# PREMISES FOR A MODEL OF DECISION – MAKING ON THE FINANCING OF A PROJECT

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*The classical theory of finance is based on the premises of rationality and maximizing profits that accompany economic decision-making. Complementarily, the modern theory of behavioral finance studies the effect of emotional and psychological factors of decision- maker on the choice of financing sources for economic activities. In opposition with the classical perspective, the contemporary theory of finance brings up to the stage various aspects of decision making, including elements of strategic behavior towards risk. All these contradictory elements are used as premises for modeling the decision making process of financing a project.*

*Keywords: decision - making, behavioral finance, strategic behavior.*

*JEL Classification: D8; C 70; D03.*

## 1.Introduction

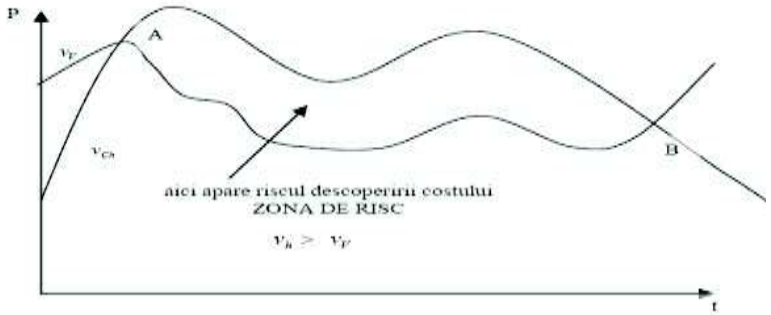
This paper presents a decision analysis model on financing alternatives that may be used to finance a particular project. The concept of project involves a number of defining elements that distinguish it from any other activity. Firstly, a project involves tracking a series of objectives to achieve a specific purpose. It also implies going through several activities ordered in time and space, as a process. The notion of project differs from that of a process in the sense that the objectives pursued by the project involve achieving a result which means the ending of the project, while in a process each output is a new entry for another stage without implying the existence of a certain limit point.

The present research offers a new approach of the financial risk in funding a project. In terms of project management, the required project resources, human, material and money are accounted separately at project level and quantified in monetary project budget. In this context, there will be analyzed the generated cash flows within the project.

The classical methods used to measuring[348] risk by statistical probabilities of occurrence for a risky event, the economic model described in this paper brings an innovative element. This refers to a systemic vision of risk, studying the cumulative effect of factors that lead to specific risks in the building of the project. The model introduces the time factor in the analysis because of its influence to the financial balance between revenue and expenditure in the budget of the project is due to timing of receipts and payments over time. Time factor entered into the equation leads to indicators such as the velocity of cost and revenue whose temporal evolution can generate the emergence of systemic imbalances in the financial equilibrium of the project leading to risk. The model examines the risk of not being able to cover the project cost from the revenue generated in the project. Starting from the premises that a higher level of velocity of cost and revenue can lead to the occurrence of risk and depending on the duration of exposure to this risk the project can approach financial collapse. The figure below shows how velocity of cost and revenue leads to risk represented by the bounded area between the two velocity curves.

[348] Kolmogorov N., Fomin S., (1970), Introductory real analysis, Dover Publications, New York,p.34

Chart.1.Representation of velocity variation of revenue and cost within the budget of a project.




Source: Own approach

The model provides decision support needed by any financial manager in selecting the most appropriate financial sources to run a certain investments made through a project. Model analysis implies identifying "risky areas". These are the places where risk can occur due higher levels of revenue velocity greater than those of cost generated by the financing sources used. The model analysis implies studying the behavior of risk into four scenarios. Varying the funding sources and thus the velocity of cost but keeping the revenue levels the same throughout the scenarios implies studying the variation of risk levels due to financing. Alternative funding sources. available[349] are described in the table below:

*Table 1. Funding sources used in the model.*

| TYPE OF FINANCING | DEFINITION |
|---|---|
| Investment funds (equity) | Investors are individuals who have cash they want to invest in companies with a high risk profile through the purchase of stocks or shares in a company with the purpose of exercising control over it. |
| Bank loan | Bank loans are repayable sources of financing to companies in exchange for the payment of an interest (cost). |
| Grant | Grants are offered to enterprises by public or private institutions on a project basis or a business plan. |
| Public-Private Partnership | A form of partnership between public institutions and private companies to financing public utility projects. |
| Self-financing | Using revenue generated by the project to cover the necessary operating and financial costs. |

Source: own approach

Throughout the scenarios used to test the model, the revenue generating capacity of a given project will be considered to be the same along the scenarios. The variable elements of the analysis will be the funding available to finance a project. The role of the model is to provide an informational tool for making decisions regarding the financing sources of an investment project.

***2. Model description***

The model is defined through several steps. The first step in building the analysis of the model refers to defining the notions of velocity of revenue and cost. The second step in the model refers to building function φ (t), as the difference between the velocity of cost of funding accessed and other operating expenses of the project concerned and the velocity of revenue generated from the investment made through the project. The notions of velocity of cost and revenue are defined as

[349] Tulai Constantin, (2003), *Finanţele publice şi fiscalitatea,* Ed. Casa Cărţii de Ştiinţă, Cluj Napoca, p.23

follows: $v_v = \frac{\Delta V}{\Delta t}, v_{Ch} = \frac{\Delta Ch}{\Delta t}$, where: $v_v$ is the velocity of revenue generated from the investment realized in the project , $v_{ch}$ is the velocity of cost generating from operating and financing activities. Δt = is the period of time between two reimbursing installments, which is considered to be of 1 year.

1.The notions of revenue (V) and cost (Ch) are described in the budget equilibrium equation described below:

$Cf + Chf = V$

$Cf = S_0 + cf$

deriving the formula we can obtain the dynamic equilibrium equation as follows:

$\Delta Cf + \Delta Chf = \Delta V,$

$\Delta Chf = 0$

The analysis of the model implies the following premises:

- the revenue generated by the investment made through the project financed stays the same through the scenarios but the $v_v$ is the velocity of revenue generated from the investment isn't the same because of the different periods of time between the instalments in various types of financing.
- the cost of operating investment made is held constant throughout the analysis,
- these elements are possible due to the fact that the analysis purpose refers to comparing the possible financing sources for the project in order to select the financial structure based on the criteria of risk, as tackled by this paper.

2.There is the function φ (t) of recovering the cost from the revenue from the projects' buget as the difference between velocity of revenue and project cost, as follows: $\varphi(t) = v_V(t) - v_{Ch}(t)$. The function can be defined at each point in time t chosen to coincide with the time of each installment repayment of the funding accessed. There are three possible values that the function φ (t) is able to take:

a) $\varphi(t) > 0 \Rightarrow v_V(t) - v_{Ch}(t) > 0$, in this case we have a full "covering" of the costs from the revenues generated by the project, at time t, chosen as a reference.

b) $\varphi(t) = 0 \Rightarrow v_V(t) - v_{Ch}(t) = 0$, in this case we have a balance between the revenue and cost at the budget of the project, when the project is at the breakeven point.

c) $\varphi(t) < 0 \Rightarrow v_V(t) - v_{Ch}(t) < 0$, in this case the project revenues are not enough to cover the costs required for the project. This situation should be temporary as the project financial balance depends on the period of time that this situation prevails, in order to prevent a financial collapse of the project.

3. The next step in the model analysis refers to the defining of the function of risk R (t) as the graphical area between the curves generated by velocity of cost and revenue generated by the project. There is a proportionality relation between the area of the function R(t) and the dimension of risk of not being able to cover the projects' cost form the revenues generated. We are able to formulate the risk function R(t) depending on the factor of time:

$$R(t) = \int_0^t [v_v(t) - v_{Ch}(t)]dt = \int_0^t \varphi(t)dt = \sum_0^t \varphi(t)\Delta t \wedge \Delta t^* = t_1 - t_0 = 1$$

$R(t) = \sum_0^t \varphi(t) = \sum_0^t [v_v(t) - v_{Ch}(t)]$. Where the indicators have been described beforehand.

3.The decision function is defined as follows: $F(x)=\begin{Bmatrix}1\Leftrightarrow R(t)\geq 0\\ -1\Leftrightarrow R(t)<0\end{Bmatrix}$ where F (x) = 1, the subject will select this type of funding, F (x) =- 1, the subject will not choose the funding,

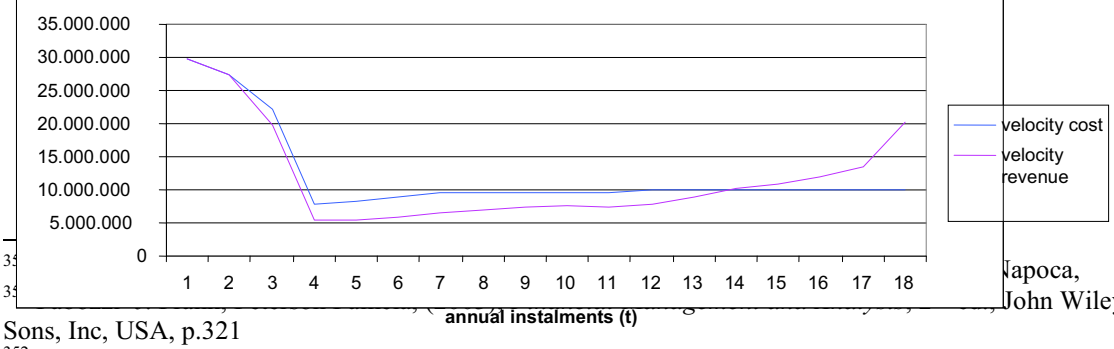
**3. *Scenario analysis***

Model testing will be done by simulating four scenarios for scientific validation. The experiment will be done by simulation. The analysis of the model described above will be achieved by using four scenarios related to four combinations of project financing[350]:

| Table 2. No.1 Scenario assumptions. |
|---|
| Credit financing is used for the investment in the project that runs over 18 periods (years), Cost of financing refers to the annual installments of loan repayment and interest payments since the third year of the operating of investment. |
| No.2.Scenario assumptions |
| Credit financing is used in combination with equity, for the project that runs over 18 periods (years). Equity loan will be repaid together with the rate of return required by investors[351] in two different installments, in the 7th and 9th year respectively. Cost of financing refers to repayment in annual installments and interest on loan, from the 7th year after accessing credit to finance repayment of the loan in the form of equity; |
| No. 3. Scenario assumptions |
| Public-private partnerships are used for financing the investment projects that are conducted in partnership with the state, over 18 years. To finance the investment through a bank loan to be repaid together with the cost from the 3 rd year. Cost of financing refers to the annual installments of loan principal and interest rate repayments and pay a fee[352] for the provision of public service concession, since 3rd year. |
| No. 4.Scenario assumptions. |
| Grant funding is used for the investment in the project that runs over 18 periods (years). The investment is financed by bank credit to be repaid together with the cost from the 3rd year. Since the 4th, over 10 years, the annual grant will reimburse the expenditure on investment in 80% of the total value of the investment[353]. Cost of financing refers to paying the annual installments of loan repayment and interest rate, since the 3rd year. |

Source: own approach

**Graph 1. Credit – The velocity of cost and revenue in the project**

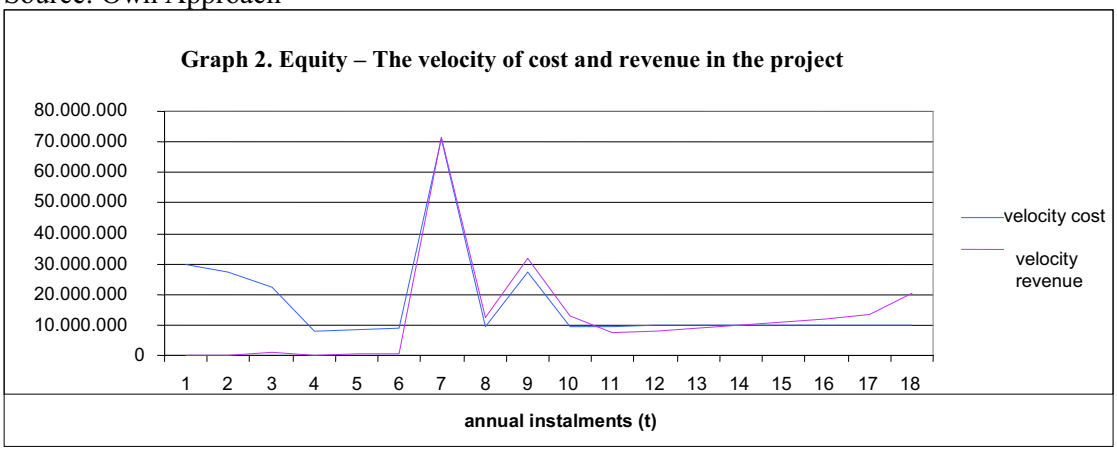



Napoca, John Wiley & Sons, Inc, USA, p.321

[352] Damodaran Aswath, (2008), *Investment Valuation*: 2nd ED., Mc.Graw Hill, Brealy and Myers – Finance, p.45

[353] Gareis Roland, (2006), Happy projects!, Ed. aII-a, ed. ASE, Bucureşti, p.45

Source: Own Approach

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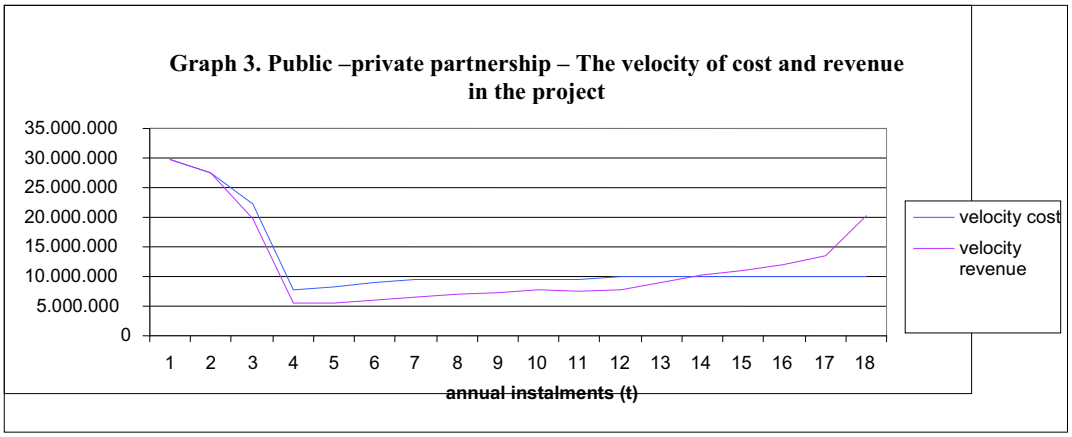


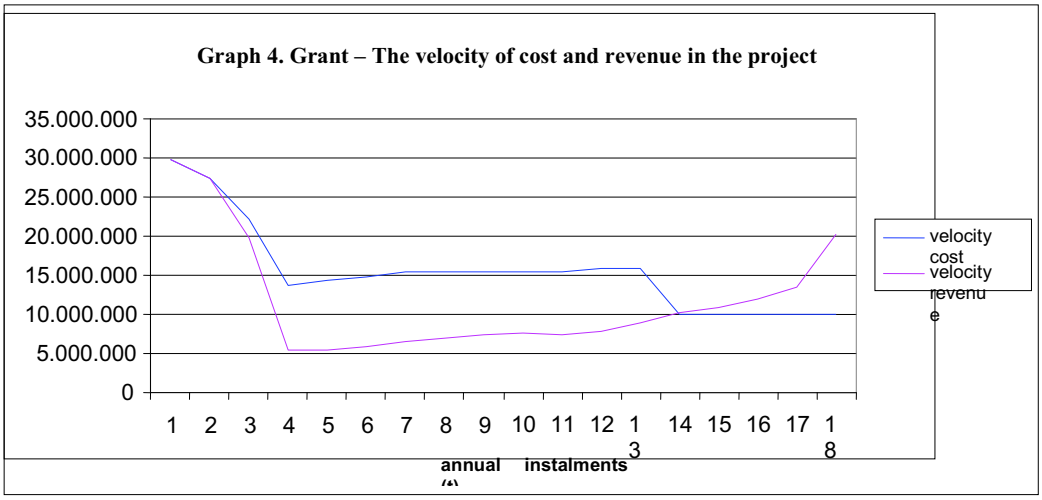


Source: own approach

**4. Conclusions**

The scenario analysis shows that there are parts of the graph where revenue is above the curve of cost and the type of financing reflects a favorable situation for a minimum risk. There are areas on the graphs of risk where the velocity of cost is higher than the velocity of revenue indicating a higher level of risk. Depending on the length of time that this situation is maintained the risk of not being able to cover the cost in the project by the revenue generated by using such financing and there is the possibility of a financial collapse in the state of financial balance of the project.

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