNO policies or regulators. [J.A. Shakhtar, 2016], given the recent changes in market conditions and the continuing uncertainty in the market, Heinz's internal financial analyst should estimate the company's weighted average cost of capital (WACC). [Mark Lipson, 2016].

In the CIS countries, theoretical aspects of the investment flow management in the distributed networks are described by [E.V.Mikhaylova, 2001], [N.D. Guskova et al.

2006], [O.Sucharev et al., 2006], [V.Mishchenko 2003] and on attracting investment to development.

The models offered by these scientists do not take into account the uncertainty, risk and risk limits of investment and the conditions for modernization of enterprises and enterprises. The proposed econometric and economic-mathematical modeling model, along with the abovementioned facts, is a scientifically-practical development of the current state of the national economy and the development prospects, considering the conditions of modernization and technical and technological re-equipment of enterprises.

Research Method

It is also important to note that economic processes are very complicated, and nowadays computer technology is a good helper in analyzing and implementing scientific conclusions. The author has developed an algorithmic program for the analysis of the sectoral distribution of investment in the EXSEL program of computer technology using mathematical and statistical models to improve productivity and accuracy. In order to utilize the developed algorithmic program, firstly, the statistical parameters of the selected objects are determined and subtracted to the EXSEL program in the range of [0; 1] for the purpose of achieving certainty in the results of research, and is determined on the last column of the average arithmetic.

According to the State Statistics Committee of Uzbekistan, the volume of investment in agriculture and construction has been 10-15 times lower than in the industrial and service sectors. In the period from 2000 to 2018, the aggregate annual investment in the economy was 88528.1 billion soums. It is necessary to identify a number of indicators on this situation.

Table 1. The value of mathematical and statistical indicators calculated

Indicators and their identification	Estimated values	Indicators and their identification	Estimated values
Average value -$\bar{X}$	0.2	Minimum value -X_{min}	0,008
Default retention - y	0.2	Maximum value -X_{max}	1,0
Variation coefficient -V	103 %	The number of calculated intervals in the Sterjesa formula -n	5

Source: author's work on the basis of the data from the State Statistics Committee of the Republic of Uzbekistan.

Based on the data in the table, a linearized scale chart of investments in economic sectors is drawn up. For this purpose, first of all, on the basis of the annual dynamic indicators of the intersectoral allocation of investments

$$\bar{X}_1 = \frac{1}{4}\sum_{i=1}^{4} x_i,\ \bar{X}_2 = \frac{1}{4}\sum_{i=1}^{4} x_i\ , \ldots ,\bar{X}_{17} = \frac{1}{4}\sum_{i=1}^{4} x_i; \quad (1)$$

they are grouped according to their boundary values using the mean values determined by the formula. According to the goal, the set of calculations for each set of conditions and models will be carried out under the "EXCEL" program.

According to which column 1 is the name of the circumstances, the boundaries of distribution of the investment in columns 2 and 3 are set on the following conditions:

0,008≤" Too bad"<0,159; 0,159≤" It's bad"<0,318; 0,318≤" Medium"<0,477; 0,477≤" Good"≤0,637; 0,637≤" Very good"<0,80;

On column 4:

$$x_{31} = \text{ТЕКСТ}(x_{21};"0{,}00")\&" - "\&\text{ТЕКСТ}(x_{31};"0{,}00"),$$
$$x_{32} = \text{ТЕКСТ}(x_{22};"0{,}00")\&" - "\&\text{ТЕКСТ}(x_{32};"0{,}00")$$
$$x_{33} = \text{ТЕКСТ}(x_{23};"0{,}00")\&" - "\&\text{ТЕКСТ}(x_{33};"0{,}00")$$
$$x_{34} = \text{ТЕКСТ}(x_{24};"0{,}00")\&" - "\&\text{ТЕКСТ}(x_{34};"0{,}00")$$
$$x_{35} = \text{ТЕКСТ}(x_{25};"0{,}00")\&" - "\&\text{ТЕКСТ}(x_{34};"0{,}00") \quad (2)$$

algorithm. The values obtained from the mean square bar are reflected on the boundaries in each case using the developed algorithm. Then, the number of periods of distributed investment by the defined limits,

On column 5:

$$x_{51} = \text{СУММ}((\text{Accounts} >= x_{21}) * (\text{Accounts} < x_{31}));$$
$$x_{52} = \text{СУММ}((\text{Accounts} >= x_{22}) * (\text{Accounts} < x_{32}));$$
$$x_{53} = \text{СУММ}((\text{Accounts} >= x_{23}) * (\text{Accounts} < x_{33}));$$
$$x_{54} = \text{СУММ}((\text{Accounts} >= x_{24}) * (\text{Accounts} < x_{34}));$$
$$x_{55} = \text{СУММ}\big((\text{Accounts} >= x_{25}) * (\text{Accounts} < x_{35})\big) \quad (3)$$

the sum of the units of distribution in the order of the algorithm is placed. Column 6 shows the percentage of time periods allocated to sectors by sectors:

$$\text{For 1 status: } x_{61} = x_{51} \div \sum_{i=1}^{5} x_{5i};$$
$$\text{For 2 status: } x_{62} = x_{52} \div \sum_{i=1}^{5} x_{5i};$$
$$\text{For 3 status: } x_{63} = x_{53} \div \sum_{i=1}^{5} x_{5i}$$
$$\text{For 4 status: } x_{64} = x_{54} \div \sum_{i=1}^{5} x_{5i}$$
$$\text{For 5 status: } x_{65} = x_{55} \div \sum_{i=1}^{5} x_{5i} \quad (4)$$

algorithm and finally, the column 7, which describes the distribution of investment, is calculated using the following agor- mical model:

$$x_{71} = \text{НОРМРАСП}(x_{31};\text{СРЗНАЧ}(X_1 : X_{18});\text{СТАНДОТКЛОНП}(X_1 : X_{18});1) -$$
$$\text{НОРМРАСП}(x_{21};\text{СРЗНАЧ}(X_1 : X_{18});\text{СТАНДОТКЛОНП}(X_1 : X_{18});1),$$
$$x_{72} = \text{НОРМРАСП}(x_{32};\text{СРЗНАЧ}(X_1 : X_{18});\text{СТАНДОТКЛОНП}(X_1 : X_{18});1) -$$
$$\text{НОРМРАСП}(x_{22};\text{СРЗНАЧ}(X_1 : X_{18});\text{СТАНДОТКЛОНП}(X_1 : X_{18});1),$$

x_{73} = НОРМРАСП(x_{33};СРЗНАЧ($X_1 : X_{18}$);СТАНДОТКЛОНП($X_1 : X_{18}$);1) - НОРМРАСП(x_{23};СРЗНАЧ($X_1 : X_{18}$);СТАНДОТКЛОН П ($X_1 : X_{18}$);1),

x_{74} = НОРМРАСП(x_{34};СРЗНАЧ($X_1 : X_{18}$);СТАНДОТКЛОН П ($X_1 : X_{18}$);1) - НОРМРАСП(x_{24};СРЗНАЧ($X_1 : X_{18}$);СТАНДОТКЛОН П ($X_1 : X_{18}$);1),

x_{75} = НОРМРАСП(x_{35};СРЗНАЧ($X_1 : X_{18}$);СТАНДОТКЛО НП ($X_1 : X_{18}$);1) - НОРМРАСП(x_{25};СРЗНАЧ($X_1 : X_{18}$);СТАНДОТК Л О Н П ($X_1 : X_{18}$);1).

(5)

Reliability of the detected model

$$X_n^2 = \sum_{i=1}^{n} \frac{(O_i - E_i)^2}{E_i}; \qquad (6)$$

Pyrson [14] ie in MS EXCEL x_{77} = ХИ2ТЕСТ(x_{61}:x_{65};x_{71}:x_{75}) It is examined by Xi-square criterion. In order to combine and summarize these methods, it is desirable to place the calculations on the results of the linear and logarithmic normal distribution listed above, which, in turn, will make it possible to draw conclusions.

The models based on the theory of indeterminate collections of proposed investments allow for the elimination of deficiencies and limitations of existing methods of estimation of qualitative indicators without quantitative indicators of experts, carrying out operations on unaccounted access data, modeling of complex dynamic systems and their accuracy comparisons, estimation of risks of investment processes [15]. This, in turn, ensures the development of effective investment programs in the light of the current situation.

Result and Discussion

The development of the country's economy and integration into the global community are directly reflected in the cooperation and economic relations with foreign countries. This is particularly evident in the current globalization process. It is important for the world community to integrate into the globalization process with the leading countries of the world, to ensure that the state policy in the socio-economic and political spheres complies with the policies of partner countries on a mutually beneficial basis.

The globalization process involves liberalization of the economy, acceleration of scientific and technological progress, strengthening of competition and a number of other conditions. As noted above, the investment activity for the world economy and the globalization of the global economy are of great importance today. The growing role of developing countries and countries in the market economy on the international division of labor has a positive impact on it.

Today, the Republic of Uzbekistan has an investment climate with all the economic, political and legal foundations for accession to the largest recipient countries. However, this does not mean that all conditions for attraction of foreign investors are created in Uzbekistan. Therefore, based on the above mentioned principles, it is necessary to develop measures to improve the mechanism of attracting investments, to effectively utilize them, and to arrange the directions and distribution of the distribution. Based on the above-mentioned methodology, we will carry out the research using the statistical data of the capital investments of the Republic of Uzbekistan for 2000-2018, which are distributed to the economic sectors. The results of the survey can be found in Table 2 below.

Table 2. Periodic distribution of investments in linear scales networks

№	Periodic amount of investments (UZS bn)			Number of periods		Plot size
O / r	≥	<	" from "	in unity	%	%
Too bad	**0,008**	**0,159**	**0,01 -0,16**	**10**	**52,6%**	**20,9%**
It's bad	**0,159**	**0,318**	**0,16 -0,32**	**3**	**15,8%**	**26,4%**
Medium	**0,318**	**0,477**	**0,32 -0,48**	**3**	**15,8%**	**20,7%**
Good	**0,477**	**0,637**	**0,48 -0,64**	**1**	**5,3%**	**10,4%**
Very good	**0,637**	**0,796**	**0,64 -0,80**	**2**	**10,5%**	**3,4%**
TOTAL ON TIME				**19**	**100%**	**81,8%**
Comparison of real and normal distribution of investments xi-test						**95,0%**

Table 2 shows that the last column represents the values we have set out above. These definitions can be seen from the fact that in 2000-2018 investments in fixed capital of the Republic of Uzbekistan were disorganized. Overall, 81.8 percent of the total investment required 8.2 percent of the total investment. In this regard, it is desirable to compare the aforementioned table with the results of the logarithmic normal distribution.

All columns other than the second and third columns of logarithmic normal distribution are determined by the above methods. The first column of the second column is selected based on 10,000,000 (0,0001), and the first column of the third column is set to match the maximum value of the fifth column. In the study, the first column of the first column was raised by 15 times, and the second column was 0,00015. In the second column of the third column, the boundaries given in the second column of the boundaries shall be determined by multiplying the value of the periodic distribution of investments, and the periodic distribution value shall be calculated using the following formula: $d = 10000^{\frac{1}{i-1}}$ $in\ that, i = \frac{X_{max} - X_{min}}{n}$;

Here i - The number of calculated intervals in the Sterjesa formula (Table 3).

Table 3. Periodic distribution of investments on the main capital of the Republic of Uzbekistan on a logarithmic scale d =8,74

№	Periodic amount of investments (UZS bn)			Number of periods		Plot size
o/n	≥	<	"дан -гача"	Бирликда	%	%
Too bad	**0,0000**	**0,0001**	**0,00001-0,01**	**0**	**0,0%**	**0,00%**
It's bad	**0,0001**	**0,0010**	**0,00012-0,01**	**0**	**0,0%**	**0,04%**
Medium	**0,0010**	**0,0092**	**0,00105-0,01**	**6**	**31,6%**	**1,04%**
Good	**0,0092**	**0,0802**	**0,00917-0,11**	**8**	**42,1%**	**9,74%**
Very good	**0,0802**	**0,7009**	**0,08017-0,71**	**5**	**26,3%**	**32,27%**
Total in duration				**19**	**100%**	**43,1%**
Xi square test of comparison of actual and normal distribution of investments						75 %

For logarithmic normal distribution, taking into account that lifetime failure is a common condition, according to the table data, 6 cases in case 3, 8 in 4 cases, and 5 in 5 cases, 100 percent in all and the share of investment was 30.54% and 33.8%, respectively, compared to the level of the norm, and was 5.95% less than the level 5 in the 5th position. Over the years 2000-2018, a total of 56.9% of total investment was allocated. It is possible to conclude that according to the normal distribution of the linear distribution, normal distribution of logoristic distinction is more accurate.

Indeed, when we measure the amount of capital investment distributed over the years, the level of inflation will change and the amount of investment will change depending on price changes. This results in an increase in investment volumes over time over a relatively smaller year and, as a consequence, the low return on investment in the past period indicates a low effect on the situation (this is illustrated in Table 3 on linear scale).

It should be noted that these distribution models, which were used in the research, are criterion and adequacy of the criterion. The criterion Xi is the most common criterion for comparing the hypothesis that the series of observations corresponds to a certain theoretical division law. When using the Xi-square criterion, it does not require competing assumptions, but an example of a particular law. Xi square test is any statistical test of hypotheses, with zero hypothesis being the standard distribution of the criterion. The zero hypothesis is regarded as subject to the randomly-set, specific theoretical division law.

Conclusion

Optimization of issues of organizing and forming investment processes in uncertainty. The theory of probability is involved to address these issues. However, in some cases the application of the theory of probabilities is not sufficiently clear and substantial. In such circumstances, using different approaches to the probability theory, ie the use of existing approaches to evaluating uncertainty, provides a clear and complete assessment of the process.

The use of unmatched batching capabilities, first of all, enables the introduction of qualitative variables in analysis, the availability of unclear access data operations and linguistic criteria, rapid modeling of complex dynamic systems and their comparative accuracy, eliminating deficiencies and limitations of existing methods in assessing investment risks .

In allocating investment, it is necessary to first determine the attractiveness of the region, industry or enterprise, its harmless point, investment limits, and the degree of risk and risk. This, in turn, implies the use of a complex system of econometric models of investment allocation.

Econometric methods can not simply ignore commonly used traditional methods, but also help them to further develop and analyze objective variable outcomes by using other indicators. This will allow for forecasting and managing the production results in dozens of industries and thousands of companies on a scientific basis on a scientific basis.

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