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

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This is a nice study that adds more empirical evidence to the efficacy of accounting-based bankruptcy prediction models. It is especially important as other techniques like machine learning and AI, etc., are found more and more in the literature. This study, however, is on a small country's (Portugal) sample of firms, but not a trivial exercise. Indeed, in possible future work, the study should probably be expanded to all or most EU countries, using the same database that was used for Portugal, or at least from the same source, Bureau Van Dijk.

With respect to the abstract, here are my comments:

The word "conventional" is, perhaps, not the best word to use in describing accounting-based models; perhaps "generally used and popular" is better?

Perhaps should add a relevant recent sample of small, medium, and large Portuguese firms, and that the study is applied to this most recent sample of firms, rather than to recent financial ratios.

I'm not sure why the use of micro firms will be biased. Perhaps some other reason such as not being audited well or incomplete data in many cases? Also, it is a bit confusing since the definition of micro firms was both less than €1 million and later on less than €2 million. Perhaps just leave it at less than 10 workers.

I think it's valid to say that the results on this new sample affirm that these models that were built in the past are "expected" to have lower accuracy than the initial results of the two studies. So use "as expected" when talking about the results of the two studies.

In the last bullet of the abstract, it is not quite accurate to say all Portuguese firms, rather all but micro enterprises, and not including financial companies.

The following are comments on the text of the article, not in any order of importance:

The Altman (1983) article was developed not only on non-listed companies, but also on non-manufacturers as well as manufacturing firms, and for firms in emerging markets.

Well, it is true that both the Altman and Zmijewski models lost accuracy from what was originally published in their

groundbreaking articles, but it was found that the Altman model still outperforms market-based models. Perhaps the best study that shows that the accounting-based Altman model outperformed market-based models was published by Das, Hanouna, and Sarin (2009), ”Accounting-based versus market-based cross-sectional models of CDS spreads,” Journal of Banking and Finance, 33(4), 718-730.

Perhaps you should not only cite the Altman and Hotchkiss (2006) book but also the Altman, Hotchkiss, and Wang, 2019 (4th edition), since that is the only edition still in print.

I am not sure I understand why using the number “1” as a filler for missing values of ratio denominators produced errors. Explain this sentence carefully or drop it completely. How frequent were the missing values?

It might be interesting to compare the bankrupt vs. non-bankrupt firms by industrial sector. That is, what percentage of the firms were, for example, manufacturers, retail and wholesale, real estate, and construction, and services in the two samples.

It is interesting to note that in the descriptive statistics of the bankrupt versus non-bankrupt sample, it was found that for the Altman ratios, the medians were all negative for the bankrupt group and positive for the non-bankrupt group. While the Zmijewski ratios, for example, FINL, this was not the case, and there may not be a significant difference between the two groups. I could not see the bankrupt group ratios for the LIQ ratio of Zmijewski. Perhaps it was the printout? It is suggested that you do a T or F test to test the difference in medians between the two groups for all of the ratios in the two models.

In terms of the comparison of results, the difference between Altman and Zmijewski was 3% for the type one error and 4.5% for the type two error, and the overall accuracy had a difference of 4.5%, in all cases favoring the Altman model. I agree that both models were still quite accurate, especially after all these years. That’s the major takeaway, but it would be interesting if we could compare not only the difference in accuracy, but also conduct a statistical test of the differences.

While it is true that both studies’ original accuracy was greater than 95%, that was using the same sample for building the model and then testing the accuracy. For the Altman studies, and maybe the Zmijewski study also, the subsequent sample of US firms' accuracy level did drop, but only to the low to mid 80% level, which is close to the 85.5% in the Portuguese sample for Altman and the 81% for Zmijewski. It is quite interesting that both studies have proven to be still quite accurate and robust even after all these years, and the overall accuracy of the models is still in the low to mid 80% level. And the results of the Portuguese sample, 85.5% for Altman and 81% for Zmijewski, are very similar to subsequent robustness tests in the US. This is powerful evidence of the continuing accuracy and popularity of these models.

As for future research, it would be interesting to extend this test to many other, if not all, EU firms, not just Portugal. There probably should be more on the development of the two models in the early part of the paper, and also reasons for their popularity and examples. With respect to at least Altman, the use and prominence of his model by Bloomberg, Capital IQ, and many other software products. Also, perhaps to extend the comparison to other accounting-based models, like Ohlson and Taffler, among others.

Overall, this is a competent and interesting article and should be publishable, but perhaps not in the major journals, but certainly in a European-based empirical journal. Good luck!

Ed Altman. (February 13, 2024.)