



## Testing the Score Function | in Determining the Risk of Bankruptcy

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### ABSTRACT

*For a firm the causes generating risk can be multiple, from the specific performed activity, continuing with competition, the quality of the management system, the system of relations with customers, suppliers, banks, the lack of real information, circumstances of major force. It is therefore vital to know, even if only estimated, the dimensions of the real or potential risk, the generating causes, the possibilities of intervention by the managerial act. The bankruptcy risk is also influenced by factors others than financial ones. The analysis using the score function is not sufficient to show a clear failure.*

**KEYWORDS :** financial indicators, risk, bankruptcy

Becoming aware of the possibility of bankruptcy and identifying the causes that can generate it is a must. Any action taken to identify the causes leading to the occurrence of bankruptcy can significantly reduce company costs - direct costs (determined by accountants and lawyers' fees costs) and indirect costs (determined by the losses of the company and of the institutions with which it relates) generated by economic failure.

#### 1. Research premise:

The bankruptcy risk is influenced by other factors than the financial ones. Referring to the methods of forecasting bankruptcy the literature only relies on mathematical models having as variables the company's financial indicators. We will try to demonstrate that the analysis using the score function with financial variables is not enough to indicate a clear bankruptcy. If the premise of the research is confirmed, the analysis of some market factors (competition, economic and political environment stability, bureaucracy, taxation etc.) should be considered when determining the risk of bankruptcy.

#### 2. Current state of the research:

The challenge of the current economic reality is trying to use some economic models (building a score function which aims to provide predictive models for assessing the risk of bankruptcy of a company) to forecast the bankruptcy of enterprises, even if Taffler claimed (Taffler, Houston, 1980), that "every country needs its own model". The idea supported by Taffler limits the possibility of Romanian firms to apply the diagnostic models based on the score function, developed in other countries, as the variables of these models have a strong national character. In practice, the idea of limiting the conclusions and the applicability of a score function only for the economic space it was built for is widely accepted, even if it turned out that some models have a high degree of universality.

The most common statistical method used in studies of bankruptcy is the discriminant analysis which attempts to find certain variables that can be predicted (the Z score): the Altman model (the "Z" model/function), the Conan-Holder model and for Romania, the Anghel model and Băileșteanu model.

Because of the limits of the Conan-Holder model (the indicators employed cover only part of the remuneration of capital, the financial stability may increase due to a higher level of debt of the company, the intermediary liquidity can be achieved by increasing the trade credit to customers), the Altman model will be tested further - in addition, it is applicable in all industries using primary statistical data and not obtained by processing and it is most recommended for a rapid global assessment of the bankruptcy risk. This is because the Altman model was built under a stable economy, but it also considers the possibility that a state of economic instability may occur. To confirm the bankruptcy / non-bankruptcy, the result will be compared with the result obtained by applying Băileșteanu model.

The "Z" Altman model, which is a statistical and mathematical model of forecasting the bankruptcy of companies, used the variables considered to be the most representative part of a company's financial condition. He found that the analysis based on several variables, made with 5 indicators, allowed the provision of 75% of bankruptcies, two years before they occurred.

The "Z" Altman model is as follows:

$$Z = 3.3X_1 + 1.0X_2 + 0.6X_3 + 1.4X_4 + 1.2X_5$$

The variables used are: the flexibility of the company, the self-financing rate of total assets, the debt capacity of the company, the economic rate of return, the return on assets. Depending on their score, firms rank on three levels, namely: creditworthy companies ( $Z > 3$  or  $2,7$ ), companies with temporary financial difficulties ( $1,8 < Z < 3$  or  $2,7$ ), bankrupt firms ( $Z < 1,8$ ).

**Băileșteanu model** assumes (Băileșteanu, 1997), that the facts that signal the company bankruptcy are: impossibility of paying current obligations, lack of financial resources for repayment of medium and long term debts, delayed collection of the money owed for the delivered products and lack of earnings:

$$B = 0,444X_1 + 0,909X_2 + 0,0526X_3 + 0,0333X_4 - 1,414$$

The variables of the model are: current liquidity ( $X_1 =$  current assets / current liabilities), solvency ( $X_2 =$  (net profit + depreciation) / (repayment rate + interest on credit)), rotational speed of customer loans ( $X_3 =$  turnover / customers), the rate of profit ( $X_4 =$  profit / cost \* 100).

The interpretation of the values of the score function: company bankruptcy is imminent ( $B < 0,5$ ), the risk of bankruptcy of the company is high ( $0 \leq B \leq 1,1$ ), the company is in a state of uncertainty ( $1,1 \leq B \leq 2$ ), the risk of bankruptcy is unlikely ( $B > 2,05$ ).

The main limitations of applying the models based on the score function developed in the country are:

a) the selection of the sample lying at the construction of score functions is not based on a statistically relevant population or the sample selected for analysis does not necessarily reflect the bankruptcy - non-bankruptcy situation of the Romanian economy. This is due to the fact that Romania has a relatively few number of clear / declared bankruptcies, and a large number of possible bankruptcies therefore taking or not taking into account those companies that are bankrupt (insolvency, consecutive losses for a longer period of time etc.), but have not been declared as such may have a direct impact on the accuracy of the truthfulness of the model itself.

b) the lack of a longer period for analysis before bankruptcy - In Romania the high degree of instability that characterizes the economy has a direct influence on the methods used.

c) the character of the overall score functions developed - current concerns are focused on providing a function applicable to all Romanian economy; the limitations of these tests are related to the fact that a bankruptcy prediction model is limited to the industry or industries on which it was built;

d) not including the “non-financial” indicators when substantiating the score in Romania shows that when a company goes out of the market it is not necessarily the result of poor management, but in many cases it may result from the economic and social environment in which the company operates which implies taking into account other variables than the financial rates. The limit that must be considered is that the inclusion of such variables (which express the characteristics of the economic environment and industry) generates models with a geographic and time limitations but more pronounced compared with models based solely on financial ratios.

**3. Testing the models:**

To test the models mentioned above, to demonstrate that considering only the financial indicators in analysing the bankruptcy risk is insufficient, we considered the situation of a representative manufacturing firm (wood processing industry) - table 1, table 2 - which, since 2009, has faced serious financial problems, and in 2013 declared bankruptcy.

**Table 1: The result of the score function following the Altman model**

| Indicators  | Symbol / Calculation | 2009     | 2013      |
|---|----------------------|----------|-----------|
| Total assets  | At                   | 5231366  | 2207642   |
| Current assets  | Ac                   | 4617173  | 2151709   |
| Turnover  | CA                   | 4436643  | 1395104   |
| Equity  | Cpr                  | 1531216  | -2588378  |
| Total debts   | Dt                   | 3680760  | 4779405   |
| Gross profit  | Pb                   | -346541  | -779148   |
| Reinvested profit   | Prein                | 0        | 0         |
| X <sub>1</sub>  | Pb/At                | -0,06624 | -0,281698 |
| X <sub>2</sub>  | CA/At                | 0,848085 | 0,504394  |
| X <sub>3</sub>  | Cpr/Dt               | 0,416005 | -0,541569 |
| X <sub>4</sub>  | Prein/At             | 0        | 0         |
| X <sub>5</sub>  | Ac/At                | 0,882594 | 0,777941  |
| Z=3,3X <sub>1</sub> +1,0X <sub>2</sub> +0,6X <sub>3</sub> +1,4X <sub>4</sub> +1,2X <sub>5</sub> |                      | 1,9382   | 0,311922  |

**Table 2: The result of the score function following the Băileşteanu model**

| Indicators                                | Symbol/ Calculation | 2009    | 2013    |
|---|---------------------|---------|---------|
| Current assets                            | A <sub>1</sub>      | 4617173 | 2151709 |
| Current liabilities                       | P <sub>1</sub>      | 3680760 | 4779405 |
| Net profit                                | P <sub>n</sub>      | -353874 | -779148 |
| Amortization                              | A <sub>m</sub>      | 185000  | 120000  |
| Reimbursement rate credit + interest rate | D                   | 252000  | 252000  |
| Turnover                                  | CA                  | 4436643 | 1395104 |

|   |                                     |          |          |
|---|-------------------------------------|----------|----------|
| Customers   | clients                             | 265717   | 307284   |
| Total costs   | Ct                                  | 5741202  | 2510266  |
| X <sub>1</sub>  | A1/P1                               | 1,254408 | 0,450204 |
| X <sub>2</sub>  | (P <sub>n</sub> +A <sub>m</sub> )/D | -0,67013 | -2,61567 |
| X <sub>3</sub>  | CA/clients                          | 16,69687 | 4,540113 |
| X <sub>4</sub>  | Pn/Ct*100                           | -6,16376 | -31,0385 |
| B=0,444X <sub>1</sub> +0,909X <sub>2</sub> +0,0526X <sub>3</sub> +0,0333X <sub>4</sub> -1,414 |                                     | 0,620807 | -2,97252 |

Since the results of both models tested recorded in 2009 certainly do not indicate a failure, although failure occurred in 2013, as confirmed by the results achieved by score functions obtained for 2013, the working hypothesis from which we started is supported. If in 2009 these “other factors” would have been considered it is likely that the restructure plan of the company’s activity (supporting investments in equipment performance, product quality, identifying and attracting new customers by sustained national and international promotion, etc.) would have been able to determine a strategy - which implemented correctly - could have avoided the bankruptcy of the considered company. These “other factors” (non-financial factors) have an impact at least equal, if not greater, in determining the risk of bankruptcy. In this situation, the failure was caused by market conditions (competition). The main competitors of the considered company brought new and high quality products on the market, which has reduced the market share (80% of company sales being carried out on the overseas market) of the considered company. The bankruptcy risk analysis should have been completed with the market analysis both as consumer preference (improving product quality) and as analysis of competition and development strategies promoted by it. Without diminishing the role of the financial capacity in supporting the investment of the firm, a market analysis would have indicated the investments that could sustain the increase in market share. An optimal solid level of financial indicators without a market analysis will not eliminate the risk of bankruptcy. The considered company disregarded the market and the result – the bankruptcy – was unavoidable in 2013.

**4. Research results:**

Also, when setting up such models, it is advisable to include some non-financial indicators representative of industry or industries concerned, so as to take into account the main economic and social factors from the environment of the firm, which can influence its outcomes, thereby increasing the accuracy of predictability.

Finally, imposing maximum – minimum limits should be used when determining the value of the indicators used in determining the score function so as to counterbalance the negative effect induced by the specific transition period and the absence of reliable and relevant information for a longer period of time.

The informational score valences of the method should not be overstated as discriminant analysis reduces the basic information by selecting the most significant rates, considered at a certain moment, while a company is an economic and social system which operates in a complex environment with many more variables that influence its health and weakness.

Therefore it is recommended to use the method scores in parallel with classical methods of diagnosis - analysis of financial flows, financial equilibrium, profitability etc. and finally, global risk assessment of the company.

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