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DECISION TREE IN MEASURING INDIVIDUAL COMPANY RISKS

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ABSTRACT
Modern business is inconceivable without change management. The active attitude of a company towards change is materialized through projects. A project is, typically, a certain innovation accompanied by the influence of different risk factors.
A risk is defined as a danger of a loss or damage, that is, as a possibility of an unfavourable future development, often dangerous for the very survival of a company. The company takes into consideration the fact that future expectations can have many alternatives. Therefore, it cannot be known in advance whether the future outcome will prove positive or negative for the company. Consequently, it cannot be known whether the company will make a greater or smaller profit or loss.
Individual risk is an important determinant of a company's project as well as of the market risk. That is why the analysis of these determinants is an important premise and a starting point for measuring of a project's risk level.
This paper will dwell on an analysis of individual risk by application of the decision tree method.
Key words: decision tree, risk, uncertainty, changes, management

1. INTRODUCTION
Modern business is inconceivable without change management. Introduction of changes is the only way for a company to survive and to make progress. Changes occur in a constantly changing environment, so that the already established changes generate new ones, and the success in their monitoring is reflected in business results.

Every change implies a certain amount of risk and uncertainty on the market where nothing is certain and in a business environment where everything is multi-valued and uncertain. The state of risk is characterized by stochastic behaviour, which means that for a known entry the set of possible outcome values whose probability can be assessed is also known. As opposed to risk, uncertainty is a phenomenon characterized by random behaviour, which means that for a known entry the future outcome cannot be predicted. This is especially pronounced in long-term investment decisions, which is why the risk level is very noticeable. Hence, both risk analysis and management become more and more important from day to day.

How to define risk? There is no unanimously accepted definition. Most often, risk is viewed as a probability of unwanted outcome i.e. exposure to loss or damage occurring due to insufficient and/or unreliable information. Damodaran in [1] defines risk as a "probability of having a result in a life game we might not like. Risk is exposure to dangerous or hazardous situations." Nevertheless, one thing is certain. While making investment decisions, not only risk, but also yield must be taken into consideration. That is why it would be best to define risk as a mixture of dangers and possibilities, as the probability of deviation of the actual yield from the expected one.

It is a rule that more hazardous projects generate a greater yield as a reward for a higher risk level. Therefore, it is very important to be able to manage risk, which implies quantifying both risk and yield. Improper quantifying could lead to investment into a project doomed to failure.

2. INDIVIDUAL PROJECT RISK

Individual project risk is one of three risk components of every project. Every project can be viewed either as an isolated investment or as a part of a set of company's projects whose results will affect the value of the company's shares in the capital market.

Individual risk is a dispersion of the project profitability about its expected profitability [5]. It refers to the risk of an object observed separately and by itself is of little significance. It is more relevant in non-profit organizations with a single project, in companies manufacturing only one type of product or who participate in one market only. It is considered to be a relevant risk to the company itself, that is, as the participation of the individual project risk to the total company's risk. That is why individual risk analysis is an important premise and a postulate in assessment project risk.

Individual risk analysis begins by determining the uncertainty of realizing the planned cash flow of the project, which can be performed in different ways, ranging from information evaluation to complicated statistical analyses.

Individual risk assessment starts from determining the probability distribution of each element having influence on the expected cash flow, such as a business scope, prices, variable costs, capital costs and such. That is

$$V = (p-t_v)\,q - T_f + A$$

where:

V = planned cash flow of the project; p = unit selling price; t_v = variable costs per unit ; q= sale quantity; T_f = total fixed costs; A = amortization of investment project

Each element has its own probability distribution and the evaluation of particular elements and their correlation influencing the probability distribution of the planed cash flow of the project and thereby the individual project risk.

3. MEASURING OF INDIVIDUAL RISKS USING THE DECISION TREE TECHNIQUE

Decision tree analysis is a method which projects life expectancy scans on certain phases in the investment and effecting period.

The aim of this method is not only to assess the risk of a project, but also to create the necessary analytical frame for reducing investment risk.

Decision tree analysis is used for projects that need long-term investment, and these are, above all, projects that are related to investing in completely new production capacities. With these projects, the company management has at its disposal the time in which the project assessment can be repeated through individual investment phases, in order to see if entering the following phases pays off or the project should be abandoned. In that way the potential loss would be diminished comparing to waiting for the analysis of the investment to be finished after the termination of the overall investment period.

4. LIFE EXPECTANCY PHASES

Decision tree analysis will be explained through the project that is related to long-term investments in building the capacity for fruit processing.

Investment and effecting phases are:

I phase: The Drafting of the study on a new product line of market potential. The study would be realized immediately. The expected costs are 50,000€.

II phase: In case the market potential study shows a satisfactory claim for a new product line, we will resort to the production of new fruit products and enable profit testing for the following phase. The production of a new fruit product requires 50,000€ extra investment costs for the following year.

III phase: In case the response on probatory new production shows good results, we will resort to the development of extra production facilities. Net costs are estimated at 500,000 €. The building period would take one year.

IV phase: Effecting. Following the completion of new production facilities, a four-year effecting period is expected.

The cost of 50,000€ for the study on fruit market potential is to be expected in the null period. The probability that its customers will accept the programme is estimated at 80% and in that case investing will be continued in the second phase, which is to be finished in the following year. The probability that demand will not be satisfactory is 20% and in that case the investment would be aborted, which would mean the loss of 50.000€.

In the end of this period, that is the second phase, 100.000€ would be invested for a new product probatory production. It is estimated that the probability that the probatory product will be well accepted by its customer, is 70%, which would mean shifting to the next phase. The total plausibility of the transfer from one phase to the other is 56% (0.8 * 0.7 = 0.56). The plausibility that demand will not be satisfactory is 30%, which would mean the abortion of investment and a 50.000€ loss, that is a further loss of 100.000€ whose present value is 89.300, so that the total present value in case of cessation after the second phase is 139.300, and a plausibility that this will happen 24% (0.8*0.3 = 0.24).

Chart 1: Plausibility

Total value	So K=12	Ponder. So
0.168	1243.5	208.9
0.280	32.5	9.1
0.112	1178.2	132.0
0.240	139.3	33.4
0.200	50	10.0
1.000	Expect.	42.6

Chart 2: Calculation of net present values (in 000)

Year	Disc. factor	Cash. flow	Investment phases		Alternative expenses		
			I	II	900	400	-100
0	1.000	50	-50	-50	-50	-50	-50
1	0.893	100		-89,3	-89,3	-89,3	-89,3
2	0.797	1000			-797	-797	-797
3	0.712	900			640,8	284,8	-71,2
4	0.636	400			572,4	254,4	-63,3
5	0.567	or			510,3	226,8	-56,7
6	0.507	100			456,3	202,8	-50,7
Net present value			-50	-139,3	1243,5	32,5	-1178,2

The end of the second year brings the third phase of the project's life cycle to an end, which is also the final investment phase, after which the project effecting time begins. The project leaves four years for effecting of possible cost increase, that is, three more years for a possible increase of present value in order to cover eventual risks in monetary expenses.

Expectations have shown with 30% plausibility, that the four years of effecting will result in 900.000€ cash flow per year; with 50% plausibility that they will be 400.000€; 20% that they will result in a negative annual cash flow of 100.000€. The probability of the beginning of exploitation is 56%, which is the reason for the plausibility of optimistic project cash flows 16.8 (0.56 * 0.3 = 0.168) that will bring a net present value of 208.908 €. The probability that the project will result in restrained net cash flows is 28% (0.56 * 0.5 = 0.28) and it will bring net present value of 9100€. The plausibility that the project will result in a loss during effecting is 11.2 % (0.56 * 0.2 = 0.112), which would cause negative net present values of 131.992€. Net present values derived from individual phase cut-offs, which is according to individual exploitation expenses, are ponderated by total emergence value. By their adding we get the net present value of the project of 42.584€, which means that the project is efficient.

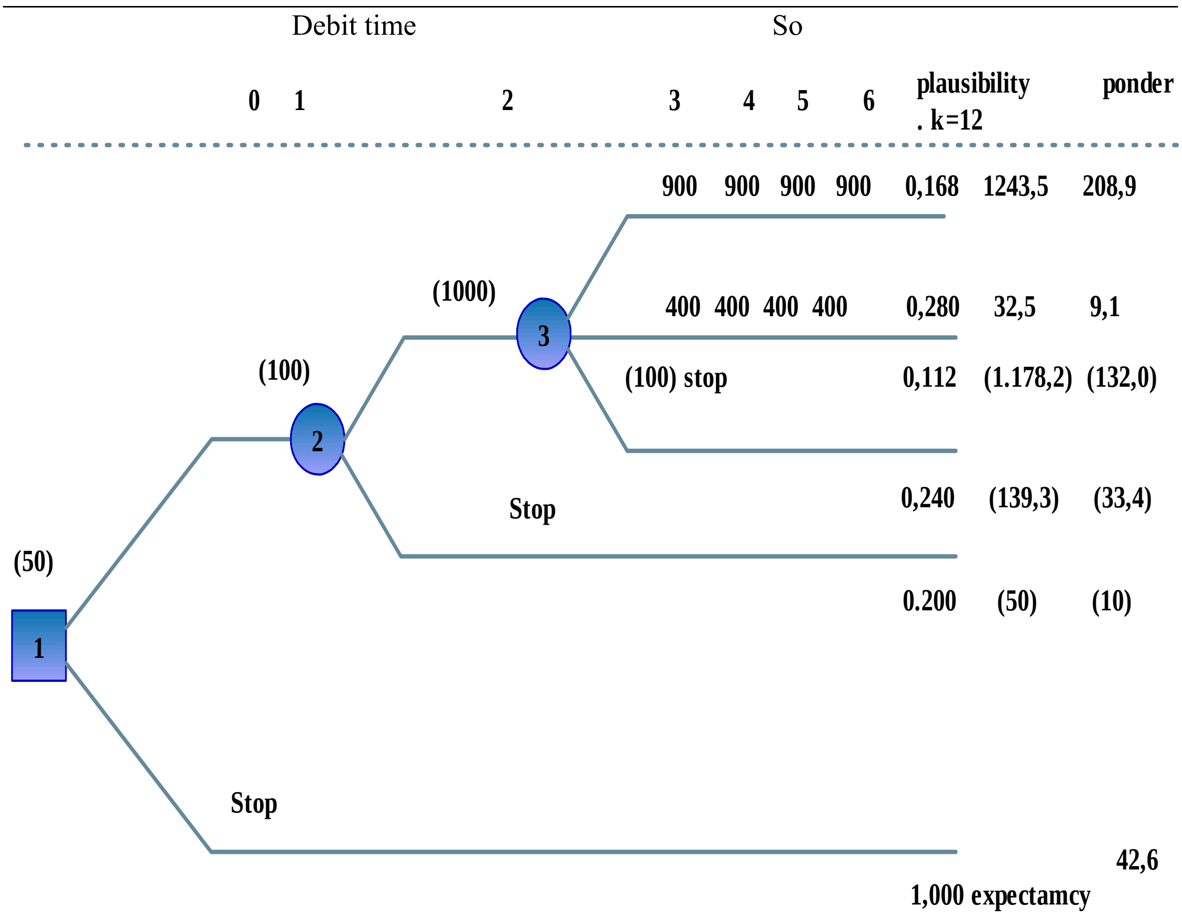

Figure 1: Decision tree

5. CONCLUSION

Decision tree analysis enables abandoning a project even before the expiry of its physical that is economical, time limit, if that proves to be more efficient from the point of view of the net present value. By abandoning the project the risk level decreases.

The use of a decision tree has its advantages compared to other methods in the following situations: a) when choosing between actions whose outcome is influenced by various groups of external factors; b) in high-risk situations where the probability of a particular outcome varies depending on actions taken; c) in sequential decision making, that is, when we observe chronological chains of mutually interconnected decisions.

6. REFERENCES

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