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Emerging Markets Queries in Finance and Business

Stochastic methods for prediction of the bankruptcy risk of SMEs

Mariana Bălan[a,*]

[a]*Institute for Economic Forecasting, Bucharest, 050711, Romania*

Abstract

In economic theory, there were and still are concerns for the development of bankruptcy risk prediction methods starting from their rates related to the status of "health" or "weakness" of economic entities. One of the financial analysis methods commonly used today are the stochastic methods. Comparing a priori and a posteriori probabilities allows the acknowledgement of the Score areas where the risk of bankruptcy is higher. The Score function is very sensitive to any relevant changes in the economic situation and get a genuine alarm about the economic-financial status, offering the possibility of a superior quality forecasting. This paper presents, in a first part, the theoretical formulation of the same stochastic methods and Score function for the financial analysis of an economic entity and, in the second part, the results obtained by applying this methodology in the small and medium enterprises in the Romanian 3rd development Macro-region. Using this methodology has enabled both the least risk of bankruptcy for some SMEs, but also identifies strengths and weaknesses in financial management for the grounding of new strategies for maintaining and development of the unit.

"Keywords: stochastic metods, bankruptcy risk, analysis scale, decision threshold, Kolmogorov function, small and medium enterprises"

1. Introduction

The Score function is very sensitive to any relevant changes in the economic situation and get a genuine

* Corresponding author.
E-mail address: mariana.balan@gmail.com.

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alarm about the economic-financial status, offering the possibility of a superior quality forecasting.

The first major model on the analysis of the risk of bankruptcy, both in the literature and in practice, belonged to E. I. Altman, published in its original form in the year 1968 and known as the Z Score function. Further on, a model for classifying economic entities similar to Altman model was conducted by economists J. Conan and M. Holder in 1979.

This paper presents, in a first part, the theoretical formulation of the Score function method for the financial analysis of an economic entity and, in the second part, the results obtained by applying this methodology in the small and medium enterprises in the Romanian 3rd development Macro-region. Using this methodology has enabled both the least risk of bankruptcy for some SMEs, but also identifies strengths and weaknesses in financial management for the grounding of new strategies for maintaining and development of the unit.

Conjectural changes generated by the current economic and financial crisis may involve an exchange rate of bankruptcy, when the probability is a priori. Applied distributions of Score in each category, the updated values of the a priori probabilities, adjusting a posterior probabilities for a new context and using the techniques presented in this paper have been successful in getting a broad picture of the economic-financial situation of small and medium-sized enterprises in the area under consideration and, at the same time, have allowed the determination of an overall diagnosis, which have facilitated the synthesis of their economic and financial situation.

2. Theoretical formulation of the problem

It is considered K economic entity groups subject to study, of which: $N_1, N_2, \ldots N_N$, are "non-went bankrupt" entities and $F_1, F_2, \ldots F_M$, economic entities considered "went bankrupt".

Score function "Z" proposed by Altman is, in fact, a form of multiple regressions:

$$Z = a_0 + a_1 R_1 + a_2 R_2 + \ldots + a_n R_n \qquad (1)$$

where: $R_1, R_2, \ldots, R_n$ are the considered rates in the drafting of the model of economic entities sharing

$a_1, a_2, \ldots, a_n$ are the coefficients of the considered financial rates;

a_0 is the open term the intercept of the classification function

Calculation of parameters $a_0, a_1, a_2, \ldots, a_n$ is to be determined by application of the method of least squares, with the condition that the sum of empirical terms deviations from the regression line, squared, to be minimal.

For each of the considered groups "viable" and “went bankrupt entities”, but for the entire assembly, as well the Score function is to be determined.

Analysis of the distribution curve of each of the determined Score functions allow establishing a posterior probabilities corresponding to, knowing that the Score for each of them belongs to one of the unfavourable, neutral or favourable areas.

A transaction concluded with a loss with a bankrupted entity will lead to a sudden loss for the counterparty or for all items involved. Forgoing a transaction with a company that will prove to be really powerful is a loss of gain whose cost may be extended depending on the difficulties to find a new partner. Taking into account these costs will allow to estimate a decision threshold, namely the Score value where to cancel the transaction. So, it is necessary to draw curves associated with the function, namely for each of the Scores the average density is calculated, given by the relation:

$$f\left(Z, \overline{Z}, \sigma_Z\right) = \frac{1}{\sigma_Z \sqrt{2\pi}} e^{-\frac{1}{2}\left(\frac{Z-\overline{Z}}{\sigma_Z}\right)^2} \qquad (1)$$