

METHODOLOGY «COMPRAMULTIFACTOR»: RESULTS AND DEVELOPMENT TRENDS

Aidar Sultangalievich Puryaev , Tansylu Anvarovna Sharipova
Kazan Federal University, 18 Kremliovskaya str, 420008, Kazan, Russian Federation

ABSTRACT

In this work we actualize the problem of assessing the effectiveness of investment projects (activities) from a position of compromised and optimizing approach. The compromise approach is defined as a possibility of account during the process of assessing the effectiveness of investment projects with different essence and dimensions parameters in a single dimensionless scale. We expound the results achieved in the development of alternative methods for evaluating the effectiveness of investment projects in industry - "Compramultifactor": the conceptual instrument, general and specific principles of compromise estimate for certain kinds of activity, groups of private parameters estimation of efficiency of investment projects, mathematical tools developed for specific projects methodology of evaluation. We reveal directions of methodology development for assessing the effectiveness of innovation and investment projects in modern conditions of global economy.

Keywords: investment project, assessment efficiency, "Compramultifactor", industrial enterprise.

INTRODUCTION

The most important factor of economic development - is the scientific and technical progress, which is identified with the innovative process. Disruptive character of development has communicatory civilization that permeates the entire economy. There is a growing social orientation on new technologies, the global nature of the creation and using of knowledge, technologies, products and services. It becomes as well-formed idea that the future state of the economy and the enterprise's economy in particular is determined by the importance of the innovations that improve the productivity of all factors of production. The innovation process is always accompanied by the investment process. And the success of innovation depends on the objective and adequate reality of an assessment of investment of activities and projects.

An important problem in the theory of estimation of efficiency of investment activity is the problem of the relation between theory of economic efficiency and real process of making an investment decision, which is conceptually shown in work of S.V. Pimenov [1]. It is namely established:

- axiomatic of evaluating the effectiveness of investment theory does not reflect the real level of business activities' complexity;
- existing methodological approaches and technology of obtaining results are closed to the investor (or decision maker). Financial profile of the project in real conditions of high uncertainty is only a tool of language to describe the project, rather than evaluating the effectiveness.

Evaluating the effectiveness of investment projects in general and especially related to the introduction of novelty (innovations) in the industry, in our view, cannot be based on traditional economic (valuable) effectiveness evaluation. As the real difficulty in assessing effectiveness is that ongoing projects are not isolated from the environment today, tomorrow and particularly in the distant future. This connection is expressed in terms of the consequences of implementation of these projects in related areas, vital functions subsystems (e.g., in ecology, social sphere, energy and resources security, policy in the fight against terrorism, scientific and technical security and independence, in the image of external economic and external policy activities, etc.). Not all projects that are highly effective in valuation concepts may be

acceptable from the perspective of constraints on other important parameters of assessment from these listed non-economic conjugated spheres of activity.

By means of this we actualize the problem of assessment of projects' effectiveness, here is stressed the need to study the problems of assessing the efficiency and development of alternative methodologies for assessing the effectiveness of investment projects, which will allow to choose the best option of the investment project considering constraints of any number of non-economic parameters of different physical nature. So a special compromise approach is required to assess the effectiveness (optimality) of investment projects by taking into account assessing the effectiveness of the complex of particular evaluation parameters of different nature and dimension.

METHOD OF RESEARCH PROBLEMS

The task of research is to offer an alternative methodology to traditional (economic) assessment of evaluating the effectiveness of investment projects in industrial enterprise, allowing to take into account (to generalize) the different of physical nature the estimated parameters.

Methods of research: analysis of existing methods, evaluation criteria of effectiveness and evaluation parameters used in the industry (literature review); study and application of the aggregation theory and the theory of fuzzy sets in the alternative assessment methodology.

RESEARCH

The development of alternative methodologies for assessing the effectiveness of investment projects was preceded by the following study:

1. The essence of the concept "efficiency" was investigated, which is traditionally used in domestic economic science. The author has studied: a) effectiveness as the ratio of cost effectiveness and the corresponding results (economic efficiency) [3]; b) the effectiveness as the characteristic of the economic system state, or as a characteristic of management quality [3]; c) the effectiveness as the measure of approximation to an optimal state of the economic system [4, 5]; d) the effectiveness as the movement's quality and use of limited resources [6]; effectiveness as a complex category of matching the interests of project's participants [7, 8, 9].
2. We highlight the five fundamentally different methods and methodological approaches to the study of assessing the effectiveness of investment projects and carried out a logical analysis of these approaches in order to identify their advantages and disadvantages [10].
3. We reveal tendencies of development of the efficiency estimation theory of investment projects and the activities of the enterprise for the period of the 70s to the present time , namely: a) comprehensive, multi-criteria, integral and national economic approaches to the assessment of efficiency of investment activity of the enterprise; b) the direction of adapting the concept of comparative economic efficiency (the classic problem of the limit distribution of investment V.V. Novozhilov); c) the trend of improvement of "Cash flow" methods through the development of more sophisticated mathematical tools; d) the direction of a radical change in the system of assessing the effectiveness of investment projects based on the use of new concepts, methods and approaches in the study [10].
4. A hypothesis of the existence of certain patterns of development of the native estimation theory of the effectiveness of investment project is represented and postulate of developing alternative concepts for assessing the effectiveness of investment projects is accepted [10].
5. We propose judgment of classifying a system-synergetic methodology for assessing the effectiveness of the enterprise to the fogged direction and having a weak link with science [10].

RESULTS

As a result of undertaken study alternative methodology for assessing the effectiveness of investment projects is worked out to the following theoretical and methodological guidelines [10, 11]:

Definitions of the concepts of "efficiency" and "effectiveness of the investment project" are specified, which are the fundamental definitions of methodology compromise evaluation of investment projects efficiency ("Compramultifactor") and creating the necessary conditions and background for its development. The essence of "efficiency" category, criteria, assessment scale are shown in Table 1.

Table 1 - Differences in characteristics of assessment methodologies

Characteristics	Cost (traditional) efficiency evaluation of investment project's results	Methodology of "Compramultifactor"
"Efficiency" category	As characteristic of ratio results and coincided expenses.	As characteristics of compromising compliance with the conditions and restrictions (including the value) of the decision maker (DM) and (or) supervisory member.
Criteria of efficiency	Maximization of ratio results and coincided expenses. (maximum result / costs; maximum NPV, IRR; minimum amount of fixed costs, etc.	Maximization of characteristics of compromise compliance with the conditions and restrictions (maximum generalized function of desirability D).
Scale of assessment	Cost scale	Nondimensional scale
Evaluation parameters	Cost parameters	Different parameters according to the physical nature.

2. We offer conception of alternative methodology for efficiency assessment of investment projects (using evaluation of projects, implemented in engineering as example).

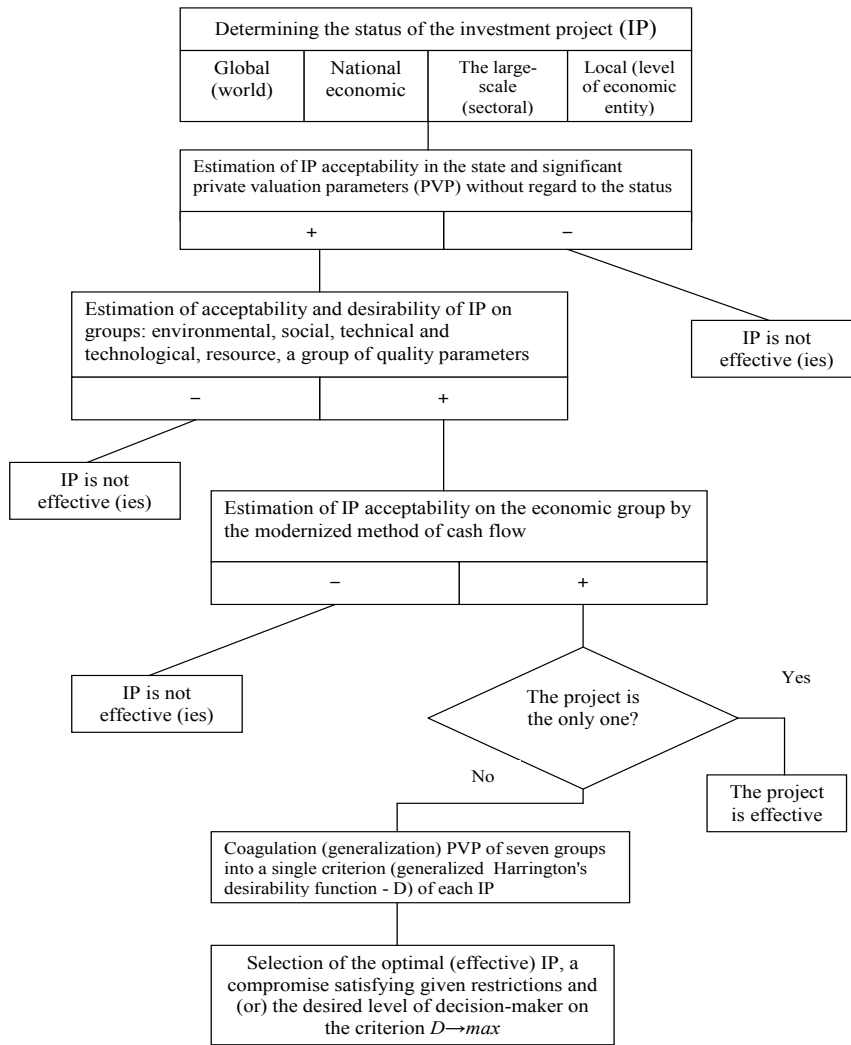


Fig. 1. - The concept's scheme of efficiency estimation of IP "Compramultifactor" [12]

3. The mathematical apparatus of the conversion value of the linguistic variable (term) into the desirability function is worked out, which allows to take into account in the process of compromise evaluation of the investment project effectiveness of constraints and (or) the desired levels by values of private parameters given in the form of fuzzy sets.

4. Concrete methodology for assessment the investment projects' effectiveness are developed, groups of private evaluation parameters of these methods, the principles of effectiveness evaluation (methodological and specific). The name, content, and a correspondence between the positions of data presented in table 2.

Table 2 - Developed methodical positions of methodology "Compramultifactor"

N₂ N₂	Methods of effectiveness assessment	Principles of assessment	Private evaluation parameters (PEP)
1	Methods of assessing the	1. Multifactor of evaluation of	1. Group of state-relevant

№ №	Methods of effectiveness assessment	Principles of assessment	Private evaluation parameters (PEP)
	investment projects effectiveness in mechanical engineering [10]. Integral assessment criterion: $D_j \rightarrow I$ $D_j = \sqrt{d_{j-19} \cdot d_{15j} \cdot d_{12j} \cdot d_{13j} \cdot d_{14j}}$	investment projects' efficiency (complexity in the evaluation). 2. Principle of observing the evaluation process of investment projects' effectiveness as a compromise system. 3. The principle of governmental admissibility in the process of investment projects' efficiency 4. The principle of considering the enterprise in the form of ecological and socio-economic system. 5. The principle of accounting qualitative and specific parameters in the process of evaluating the investment projects' efficiency. 6. The principle of aggregation (generalization) in the process of evaluating the investment projects' efficiency. 7. The principle of private assessment equivalence of evaluation parameters (optimization) and inequality of restrictions on them. 8. The principle of comparability of the investment projects' comparison conditions. 9. The principle of accounting the time factor in the investment project. 10. The principle of uncertainty, risk assessment and the impact of fluctuations on the economic process. 11. The principle of continuity (permanence) of evaluating the selected option of investment project.	parameters. 2. Ecological group. 3. Social group. 4. Technical and technological group. 5. Resource group. 6. Group of unclassified qualitative parameters 7. Economic group. 35 parameters in total.
2	Innovative methods of investment projects' evaluation. Integral assessment criterion: $D_j \rightarrow I$ $D_j = \sqrt{D_{1-15j} \cdot d_{16j} \cdot d_{17j} \cdot d_{18j} \cdot d_{19j}}$	The same principles as in plan 1.	1. Group of state-relevant parameters. 2. Ecological group. 3. Social group. 4. The group of qualitative parameters 5. Economic group. 19 parameters in total.
3	General methodology for	The same principles as in plan 1.	1. Group of critical

№ №	Methods of effectiveness assessment	Principles of assessment	Private evaluation parameters (PEP)
	the innovative projects assessment in the enterprise. Integral assessment criterion: $D_j \rightarrow I$ $D_j = \sqrt[n]{D_{1-7j} \cdot d_{8j} \cdot d_{9j} \cdot d_{10j} \cdot d_{11j}}$		parameters 2. Group of economic parameters Only 11 parameters.
4	Methods of assessing the innovative projects in the petrochemical industry [13]. Integral assessment criterion: $e_j \rightarrow \max$ $e_j = \int_K h_j \times \alpha$	The same principles as in plan 1.	1. Indicators of resource security. 2. Indicators of economic efficiency. 3. Indicators of technical and technological efficiency. 4. Organizational and meaningful indicators. 5. Indicators of social efficiency 6. Indicators of environmental efficiency. 19 parameters in total.
5	Methods of assessing of ecologically oriented innovative investment projects [14]. Integral assessment criterion: $D_j \rightarrow I$ $D_j = \sqrt[n]{D_{1-8j} \cdot d_{9j} \cdot d_{10j} \cdot d_{11j} \cdot d_{12j} \cdot d_{13j}}$	1. The principle of taking into account the public interest. 2. Obligation of taking into account all the environmental parameters of the project, i.e., its impact on all components of the environment. 3. Consideration of regional specificity of the area of project implementation. 4. The generalization principle of all developed and used private efficiency assessment parameters. 5. Comparability of different projects' conditions comparison of (projects' options) 6. Quantitative account of private parameters assessment. 7. Accounting in quantitative form of the impact of uncertainties and risks that accompany the implementation of the project 8. The principle of the maximum effect.	1. Ecological assessment parameters. 2. Natural resources extraction parameters 3. Level of non-waste production. 4. Parameter of technology-related risk. 5. The indicator of ecological condition of the area of project implementation. 6. The urgency of the project implementation. 7. Status of the area of project implementation. 8. The parameter of uncertainty and risk of the project. 9. Economic valuation parameters. 20 parameters in total.

The study of global experience of investment planning lets to reveal the following trends in the evaluation of innovation and investment projects effectiveness:

1. Development of ecologically oriented valuation parameters used as independently (for ecological projects) and as part of any innovation project. Ecological projects, "green economy" become a driving force in the global society. Investment strategy directed to reducing of industrial pollution in the manufacturing sector is becoming increasingly actual [15, 16].
2. Production sector orientation in energy-efficient innovation and investment projects determine the non-economic parameters as top in the evaluation and selection of projects [17, 18].
3. Climatic changes, greenhouse gases, global warming - all this determines the dimensions of investment policy particularly in developed countries. Orientation on projects let to modify climatic change and reduce greenhouse gas emissions [19] requires a rethinking of obtaining short-term economic gain, income and preferences. More and more there are objective conditions in order cost parameters of effectiveness assessment to bring to the category of controlled, not managing.

CONCLUSION

Thus on the basis of undertaken research and the results obtained at this time we revealed the global trend of optimizing the investing activities in order to obtain the benefits system, the long term benefits, not only obtaining profits system from investments, tangible benefits of economic efficiency in the short term. The objective of effectiveness evaluation becomes the task of complex optimization taking into account a large number of dynamically changing private parameters of evaluation of various physical nature and dimension. The solution of this optimization problem is brought to the development of non-monetary alternative methodology of assessing the effectiveness of "Compramultifactor" investment projects, testing of its methodologies and taking it as a basis in evaluating the effectiveness on governmental level. The methodology should include methods for evaluating the projects effectiveness in different activity areas, developed on principles pointed in Table 2.

In the context of global implementation of information technologies in all spheres of activity is no exception and estimated activity of investment projects. An important direction of development of this methodology is its automation and mass distribution in the field of business, in the supervisory authorities.

ACKNOWLEDGEMENTS

The work is performed according to the Russian Government Program of Competitive Growth of Kazan Federal University.

REFERENCES

- S. V. Pimenov, "Problems of application of the theory of economic efficiency in the actual process of making investment decisions," Vestn. INZhJeKONa. «Jekonomika» [Bulletin ENGECON. "Economics"], no. 4(9), pp. 25–30, 2005.
- V. V. Novozhilov, Measurement problems the costs and results in optimal planning. Moscow: "Nauka," 1972.
- H. N. Gizatullin, "On the problem of the creation of enterprise management systems in transition economies," in Proceedings of the All-Russian symposium on economic theory, 2003, pp. 31–44.
- Genkin, B.M., and M.I.Kozlova. "About performance indicators and concepts of motivation of effective work" Vestnik INZhJeKONa. «Jekonomika». 4(5) (2004): 3-9.
- M. Blaug, Jekonomicheskaja mysl' v retrospektive [Economic thought in retrospect]. M.: «Delo Ltd», 1994.
- I. I. Sidorov, Logisticheskaja koncepcija upravlenija predprijatiem [Logistic concept of enterprise management]. SPb.: «Znanie», 2001. 1
- V. V. Kosov, V. N. Livshic, and A. G. Shahnazarova, Metodicheskie rekomendacii po ocenke jeffektivnosti investicionnyh proektov [Methodical recommendations according to efficiency of investment projects], Second edi. Moscow: "Jekonomika," 2000.

- P. N. Zavlin, A. V. Vasil'ev, and A. I. Knol', *Ocenka jekonomicheskoy jeffektivnosti investicionnyh proektov (sovremennye podhody) [Estimation of economic efficiency of investment projects (modern approaches)]*. SPb: "Nauka," 1995.
- B. L. Kuznecov, S. B. Kuznecova, and F. I. Andreeva, "Effectiveness of corporate development," in *Economic Synergetics: meeting the challenges and threats of the XXI century*, 2005, pp. 119–126.
- A.S.Puryaev, *Compromise efficiency assessment of investment projects. Research and Development*. Saarbrücken: LAP LAMBERT Academic Publishing, 2011.
- A.S.Puryaev, "Theory and Methodology compromise efficiency assessment of investment projects in mechanical engineering," *Autoabstract Dr. Diss.*, p. 39, 2009.
- A.S.Puryaev, "Private Valuation Parameters of Efficiency the Investment Projects in the Concept 'Compramultifactor,'" *Mod. Appl. Sci.*, vol. 9, no. 11, p. 263, Sep. 2015.
- Kharisova A.R., Puryaev A.S. *Competitiveness assessment of engineering products. Source of the Document IOP Conference Series: Materials Science and Engineering. Volume 69, Issue 1, 2014, Article number 012020*.
- G. F. Jusupova, "Ecological innovative investment project: features and determination," *Azimuth nauchnyh Issled. jekonomika i Upr. [Azimuth Sci. Res. Econ. Manag.]*, no. 3(16), pp. 220–223, 2016.
- T. Sueyoshi and M. Goto, "Investment strategy for sustainable society by development of regional economies and prevention of industrial pollutions in Japanese manufacturing sectors," *Energy Econ.*, vol. 42, 2014.
- M. Goto, A. Otsuka, and T. Sueyoshi, "DEA (Data Envelopment Analysis) assessment of operational and environmental efficiencies on Japanese regional industries," *Energy*, vol. 66, 2014.
- S. Chakravarty and M. Tavoni, "Energy poverty alleviation and climate change mitigation: Is there a trade off?," *Energy Econ.*, vol. 40, 2013.
- E. Kriegler, J. P. Weyant, G. J. Blanford, V. Krey, L. Clarke, J. Edmonds, A. Fawcett, G. Luderer, K. Riahi, R. Richels, S. K. Rose, M. Tavoni, and D. P. van Vuuren, "The role of technology for achieving climate policy objectives: Overview of the EMF 27 study on global technology and climate policy strategies," *Clim. Change*, vol. 123, no. 3–4, 2014.
- E. De Cian, F. Sferra, and M. Tavoni, "The influence of economic growth, population, and fossil fuel scarcity on energy investments," *Clim. Change*, vol. 136, no. 1, 2016.