# RESEARCH OF RISK ASSESSMENT METHODS IN CONSTRUCTION

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**Annotation:** In this article, the authors consider methodological approaches to assessing the risks of a construction enterprise. The main stage of risk management in any enterprise is risk assessment. Currently, a large number of approaches are used to assess the risks of enterprise activities. This article highlights the basic and available to any enterprise, including construction, methods of assessing the risks of activities.

**Keywords:** risks, construction company, risk assessment, expert assessment method, decision tree, statistical methods of risk assessment.

**Аннотация:** В статье авторы рассматривают методические подходы к оценке рисков строительного предприятия. Основным этапом управления рисками на любом предприятии является оценка рисков. В настоящее время используется большое количество подходов к оценке рисков деятельности предприятия. В данной статье освещены основные и доступные любому предприятию, в том числе строительному, методы оценки рисков деятельности.

**Ключевые слова:** риски, строительная компания, оценка рисков, метод экспертной оценки, дерево решений, статистические методы оценки рисков.

The risk is a measurable part of uncertainty, for which we are able to estimate the occurrence probability and the size of damage. The risk is assumed as a deviation from the desired level. It can be positive or, which most often happens, it can be negative. Therefore, the risks analysis is so important for project selection and coordination of construction work. The risk analysis is regarded as the analysis of adverse events even at the stage of planning and programming of a construction project. This analysis enriches the decision-making process and provides additional arguments, which help to select the optimal variant of a construction project using the Multi-Aspects approach. This article presents three different methods of the risk analysis as well as highlighting their disadvantages, advantages and primary areas of application (selection or pre-estimation). These methods differ in their methodology from each other. The verification was started from the simplest techniques using some qualitative variables. This method is based on the considerable subjectivity of a decision maker although it is relatively simple and easy to use. The analysis was finished on the statistical method, which determines the type of used data therefore it affects the quality of the results. The areas of application and analytical capacity of the listed methods are illustrated with the short examples, simultaneously outlining their characteristics from the analysis. The research

problems, which are the canvas of application of the discussed methods are not mutually interrelated. They present different aspects of variants of the investment process.

The construction industry is one of the key sectors of the domestic economy, it influences the development of almost all sectors and largely sets the direction for solving the economic and social problems of the country's development. As a result, the construction industry has many obstacles determined by factors that increase the level of risk in the industry:

- high level of competition;

- high prices for raw materials and supplies;

- insufficient financing of construction;

- long terms for obtaining a building permit due to bureaucratic procedures for conducting state and municipal auctions in construction. Considering the topic of risk management, first of all, it is necessary to resolve issues that relate to their assessment. This is precisely due to the fact that at the stage of risk assessment, they are identified from the most significant for the enterprise to the least, as well as their analysis [1, p.25]. Thus, for effective risk management, it is necessary to research and analyze the causes of certain risks in order to make an appropriate management decision.

Risk assessment is usually divided into two complementary approaches - quantitative and qualitative.

Qualitative analysis helps to identify the causes, areas, factors of the formation of risks, as well as these risks. Quantitative, in turn, makes it possible to determine the size of risks in quantitative measurement of both individual types of enterprise activities and the entire enterprise as a whole [6, p. 24]. The main methods used in assessing the risks of a construction enterprise are shown in Figure 1.
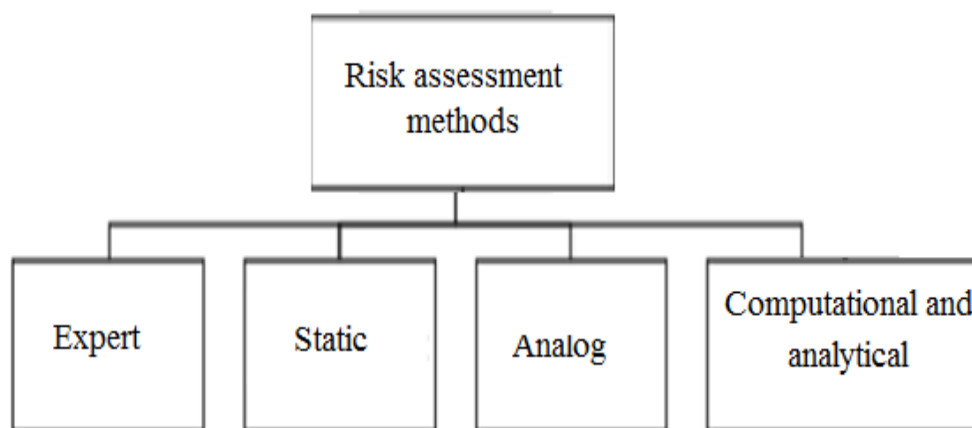


Figure 1. Methods for assessing the risks of a construction enterprise

Expert assessment methods are used when the enterprise does not have information support to carry out the necessary calculations and comparisons. These methods are based on the assessment of qualified specialists in various fields of activity with the subsequent processing of the results. Expert assessment methods are mainly used to determine the level of probability of occurrence of such risks as currency, inflation, investment, etc. [7].

The disadvantages of the expert method are the following factors: the unreliability of the estimates obtained, the difficulty of carrying out a full-fledged survey of experts and processing the results. To increase the accuracy of expert assessments, it is necessary to tighten the criteria for the selection of qualified specialists - experts and involve not only internal specialists, but also external ones who are involved in the same activity, the risk assessment is carried out. With the correct organization of the process of processing and checking the opinions of experts, high reliability of estimates is guaranteed.

Using statistical methods of assessment, the construction company is able to quantify the level of risk. On the basis of statistical methods, the possibility of risks arising can be determined by financial, investment transactions, investment projects, etc. The disadvantages of this method, as a rule, include the need for a sufficient amount of statistical information support [8, p. 35].

The types of statistical methods are presented in Figure 2. The average expected value is the numerical value of an unexpected situation, which is defined as the weighted average of all possible outcomes, where the probability of these outcomes is applied as the frequency or weight of the corresponding value, that is, this is the value that we expect on average.

Figure 2. The types of statistical methods
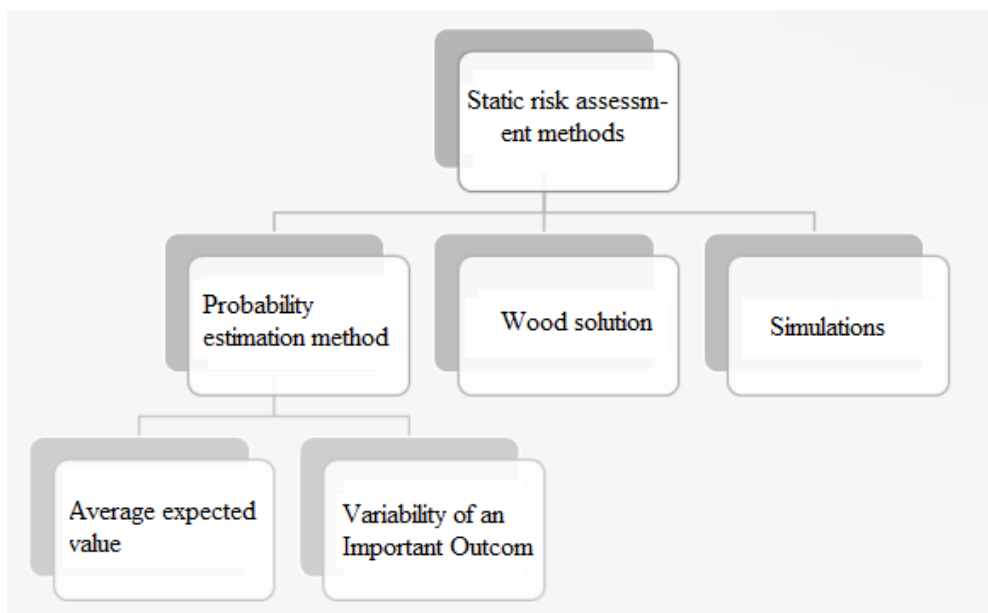


In turn, the variability of a possible outcome is the level of deviation of the expected value from the mean. For this indicator, two criteria are used: variance and standard deviation. The variance is the weighted mean of the squares of the deviation of actual results from expected means.

$$\sigma^2 = \frac{\sum (x - \bar{x})2}{n},$$

o        where $\sigma^2$ is the variance;
o        x is the expected value for each case of observation;

o       $\underline{x}$ is the average expected value;

o       n is the number of cases of observation (frequency).

o       The standard deviation is determined by the formula: (2)

$$\sigma = \sqrt{\sigma^2} \quad (2)$$

The coefficient of variation is usually used for analysis. It represents the ratio of the standard deviation to the arithmetic mean and shows the degree of deviation of the values obtained.

$$V = \pm \, \sigma/_x \times 100\,\% , \quad (3)$$

where V is the coefficient of variation,%.

The coefficient of variation can vary from 0 to 100%. The larger the coefficient, the stronger the variability.

The decision tree method is based on the relative risk assessment of alternatives to achieve the set goal. When using this method, you first need to determine the sequence of actions or events that lead from the initial state to the final state. All this presented sequence of alternative actions and events is a "decision tree" [3, p. 58].

This method is very time consuming, has a one-sided nature, since it takes into account the actions that the enterprise can take, and those outcomes that may occur, from its point of view. The modeling method is based on game theory: participants are expected to choose a behavior model independently of each other.

The goal of the game is to choose the strategy that will have the most significant result, and, therefore, the most significant risk. This method, modeling, makes it possible to choose the best option from possible alternatives in time, while assessing the risk using economic and mathematical methods, thus, getting the opportunity to reduce or completely avoid the risk of financial and economicactivities[4,p.35].

Using computational and analytical methods of assessment, an entrepreneur can quantitatively assess the likelihood of the risks of his activities, while owning only internal information, that is, in the event the probability of a particular risk is determined using the planned indicators of the financial activities of the company. Analog assessment methods make it possible to determine the degree of risk occurrence for individual operations carried out by the enterprise. These methods are usually used in assessing investment, currency, and credit risks. Using the method of analogs, information about the risk that similar transactions or transactions have had is applied. The information obtained in this way is processed, as a result of which, when implementing a new project, operation or transaction, the potential risk is taken into account [3, p.215].

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