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IMITATIONAL MODELING AS A TOOL FOR EVALUATION OF RISKS IMPACT ON THE INVESTMENT PROJECT EFFICIENCY

In practice imitational modeling is an effective method for evaluation of risks impact on the investment project efficiency. The advantage of this method is that it correlates well with other economic and statistical methods, including the theory of games. As noted in the literature, this method is most promising for application, as at any time it can be added and integrated to the classical methods, it's especially important in a variety of risk situations and uncertainty.

As a tool for experimental study of complex systems imitational modeling covers methodology of model systems, methods and tools of software algorithm implementations of imitators, planning, organization and computer experiments implementation with simulation models, machine processing and result analysis [4, p. 19].

In a broad sense imitational modeling is a process of constructing models of real system and experimenting on this model to determine the treatment system or to evaluate (within the constraints caused by some criterion or set of criteria) different strategies for the operation of the system. And in the narrow sense imitational modeling is a computer reproduction of real production or organizational system [4, p. 27].

The analysis of scientific literature [1-5] allowed to determine a sequence of steps of imitational modeling for evaluation of risks impact on the investment project efficiency (fig. 1).

For the investment project efficiency evaluation it is accepted to determine the net present value, so this model is recommended for determining the level of risks impact. Net present value is a function of variable and fixed parameters. The variable parameters usually include variable costs per unit of output, price, sales, and the fixed are fixed costs, discount rate, the period of the project etc. Mathematical model is written in the following way:

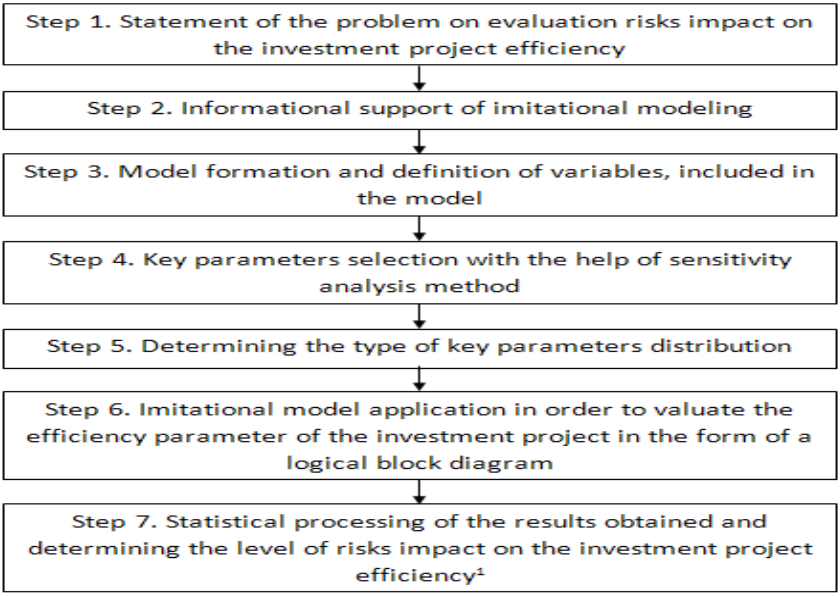
$$NPV = f(x_1, \ldots, x_i, \ldots, x_n; a_1, \ldots, a_j, \ldots, a_m), \quad (1)$$

where x_i – variable parameters;

n – number of variable parameters in the model;

a_j – fixed parameters; m – number of fixed parameters in the model.

Sensitivity analysis method enables the possibility to evaluate deviation parameters impact on the resulting index. With the help of it the key (with the greatest force) parameters can be identified.



[1]*Developed by the author*

Figure 1 The sequence of imitational modeling for evaluation of risks impact on the investment project efficiency

Along with the statistical hypotheses check concerning medium in some cases it is necessary to verify the hypothesis concerning the nature of the distribution. The distribution in general totality is subordinated to some statistical law.

Statistical hypotheses verification lies in the fact that based on comparison of the actual frequencies with the theoretical the conclu-

sion about correspondence between the actual and theoretical distribution should be made. The most widespread work is the law of normal distribution and it should be used when determining the type of distribution found by the method of sensitivity analysis of key parameters.

To determine the level of risks impact on the investment project efficiency is suggested with the help of a matrix based on the use of two parameters, namely the level of losses (*P*) and the frequency distribution losses (*N*). Most authors suggest to estimate losses in absolute form, but this method has a drawback because it fails to clearly establish the specific value of losses, which determines the level of risks of an investment project. That is, for one operation in $ 1000 the losses may be insignificant in value, while for the other the losses of $ 100 is of great significance. Therefore, to eliminate this drawback it is suggested to use the relative level of losses (*P*). The *P* index can take degree from 0 to 100 %. The level of risks impact on the investment project efficiency is suggested to divide into low, medium and high. According to this classification it is suggested to separate the *P* index into three intervals: $0 \leq P < 33,3$; $33,4 < P < 66,6$; $66,7 < P \leq 100$ (tab. 1). The frequency distribution of losses (*N*) is defined as the cumulative (integral) percentage level of losses and it is also offered to split it into three intervals $0 \leq N < 33,3$; $33,4 \leq N < 66,6$; $66,7 \leq N \leq 100$ (tab. 1).

Table 1

Matrix for evaluation of risks impact on the investment project efficiency

Level of losses, *P*, % / Frequency distribution of losses, *N*, %	[0; 33,3)	(33,4; 66,6)	(66,7; 100]
[0; 33,3)	law	law	medium
(33,4; 66,6)	law	medium	high
(66,7; 100]	medium	high	high

[1]*Developed by the author*

Consequently, the use of imitational modeling allows to estimate the risks impact on the investment project efficiency, and, as concluded, in the presence of several alternative projects, choose the project that is the least sensitive to risks. This enables you to make rational management decisions on the choice of risk management activities according to their level.

Литература

1. Вітлінський В.В. Моделювання економіки: Навч. посібник / В.В. Вітлінський. – К.: КНЕУ, 2003. – 408 с.

2. Емельянов А.А. Имитационное моделирование экономических процессов: Учеб. пособие / А.А. Емельянов, Е.А. Власова, Р.В. Дума; под ред. А.А. Емельянова. – М.: Финансы и статистика, 2002. – 368 с.

3. Наливайченко С.П. Застосування методів імітаційного моделювання при аналізі ризиків у світовій економіці / С.П. Наливайченко // Культура народов Причорномор'я: Научный журнал. – Симферополь, 2009. – № 156. – С. 47-49.

4. Ситник В.Ф. Імітаційне моделювання: Навч.-метод. посібник для самост. вивч. дисц. / В.Ф. Ситник, Н.С. Орленко. – К.: КНЕУ, 1999. – 208 с.

5. Шеннон Р. Имитационное моделирование систем – искусство и наука / Р. Шеннон. – М.: Мир, 1978. – 418 с.