THE COMPLEMENTARITIES OF CRITERIA AND THE SELECTION OF INVESTMENT PROJECTS

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ABSTRACT

The investment policy has to be based on universally acknowledged and accepted project selection criterion. A decision regarding the pertinence of a particular investment or regarding the choice among several projects, can not be based on a single criterion of efficiency, but on a sum of complementary criterion that are considered representative.

Presenting these criteria shows that the discount rate, the net present value, the internal ratability and the rate of return, can lead to choosing one of several investment options. In the valuation of investment projects practice, the calculation of these indexes can often lead to discrepant results and thus making it more difficult to analyze and choose the more efficient project or project variation. The authors' goal in this paper is to summarize the results of the research conducted in order to limit the deficiencies that the above mentioned criteria present.

KEYWORDS: *investments, efficiency, optimization, indexes, project*

1. The methodological phases of investment economical efficiency valuation

The investment economical efficiency valuation is conducted as a continuous process during the preparation of investment decisions, aiming the assurance of the elaboration and implementation of maximum economic efficiency solutions. Furthermore, the preparation of investment projects implies a series decisions and it is conducted as a repetitive process, with possible recurring phases and moments, a process in which subsequent phases are related by inverted bonds. At each step, local decisions are being made regarding solutions to problems that the specialists in charge with the investment project are facing.

From a methodological point of view, the analysis of the investment economic efficiency includes:

- interpreting and assessment of the results obtained during the calculation of the settled indexes;
- analysis of the efficiency for each project variation (absolute efficiency) both qualitative and quantitative, keeping in mind the foreseen economic and social effects, the total costs, the funding options, the structure and quality of the products and services, the economic lifetime etc;
- analysis of the indexes for each project variation and comparing them in order to find the maximum efficiency variation;
- preparing the recommendations for the deciding responsible, regarding the most efficient variation that could be chosen in the given conditions;

- the investment decision will result from a consciously selection, based on scientific fundaments, of the most efficient project variation among a variety other acceptable variations[1].

2. The screening of investment projects

The preconditions, that an efficiency appraisal criterion has to meet, are the following: simple wording, to synthesize the goal, to be expressed as much as possible using mathematical functions, and in order to measure the economic efficiency, to be quantified by at least one index[2]. The screening of the investment projects (or the project variation) is realized through an index system that, generally, can be considered ordered and coherent. Still, in practice there are numerous the cases when the results of some of the indexes are conflicting, and thus complicating the selection of the optimum variation. Such situation is often generated by two of the most representative indexes of the system: the net present value (NPV) and the internal return rate (IRR). We will focus on these two indexes in the following paragraphs.

2.1 The net present value

This index synthesizes, in absolute value, the addition of economic advantage of an investment project, the gain of the investor for the project assigned capital, expressed either in the form of cash flow or net present value. This is where resides the importance of this index as compared to the other indexes used in the calculation and analysis of investment projects.

The index attains a comparison between the total discounted cash flow disengaged throughout the economic lifetime of a project, or variations of investment projects, (CF_{ta}) and the investment effort generated by the project, expressed in actual value (I_a). It is an integrated index for economic efficiency of investments, because the reference moment for its calculation is the one of the starting of procedures in the project.

For the projects in which the implementation period (d) is less than a year, and the exploitation of the fixtures, installations, and production capacities begins in the same year, the mathematical equation is the following:

$$NPV= -I_t+\sum_{h=1}^{d} CF_h(1+a)^{-h}$$

CF_h: the annual cash flow

NPV, through its purport, determines the economic value of a investment project and in the screening of the projects the goal is maximizing this value through the optimization of the investment decision, following the maximization of the NPV criterion. The projects or projects variations, in which the NPV is grater than 0, are considered acceptable and can be selected.

A net present value grater than 0 reflects the possibility that, through the economic activity that is being conducted after the implementation of the project, a value grated than the consumed capital will be generated. In the same time , a project in which NPV is grater than 0 produces excess cash flow, assuring the capability of reimbursing credits and

[1] Ionita, I. si colectiv – *Fundamentele investitiilor, teorie & Practica*, editura Macarie, Targoviste, 2003

[2] Ionita, I si colectiv – OP cit., 2003

interests in due time. In case NPV is equal to or less than 0, the project is unacceptable, his efficiency being inferior to the updating rate.

The dimension of the NPV is influenced in a decisive way by the level of the updating rate, thus forcing the specialists to be especially careful in the substantiation of its level. In the cases when an excessively large rate is being used in the calculation, the resulted NPV could be less than 0 and as a consequence, the project becomes ineffective and could get rejected. Such situation is presented in figure 1.

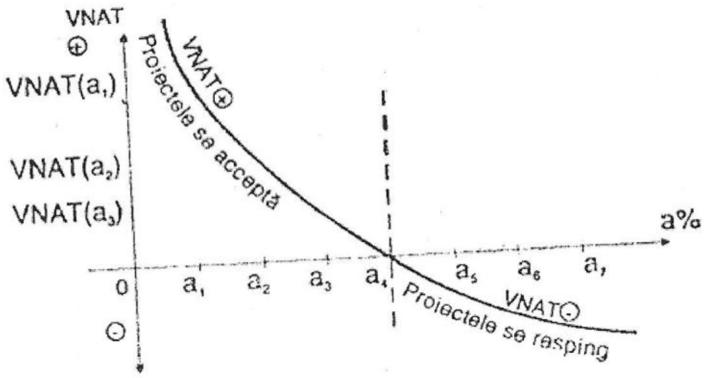


Figure 1

2.2. The internal rate of return

IRR expresses the discount rate that results in an actual net value of 0. This index can be calculated in two stances: financial and economical. As compared to the actual net value, the financial internal return rate (FIRR) has some limits, as a consequence to the fact that the annual capital flows are discounted at a rate that does not express the opportunity cost of the capital.

Assessment of project efficiency by IRR is the following:

- for a project in which the IRR is equal to the discounted rate, the NPV in this case is equal to 0 the investor is indifferent either invest in that project or if put the investment in financial instruments;
- for projects in which IRR is greater than the NPV discount rate and therefore will be greater than 0, the investment is efficient and the project can be accepted;
- for projects in which IRR is less than the discount rate, so NPV is negative, the investment is inefficient and will not be accepted.

The IRR calculation is done by solving a complex equation of degree n, which requires the use of an algorithm given by computer. In practice, the IRR can be determined and by repeated attempts until there is a discount rate that makes the NPV to be zero.

Besides measuring the profitability of an investment project, the IRR is used for setting the maximum interest rate on loans that finance the project. If the whole investment necessary for edification of the project would be borrowed at a rate equal to the IRR, the cash flow amounts accumulated would be void at the end of the period.

The World Bank, like most funding bodies, uses this index in economic and financial analysis of projects and the criterion of acceptance for a project is that the index should bemore than the opportunity cost of capital, the ranking of projects being made in the decreasing order of the IRR.

In mutually exclusive projects, comparing them only in terms of IRR can lead to choosing an inefficient choice. Therefore, to achieve an accurate ranking is required to add and use other indexes. The major companies use either the NPV or IRR index when assessing major projects. Most often, companies use IRR more than NPV despite the theoretical superiority of the latter. The most common usage seems to come from the fact that the IRR was applied before the NPV calculations. It is noteworthy however that the polls show, generally, a tendency to use NPV index.

3. Inconsistencies between the net present value and the internal return rate

Figure 1 shows the variation of current net worth of two projects depending on the discount rate, which is a function downward that crosses the rates axis at a point called the IRR. The curves of the two different projects were represented, one characterized by NPV1 and the IRR1 and the other by NPV2 and the IRR2. Let's recall that NPV1 and NPV2 are the net present values of two projects defined by the discount rate itself. If the comparison is made only after IRR critera the first project would be chosen, and if the selection criterion would have used NPV, the project of choice would be the second. The value "x" of the discount rate that is obtained at the intersection of two curves is the one that cancels the difference (NPV2-NPV1). The internal rentability rate replaces project 1 with project 2. NPV has the advantage of being an additive index, expressed in monetary units, which gives a relative suggestive character. Its value is based on the discount rate proposed by the investor according to concrete conditions in which to project.

IRR is not an additive index, but the notion that one represents (rate of return) is relatively familiar to the recipients of a rentability study. However, if this is a criterion that allows the decision to invest (or not invest) in a project (IRR> discount rate) its use in comparing several projects should remain limited.

Finally, the IRR of the two projects are by definition only fictitious discount rates for which the NPV's are canceled.

Since the internal rates of return are different the discount rates that they represent will be different, which is a basis for fluid reasoning, because the investor is the same.

In our assessment IRR should preserve mainly the role in the selection of external funding. Thus, for the example illustrated by the previous chart, the best contribution consists of:

- choice project in which NPV is highest (in the example NPV2);
- the check if IRR2 (inferior to IRR1) still remains above the maximum rate at which the loan may be contacted;
- the incidence of external financing is calculated with the rate of financial profitability of the project and with the overall NPV calculation (including external financing plan).

The NPV represented in Figure 1 does not take into account any loans. Finally there are rememberd only projects that must be first analyzed theoretically under their own profitability angle, with included external financing.

When firms choose investment projects they are using for analysis both the index NPV and the IRR. However, the two indicators provide a different view on the efficiency of the project, and this can lead to conflicting results. The NPV focuses on the value a project will add to the share capital of the company, assuming the material flows listed materializes, and the IRR indicates the date of return to investment in the project, in terms that the initial estimates materialize. Therefore, NPV allows the evaluator to focus on the value a project will bring to the capital of shareholders, and the IRR to focus on the rate of return brought by the project. When the two indicators prove contradictory, leading companies should try to maximize their capital and not the rate of return.

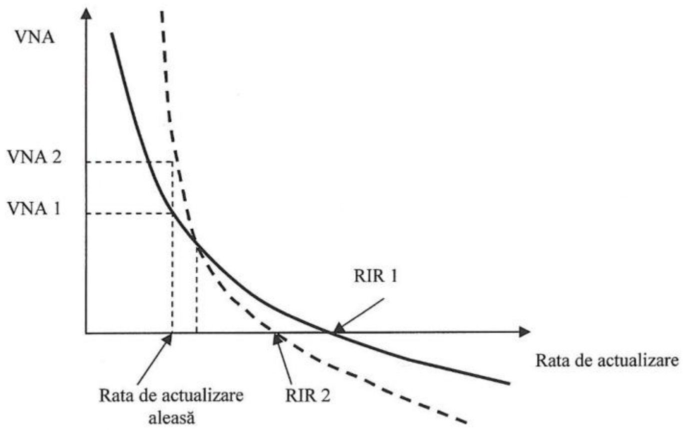


Figure 2

- For projects that are mutually exclusive

If the company has to choose between two mutually exclusive projects, the two indicators, NPV and IRR may give conflicting results. NPV may indicate that one is the best project, while the IRR may suggest that the other project should be accepted.

Example 1. To consider two projects, A and B, whose cash flows are presented in Table 1

Table 1
(thousands lei)

Year	Project A	Project B
0	-120.000	-120.000
1	100.000	10.000
2	50.000	60.000
3	10.000	110.000

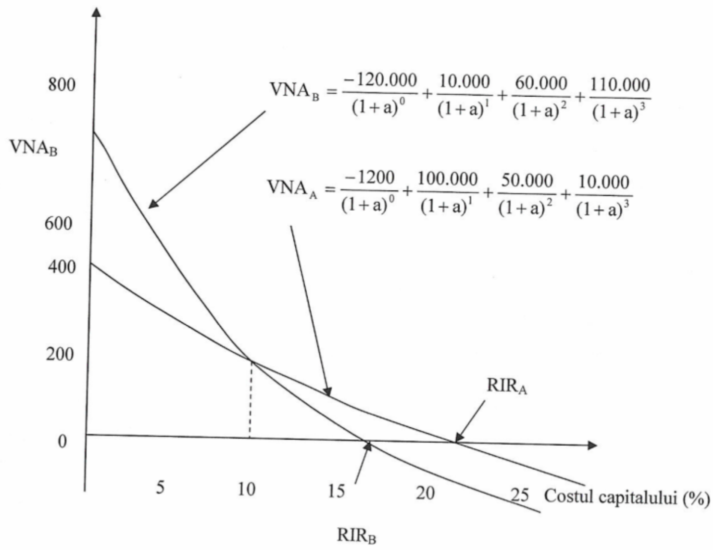
Their relative values at different discount rates are as follows (table no.2)

Table 2
(thousands lei)

Discount rate (%)	Project A	Project B
0%	40.000	60.000
5.0%	30.000	40.000
10.0%	20.000	20.000
15.0%	10.000	5.000
20.0%	5.000	-8.500
25%	-2.500	-17.005
35%	-10.000	-20.000

The graphic representation of the VNA profiles belonging to the two projects are described in pic.1 We can see that RIR_A = 22%, iar RIR_B = 17%. Because important cash flow comes later for project B, when the update effects are stronger, this project's VNA is rapidly decreasing concurrent to updatings rate increase. Conflicting results show up as effect of differences in size or period. In these situations, the company's investment amounts will be different from one yer to another, depending on the selected project.

The focal point in resolving this conflict is: how profitable it is to dispose of the cash flows early and not later? Decision rules in case NPV and IRR indicators are based on different assumptions regarding the rate of reinvestment. The NPV indicator implicitly assumes that cash flows generated in a project will be reinvested at the cost of capital, while IRR assumes that the company will reinvest these amounts at a rate equal to IRR. These assumptions are inherent to the mathematical process used to update the two indicators. It is but obvious for a trial logic as the correct hypothesis is that the reinvestment rate will be equal to the rate of cost of capital. Leading further to the idea that the NPV is preferred, for firms that can borrow capital at a cost close to the current cost of capital. A study in the U.S. and Canada about the preferences of evaluators for the two indicators shows that despite the existing academic preferences in these countries for the NPV indicator, the business executive staff prefer the IRR and less the NPV. The explanation would be that managers find the most natural form of investment efficiency analysis the rates of return than as absolute values in dollars, as is expressed in NPV results. Starting from this preference of evaluators to express the efficiency as a percentage of a project, we proposed the solution consisting of a new method of assessment, percentage expressed, that eliminates the contradictions between the two indicators. We called Global this process the Overall Return Rate (ORR). The equation for calculating this indicator is:



Graphic 1

- Reinvestment-rate hypothesis.

VP costuri = VP valoare terminala

$$\text{VP costuri} = \frac{VT}{(1+RRG)^n}$$

Termenul din stanga ecuatiei este valoarea actualizata prezenta a cheltuielilor cu investitiile, atunci cand rata de actualizare folosita este egala cu costul capitalului, iar numaratorul termenului din dreapta este suma valorilor viitoare a intrarilor de numerar, presupunand ca aceste sume se reinvestesc la o rata egala cu rata costului capitalului. Numaratorul este denumit si valoare terminala (VT), iar rata de actualizare care face ca valoarea actualizata prezenta a costurilor sa fie egala cu valoare actualizata prezenta a valorii terminale, este definita ca fiind RRG. Superioritatea indicatorului propus de noi consta tocmai in aliminarea contradictiilor dintre VNA si RIR in forma actuala. Daca se evalueaza eficienta a doua proiecte egale ca marime atat VNA cat si RRG vor conduce la aceeasi decizie de selectare. Astfel, pentru doua proiecte A si B, Daca VNAA>VNAB, atunci si RRGA>RRGB si nu vor apare rezultate contradictorii. Aplicata la exemplul prezentat la paragraful trei, RRG = 6.5%, ceea ce reprezinta o evaluare corecta a proiectului.

The term on left of this equation is the present value of investment expenditure, when the discount rate used is equal to the cost of capital, and the numerator term on the right is the sum of future values of cash inflows, assuming that these amounts are reinvested at a rate equal to rate cost of capital. The numerator is also called terminal value (TV), and the discount rate that makes the present discounted value of costs to be equal to the present discounted value of terminal value, is defined as the ORR. The superiority of the proposed new indicator lies precisely in elimination of the contradictions between NPV and IRR. If assessing the effectiveness of two projects of equal size both NPV and ORR will lead to the same selection decision. Thus, for two projects A and B, if $NPV_A > NPV_B$ then $ORR_A > ORR_B$ and inconsistent results will not appear. Applied to the example given in paragraph three, ORR = 6.5%, which is a correct assessment of the project.

4. Conclusions

Improving the methodology of calculation and analysis of economic and financial efficiency of investment projects and aligning it with international requirements of financing bodies, should be a permanent concern of specialists. Economic recovery after the current crisis will be achieved in particular by the programs and investments. The input of foreign private investment and the attraction of European funds, are factors that require a methodology accepted throughout Europe, through which a demonstration of their effectiveness would be possible.

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