LIMITS ON THE EVALUATION METHODS OF INVESTMENT PROJECTS

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Abstract: *To help companies that confronts the dilemma of selecting investment drafts, economic theory has developed criteria based mainly on quantitative elements in the analysis and selection of projects. In circumstances of risk and uncertainty, the typical decision problem regarding investment is sufficiently complex, allowing a number of possible outcomes for each strategy, results that are often dependent on conditions beyond the control of the decision maker. The purpose of this article is to discuss the most common methods of selecting investment projects, focusing on methodological limitations of their use, suggesting that no technical investment analysis can replace the contractor's intuition, compelled to act in a difficult environment by definition*

Key words*: investments valuation; indicators of investment; entrepreneurship.*

INTRODUCTION

Most criteria used for the selection of the investment projects are based on a rationality that seeks only objectives such as profitability and recovery of the initial investment. However, in an uncertain environment, external constraints influence the decision to invest and sometimes forces agents to focus on other strategic and survival concerns of the companies to the detriment of the unique optimization of the profit and of the recovery over time of the financial resources committed.

Given the need to provide a rational allocation of limited capitals, the current methods used for the selection of investments are resumed to the use of certain criteria such as the net present value *(NPV)*, the internal rate of return, the recovery time and profitability accounting ratios. Regardless of the method adopted, the selection of the project implies investigation of all alternatives, because the experience proves that it is wise to decide by comparing.

MATERIALS AND METHODS

Using these established methods of economic literature raises the question whether they are sufficient in the complex process of evaluation of investments.

This paper aims to present, for the proposed criteria in most textbooks of financial engineering, the restrictive assumptions necessary for their use in enterprise practice, and also to draw attention to the need to assess by economic calculation of all the individuals factors, for an efficient allocation of resources under conditions of risk or uncertainty.

RESULTS AND DISCUTIONS

1. Net present value

The basic idea from which the investment decision-making starts is that companies always try to purchase assets able to produce more than they cost. This is equivalent to saying that the company should only invest in assets with a *positive net present value*, the present net value of an asset (investment project *I*) being given by the difference between the present project value *(PV)* and the cost of this investment project:

$$NPV = PV - C^{l} \quad (1)$$

where:
NPV = the net present value expected from the realization of the project;
PV = the present value of project;
C= the investment cost in project.

The discount equals to bringing in the present the future cash flow spread over the investment project completion period. [2]

$$PV = \sum_{t=1}^{n} \frac{CF_t}{(1+i)^t} \quad (2)$$

where:
CF_t = the value of the net cash flows brought by the realization of project *in period t*;
i= the discount rate used for the calculation of the present value in period 1,*n*;
[1,n] = the time horizon of the completion of project .

Between two investment projects, the one whose net present value is higher will be selected. The selection of the best investment alternative, however, implies obstacles when the selection focuses on cash flows that correspond to different periods. This is the result of comparing the NPV of investment projects whose operation would take place at distinctive moments, either because the lifespan of one of the analysed projects is higher, or due to the availability level of certain limited resources. Strictly speaking, discounting cash flows is questionable due to the dilemma of choosing the discount rate.

It seems logical to choose the interest rate of the money market as discount rate, because this is equivalent to lending money in this market. Capitals C can be reinvested on the money market at the interest rate of the money market at any time, in order to obtain cash flows (CF). In other words, the alternative to industrial investments would be to invest the amount spent on the project in the money market, because it is necessary to use limited resources efficiently.

This is an estimate of the discount rate as an opportunity cost of the invested capital, so this opportunity cost is the cost of financing the investment from equity capitals and will be assessed as a rate of return required by investors for this project. [4]

In a certain economic environment, the investment is risk-free and the rate of return required by equity investors is the risk-free interest rate. This is the nominal interest rate that also integrates an inflation rate. It is assumed that the interest rate and the future cash flows of the investment projects are known in advance and accurately. The possible variations of the interest rate and the non-profitable activity and insolvency risk are not taken into account. It is also assumed that the operation is conducted on an efficient financial market without transaction costs, and that the interest rate on bank investment is equal to that of the loans granted. The investment decision is independent from the financing decision because all the sources of capital are offered at the equilibrium price between demand and supply, homogenously anticipated.

But these assumptions (efficient market, information symmetry, risk neutrality, constant inflation rate, etc.) are clearly restrictive. It is true that the discounting method, which gives the current value of the future results, is used in practice outside these restrictive conditions, in order to obtain a first indication about alternatives based on expected earnings. All the projects that will have a positive NPV are preferable to cash investments at a market interest.

It should be noted that if the decision-maker continues with the pure profit maximization objective, he loses sight if the fact that the possibility of the liquidity risk

[1] If the initial capital investment is not fully supported in year 0, C will be represented by the sum of the present costs spread on the investment project completion

occurrence – translated by the variability of the future cash flows – is absent from the test that appears in a way as a measure of a secure future.

The incorporation of risk in to the company's investment decision can be made starting from the statistical observation of the cash flow variations which were previously recorded for similar investment projects, and then by extrapolating these variable cash flows and their occurrence frequencies. In the case of an innovative investment project, the estimated variability of the cash flows and their occurrence probabilities can be simulated. [1]. The hope to obtain a certain cash flow is determined as weighted cash flow average with the occurrence probability of each of them in the future. Since the cash flow with the highest occurrence probability is the average itself, the numerator in formula (2) will be changed by $E(CF_t)$:

$$E(CF_t)=\sum_{i=1}^{m} CF_{it} * p_{it} \tag{3}$$

where p_{it} represents the occurrence probabilities related to cash flows i in year t
Under these circumstances, the net present value will become the expected net present value:

$$E(NPV)= \sum_{t=1}^{n} \frac{E(CF_t)}{(1+k)^t} - C \tag{4}$$

where discount rate k is the standardized rate of return required by the investors which will have to remunerate the risk undertaken by the investors in accepting investment projects and which replaces the risk-free interest rate used to update the value of the investments in a secure environment.

The optimization of an investment decision will be attempted by choosing options through which the expected NPV is maximized.

The selection of the discount rate is also difficult if we take into account the decision-maker's subjectivism, depending on his propensity for risk. A risk-averse investor will require a high risk premium, nevertheless, the use of a high discount rate makes sense only when facing exorbitant risks, which would lead to the significant depreciation of the future. Otherwise, the present value, calculated at a rate of this level, tends to be limited to an incomplete role for the decision-making, without taking into account real, non-determined risks, in relation to its interpretation.

NPV depends on the discount rate used. A project can have a positive NPV for a low discount rate, and a negative NPV for a higher discount rate. In order to eliminate this disadvantage, the NPV criterion is used together with the IRR indicator.

2. The internal rate of return (IRR) is the discount rate which brings the net present value of the income and expense flows of an investment to zero. It is expressed in percentages, being the indicator of the relative efficiency of the investment, and the basic condition for a project to be desirable is an IRR higher than the discount rate.
The internal rate of return of the project is import ant when the income flows are negative in the first years (due to incurring investment expenses over several years) and subsequently, positive.

The IRR criterion will also be used if it is necessary to compare certain incompatible options (which cannot be accomplished at the same time) from the NPV perspective, and the winning project will be the one with the highest IRR.

However, in some cases, the IRR indicator cannot be calculated (project with negative flows only, e.g. an investment project for a national road, where financial flows are all negative) or when a project has multiple IRR (projects where incomes are reinvested, such as a project for an ecological waste landfill, for which the analysis horizon

is given by the filling capacity – e.g. 30 years – but investments are required every 5 years I n order to close a cell and build a new one).

Assuming that the sole purpose of the decision-maker is to maximize profit, it is not sufficient to have an IRR higher than the discount rate so that a project can be accepted, IRR should also exceed a threshold limit, namely the economic rate of return of the company which is equivalent to the weighted average cost of capital.

3. The payback time criterion

According to this method (payback), the investment alternatives will be selected depending on the rapidity of the recovery of the invested capital. [1] This time required to recover the amount allocated for the investments expresses the number of years of recovery through average annual cash flows discounted calculated according to the formula:

$$Tr = \frac{C}{CF^{act/an}} \quad (5)$$

where:

Tr = the required time;

C = the investment cost in project;

$CF^{act/an}$ = the average annual discounted cash flows.

The project selected from the alternative investment projects will be the one whose payback time is minimum and, at the same time, shorter than the investment lifespan. In this case, the main objective is not to maximize profit, and the decision is guided b the minimization of the liquidity risk implied by the new project.

Such a criterion has the advantage of simplicity when the benefits are known, at least for the period of time necessary to recover the initial investment. In this respect, it may be appropriate in companies with repeated investment opportunities whose payback time is short (2-3 years) but which are limited by the funding means.

This is also appropriate for a first assessment of investments in fields where the technological progress is rapid and the high technological obsolescence, or when the external aspects can change the company's operating conditions in the near future.

We can ask ourselves whether the rapidity of the recovery of the initial costs reflect the quality of a project? On the one hand, this criterion provides a significant share of rapid gains – which should not be the only preoccupation for investments – and on the other hand, it ignores what happens beyond the minimum capital payback time. Consequently, the payback time method has a major inconvenience major, due to the fact that it eliminates from the selection the investments projects with a good rate of return, in the long term, which could be essential for the prosperity of the company.

4. Accounting rates of return

Investment projects can also be assessed (evaluated), starting from the projected income and expense account of the new investments and then comparing the ratios between the future gains and the total operating costs incurred .

The preparation of a project, especially when it comes to the creation of a production facility, often leads to the assessment of the investment expenses and to the creation of prospective (provisional) accounts. If it is possible to determine the impairment corresponding to the value loss by physical wear and tear or obsolescence of the fixed assets, and also to determine the profits and taxes, various rates of return will be calculated by dividing annual expressions of the earnings before or after depreciation and taxes, to the invested capital: (Profit before or after depreciation / Investments) * 100; (Profit after depreciation and taxes / Investments) *100. [4]

If there are no credible annual average forecasts, these indicators might lead to the rapid elimination of interesting options before analysing such options more thoroughly.

Moreover, regardless of the form used for these indicators, they do not provide the basis of an extended comparison of the investment options. In fact, they only make sense for the first years of operation, assuming that uncertainty does not affect a short horizon. On the other hand, making a favourable decision concerning an investment project based on such indicators is a recognition of the fact that the results of the financial years taken into account will be maintained, at least in the years required to recover the invested capital.

Analysing the assessment criteria discussed hereinabove, the consequences of an investment project seem to be limited to the future income flows assumed as available in the future.

In reality, the problem is much more complicated, given that few aspects remain certain in the long term. The results of a major investment, for example, are impossible to predict with certainty when we take into account the dynamic interaction between several unknown values such as the general economic situation, the national/international competition, consumers' tastes, the political climate in different countries, and technological progress.

Although it is true that the use of these indicators is easy, they remain precarious insofar as a distorted assumption is used about the expected return.

Due to the fact that performance depends on the economic conditions as well as on many other environmental factors, eventually, these criteria should be supplemented by adequate quality-related considerations.

Indeed, agents' decisions can be dictated by long-term strategic reasons rather than on the usual profitability concerns: for example, a company intends to reach a certain market share, by a simple satisfactory profile, and the achievement of this objective could imply the development of new products, or the establishment in a country with a potentially higher demand than the forecast short-term one, in order to avoid, among others, the establishment of the competition.

Moreover, investment decisions will be dependent on considerations concerning the general environment: the level of cooperation with the public authorities, the technological capabilities, the easiness of recruiting staff, proximity to target customers, the supply of raw material, etc. The assessment of the corporative behaviour in this environment could also highlight the importance of certain restrictive factors.

The selection of the investments of a company can eventually appear extremely restrictive insofar as, for a certain project, each scenario requires several parameters such as: export opportunities, competition reaction alternatives, the cost of purchasing the means of production , and fiscal policy measures, etc.

Despite the existence of a set of decision-making models and methods under uncertainty conditions, the possibilities of insurance against uncertainty or of incorporating uncertainty in the decisional problems are low. This is the reason why, more often than not, decision-makers combine various methods of operation with uncertainty, by joining methods such as: insurance, flexible investments, diversification of the company interests, acquiring additional information, changing purposes, resorting to the authorities for orientation and control of the environment.

CONCLUSIONS

The analysis of the company's investment decision is traditionally discussed in relation to financial concepts, especially through concepts such as the net present value, the internal rate of return, or the invested capital payback time. However, limiting the investment decision to a mere discount calculation - in which the calculation of the

discount rate occupies the central place – and/or to comparing immediate payments to future earnings may seem a too simplistic approach applied to an undoubtedly more complex reality.

Indeed, the ever increasing instability and competitiveness of the business environment change the forecast evolution of the activity and profitability, and the high level of inertia of a productive investment project is a major characteristic that can hardly be ignored.

The evolution of the literature dedicated to investment theory has mainly focused the restrictive impact that could be exercised by the irreversibility and un certainty phenomena. However, if the influence of these effects is now well admitted at a strictly microeconomic level, its formalization in econometric models has faced, until now, practical difficulties in measuring uncertainty, on the one hand, and a strong heterogeneity of individual behaviours, on the other hand.

In short, the uncertainty about the future and the fragility of certain assessment methods leads to the conclusion that it is easier to choose an option whose main constraints, identified in a global framework for the analysis of the costs and benefits, can be relatively measures. Despite these precautions, the final decision will be a bet more or less risky, because the past is certain, but the decision-maker works with the future.

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