



An accuracy test of Altman and Zmijewski accounting-based bankruptcy models

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Abstract

The aim of this research is to test if conventional accounting-based bankruptcy prediction model parameters are still valid when applied to the most recent financial ratios of Portugal's small, medium, and large companies.

We estimate Altman's Z"-score and Zmijewski bankruptcy probability for all of Portugal's companies with more than 10 workers and 1 million euros in assets from 2016 to 2021. We excluded micro-enterprises to avoid biased results. We also excluded banks and insurance companies.

We find that both models maintain reasonable accuracy, although lower than in the initial years, and that the Zmijewski model has a lower accuracy (81%) than the Z"-score (85.5%).

This is the first study comparing the accuracy of the Z"-Score and Zmijewski models run on a sample comprising all of Portugal's companies.

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NOTE TO READERS: this is an extended abstract co-authored with Prof. Ana Pinto Borges (anaborges@isag.pt). The original short-paper that was peer-reviewed in Qeios (<https://doi.org/10.32388/GRY2NL>) is being revised according to the suggestions to be presented in a conference.

Purpose

The Altman Z-score and the Zmijewski Model are both financial models used to predict the likelihood of bankruptcy in a company. The Altman Z-score (1968) calculates a score based on a combination of five financial ratios: working capital to total assets, retained earnings to total assets, earnings before interest and taxes to total assets, market value of equity to total liabilities, and sales to total assets. The Zmijewski Model (1984), also known as the Z-score Plus, is an updated version of the Altman Z-score model, which includes an additional financial ratio, net income to total assets. When comparing the two models, literature review from 2015 onwards confirms the findings of previous studies that the Zmijewski Model is considered to be more accurate in predicting bankruptcy compared to the Altman Z-score. In this paper, we intend to test if conventional accounting-based bankruptcy prediction model parameters are valid when applied to the most recent financial ratios of Portugal's small, medium, and large companies, and in case the two models show validity, verify which is more precise.

Methodology

We collected the data from the SABI (Iberian Balance Sheet Analysis System) database of Bureau Van Dijk, a Moody's Analytics company, where companies are classified according to the NACE codes and can be selected according to their status: active or bankrupt. We excluded banks and insurance companies, selecting all companies in the remaining sectors. We also do not consider the micro-enterprises to avoid biased results. We estimate the Altman's Z"-score and Zmijewski bankruptcy probability for all of Portugal's companies with more than 10 workers and 1 million euros in assets from 2016 to 2021.

Results

We find that both models maintain a reasonable accuracy, although lower than in initial years, and that the Zmijewski model has a lower accuracy (81%) than the Z"-score (85,5%) contrary to recent literature. This result was not expected, because Zmijewski's model was developed with a more robust technique (probit regression) than Altman's (multivariate

discriminant analysis). This last technique assumes more unrealistic assumptions, namely, it assumes a methodology based on equal samples of bankrupt and non-bankrupt companies, a normal distribution and equal covariances of the indices, which tended to produce biased results.

Conclusion

Recent literature review confirms that the Zmijewski Model is considered to be more accurate in predicting bankruptcy compared to the Altman Z-score in many countries, however, the choice of the model may depend on the specific industry and country being analyzed. Our paper confirms the opposite previously verified in the literature review. Future research should be conducted to further test the accuracy of both models in different countries and industries.

Research limitations

The models did not consider the company's economic activity and simultaneously integrated small and medium-sized companies. In addition, they contemplate the years of COVID-19, when companies integrated in some sectors were more likely to go bankrupt.

Originality

With this article we intend to fill the gaps in the literature: i) this is the first study comparing the accuracy of Z''-Score and Zmijewski models run on a sample comprising all of Portugal's companies; and ii) we consider a diversified set of companies, not focusing on a single sector of activity.

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