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GENERALIZING THE PRACTICAL EXPERIENCE OF PROPER ESTIMATING THE INNOVATIVE INVESTMENT PROJECTS EFFICIENCY

УЗАГАЛЬНЕННЯ ПРАКТИЧНОГО ДОСВІДУ ВЛАСНОЇ ОЦІНКИ ЕФЕКТИВНОСТІ ІННОВАЦІЙНО-ІНВЕСТИЦІЙНИХ ПРОЄКТІВ

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Зажарченко В.І. Узагальнення практичного досвіду власної оцінки ефективності інноваційно-інвестиційних проєктів. Науково-методична стаття.

Представлено власний практичний досвід оцінки здійснених у реальній практиці інноваційно-інвестиційних проєктів та узагальнено типові помилки, які автори дослідження з цього напрямку припускаються: відсутність обґрунтованих особливостей кожного проєкту, тобто урахування економічної ренти; обов'язкове проведення при обґрунтуванні складних проєктів аналізу чутливості; наявність і оцінка додаткових доходів на ліквідаційній стадії проєкту; неухвалене відношення до визначення відсоткової ставки доходу та інвестицій, що можуть бути залучені у проєкт; обов'язкова наявність проведених передпланових досліджень.

Інноваційно-інвестиційні процеси відіграють вирішальну роль у забезпеченні економічного зростання держави, у реалізації інноваційної моделі розвитку її національної економіки. Але вітчизняне промислове виробництво в цілому й далі залишається не сприятливим до нововведень, хоча протягом останніх років відбулися помітні зрушення в економічному розвитку країни. Саме тому питання формування науково обґрунтованої інноваційно-інвестиційної політики, реалізації ефективних інноваційно-інвестиційних проєктів має бути приділено значно більше уваги у дослідженнях вітчизняних фахівців, оскільки стрімкий розвиток світової та української економіки на майбутнє буде визначатися рівнем інноваційно-інвестиційної активності.

Ключові слова: інновація, інвестиція, проєкт, дохід, витрати, ефект, оцінка, аналіз, ліквідність, планування

Zakharchenko V.I. Generalizing the Practical Experience of Proper Estimating the Innovative Investment Projects Efficiency. Scientific and methodological article.

The own practical experience of estimating the innovative and investment projects realized in real practice is presented and the typical mistakes which the authors of research in this direction assume are generalized: the proved features absence of each project, i.e. the economic rent account; mandatory sensitivity analysis when substantiating complex projects; availability and assessing the additional income at the liquidation stage of the project; careless attitude to the determination of income interest rate and investments that may be involved in the project; mandatory pre-planned research is required.

Innovation and investment processes play a crucial role in ensuring the economic growth of the state, in the innovative model implementation of its national economy development. But domestic industrial production as a whole remains unfavourable for innovations, although in recent years there have been significant changes in the country's economic development. That is why the issue of forming a scientifically sound innovation and investment policy, effective innovation and investment projects implementation should be given much more attention in the research of domestic experts, as the rapid development of the world and Ukrainian economy in the future will be determined by innovative and investment activity.

Keywords: innovation, investment, project, revenue, expence, effect, estimate, analysis, liquidity, planning

In recent years the investment process in Ukraine is not unambiguous. If in the early 2000s experts noted the creation of an investment model in the country after the turmoil of the 1990s, today we see this process revival. But the new governmental economic strategy "Growth through investment" (2019) gives hope: the country's GDP growth was by 40%, attracting at least 50 billion USD foreign direct investment, more than a million workplaces creation (for the next 5 years).

In our case, it is urgent to move from the economy of consumption to the economy of development, to create a policy that increases workplaces, raises wages, innovative and investment climate formation [25], in which new enterprises are created. The average depreciation of fixed assets in Ukraine is 60%. In order to reach 35% (for example, as in Slovakia), this strategy requires almost 50 billion USD investments in the next 5-10 years.

The difference in the level of production per person employed is also striking: in Ukraine, per worker in 1991 prices, production was 20 thousand USD, and in Eastern Europe was 35-65 thousand USD. As the economies were more modern there. The percentage of high-tech goods and services in Ukrainian exports was 17. Everything else was raw materials. In the processing industry, the high technology percentage was 3. Our economy is now technologized. A scientific-based programme is needed to attract investments, first of all, to the real sector of the Ukrainian economy.

In Ukraine, there are about 1 thousand USD investments per person. In Poland, there are 6,000 USD investments. In Slovakia, there are 10 thousand USD investments per person. The share of Ukrainian GDP in world trade is 0.3%, the share of exports in world trade is 0.2%, the share of exports in GDP is 45%. It means that we have a very small and open economy, so half of the economy is export. We are completely dependent on the world. It is needed to be more flexible. And this requires that the markets for land, capital, labour, and technology work effectively.

It is also necessary to scale the positive experience of attracting investments, which is in the agro-industrial complex and the IT sector. They differ from others in that they are able to integrate into global economic chains. That is, they work with global customers, suppliers, and this is competitiveness, skills and technology. Such investment in human capital, fixed assets, integration into global markets must be brought to the whole country's level. All this must be supported by a favourable business climate. We are talking about trust in the courts, effective customs, antitrust policy, deregulation, the fight against raidership.

Most researchers note that since innovative projects are inherently investment, for pre-planned studies of innovative and investment projects, it is proposed to use the traditional indicators of economic efficiency of investment projects, which in economics are divided into two groups: static and dynamic [16]. It is clear that the most accurate are methods that are based on dynamic, i.e. discount estimates. United Nations Industrial Development Organization (UNIDO) recommends the use of indicators primarily for the investment projects evaluation: net present value – NPV, internal rate of return – IRR, profitability index – PI, payback period – PBP [3].

Thus, serious improvements in the investments quality should be carefully considered, especially since this has been initiated by the national government. The investment objectives realization involves creating the innovative investment projects that provide investors and innovators and other participants in such projects with the necessary information for making investment decisions. In this context, it is appropriate to have a conversation about the correctness of evaluating the effectiveness of important national and regional economies, individual enterprises and innovative investment projects.

Analysis of recent researches and publications

An objectively necessary part of the reproduction process is the worn-out fixed assets replacement with new ones, which is carried out through the mechanism of accumulation of depreciation and their use for the purchase of new equipment and modernization of existing fixed assets. At the same time, a significant expansion of production can be achieved only through new investments, which are aimed at creating new production facilities and improvement, quality upgrades of equipment and technology, innovative products and technological processes development (remember that M. Blaug divides innovations into two classes: process innovations and product innovations [4, p.438]), the spread of new forms of business and labour, new markets development. These particular investments, which are used for the development and expansion of production in order to extract income in the future, are the content of innovative and investment activities. The following domestic scientists have devoted their researches to investments substantiation in innovation: T. Ben [1; 2], I. Hruzkov [6], O. Derykolenko [7], A. Kabanov and V. Neienburh [14], O. Krylova [15],

A. Kuznietsova [16], V. Miachyn [18], T. Polozova [20], O. Prokopenko and V. Shkola [21], V. Savchuk [23], L. Fedulova [26], S. Filyppova [19], O. Yankovyi [27]. Thus, V. Savchuk, summarizing his practical experience in promoting Western technologies of financial management, tries to systematize the main features of approaches to justifying the investments integrity [23, p.19]. In his works, T. Ben compares the Standard Methodology for Determining the Economic Efficiency of Capital Investments and New Technology in the National Economy of the USSR and the modern one (as I understand it, the methodology approved by the Ministry of Economy of Ukraine [17]), which takes into account cash flow discounting [1, p.41-42]. O. Prokopenko and V. Shkola investigate scientific approaches to the concept interpretation of the life cycle of innovation and its stages definition [21, p.215-220]. A. Kabanov, V. Neienburh and Yu. Drachuk insist that the methodological approaches systematization to determining the economic efficiency of innovations should be organically included in the relevant sectoral guidelines and regulations [14, p.74].

T. Polozova in her research paper addressed an important modern problem - the innovative and investment mechanism formation to ensure the enterprise competitiveness, the practical implementation of which is carried out on the example of machine-building enterprises of the Kharkiv region [20, p.525-536].

She also provided guidelines for a system formation for monitoring the adequacy of its operation [20, p.322-331], on the basis of expert analysis developed the methodological approach to assessing the possibilities of the enterprise innovative and investment development of [20, p.571-580].

In his works, I. Gruznov turns to organizational and economic mechanisms for the creation and implementation of advanced technical, organizational, and economic solutions for managing the processes of innovations research and development [6, p.138-141].

A. Kuznetsova investigates investment and innovative activities in the context of creating a mechanism for its financing [16, p.70-71] and its implementation in the banking sector [16, p.259-291] and insurance [16, p.307].

Unsolved aspects of the problem

Respecting the viewpoint of domestic experts on this important issue - the quality of estimating the innovative and investment projects effectiveness – beyond their research are such important issues as: a) taking into account the effect of economic rent when evaluating the project, b) the absence of a requirement for mandatory sensitivity analysis, c) the presence and assessment of the project liquidation stage d) a superficial relationship to interest income, e) the mandatory availability of planned studies. In order to clarify these important parameters of innovative and investment design, this research paper is proposed.

V. Savchuk, using Western sources and his own experience, identifies two approaches to evaluating

the investment effectiveness- the first one assesses all the budget capital effectiveness, and the second one - the effectiveness of the investor's own funds [23]. It is reasonable to consider only that net discounted income should be greater than zero and that the domestic return rate should be higher than the capital value. And is it based on generally accepted standards? It is not enough to assess only two indicators.

T. Ben, comparing two methods of estimating the economic efficiency of innovations - the Soviet period and the modern one, which is based on international approaches, notes the pros and cons of each of them [2, p.12-14]. But the first one refers to the capital investments evaluation, and the second one - to the investments evaluation. But it is different. So to speak - you can not simultaneously "harness a horse and a trembling doe". O. Prokopenko and V. Shkola define the following stages of the investment cycle: analytical and exploratory, R&D, market testing, commercial production [21, p.217-219]. However, the stage of reorganization / restructuring / liquidation is not taken into account, which is how the full cycle should end.

A. Kabanov, V. Neienburg and Y. Drachuk propose to conduct the effectiveness assessment at the following stages of an innovative project: a R&D plan formation, reference terms development, testing the prototypes of new products and technologies, introduction into industrial production. It seems that we are talking about the feasibility study of each stage. But these specialists, firstly, do not have a complete project cycle, and secondly, they do not indicate the overall feasibility study of the entire project.

I. Gruznov pays primary attention to the model formation of a product life cycle as an object-oriented system to increase the researchers and developers' efficiency of innovative products [6]. That is, he leaves such important issues at a purely theoretical and methodological level.

O. Krylova, defining that "Solvency, being a characteristic of cash flow and a consequence of high-quality (low-quality) management, also has a reverse effect on it. Solvency demonetizes and disintegrates cash flow and, as a consequence, reduces the amount of net cash flow", concludes that there is a direct relationship between qualitative and quantitative characteristics of cash flow, i.e. between solvency and the amount of net cash flow [15, p.33]. But she, unfortunately, has no clear indications of these characteristics.

O. Polozova, analyzing other works and conducting in detail her research on innovation and investment mechanisms in enterprises, touches on such categories as: "innovative and investment potential", "innovative and investment activities", "innovative and investment development", "innovative and investment security", "innovative and investment favourableness", "innovative and investment activity", "innovative and investment attractiveness". At the same time, for some reason she does not refer to the concept of "innovative and

investment project" and the evaluation quality of its effectiveness [20, p. 22].

The aim of the work is to study the practical conduct of a more accurate estimating the innovative and investment projects effectiveness in the real sector of the economy.

The main part

The concept of an innovative and investment project is interpreted in two ways:

- as an activity that predicts any actions implementation that ensure certain goals achievement of an innovative nature;
- as a system that includes a certain set of organizational and legal and settlement and financial documents that are necessary for any actions implementation or that describe such actions that lead to innovations (a similar approach can be found in [13, p. 46]).

Then it is possible to start a conversation about investing in real innovation and investment projects and therefore the concept of "the innovative and investment project" is used in the second definition, and in the first definition we use as the usual concept of "a project".

At the same time, we should also turn to the Ukrainian legislative framework and analyze the rather generalized definitions of the term "the project", which, in the first approximation, will satisfy us:

- innovative project - is a set of documents that defines the procedure and set of all necessary measures (including investment) for the creation and implementation of innovative products and (or) innovative goods [9, p.5];
- an investment project - is a set of organizational, legal, financial and engineering measures carried out by the investment activities subjects in accordance with the planning and settlement documents, which contain a justification for the need for such measures [10, p.5];
- a scientific (scientific and technical) project - is a set of measures related to ensuring the implementation and direct conduct of scientific research and (or) scientific and technical developments in order to achieve a specific scientific or scientific and technical (applied) result [11, p.7].

A fairly similar definition is given by the dictionary: "An innovation project - is a set of documents that defines the procedure and a number of interrelated investment measures aimed at the commercial application of innovative developments, new products development, new technologies introduction" [8, p. 732].

There are different classifications of innovative and investment projects. Depending on the features that underlie the classification, it is possible to identify the following innovation and investment projects:

- in relation to each other: independent, alternative, intercomplementary;

- by implementation term: short-term (up to 3 years), medium-term (3-5 years), long-term (more than 5 years);
- by scale: small, medium, large, megaprojects;
- by main focus: commercial, social, environmental, etc.;
- depending on the impact of implementation results: global, national, large-scale, local;
- depending on the risk magnitude: reliable, risky.

Any innovative and investment project implementation pursues a specific goal. For different projects, the goals may be different, but in general they can be divided into four groups: the products (services) preservation in the relevant market; expanding production volumes and improving the products (services) quality; the latest products release; solving social and economic problems.

All innovation and investment projects have some common features that allow them to be standardized: the presence of a time lag between starting the investment innovations and the income moment, the project cost estimate and others.

Innovative and investment projects have various forms and meanings. Investment decisions that are considered during the innovative and investment projects are attributed exclusively to: new products (services) creation and commercialization, which are characterized by the attitude to the fifth – sixth – seventh technological modes [12; 26]; introducing fundamentally new technologies for the given territory; forms of labour organization; scientific research. That is, this refers to the so-called "net investment" (the author's viewpoint). But some authors may find a different view, from our position, controversial: «net investment is the amount of gross investment less the amount of depreciation over a period" [13, p.15]. In turn, we also give a more general definition: net investment – is the amount of gross investment excluding depreciation (Wikipedia). Which may also be of little satisfaction in the sense of the study of innovative and investment activities. Therefore, the above mentioned definition given by the author should be followed.

After such necessary theoretical generalizations in the field of innovative and investment activities we pass to the main part of research – eliminating the widespread mistakes of the practical plan of its realization.

A. Economic rent. R. Braille and S. Myers give the following definition: "Profits that exceed opportunity costs are called economic rents" [5, p.226]. That is, this means the special advantages of each project, despite the fact that it and alternatives, all indicators in accordance with the international methodology for assessing the effectiveness of UNIDO investments [4] – are positive. It is necessary to insist on the economic rent determination of the innovative and investment project, as well as to calculate it.

Carrying out a consulting project to justify the use of new technology at "Hydraulics – 2" LLC for producing the hydraulic steering mechanisms [19, p.92-95], such aspects were taken into account. The modern approach to estimating the innovative and investment projects that have a positive net consolidated value cannot take into account the results, which are evaluated in nominal terms, as there are probable obvious mistakes made in forecasting cash flows. The net consolidated cost of a new project can only be positive if it is certain that the enterprise under study has some special advantages. That is, the source of economic rents is determined.

This project provided an opportunity to define such a concept as "hidden disposal of capacity", which is directly related to the economic rent concept. These are not obsolete fixed assets of the enterprise, which do not allow, in turn, to install more adequate new equipment and use modern circulating assets [19, p.95].

B. Sensitivity analysis. S. Ross and his colleagues define this concept as follows: "the study of what can happen to NPV, if one varies any one variable, considering all the others unchanged" [22, p.272].

We will consider such a necessary element of an innovative and investment design – as a kind of scenarios analysis of the innovative and investment project; we investigate possible NPV fluctuations when changing only one variable. If the NPV is very sensitive to very small changes in the components cost of the project cash flow, the risk of forecasting associated with this change will be high.

As an example, we present a fragment from the consulting project at "Pervomaiskieselmash" ALC on introducing new technology in connection with this enterprise transition to manufacturing the new products – i.e. cogeneration units. We use the main options for all the variables values, excluding sales (table 1).

Table 1. The Variants of Innovative and Investment Project Indicators-1

Scenario	Sales volumes, thousand, UAH	CF, thousand, UAH	NPV, thousand, UAH	IRR, %
Main	162,0	1614,6	420,3	15,2
Pessimistic	148,5	1436,4	-222,1	10,1
Desirable	175,5	1792,8	1062,6	19,8

Source: author's own development

Then we calculate the CF and NPV, using the largest and smallest values of this variable Using the

comparative method, we leave all the values, except for fixed costs, and repeat the analysis (table 2).

Table 2. The Variants of Innovative and Investment Project Indicators-2

Scenario	Fixed costs, thousand, UAH	CF, thousand, UAH	NPV, thousand, UAH	IRR, %
Main	1350,0	1614,6	420,3	15,2
Pessimistic	1485,0	1525,5	99,1	12,6
Desirable	1215,0	1703,7	741,4	17,5

Source: author's own development

As it can be seen from the data obtained, the NPV, which was obtained by calculation, is more sensitive to changes in sales than to changes in fixed costs. In the pessimistic case, when the fixed costs change, the NPV remains positive.

Graphic illustration of the sensitivity analysis to changes in sales is Figure 1. NPV is marked on the

vertical axis, and sales are marked on the horizontal axis. As can it be seen from the graph, for different data combinations, all possible options are located in a straight line. The greater the rise of the line, the higher the sensitivity of NPV to the value of the studied variable.

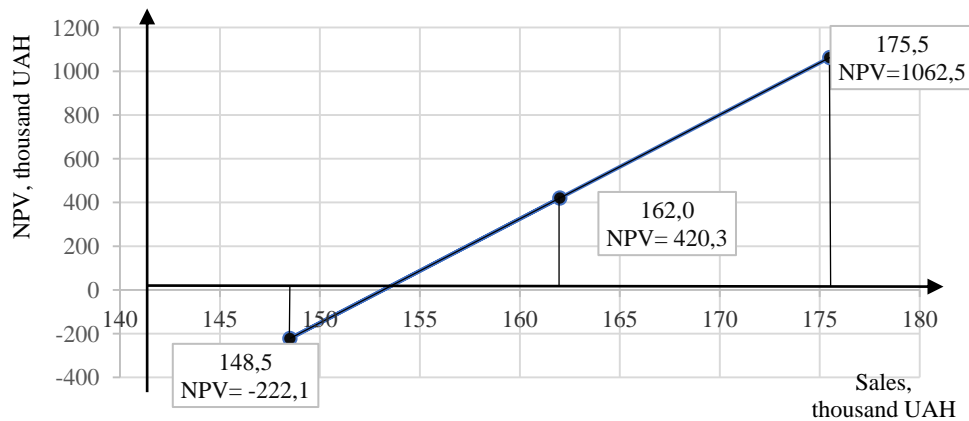


Figure 1. The Sensitivity Analysis to Changes in Sales

Source: author's own development

Note that the sensitivity analysis allows you to identify variables that deserve special attention. If the NPV is particularly sensitive to a variable that is difficult to predict (for example, sales), the forecasting risk degree is very high. In this case, we strongly recommend further market research. As one of the varieties of the project scenario, this type of analysis has the same disadvantages, as it does not provide for further specific actions.

Very few researchers mention this mandatory apparatus in the process of estimating the projects

effectiveness. For example, R. Fattakhov used it in assessing the economic efficiency of a large-scale project – a production complex, supply and sale of bakery products in Tatarstan (RF) [24, p.152]. But there are examples of thorough innovation and investment projects in which experts forget about the use of sensitivity analysis [7; 18].

C. Liquidation phase. In most studies and textbooks [13; 16] this fourth phase of innovation and investment projects is ignored, which is additional income from project implementation (Fig. 2).

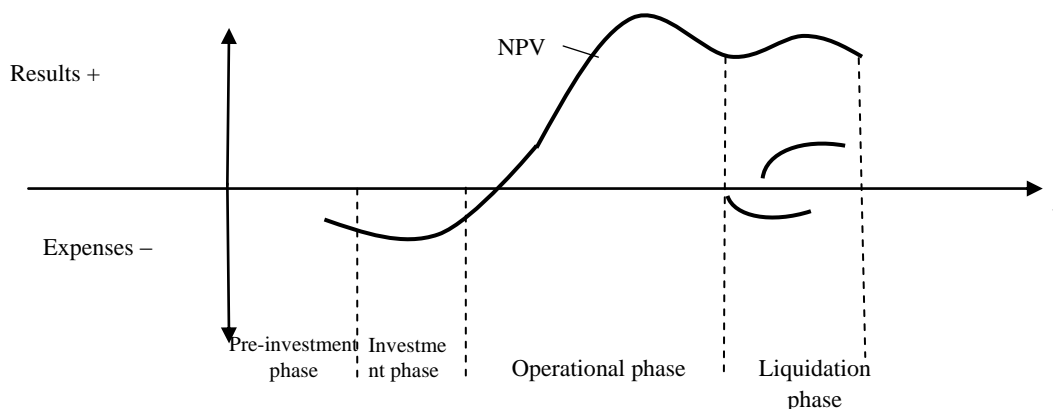


Figure 2. The Schedule of an Innovative and Investment project

Source: compiled by autor on materials [19, p. 56].

In the liquidation phase, the entity first incurs the expenses associated with the project disposition and then receives the corresponding income from the sale of the remaining equipment at residual value.

D. The cost of capital. In most works of educational and methodological nature it is offered to form a return rate (cost of capital, interest on capital, discount rate) with only three components:

$$r = i + R + P, \tag{1}$$

where i – is an expected inflation; R – is a risk as a time factor associated with the uncertainty of the object (enterprise, person); p – consumption deduction fee.

In general, we consider investments as deferred consumption (perhaps this is the shortest definition of investments).

For a more detailed estimating the innovative and investment projects (and for real practice this is especially important), we will try to pay more attention to this important indicator:

a) taking into account the risk-free part of the project:

$$r = r * f + R, \tag{2}$$

where f – is a return rate on risk-free innovation and investment projects;

b) nominal return rate:

$$r = rD + i, \tag{3}$$

$$rD = p + R,$$

where rD – is real return rate;

c) the availability of increased liquidity of the project:

$$r = i + R + p - L, \tag{4}$$

where L – is a premium for increased liquidity of the project (in general, we consider liquidity as one of the risk components);

d) taking into account non-participation in production:

$$r = i + R + p - e, \tag{5}$$

where e – is the reduction for non-participation in production;

e) using Fisher's test, especially in the high inflation presence:

$$r = (1 + i) * (1 + R + p) - 1, \tag{6}$$

f) taking into account the synergy effect:

$$r = (1 + i) * (1 + R * (1 + p)) - 1, \tag{7}$$

g) taking into account the type of risks :

$$r = i + p + R_s + R_u, \tag{8}$$

where R_s – is a systematic risk, R_u – is an unsystematic risk.

In the real work on innovative and investment projects in computer programmess for calculating economic efficiency, it is necessary to make these amendments in order to more accurately estimate the initial indicators.

E. Pre-planned researches. Today, especially when the estimating innovative and investment projects, it is important to conduct thorough pre-planned researches. Pre-planned researches are preliminary conduct, before the main work on the implementation of the consulting project, analysis, diagnosis, modeling and optimization of key parameters that ensure a customer's goals achievement (the author's definition). During the consulting project implementation at "Odessa Plant of Radial Drilling Machines" PJSC – evaluating the options for technical modernization of the main production – was carried out as a pre-planned study of economic and mathematical modeling based on the tool of correlation and regression analysis. (Figure 3).

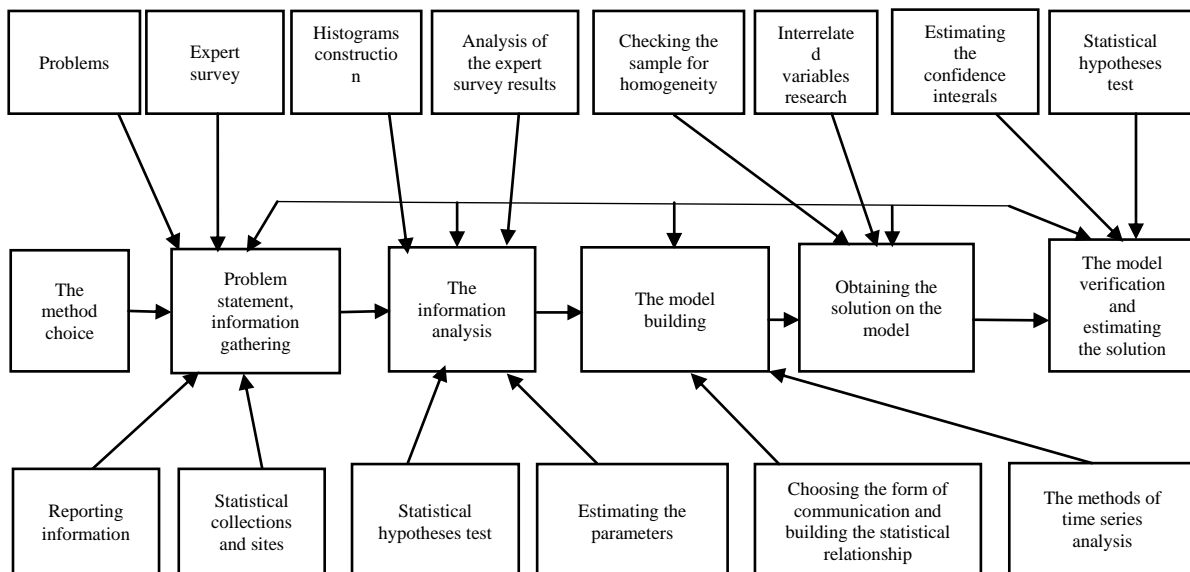


Figure 3. Stages and Methods of Economic and Mathematical Modeling in the Pre-Planned Researches Process
 Source: author's own development

The mandatory pre-planned research will increase the reliability of innovation and investment design and the project reality itself.

Conclusions

At the present stage of Ukraine's economy development, the innovation and investment strategy should be the focus of the government and the dominant of market economy. The key determinant of ensuring the innovative model implementation of the national economy development will be a purposeful search for investment in innovative projects. And the task of their reasonable assessment in terms of

economic efficiency will be very important. In this research paper, attention was paid only to certain aspects of estimating the real effectiveness of innovation and investment projects. These mistakes are also made by university teachers when writing textbooks and lecturing.

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Abstract

Approval of the innovation and investment strategy of the national economy cannot be carried out without proper study and justification not only of the role and importance of innovations and investments in the theory of economic growth, but also the problem development of reliable estimating the innovative and investment projects.

In recent years, Ukrainian scientists have made the first attempts to study the causal links between investments and innovations, but even today a number of important issues require not only detailed analysis and shortcomings identification, but also applied research in the field.

The article presents our own practical experience in evaluating the innovative and investment projects implemented in real practice, and summarizes the typical mistakes made by the authors of the study in this direction: the lack of proven features on each project, i.e. accounting for economic rent; mandatory sensitivity analysis when justifying complex projects.

Domestic industrial production in general remains unfavourable for innovations, although in recent years there have been significant changes in the economic development of the country. That is why the formation of scientifically sound innovation and investment policy, effective innovative and investment projects implementation should be given much more attention in the research of domestic experts, as the rapid development of the world and Ukrainian economy in the future will determine the level of innovative and investment activities.

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