

Emerging Markets Queries in Finance and Business

A statistical model of financial risk bankruptcy applied for  
Romanian manufacturing industry

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**Abstract**

The risk of bankruptcy was and is the subject of many research studies aiming to identify the time of bankruptcy, competing factors to achieve this state, the main financial criteria which best expresses this orientation, the bankruptcy, etc. Although there are models that have proved their viability over time, we note that the developed models are successfully applied in space and time in which there were created. In this article we tried to develop a statistical model for prediction of bankruptcy risk, available for the companies which operate in the Romanian space. Thus, we applied a multidimensional analysis technique, namely Principal Component Analysis on two groups of companies in the manufacturing sector, during the period 2000-2011, also including the global financial crisis impact. The financial crisis is the main factor that influenced the economical and financial company's state, starting with 2008, and thus, it is the main discrimination factor with a strong impact on the company's financial condition. The two groups of companies are selected from among the listed companies, which are operating in the manufacturing area of activity, respectively one group consists in the listed companies and another group consists in firms that will be unlisted in the next years. The statistical model can be successfully used to predict the risk of bankruptcy for companies which activate in manufacturing area of activity in Romania.

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## 1. Introduction

Unprecedented global economic development culminating in the current economic crisis demonstrates that the results of research studies on the prediction of bankruptcy risk are insufficient. Moreover, the financial crisis increases the risks that affect the proper functioning of a company. This increase can be translated by an increase in uncertainty about its ability to continue working, Robu & Mironiuc, 2012.

In this context, a review of predictive models of bankruptcy risk is imperative. A score function is influenced by characteristics of the country or region for which it was created, by the economic and financial development level of the country concerned, by the industry in which companies are operating, by the accounting system used, by the influence of taxation, by the predominantly type of financing etc.

This paper aims to select the optimum combination of predictable financial indicators for the bankrupt companies. In the future research we will continue our study with an application of multiple discriminant analysis in order to achieve a classification of companies into "bankruptcy" and "non-bankruptcy" based on a score function.

## 2. Literature review

The earlier work of Beaver, 1966, indicated that the financial ratios can predict the likelihood of bankruptcy. His univariate study evidenced that the financial ratios of bankrupt firms generally differ from those of non bankrupt firms and pointed out the importance of cash flow-to-debt ratio. The work began by Beaver was continued by Altman, 1968, who introduced the multivariate discriminant technique for predicting firms' failure MDA. Altman, 1968 found that his five ratios outperformed Beaver's cash flow to total debt ratio. These ratios are: **X1**=working capital/total assets; **X2**=total retained earnings/total assets; **X3**=earnings before interest and taxes/total assets; **X4**=market value of equity / book value of total debt; **X5**=sales/total assets.

Both Beaver and Altman are considered pioneers of bankruptcy risk modelling based on financial criteria aggregates by multiple discriminant analysis technique.

By using financial ratios, the accuracy of the prediction of bankruptcy of a company exceeds 90%, Chen and Shimerda, 1981. Although, it should be noted that some researchers, that is to say, Morris, 1998, argue that since the bankruptcy was due to unforeseeable events, therefore it can not be predicted. More than that, it's imposed that financial ratios of a specific business *to be best interpreted as a group*, Walton et al. 2003, rather than making judgments on individual ratios because the interpretation of one ratio may be altered by other ratios of the same business.

Among the **most popular financial ratios** used often by researchers were:

- **Profitability ratio** represented by return on assets Beaver, 1966; Deakin, 1972; Libby, 1975; Ohlson, 1980; Lennox, 1999; Abdullah, 2008; Zulkarnain, 2001; Lykke et. al 2004; Siminica, 2005.
- **Leverage ratio** represented by total liabilities to total assets Beaver, 1966; Deakin, 1972; Ohlson, 1980; Zmijewski, 1984 ; Zavgren et Dugan, 1989; Mohamed 2001; Anghel, 2002; Lykke et. al . 2004; Abdullah; 2008.
- **Cash flow ratio**, represented by cash to total assets or cash to current liabilities (Lennox 1999; Zavgren et Dugan, 1989; Low et al., 2001 and Zulkarnain, 2001; Ivoniciu ,1998; Bailesteanu 1998, Anghel, 2002;
- **Size of activity** Ohlson, 1980; Lennox, 1999; Shumway, 2001; Lykke et. al., 2004.

Investigating a vast literature over 170 studies focused on prediction failure problems Bellovary, 2007 found, among those 752 factors which are utilized in the individual studies, the first ten financial ratio, as follows: Net income / Total assets; Current ratio; Working capital/Total assets, Retained earnings / Total assets; Earnings before interest and taxes EBIT / Total assets; Sales / Total assets; Quick ratio; Total debt / Total assets ; Current assets / Total assets; Net income / Net worth.

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