Project finance risk management at the stages of the housing projects’ life cycle

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Abstract. Project financing is currently one of the possible ways to attract financial resources to the Russian economy in modern conditions. In the construction industry, due to the deficit of own funds and liquid assets, a decrease in business activity is observed. If the effective measures to support housing construction are not taken, the consequences for the construction industry and its related sectors of the economy will be disastrous. Therefore, the introduction of a new mechanism for financing the housing projects will allow the enterprises to receive funds on sufficiently favorable terms and will serve as an impetus to the industrial development as a whole. The project finance use in housing is possible only with the use of escrow accounts. In this regard, the new risks for the project participants appear and those that were traditionally present with project financing are redistributed. To create an effective project financing system, it is necessary not only to develop a methodology for identifying risks with project financing, but also to develop a risk management system that allows to take the informed decisions about the financing possibility taking into account uncertainties. The authors systematized and identified the risks of project financing at all the project life cycle phases, on the basis of which a project financing risk management system was developed.

Introduction
Housing development is one of the most important areas of socio-economic transformation in Russia, based on the priority tasks - increasing housing affordability for the population, increasing the comfort level of the housing stock and ensuring a balance of supply and demand in the housing market. At the current stage of formation, the housing construction sector is characterized by a number of difficulties, among which there is a shortage of financial resources, poor material and technical provision of enterprises, low qualification of personnel, imperfection of the construction organizations’ activities regulatory framework and the lack of a comprehensive sound state policy in housing construction. In addition, the housing sector development is impeded by the financing mechanisms imperfection, the construction organizations’ financial flows opacity and their monopoly on the housing market. All these factors contribute to rising the housing prices and significantly reduce the possibility of its acquisition for the majority of the population [1, 2].

In foreign practice, the investment housing projects are often implemented using project financing. Project financing is usually called such a method of attracting long-term capital for the implementation of the large investment projects, in which the cash flow generated by the project itself is the only source of the invested funds return and securing a loan. This mechanism was introduced to the Russian housing construction market with the entry into force of the Law amendments 214-FL “On
participation in shared construction of multi-apartment buildings and other real estate and on amendments to some legislative acts of the Russian Federation”.

**Results**

Since July 1, 2019, the developers are switching to project financing under the new rules: the practice of introducing escrow accounts is being introduced.

An escrow account is a special account for accounting and blocking funds that a bank (escrow agent) receives from an interest holder to transfer them to the developer when the grounds stipulated by the account agreement arise.

The features of escrow accounts in construction can be described as follows: in case of bankruptcy of the developer, all funds are returned to the interest holder; the developer does not have the opportunity to use the funds from the account until the end of the construction; the buyer can return the money from the bank account if the deadlines for the delivery of the apartment are delayed by more than 6 months after the object is completed [3].

We can distinguish the obvious advantages that the created account gives: it ensures the fulfillment of settlement obligations under the contract; the money is safe because it is held by an independent third party (the bank as an escrow agent), to which it does not belong and does not have its own interest in the transaction; it allows to redistribute the burden of paying commissions to the bank between the buyer and seller [4].

In Russia, the number of escrow accounts opened for settlements under participation contracts in shared construction and the amount of funds deposited by participants in shared construction on escrow accounts increased to 23.2 thousand accounts and 73.8 billion rubles at the end of 2019. This is evidenced by the results of the authorized banks’ survey in which the settlement accounts of developers and escrow accounts can be opened. The geography of project financing is expanding. At the end of 2019, the projects working under the new financing scheme (for which the escrow accounts were opened and / or credit agreements were concluded) were in 68 regions of Russia [5].

The introduction of escrow accounts is ambiguously perceived by the participants of the investment and construction process, as it involves the redistribution of responsibility and, accordingly, the risks of the project between them. The study of the project risks throughout the entire life cycle based on project financing using escrow accounts is the goal of this study [6].

In domestic and foreign literature, there is virtually no uniform classification of the risks associated with the investment projects’ implementation. A large number of the participants involved in the projects’ implementation, their interests and requirements for profitability, increase the risks at all stages of the project implementation [7,8,9].

The project analysis is customary distinguished by the three project phases:

1. pre-investment
2. investment
3. operation

At each of these phases, different risks and consequences for the participants arise. An extended classification of the risks by the project life cycle’s phases and the subjects of investment activity, taking into account the development of project financing, is presented in Table 1.

**Table 1. Project Finance Risk Classification.**

| Risk group             | Types of risks     | Project Life Cycle Phase | The subject of an investment construction project exposed to this type of risk |
|------------------------|--------------------|--------------------------|--------------------------------------------------------------------------------|
| Macroeconomic risk     | Interest rate risk | 1,2                      | Customer, sponsor, investor, creditor, design company, consumer                |
|                        | Inflation risk     | 1,2                      | Customer, sponsor, investor, creditor, design company, consumer                |
| Category                          | Risk Description                                                                 | No   | Responsible Parties                                      |
|----------------------------------|----------------------------------------------------------------------------------|------|----------------------------------------------------------|
| **Legal risk**                   | Lack of a zoning plan or building permit                                         | 1    | General contractor, consumer                              |
|                                  | Risks associated with changes in legislation                                      | 1,2  | Customer, sponsor, investor, general contractor, subcontractor, design company, consumer |
|                                  | Risks associated with changes in tax and credit regulation                         | 1,2  | Investor, design company, consumer                        |
|                                  | Risks of judicial practice in relation to housing projects based on project financing | 1,2,3| Investor, design company                                 |
| **Financial and economic risk**  | Inability to arrange financing                                                    | 1    | Project Company, Sponsor                                  |
|                                  | Risks of incorrect determination of the investment project financing amount        | 1,2  | Project company, sponsor, investor                        |
|                                  | Risks of rising prices for construction materials                                 | 2    | General contractor, subcontractor                         |
|                                  | Risks of not making contracts with consumers                                      | 1,2,3| Project Company, Sponsor                                  |
|                                  | Risks of non-fulfillment of contractual obligations within the framework of an investment project | 2,3  | Project company, sponsor, investor, consumer             |
| **Organizational and management risk** | Risks of inconsistency among the project participants                               | 2    | Design company                                            |
|                                  | Risks of non-compliance with the development, coordination and approval of documents | 1,2  | Project company, sponsor, investor, general contractor, subcontractor |
|                                  | Risks of failure of supplies of material and technical resources and technological equipment | 2    | General contractor, subcontractor                         |
|                                  | Personnel qualification and social risks                                          | 2    | Design company                                            |
| **Design risk**                  | Exceeding the (initial) budget of the construction cost or delay in commissioning a construction project | 1    | General contractor, customer                              |
|                                  | Risks of poor-quality design estimates                                            | 1    | General contractor, subcontractor                         |
|                                  | Construction Risk                                                                 | 2    | General contractor, subcontractor, consumer, management company (project operator) |
|                                  | Risks caused by the state of infrastructure (utilities, connection)               | 2    | General contractor, subcontractor, consumer, Design company |
|                                  | Cash flow volatility risk                                                          | 2,3  | Management company (project operator), consumer           |
|                                  | Risk of technological disruptions and low quality of project products             | 2,3  | Management company (project operator), consumer           |
| **Demand risk**                  | Incorrect assessment of the profitability of development, lag of entry of the object to the market | 3    | Management company (project operator), consumer           |
| **Escrow Account Risk**          | Lack of control over the targeted use of financial resources                      | 2    | General contractor, subcontractor                         |
|                                  |                                                                                  |      | Investor, consumer                                        |
Freezing the funds of equity holders who bought the apartments on individual escrow accounts until the house is delivered

The need to cooperate with an intermediary, which entails additional commission costs and increases the total cost of the operation

Bankruptcy Bank. Revocation of a license. Bank verification difficulty.

Along with the risks common to all investment projects, each project has its own characteristics, the presence or absence of state support, a specific contractual and financial structure, implementation conditions and the risks associated with the specific project. Therefore, when considering and examining the investment projects, it is necessary to correctly identify both general and specific risks and objectively assess the likelihood of their occurrence, as well as possible consequences, in order to ensure the adequate coverage using the adequate tools and technologies. An additional difficulty for risk analysis is the introduced escrow account mechanism, which creates new and redistributes risks already identified between participants in the investment project [9,10,11].

Risk management in project financing is especially important, since this form of financing for the project implementation is one of the most precarious [12]. The risk management system includes their identification, quantification, selection of tools for prevention, exclusion and protection, as well as monitoring the risk level and the protective measures’ effectiveness.

At each of the investment construction project phases, different risks arise in terms of impact and consequences for the participants. In this regard, the development of a comprehensive methodology for classifying, identifying and assessing the risk of each subject of the project activity, taking into account the life cycle of the project, will create an effective risk management system for the specific project’s implementation.

After identifying the risk and determining the phase of its occurrence, it is necessary to assess it. In this study, the risk assessment was carried out using the expert assessment method. Each type of risk is evaluated according to two criteria: the probability of its occurrence for the respective subject and the strength of its impact. The probability of risk occurrence is determined on a 10-point scale: 1 - the probability of its occurrence is unlikely, an almost impossible event, 10 - high probability of this risk, almost inevitable event. The strength of the impact on the investment project’s subject is evaluated on a 5-point scale: 1 - insignificant impact power, 5 - critical impact on the subject.

The risk for each entity at the appropriate phase of the investment project is calculated by the formula:

\[
    r_{jk} = \sum_{i=1}^{n} \left( \frac{P_{ijk}}{\sum_{i=1}^{n} P_{ijk}} \times \frac{b_{ijk}}{\sum_{i=1}^{n} b_{ijk}} \right)
\]

where \( r_{jk} \) – is the risk value of the k-th subject in the j-th phase of the investment project; \( P_{ijk} \) – is the probability of occurrence of the i-th type of risk for the k-th subject at the j-th phase of the investment project; \( b_{ijk} \) – is the impact force of the i-th type of risk for the k-th subject at the j-th phase of the investment project; \( i \) – is the type of risk identified in the project (1, ..., n); \( k \) – defines the entity participating in the investment and construction project (1, ..., m); \( j \) – denotes the phase of the investment project (1 - pre-investment, 2 - investment, 3 - operational); \( n \) – shows the number of risk factors.

\[
    P_{ijk} = \frac{\sum_{z=1}^{g} P_{zijk}}{z}
\]
where $\overline{p}_{ijk}$ – is the average value of the probability of occurrence of the i-th type of risk in the k-th subject at the j-th phase of the investment project; $\overline{p}_{ijk}$ – shows the probability of occurrence of the i-th type of risk for the k-th subject at the j-th phase of the investment project by the z-th expert; $z$ – defines the expert involved in the assessment (1, ..., e).

$$\overline{b}_{ijk} = \frac{\sum_{z=1}^{e} b_{zijk}}{z}$$ (3)

where $\overline{b}_{ijk}$ – is the average value of the impact force of the i-th type of risk for the k-th subject at the j-th phase of the investment project; $b_{zijk}$ – is the impact force of the i-th type of risk for the k-th subject at the j-th phase of the investment project by the z-th expert.

The risk level is characterized on the basis of a complex integral indicator based on the distribution into groups.

The calculation of the minimum number of groups was carried out by the formula [13]:

$$n = 1 + 3,322 \times \log_{10} N$$ (4)

where $n$ – is the minimum number of groups; $N$ – is the number of population units.

Next, the size of the intervals is determined by the formula:

$$h = \frac{R}{n} = \frac{x_{\text{max}} - x_{\text{min}}}{n}$$ (5)

where $h$ – shows an interval size; $R$ – defines the range of variation; $x_{\text{min}}$ – denotes the minimum value of the characteristic in the aggregate; $x_{\text{max}}$ – is the maximum value of the characteristic in the aggregate.

Having calculated the size of the interval, the number of groups, a classification of risk levels in Table 2 has been performed.

Table 2. Risk classification.

| Risk characterization          | The value of the risk integral indicator |
|-------------------------------|------------------------------------------|
| 1 Low risk                    | 1$\leq r_{ik} \leq$ 9,16                |
| 2 Moderate risk               | 9,17$\leq r_{ik} \leq$ 17,33             |
| 3 High risk                   | 17,34$\leq r_{ik} \leq$ 25,5             |
| 4 Very high risk              | 25,51$\leq r_{ik} \leq$ 33,67            |
| 5 Critical level of risk      | 33,68$\leq r_{ik} \leq$ 41,84            |
| 6 Catastrophic risk level     | 41,85$\leq r_{ik} \leq$ 50              |

Based on the identification and risk assessment for each subject of the investment project, a comprehensive risk prevention and mitigation system is being developed, which is also included in the management system. The general risk management scheme for the stages of the project life cycle is presented in Figure 1.
The identified risks of project financing manifest themselves differently at different stages of the project life cycle. In addition, the strength and consequences of their impact for each subject of the investment process are strictly individual. In this regard, the measures to reduce and protect against risks also vary for each subject. As the investment design practice shows, the most effective tools for minimizing and protecting against risks are: high-quality preparation of design estimates and construction contracts; application of guarantees; limitation; hedging; insurance; the use of special settlement accounts of the project company, allowing tight control of the targeted use of the project’s financial resources (escrow accounts); other tools to reduce the negative consequences probabilities.

Summary
The project financing risk management mechanism for each subject of the investment project considered in this work will reduce the level of uncertainty at all stages of the project life cycle and increase the degree of its feasibility. Individualized risk accounting will facilitate the adoption of an informed decision on the participation in project financing for each of the participants in this process.

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