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FINANCIAL APPRAISAL OF THE INNOVATION PROJECTS

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Abstract:

The main objective of the financial appraisal of an innovation project is to measure the rentability of those projects. The financial appraisal of an innovation project is similary to investment projects at short level. But on the other side, it has certain features due to its main characteristic activities.

Keywords: appraisal, innovation projects, indexes, efficiency

1. INTRODUCTION

The main task of the financial appraisal of innovation projects is to refine the information that implies the project's viability. The financial appraisal of innovation projects is a resource investment to reduce the uncertainty degree of the information referring to the project's feasibility.

The detailed financial appraisal of an innovation project is elaborated for finalize the project' form and to select the most successful variant of the project. Also, the financial appraisal of an innovation project is worked out every time it is necessary to substantiate the decision of continuing or stopping the evolution of an innovation project.

2. SPECIFIC FEATURES OF THE INNOVATION PROJECTS FINANCIAL APPRAISAL

The financial appraisal of an innovation project has some similitude to investment projects' financial appraisal. From the

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recouping period point of view, the research and development costs referring to an innovation project can be assimilated to the investments costs referring to an investment project. From this point of view, the R&D costs profitability has to satisfy the same financial requirements as the investment costs.

On the other hand, the financial appraisal of the innovation projects implies some difficulties due to the characteristics of the activities of an innovation project. The financial information detained at the decision time, referring to the beginning of an innovation project, has a higher degree of uncertainty comparing to a material investment project. In the selection stages, the quality of the information referring to the innovation project is much decreased. It settles the elimination of those variants of the project considered not to be winning and the retaining of those variants that are considered to have a very high potential of success. This implies that identifying the main areas of uncertainty and also, the influence' intensity of those areas upon the project profitability is very important (Şipoş, 2004).

An innovation project is generating profit after a long period of time and the size of the profit flow is difficult to estimate due to the uncertainty of the social-economic environment evolution. More, an underway innovation project can be stopped every moment based on supplementary information. If the innovation project is stopped in the beginning stages the financial loses are more reduced. In this way, the profitability appraisal of an innovation project in the short run inhibits every innovation initiative.

Also, the innovation projects that have a high level of newness are unique and it is difficult to settle a quantitative measure of the global efficiency of a previous project that could indicate the performance evolution of the new innovation project.

In order to estimate the future performance of an innovation project, the forecast of the social-economic environment evolution is very important regarding to the accumulated experience due to the previous projects. The uncertainty of the social-economic environment evolution determines the impossibility of a high level of accuracy quantize of the global financial performance of a project. But this doesn't mean that the financial appraisal is not important. Very often, the R&D managers substantiate the decisions referring to innovation projects based only on a rigorous financial appraisal of those projects.

This implies some actions that have to raise the forecasts precision, such as (Krajewski and Ritzman, 1998):

- The assignment of the necessary resources for estimations (human resources, material resources, financial resources), as well quantitatively as qualitatively;
- The effort for improving the estimation' accuracy has to be permanent. In this way, the successive decisions will be based on information characterized by a higher level of accuracy.
- The assessment of the previous projects results is very important. This may indicate the causes of the main errors and the estimations accuracy, in accordance with the degree of the newness of the project and the degree of technology's maturity.
- Reducing of the subjective influences of those who elaborate the forecasts upon the estimations is also important.

The main objective of the financial appraisal is to estimate the innovation projects' profitability. This means that the

financial appraisal of an innovation project is analyzing if the amount of incomes is sufficiently high to assure the recovering of the costs referring to the innovation project and to get a profit. This implies to draw up the forecast for the income and the forecast for costs referring to R&D activities, production activities and distribution activities. The incomes and all the costs referring to the innovation project will be cumulated, in accordance with their spacing in time, and will be analyzed from a global perspective. As part of the financial appraisal of innovation projects, the project sensibility analyze will appreciate the importance of the effective level of incomes and costs deviation from the estimated levels.

In order to join an efficient management of the financial resources with the best financing of the project, the assignment of financial resources needed for project elaboration is very important, but is not sufficient. Assuring the financial resources at the right time is also very important. This implies that at evaluating the investment effort needed for elaborating the project the spacing in time of the costs must be considered together with the global size of the investment costs. In the first stages of the project's elaboration, the estimation of the investment costs and the spacing in time of those costs are characterized by a high level of uncertainty.

The assignment of the financial resources at the right moment depends by the evolution of the cash flows released by all projects from the firm's projects portfolio. Generally, the availability of financial resources at the right moment is a critically success factor of a project. This determines the necessity of a high level of accuracy estimation of the evaluated project cash flows according to the cash flows released by all the other projects of the firm's. An accurate estimation of the evaluated project cash flows may be elaborated only after a detailed planning in time of all innovation project activities and estimating the costs implied by running these activities.

The project cash flows forecasting implies the following activities (Melnyk and Denzler, 1996):

-Identification of the financial elements of the innovation project;

-Forecasting the expected project's effects;

-Estimating the total amount of costs for creating a new product (total amount of investment costs of the project);

-Forecasting the launch date for the new product;

-Estimating the operation and maintenance costs for the new product;

-Estimating the operation and maintenance costs of some existing equipments that will be replaced by the new equipment obtained through the project (if the new product is an industrial equipment);

-Estimating the duration of the economic life of the new equipment;

-Estimating the remainder value of the new equipment at the and of it's economic life;

-Forecasting the probable financing costs after the period of evaluation;

-Spacing in time of all costs that compose the cash out-flows;

-Spacing in time of all elements of incomes that compose the cash in-flows;

-Estimating the net cash flow spaced in time, as the difference between the cash in-flows and the cash out-flows at different moments.

The moment of recouping the whole investment is given by the point in which the cash in-flow become equal to the cash out-

flow and the net cash flow is 0. The project cash flow estimation according to the firm's available resources will point out the following situations:

-If the whole amount of elaborating project costs is fitting in the assigned financial resources, the financial resources availability is not coercion for the project's running.

-If the whole amount of elaborating project costs exceeds the available assigned financial resources, the managers have to identify solutions for assuring the financial resources for financing the elaboration project costs. When the financial resources can not be assured completely, the project must be given up.

-The firm's cash flow evolution has to assure at the right time the resources for the evaluated project. It has to consider that the firm's cash flow may be temporary reduced due to some unforeseen situations and, by the other hand, the effective project costs may exceed the estimated project costs. In the same time, the managers have to find out solutions either for re-spacing in time the project elaborating activities, or for planning the project elaborating activities in a period of time when the situation of the firm's cash flows is favourable.

Figure 1 presents the time evolution of the cumulated investment effort referring to an innovation project and the moment of recouping the whole investment (Twiss, 1992). The point of intersection between the turnover curve and the operation costs curve represents the breakeven point that is pointing out the moment of recouping the operation costs. The point of intersection between the cash in-flows and the cash out flows represents the breakeven investment point that is pointing out the recouping the whole project investments. The period of time needed for reaching the breakeven investment point shows the investments recouping tern.

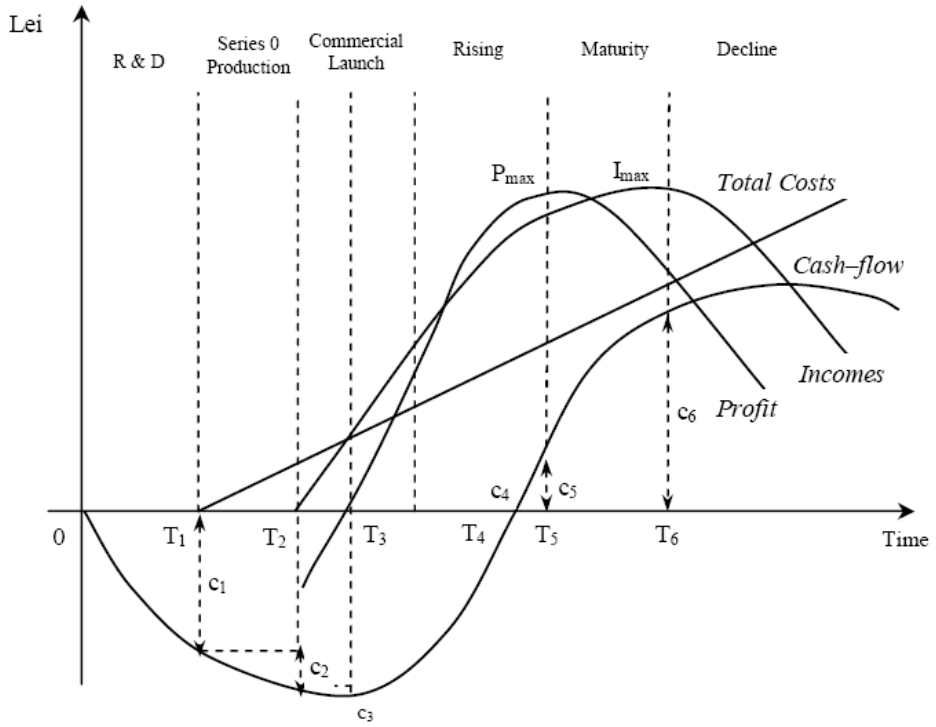

Figure 1. Time evolution of the cumulated investment effort referring to an innovation project

3. THE MAIN INNOVATION PROJECTS EFFICIENCY INDICATORS

The estimation of the innovation project cash flow is the base for determining the project efficiency indicators. These indicators are criteria for the financial appraisal of the innovation project (Negrilă, 2003).

From the innovation project's point of view the most used financial appraisal criteria are:

- Net Present Value;
- Internal Return Rate;
- Modified Internal Return Rate;
- Profitability Index;
- Total Present Income/Total Present Costs Ratio ;
- Investment Recouping Term;

Through its content, the indicator Net Present Value (NPV) underlines the economic advantage generated by an innovation project, comparing the estimated total discounted cash-flow given by the project during its life time with the total present investment effort implied by that project.

If the period of the project's elaboration is short (under one year), the net present value is given by:

$$NPV = -It + \sum_{t=1}^{T} CFt \frac{1}{(1+e)^t} \quad (1)$$

If the period of the project's elaboration is over one year, the net present value is given by:

$$NPV = - \sum_{t=1}^{T} It \frac{1}{(1+e)^t} + \sum_{t=1}^{T} CFt \frac{1}{(1+e)^t} \quad (2)$$

It is believed that in this indicator formula should be also introduced the residual value and the relation becomes:

$$NPV = - \sum_{t=1}^{T} It \frac{1}{(1+e)^t} + \sum_{t=1}^{T} CFt \frac{1}{(1+e)^t} + RV \frac{1}{(1+e)^T} \quad (3)$$

where:

It – the investment in the year t;

CFt – the cash-flow in the year t;

RV – residual value;

e – discount rate;

T – the term of the project's elaboration and exploitation.

If the net present value is positive that means that the return of the project is greater than the discount rate amount and can be obtained a larger cash-flow than the initial effort and that leads to choose the project. The discount rate's amount is the minimum value of the project's expected return and is seen like a "threshold value" which has to be outrun by the project for selecting.

A negative net present value indicates that the return of the project is under the discount rate amount and the investment effort cannot be recouped on the exploitation period and the project is rejected.

A project is more efficient if the discounted cash-flow amounts are much greater than initial investment effort. In the process of evaluating different variants of the same project will be selected the variant with the greater amount of the net present value.

Internal Return Rate (IRR) of an innovation project is that discount rate which makes that the cumulated discounted cash-flow (or net present income) to be null. The relation is:

$$\sum_{t=1}^{T} It\frac{1}{(1+e)^t} = \sum_{t=1}^{T} CFt\frac{1}{(1+e)^t} + \\ +RV\frac{1}{(1+e)^T} \quad (4)$$

That indicator is a percentage amount that synthesizes the value of a project, after the relation:

$$IRR = e_{min} + (e_{max} - e_{min}) * \frac{CF_{\min}}{CF_{\min} + |CF_{\max}|} \quad (5)$$

unde:

emin – the minimum discount rate for that the cumulated discounted cash-flow is positive and very close to zero;

emax – the maximum discount rate for that the cumulated discounted cash-flow is negative and very close to zero;

CFmin – the cash-flow discounted with emin;

CFmax – the cash-flow discounted with emax.

An innovation project is accepted only if the internal return rate generated by the project is greater than minimum expected return rate. This indicator allows to selects the profitable projects by the unprofitable ones and to descending sorts the profitable projects after their profitability. The utility of the internal return rate can be seen especially than the project's selection is made with constraints imposed by the allocated budget for the research and development activities.

The main limit of this evaluation criterion is that considers the hypothesis of continuous reinvestments of the future incomes at the same return rate's level. The using of the internal return rate is based on the idea that all the innovation projects initiated by an enterprise have the same return rate that is less probable.

The modified internal return rate is correcting some deficiencies of the internal return rate, considering that cash flows generated by the evaluated innovation project are invested at an efficiency rate equal to the capital cost. The relation of the modified internal return rate became:

$$log(1+MIRR) = \frac{\log \sum_{t=T+1}^{n} IT_t \cdot (1+e)^t - \log \sum_{t=1}^{n} CT_t \cdot (1+e)^t}{n} \quad (6)$$

where:

ITt reprezents the annual income obtained during the exploitation of the innovation project

CTt represents the total annual costs (investment costs and operation costs) referring to the innovation project.

An innovation project will be selected only if the modified internal return rate of the project is higher than the minimum expected return of the project.

The profitability index expresses the relative return of the investment referring to an innovation project during its whole economic life. The profitability index may also express the net present value that returns to a monetary unit of investment.

The relation for the profitability index is:

$$PI = \frac{\sum_{t=1}^{T} CFt * \frac{1}{(1+e)^t} + RV * \frac{1}{(1+e)^T}}{\sum_{t=1}^{T} It * \frac{1}{(1+e)^t}} \quad (7)$$

If the function's numerator is expressed in accordance with the net present value, the relation becomes:

$$PI = \frac{\sum_{t=1}^{T} NVt * \frac{1}{(1+e)^t}}{\sum_{t=1}^{T} It * \frac{1}{(1+e)^t}} \quad (8)$$

If the elaborating period of the innovation project is very short (some month) the relation is:

$$PI = \frac{\sum_{t=1}^{T} CFt * \frac{1}{(1+e)^t} + RV * \frac{1}{(1+e)^T}}{I} \quad (9)$$

Or:

$$PI = \frac{\sum_{t=1}^{T} CFt * \frac{1}{(1+e)^t} + RV * \frac{1}{(1+e)^T} - I + I}{I} =$$

$$= \frac{NPV + I}{I} = \frac{NPV}{I} + 1 \quad (10)$$

The innovation project is selected if PI > 1. If PI <1 the innovation project will be rejected. In the case of evaluating more variants of the same innovation project, the variant with the highest value of the profitability index will be selected.

The profitability index put advantage on incremental innovation projects that require a lower level of investments, despite the radical innovation projects that require a higher level of investments, but can have a higher net present value than the incremental innovation projects. Due to this limit, in the appraisal and selection process of the innovation projects the profitability index must be used only together with other indicators.

Total present income/Total present costs ratio is used in innovation project selection decisions, by evaluating the incomes that can be obtained in accordance with a given amount of costs (total investment costs and operation costs during the whole project economic life).

The relation is:

$$TPI/TPE = \frac{\sum_{t=1}^{T} ITt * \frac{1}{(1+e)^t} + RV * \frac{1}{(1+e)^T}}{\sum_{t=1}^{T} (It + Ot) * \frac{1}{(1+e)^t}} \quad (11)$$

The condition for an innovation project selection is that the total present income/total present costs ratio must be higher than 1. The innovation projects with a total present income/total present costs ratio under 1 will be rejected. In the case of evaluating more variants of the same innovation project, the variant with the highest value of the total present income/total present costs ratio will be selected.

In grounding the decision of innovation projects selection it has to consider that the value of the total present income/total present costs ratio depends on the discount rate used:

- the lower discount rate is, the higher the total present income/total present costs ratio will be;
- if the value of discount rate is increasing, the value of the total present income/total present costs ratio will decrease and can become under 1.

The decision of innovation projects selection must not be based only on the value of the total present income/total present costs ratio. This indicator must be used together with the other financial indicators of an innovation project.

The investment recouping term (IRT) is the period of time needed for the recouping the

initial investment effort based on the innovation project's net cash flow:

$$I_{RT} = \frac{\sum_{t=1}^{T} It * \frac{1}{(1+e)^t}}{DCF / year} ;$$

$$DCF/year = \frac{\sum_{t=1}^{T} CFt * \frac{1}{(1+e)^t} + RV * \frac{1}{(1+e)^T}}{T} \quad (12)$$

or:

$$I_{RT} = \frac{\log C\overline{F} - \log(C\overline{F} - I * e)}{\log(1+e)} \quad (13)$$

From the perspective of the non-recouping risk of the initial investment effort, a project with a short recouping term is considered to be less risky than another project with a longer recouping term. As much the investment's recouping term is smaller as the project's liquidity is greater and the non-recouping risk of the investment is reduced. This indicator assures the selection of the innovation projects based on the speed of the initial investment effort recoup and evaluates the non-recouping risks.

Using the investment recouping term as an evaluation criterion for the innovation projects implies to establish a "threshold value" for the recouping term and to compare the recouping term of the project's investment with the chosen threshold value. The selection of the innovation projects accepts the projects with an investment recouping term under the threshold value and rejects the projects with an investment recouping term over the threshold value. In the case of different variants evaluation for the same project, it will be selected the variant that assures the smallest investment recouping term.

Some limits of that indicator as an evaluation criterion for the innovation projects are the following:

- Encourages the manager's orientation to the short term advantages, which may determine the rejecting of long term projects even those projects assures higher returns on their life time;
- After some calculating methods of this indicator, is neglected the influence of the time factor to the effects and the efforts of the investment project.

Due to the presented limits, although it gives a clear image over the liquidity and risk degree for a project is recommended that in the evaluating of the innovation project's financial implications the recouping term to be used and analyzed only together with the net present value and the internal return rate.

4. CONCLUSION

The financial appraisal of an innovation project implies a series of specific issues determined by the characteristic activities of an innovation project but also have some similarities with the financial appraisal of the investment projects.

The evaluation of the innovation projects performances based only on financial appraisal indicators is a narrow approach. The financial appraisal of the innovation projects is a very useful tool for the manager's decisions referring to selecting and continuing a project. But only the efficiency indicators used by the financial appraisal are not sufficient to take an optimum decision. This is due to that many of these projects are influenced not only by quantitative factors but also by qualitative factors. Thus, it is necessary to include both quantitative and qualitative criteria and also the risk analysis in the appraisal procedures.

ФИНАНСИЈСКА ПРОЦЕНА ИНВЕСТИЦИОНИХ ПРОЈЕКАТА

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Абстракт:

Основни циљ финансијске процене иновационих пројеката је мерење њихове рентбилности. Финансијска процена иновационог пројекта је слична као код инвестиционих пројеката кратког века. Ипак, с друге стране, има одређене особености по својим карактеристичним активностима.

Кључне речи: процена, иновациони прокејти, индекси, ефикасност

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