Risk assessment of investment projects implemented on the basis of project financing

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Abstract. Risk assessment of investment projects still remains a difficult problem in the real investment practice. The development of project financing techniques and methods complicated this task, because new subjects of investment activity, participating in the implementation of the project and requiring consideration of their interests appeared. This, in turn, is seen in the redistribution of common project risks. In addition, new forms of financing create new risks. In this article the authors systematized the risks of project financing which exist for every participant of the investment process throughout the project lifecycle. This approach has been tested on a real investment project. Taking risk into account and risk assessment should allow all interested parties to make an informed decision about the advisability of participating in the project.

1. Introduction

Recently, due to the inappropriateness or impossibility of applying traditional project investment methods, there has been a need for new tools and forms of attracting investments. One of such forms is project financing, which differs significantly from traditional tools and makes it possible to put into practice on favorable credit conditions large-scale projects that require high costs.

This method of financing represents financing of investment projects, in which the source of repayment of investments is the income generated by the project in the future.

2. Materials and methods

A significant contribution to the study of the mechanism of project financing and the evolution of its forms was made by Peter K. Nevitt, Philip R. Wood, Frank J. Fabozzi, Richard R. Brealey, Stewart C. Myers, who primarily noted its isolation from the main activities of the company and the ability to minimize its risks [1, 2, 3, 4].

In their researches Shenaev V. N. and Irmiyazov B. S. focus attention on the problems of risk sharing between participants of project financing [5]. However, despite the variety of studies in this area, modern risk management techniques for project financing have not yet been sufficiently formed. In our research we used abstract-logical, statistical-economic, economic-mathematical and expert research methods of risk systematization and assessment.
3. Results
The authors conducted a study that allowed them to systematize and provide an objective evaluation of the investment projects risks which are implemented on the basis of project financing. By conducting an expert survey among entrepreneurs, investors, scientists and specialists who are directly involved in the development and implementation of investment projects, as well as in consulting, we identified the types of risks and the degree of their influence at various stages of the implementation of investment projects. Distribution of answers to the question “What types of risks have a significant impact on investment projects implemented on the basis of project financing?” is given in Figure 1.

Among the risks that have a significant impact on investment projects which are implemented on the basis of project financing, most of the respondents indicated financial and economic risks. It is these risks that accompany any large project and affect the cash flows generated by the project, as well as its financial stability and solvency. In addition, according to respondents, legal and market risks also have a special impact on investment projects. Some respondents noted that some projects may have specific risks that are not included in the response options we offered them to choose from. This is due to industry-specific features of ongoing projects, as well as to the lack of an open mechanism for conveying the experience of using this method in investment projects in the constituent entities of the Russian Federation.

![Figure 1. Distribution of answers to the question “What types of risks have a significant impact on investment projects implemented on the basis of project financing?”](image)

For effective risk management, it is necessary to assess risks, so one of the questions was devoted to identifying methods that will help to objectively assess their size. Distribution of answers to the question “With the help of what methods is it necessary to assess the risks of investment projects implemented on the basis of project financing?” is presented in Figure 2.

Most of the respondents believe that it can be done more accurately by analyzing project development scenarios and by sensitivity analysis, however, to conduct a more objective risk assessment, it is necessary to use a combination of the presented methods. Also, about 20% of respondents expressed a special opinion that it is necessary to develop new techniques for assessing risks of investment projects implemented on the principles of project financing and to evaluate the specific risks of the borrower and lender separately. In domestic and foreign practice, there is such experience, for example, to use methods of mathematical modeling to assess the risks of projects financing [6].
Figure 2. Distribution of answers to the question “With the help of what methods is it necessary to assess the risks of investment projects implemented on the basis of project financing?”

In special scientific literature, there is virtually no uniform classification of the risks of investment projects. Traditionally, the risks associated with the implementation of an investment project are divided into systematic (non-diversifiable) and unsystematic (diversifiable). Systematic risks include environmental and project risks (political, legislative, macroeconomic). Unsystematic risks include risks associated with the project itself and with the mechanism of its financing. Methods of analysis and development of measures to reduce systematic and unsystematic risks differ significantly [3, 4].

Some authors consider project risks as a whole, by which they mean the deterioration of the final indicators of the project efficiency arising under the influence of potential threats, uncertainty or incorrect project structuring [7, 8]. Project risks are determined by the fact that future project income is not a deterministic value that is known at the time of the decision to invest, as well as the amount of potential losses or lost revenues is unknown. Therefore, a thorough risk analysis is necessary in order to determine the risk profile of the investment project, ensure qualified risk management and develop effective techniques to reduce them at various stages of the project life cycle [9, 10].

Along with common risks that are typical for all investment projects, each project has its own characteristics, a specific contractual and financial structure and conditions for its implementation, and it is associated with industrial and regional risks specific to this particular project [11, 12, 13].

The study which we conducted allowed us to systematize and identify the risks of project financing, which are presented in Table 1.

Table 1. Systematization of risks of project financing.

| Subject of the project | Identification of the risk connected with the activities of the subject |
|------------------------|---------------------------------------------------------------------|
| Customer               | Funding risk is associated with the inability to attract the necessary funding within an acceptable time frame and on acceptable terms |
| Sponsor, Investor      | Risk is associated with the lack of the necessary amount of free cash from sponsors and investors |
| General contractor,    | Risk is associated with violations in the organization |
Let us consider the process of risks systematization, identification and assessment using the example of a project for the construction of a block of flats that has 93 apartments in the city of Khabarovsk (Russia). The financial model incorporates a project financing scheme with full recourse on the borrower. The share of borrowed capital is 80% of all project capital costs.

In this project, seven types of risk were identified: the risk of sponsors and investors; general contractor risk; operational risk; competitive risk; funding risk; interest rate risk; ultimate customer risk.

The results of these risks assessment are given in Table 2.

### Table 2. Risk event probabilities.

| Name of risk                        | Low | Medium | High  |
|------------------------------------|-----|--------|-------|
| Risk of sponsors and investors     | 0.15| 0.25   | 0.35  |
| Risk of the general contractor     | 0.20| 0.35   | 0.50  |
| Operational risk                   | 0.05| 0.10   | 0.15  |
| Competitive risk                   | 0.10| 0.15   | 0.20  |
| Funding risk                       | 0.30| 0.35   | 0.40  |
| Interest rate risk                 | 0.15| 0.20   | 0.25  |
| Ultimate customer risk             | 0.20| 0.25   | 0.30  |

The conducted project risk analysis made it possible to make certain adjustments to the initial financial model of the project and on its basis to calculate the performance indicators, which are presented in Table 3.

When we took into account all the risks of the project financing which we researched we could identify weaknesses which the project owner had. If these risks arise, his participation in the project is ineffective. The weak position of one of the participants in project financing threatens the implementation of the entire project as a whole.
### Table 3. Performance indicators before and after the adjustment of the financial model of the project.

| Name of indicator | Before adjusting the financial model of the project | After adjusting the financial model of the project, taking into account identified risks |
|-------------------|----------------------------------------------------|--------------------------------------------------------------------------------------|
|                   | For the creditor (bank) | For the project | For the owner of capital | For the creditor (bank) | For the project | For the owner of capital |
| Net present value (NPV), thousand rubles | 20632 | 4709 | 1814 | 17890 | 1739 | -1192 |
| Discount payback period, year | 1.24 | 1.37 | 1.37 | 1.26 | 1.41 | No |
| Internal rate of return (IRR), % | 38.8 | 13.3 | 13.5 | 32.1 | 8.50 | 0.8 |

### 4. Conclusion

Based on the study, we can conclude that when structuring and project appraisal of investment projects, it is necessary to correctly identify project risks and objectively assess the likelihood of their occurrence, as well as possible consequences, in order to ensure adequate coverage using adequate tools and techniques. It is very important that the choice of procedures for reviewing projects ensures the maximum neutralization of subjective factors that may accompany credit and investment processes.

From the point of view of the investing decision maker, the ratio of risk and profitability is the basic category that underlies the decision to invest. The developed effective risk identification system for project financing will allow to make an objective decision on the possibility of financing taking into account uncertainty factors.

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