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PRAGMATIC APPLICATION OF THE METHODS OF ESTIMATION OF INVESTMENT PROJECTS IN UKRAINIAN REALITIES

In this article attention is given to pragmatic aspects of the application of various methods of estimation of investment projects, taking into account the realities of the economy. The measure of justification of investment decisions that are taken, and, ultimately, the financial results of the activities of the entity depend on the methods of estimation of investment projects. Any enterprise, the city, state authorities, international organizations and institutions face the adoption of investment decisions. The paper considers the characteristics of static and dynamic methods of estimation of investment projects. Additionally, the focus is put on determining the discount rate of cash flows for projects via classical approaches that take into account the current situation in the country. Application of dynamic methods of estimation of investment projects using a discount rate at the level of the average profitability of available investment alternatives at least to preserve investment capital and maintaining the value of the business is substantiated.

Keywords: *investment projects, static and dynamic methods of an estimation of investment projects, the discount rate, the risk-free rate, the cost of equity capital, the premium for the risk of the country.*

Investment is the key to the extended reproduction, a necessary condition for the development of both enterprises and economies at large. The final result of the activity depends on the quality of the adopted investment decisions. Making investment decisions is inevitable not only for any enterprise, but also city and state authorities, international organizations and institutions. The level of substantiation of approved investment decisions depends on the methods used.

On the other hand, the feasibility of the application of different methods of estimation of investment projects, their practical appeal, certain specifics apply depends on the current state of economy, the level and stage of development of the financial market, characteristics of the risks inherent in the country and to the company at the time of the evaluation and the period of realization of the investment project.

In scientific literature issue evaluation of investment projects revealed quite extensively. among the most important in this context, it is worth noting the V. Berens, R. Brealey, U. Götze, A. Damodaran, T. Koller, T. Kopeland, W. Sharp, as well as national experts who study the issue of the application of different methods of making investment decisions, V. Savchuk, A. Tereshchenko, I. Blank, V. Vilenskyi, T. Mayorova, A. Mertens, A. Peresada.

Noting the great significance of the work of these authors, they left some practical aspects of the application of the aggregate methods that depend to a large extent from the conditions of the functioning of the economy, which, in turn, affect the feasibility of applied assumptions, model evaluation, determination of cost indexes of the variables that are taken into account when making investment decisions.

The **purpose** of the article is substantiation of the application of the methods of estimation of investment projects given the Ukrainian realities that affect the acceptance of investment decisions.

In accordance with the classical approach to the assessment of investment projects there are two methods: *static* and *dynamic*. Static methods do not take into account the cost of money at the time. The most famous of static methods used include payback term, rate of return, the method comparison of costs, and the method of comparison of profits.

The advantages of these methods is their relative ease of use but since static methods ignore the value of money over time, they do not suffice while making investment decisions. These methods focus on a single financial indicator while ignoring the others. The effectiveness of

investment projects can be absolute (assessment carried out for a single project or independent projects) and relative (comparing alternative projects while making the investment decision).

This assessment of investment projects is based on certain assumptions: source data and their relationships are known with some precision; all relevant effects can be derived, attributed to a specific investment project and projected in the form of cash flows; no relationship exists among alternative investment projects that are analyzed, in addition to their mutual exclusivity; decisions about funding or production are taken before the investment decision; the life cycle of the project is defined [1].

In this way, the analysis only average indices reduces the usefulness of results of evaluation of efficiency of investment projects.

The quality of efficiency estimations of projects depends on the reliability of predictions, and it is, in fact, the comment for all methods of estimation of investment projects. The main disadvantage of static methods is their static nature, that is, when their use is not possible given that the cash flows occur in different time periods and have a different value in time.

The second group of methods (dynamic methods) of estimation of investment projects are those based on discounting the cash flows. Therefore, these take into account the concept of changing the value of money over time. Dynamic methods can use a discount or extended cash flow: Net Present Value (NPV), Discounted Payback Period (DPP), Internal Rate of Return (IRR), Modified Internal Rate of Return (MIRR), Compound Value Method, Critical Debt Interest Rate Method (see Table 1).

Among these discount methods the NPV-method, the DPP-method, the IRR and the MIRR-methods are the ones most frequently used in the practice of evaluation of investment projects (as opposed to the static methods and techniques, based on cash flows). However, it should be noted that first, they are based on certain assumptions, and second, their application must take into account the "bottlenecks", specifics and some restrictions for various projects. We are considering these "bottlenecks", these specific aspects of use of dynamic methods for assessing investment decisions right away.

Table 1

Generalization of the basic dynamic methods of estimation of investment projects

The method	Description	The formula
The method of Net Present Value	Shows how much in absolute terms will the investor get beyond the discounting rate	$NPV = \sum_{k=0}^{n} \dfrac{CF_k}{(1+r)^k}$
Discounted Payback Period method	Specifies the period of time required for the reimbursement of the initial investment, taking into account the factor of time	$C_0 = \sum_{k=0}^{DPB} \dfrac{CF_k}{(1+r)^k}$
The method of Internal Rate of Return	Shows the upper border of the valid discount rate, excessing which makes the project not profitable	$\sum_{k=1}^{n} \dfrac{CF_k}{(1+IRR)^k} = CF_0,$
The method of Modified Internal Rate of Return	Involves finding such internal rate of return that equalizes the current estimate of investment costs and the future value of cash flow for the project and is calculated at a certain ad valorem rate	$\sum_{k=0}^{n} \dfrac{CF_k}{(1+r)^k} = \dfrac{\sum_{k=0}^{n} CF_k^{+}(1+r)^{n-k}}{(1+MIRR)^n}$

| Compound Value Method | Future value is the total net value of compounding cash flows according to the results of the investment project at the end of its life cycle | **$$CV_{K+} = \sum_{k=0}^{n} NCF_{k+} \cdot (1+c)^{K-k},$$ $$CV_{K-} = \sum_{k=0}^{n} NCF_{k-} \cdot (1+d)^{K-k},$$ $$CV_K = CV_{K+} + CV_{K-}$$ ***$$CV_K = NCF_K + \begin{cases} CV_{K-1} \cdot (1+c), & for\, CV_{K-1} \geq 0 \\ CV_{K-1} \cdot (1+d), & for\, CV_{K-1} \prec 0 \end{cases}$$ |
| Critical Debt Interest Rate Method | Shows the earned interest on the attached capital for each period of the investment project at a given interest rate | $$d_c \approx d_1 + \frac{CV_1}{CV_1 - CV_2} \cdot (d_2 - d_1)$$ *CV* 1,2-calculated future value when debt rates $d1$ and $d2$, respectively |

where k – the period of the project

n – the period of the duration of the project

CFk – cash flow at k-th period

r – the discount rate

d – the debt interest rate for building cash outflow

c – the credit interest rate for building cash inflows

$CF\,k-$ cash outflows

$CF\,k+-$ cash inflows

The assumption in the application of dynamic methods of estimation of investment projects are the following:

−the investment project must be presented as a set of expected cash flows (positive or negative) during the entire life cycle of the project;

−all of the effects of alternative investment projects in these cash flows, other effects are not considered;

−all cash flows can be projected and attributed to a specific period of time.

The NPV-method is one of the most common used in practice. Its benefits are naturally being a relatively simple calculation of the indicator based on skills for discounting cash flows; the results of the application of the method are more realistic compared with static methods.

Disadvantages of NPV method include the need of several types of predictive values of the indicators (output, all future cash flows, the life cycle of the project, the liquidation value of the working capital, which is released at the end of the project, the discount rate). Note that these flaws are inherent to all dynamic methods of estimation of investment projects.

The assumptions for the application of the method of net present value are the following:

a) one target is considered acceptable but the profitability of investment projects often depends on several targets. That is one target indicator for making investment decisions may not suffice. In this case, multiple-indices methods can be used [1, p. 169].

b) the life -cycle of the project is determined before the application of NPV-method, and it is appropriate.

in) other relevant decisions (concerning the financing and production) are made before the investment decision, in order to forecast cash flows for individual investment projects. In fact, such decisions are made in parallel, and it is difficult to attribute certain cash flows to a particular investment project. In this case, a model for joint decision-making, which can lead to overall optimal solution, may be used [1, p. 221].

g) use of accurate data. It's hard to imagine a 100% correct prediction according to the project. Therefore, it is necessary to take into account the criteria of uncertainty when forecasting cash flows for more important investment projects [1, p. 261].

d) cash flows can be attributed to specific periods of time (at the end or at the beginning of the year) but this is not always true, because the project cash flows may occur at any time. The accuracy of the calculations may increase by reducing the periods of prediction to a quarter or a month (or week or day) and correcting these in accordance with the discount rate. This will improve the accuracy of calculations and increase the complexity of the calculation.

e) all current and future investments that are not exactly defined will bring appropriate return equal to the discount rate alone. This assumption is somewhat remote from reality; therefore, it is well possible that future investment returns will differ from discount rates. Then investors will consider various possibilities for investment in more profitable projects.

f) there is a perfect capital market, which means that the loans can be taken and financial investments made in any moment of time, in any amount, ensuring a return to the level of a single (unified) discount rate. It is clear that such a perfect market does not exist.

g) the discount rate may vary during the life cycle of the project. Determining the discount rate deserves a special attention first due to controversial approaches to definition, and second due to the current specifics of the national economy.

The problem of calculating discount rates in the developing countries, which also experience a financial crisis, is linked with the risk-free rate, market average risk premium, and the use of calculation models for determining the cost of capital equity.

It is clear that the discount rate requires an adequate calculation and substantiation, because that is one of the key variables parameters in models of evaluation of feasibility of investment projects. In the case of inadequate definition, it may significantly affect the character of the investment decision. The method of calculating the discount rates depends on the objectives and the scope of its application: assessment of the fair value of financial instruments; in the banking business for compensation of possible losses for the individual types of active bank operations; in matters of financial management enterprises – determining the fair value of financial investments in corporate rights of enterprises that do not have circulating on the stock market; calculation of efficiency of investment projects; calculation of business cost; calculation of cost-oriented indicators.

When evaluating investment projects, the most acceptable way of determining the rates of discounting is the calculation of the weighted average cost of capital (WACC). The WACC rate is really a comprehensive indicator that takes into account the capital structure of the business (or project), that is, displays the management position on managing the capital structure, real credibility of the enterprise and the cost of capital items used. The latter are still formed under the influence of many factors of both internal and external nature.

The first problem that arises in calculating discount rates is the problem of recycling [4, p.62]. It is relevant in determining the market value of equity of the enterprise, for which the discount rate is necessary. This problem, however, does not occur while using the methods of estimation of efficiency of investment projects. There the capital structure is taken as the target while taking into account the capital management policy of the enterprise.

The next element to address is the cost of equity capital, determined by the different models and often requiring data about the market value of shares of the company. It too affects the discounting rate if taking the WACC, yet sometimes is difficult to be applied by domestic firms. One of the most common application models to assess the cost of equity capital is the capital assets pricing model (CAPM), based on the risk-free rate. Its level deserves a special attention in the modern conditions of functioning of the domestic economy. Domestically, the risk-free rate is assumed at the level of the government bonds return, rates of refinancing of the National Bank of Ukraine or the high rates for deposits in most peer banks.

The level and dynamics of the so-called "risk-free" references is listed in the Table 2, 3.

Table 2

The dynamics of the NBU discount rate 2009-2016, % *

25.09.15-	28.08.15-25.09.15	04.03.15-27.08.15	06.02.15-03.03.15	13.11.14-05.02.15	17.07.14-12.11.14	14.04.14-16.07.14	13.08.13-14.04.14	10.06.13-12.08.13	23.03.12-09.06.13	10.08.10-22.03.12	08.07.10-09.08.10	08.06.10-07.07.10	12.08.09-07.06.10
22	27	30	19,5	14	12,5	9,5	6,5	7	7,5	7,75	8,5	9,5	10,25

* compiled according to [5].

Table 3

The average weighted yield of government bonds denominated in UAH (primary market), % *

January 2016	2015	2014	2013	2012	2011	2010
6.25	13.07	13.44	13.13	12.94	9.17	12.48

* compiled by nbuv.gov.ua

The average weighted yield medium-term government bonds, denominated in UAH on the secondary stock market in January-February 2016, fluctuated between 6.73 and 22.08%.

As for the sovereign credit ratings of the country note that starting from 2014 the sovereign ratings of Ukraine and its debt obligations significantly deteriorated.

The *Standard & Poor's* rating agency downgraded the rating of our country in foreign currency from "CCC+/C" to "B–/B" at the beginning of 2014; in December 2014 the long-term rating of Ukraine in foreign currency liabilities worsened from "CCC" to the "CCC-" , giving the rating a negative forecast. In April 2015, the same agency downgraded the long-term sovereign credit rating of our country in foreign currency from "CCC-" to "CC", although as of March 2016 the rating stays at the level B- stable [6].

The *Moody's Investors Service* rating agency worsened Ukraine's Eurobonds rating from C*aa1* to *Caa2*, with a negative forecast in January 2014. It also lowered the rating of our country to *Caa3*, where it currently remains [7].

The *Fitch* rating agency reduced the long-term rating of our country in foreign currency from "CCC" to "CC" in in February 2015. Currently, the rating is at level CCC stable [8].

Even taking into consideration some improvement of the level of sovereign ratings in all districts, the obvious inclusion is that Ukraine belongs to the group of countries with a high level of credit risk, which is a clear signal to investors on the risk damage, considering the range of adverse factors, both of internal and external nature [9].

As rating agencies note in their comments and publications, low sovereign rating of the country negatively influences the activities of other issuers. Distribution of the negative impact of declining sovereign rating takes place through various channels: the decline of economic activity, increasing the risks of liquidity and financial expenditures through reducing the confidence of investors and the availability of loans and capital outflow, which, in turn, can lead to a banking or currency crises. These cause government austerity measures that will reduce or delay government payments and can put pressure on the overall level of economic activity. Also, adverse changes or restrictions in currency exchange rates, interest rates and the level of prices, government intervention, changes in regulatory procedures, tax policy, increasing the risks of political and social instability, may apply [10].

That is, given the high level of profitability and significant volatility of these "risk-free" tools, financial crisis, extremely low sovereign ratings of Ukraine, these approaches of risk-free rates are not applicable. Therefore, one should listen to the opinions of the competent experts who offer to apply the so-called global risk-free rate on the level of 3-4% denominated in US dollars.

When you consider all of the above and apply in an adequate way to modified the model to determine the components of bid discounting, its level will make up almost 35% in USD and 65% in UAH [4], [9]. Therefore, it becomes clear that the investment projects of real sector of economy to implement would be impractical, but then the question arises, whether businesses refuse from investment projects, not having even hope to save the capital from inflation and the chance for further development of the enterprises, or still assess investment projects without taking into account the concept of the value of money in time or with the use of dynamic methods, taking the discount rate on the level of available investment alternatives (average rate for deposits or average level of return for the project). Relying on the reasoning of scientists and pragmatism of business, we express the opinion in favor of the latter option and making positive decisions about investing if you receive satisfactory indicators net new value of the project, the internal rules of profitability and payback within the project life cycle.

Consider the dynamics and structure of capital investments in the period from 2010 to 2011 to January 2016 r. (tabl. 4). the modern condition of the market of capital investment, unfortunately, is characterized as stagnating and weak, even though the hope for revival appeared with the beginning of 2016.

Table 4

Capital investments by types of assets for 2010-2016, million UAH *

Indicator	2010	2011	2012	2013	2014	01.01.2016
only	180575.5	241286	273256	249873	219420	251154.3
investments in tangible assets	173662.8	231910	264854	239394	212035	233593.9
The share in total,%	96.17%	96.11%	96.93%	95.81%	96.63%	93.01%
Residential building	25753.7	26582.3	34256	36128.9	33177	43497.1
in% to the investment in tangible assets	14.83%	11.46%	12.93%	15.09%	15.65%	18.62%
non-residential buildings	37156.6	49113.5	54772.7	45252.3	40859.7	37252.7
in% to the investment in tangible assets	21.40%	21.18%	20.68%	18.90%	19.27%	15.95%
civil engineering constructions	39062.6	57935.2	61380.3	51844.2	46599.3	49015.7
in% to the investment in tangible assets	22.49%	24.98%	23.18%	21.66%	21.98%	20.98%
Machines, equipment and accessories	54059.2	71771.4	77015.4	79032.9	68948.8	77340.9
in% to the investment in tangible assets	31.13%	30.95%	29.08%	33.01%	32.52%	33.11%
Miscellaneous	11.34%					
investments in intangible assets	6912.7	9375.8	8402.3	10479.8	7384.8	14782.4
The share in total,%	3.83%	3.89%	3.07%	4.19%	3.37%	6.99%

* http://www.ukrstat.gov.ua/ [11].

The structure of investment is not uniform, the largest amount of capital investment is concentrated in machines, equipment, engineering facilities and residential and non-residential buildings.

Consider the investment project for the acquisition of commercial real estate in the central part of Dnepropetrovsk value of UAH 15 million. The total area of the object of 1000 m2. The object lease is planned for 400 USD/m^2 a month. Calculation of key indicators on the investment project are included in the table. 5.

Table 5

Indicators of investment project

Indicator	0	1	2	3	4	5
Net cash flow	-15 000000	4800000	4800000	4800000	4800000	4800000
Discount multiplier	1.00	1.18	1.39	1.64	1.94	2.29
discounted net cash flow	-15 000000	4067797	3447285	2921428	2475787	2098124
accumulated discounted cash flow	-15 000000	-10932203	-7484918	-4563490	-2087703	10420.9
NPV, thsd. UAH	10420.9					
DPP, years	4 years 11 months.					
IRR, %	18					

Thus, the calculation of the dynamic performance of the project shows its usefulness: internal rate of return is equal to 18%, the net present value of the project is more than 0, the project pays off in term of the life of the project, up to 5 years (4 years and 11 months). Note that the estimated effectiveness of the project will increase in case, if the investor plans after 5 years of use to sell this item in calculating the rise of the commercial real estate market.

In conclusion, the use of methods of estimation of investment projects is a pressing issue. Using dynamic methods is more appropriate than the static, but should take into account the existence of certain assumptions about their application, which somewhat reduce the practical value (meaning) of these methods in the classic version of the application. Special attention deserves the ways to determine the discount rate in conditions of unstable economy, namely the definition of risk free rates and the cost of equity capital. Results of the study showed the impossibility of transferring the practice of developed countries to the Ukrainian reality and determine the discount rate in acceptable to countries with stable economies. Because it is proposed to apply dynamic evaluation methods for investment projects, discounting cash flow at the average rate on the deposits or the average rate of return for the other projects of the enterprise or its rivals, at least until the economy stabilize.

Note the option to use dynamic methods of an estimation of investment projects that are based on the procedures of compounding and take into account the different rates of increase for incoming and outgoing cash flows.

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В статье уделено внимание прагматическим аспектам применения различных методов оценки инвестиционных проектов с учетом реалий украинской экономики. от применяемых методов оценки инвестиционных проектов зависит степень обоснования принимаемых инвестиционных решений и, в конечном счете, финансовый результат деятельности предприятия. с принятием инвестиционных решений сталкиваются многие предприятия, местные и государственные органы власти, международные организации и институты. Рассмотрены характеристики статических и динамических методов оценки инвестиционных проектов. сосредоточено внимание на определении ставки дисконтирования денежных потоков проекта с использованием классических подходов и с учетом текущей ситуации в стране. обосновано применение динамических методов оценки инвестиционных проектов с использованием учетной ставки на уровне средней доходности доступных альтернатив вложения капитала, по крайней мере, для сохранения инвестиционного капитала и поддержания стоимости бизнеса.

Ключевые слова: инвестиционные проекты, статические и динамические методы оценки инвестиционных проектов, ставка дисконтирования, безрисковая ставка, стоимость собственного капитала, премия за риск страны.

The article highlights the pragmatic aspects of different methods of investment project appraisal taking into account the realities of the Ukrainian economy. The measure of justification of investment decisions taken depends on the applied methods for investment project appraisal and, ultimately, the financial results of the entity. Any companies, local and state authorities, international organizations and institutions faced investment decisions. The characteristics of static and dynamic methods of investment projects appraisal are considered. The attention is paid to the determining of the discount rate for the project cash flows for the classical approach and for the current situation in the country. The application of dynamic methods of investment project appraisal has been substantiated a discount rate equal to the average rate of return of available alternative investment at least to keep capital investment and save business value.

Key words: investment projects, static and dynamic methods of investment project appraisal, discount rate, risk-free rate, cost of equity, country risk premium.