Theoretical considerations regarding risk analysis models

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Abstract

The considerations regarding risk analysis and risk management have important use in any economic activity. Due to the actual evolution of the global economy, the number and complexity of the factors influencing economic development grow. Risk becomes a basic aspect associated to the activity of any economic agent. Depending on the abilities and specific capacities, any economic entity will take a certain risk relative to its own activity also known as failure risk. Based on the assumed risk level, the management policies may be adopted and the future strategies set up on short, medium and long term. Generally, economic agents' risk is considered to be the way the output of an activity varies under the pressure of the outer environment.
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Introduction

Concerning the moment a risk appear with regard to a company activity, it may be said that it is influencing permanently the evolution of the company. It appears when the company starts its activity or an investment; it continues while setting the objectives and the development of the activity, and continues with financing sources, management implementation, market finding, setting prices/taxes etc.

In other words, taking wrong strategic decisions, adopting wrong management steps or not correlating production volume to the specific requirements of the target market represent aspects that amplify the risk related to any economic enterprise. Thus, identification and avoidance of those steps implying a significant raise of risk associated to any economic activity and a raise of potential loss level represent a permanent target of all economic decision makers.

Following the studies, it results that profitableness of the economic activity is significantly influenced by the risk levels the agent accepts to assume. In other words, any economic agent allows himself to take a certain risk only in case the profitableness anticipated is a significant one.

Introducing *risk management* concept appears as being necessary. It considers minimizing losses, supplementary expenditures respectively while risk's producing.

Risk management consists in two main aspects, respectively: risk evaluation and adoption of measures to ensure the avoidance or risk effects diminution.

Risk evaluation implies using analysis methods, means and statistical techniques allowing approaching the factors generating risks while losses were minimal.

The second aspect of the risk management, adoption of ensuring measures to avoid or diminish risk effects considers redirecting transactions to lower risk exposure areas, up to giving up to those transactions, adopting some ensuring policies as last solution when prevention measures are not enough.

Risk may be generated by a diversity of internal factors and/or external independent by the economic agent, as follows: the specific activities developed by the agent, management policy adopted for all decision and management levels, agent's relations with providers, clients etc; economic, political, legal and legislative conjuncture; other factors.

Literature review

Ambrus, Mobius and Szeidl (2014) developed on the rish shared in social networks. Angeletos and Panousi (2011) analyze the entrepreneurial risk. Anghel and Dumitrescu (2016) focus on the liquidity risk, presenting an appropriate analysis model. Anghelache, Anghelache, Anghel and Niță (2016) approach the banking sector related risks, a previous work by Anghelache, Dincă, Asmarandei and Sfetcu (2009) described preventive measures to be used against these risks. Anghelache, Anghel and Manole (2015) provide theoretical and practical reference for risk modeling. Bansal and Shaliastovich (2013) analyze the risks on the bond and currency markets. Colacito and Croce (2011) evaluate the correlation between risk and real exchange rate. Du and Schreger (2016) develop on the sovereign risk influencing the currency. Krakel (2008) approaches the uneven tournament game with risk averse players from the viewpoint of risk optimization. Longstaff, Pan, Pedersen and Singleton (2011) evaluate the sovereign credit risk. Manole and Ursache (2015) present some models used in economic risk analysis. Savor and Mungo (2013) research focuses on the investors' attitude versus economic risk.

Methodological aspects:

Until now, in theory, any standard classification of all possible risks affecting the economic activity of an agent wasn't identified. Tagging risks may be done considering different characteristics specific to this the economic category identified.

The first risk classification criterion resides in the nature of risks. Thus, risks may be classified as follows:

- **commercial risk** refers to the development of the commercial activities of a company – providing raw materials and materials, selling the products, identifying more attractive markets and going to them-;
- **contractual risk** refers to the legal aspects of economic contracts closure and working;
- **economic risk (exploitation, operation and production risk)** refers to economic cycle operation circumstances, optimal resources exploitation, and optimal conditions for production activities etc;
- **financial risk (capital risk)** refers to the financial structure of company's capital;
- **currency risk** appears as a consequence of currency rate change for the currency used by the company in its transactions;
- **political risk** refers to losses conditioned by political regime changes or significant changes of the legal framework;
- **catastrophe risk** refers to losses owed to natural or human catastrophes.

Another risk classification criterion for the microeconomic level refers to the manner risks appear. **There** are three main risk categories:

- **economic risk** is determined by the incapacity of the company to adapt properly and in time, with minimal costs to the variation of the economic environment;
- **financial risk** depends on the debt rate and can be expressed by using result indicators calculated for the company respectively;
- **bankruptcy risk (insolvency risk)** that might be considered a financial risk, is connected to solvency as an important chapter of the economic-financial and patrimonial analysis of any economic entity.

Economic risk might be seen in the probability of losses due production shortage. Its level is influenced by the economic agent's efforts and by the evolution of the - Depending of the activity type of the economic agent and its rank inside the economic environment, the result of the economic exercise is determined by a series of aspects, such as: most of the tariffs for

utilities, growing competition level on the target market or technological progress. Also, the level of the economic risk that affects the economic agent's performance may be influenced by internal factors such as structure and size order of costs and by their behavior as to activity volume.

Economic risk evaluation by means of profitability threshold

Thus, the analysis of the economic risk by using profitability threshold (critical turnover, critical point, dead point) is necessary. Profitability threshold is considered to be a measure for company's flexibility up against its fluctuations, and also a way for risk measuring. Risk level will reduce itself with the diminution of the profitability threshold value.

The structure of costs and their partition as fix and variable present an important influence on company profitability.

The fix costs are independent as to whole activity, but they are intended to be covered even in those circumstances when the economic agent doesn't get any profit. Here are included costs for water and sewage, electricity, maintenance of the production spaces, costs for the management staff etc.

The variable costs are in a direct proportion with production level. The main cost types for this category refer to raw materials and direct materials provision, productive staff salaries, transport activities related to the production process etc. Exploitation risk is more powerful influenced by the fix costs value as they can be more easily covered when the turnover grows. Making use of the profitability threshold to evaluate the risk should admit therefore a calculation methodology and the awareness of its cognitive value. Finding profitability threshold is possible in value or physical units, day numbers, for the entire activity or for one process only. Concerning the companies with a uniform production, the profitability threshold in physical units is obtained starting with the hypothesis of a unitary variable cost consistent with the growth of production volume. This means that, no matter the physical volume of the sold production, the variable costs per product unit remains constant, only the total volume of costs being variable.

Also, starting from the hypothesis of a constant unit price per product (p), regardless the sold physical production volume:

$$p = \frac{CA}{q}$$
$$c = \frac{CV}{q}$$
, both relations are considered to be constant.

Considering the set of hypothesis previously defined, the profitability threshold for the physical the sold physical production covering the total of costs is calculated based on the relation system as follows:

CA = CT
CT = CV+CF
CA = CV + CF
$p \cdot q = v \cdot q + CF$

$$q = \frac{CF}{p-v} = \frac{CF}{mcv} = q_{PR},$$

where:
CV = variable costs;
CF = fix costs;
$m c v = p - v$ = unitary margin on variable costs.

Based on the theoretical arguments previously presented here, it is possible a graphic presentation of the relation existing between fix and variable costs value and the level of the production that allows the profitability threshold attaining.

Linear profitability threshold in physical and value units for a nonproductive company
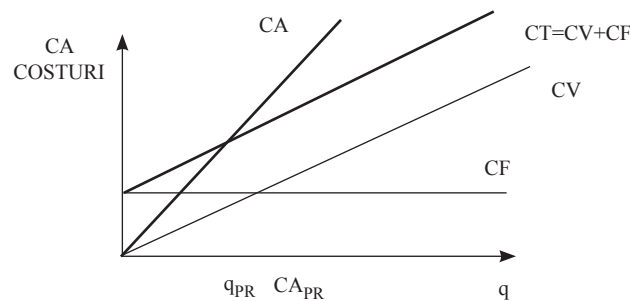
Based on the above graphic image and the previous theoretical elements it follows that:

- Company has no profit or loss when the company accomplishes the physical volume of production q_{PR}.
- Profit instability and operational risk level register very high values, when activity level is about critical point.
- Turnover exceeds costs and the company has profit, when the physical volume of production is higher than q_{PR}.

• Turnover does not cover costs level and the company has losses, when its physical volume of production is lower than q_{PR}.

Setting profitability threshold in value units means to use the same basic relations making possible to get profitability threshold by multiplying the profitability threshold in physical units by unitary selling price (p).

$$R_{mcv} = \frac{p - v}{p}$$

$$CA_{PR} = \frac{CF}{Rmcv}$$

$$CA_{PR} = q_{PR} \cdot p$$

where:

R_{mcv} - margin rate on the unitary variable cost.

When time date is wanted determined or the number of days necessary to reach the critical point the profitability threshold might be evaluated in days. The following calculation relation might be used:

$$PR_{days} = \frac{CA_{PR}}{CA_{prev}} \cdot 360$$

Setting the profitability threshold is only the first stage when evaluating the risk when exploiting enterprise possibilities. In order to do this, a set of specific indicators able to express better the level of risk assumed by the firm should be determined. Among them there is:

• **α position indicators as against profitability threshold**

$$\alpha = CA_{prev} - CA_{PR}$$
$$\alpha' = \frac{CA_{prev} - CA_{PR}}{CA_{PR}}$$

The position indicator in absolute values is known as "absolute flexibility" and it expresses the company's capacity to modulate its production and to adapt to market requirements. The bigger is this indicator, so the operational risk is smaller.

The position indicator in relative values with a calculation basis of the turnover relative variation, as against the profitability threshold is called also "volatility coefficient". It has the same informational value as the absolute indicator.

• The relative position as to the profitability threshold

$$R_{PR} = \frac{CA_{PR}}{CA_{prev}} \cdot 100$$

Technically, the exploitation risk level will grow with this indicator level.

• Security indicator

The security indicator allows the evaluation of the security margin of the economic agent at a certain moment. This indicator may be calculated with this calculation relation:

$$I_S = \frac{CA_{prev} - CA_{PR}}{CA} \cdot 100$$

The evaluation of the position of an economic agent as to the value of the profitability threshold allows submission to one of the following circumstances:

- unstable – turnover is up to 10% over the profitability threshold;
- stable – turnover is up to 20% bigger than the profitability threshold;
- comfortable – turnover exceeds up to 20% the profitability threshold.

Analysis of the profitability threshold is used as an efficient method to evaluate risk in exploitation especially when adopting management decisions of great importance, as follows:

- in case of certain decisions regarding certain products, profitability threshold analysis
- may be helpful to determine the size of the turnover for the respective product, making the company profitable if producing it;

When evaluating the effects of a general extension of the operations level of a company; the extension will generate an increase both of the fix and variable costs, but also of the forecasted turnover;

- in case the economic agent intents to develop projects to modernize and automate the company, asking for investments in fixed assets, with a view to a further diminishing of the variable costs (especially work costs), the analysis of the profitability threshold may help the deciding agent to foresee the consequences of these projects.

The evaluation of the economic risk by elasticity coefficient

Another way to evaluate the exploitation risk for an economic agent needs the analysis of the sensibility result of exploitation when the environment where the company operates is variable. The elasticity coefficient was introduced, that can be determined by the following calculation relation:

$$e = \frac{\frac{\Delta RE}{RE}}{\frac{\Delta CA}{CA}}$$

RE - the result of exploitation activity;
CA - foreseen turnover.
Between elasticity coefficient and the profitability threshold the following calculation relation may be identified:

$$e = \frac{\frac{RE - RE_{PR}}{RE}}{\frac{CA - CA_{PR}}{CA}} = \frac{CA}{CA - CA_{PR}} = \frac{CA}{CA - \frac{CF}{R_{mcv}}}$$

where:
RE = Exploitation result;
RE_{PR} = exploitation result in the critical point;
RE_{PR} = 0;
CA = foreseen turnover.

The value of the elasticity coefficient depends on the relation between activity level and the profitability threshold. When the economic agent is distant as against the profitability threshold, and the position indicators are higher, the elasticity is smaller, so the exploitation risk is smaller. Around the profitability threshold, the elasticity of the exploitation result is higher and so the exploitation risk.

Conclusions
This paper demonstrated the usefulness of risk analysis methods. The authors have presented the classification of risks. In spite of the significant evolution of the late prevision techniques and methods, it is practically impossible for an economic agent to make an accurate estimation of different output components (cost, price, physical volume) or those of the exploitation circuit. This is the way risk influences the activity of any economic agent. One of the recommended methods of operational risk valuation is the study of profitability threshold.

Bibliography

1. Ambrus, A., Mobius, M., Szeidl A. (2014). *Consumption Risk-sharing in Social Networks*, American Economic Review 104(1), Pages: 149-182
2. Angeletos, M., Panousi V. (2011). *Financial Integration, Entrepreneurial Risk and Global Dynamics*, Journal of Economic Theory 146:3
3. Anghel, M.G., Dumitrescu, D. (2016). *Model for Analyzing the Liquidity Risk*, Romanian Statistical Review Supplement, Issue 6/2016, Pages: 68-70
4. Anghelache, C., Anghelache, G.V., Anghel, M.G., Niţă, G. (2016). *General Notions on banking Risks*, Romanian Statistical Review Supplement, Issue 5/2016, Pages: 13-18
5. Anghelache, C., Anghel, M.G., Manole, A. (2015). *Modelare economică, financiar-bancară şi informatică*, Editura Artifex, Bucureşti
6. Anghelache, C., Dincă, I., Asmarandei, A., Sfetcu, M. (2009). *Principalele măsuri de prevenire a riscurilor bancare*, Supliment al Revistei Române de Statistică, Pages: 123-126
7. Bansal, R., Shaliastovich, I. (2013), *A Long-Run Risks Explanation of Predictability Puzzles in Bond and Currency Markets*, Review of Financial Studies, 26, Pages: 1–33
8. Colacito, R., Croce, M. (2011). *Risks for the Long Run and the Real Exchange Rate*, Journal of Political Economy, 119 (1), Pages: 153–181
9. Du, W., Schreger, J. (2016). *Local Currency Sovereign Risk*, The Journal of Finance, 71 (3), Pages: 1027–1070
10. Krakel, M. (2008). *Optimal risk taking in an uneven tournament game with risk averse players*, Journal of Mathematical Economics, 44(11), Pages: 1219–1231
11. Longstaff, F., Pan, J., Pedersen, L., Singleton, K. (2011). *How Sovereign Is Sovereign Credit Risk?*, American Economic Journal: Macroeconomics, 3 (2), Pages: 75–103
12. Manole, A., Ursache, A. (2015). *Modele utilizate pentru analiza riscului economic*, ART ECO - Review of Economic Studies and Research, Vol. 6/No. 2, Pages: 84-90
13. Savor, P., and Mungo, W. (2013), *How Much Do Investors Care About Macroeconomic Risk? Evidence from Scheduled Economic Announcement*, Journal of Financial and Quantitative Analysis 48, Pages: 343–375