CONFLICT BETWEEN NET PRESENT VALUE AND INTERNAL RATE OF RETURN METHODS

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Abstract: In the conditions of lack of financial resources, ie the fact that decision makers do not have capital in unlimited amount, some profitable projects cannot be realized. In other words, the limited capital brings about the obligation to choose between one or more projects that are profitable, that is, it imposes the problem of ranking projects. In some situations, discount methods for assessing the economic efficiency of investment projects evaluate projects in different ways and may rank the same projects in different ways. In such cases, conflicts of different methods may occur. This paper will analyze conflict between net present value and internal rate of return methods. The net present value of the project is the value of the net cash flow in the entire period of the project, which is reduced to the present value by discounting. The internal rate of return method is a modern dynamic method of assessing the profitability of investment projects that is very often applied.

Keywords: net present value, internal rate of return, cash flows.

INTRODUCTION

Project profitability is one of the most important criteria when evaluating projects. Profitability is defined as the economic principle of reproduction, which indicates the relationship between the funds that are engaged and the results of investments in a certain period of time. Therefore, profitability is an economic measure of how successful a business or investment will be. The evaluation uses investment criteria that measure the achievement of strategic goals (Sikimic & Kalicanin, 2019, p. 410). It is also characteristic of the investment criteria to determine the method by which the profitability of the project will be assessed. These methods can be static and dynamic. Dynamic criteria are more important in assessing the profitability of the project, while static are only complementary. Dynamic project evaluation methods include the following:

- net present value method of the project,
- internal rate of return,
- profitability index and
- discounted acceptance period.

1. NET PRESENT VALUE

The net present value of the project is the value of the net cash flow in the entire period of the project, which is reduced to the present value by discounting (Stojanovski, 2009, p. 38). It can be determined:

by discounting cash inflows and outflows, ie the value of net cash flow for each year of the project and determining their difference:

$$NPV = \sum B(t)/(1+d)t - \sum C(t)/(1+d)t$$

Determining the difference between cash inflows and cash, ie determining the net cash flow for each year, and then discounting it in order to obtain the net present value of the project:

$$NPV = \sum [B(t) - C(t)]/(1+d)t$$

In the above formulas, the meaning of the symbol is as follows:

NPV - Net present value

B (t) - Cash inflow in year t (benefit)

C (t) - Cash outflow in year t (cost)

t - year from the project life

d - discount rate (Kerkez, 2018, p. 70).

In order for a project to be determined as eligible at a given discount rate, it is necessary that the discounted cash inflows exceed the sum of the discounted cash outflows, so that the net present value is greater than zero. When using the net present value method, the following criteria are used for decision making:

- net present value> 0, the project is determined as profitable, and is accepted,
- net present value <0, the project is determined as unprofitable and unacceptable and will be rejected,
- net present value = 0, the project has a marginal significance (Đuričin, 2003, p. 317).

When the value of the net present value is less than zero, it means that the present value of income is less than the present value of costs for the selected discount rate. Thus, the present value of the income is not sufficient to cover the initial investment. In such situations, investors choose to invest in a project that is better (Kerkez, 2018, p. 71).

The accuracy of future cash flow projections and the application of the discount rate affect the net present value. If a discount rate that is higher than the real one is chosen, the size of the net present value criterion will be smaller than the size that can be realistically expected and vice versa. In both cases, the assessment of the investment will be inaccurate and inaccurate, which ultimately leads to wrong decisions. The average cost of capital is most often used as a discount rate and it depends on the structure of the source of financing and the price of each individual source in the structure of financing (Damnjanović, Šegrt, & Todorović, 2017).

If the net present value is used as a criterion when deciding on the investment, then all independent projects whose net present value is greater than or equal to 0 are accepted, when discounting is done using the discount rate as an opportunity cost of capital. (Đuričin, 2003, p. 317).

It is true that independent projects are not mutually conditioned. This means that the realization of one project does not mean the exclusion of the realization of another project. However, the net present value criterion cannot be used when ranking projects. Net present value is an absolute, not a relative measure. In case both projects have a net present value higher than zero and in case there are sufficient funds for their financing, the difference in net present value is not decisive. In such situations, it is recommended that both projects be accepted (Kerkez, 2018, p. 71).

The problem arises in situations where funding is limited or in deficit. The net present value criterion does not sufficiently show the impact of the period of exploitation of investments, does not take into account the total amount of required investment funds, there are difficulties in real choice of discount rate which has a great impact on the accuracy of choice, especially when choosing between several alternatives. Given the above, we can conclude that the criterion of net present value has certain advantages and disadvantages (Vukadinović & Jovičić, 2012, p. 110).

Table 1. The advantages and disadvantages of the net present value

Advantages	Disadvantages
time value is taken into consideration	the problem of choosing a real discount rate
the entire lifespan of the investment will be observed	it does not sufficiently show the impact of the period of exploitation of the investment
It enables good results in case a sufficient amount of financial resources is available for investment	it is not the most suitable for application when choosing between several investment alternatives
It allows the possibility of correction and introduction of restrictions which increases the accuracy of the choice	It does not take sufficient account of the amount of funds required for investment

(Source: (Vukadinović & Jovičić, 2012))

2. INTERNAL RATE OF RETURN

The internal rate of return method is a modern dynamic method of assessing the profitability of investment projects that is very often applied. This method is based on cash flows while respecting the time value of money and is also referred to as the rate of return rate and the profit method. The internal rate of return method is derived from the net present value method and is used in large investment projects, with the aim of avoiding problems regarding the prediction of the real discount rate (Kremenović, 2018, p. 360).

The internal rate of return method is defined as the discount rate that equates the present value of the net cash flow from the operation of the project with the present value of the capital investment, ie reduces the net present value of the project to zero (Ivanišević, 2009, p. 183).

In order to notice which discount rate during the realization of the investment project does not bring any gains or losses, ie at which the lowest discount rate is justified the realization of the investment project, the method of internal rate of return is used. The starting point here is the dependence of the present value of the investment and the interest rate as a discount factor (Kremenović, 2018, str. 360).

Internal rate of return is the rate that reduces the present value of cash flow to zero. This rate, in addition to the return on investment, shows the highest interest rate on loans that the project can accept without making a loss (Stojanovski, 2009, str. 38).

The internal rate of return is calculated by a formula:

$$NPV = \sum [B(t) - C(t)]/(1+r)t = 0$$

In the above formulas, the meaning of the symbol is as follows:

NPV - Net present value

B (t) - Cash inflow in year t (benefit)

C (t) - Cash outflow in year t (cost)

t - year from the project life

r - discount rate (Kerkez, 2018, p. 72).

The internal rate of return is calculated by trial and error by assuming a discount rate and calculating the net present value of the project. In case a positive value is obtained, the procedure is continued by gradually increasing the discount rate and again calculating the net present value until the moment when its negative value is obtained. net present value means that the required internal rate of return is limited at the top and bottom by these two rates. According to the criterion of the internal rate of return, a project is considered acceptable if the internal rate of return is equal to or higher than the interest rate on long-term loans. (Stojanovski, 2009, p. 38).

If we denote the percentage of financing costs with P, the application of the internal rate of return criterion is reduced to the following:

IRR> P, the project will be accepted;

IRR <P, the project will be rejected;

IRR = P, the project has a marginal significance (Đuričin, 2003, p. 318).

The realization of an investment project within the internal rate method is justified (economically) if this rate is higher than the minimum acceptable rate. The minimum acceptable rate is usually the interest rate that prevails on the capital market or the interest rate at which a loan can be obtained for the realization of the investment. If the internal rate of return is higher than the minimum acceptable rate, ie the minimum rate of the investment criterion, the investment is acceptable, and vice versa. If these two rates are equal, the investment project is of marginal importance. In cases of choice between mutually exclusive investment projects, an investment project with a higher internal rate of return is selected. If the inflow of money were one-time, the account would be simple. Because cash flows are generated over a long period of time, depending on the characteristics, the internal rate of return can be calculated using financial tables (one inflow or more equal inflows) or the trial and error method (for unequal cash flows). Mathematically, the internal rate of return is the root of the present value of cash flows (Kremenović, 2018, p. 363).

Table 2. The advantages and disadvantages of the internal rate of return

ADVANTAGES	DISADVANTAGES
It doesn't require a discount rate forecast	complicated calculation procedure
It represents a suitable criterion for evaluation of projects with a longer period of exploitation, uniform net cash flow and in case of limited investment funds	it does not take into account time preferences
It shows better characteristics in a situation when an investment project should be selected or rejected than in the case of choosing between several investment alternatives	difficulties in determining the minimum internal rate of return
It provides information on the maximum rate at which funds can be borrowed for the implementation of the proposed investment;	/

(Source: (Vukadinović & Jovičić, 2012))

3. CONFLICT BETWEEN NET PRESENT VALUE AND INTERNAL RATE OF RETURN METHODS

The most important difference between the net present value and the internal rate of return is in the applied update rate. The interneal rate of return method for the discount rate takes an interest rate that equates the present value of the effects with the present value of the investment, ie that reduces the net present value to zero. The net present value method, on the other hand, is discounted at the rate of the investment criterion, ie at the average cost of capital or the standard rate of return. For this reason, it can be concluded that by applying all discount methods, competing projects must be ranked in the same way. However, in some cases, these methods may rank the same investment projects differently (Meta, 2015). This is especially characteristic of projects characterized by:

- different dynamics of effects,
- different amount of investment and
- different length of economic life (Orsag, 2002).

In a situation when there are two or more investment proposals that are mutually exclusive, ie accepting one automatically means rejecting the other, the net present value method and the internal rate of return method can give results that are contradictory. In other words, the net present value may suggest accepting one proposal, while the internal rate of return may favor another proposal (Kumar, 2021).

The conflict between net present value and internal rate of return exists in a situation where the net present value method ranks projects differently from the internal rate of return method. Net present value and internal rate of return are most commonly used when analyzing investments and capital budgeting. Their similarity

is reflected in the fact that they include the time value of money. However, they differ according to the main approach. The net present value is the absolute measure, ie the measure of profit or loss that the project undertakes, and the internal rate of return is the relative measure, ie the rate of return that the project offers during its lifetime (NPV vs IRR, 2021).

To illustrate the above, we can assume that project X and project Y are mutually exclusive and cannot be undertaken at the same time and the results of their evaluation are giving a single answer in terms of accepting or rejecting one of them. Thus, project X is favored by the net present value method, while project Y is favored by the internal rate of return method. Such situations happen very often in practice and are mostly determined by the distribution of project cash flows over time, rather than by the amounts of initial investment, which can be equal (Mackevičius & Tomaševič, 2010).

The reason for conflicts when ranking projects can be the following problems:

- Significant difference in the amount of cash expenditure of the project proposals under consideration;
- Differences in cash flow patterns of project proposals and
- Difference in life expectancy or unequal life expectancy of project proposals (Kumar, 2021).

In case there is any of the above reasons, when choosing between mutually exclusive projects, the project that gives the largest positive net present value using the appropriate cost of capital should always be chosen. The reason for this is the company's effort to maximize shareholder profits, and the project with the largest net present value has the most favorable effect on share prices (Kumar, 2021).

To illustrate the above, we will give an example of a company whose cost of capital is 10%. This company considers project A and project B, which are mutually exclusive, and Figure 1 shows the cash flows:

Figure 1. Cash flows of company**(Source:** (Kumar, 2021))

Year	Project A ₹	Project B ₹
0	−50,000	−80,000
1	62,500	96,170

Suggest which project should be taken up using *(i)* Net Present Value Method , and *(ii)* the Internal Rate of Return Method.

Solution :

			(i) Calculations of Net Present Value (NPV)			
Year	P.V. Factor	Project A		Project B		
		Cash Flow (₹)	Present Value (₹)	Cash Flow (₹)	Present Value (₹)	
0	1	−50,000	−50,000	−80,000	−80,000	
1	.909	62500	56.812	96170	87.418	
Net Present Value (NPV)			+6812		+7418	

	(ii) Calculations of Internal Rate of Return (IRR)			
		Project A		Project B
P.V. Factor = $\dfrac{\text{Initial Outlay}}{\text{Annual Cash Flow}}$ IRR (Using P.V. Tables)		$\dfrac{50,000}{62,500} = .80$ 25%		$\dfrac{80,000}{96170} = .83$ 20%

The net present value method would favor investment in project B. This is because project B has a higher positive net present value. The internal rate of return method would favor project A because the internal rate of return is higher for this project. Thus, in this case there is a conflict between the net present value and the internal rate of return when ranking two project proposals that are mutually exclusive. In such circumstances, it is proposed to invest in project B because it gives a higher net present value, and in that way the company will be able to maximize the wealth of shareholders (Kumar, 2021).

CONCLUSION

Finally, it can be concluded that in practice it often happens that a certain company has to choose between two projects that are profitable and that are mutually exclusive. The limited capital brings about the obligation to choose between one or more projects that are profitable, that is, it imposes the problem of ranking projects. In some situations, discount methods for assessing the economic efficiency of investment projects evaluate projects in different ways and may rank the same projects in different ways. In such cases, conflicts of different methods may occur. The conflict between net present value and internal rate of return exists in a situation where the net present value method ranks projects differently from the internal rate of return method. In such circumstances, it is proposed to invest in project with higher net present value because in that way the company will be able to maximize the wealth of shareholders.

REFERENCES:

1. Damnjanovic, R., Segrt, S., & Todorovic, L. (2017). Finansijski menažment kao sredstvo za donosenje investicionih odluka. Tehnika - menadžment, 285-291.
2. 2. Đuricin, D. (2003). Upravljanje pomocu projekata. Beograd: Ekonomski fakultet.
3. Ivanisevic, M. (2009). Poslovne fi nansije. Beograd: Ekonomski fakultet.
4. Kerkez, S. (2018). Model optimalne strukture izvora finansiranja investicionih projekata. Banja Luka: Ekonomski fakultet.
5. Kremenovic, D. (2018). Izražavanje koristi investicionog projekta na gotovinskoj osnovi. Casopis za ekonomiju i tržisne komunikacije, 348-368.
6. Kumar, S. (2021, 11 19). NPV and IRR: Differences, Similarities and Conflicts-Capital Budgeting. Retrieved from https://www.yourarticlelibrary.com/accounting/capital-budgeting/npv-and-irr-differences-similarities-and-conflicts-capital-budgeting/67858
7. Mackevicius, J., & Tomasevic, V. (2010). Evaluation of investment projects in case of conflict between the internal rate of return and the net present value methods. Ekonomika, 116-130.
8. Meta, M. (2015). Konflikti u rangiranju konkurentnih investicionih projekata. Socioeconomica, 309-324.
9. NPV vs IRR. (2021, 11 19). Retrieved from https://xplaind.com/362789/npv-vs-irr
10. Orsag, S. (2002). Budžetiranje kapitala-procjena investicijskih projekata. Zagreb: Masmedija.
11. Sikimic, U., Kalicanin, M., & Kalicanin, Z. (2019). Nacin merenja koleteralne pozicije banke prilikom odobravanja plasmana. Ecologica: naucno-strucni i informativni casopis, god. 26, br. 95, str. 409-414.
12. Stojanovski, Đ. (2009). Ocjena rentabilnosti i rizicnosti projektnog ulaganja. Bankarstvo 5/6, 32-51.
13. Vukadinovic, P., & Jovicic, Z. (2012). Investicije. Beograd: Univerzitet Singidunum.