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CONSIDERATIONS ON THE METHODS OF PREDICTION OF AN ENTITY'S BANKRUPTCY

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Abstract: *Assessing and evaluating the financial health of an entity requires assessing the risks accompanying the activity, some of which indicate vulnerability, while others predict bankruptcy.*
The study of the bankruptcy causes has shown that this phenomenon is a consequence of the progressive degradation of the entity's financial situation and may be predictable long enough before its appearance by means of some accounting and banking methods.
To what extent do these methods allow the detection of the signals of degradation, which anticipate the bankruptcy? Is it enough to use just a single method? Is it necessary to combine several methods of analysis? These are some questions that support the desirability of this theme.

Key words: *assessing the risk of bankruptcy, accounting methods, banking methods.*

Introduction

In Romania, insolvency is regulated by Law no. 85/2006 regarding the insolvency procedure. The law treats approximately equal the two major components of the insolvency (judicial reorganization and bankruptcy).

Both the studies and the analysis published in the insolvency field in our country show that the majority of the entities to which the insolvency procedures opened ends up becoming bankrupt, after the period of observation. This conclusion is supported by the statistical data of the Ministry of Justice, according to which the percentage of the cases confirming the plan of reorganization, on which judicial reorganization is carried out, fell steadily. Moreover, the very future regulation introduced by Law no. 85/2006 recognize this, by establishing a simplified bankruptcy procedure, procedure that provides the legal means for rapid removal from the market of the entities that do not have real chances of recovery.

Insolvency and, implicitly, bankruptcy are the consequence of a high level of indebtedness and a low degree of solvency that can bring the entity in financial difficulty, which requires the procedure of judicial reorganization.

The causes that can lead to bankruptcy are numerous and aim, primarily, the reduction of the activity, the reduction of the margins and the rates of profitableness, specific cash-flow problems, and managerial problems.

To the study of the causes of bankruptcy, in addition to the national scientific effort to tackle the phenomenon and to make decisions to improve the legislation in the field and, especially, the measures to

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decrease or maintain control of it, we should add the broad international experience in the field, which shows that it can be forecast by using some accounting and banking methods.

Analysis of the Methods of Detecting and Prediction the Risk of Bankruptcy

The risk of bankruptcy expresses the possibility of occurrence of failure in payment of the falling due obligations as a result of closing with losses the previous years, uncovered losses that have entirely exhausted the equity. It can be predicted, as we have already shown, using both accounting methods and banking methods.

The accounting methods aim at the financial ratios balance on short and long term, solvency and liquidity, and the banking methods require the calculation of some score-functions, which allow the early detection of the risk of bankruptcy.

The calculation of a score-function is based on a set of financial ratios got from groups of entities that had behaved differently when confronted with the risk of bankruptcy. The specific literature recorded several scoring methods of predicting the risk of bankruptcy, of which we mention: the Altman model, the Conan-Holder model and the Romanian Commercial Bank model.

The Altman model developed in 1968 in the U.S.A., was the first score-function allowing the anticipation of 75% of the bankruptcies two years before they happened, being applicable, in particular, to the entities listed at the stock exchange.

The Z score-function involves five variables (ratios) and has the following expression:

$$Z = 1.2R_1 + 1.4R_2 + 3.3R_3 + 0.6R_4 + 0.999R_5 \quad (1)$$

where:

R_1 = current assets/total assets

is a measure of the entity's flexibility and underlines the percentage of the current assets within the total assets. High values of this record indicate the efficient use of the current assets;

R_2 = reinvested profit/total assets

is a measure of the capacity of the internal financing; an as high as possible value of this record being recommended;

R_3 = operating earning/total assets

represents the rate of efficiency of the use of the assets; an as high as possible value is recommended;

R_4 = market value of equity/total liabilities

represents the financial autonomy;

R_5 = gross turnover/total assets

is a ratio of the effectiveness of the assets, i.e. total asset turnover.

Depending on this score, the entity's vulnerability to the risk of bankruptcy is evaluated as follows:

- $Z > 2.675$ - good financial situation, reduced risk of bankruptcy up to nonexistent;
- $1.81 < Z < 2.675$ - precarious financial situation, undetermined bankruptcy risk;
- $Z < 1.81$ - difficult financial situation, insolvency, imminent bankruptcy risk.

By ordering on the basis of the correlation coefficient, Altman determined the relative contribution of each rate to the discriminatory power of the Z score-function and found that the first is the efficiency ratio of the use of the assets (R_3), followed by the total asset turnover (R_5), the degree of financial autonomy (R_4), the internal financing capacity (R_2) and the percentage of the assets within the total assets (R_1).

We are presenting below a possible model of calculating the Z score-function based on hypothetical data that can be extracted from an entity's financial statements (table no. 1):

Table no. 1
Calculation of the Z score-function – the Altman model

Variables (rates)	Year N-1	Year N
R_1 = current assets/total assets	141852/236420 = 0.60	181373/259104 = 0.70
R_2 = reinvested profit/total assets	23660/236420 = 0.10	38866/259104 = 0.15
R_3 = operating earning/total assets	26007/236420 = 0.11	33684/259104 = 0.13
R_4 = market value of equity/total liabilities	175390/78650 = 2.23	201880/72100 = 2.80
R_5 = gross turnover/total assets	203322/236420 = 0.86	233194/259104 = 0.90
The Z score-function	3.420	4.058

The values of the score-function determined for the two financial years, higher and increased values from the limit of 2.675 show a good financial situation, without any risk of bankruptcy. The entity is solvent, credible, the risk of bankruptcy is nonexistent and, therefore, eligible for credits.

The main disadvantage of this method is its restricted area of applicability, limited only to the entities from the American manufacturing sector in which the research found at its basis was carried out, and the conclusions can be extrapolated to a wider universe only, and only if one adapts the model of calculating the score-function to the particularities of a sector.

The Conan-Holder model

J. Conan and M. Holder have developed a model of discriminatory analysis that determines the likelihood of an entity to reach the state of bankruptcy.

The score-function related to this model differs according to each sector of activity and allows the association to score of a probability of bankruptcy.

The model was developed in 1978 on a sample of 190 small and medium-sized entities, of which half became bankrupt between 1970-1975.

For the industrial entities, the score-function is as follows:

$$Z = 0.24R_1 + 0.22R_2 + 0.16R_3 - 0.87R_4 - 0.10R_5 \quad (2)$$

where:

R_1 = gross surplus from operating/total liabilities;

R_2 = permanent capital/total assets;

R_3 = current assets – inventories/ total assets;

R_4 = financial expenses/turnover;

R_5 = employee benefits expenses/added value.

Depending on this score, the entity's vulnerability to the risk of bankruptcy is evaluated as follows:

- $Z > 0.16$ - very good financial situation, bankruptcy risk < 10%;

- 0.10 < Z < 0.16 - good financial situation, bankruptcy risk between 10% - 30%;
- 0.04 < Z < 0.10 – alert, bankruptcy risk between 30% - 65%;
- - 0.05 < Z < 0.04 – danger, bankruptcy risk between 65% - 90%;
- Z < - 0.05 - failure, bankruptcy risk > 90%.

The values of the score-function determined for two financial years, based on the hypothetical data extracted from the financial statements of the entity selected as a case study, are presented in table no. 2:

Table no. 2
Calculation of the Z score-function – the Conan-Holder model

Variables (rates)	Year N-1	Year N
R_1 = gross surplus from operating/total liabilities	48763/78650 = 0.62	69216/72100 = 0.96
R_2 = permanent capital/total assets	179680/236420 = 0.76	199511/259104 = 0.77
R_3 = current assets – inventories/total assets	118210/236420 = 0.50	158054/259104 = 0.61
R_4 = financial expenses/turnover	4067/203322 = 0.02	6996/233194 = 0.03
R_5 = employee benefits expenses/added value	46795/95500 = 0.49	52800/120000 = 0.44
The Z score-function	0.329	0.427

The values of the score-function, which are higher than and increasing from the limit of 0.16, indicate a very good financial situation, the bankruptcy risk being less than 10%. The entity is solvent, trustworthy and can qualify for loans.

The Romanian Commercial Bank model uses a set of rates and performance ratio to determine an entity's credit worthiness for the granting of a credit on a score scale of six criteria (table no. 3).

Table no. 3
Criteria for assessing financial credit worthiness

Specification	Limited values	Points
0.	1.	2.
Current ratio	< 80%	- 2
	80% - 100%	- 1
	100% - 120%	+ 1
	120% - 140%	+ 2
	140% - 160%	+ 3
	> 160%	+ 4
0.	1.	2.
Solvency	< 30%	0
	30% - 40%	+ 1

	40% - 50% 50% - 60% 60% - 70% 70% - 80% > 80%	+ 2 + 3 + 4 + 5 + 6
Financial profitableness	< 0% 0% - 10% 10% - 30%	0 + 3 + 4
Asset turnover	< 5 5 - 10 > 10	+ 1 + 2 + 4
Dependence on markets Supply: from the country (A_t); from abroad (A_i) Selling: in the country (D_t); abroad (D_e)	$A_t > 50\%$; $D_e > 50\%$ $A_i > 50\%$; $D_e > 50\%$ $A_t > 50\%$; $D_t > 50\%$ $A_i > 50\%$; $D_t > 50\%$	+ 4 + 3 + 2 + 1
Guaranties	Charged deposits Pledges, mortgages Acquisitions of credits Cession of debentures	+ 4 + 3 + 2 + 1

Based on the scale, any entity can be introduced in one of the categories presented in table no. 4.

Table no. 4
Entities' classification according to the credit worthiness

Category	Points	The economic-financial situation – degree of risk
A	> 20	Very good, credits can be granted
B	16 - 20	Good, credits can be granted
C	11- 15	Oscillating, presents high risk
D	6 - 10	Special risk, does not present credit worthiness guarantees for being granted a credit
E	0 - 5	Precarious financial situation, with no credit worthiness guarantees

Entities that accumulate over 16 points (categories A and B) present a good economic and financial situation and can benefit from bank loans. Those that accumulate between 11 - 15 points show a high degree of risk, the granting of any loan involving a relative high risk premium. These entities should be watched from the solvency point of view in order to recover the loan at the first sign of disbelief. Categories D and E do not present sufficient credit worthiness guarantees and can not qualify for loans.

The method of scoring points for the assessing criteria for financial credit worthiness of the entity selected for study on the basis of the data extracted from its financial statements is illustrated in the following table:

Table no. 5
Scoring points scale

Specification	Year N-1		Year N	
	Level	Points	Level	Points
Current ratio = (current assets/current liabilities)x100	(141852/74500) x 100 = 190.40	4	(181373/70000) x 100 = 259.10	4
Solvency = (equity/total capitals) x 100	(175390/236420) x 100 = 74.18	5	(201880/259104) x 100 = 77.91	5
Financial profitableness = (gross profit/equity) x 100	(28700/175390) x 100 = 16,36	4	(41000/201880) x 100 = 20.30	4
Asset turnover = turnover/current assets	203322/141852 = 1.433	1	233194/181373 = 1.285	1
Dependence on markets (%)	$A_t > 50$; $D_t > 50\%$	2	$A_t > 50$; $D_t > 50\%$	2
Guarantee	Mortgage	3	Mortgage	3
Total		19		19

The score made by our entity classifies it in the B category, which means a good economic-financial situation and may benefit of bank loans with no risk of default on their maturity.

Conclusions

Bankruptcy is the result of gradual deterioration of an entity's financial situation. It can be anticipated long enough before its occurrence, as we have already shown, using different accounting and banking methods.

In short, the accounting methods aim at the financial ratios balance on short and long term, solvency and liquidity, and the banking methods require the calculation of some score-functions.

Using statistical methods of discriminant analysis, the value of the score-function calculated on the basis of some financial ratios allows us to classify the entities, from the economic-financial point of view, in: healthy, poor and bankrupt.

We also noted that the assessment of the bankruptcy risk is based both on financial ratios and non-financial ones that are specific to some homogeneous realities, respectively to some sectors of activity, which allows us to extrapolate the findings only, and only if the model of calculation is adapted to the particularities of each sector. A model suitable for the Romanian economy is developed by the Romanian Commercial Bank, where the economic and financial performances have a decisive.

It is not sufficient to use a single method; in time, several methods of analyzing the financial position should be combined, enabling the detection of the first signals of depreciation that anticipate bankruptcy at least three years before it happens.

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