

## FEATURES OF INVESTMENT RISK ANALYSIS AND ASSESSMENT

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**Abstract.** The article examines the essence of the analysis and assessment of the risks of investment projects in the innovative development of the country's economy. One of the most important tasks for investors in the context of the coronavirus crisis is the analysis, assessment and effective management of risks that can affect investment projects before investing. And also, the investor must identify the factors that negatively affect the project and develop measures to reduce their negative impact. Based on the above, it can be said that improving the risk management methodology and evaluating investment projects based on modern and best practices has become one of the urgent tasks. In this article, the author explains the essence of risk management and presents the main stages of risk management developed by foreign and domestic economists, and also expresses her own opinion about the stages of risk management of investment projects in the form of a scheme. The article also presents the content of the methods of risk analysis that are frequently used in practice. In particular, the author shows the essence of methods for assessing investment risks, such as Break-even point, the sensitivity analysis of the project, the method of Scenarios, the method for assessing the sustainability of the project, Expert evaluation method, Analogy method, and others.

### **We can identify two aims of research:**

- 1) to study the stages of investment risk management, developed by foreign and domestic scientists, and, on their basis, to propose the stages of risk management, developed by the author;
- 2) to study various methods of risk assessment, which are a key part of investment risk management, and develop proposals for their application in Uzbekistan.

To achieve the objectives of the study, the following **tasks were identified:**

- explain the content of the economic categories "risk" and "investment risk";
- explain the content of investment risk management;
- study of the process (stages) of investment risk management, developed by foreign and domestic economists;
- development by the author of the stages of the investment risk management process;
- study and outline methods for assessing the risks of investment projects;
- development of recommendations on the application of risk assessment methods in Uzbekistan.

**Subject of research:** methods for assessing the risks of investment projects.

Information sources for writing the research was books and articles by foreign and domestic economists.

**Keywords:** risk, investment risks, risk analysis, risk management, methods for assessing investment risks.

**JEL code:** G11

### **Introduction**

In defining the priorities and development programs of the Republic of Uzbekistan, of course, the main focus is on creating a more favourable investment climate in the country and attracting foreign investment in the national economy. The President of the Republic of Uzbekistan Sh. M. Mirziyoyev in his Address to the Oliy Majlis wrote that: "Investments are the driver of the economy, in Uzbek, it is the heart of the economy, this is no exaggeration. Along with investment, new technologies, advanced experience, highly qualified specialists will come to various industries and regions, and entrepreneurship will develop rapidly". This is true, because the implementation of active and effective investment policy and the achievement of a more favourable investment climate for investors – has a positive impact on the economic and social development of the country.

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Given the significant impact of the coronavirus pandemic on international capital flows, there is a need to fully demonstrate the investment potential of our country to attract more foreign investment in the national economy. One of the most important tasks for investors in the context of the coronavirus crisis is the analysis, assessment and effective management of risks that can affect investment projects before investing. And also, the investor must identify the factors that negatively affect the project results and develop measures to reduce their negative impact. Based on the above, it can be said that improving the methodology of risk analysis and assessment of investment projects on the basis of modern and best practices has become one of the urgent tasks.

In the economic literature, a number of economists define risk in different ways. The word "risk" has Spanish-Portuguese roots and means "reef", "underwater rock". This is associated with the concept of "maneuvering between the rocks", which means that it is fraught with danger (Kuznetsov, B. T., 2015).

In the dictionary of the Russian language, the famous lexicographer Ozhegov S. I., risk is defined as "a random action in the hope of a happy outcome" (Ozhegov, S. I., Shvedova, N. Yu., 2006), and in the world-famous Webster dictionary, risk is defined as "the possibility of loss or injury" (Merriam-Webster's Dictionary and Thesaurus, 2014).

The concept of "uncertainty", which is very close to the concept of "risk", is used by a number of economists as a synonym for the classification of certain types of risk, in particular M. Bernadete Junkes, Anabela P. Tereso, Paulo S. L. P. Afonso wrote in their research: "Risk is, fundamentally, the possibility of financial loss. It is used as a synonym of uncertainty and refers to the variability of returns associated with an investment project" (Junkes, M. B., Tereso, A. P., Afonso, P. S. L. P., 2015). Professor Livshits V. N. explaining the difference between risk and uncertainty, wrote that: "Uncertainty is the incompleteness and inaccuracy of information about the conditions for the implementation of the project. The risk of a project for a given participant is understood as the possibility of such conditions for the implementation of the project, which he assesses negatively" (Vilensky, P. L., Livshchits, V. N., Smolyak, S. A., 2008).

Another Russian economist, Khominich I.P. argued that: "Risk is an economic category that represents the possibility of an event occurring that can entail three economic results: negative (damage, loss), zero and positive (benefit, profit). Risk is a subjective-objective category. The subjective side of risk lies in making certain strategic decisions and calculating the likelihood of their result. The objective side of risk is a qualitative and quantitative expression of possible manifestations of risk and their consequences" (Khominich, I. P., 2019).

Michel Crouhy, Dan Galai, Robert Mark in their book commented on the concept of risk as follows: "In particular, we understand that risk is not synonymous with the size of a cost or of a loss. After all, some of the costs we expect in daily life are very large indeed if we think in terms of our annual budgets: food, fixed mortgage payments, college fees, and so on. These costs are big, but they are not a threat to our ambitions because they are reasonably predictable and are already allowed for in our plans.

The real risk is that these costs will suddenly rise in an entirely unexpected way, or that some other cost will appear from nowhere and steal the money we've set aside for our expected outlays. The risk lies in how variable our costs and revenues really are. In particular, we care about how likely it is that we'll encounter a loss big enough to upset our plans" (Crouhy, M., Galai, D., Mark, R., 2006).

Michel Crouhy continued his scientific research on risks and highlighted three broad risk types in the global banking industry:

"Credit risk is the risk of loss following a change in the factors that drive the credit quality of an asset. These include adverse effects arising from credit grade migration, including default, and the dynamics of recovery rates.

Market risk is the risk of losses arising from changes in market risk factors. Market risk can arise from changes in interest rates, foreign exchange rates, or equity and commodity price factors.

Operational risk refers to financial loss resulting from a host of potential operational breakdowns that we can think of in terms of people risks, process risks, and technology risks (e.g., frauds, inadequate computer systems, a failure in controls, a mistake in operations, a guideline that has been circumvented, or a natural disaster)".

Uzbek scientist, professor Abdullayeva Sh. Z. explained the difference between risk and danger as follows: "Danger is an already existing reality, that is, in most cases, danger is primary, risk is secondary. Usually, knowing that there is a danger and deciding to deal with it and get a positive result creates a risk. Danger often leads to negative situations. In our opinion, positive results of dangerous situations can be achieved only by risking" (Abdullayeva, Sh. Z., 2002).

Uzbek Professor Vakhobov A. V. defines: "Investment risk as an integral part of the overall financial risk, which includes the possibility of financial losses and incomplete return on investment or additional investment costs" (Vakhobov, A. V., Khazhibakiev, Sh. Kh., Muminov, N. G., 2010).

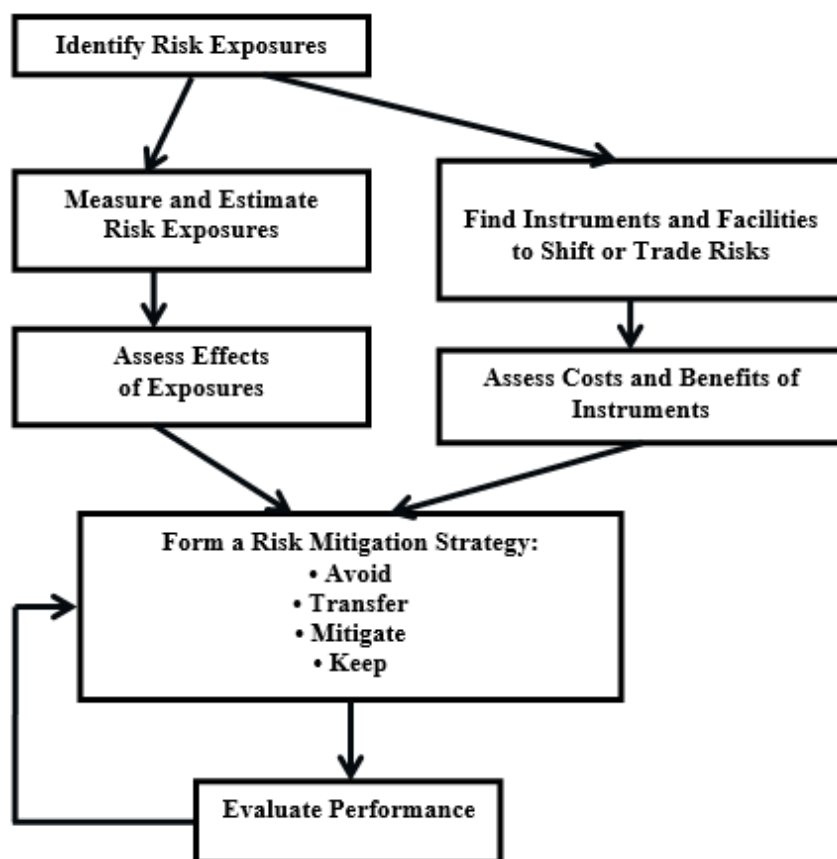
Martina Merkova, Josef Drabek commented on risk: "Risk is unavoidable part of any entrepreneurship, so it is very important to make its analysis, but, paradoxically at the same time, it is one of the most underestimated parts of the project" (Merkova, M., Drabek, J., 2015).

Analysis of the set of definitions given to the nature of risk allows us to single out the main aspects that lead to risky situations: the random nature of the emerging situation; availability of alternative solutions; the ability to determine the expected result; the likelihood of additional costs; the possibility of obtaining additional income.

Currently, project risks are understood as a set of situations that lead to a decrease in the expected benefit (efficiency) from the project. At the same time, the risk of an investment project is also the sum of risks that impede the implementation of the investment project or reduce the efficiency of the project. Investment risk can be defined as the possibility of loss of reserves, the inability to receive income or the need for additional costs as a result of making a certain investment decision.

### **Research results and discussion.**

To date, for the successful implementation of investment projects, measures are being developed to effectively manage and reduce investment risks.



Source: Michel Crouhy, Dan Galai, Robert Mark, 2006.

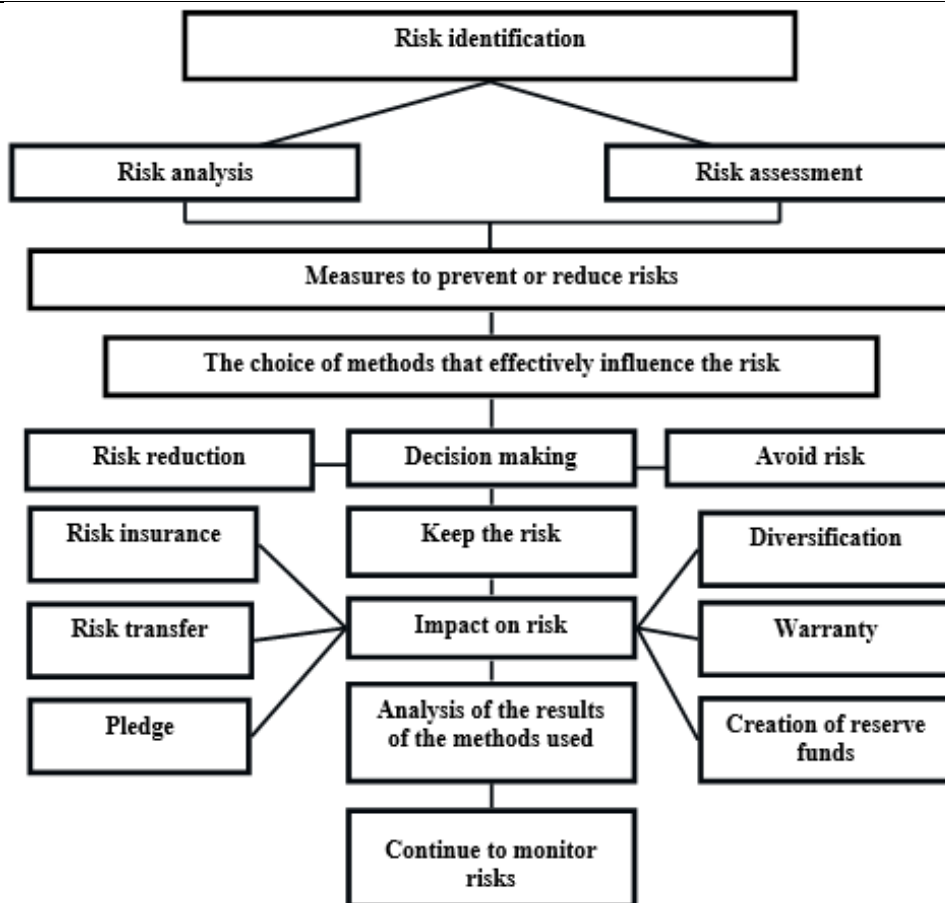
Fig. 1. Risk management process proposed by Michel Crouhy

When developing and implementing an investment project, it is necessary to take into account, study and analyse each type of risk, develop measures to reduce them, which is the most effective way to prevent risk events.

Risk management can be understood as a set of actions aimed at determining a reasonable combination of risk and reward (Mamatov, B. S., Khuzhamkulov, D. Yu., Nurbekov, O. Sh., 2014). In our opinion, risk management is a structural process that is constantly carried out in a company in order to identify, assess, calculate, control (monitor) and reduce risks affecting the profitability of an investment project and their consequences. The purpose of risk management and assessment is to provide the investor with the information necessary to make decisions on the advisability of participating in the implementation of an investment project and to develop measures to protect against possible financial losses.

Foreign and domestic economists have described the risk management process in their scientific papers. They are shown in Figures 1 and 2.

The risk management process described by foreign and domestic scientists has both common features and differences. In both of these processes, risk management begins with risk identification, next stages are analysis and assessment of risks, and the last stage is the choice of risk management methods which is based on the result of the assessment. The existence of differences is mainly associated with the development of not only primary, but also secondary stock markets abroad, which was further considered by foreign scientists when using financial instruments in risk management.

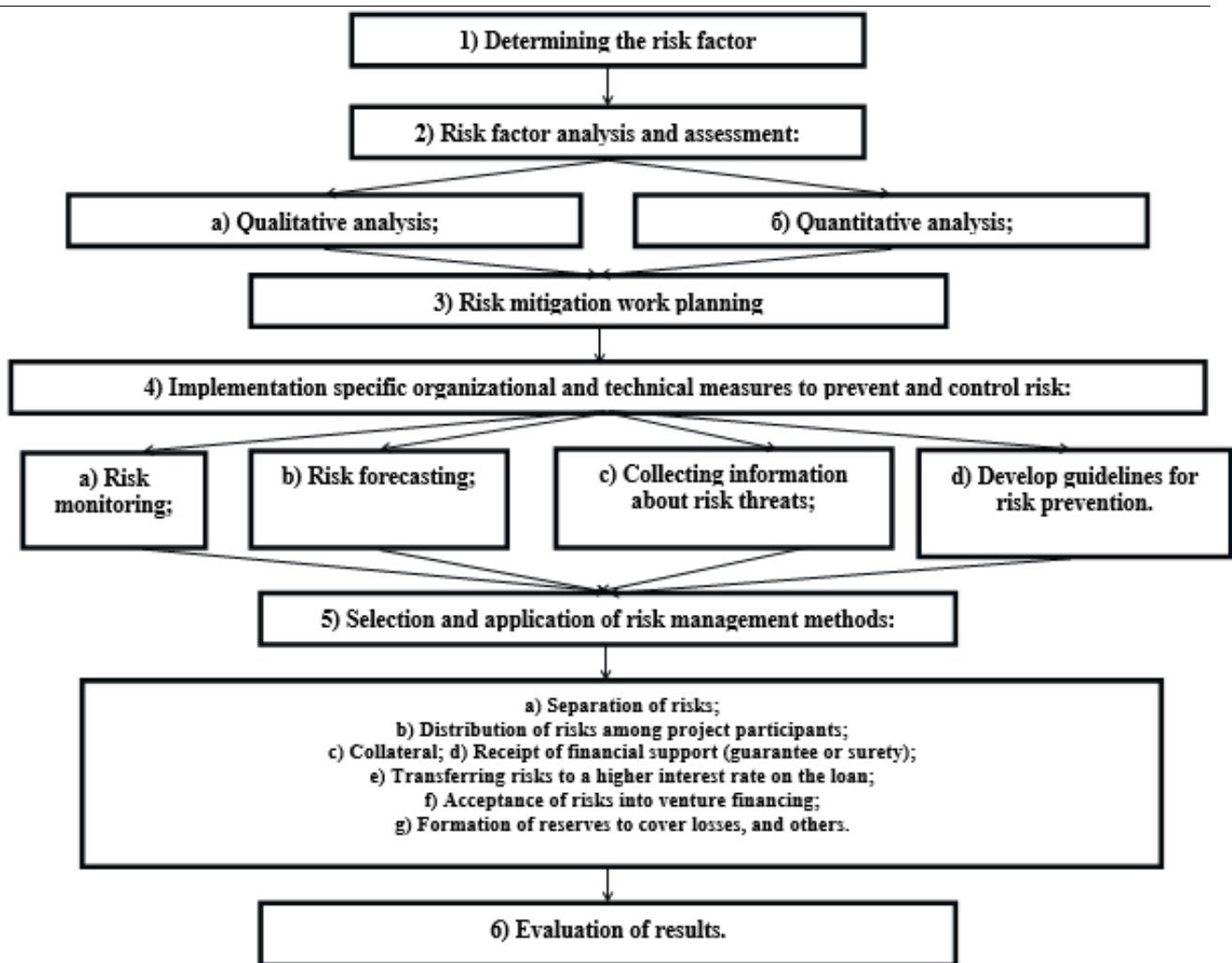


Source: Abdullayeva, Sh.Z., 2002.

Fig. 2. Risk management process proposed by Abdullayeva Sh.Z.

In our opinion, the main stages of risk management can be summarized as follows (Figure 3).

As you can see from Figure 3, risk management consists of six stages, the first of which is to determine the risk factor, that is, the cause of the risk and the event or situation that may affect the project. At the second stage, the analysis and assessment of risks is carried out; it should be noted that risk assessment can be divided into two groups: a) qualitative risk assessment - aimed at identifying types of risks, their causes and organizational measures to reduce risks; b) quantitative risk assessment - means calculating a quantitative expression of project risks through project indicators, determining the likelihood of risks and the impact of risks on the project. Risk mitigation planning is the application of specific measures within the selected risk management measures and methods. At the fourth stage, risk prevention and control is carried out; specific organizational and technical measures based on specific plans and programs, such as risk monitoring, risk prediction, collection of data on negative impact and subsequent costs associated with risk, development of risk prevention guidelines are discussed. Then, in the fifth step, risk management methods are selected and applied. At the final stage, information about risky situations and their consequences are collected and recommendations for the future are given. The received instructions and conclusions will be used in the implementation of subsequent projects.

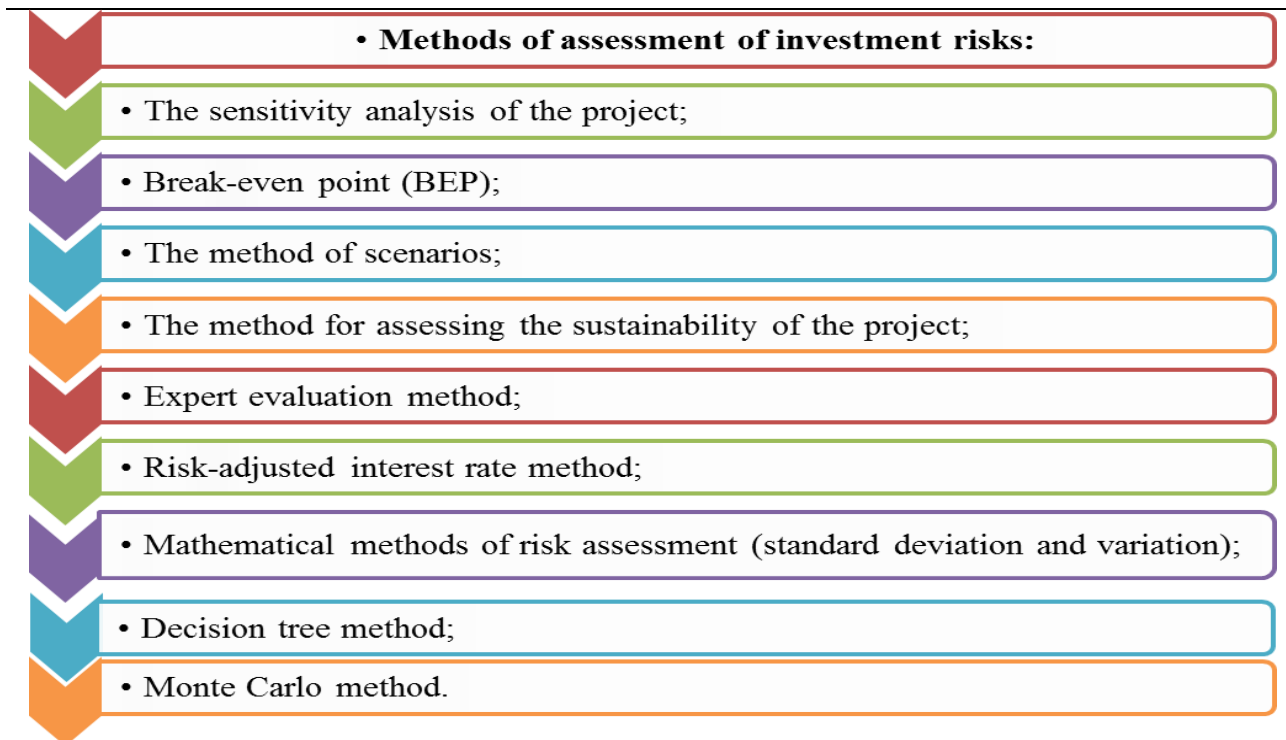


Source: developed by the author

Fig. 3. Stages of investment risk management

It should be noted that when managing the risks of investment projects, management methods are selected based on the results of their analysis and evaluation. This means that the more accurate the project risk assessment is, the more accurate and reliable the project data will be and the more efficient project management will be.

In practice, there are several methods for assessing investment risks, the main of which are listed below (Figure 4).



**Source: developed by the author**

**Fig. 4. Methods of assessing investment risks**

1. The sensitivity analysis of the project shows how much the main indicator of the project efficiency (NPV or IRR<sup>2</sup>) changes with a certain change in the given parameters of this project. The more the project performance indicators change with the change in the initial conditions, that is, if the project is more sensitive to changes in direct and indirect factors, the higher the project risk level.

The following algorithm is used to perform the sensitivity analysis.

- 1) First, the main indicator of the project is selected, for example, net present value or internal rate of return.
- 2) Then the factors that most significantly affect the sensitivity are selected, for example, the selling price, the value of variable or fixed production costs, sales volume, loan fees, the amount of investment costs, and the cost of capital raised.
- 3) Next, the value of the main indicator for the given ranges of factors is calculated.
- 4) Finally, the factors to which the project is most sensitive are determined, and a decision is made to implement the project or to complete the feasibility study.

The factors that affect the efficiency of the project (that is, they are called parameters) are divided into two groups:

- factors directly affecting income and expenses: sales volume, product price, production costs, investment volume, interest payments on loans and others.
- indirect factors: the terms of construction, the production period, delays in payments, sales of finished products, inflation, income tax rate and others.

Sensitivity analysis is recommended to identify factors that significantly affect the results of investment projects, and for comparative analysis.

<sup>2</sup> NPV – Net present value; IRR – Internal rate of return (They are indicators that assess the effectiveness of investment projects).

2. By using the "break-even point" method, we can determine the volume of sales (quantity of products) when the revenue from sales are equal to the costs of its production. The break-even point (BEP) in economics, business, and specifically cost accounting, is the point at which total cost and total revenue are equal: there is no net loss or gain, and one has "broken even". The break-even point (BEP) represents the sales amount – in either unit or revenue terms – that is required to cover total costs (both fixed and variable). Total profit at the break-even point is zero. Break-even is only possible if a firm's prices are higher than its variable costs per unit.

The main purpose of break-even analysis is to determine the minimum output that must be exceeded in order to make profit.

In the linear Cost-Volume-Profit Analysis model (where marginal costs and marginal revenues are constant, among other assumptions), the break-even point (BEP) (in terms of Unit Sales ( $Q$ )) can be directly computed in terms of Total Revenue ( $TR$ ) and Total Costs ( $TC$ ) as:

$$TR = TC \quad (1)$$

$$PxQ = TFC + VxQ \quad (2)$$

$$Q = TFC/(P - V) \quad (3)$$

Where:

$TFC$  – Total Fixed Costs;

$P$  – Unit Sale Price;

$V$  – Unit Variable Cost.

The formula (3) allows to find the amount of goods sold, at which the Total Revenue is equal to the sum of Total Costs. The lower the break-even point, the more sustainable the project.

Thus, the following conclusions can be drawn from the application of the break-even point method:

- - a high break-even point is undesirable for the enterprise, on the contrary, it means that the lower the break-even point, the more sustainable the project;
- - the higher the fixed costs, the higher the break-even point;
- - the larger the difference between the unit price of a product and the variable costs per unit of product, the smaller the break-even point.

3. Scenario analysis allows us to determine the impact on the main indicators of the project of all project parameters. In this case, the deviations of the project parameters are calculated taking into account the correlation between them. During the risk analysis, three scenarios are calculated: pessimistic, baseline and optimistic. In a pessimistic scenario, parameter values are used that are lower than expected. This takes into account the correlation between the parameters. For example, a decrease in the volume of products sold is likely to lead to an increase in the price of these products. If, at the same time, all the parameters that are significant for successful work on the project are deteriorated, then a decrease in the quality of the project should be expected. However, the probability of simultaneous deterioration of a large number of weakly correlated values is small. Therefore, the choice of the characteristics of the pessimistic scenario should be treated very carefully. The same difficulties are encountered when developing an optimistic scenario. The Monte Carlo simulation method is devoid of these drawbacks.

4. The method for assessing the sustainability of the project is one of the types of the scenario method described above. It assesses the risk of losing or decreasing the expected profit or increasing losses or costs when the conditions of the investment project change, that is, when the project scenario changes. Often three scenarios are used when conducting a risk analysis: baseline, optimistic and pessimistic. The



net present value is calculated accordingly for each scenario: for the optimistic scenario -  $NPV_{op.}$ , for the baseline scenario -  $NPV_{base.}$  and for the pessimistic scenario,  $NPV_{ps.}$ . The deviation of the project from the net present value is calculated using the following formula:

$$Var(NPV) = NPV_{op.} - NPV_{ps.} \quad (4)^3$$

Where:

$Var(NPV)$  – Variation of Net Present Value;

$NPV_{op.}$  – Net Present Value for the optimistic scenario;

$NPV_{ps.}$  – Net Present Value for the pessimistic scenario.

According to this formula, the wider the project NPV variation width, the higher the risk level.

5. The main advantage of the expert evaluation method is that the experience of experts is used in the project analysis process and in the calculation of the impact of various quality factors. The algorithm (procedure) for expert assessment of project risks is as follows:

- development of a set of risks that may occur during the life stages of the project;
- segregation of risks by significance level, this means determination of the probability of occurrence of risks and the level of risk (damage) caused by this risk through an expert.

The disadvantage of this method is that the expert evaluates the project subjectively based on personal experience, but the advantage of the method is the possibility of its application for non-recurring events and in the absence of a sufficient amount of statistical data.

6. The analogy method consists in analysing all available data relating to the implementation of similar projects by a firm or a bank in the past in order to calculate the probabilities of loss. A huge role in this is played by a database of all previously undertaken projects, created on the basis of their assessment after completion. The analogy method is most widely used when assessing the risk of frequently recurring projects, for example, in construction. If a construction company intends to implement a project similar to already completed projects, then to calculate the level of risk of an undertaken project, a so-called risk curve can be built on the basis of the available statistical material. For this purpose, areas of risk are established, limited by the lower and upper limits of total losses.

In addition, the following methods are used to analyse and assess investment risks: Mathematical methods (standard deviation and variation), Risk-adjusted interest rate method, Decision tree method, Monte Carlo method, and others.

## Conclusions, proposals, recommendations

Effective implementation of investment projects in the national economy requires improved methods of project risk assessment and management. To this end, the following conclusions and recommendations have been developed:

- 1) In investment risk management, methods are selected based on the results of risk analysis and assessment. On the other hand, effective project management leads to the desired result. Therefore, the risk assessment of the project must be thorough and reasonable.
- 2) The specificity of the risks affecting the project should be taken into account when choosing methods for assessing risks and managing investment projects. In this case, for example, risks are divided into insured and uninsured. Of the uninsured risks, it is preferable to use the method of allocating

<sup>3</sup> Nosirov, E.I., Mamatov, B.S., Shaislamova, N.K., Sharifkhodjaeva, K.U. (2012). Investitsiya risklarini boshqarish. (Investment risk management). Tashkent: Fan va texnologiya. p. 148.

financial reserves and determine the amount of funds required to cover costs, rather than manage force majeure risks or political risks using the method of insurance and calculating insurance costs.

3) When assessing the risks of investment projects, it is necessary to carry out a comprehensive assessment. Risk assessment requires a comprehensive assessment based not only on a unified assessment method, but also on the integration of objective methods (based on statistical and reporting data) and subjective methods (based on expert opinion), as well as other methods of qualitative and quantitative assessment. In this case, the disadvantage of one method is compensated by the advantage of the second and an impeccable risk assessment is achieved.

4) Methods for assessing risks in the national economy should be based on foreign experience and, in particular, on assessment methods which are used with information and communication technologies. The application of risk management methods based on financial instruments proposed by foreign economists leads to the use of innovative financing mechanisms, advanced and modern management methods.

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