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# Review of the Doctoral Dissertation

of mgr inž. Jackson Arroyave

title: Evaluation of long-term trajectories for Colombian

businesses based on statistical models of firm's bankruptcy prediction

Supervisor: dr hab. inž. Tomasz Korol, prof. PG, Gdańsk University of Technology

## The importance of the topic

The topic of the thesis, dealing with long-term trajectories for the bankruptcy prediction represents an important topic. I strongly agree with the author that much research effort has been paid to predict bankruptcy over short-term horizon, contrary to analysing options of prolonging the prediction horizon. From this perspective, the topic of the dissertation contributes to filling a currently existing research gap. Focus on the Colombian companies could be also considered as contributive to the current state of art.

## The aim of the dissertation, its structure and research methods applied

The aim of the dissertation, specified on page 10 is as follows: '*... the main objective is to develop long-term trajectories with the use of seven common statistical models that in the literature are characterised by high effectiveness and additionally with two own models estimated by the author specialised in Colombian companies and to verify their influence on the increase of effectiveness on the long forecasting horizon.*'

In the following text, the main objective was accompanied by partial objectives, research questions, and hypothesis which are logically aligned with the main objective.

I find positively that the analysis was conducted on various models, which are based on different methodology, as the outcomes of the analysis are more robust and not only valid for a specific methodology or a specific set of variables. The results of the dissertation clearly showed that not all the analysed models could be effectively used for deriving the trajectories. I highly assess that the author created his own models and subjected them to the analysis as well.

The structure of the dissertation is logical, however, at some points also disproportional. High attention is paid to the causes of the business bankruptcy and the very definition of the bankruptcy condition, while the results and discussion part is much shorter comparing the previous chapters of the dissertation. Also, the fact that the



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majority of the sources, presented throughout the literature review, are older than 10 or more years, could be perceived as a shortcoming. I find especially the results part very brief, particularly the part that deals the details of estimating the authors' models, especially the part that deals with variable reduction (pages 126 and 127). Also, a separate discussion part, which would discuss and the causes of different trajectories of bankrupt and non-bankrupt companies, would be very beneficial to the dissertation.

**From the methodological perspective, I deeply miss a separate methodological chapter which would describe the methods of the research and the process of verifying the presented research hypothesis.** The author presents the research hypothesis on page 12, while on page 161 those hypotheses are presented as accepted or rejected, with a **very brief explanation on what grounds the given hypothesis was accepted or rejected.**

For example, H1 (stated on page 10): *'There is a statistically significant difference in the values of the financial ratios between the failed and non-failed Colombian firms.'*

**The author does not provide any link to the specific results, which have led him to accepting this hypothesis.** The results are mentioned on pages 126, 127 and 161. Quote the text on page 126: *"...fourteen ratios were selected using SPSS correlation analysis. Lastly, the ratios were then applied to the design of a model performing discriminant analysis.'* Later, on the same page (in Table 4.3) statistics on regression model including multiple R or R squares are presented. This is rather confusing, as for the discrimination analysis, such statistics is not applicable, instead of that the Wilk's lambda statistic is being used.

When accepting H1 on page 161 the author claimed that: *"Concerning the first hypothesis H1, this study identified that failed and non-failed companies present distinct financial ratios with statistically significant differences. Those ratios are EBITDA / Total sales, ... Therefore, H1 is accepted."*

This conclusion is very confusing, as the only table presenting any p-values is the table on page 127 (namely table 4.5), where only one statistically significant variable with a value of p lower than 0.05, namely X6 standing for the ratio of current assets and current liabilities, is presented. **This particular issue could be discussed during the defence of the dissertation.**

Regarding hypothesis H3: *'The logit model can be used to develop long-term trajectories of Colombian firms'*, which was later rejected on page 161. The reason for rejecting thy hypothesis is (see page 151): *'Logit models were not evaluated because they do not characterise trajectories properly, namely, that is, they are not appropriate due to their particular characteristics, showing results between zero and one. In this dissertation and using the three Logit models resulted in practically all values closer to one for all years evaluated, therefore, the author did not create the trajectories.'* I believe that rejecting the hypothesis was rather unnecessary, as the logit method results could be used in a form of a non-transformed function, where the results are theoretically unbound, similarly to discriminant analysis results. From this perspective, the reasons for rejecting H3 do not hold in general.

#### **Specific Comments and questions:**

1. Could you explain in more detail the grounds on which the H1 was accepted? Presenting the details that prove the importance of the model's variables.
2. Could you briefly discuss the way in which the trajectories concept could be used for an ex-ante bankruptcy prediction?




### Final evaluation

The dissertation deals with the dynamic nature of the bankruptcy process, whereas this feature is often neglected by the main stream of literature. Research on the trajectories of Columbian businesses is therefore contributive to the current state-of-the-art. In my opinion, the obtained research results are valuable. The author has shown that the concept of trajectories could be effectively used for spotting the causes of bankruptcy of Columbian business long before the bankruptcy actually occurs. The authors also showed, that this feature is not common to all bankruptcy models.

On the other hand, some imperfection of the thesis could also be found. Especially from a methodological point of view, the hypotheses verification itself deserved a more detailed description. The results presented are often too brief to convince the reader about validity of some results.

**In my opinion, despite the mentioned shortcomings the objective of the dissertation thesis was fulfilled, the candidate Jackson Arroyave proved knowledge in the discipline as well as the ability to conduct scientific research independently and, therefore, all requirements for obtaining a Ph.D. degree were fulfilled.**

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