Bankruptcy Risk Analysis Based on the Patrimonial Balance Sheet

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Abstract

Due to the fact that the results obtained and those expected are permanently under the influence of unforeseen events that may occur at any time of the activity of an economic operator, in the competitive economy, the viability of any business is linked to risk. The risk is related to uncertainty, which expresses a state of uncertainty regarding the future. In the paper, the authors try to present by statistical methods, respectively by the method of scores and by the method of financial diagnosis, an analysis regarding the risk of bankruptcy based on the financial-accounting function, which mainly focuses on profitability and risks. Within the financial-patrimonial analysis of an economic entity, a particular place is occupied by its ability to be solvable, but without losing sight of the risk analysis of bankruptcy. The authors believe that any activity involving a consumption of capital is subject to risks that accompany profitability. The paper concludes with the authors' conclusions regarding the need for bankruptcy risk analysis.

Key words: analysis, financial balance, bankruptcy, risk, solvency

J.E.L. classification: G17, G19, G32

1. Introduction

The contemporary society is constantly confronted with a variety of risks: environmental - natural, professional, which affect health, etc., whose action can be decisive. There are a multitude of definitions given to the risk, and one of them presents the risk as a threat, a possibility of producing an event that causes damage, which is characterized either by the probability of occurring or by the severity of its consequences.

The extent of the risk cannot be known exactly, depending on the conditions under which it occurs, the risk being able to produce more or less different effects. The same type of risk can be measured, described, analyzed, in different visions and purposes, depending on the observer concerned, although another person, regarding an objective outside the situation can make a correct assessment of the potential risk. Regarding this fact, future actions will be directed by the person directly interested in managing the respective risk, depending on his degree of perception on the risk.

Risk, which originates from multiple causes and various forms, is a natural component of the economic-social life having several meanings, such as: accident, danger, uncertainty, uncertainty regarding the exposure of an economic entity to the external or internal environment, damage, a property or a person subject to a danger, probability of winning, etc. In the contemporary society the listed risks have been grouped into certain types of risk, as for example a grouping may include: country risk, insurance risk, foreign exchange risk, contractual risk, bankruptcy risk, investment decision risk, risk securities, marketing risk, etc.

In fact, each risk is composed of four components classified as follows:

- resources, assets, population or earnings (who or what is affected) that can be threatened by dangers, i.e. things on which the continuity of the operations of an activity depends;

- the factors that affect the evolution of the risk those internal or external particularities of these resources that tend to increase or reduce the probability of the danger or the severity of the consequences, if realized; the continuity of the activity carried out by an economic entity implies substantial efforts, as well as an increased attention to the way in which the internal and external environment evolves from the branch in which it operates;
- dangers (those that trigger the risk) a wider notion of a range of forces that can produce an adverse result;
- consequences (consequences of the occurrence of the risk) how the effects of the danger affect the consumption of various resources.

We must emphasize that, over time, the risks have happened, are happening and will happen, affecting the assets, values, assets, life or integrity of the natural or legal persons, as the case may be.

Over time, an imperative necessity has become receiving as precise information as possible regarding the possibility of bankruptcy of an economic entity. Bankruptcy is the last stage in the economic existence of an economic entity. In the specialized literature the term of failure is considered the equivalent of bankruptcy and vice versa. Basically, bankruptcy is the last stage in the existence of an economic entity, the financial imbalance being its pre-emptive stage and represents according to the concluded financial contracts, the inability to pay off current bonds through liquid current assets.

In the last decades, many specialists in the field of finance, financial analysis, financial management, applied statistics, etc. had a major concern in developing models for risk analysis, monitoring and counteracting.

Each economic entity that performs the financial analysis aims to measure the profitability of its capital and the risks with which the respective profitability was obtained. At the level of the entire economic asset, respectively of each source of capital (equity or long-term debt), both risk and profitability are analysed.

The objective of the scoring method is to provide predictive methods of evaluating the risk of bankruptcy by an economic entity.

Scoring method aims to provide predictive methods for assessing the risk of bankruptcy of an economic entity. Its application involves observing a set of economic entities grouped into two categories, respectively with financial problems and without financial difficulties. For each category a set of ratios is applied, and then the best linear combination of ratios is determined to allow the different groups of economic entities to be differentiated.

In this context, risk analysis represents an important dimension of strategic business management, given the fact that, an economic entity does not have the certainty of future results flows and does not have complete control over them. The object of risk management which is achieved through a succession of steps, such as: identifying the type of risk, analysing and evaluating each risk, prioritizing the interventions in risk situations, etc., is given by the prevention and limitation of the risk factors, as well as by towards permanent control over the dynamics of risk.

2. Theoretical background

At the global level, starting with the 60s, the concern for forecasting the risk of bankruptcy was realized through the method of scores using statistical elements of financial analysis, starting from the ratios system. Any economic entity that tends to fit in with the demands of the market economy, regardless of the activity profile, the legal form, the size and socio-economic space in which it operates, needs to adapt permanently to the risky situations that may arise, both in current activity as well as prospective activity.

An essential role in this regard lies with the proper analysis and assessment of risks, which through the methodological approach taken ensures the identification of possible solutions to avoid, reduce or control potential difficulties that may arise during the activity of the economic entities.

The answers to the established problem were made possible by the documentary research for understanding the theoretical aspects of a series of works, both from foreign literature (as reference names F. Choi, C.A. Frost, G. Meek with the work "International Accounting", C. Nobes, R.

Parker authors of the book "Comparative international accounting", etc.), as well as within the national one.

Over time, the concept of risk and its methods of evaluation have been studied by authors such as: M. Niculescu "Strategic global diagnosis", E. Druică "Economics of risk. Theory and applications", I. Vasile "Financial management of enterprise". Also, in our country an important contribution in the economic-financial analysis was made by Mr. Pruna Petru - 2003.

With the conceptual globalization of risk, new valences gained. In our century, the scientific outlook is dominated by its uncertainty and its appeal. We live in a stochastic universe, and probabilistic thinking applies in all spheres of activity.

3. Research methodology

The study approach is, in principle, an analysis of the specialized literature in the analyzed field. The research methodology applied to the present study is based on the preliminary documentation for understanding the concepts of diagnostic analysis and bankruptcy risk.

Theoretical research describes and analyses the current state of knowledge, contributing to its completion and clarifying certain aspects necessary for the subsequent application. The starting point of the research is the theoretical documentation through the literature specific to the field, fact that allowed the authors' opinion to be expressed at the end of the paper.

The theoretical approach is complemented by an empirical study applied to an economic entity in the industrial field, starting from the following hypotheses:

H1 - risk assessment is a priority for economic entities;

H2 - certain characteristics of the accounting information have a decisive influence in the process of evaluating the risk of bankruptcy.

4. Asset balance sheet - source for static analysis of bankruptcy risk

The most well-known definition of risk is that given in 1921 by Frank Knight. In the paper entitled *Risk*, *uncertainty and profit*, it suggests that the terms of risk and uncertainty are revealed in the economic-financial analysis of an economic entity. He states that "the term *risk* can be used to maintain the distinction between measurable and immeasurable uncertainty."

Essentially, the financial-patrimonial analysis is a static analysis in which the solvency and value of an economic entity are priority. If in the past the patrimonial analysis was the only way of assessing the risk, and the working capital and the solvency ratios were the tools for investigating the bankruptcy risk, at present, it is analysed through three methods presented in table no. 1.

Table no.1 The correlations between the accounting information and the main methods of evaluating the risk of bankruptcy

The type of	Method of	Examples of information used in the Sources of information		
risk	evaluation	calculation		
Risk of	Patrimonial balance	Equity, Short and long term debt,	Balance sheet; Profit and loss	
bankruptcy	sheet - Static analysis	Permanent capital, Fixed assets	account	
	Ratios method -	Working capital, Short and long-term debt,	Balance sheet; Profit and loss	
	Static analysis	Equity, Current assets	account	
	Scoring method -	Total assets, Turnover, Equity, Debts, Chart of intermediate manageme		
	Static analysis	Reserves, different types of expenses	balances, Balance sheet; Profit and	
			loss account	

Source: authors' processing

The authors believe that coherent financial statements that faithfully represent the entire economic and financial activity of the economic entity help to increase the degree of risk management. The operational tools used in the analysis of the risk of bankruptcy are mainly the solvency ratios and the working capital.

4.1. Analysis of the working capital fund

The financial statements are intended to provide useful information in making economic decisions and to the users, regarding the performances and financial position of the economic entities. Economic decisions involve assessing the ability of the economic entity to generate cash or cash equivalents, the period and the security of their generation. The balance sheet provides the economic-financial indicators used in the static analysis. This analysis helps in the financial diagnosis of the economic entity, as well as in determining the strengths and threats of the activity of the entity.

In the patrimonial regard, the assets and liabilities are composed of two masses, such as:

- a ground with a duration <1 year, movable, composed of the current assets Ca and short-term bonds of the STB;
- a ground with a duration> 1 year, permanent, consisting of the permanent capital CP and the fixed assets Fa.

An economic entity is solvable, according to the patrimonial theory, if it ensures the balance of the grounds of the same duration and it respects the following financial rules:

Fixed assets Fa = Permanent capital PC

Current assets Ca = Short-term bonds STB

As the assets and liabilities are from the point of view of the asymmetric risk, the realization of these requirements in practice is difficult, a perfect regularity between receipts and payments could not exist. Thus, according to the economic theory, a reserve called the patrimonial working fund is required. This fund represents the part of the permanent capital that exceeds the value of the net assets and can affect the financing of the current assets, according to the calculation relation:

$$WC = Ca - STB$$

Therefore, the working capital represents the surplus of the current assets over the value of the short-term payment bonds. It is possible to calculate an own working capital, respectively a foreign working capital, starting from the own and borrowed component of the permanent capital. The amount of the surplus of own capital over the value of the fixed assets is given by the own working capital and is determined by the following formula:

Own working capital = Working capital assets - Long and medium term bonds

The difference between the working capital fund and the own working capital represents the foreign working fund. The correspondence of the liquidity of the assets with the demand of the liabilities allows the short-term assessment of the risk of default for the bonds, therefore of the risk of bankruptcy.

Situations that may exist between current assets, such as potential liquidity and demand

a)
$$Ca = STB \rightarrow WC = 0$$

In this case, the short-term solvency seems certain, but the balance is fragile due to the disturbances that may intervene in the realization of the debts.

b)
$$Ca > STB \rightarrow WC > 0$$

In this case, there is a surplus of potential short-term liquidity, compared to the potential short-term demand, in which case the entity has a favourable situation in terms of solvency, being able to meet the maturity bonds, having a buffer stock of potential liquidity.

c)
$$Ca < STB \rightarrow WC < 0$$

In this case, the liquidity covers the requirements, the entity has difficulties in maintaining the financial balance. There is a short-term surplus of liquidity compared to short-term demand. From the solvency point of view, the entity presents a favourable situation, being able to meet the bonds on maturity, by having a buffer stock of liquidities.

d) Ca
$$<$$
 STB \rightarrow WC $<$ 0

In this case, the liquidities one fully covers the demands, the entity having difficulties in maintaining the financial balance. For the financial balance, the proper assessment of the significance of the working capital requires taking into account the average duration of the assets and liabilities that in practice are not equal, but for an exception.

Therefore:

- if the current assets rotate faster than the liabilities, the entity can ensure its financial balance, this being compatible only with a working capital lower in value, but also with a negative working capital;
- if current assets rotate slower than short-term liabilities, maintaining a financial balance requires a positive working capital and a higher value.

So, there is no simple relationship between the working capital and the risk of bankruptcy within an economic entity, as long as some achieve a financial balance with a negative working capital, and others prove insolvency as opposed to obtaining a positive and respective working capital, maintaining the solvency with a low working capital vs. financial imbalance despite the very high working capital.

Financial working capital = Equity + Medium and long-term debt - Fixed assets
We consider an example on an industrial economic entity that presents the following simplified balance sheet:

Assets	Balance at t	he end of the	Capital and debt	Balance at the end of the	
	financial year			financial year	
	N-1	N		N-1	N
Fixed assets	367.922.117	362.099.332	Equity	302.712.358	321.819.179
Intangible assets	1.585.663	1.902.075	Provisions	1.386.000	1.386.000
Property, plant	350.407.233	352.547.167	Liability	-	194.498.687
and equipment					
Financial assets	15.929.221	7.650.090	Long-term debt	-	84.642.694
Current assets	111.524.084	180.424.106	Short term debts	-	109.855.993
Stocks	-		Providers	-	25.657.622
Claims	101.297.049	84.642.694	Other operating debts	109.297.049	84.642.694
The house and	10.227.035	3.829.843	Short-term bank debt	66.050.794	2.419.413
bank accounts					
Prepayments	-	838.050	Revenue in advance	-	-
Total assets	479.446.201	543.361.488	Total capital and debt	479.446.201	543.361.488

The profit and loss account of the entity under consideration is as follows:

Element	Financial year N		
Fiscal value	522.962.407		
Material expenses	280.967.413		
Staff costs	81.905.612		
Interest expenses	2.419.413		
Income tax expenses	6.450.448		
Net income	19.106.820		

According to the Ac > OTS rule, the working capital WC > 0 means that the financial balance is satisfactory as the liquidities fully cover the potential requirements. During 2017-2018 WCF is positive, the entity being able to cover the need for investments from permanent capital.

4.2. Analysis of financial quality through the ratios method

According to some authors (Ph. Avare et.al, 2002) the synthesis accounting documents are the basis of the risk determination method using ratios, transforming the raw data into useful information. The origin of the financial profitability of the economic entities derives from the profitability of the asset.

According to some specialists, the financial profitability will be equal to the economic one if the interest ratio is equal to the economic profitability, and if the cost of the debt is higher or lower than the economic profitability, the result available to the shareholders will decrease or increase as a result of the loans.

The deregulation of the cash flows and payments can lead to the insufficiency of the liquidity thus appearing the liquidity risk - practically an insufficiency of the liquidity at the terms of repayment of the credits and the related interests. The objective of the liquidity ratios is the measurement of the capacity of the economic entities to honor their financial commitments in the short term.

Liquidity rules require comparing the duration of allocations with that of resources. We present below the calculation formulas of these indicators.

Current liquidity analysis:

Current liquidity (Cl) expresses the ability of an economic entity to meet its short-term bonds from current assets and is calculated as the ratio of current assets to current liabilities.

The minimum value of the indicator is 1.00, and if the resulting value is lower, it is concluded that the company is in danger of inability to pay. The maximum accepted value is 2.00, and if the resulting value is above this threshold, it is concluded that the economic entity properly uses the current assets.

$$C1 = \frac{Current \ assets}{Current \ debts} = \frac{180424106}{109855993} = 1,64$$

The value obtained being of 1.64, it turns out that the considered entity properly uses current assets and is not in danger of incapacity to pay.

Rapid liquidity analysis:

Rapid liquidity (Rl) means the ability of an economic entity to pay relatively quickly, short-term liabilities, from current assets, except for stocks considered to be the least liquid.

The indicator's reference values are:

- the minimum value 0.65 below this level the entity is in danger of inability to pay;
- maximum value 1.00 above this value it is considered that the current assets are not used properly.

$$Rl = \frac{Current \ assets - Stocks}{Current \ debts} = \frac{119258604}{109855993} = 1,09$$

The value obtained by 1.09 denotes that the economic entity may cover its current bonds from current assets, but it may also mean that the entity does not properly use its current assets.

General solvency analysis:

The minimum accepted level of these ratios is 2.00 and the maximum of 3.00.

$$ISG = \frac{Total \ assets}{Total \ debts} = \frac{543361488}{194498687} = 2,79$$

The value obtained by 2.79 denotes that, the economic entity uses the current assets properly and is not in danger of incapacity to pay.

Debt ratio analysis:

If the percentage of this ratio exceeds 60%, then, the economic entity is not eligible for a new loan, the financial institutions not granting any loans in these situations.

$$Dr = \frac{Borrowed\ capital}{Comitted\ capital} = \frac{84642694}{406461873} \ x\ 100 = 20,83\%$$

In this case, the debt ratio is 20.83%.

Analysis of the interest ratio debt

This ratio reflects the ability of the economic entity to make a profit to pay interest on loans and to remunerate shareholders in the form of dividends.

The recommended level is at least 3.

$$Ir = \frac{Profit before interest payment and profit tax}{Interest expenses} = \frac{27976682}{2419413} = 11,56$$

The economic entity considered has an interest ratio of 11.56 which is a good interest ratio.

4.3. Scoring method - bankruptcy risk analysis

The scoring method uses quantitative data on the situation of the economic entity, in order to achieve a financial score for the general financial assessment.

The most used method by the banking and financial media for their own credit ratings is the "scoring" method, based on the "Z" model, which allows for quick positioning towards the beneficiaries of loans regarding the risk of bankruptcy. This method represents a means of identifying the risk of bankruptcy and the evolution of the activity carried out by an economic entity.

The Z score seems to be a linear function with several variables characterized by weighting coefficients, determined by the method of least squares.

Concerns regarding the elaboration of forecasts regarding the risk of bankruptcy start from a grouping of ratios closely correlated with the health status of the economic entities, aiming to determine a function that allows to estimate the probability that an economic entity will register losses and consequently be unable to honor his clients and banks that gave him loans.

There are several scoring methods for early risk assessment and forecasting of bankruptcy, such as: the Conan-Holder model, the Bank of France model, the Romanian Commercial Bank model, the Agricultural Bank model, the Altman model.

The authors decided to apply the Altman and Taffler models.

Altman Model:

The following calculation relation is used in the application of the model:

$$\begin{split} Z=&0,717X_1+0,847X_2+3,107X_3+0,420X_4+0,998X_5,\\ \text{where:}\\ X_1=&\frac{\textit{Current assets}}{\textit{Total assets}}=\frac{180424106}{543361488}=0,332\\ X_2=&\frac{\textit{Reinvested profit}}{\textit{Total assets}}=\frac{19106821}{543361488}=0,0352\\ X_3=&\frac{\textit{Gross profit}}{\textit{Total assets}}=\frac{25557269}{543361488}=0,047\\ X_4=&\frac{\textit{Equity}}{\textit{Long-term obligations}}=\frac{321819179}{84642694}=3,802\\ X_5=&\frac{\textit{Fiscal value}}{\textit{Total assets}}=\frac{522962407}{543361488}=0,9625 \end{split}$$

It is known that, for different values of Z, in practice the following situations are encountered:

Z <1,8 - bankruptcy in one year;

 $1.81 \le Z \le 2.675$ - area of uncertainty with a high risk of bankruptcy;

 $2,675 \le Z \le 2.99$ - area with low bankruptcy risk;

Z> 2.99 - area without the threat of bankruptcy.

$$Z = 0.717 \times 0.332 + 0.847 \times 0.0351 + 3.107 \times 0.047 + 0.420 \times 3.802 + 0.998 \times 0.9624$$

= $0.238 + 0.0297 + 0.146 + 1.5968 + 0.96 = 2.97$

The value obtained is 2.97 - which indicates that the economic entity is in an area with a low risk of bankruptcy.

Taffler Model:

The minimum threshold for this model is 0.2. If the minimum threshold is lower, then the economic entity is on a direct path to bankruptcy.

The following calculation relation is used in applying this model:

$$Z = 0.53X_1 + 0.13X_2 + 0.18X_3 + 0.16X_4$$

where:

$$X_1 = \frac{Profit}{Short\ term\ debts} = \frac{19106821}{109855993} = 0,1739$$

$$X_2 = \frac{Current \ assets}{Amount \ of \ debts} = \frac{180424106}{194498687} = 0,9277$$

$$X_3 = \frac{Short\ term\ debts}{Total\ assets} = \frac{109855993}{543361488} = 0,2022$$

$$X_4 = \frac{Profit}{Total \ assets} = \frac{19106821}{543361488} = 0,0352$$

The resulting value is 0.2560 which indicates that the economic entity has low chances of reaching bankruptcy in the near future.

5. Solvency ratios analysis

The solvency ratios make a report of the liabilities required and of the assets obtainable in order to evaluate the risk of bankruptcy. In this regard, the most used ratios are:

a) The general solvency ratio (GSR) - compares all the bonds due under one year, with all the potential liquidities associated with the current assets and is calculated according to the following calculation relation:

This ratio allows the appreciation by the current asset, of the degree of coverage of short-term bonds. The unitary size of the ratio shows the full correspondence between the current assets and their sources. The supra-unitary size of this ratio shows a higher level of current assets than shortterm liabilities and respectively the use for financing the exploitation of part of the permanent capital. This ratio is also called the ratio of the working capital WCR which is determined by the following calculation relation:

When the coverage of current assets competes for permanent capital, in addition to short-term bonds, the working capital ratio is superunit. The significance of the general solvency ratio has a large margin of approximation due to the large number of variables, such as: the intensity of the seasonality of the activity of the economic entities, the structure of the current assets, the nature of the activity sector, the ratio of rotation of the assets and stocks.

b) The partial solvency ratio PSR is characterized by excluding stocks from current assets due to the high degree of uncertainty in terms of liquidity and their value. It is determined by the following calculation relations:

PSR reveals the ability of the economic entity to pay its short-term bonds, from availability and from receivables. A sub-unit size of this ratio indicates the need for a high degree of prudence regarding the structure of the receivables, respectively the number of clients and their weight in the total receivables. The ratio between 0.8 and 1, according to some specialists in the economic field, represents an optimal situation regarding the solvency.

c) Immediate solvency ratio ISR corresponds to the most liquid elements of the asset, with short-term bonds:

ISR = (Investments + Availability)/(Short-term obligations)

In economic theory it is estimated that ISR must be greater than 0.3.

A good interpretation of the ratio must also contain information on the conditions of the activity of the economic entity, since, although a high level of this ratio indicates a high solvency and a good liquidity, it can have various meanings, including a less performant usage of available resources. On the one hand, a high size of the ratio does not represent a guarantee of solvency if the other assets have a low degree of liquidity, and on the other hand, a low size of the immediate solvency ratio can be compatible with maintaining the financial balance in the situation in that the economic entity would greatly reduce the value of the receipts, under the conditions of holding stocks, receivables, investment values, in full agreement with the exigibility of the bonds within the stipulated term.

In order to assess the risk of bankruptcy, the financial institutions in the market economy countries also resort to other types of ratios, such as the Raf financial autonomy ratio. This ratio is calculated with the following calculation relation:

RFA = (Medium and long term bonds)/(Equity)

The size of the ratio is preferred by the creditors to be sub-unitary, and for the assessment of the solvency degree of an economic entity, the net accounting asset is compared with the total of the liabilities, the net accounting asset preferable to be greater than one third of the liabilities.

In practice, the solvency of an economic entity by the ratio method is less significant, the emphasis being placed on the appreciation of the overall liquidity of the entity.

6. Conclusions

The manifestation of the general financial balance at the level of the economic entity is revealed with the help of the analysis for the financial-patrimonial position.

A positive working fund reveals the long-term achievement of the financial balance. During the analyzed period, the positive size of the working capital reflects the long-term economic entity independently from the creditors. Taking into account the fact that the potential liquidities fully cover the potential exigencies, it follows that the considered economic entity does not present difficulties regarding the financial balance, and the need for investments can be covered by the permanent capital.

The authors conclude that the scoring method is an accuracy method for conducting bankruptcy risk analysis within an economic entity.

Therefore the two hypotheses stated at the beginning of the study, respectively the first hypothesis that the risk assessment is a priority for the economic entities is verified and valid, and with regard to the second hypothesis that certain characteristics of the accounting information they have a decisive influence in the process of evaluating the risk of bankruptcy, it can also be said that it is a verified and valid statement.

Therefore, the economic entity in this case, knows very well the problems related to risk management and therefore manages them very well, being an example to be followed for other entities. Following the application of the scoring method, the economic entity proved to be solvable and is very knowledgeable about the mechanism of securing and using potential liquidities to meet their potential needs.

Through the balance sheet it was found that, the permanent needs for the allocation of the money funds are covered by the permanent capital, especially from the equity, and the temporary needs are financed from the temporary resources.

Thus, the economic entity carries out a profitable activity and has a stable situation on the economic market. Its vision for the future is to attract new customers and expand its activity in other areas of our country.

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