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Application of Economic-Mathematical Models for the Formation and Modernization of İnvestment Strategies in Financial Markets

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ABSTRACT

In this article, the relevance of the next and most important relevant problem in the global world, in the context of the application of statistical and mathematical methods, and in the context of the emotional and subjective approaches of investors, has been analyzed. The most commonly used economic-mathematical models for the formation and modernization of investment strategies in financial markets, namely the "Portfolio theory" (Markowitz model), the "CAPM" (Capital Asset Pricing Model), and the issue of measuring the value of capital based on mathematical methods have been considered. "APT" (Arbitrage Pricing Theory), "VaR" (Value at Risk) model, "Dynamic" optimization model, and various tools have been used in the context of modernization based on mathematical formulas.

Keywords: Economic-Mathematical Models, İnvestment Strategies, Financial Markets

INTRODUCTION

The effectiveness of investment strategies in financial markets, of course, requires a large amount of correct scientific approach and depends largely on the application of correct economic-mathematical models. These models mainly allow investors to minimize risks, further increase returns, and make more correct decisions and rationally build the relevant process at the level of modern requirements.

Today, everyone understands the necessity and importance of applying economic-mathematical models, and scientific-theoretical and practical research is being conducted in this direction all over the world [2. Pg. 219]. In this direction, mainly in the context of risk and profitability balance, finding the optimal balance of risk and return, which is considered the most important issue in investment decisions, is considered the most important problem today [6. Pg. 58]. .

The next and most important problem in the global world is, of course, the issue of objectivity of decisions [3. Pg. 501]. In the context of the application of statistical and mathematical methods, it becomes possible to reduce the emotional and subjective approaches of investors [12. Pg. 93] . Another important issue is to determine the broad aspect of forecasting capabilities. The models to be applied here allow for a preliminary assessment of market trends, price changes and the impact of macroeconomic factors.

The most commonly used economic-mathematical models for the formation and modernization of investment strategies in financial markets are mainly the following. These are:

- **Portfolio theory (Markowitz Model);**
  - ✓ Reducing risks in investment projects through asset diversification;
  - ✓ Selecting the most optimal investment portfolio based on covariance and dispersion.
- **CAPM (Capital Asset Pricing Model);**
  - ✓ Estimating the expected return on assets in accordance with market risk and in accordance with modern requirements;
  - ✓ It is a measurement of the cost of capital based on the formula E(Ri)=Rf+βi(Rm−Rf)E(R_i) = R_f + \beta_i (R_m - R_f).
- **APT (Arbitrage Pricing Theory);**
  - ✓ Price explanation based on multifactor models;
  - ✓ Analyses in the context of taking into account the impact of inflation, interest rates, economic growth and other macro factors;
- **VaR (Value at Risk) Models;**
  - ✓ Measuring the maximum losses that can occur in an investor's portfolio with a certain probability;
  - ✓ Monte Carlo simulations or applications with historical models.
- **Dynamic Optimization Models;**
  - ✓ Planning investment decisions taking into account the relevant time factor (e.g., Bellman equation);
- Modernization directions include:
  - ✓ ***Application of Digital Technologies***: This includes forecasting market trends with learning models based on artificial intelligence and machine learning;
  - ✓ ***Big Data Analysis:*** This includes taking into account the impact of social networks, news, and investor behavior on market prices through mathematical models.
  - ✓ ***Stochastic Models:*** This includes the application of Ito or Geometric Brownian motion models to account for the random nature of price changes.
  - ✓ ***Stress-Testing Models:*** This includes testing the sustainability of portfolios in the face of global financial crises and sharp market changes.

All of the above will be used in the analysis of the relevant topic we have set before us. The application of economic-mathematical models in the formation of investment strategies in financial markets is based on theoretical-methodological foundations.

Mathematical models solve the problem of market uncertainty, risk management and optimal decision-making [4. Pg. 79]. It should not be forgotten that the theoretical foundations of economic-mathematical models are mainly closely related to the following approaches [7. Pg. 121] . The first is the theory of optimization, where The goal is to minimize risk and maximize profitability within certain constraints. The basic approach is implemented in the context of linear and nonlinear programming and dynamic programming.

Of course, one of the important approaches is the approach based on the context of probability and statistical methods [10. Pg. 235] . Here, It is the application of dispersion, covariance, and correlation methods for appropriate forecasting and risk measurement in terms of income-based distribution of investment assets .

Stochastic models also meet the requirements of the day and are considered very important in the market [17. Pg. 35]. This includes, taking into account random changes in the prices of financial assets and models based on the Ito calculation, Geometric Brownian motion and other random processes. Another method is considered to be an approach based on game theory and includes, modeling the mutual behavior of **investors** and other market participants, the impact of cooperative and non-cooperative games on strategy choice.

Application of economic-mathematical models for risk management during the formation and modernization of investment projects in financial markets

In the modern world, investors rely specifically on the analysis of project risk in order to effectively formulate their strategic activities in the market or to make the relevant activity more modern [22. Pg. 125] . It is from this context that the appropriate approach is considered as a tool, and therefore the economic -mathematical model of the project itself is taken as a basic method. In international business conditions, it can be considered the most

logical decision to study the application of economic-mathematical tools for project development in the context of investments.

Developing an investment project is its financial analysis, which is why the superficiality of the design in the context of a financially sound example of a project is necessary to assess its effectiveness [8. Pg. 63]. Based on the appropriate degree of accuracy , we also have the opportunity to determine in advance the quality of the risk analysis carried out.

The development of a business plan project and special software for risk analysis is required [9. Pg. 199] . Therefore, as the research reflected here and conducted on this topic continues, the solution to the relevant problem becomes clearer.

It is important to include the process of obtaining and effectively distributing the financial resources necessary to achieve the project 's goals in accordance with the financial planning model [5. Pg. 438] . It should not be forgotten that structurally this model is based on the balance sheet constraint and the maximum NPV of the project. The formulation of this model should be developed sequentially, and the appropriate mathematical notations will be applied and the economic meaning of the proposed corresponding ratios will be explained .

For example, if $Mm(t)$ financial resources are invested in a certain investment project during the period of time , then t the m index determines the direction of their use .

These directions may include the following:

- Identification and acquisition of suitable land;
- Acquisition of the passive part of fixed assets (warehouse, commercial, office and production buildings);
- Current market rent;
- Financial resources spent on the construction of real estate;
- Reconstruction of facilities or buildings;
- Acquisition of the active part of the fixed assets;
- Relevant financial resources spent to create a positive image of the business entity in the market;
- Initial costs and corresponding turnover and expenses for marketing to be carried out in the market.

can calculate the integral volume at this stage, i.e. in the context of the (first) financial investment, using the following formula. This is: $M(t)$

$$M(t)=\sum_{m=1}^{m=M_o}\sum_{t=1}^{t=T}M_m(t)$$

Here:

$Ff(t)$ - financial sources of capital investment;

t - an activity that has begun at a moment in time;

f - the index is a specific source of personal or debt capital.

This issue can be resolved at the same time through the following means :

- Companies or companies that initiate the implementation of the relevant investment project - $F1(t)$;
- Potential investors $F2(t)$:
- Economic entities implementing the investment project $F3(t)$- ;
- Financial lenders- $F4(t)$;
- Refinancing of the relevant investment project- $F5(t)$.

In the next, i.e. second stage, during the investment project and its life cycle, we can get the total amount of funds received from various sources equal to the following ratio. This is:

$$F(T)=\sum_{f=1}^{f=F_0}\sum_{t=1}^{t=T}F_f(t)$$

Considering that financial resources are spent on the investment project at any time and the capital investment is paid off , as a result of its implementation out of necessity, we can establish the following balance ratio. This is:

$$\sum_{f=1}^{f=F_0}F_f(t)=\sum_{m=1}^{m=M_0}M_m(t)\text{including}\,M(T)=F(T)$$

Here:

r - The annual interest rate of the loan resources attracted for the investment project;

$h1$ - The tax rate imposed on the relevant profit derived from the investment project;

$h2$ -The tax rate imposed on property within the framework of the implementation of the relevant investment project;

$a1$ -The interest rate charged on the financial amount allocated for the restoration of buildings and facilities under the project;

$a2$ -It is the interest rate of the financial amount allocated for the restoration of the active part of the fixed assets within the project.

In the context of all financial resources received for the investment project, they are returned in accordance with the current financial laws on the basis of the concluded loan agreement [11. Pg. 47]. In this regard, the following conditions can be included here . These are:

- repayment of the principal amount of the loan ;
- repayment of loan interest.

These calculations are mainly carried out in the third stage of the model. The approach taken here is to solve the problem within the framework of relevant mathematical laws. Let's say that if $K_b(t)$ the amount of the loan is considered, t received at the relevant moment in time (here it should not be forgotten that the loan received is one of the various sources for providing the project with financial resources as a whole), or rather this:

$$K_p(t) = Fa(t)$$

Here:

$K_p(t)$ - the amount of the loan repayment at the time of issuance within the framework of the relevant investment project;

$K_a(t)$ - the total amount of the loan at the time of issuance within the framework of the relevant investment project.

Considering that the amount of debt to creditors t at the moment of time consists of the amount of the loan received and the balance of the outstanding debt at this moment, that is, t the reduced amount of the loan at the moment of time , we propose the following formula for calculation , written in the form of a ratio . This is:

$$K_a(t) = \sum_{\xi=1}^{\xi=t} K_b(\xi) - \sum_{\xi=1}^{\xi=t-1} K_p(\xi) = = K_b(t) + K_a(t-1) - K_p(t-1)$$

Here:

r - is the annual interest rate of loan resources attracted within the framework of the investment project;

r_t - its meaning (for example, a tariff based on a period of a quarter);

To find a solution to the relevant problem, we suggest using the following ratio. This is:

$$r_t = \sqrt[t]{(1+r)} - 1,$$

Here:

t – the number of periods in a year t (for example, for a quarterly tariff $t = 4$);

$K_p(t)$ - is the amount of interest that t can be obtained by transferring the following ratio in the current period, which is consistent with the interest rate. This is:

$$K_r = (t) = \left(\sqrt[t]{1+r} - 1\right) K_a(t)$$

Of course, the fourth stage is of great importance, and now we are moving on to the stage of its organization. Here, $S_s(t)$ **If** we note the cost of project products and services , then t this is planned and planned s over time . Then the index will show us the cost item (this includes raw materials and materials, semi-finished products and assembly , fuel and energy, employee wages, amounts added to wages, depreciation of fixed production funds, transportation costs, marketing costs, loan interest rates in the cost structure , auxiliary costs). We propose to calculate the cost equation using the following formula. This is:

$$S_s(t) = \left[a_1 \sum_{\xi=1}^{\xi=t} \sum_{m=1}^{m=5} M_m(\xi) + a_2 \sum_{\xi=1}^{\xi=t} M_6(\xi) \right] \left(\sqrt[t]{1+r} - 1\right)$$

At this point, we can find the answer to the question of what level constitutes the corresponding volume of the cost price based on the formula we propose below. This is:

$$S(t) = \sum_{s=1}^{s=S_0} S_s(t)$$

The fifth stage in the solution of the relevant problem requires us to calculate the income from the investment project. Since it is precisely the process of collecting income in the context of the sale of the project product and other commercially based sales , including the liquidation of the fixed assets of this project, is an important issue.

Considering that, $V_\nu(t)$- at the appropriate time of the implementation of the investment project, let's note the amount of income generated from the sale of this project product or services . Here:

ν The index indicates a specific source of income ;

$V(t)$- if the integral volume of income from sales activities is considered, then we propose the following equation for its formation. This is:

$$V(t)=\sum_{\nu=1}^{\nu=V_0} V_\nu(t)$$

Finally, the sixth stage is a step related to the net income obtained from the investment project and the final result of the project, taking into account the application of taxes. However, it should not be forgotten that the main directions for the use of net income are the following main factors. These are:

- motivating managers;
- conclusion of a loan agreement;
- reinvestments and dividends.

Determination of İncome up to the Tax Payment Period

Of course, the important thing here is to know the amount of income up to the tax payment period. For this, we propose the following formula. This is:

$$P(t)=V(t)-S(t)$$

Need to compile the tax block in its entirety , and here we need to consider income tax and property tax . It is in this context that this issue is solved as an equality in the following formulas, respectively. This is:

$$H1(t)-h1P(t)$$

$$H_2(t)=h_2\sum_{\xi=1}^{\xi=t}\sum_{m=1}^{m=6}M_m(\xi)$$

In this case, net income can be determined by meeting modern requirements with the following formula proposed by us. This is:

$$NP(t)=P(t)-\sum_{h=1}^{h=2}H_h(t)$$

So, the final result of the investment project (of course, for a certain period) is equal to:

$$R(t)=NP(t)+K_0(t)-M(t)$$

Here:

$K_0(t)$- is the corresponding amount of real financial resources paid to the creditor over a certain period of time.

The corresponding accumulated result of the investment project's market performance can be determined based on the formula proposed by us. This is:

$$AR(t)=\sum_{\xi=1}^{\xi=t}R(\xi)=AR(t-1)+R(t)$$

In the context of the complementary stage of the model developed by us, the solution to the problem of calculating the amount of net discounted (accounting) income (NPV) of the investment project is provided. We propose to determine this issue by the following formula. This is:

$$NPV=\sum_{\xi=1}^{\xi=t}\frac{R(\xi)}{(1+r)^{\xi}}=\sum_{\xi=1}^{\xi=t}\Big[R(\xi)+S_1(\xi)-\\ -\sum_{h=1}^{h=2}H_h(\xi)-\sum_{m=1}^{m=M_0}M_m(\xi)\Big]$$

The construction of an investment project model can be in various variants, and let's consider another one of them , where it is possible to study project risks and is based on the principle of periodic cash transfers to the project [13. Pg. 71.]. Considering that this particular model was developed specifically for computer sales and the purpose of creating such a special model is the need to conduct many reports required for financial research of investment projects .

In the context of the effective use of the proposed model, it is necessary to rely on the efficiency indicators of the project based on the annual provision of cash resources, taking into account the tax system. Because this issue is accepted as a criterion in international investment practice . Therefore, when using personal and debt assets, it

allows us to build a project budget and analyze its ability to influence changes in the main parameters of economic entities implementing the project .

In this model that we have developed, an investment project is described as a combination of three types of cash flows. These are:

- current expenses;
- income;
- capital investment.

It should be noted that the corresponding cash flow can consist of practically unlimited expenses and income in each model. Therefore, the formation of the names of the items and contents can be determined by the respective user .

Another characteristic feature here is the model of the corresponding project. It is defined by the user at the initial stage and it is important that it is the same for all elements of the project. The model allows us to conduct three types of analysis. These are:

- profit and cost analysis;
- analysis of financial resources;
- effectiveness analysis.

The analysis of financial provision is a variation of the usual analysis of income and expenses [26. Pg. 147.]. In this case, it is important to take into account not only the material flow of funds, but also the sources of financial provision of the project , and, consequently , the additional costs due to debt (if any), in the conditions of a modern market economy.

When such an analysis is carried out, it is possible to calculate the necessary financial statements for each year of the project, the calculation of project dividends, as well as the shortened balance sheet form of the project and a number of financial indicators for the implementation of the project . In the analysis of the effectiveness of the project , the impact of the variability of the input characteristics can be carried out in various ways. These are:

- First, based on user content, it is possible to conduct an "interactive" effectiveness analysis, which consists of reporting on a large number of different variability models in the characteristics of the project;
- Second, a type of effectiveness analysis can be conducted in which changes in the project items can be automatically seen at different rates, varying towards increase and decrease, and on this basis, a logical judgment can be made that all items of the relevant project are mutually independent;
- Finally, the third option for effectiveness analysis is lossless, and its methodological description can be explored in the course of the work.

Special attention is paid to the taxation of cash flows related to the finalization of cash flows . Here, three types of taxes are mainly considered . These are:

- property tax;
- municipal tax;
- I am a tax payer (income tax).

It should not be forgotten that in modern conditions, project budgets are formed from two main sources. These are:

- person ;
- with borrowed funds.

The project's private funds are collected from two sources. These are:

- money given to the statutory fund;
- revenues from the project.

Debt funds are generated as a result of obtaining loans. There are 2 methods of obtaining loans. The model includes those necessary to provide the project with financial resources. These are:

Method I - a direct assignment may be made in the direction of assigning several loans (or credit lines), the credit terms for each of which may be different , and in this case, in the context of debt repayment for each of them , a calculation model is developed, the process of obtaining and repaying the loan is indicated, and a final schedule is drawn up;

Method II - automatically determines the project's need for borrowed funds and reports on the repayment of the loan under the loan terms . In this method, there can be two types of loans: loans to finance capital investments and loans to finance operating expenses.

An automatic calculation is performed that assumes the need for borrowed funds for each type of loan and the corresponding result is displayed. The difference between the two types of loans is only in calculating the amount of credit necessary for use in various elements of the project .

At this time, a complete set of parameters is provided for conducting financial analysis, and their composition includes the following :

- the profit percentage at the discount rate used to determine the project's pricing criteria ;

- Dividends are allocated (divided) according to their respective characteristics ;
- profit income (before taxes are paid) ;
- used to repay debt;
- financial funds deposited;
- or targeted use of income from funds not used in the project implementation process ;
- The tax amount used for the relevant scope of tax application to the project.

To conduct an analysis of financial resources, additional structural data is involved, where information is collected about financial capabilities and requirements for each year of the project, which is carried out on the basis of a schedule of receipt and repayment of loans [16. Pg. 83.]. At this stage, in the context of profit (the flow of project financial resources occurs in the same model as in the cost analysis), in the corresponding analysis of finance, the process is somewhat complicated by the involvement of costs and revenues, such as (in comparison with the analysis of profit and cost) the provision of the project with financial resources, repayment of debts , as well as interest on deposits . The calculation of project efficiency criteria is carried out after the process of building financial flows to the project for all years.

One of the main shortcomings of the corresponding method is the impossibility of specifying the type of distribution of costs and revenues within the activity phase (they can be accumulated at the beginning or end of the phase). The second drawback is that for activity phases that are not equal to one year , the user has to recalculate the discount amount, the tax amount, the amount of annual credit for the selected activity phase (month, quarter, etc.). Finally, the biggest problem in using the corresponding method is the impossibility of using it at different discrete phases. This forces many data of the corresponding project to adapt to the requirements of the method.

In this context, if we put the popular approach into words, we can say that risk has already become a subjective truth and, if we express it through our manifestations, it is a result that is obtained in the appropriate manner. However, it is necessary to consciously approach risk as a management parameter, not only to prevent it in time, but also to make it harmless.

Thus, a problem that is possible, reasonably related to the project risk, is revealed and, based on the accepted risk concept, can lead to an undesirable development of events . As a result, the likelihood of causing deviation from the set goal increases, forcing us to find a solution to the impossibility in the direction of eliminating potential causes .

The process of achieving the chosen goal, the management of the project-investment activity takes place on the basis of making decisions that provide a somewhat favorable level of risk [14. Pg. 96.]. It should correspond to a certain balance between the risk of profit and loss , and this problem should be solved by calculating a special method, which, based on the applied serious analytical work, can solve the relevant issue [20. Pg. 47.]. From here, it emerges that the allocation of opportunities , the assessment of the initial, previous level of risk , the implementation of measures against the final result of the risk, together with the implementation of measures against it, is an important factor.

Suppose PV we express the net income of the theoretically designed project as the difference between its income and the amount of 4. Then: B

C - the costs incurred to eliminate the risk are integral production costs that are not taken into account ;

M are the integral costs incurred to reduce risk ;

N - are the integral costs incurred to eliminate the risk;

K - are the costs incurred to compensate for the risk. This is:

$$PV = B - (C + M + N + K)$$

For the realization of the risk, the corresponding project loss can be conditionally divided into two parts, indirect and indirect [25. Pg. 68.]. Here, category I includes losses associated with the deterioration of equipment and raw materials, the destruction of buildings and structures, and the partial or complete deterioration of the final product of the project. Direct losses are calculated by more complex means. These are:

1. losses existing in the market (for example, unknown risks in the development of a new market as a result of the emergence of new competitors, the identification of factors limiting business by an expert, and the adoption of negative laws);
2. loss of profit (for example, changes in the ratio of financial units to relevant interest rates, changes in foreign exchange rates);
3. reduction in the number of core staff members (for example, due to dismissal, death, or the level of the current professional being below the required level, resulting in the impossibility of organizing a replacement or retraining);
4. q) judicial and legal losses (for example, participating in litigation processes that cause both financial and time losses);

5. d) losses related to variables in the external environment (for example, activities aimed at shaping public opinion in order to adopt new laws that require additional costs);
6. e) political-economic losses (for example, war, change in social structure, global financial crisis, inflation spike, and other issues).

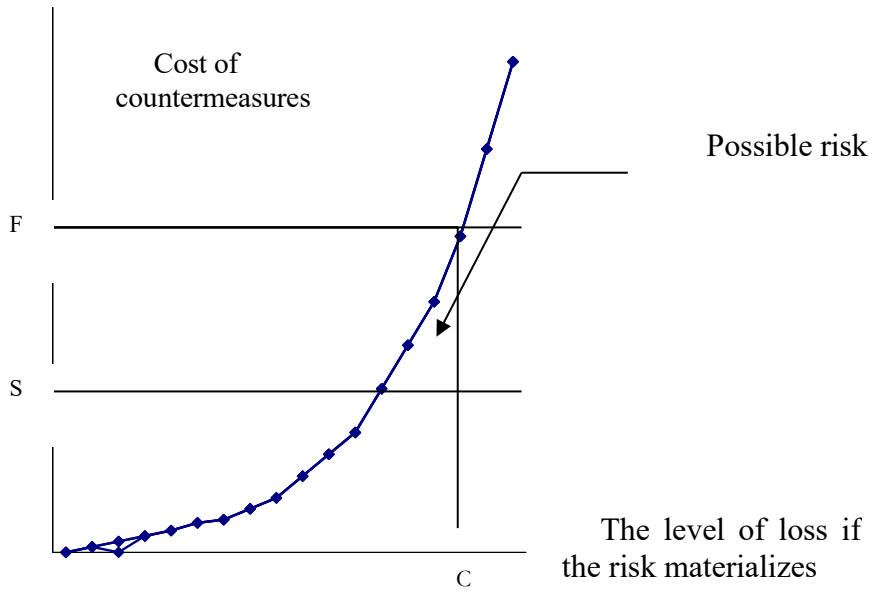
The natural desire of the project manager is to reduce risk losses in the process of implementing the investment project he is implementing , because with the increase in costs spent on anti-risk measures, the cost of the project itself also increases [18. Pg. 67.]. An important condition for the more efficient investment project is the analysis of the interdependence of costs spent on combating the level of possible risk [21. Pg. 89.]. At the following stage, it is important to determine the appropriate relationship between the costs spent on research work carried out against risks (ordinate axis) and the value of possible damage (abscissa axis).

The mentioned interdependence , let us apply the appropriate mechanism proposed in this article for qualitative risk analysis , and on its basis, it is possible to reveal the risk factors of the project and calculate the value of the damage that may be caused to the project. Subsequently, it is necessary to arrange the obtained results in the appropriate order in order of increasing order and calculate the possible costs to prevent such damage.

The cost of risk mitigation measures can be represented by a corresponding curve [24. Pg. 36.]. However, it is very important to take into account a certain amount of unforeseen costs in advance , and this is associated with determining the initial (minimum) level of possible damage in the event of a direct fight against the occurrence of the risk . S

Let's say that the line is the ratio of the final amount F of costs spent on implementing countermeasures to the amount of risk that can be "continued" in the project budget. The lines shown here, straight and curved, divide the entire plane into a number of areas, which reflect the functional dependence of the costs spent on countermeasures on the amount of possible damage . As can be seen in Figure 1, D the area reflects the amount of costs, [taking into account the final limit of costs necessary to eliminate]the risk, which is ultimately possible .

The Level of Possible Risks in Total Costs İllustrated Dependency Graph



Picture-1

If the flat F area is determined by the extremely important costs of the project budget spent on combating risks, then increasing these costs can lead to the bankruptcy of the relevant project. Therefore, we witness the need to restructure the internal structure of the relevant project (for example, selling part of the assets of the economic entity, those currently implementing the relevant project).

In the context of project implementation, its essence should include both various risk factors and the costs of anti-risk measures, as a multifactorial structural analysis [19. Pg. 64.]. The appropriate project can be determined in advance in order to make the most optimal decisions in the course of investment activity. The main tool of such analysis is economic-mathematical (modeling) methods.

As mentioned above, when assessing the current state of the project results, it is necessarily based on the construction of its financial flows . Therefore, the need for a discount is determined in advance. Taking this into account, the effectiveness of the investment project is assessed and a mechanism for the active use of the appropriate method is established. Of course, this allows us to take into account the structure of possible anti-risk measures .

A Method – the expected effective significance of this method:

$$NPV = \sum_{i=1}^{3} P_i \sum_{t=1}^{T_i} \frac{1}{(1+r_i)^t} \left(B_i(t) - \left(C_i(t) + M_i(t) + N_i(t) + K_i(t)\right)\right)$$

Here:

$B_i(t)$ - is the amount of the value of the income of the relevant project t over a period of time ;

$C_i(t)$ - t integral production costs over time, excluding costs incurred to eliminate risk;

$M_i(t)$ - is t the amount of expenditure spent on risk reduction (over a period of time) ;

$N_i(t)$ - is t the amount of integral costs spent on risk compensation at a certain stage of time ;

$K_i(t)$ - t is the amount of integral costs incurred to replace the risk at the appropriate stage of time.

P_i The considered coefficients reflect the probability of each of the three scenario variants, optimistic, pessimistic, and more likely. $(i = 1,2,3)$ Considering the importance and necessity of combating risks of a specific investment project, these probabilities should be equal to one $P_1 + P_2 + P_3 = 1$.

In the relevant article, a method based on the analysis of the structural analysis of the measures taken against risks B has been developed, which allows us to determine the expected amount of project costs spent on eliminating the risk of (PGC). Accordingly, they are also recorded for the relevant method and constitute the sum of three quantities.

$$PGC = \sum_{i=1}^{3} P_i \sum_{t=1}^{T_i} \frac{1}{(1+r_i)^t} \left(M_i(t) + N_i(T) + K_i(t)\right)$$

Here:

$M_i(t)$ mini-goods are expenses for risk reduction ;

$N_i(t)$ to make risk neutral ;

$K_i(t)$ the integral costs of replacing the risk or the expected result based on our expression;

P_i - A It fully corresponds to the coefficients determined in the method.

classifications of project risks we have considered earlier , let us assume, based on one of the uses, that the direct occurrence of a particular project risk is due to certain reasons in three main directions. These are:

- technical;
- economic;
- occurs in socio-political directions.

$HC(t), EC(t), SC(t)$ Let us note the additional costs associated with eliminating technical, economic, socio-political risks at the time t stage . Then the expected full discount costs incurred to eliminate the risk can be determined by the formula proposed by us. This is:

$$PGC = \sum_{i=1}^{3} P_i \sum_{t=1}^{T_i} \frac{1}{(1+r_i)^t} \left(HC_i(t) + EC_i(t) + SC_i(t)\right)$$

In this equation too P_i A fully consistent with the coefficients determined in the method and the technical risk

The amount of additional costs to eliminate the manifestations of the risk can be established on the basis of the balance sheet. Of course, this also includes additional costs to eliminate the risk during the time period given here, which is also conditioned by the change in the nomenclature of the released product .

In connection with ecological problems , it is necessary to analyze issues such as the elimination of force majeure manifestations of risk, which are conditioned by the aggravation of technical regulations and the obsolescence of technology. [23. Pg. 59.] . Referring to this idea, we can also regulate the costs of economic manifestations of risk in the same way.

Considering the directions of costs , the bankruptcy of a supplier or consumer, the need to attract additional investment , changes in demand , changes in the exchange rate of currency and interest rates may be the main factors [15. Pg. 83.] . The costs incurred to eliminate socio-political risks include the following. These are:

- costs incurred in the context of the project, in general, for countermeasures ;
- changes in personal property rights ;
- bureaucratic obstacles related to public unrest and changes in government patronage .

Methods B established in the relevant article are A very simple in form , but at the same time they have certain computational difficulties , which can be attributed to the calculation of the real situation in order to maintain balance. The need to insure against repetition for the calculation of these costs (only simple and independent risks are taken into account), etc. issues can be attributed to this.

Methodology used in economic-mathematical methods is an effective and active tool for making effective investment decisions. At the same time, it can be used to analyze the risks of an investment project within the framework of modern market requirements.

CONCLUSION

As a result of all the above, the following important suggestions can be made. These are:

- Since the application of economic-mathematical models creates conditions for the establishment of investment strategies on a scientific basis, it is important to ensure the process of forming more flexible, sustainable and profitable strategies in financial markets in the context of combining traditional models with modern digital technologies and artificial intelligence tools;
- Based on the diagnostic analysis of the results obtained, an analysis of the data obtained as a result of the application of economic-mathematical models should be carried out to evaluate investment strategies in financial markets, and in the context of the sustainability of the relevant strategy, it is necessary to check the risk-return balance and its compliance with changing market conditions;
- In the context of portfolio investments, the portfolio should be compared with market indices based on the average return indicator, the risk level should be measured with dispersion, standard deviation and beta coefficient, and a diagnostic analysis should be conducted to determine the efficiency of the portfolio with Sharpe, Treynor and Jensen indices;
- In the context of scenario-based pricing, based on optimistic scenarios, the probability of increasing returns during a market upswing, according to a pessimistic scenario, the sustainability of the portfolio in the event of a financial crisis or economic recession, according to realistic scenarios, ensuring the stability of the portfolio in the event of moderate market volatility;
- In accordance with the results of stress tests, it is necessary to determine the extent to which the portfolio can suffer losses in the worst case (based on Value-at-Risk) in terms of the impact of unexpected shocks (interest rate increases, currency devaluation, inflation) on the portfolio, and to determine the possibilities of converting assets into cash in the event of a liquidity crisis;
- In the context of implementing diagnostics with the application of modern technologies, it is necessary to provide a realistic assessment of risks by applying artificial intelligence models, forecasting in terms of market changes using neural networks, determining the impact of information from social networks and news on portfolio risk based on Big Data analysis , and analyzing thousands of scenarios using stochastic simulation and Monte Carlo methods;
- In the context of selecting optimal strategies, it is necessary to compare the results obtained based on different models, analyze short-term speculative and long-term strategic approaches based on different indicators, and determine the most effective strategy according to the investor's risk appetite.
- Based on the results of the appropriate diagnostic analysis offered by us, the investor can both minimize risks and make decisions for more sustainable investment projects, making his strategy more perfect and modern in the changing market conditions.

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