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Risk Analysis and Decision making process in Agricultural Enterprises of the CEEC[***]

Summary: Profit is the most important and also most controversy aim of the agricultural enterprises. This controversy is in connection with two important aspects. The first aspect represents the process of *creating the Value on the market of goods and services*, and the second is in connection with the process of *confirming of this Value on the financial market*. In that sense, Cash is obviously the most important asset of the agricultural enterprises. In the countries under transition (CEEC), another aspect of that process erases as a primary, the financial risk. So, further on, in the paper are discussed the logic of financing the growth of the agricultural enterprises in the countries under transition, in comparison with the level of risk. Such analysis represents additional guidance to the management of the firm in taking investment decision under the conditions of extreme instability and risk.

Keywords: risk analysis, financial decissions, agricultural enterprises, tranzition, cash, profitability

Rezime: Profit je najznačajniji i možda najkontraverzniji cilj poljoprivrednih preduzeća. Ova kontraverznost je povezana sa dva važna aspekta. Prvi aspekt reprezentuje proces kreiranja vrednosti na tržištu roba i usluga a drugi je u vezi sa procesom potvrdjivanja ove vrednosti na finansijskom tržištu. U tom smislu, tzv. keš – gotovina predstavlja najvažnije pojedinačno sredstvo poljoprivrednih preduzeća. U zemljama u tranziciji još jedan aspekt ovog problema dobija posebnu dimenziju, finansijski rizik. Zbog toga se u radu diskutuje o logici finansijskog rasta poljoprivrednih preduzeća sa aspekta nivoa rizika. Ovakva analiza omogućava menadžmentu preduzeća da donosi finansijske odluke u uslovima značajnije nestabilnosti i visokog poslovnog rizika.

Ključne reči: analiza rizika, finansijsko odlučivanje, poljoprivredna preduzeća, tranzicija, gotovina, profitabilnost

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1. Defining the Risk

The essence of the corporate philosophy is based on treating the enterprise as a widely opened system. It presumes creation of the mechanism and providing conditions for the functioning of the stimulative macroeconomic and market oriented system created by the government, on one side, and on the other side, declaration of business risk and all the relevant consequences to the enterprise or to its owners. Understanding of those prepositions is one of the main issues for the agricultural enterprises in the countries under transition.

Privatization of the state owned and so-called social owned agricultural enterprises is one of the basic goals in the process of corporativisation and in orientation toward market economy. Non-defined ownership is one of the main sources of the business risk in the enterprises and limitation for the defining the financial requirements and creating the profit. It is the source for the instability of the enterprise, its inefficiency and uncompetitivnes. On the other side, in such conditions, raises the number of sponsors of the enterprise who are bearing the consequences of the inefficient business orientation.

As it is stated, uncertainty and the sources of uncertainty in the agricultural enterprises could be expressed through description of phenomenon's the data are insufficient to incorporate them into the analysis in a quantitative manner and to govern the management of an agricultural enterprise in the process of creating the profit. The result of this statement is that risk analysis must provide to the owners of the enterprise quantitative elements to judge the riskiness of any business decision or project implementation. So we can define the riskiness of the project as the probable variability of its future returns. For the variable such as sales from which future returns are derived, sales risk can be defined as the variability of expected sales. In practice, during project analysis, there are usually several variables for which doubts exist as to their best estimates. The purpose of risk analysis is to help management to isolate the risks and provide a means by which the various project outcomes can be reduced to a format from which a decision can be made. So, the final consequence of risk analysis is opinion or judgment regarding the possible range of future returns on investments in agricultural enterprises, as well as the possibility of each value to be created within this range.

But besides the possibility of evaluation the business risk of one project, often there is a need for judgment of all expected risks in the agricultural enterprise, portfolio risk. The agricultural enterprises portfolio risk can be analyzed also by considering the relationship between the proposed project and the existing investments and operations of the company. It must be stressed that in spite of judging the project as risk-ness one, it could be accepted for implementation on the basis of portfolio risk analysis. But this type of analysis is out of our interest in this paper.

2. METHODS FOR QUANTIFYING RISK

Riskness in particular project or the company portfolio risk usually can be analysed by running three common methods of risk analysis: method of probability distribution; method of simulation; and method of sensitivity analysis.

2.1. Method of probability distribution

Risk is associated with variability of returns expected. So, the more variable are the expected future returns, the riskier is the investment or project, an vice versa. However, it is useful to define risk more precisely. In the case of any investment decision or any kind of business decision, it has to be done forecast of future events. Probability expectation could be defined or measured from the point of wiev of a project analyst, or as an expectation of each possibly outcome. In its simplest form , a probability distribution could consists of an optimistic, pessimistic and most likely estimate or alternatively, high (boom), low (recession) and a "best guess" (normal market conditions) estimates. Such examples could be illustrated as it is shown below (example 1):

Example 1: **Pay-off matrix for Project X and Project Y**

State of the Market	Annual cash flow Projekat X	Projekat Y
	USD	
Boom (high)	1.200	2.000
Normal (most likely)	1.000	1.000
Recession (low)	800	0

The probability expectation in the example is: in case of boom is 0.2, in normal conditions is 0.6, and probability of recession is 0.2.
Given the annual cash flows under the three possible states of the future market and their probability of occurring, weighted average projected cash flows can be calculated by multiplying each cash flow by its probability of occurrence. This is shown in the example below (example 2):

Example 2. **Calculation of expected values**

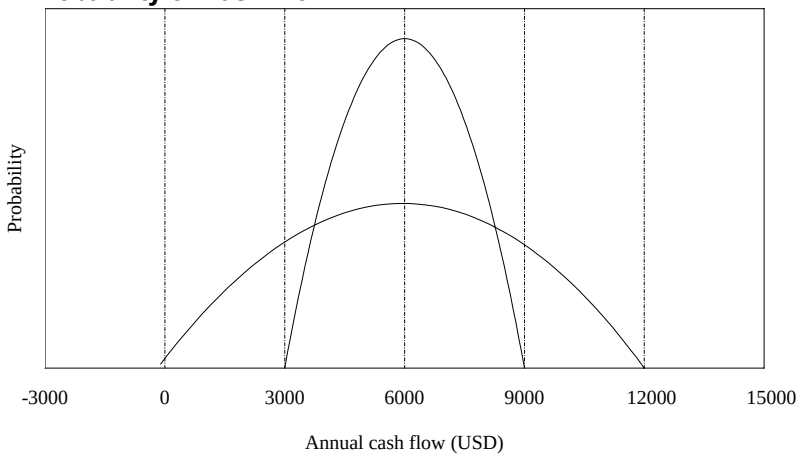
Appraisal	Cash flow	Probability	Weighted average or Expected Value
Project X			
Boom	1.200	0.2	240
Normal	1.000	0.6	600
Recession	800	0.2	160
			Expected value
Project Y			
Boom	2.000	0.2	400
Normal	1.000	0.6	600
Recession	0	0.2	0

Expected values

Calculated average value is defined as expected value of cash flow in particular investment or any business operation of the agricultural enterprise. Also, it could be stated as an basic result in comparison with the values created through alternative business decisions.

Business risk is existing always due to the particular investment and could be presented in graphical form to obtain a clear picture of variability of actual outcomes (Graph 1).

Graph 1: **Probability of Cash Flow**



For example, assume two mutually exclusive projects Px and Py which are with the same net cash flows of USD 4.000. In the same time, it could be two following cases: investment Px has probability of cash inflows in the range of USD 3.000 - USD 9.000 while investment Py has probability in the range of USD 0 - USD 12.000. Looking at the net cash flow (which is equal in both cases), one is temped to rank both investments equally. But a look at the graph above shows that the variability of cash flows for Py is greater than of Px and therefore the project Py is riskier project.

The variability of distribution is normally measured by standard deviation. The earlier example is used to calculate tha standard deviation as presented below (example 3).

Columns 1,2 and 3 are taken directly from previous example. In column 4, tha expected value from each possible outcome is subtracted to derive the deviations about the expected value. In column 5, deviations are squared. In column 6, squared deviation is multiplied by associated probability and the products are summed to obtain tha variance of the probability distribution.

The calculation provide outcomes for Px = USD 126.49 and Py = 632.45. So, it could be stated that the project Py is more riskier than project Px.

Example 3: **Calculation of Standard Deviation**

	Calculation of Standard Deviation		**USD**		
Probability	**Net Cash Flow**	**Expected value (1 x 2)**	**Deviation**	**Standard deviation**	**Variance (1 x 5)**
1	*2*	*3*	*4*	*5*	*6*
Project X					
0	1,200	240	200	40,000	8,000
1	1,000	600	0	0	0
0	800	160	(200)	40,000	8,000
expected value	**1.000**			**variance**	**16.000**
				standard deviation	**126.49**
Project Y					
0	2,000	400	1,000	1,000,000	200,000
1	1,000	600	0	0	0
0	0	0	(1,000)	1,000,000	200,000
expected value	**1.000**			**variance**	**400.000**
				standard deviation	**632.45**

But, implementation of the method could erase certain problems in the use of standard deviation as a measure of risk. Taking an example that shows the probability distributions for investments Px1 and Py1. Assume that Px1 has an expected return of USD 2.000 and standard deviation of USD 600, and investment Py1 also with the same standard deviation of USD 600 has higher expected return of USD 8.000. Investment Py1 has more risk per USD of the return than Px1. On this basis, it is reasonable to assign a higher degree of risk to investment Py1 than to investment Px1, event though both have identical standard deviations. So, it must be derived the standard deviation by the expected value of net cash flows to obtain the coefficient of variation, to handle this problem. For investment Py1, USD 600 is divided by USD 2.000 (expected value), obtaining 0.30 as the coefficient of variation and 0.075 for project Px1 that is much lower coefficient of variation. So the later project has les riskness than previous.

2.2. Method of Simulation

When cash flows are correlated over time, the standard deviation calculation will not give a correct calculation of the variation of projects Net Present Value (NPV). Also, in practice, it may be necessary to produce separate probabilities for alternative sales revenue, different items of costs, and different possible life spans. These problems can be solved by using Monte Carlo simulation analysis, by the computer, which allows the consideration of many variables and their probability

distributions as a result taking in account in the risk analysis as a part of the process of decision-making in the agricultural enterprises.

The scope of simulation analysis is connected with providing the probability distribution for Cash Flows (CF), Internal rate of return (IRR) and Net present Value (NPV). From the calculation, certain conclusions can be derived such as: "the likelihood is 80% that IRR will equal 12%" or "there is a 10% chance that the project will result in loss of USD 35.000", etc.

2.3. Method of Sensitivity Analysis

The purpose of sensitivity analysis is to define the variables to which the NPV of the project in agricultural enterprise is most sensitive, and it is normally used to measure the extent to which these variables can change before the investment results in a negative NPV. Sensitivity analysis is useful for determining consequences of specified changes in variables such as product price, sales volume, input costs and investment life span. However, only risk analysis can provide any indication of the likelihood that such events will actually occur. Management should pay special attention to controlling those variables to which NPV is particularly sensitive, once the decision has been taken to accept the proposed investment. Also, break-even analysis can be viewed as a form of sensitivity analysis. It enables the analyst to determine the impact of changes in cost, production volume and price on profits of the agricultural enterprise.

In our example, it can be used the simplest type of sensitivity analysis with variables which influence profitability as follows:

$$P - S (p - mc - vc) - Fc,$$

where: P = profit
S = Sales
p = selling price
mc = material cost
vc = variable cost
Fc = fixed cost

Sensitivity analysis is carried out by replacing the input variables that determine profitability with their expected values given in feasibility studies in order to determine profitability in quantitative terms.

Example 4: **Sensitivity analysis**

Variable	Best estimate	Increasing variable by 10%	Resulting profit USD	Change in profit %	Rank order of variables
Sales (unit)	10,000	11,000	120,000	20	2
Price (USD/unit)	50	55	150,000	50	1
Variable Costs (USD/unit)					
– raw material	10	11	90,000	(10)	3
– other variable costs	20	22	80,000	(20)	2

Fixed costs (USD)	100,000	110,000	90,000	(10)	3
Pofit (USD)	100,000				

The profit is calculated on the basis of 10% increase in variables, taking each variable at a time. If the change of variables is equal by percentage, profit is most sensitive to changes in price, followed by sales volumes and other variable costs with similar changes, and raw material and fixed costs ranking last with the same level of changes. Although this simple analysis has pointed the most sensitive variables, no insight is provided into the probability of these changes taking place. For example, the average of 10% increase in row material cost may be very high while the probability of a 10% increase in product price may be low.

Sensitivity analysis based on a discounted cash flow model is illustrated in the next example:

Example 5: **Implementation of the method of Sensitivity analysis based on DNT**

	Year 0 USD	**Year 1 USD**	**Year 2 USD**	**Year 3 USD**
Cash flow				
Cost of equipment	(100,000)	0	0	0
50.000 kom USD 2/kom	0	100,000	100,000	100,000
Variable costs	0	50,000	50,000	50,000
Net cash flow	(100,000)	50,000	50,000	50,000
The cost of capital is 12% and the Net Present Value is USD 20.095				

The calculated variables are:

(1) *Sales volume.* The net cash flow will have to fall to USD 41.634 (USD 100.000/2.4019 discount factor) for the NPV to be zero, because it will be zero when the present value of the future cash flow is USD 100.000. The discount factors for 12% and Years 1,2 and 3 are 0.8929; 0.7972; and 0.7118 respectively.

As the likely net cash flow is + USD 50.000, the net cash flow may decline by about USD 8.366 each year before NPV becomes zero.

Total sales revenue may therefore drop by USD 16.732 (net cash flow = 50% of sales). At selling price of USD 2 per product, this represents 8.366 units. Alternatively, the sales volume may decline by 16.7% before the NPV becomes negative.

(2) *Product price*. When the sales volume is USD 50.000 products yearly, total sales revenue can drop to USD 91.634 (100.000 - 8.366) before the NPV becomes negative. This represents a selling price of USD 1.83 or a reduction of approximately USD 0.17 per product which represents about 8.4% reduction in selling price.

(3) *Variable costs*. The total variable costs can increase by USD 8.366 or USD 0.17 per product. This represent increase of 17%.

(4) *Initial outlay*. The total outlay can increase by the NPV before the investment breaks even. The initial outlay may therefore increase by USD 20.095 or 20%.

(5) *Cost of capital*. IRR for the project is nearly 30%. Consequently, the cost of capital can increase by 250% before the NPV becomes zero.

The above analysis can be summarized as follows:

	Switching value		
Variable	**(%)**	**Variable**	**Switching value (%)**
Sales Volume	16.7	Initial outlay	20.0
Selling price	8.4	Cost of capital	200.0
Variable costs	17.0		

The element to which the NPV appears to be most sensitive is the price followed by sales volume and variable cost. It is important for the project sponsor to pay particular attention to these items so that can be fully monitored.

Sensitivity analysis has a number of shortages. In particular, the method requires that changes in each key variable are isolated, but the management is also interested in the combined effect of changes of two or more variables. In addition, the methods give no indication to the likely probability of changes in key variables or of a combination of variables occurring.

3. CONCLUSION

The transition process involves new relations in running the agricultural enterprises. Privatization and clear ownership are forcing the owners of the firm and managers to restructure the enterprise and make it more efficient. But, in the process of judging the business possibilities, they are faced with the risknes. Business risk is caused by the internal and external variables and with its occurring. So, besides running the profit of the firm, owners and the managers are faced with certainty of its making.

This is another relevant aspect of the same problem of creating the profit and enabling the agricultural enterprise growth. In that sense, they must be better educated. So, in the paper the three methods of risk analysis are discussed to help the managers and owners of the firm for its better management and better decision making. In that process, one can identify the level of riskness but also the certainty and possibility of creating the cash flow in the agricultural enterprise. It was the main task of the paper.

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