

## **OPERATING RISK ANALYSIS FOR AGRICULTURAL INVESTMENTS**

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*ABSTRACT: Decisions for substantiating the investments projects in agricultural sector are based on the assessment of the business's profitability but also, of the economic risk assumed by the enterprisers. The paper presents a dynamic analysis model of the operating risk which is validated in a case study using an example of an agricultural holding from viticulture. The appreciation of the economic risk is based on the Degree of operating leverage indicator, and the proposed analysis model offers the possibilities to identify the factors which can lead to an adequate management of risk. The case study presented validates the theoretical approach and highlights that the economic risk diminished due to modification of costs structure, flexibility of activity, variation of safety margin, sales and profit.*

*Keywords: operating risk, agriculture, investment, degree of operating leverage*

*JEL Codes: L21, O22, Q14*

### **Introduction**

The decision of option for the most favourable investments project is a managerial objective required by a successful business. The economic risk is a permanent presence in firms' activity and its assessment could influence the investments decision.

The risk resulted from running the investments objective could be lowered even from the previous phase of the execution works. If the vulnerability of the investments project is related with further manifestation of some conjectural factors from the external environment, it can appreciate that changes in the firm's results obtained by running the investments project depend mainly by its rapidity of reaction to adapt the supply to the market provocations (increased demand, modification of assortments, concurrence, prices variation, new technologies etc). These influences are to be found in structure of production costs and in amount of sales.

Due to the fact that indicator Degree of operating leverage measures the profit variation depending on variation in turnover, it is considered that this indicator can directly express the firm's capacity to respond to the new demands of market. A higher variation in profit depending on the action of various factors that impose a certain sales' level is to provide the image of a higher elasticity of the economic activity at once with of an increased operating risk level.

This paper has as main objective the formulation of the theoretical and practical framework for the operating risk analysis, risk which is associated with the decisions of implementing one agricultural investment project. The study addresses to some questions as: Could implementation of an investment affect the economic risk and the firm's profitability? Can influences exerted by diverse factors on the economic risk be put in evidence? Are there some possibilities of measuring the factors' influences on the operating risk?

The method used to obtain some answers related to the manifestation of the operating risk is based on the Degree of operating leverage indicator which is a measure of the effect operating leverage. Starting from its expression furthermore it was built a dynamic analysis model. The importance and originality of this model consists in the fact that it facilitates identification of some factors which are implied in manifestation of economic risk and it provides the possibility to

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measure their action. A case study which refers to implementation of an investments project for development the vineyard plantation was conducted. It validated the dynamic analysis model and the results obtained highlight that at the microeconomic level the economic risk could be measured and controlled if we knew its influence factors namely, production costs' structure, sales, profit, variable cost ratio (flexibility coefficient) and the safety margin of the economic activity.

### **Literature review**

Within the market's concurrent environment the economic operators continuously are affected by the disruptive action of various factors and the risks manifestation.

It is considered that the economic risk of firm's activity can be appreciated using some indicators as: Contribution margin ratio, Breakeven point, Margin of safety ratio, Degree of operating leverage etc (Gallagher and Andrew, 2007; Weygandt et al., 2010).

An indicator with significance for the analysis of the economic activity risk is Degree of operating leverage. This indicator expresses sensibility of firm's earnings to variation in activity (sales or production). Degree of operating leverage quantifies the impact of a certain costs structure on changes in the earnings before interest and taxes and having a good using of it, firms can manage the company risk (Mizla and Pudlo, 2012).

The amount of Degree of operating leverage depends by the action of some parameters used also for its calculation, an important role having the fixed cost in a firm's operation. In the short run the fixed operating costs can be used as a leverage in order to boost the profitability, but only in the case in which sales revenues are sufficient to cover all operating costs (Van Horne and Wachowicz, 2009).

Another important element in formation of the Degree of operating leverage is the volume of operating activity and sales. This signifies that in the presence of operating fixed costs, a small percentage variation in sales may generate a larger percentage change in earnings, producing a greater business risk or other said, something about which corporate financial stewards should be aware (Kiyamaz and Hodgins, 2003; Brigham and Daves, 2007). Many studies present other variables having significance for the increase of the Degree of operating leverage as, output proximity to the breakeven point, costs function (Block and Hirt, 2003) and short run output (Dugan et al., 1994).

Degree of operating leverage is in a direct relation with the risk manifestation within an economic activity. In the case in which the other elements are constant, a higher level of firm's operating leverage is to lead to a greater risk (Brigham and Daves, 2007).

A Degree of operating leverage greater than 1 indicates a more significant variation of earnings (losses) towards the variation in sales (Forgand and Einolf, 2007). But not in all cases, a higher operating leverage has a negative signification. Used with prudence, this indicator can contribute to the increasing of profitability (Weygandt et al, 2010).

For Romania, the specific literature deals especially with the aspects of correlation between financial leverage and profitability taking in consideration the major companies listed by Bucharest Stock Exchange (Siminică and Vasilescu, 2009), analysis of financial risk evolution depending on leverage for the construction firms (Bărbuță-Mișu, 2010), influence of the financial leverage on the firm's value (Mironiuc et al., 2012), appreciation of the risk in the pharmaceutical industry generated by the economic crisis with help of the degree of operating leverage and degree of financial leverage (Cârciumaru, 2011). Aspects concerning the impact of various factors on operating leverage and the dynamic correlations formed within the agricultural investments processes are less treated and they are research objectives in this study.

### **The research methodology**

The methodology aimed to fulfilling the main objectives of the study which are: emphasize the manifestation shape of economic risk related by the investments processes; build the analysis

model in order to quantify the influences exerted by action of some significant factors; illustrate the applicability of the model on the case of an investments project made in agriculture.

The analytical tools used in this paper are the techniques of the economic-financial analysis which in principal are related to studying the dynamics of phenomenon and variations of their determinants factors in a given period of time.

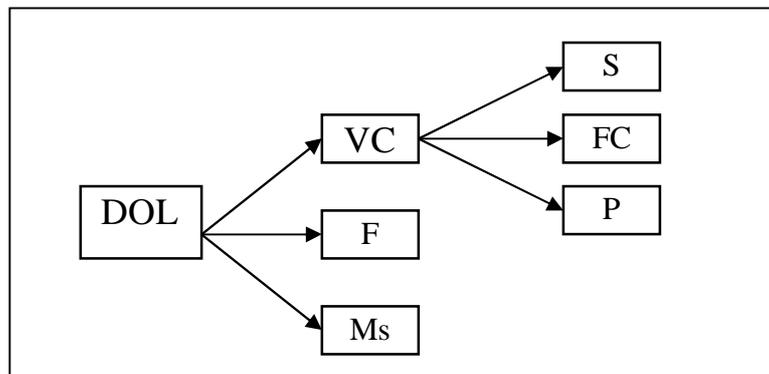
The analysis model of the economic risk was built on base of the indicator “Degree of operating leverage”. This indicator measures volatility of earnings and relates the risk with some important elements by which its manifestation depends as, sales, profit obtained and amount of the variable expenses (Weigandt et al., 2010).

Starting with the expression of this indicator we introduced in its formula the other indicators which can impact on the economic risk. Through the successive transformation of calculus of Degree of operating leverage were resulted supplementary economic factors which influence in a direct or indirect way the manifestation of economic risk.

In the case of investments processes, studying the evolution of the indicator presented in this form allows to emphasize the manifestation in time of the economic risk and the various influencing causes. If after an investments implementation, the firm’s economic risk diminished, the investments would be efficient and would increase the economic safety and profitability. Contrary, increasing of the risk level is seen as an expression of a wrong investment decision, unfavourable from the economic view point.

The dynamic analysis model developed in this study contains a relation which quantifies the variation in time of economic risk and others for measuring the influence of each direct or indirect factor.

The numeric expression of time variation of the Degree of operating leverage is due to the absolute variation of indicator after investments implementation compared with its value before the investments. Similarly there are constructed the factors analysis relations taking in consideration variation of one factor, considering that the others action is constant (figure 1).



**Figure no. 1 - Factors influencing operating risk**

Figure 1 illustrates that economic risk shown by Degree of operating leverage (*DOL*) varies in timp due to the direct action of changes in variable costs (*VC*), changes in activity flexibilității (*F*) and variation of the margin of safety (*Ms*). The factors which exert indirect influences on the risk act through the variable expenses and are variation of sales (*S*), variation of fixed costs (*FC*) and of profit (*P*).

**Analysis model of the operating risk**

The Degree of operating leverage (*DOL*) can be calculated with formula (Weigandt et al., 2010):

$$DOL = \frac{S - VC}{P} \quad (1)$$

in which:  $S$  represents sales revenues (turnover);  $VC$  - total variable costs and  $P$  - profit.

The profit can be calculated using the relation  $P = S - VC - FC$  in which the fixed costs ( $FC$ ) at their turn can be expressed based on the Breakeven point ( $S_{bp}$ ):

$$S_{bp} = \frac{FC}{1 - \frac{VC}{S}}; \quad FC = \frac{S_{bp} \cdot (S - VC)}{S} \quad (2)$$

Substituting in formula 1 the profit and fixed costs indicators, it found out another expression of Degree of operating leverage. This put in evidence the influence of activity volume given by sales revenues and its nearness to breakeven point (Long, 1992; Stancu, 2002; Burja et al., 2003):

$$DOL = \frac{S}{S - S_{bp}} \quad (3)$$

Introducing the breakeven point relation in expression of the Elasticity coefficient (3), we obtained a formula which expresses the relationship of Degree of operating leverage with some of its influencing elements:

$$DOL = \frac{S}{S - S_{bp}} = \frac{S}{S - \frac{FC}{1 - \frac{VC}{S}}} \quad (4)$$

In order to choose and execute an investment objective less risky it should to find that economic advantageous solution with a specific structure of costs which could allow a flexible running of activity. Only in the case the action of diverse factors lead to obtaining of a higher level of elasticity coefficient, the economic risk will be reduced and will increase the safety of firm's functioning.

Working on the main relation of Degree of operating leverage (relation 1) we will have an expression which highlights factors with significance in its variation as, margin of safety for the operating activity, flexibility coefficient and costs. The flexibility coefficient is in fact, the variable costs ratio and it relates the specific costs with the sales they generate  $\left(\frac{VC}{S}\right)$ .

$$DOL = \frac{S}{S - S_{bp}} = \frac{\frac{S}{VC} \cdot VC}{M_s} = \frac{VC}{\frac{VC}{S} \cdot M_s} \quad (5)$$

$$DOL = \frac{VC}{F \cdot M_s} \quad \text{and} \quad DOL = \frac{S - FC - P}{F \cdot M_s} \quad (6)$$

where:  $F$  is the flexibility coefficient or variable costs ratio;

$P$  - operating profit before taxes;

$M_s$  - sales nearness to breakeven (margin of safety).

In following it is constructed the dynamic analysis model for the operating risk using the expression of Degree of operating leverage (equation 6).

Modification of elasticity and also of the risk level due to investment implementation could be determined with relation:

$$\Delta DOL = DOL_1 - DOL_0 \quad ^2$$

1. Influence of variation of variable costs:  $\Delta DOL(VC) = \frac{\Delta VC}{F_0 \cdot Ms_0}$  , by which:

1.1. Influence of changes in sales:  $\Delta DOL(S) = \frac{\Delta S}{F_0 \cdot Ms_0}$

1.2. Influence of changes in total fixed costs:  $\Delta DOL(FC) = \frac{-\Delta FC}{F_0 \cdot Ms_0}$

1.3. Influence of profit modification:  $\Delta DOL(P) = \frac{-\Delta P}{F_0 \cdot Ms_0}$

2. Influence of changes in flexibility level:  $\Delta DOL(F) = \frac{VC_1}{F_1 \cdot Ms_0} - \frac{VC_1}{F_0 \cdot Ms_0}$

3. Influence of changes in safety margin:  $\Delta DOL(M_s) = \frac{VC_1}{F_1 \cdot Ms_1} - \frac{VC_1}{F_1 \cdot Ms_0}$

The analysis of changes in Degree of operating leverage related with its determinant factors reveals some aspects which in practice are important for the assessment of the operating risk. The next section addresses to the possibility of applying the dynamic analysis model for the operating risk highlighting its utility in the economic environment.

### Case study

The assessment of the economic risk associated with implementation of an investment variant could be made using the dynamic analysis model of the Degree of operating leverage. Elasticity is modified in time due to the action of some specific influencing factors. Identification and measurement of their action on the variation of the Degree of operating leverage represents also, action possibilities in order to have a better management of the operating risk.

In following, it is presented a case study taking as example an agricultural holding with vineyard profile. It ensures the identification of potential elements for increase the operating risk in the situation of an investment project's implementation.

The investment project aims to reestablish the vineyard plantation on an area of 50 hectares. The agricultural works consist in: preparing the soil; proper re-establishing of plantation,

<sup>2</sup> Symbols 1 and 0 are used for referring the activity specific indicators after implementation of investment, respectively before it

maintenance the new plantations in the first three years, installation of the sustaining system, and the purchase of mechanical equipments required by the vineyard works.

Recommendations of the technical project for reestablish the vineyard plantations refer to a plan which contains: 30 hectares cultivated with Sauvignon grapes (60%) and 40 hectares cultivated with Italian Realising grapes (40%).

Having in view the quality of the wine-grape varieties, soils characteristics and the vineyard works proposed, it could be estimated that the average production for the Sauvignon variety will be 8000 kilograms/hectare and 8500 kilograms/hectare for the Realising variety.

The investment project is characterized by the economic-financial parameters (table no. 1).

Table no. 1.

**Revenue and expense budget of investment project**

Indicators	Investment project
<b>I. Revenues</b>	
- Wine-grapes production, kg/ha	
Sauvignon	8000
Reasling	8500
- Area cultivated, ha	
Sauvignon	30
Reasling	20
- Price, lei/kg	
Sauvignon	1.5
Reasling	1.4
- Value production, lei	
Sauvignon	360000
Reasling	238000
Total revenues, lei	598000
<b>II. Expenditures, lei</b>	
- Materials (fuels, chemical substances, fertilizers etc)	133751
- Mechanized works	72714
- Expenses with direct labour force	139766
- Expenses with indirect labour force	17787
- Depreciation	1783
- Common expenses	16536
Total expenses, lei	382337
Gross profit, lei	215663

Source: RDSGWP Blaj

The revenue and expense budget of the last financial year concerning an area cultivated with 500 hectares (before investment) is presented in table no. 2.

Table no. 2.

**Revenue and expense budget of the financial year before implementation of the investment project**

Indicators (lei)	Financial year
Sales	3049800
Expenditures, by which:	2824900

- Materials	693397
- Mechanized works	306964
- Expenses with direct labour force	844174
- Expenses with indirect labour force	473722
- Depreciation	302482
- Common expenses	204161
Gross profit	284900

Source: RDSGWP Blaj

A synthesis of indicators concerning structure of revenues, results and operating costs for vine culture before and after implementation of the investment project is presented in the table no. 3. This table also contains elements required in order to assess the operating leverage.

Table no. 3.

**Determination of Degree of operating leverage for vine culture**

Indicators	Financial year 0 (before investment implementation)	Financial year 1 (after investment implementation)	Variation of indicators (after investment implementation)
Sales, lei	3049800	3647800	598000
Total expenses, lei	2824900	3107237	282337
Fixed costs, lei	980365	1019170	38805
Variable costs, lei	1844535	2088067	243532
Variable costs ratio (flexibility coefficient), %	60.5	57.2	-3.3
Share of fixed costs in sales, %	32.1	27.9	-4.2
Profit, thou lei	224900	540563	315663
Breakeven sales point, lei	2481937	2381238	-100699
Margin of safety ( $Ms = S - S_{bp}$ ), lei	567863	1266562	698699
Degree of operating leverage	5.4	2.9	-2.5
Expenses on sales ratio, lei/ thou lei	926.2	851.8	74.4
Return on sales, %	7.4	14.8	7.4

Source: data calculated

From the table no. 3 we can observe an improvement in activity after the investments project was made. The Degree of operating leverage indicator reduced with -2.5 (figure no. 2).

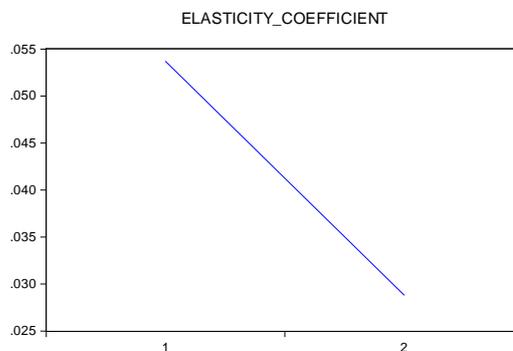


Figure no. 2. - Variation of elasticity coefficient

Another observation from the table no. 3 is that the situation reveals some possible threats coming from increasing of the fixed and variable costs and deterioration of the activity flexibility.

The other factors seem to exert a positive action. The utilisation of the dynamic analysis model of the operating risk will suggest the complete picture of factors' influences and will measure their concrete impact on the risk manifestation.

**Results and discussions**

Application of the dynamic analysis model for appreciating the operating risk conducted to obtain some results concerning Degree of operating leverage variation and the influence factors for the variant of the implemented project compared with the situation existing before its implementation (table no. 4).

Table no. 4.

**The analysis results**

<b>Influence of factors on the operating risk</b>	<b>Symbol</b>	<b>Level</b>
Variation of variable costs	$\Delta DOL(VC)$	0.71
Changes in sales	$\Delta DOL(S)$	1.74
Changes in total fixed costs	$\Delta DOL(FC)$	-0.11
Modification of profit	$\Delta DOL(P)$	-0.92
Changes in flexibility level	$\Delta DOL(F)$	0.35
Changes in safety margin	$\Delta DOL(Ms)$	-3.55

Source: data calculated

Some interpretations suggested by the analysis of the results obtained are presented in the following.

The implementation process of the project for reestablishing the vineyard area of 50 hectares had generated an improvement of the agricultural holding's production capacity and thus, it provided an increase of sales with 598000 lei. The new production costs structure imposed achieving of a breakeven sales point of 2381238 lei, which is lower than in the situation before the investment with 4.1%. This means there was an improvement of the breakeven point and also it represents a diminishing of the operating risk's level.

At the total production capacity level of holding resulted from investment it was registered a reducing of the share of variable cost in sales, so that this is similar with an important increasing of the profit's share. The new investment ensures a return of sales of 14.8%, higher with 5.5% than the plantation's profitability, in the case before the investment was made. Achieving the investment project specifications led to reduce the indicator Expense on sales ratio, with 74.4 lei/thou lei, so that the project will be feasible.

These preliminary conclusions suggest an economic justification for putting in practice the investment project. But the project has to be more serious analyzed in order to find out which are those factors that could conduct the holding towards a risky situation. The statement corresponding the economic theory that says the risk is the gain source, should be the subject of a care analysis of the managers for assuming a decision of an increased economic risk.

In the case studied, lowering the operating risk until the level of 2.9 means a situation more comfortable from economic point of view (<6) at the same time with a significantly diminishing of the agricultural activity vulnerability, of 46.3% (-2.5 points).

Given attention to the factors with significance which could be implied in variation of the economic risk's level, we identify a negative action (0.7 points) of the changes in total variable costs. Although they registered an increase in absolute figures, they have a lower share in sales, proving that the holding has a new production structure less flexible. A diminished flexibility of the production structure can determine an important increase of sensibility of operating result to

variation of the activity level and thus, the elasticity coefficient worsened due the variation of flexibility with 0.35 points.

The production modification resulted after investment implementation on the short-time ensure the sales' increasing (598000 lei), increase which is not sufficient for compensating the negative impact of other influencing factors as, reducing of flexibility (with 3.3%). That is way this factor finally, determined that the risk go up with 1.74 points.

Another influencing factor is variation of the Margin of safety. Its impact was positive, led to a low operating risk and thus points out a more advantageous position of sales towards the breakeven point of the production structure created through investment compared with the safety margin of sales before investment. This influencing factor is a counterpart for the negative action of the other factors, its impact being -3.55 points.

A positive contribution had the variation of fixed costs. Although they had increased in time, they diminished their weight in sales with 4.2% and determined a reducing of risk with -0.11 points. Also, the important increasing of profit reduced the risk with -0.92 points.

Improvement of the economic activity of the agricultural holding was produced due to increasing of efficiency (expenses on sales ratio) and changing of the production costs' structure. The diminishing of the share of fixed costs reduced the operating risk, situation that corresponds with the economic theory that according with the modification of fixed costs influences the company's risk, as measured by the variability of returns (Lev, 1974), (Berner, 2002). Besides fixed costs the other variables can produce a significance impact on the business's risk as, variable costs, prices, output (Kiyamaz and Hodgins, 2003).

### **Conclusions**

The risk is a permanent presence in economic activity and especially, within the investments processes. From this reason the decision-makers have to assess the economic risk in order to find out some modalities for its better management.

A relevant indicator for evaluating the operational risk is Degree of operating leverage that expresses the extent to which the fixed costs (compared to variable costs) contributes to the operations in a firm.

The research highlighted that Degree of operating leverage can express the concrete level of economic risk before and after implementation of investments. This aspect requires knowing the elements which could influence the risk. It is very tied with the costs structure and become more and more an expression of the risk degree resulted from the rationality in administration the firm's resources.

The analysis model proposed in this study is valuable for the situations in which the risk of the investments decisions has to be evaluated. It ensures the quantification of influences given by the variation in time of some significant factors, aspect which eases the decisions concerning the necessary measures for reducing the risk.

The model had been validated in the case study facilitating the analysis of the investment framework within an agricultural holding having in view the economic risk related to implementation of an important investments project.

Analysis made for investments process of development the vineyard plantation, revealed some elements which are also, determinant for the economic risk manifestation within the agriculture sector. If the decisions are well substantiate, they could influence the various parameters of the Degree of operating leverage, these being in fact the principal business risk components.

The analysis results points out the existence of many directions on which the decisions-makers have to concentrate in order to a more correct management of the economic risk. For most small business these directions are: improvement in market activity for achieving a high amount of sales and a better positioning towards the breakeven sales point; diminishing fixed costs in order to increase flexibility and firm's response to the market demands; functioning with more variable

costs that could be an advantage in the case of agricultural holdings; improvement the firm's safety margin and so, reduce the risk level; utilization with a higher efficiency of every resources for increasing the profit; increase the economic profitability and reduce the variation of the operating results through a better management of the production costs, eliminating all unessential elements; improvement of the managerial capacity to make the adequate changes in order to boost the efficiency.

Analysis and assessment of the investments projects from economic-financial point of view suggest that investments are feasible, efficient or risky. If we know the risk level and the elements which influence its manifestation, we can act for adoption of some measures of prevention.

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