

Gdansk University of Technology

Attention: Ph.D., Office

Evaluation of the Ph.D., Thesis Entitled: “Bankruptcy Prediction Models for Micro, Small, and Medium Private Companies: The Case of Greece.”

Ph.D., Candidate: Anastasia Spyridou

February 12, 2022

External Referee General Information:

Professor Themistoclis D. Pantos

External Referee’s Academic Affiliation:

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External Referee’s Areas of Expertise & Research Interests:

Professor Pantos is currently the Dean of Business Studies at Lincoln University in Oakland California, U.S.A. Professor Pantos joined Lincoln University in August 2019 and he served as an Assistant Provost for Doctoral Studies and Chairman of the Finance and Investments Department respectively. Prior to his appointment at Lincoln University, he served at the Faculty of College of Business at Zayed University in UAE as the "Ahmad Khalaf Al Habtoor" Chair Professor in Management and as the Graduate Director for the Master of Finance Program for the 2016-2018 academic period. Professor Pantos joined the College of Business at Zayed University in August of 2012 as a Professor of Finance. Prior to his appointment at Zayed University, College of Business in UAE Professor Pantos was the holder of the “Bridge Bank Chair for Banking and Financial Services” at the Lucas College of Business at San Jose State University in California, where he was on the faculty since 2000.

Professor Pantos was the holder of the Provost Research Fellowship Award for the College of Business, at Zayed University for the academic year 2015-2016. Professor Pantos was the recipient of the “Teacher Master Award”, at the Lucas College of Business, San Jose State University, California, for two consecutive years (2012,2011), the winner of the “CSU Faculty Excellence in Advising Award”, California State Student Association, Long Beach, California, (2011), the holder of the “Outstanding Faculty Award” from the Disability Resource Centre (2007) at San Jose State University and the winner of the prestigious “Outstanding Undergraduate Professor Teaching Award” (2004), at the College of Business, San Jose State University.

Professor Pantos has also won “The MBA Faculty Choice Award” in 2000, at Rutgers University in Camden, New Jersey. Professor Pantos has a long list of peer review academic publications and was a member of the Editorial Board of the Review of Accounting and Finance Journal from 2007-2014. Professor Pantos has published extensively in various peer-reviewed; Finance, Economics and Accounting journals and his current research interests are in the areas of

Risk of Financial Institutions in Emerging and Developed Markets, Capital Markets within the European Union, GCC and NAFTA Trading Blocs, Banking Regulation, Hedge Funds, Emerging Markets and Derivative Securities.

Professor Pantos was the keynote speaker on the 11th Academy of Business Management Meeting, entitled the “Global Conference on Business Management and Social Sciences”, on April 24, 2015, in Dubai, UAE, and the 4th and 3rd International Accounting and Finance Conferences, organized by the University of Macedonia, in Corfu and Skiathos islands, Greece, in August 2012 and 2010 respectively. Professor Pantos was the winner of the “Lucas Research Fellowship Award” in 2012 and 2011 respectively, and the holder of the College of Business “Applied Research Award” in 2007 at San Jose State University in San Jose, California.

Professor Pantos has been appointed, by the Hellenic Quality Assurance Standards Organization in University Education, as an external evaluator for the Accounting and Finance departmental units within the various Greek Universities and the promotion and tenure policy procedures associated with the retention of Greek professors and research colleagues within the European Union Universities and Technological Institutes. Prior to his academic career, Professor Pantos worked in Banking in the areas of risk management, derivative securities, and mortgage securitization. Themis has served on various University, College and Departmental Committees at Zayed University, San Jose State University, Rutgers University, and the Catholic University of America respectively and has been a frequent media commentator.

Evaluation of the Doctoral Thesis Proposal:

Ph.D., Candidate: **Anastasia Spyridou**

Ph.D., Course/School: **Gdansk University of Technology**

Ph.D., thesis title: **“Bankruptcy Prediction Models for Micro, Small, and Medium Private Companies: The Case of Greece.”**

Main subject of the Ph.D., Thesis: Bankruptcy Prediction, Corporate Finance, Forecasting Methodologies.

Evaluation of Ms. Anastasia Spyridou Ph.D., Thesis

In this report, I would provide you with my assessment of the Ph.D., thesis submitted by Ms. Anastasia Spyridou, entitled **“Bankruptcy Prediction Models for Micro, Small, and Medium Private Companies: The Case of Greece”**. The above-mentioned thesis represents an independent and comprehensive piece of scientific work of high academic standards regarding the formulation of research questions, methodological, theoretical, and empirical basis, documentation, treatment of the literature and form of presentation. The material and methods applied are relevant to the questions raised in the thesis, and the arguments and conclusions postulated are tenable. The thesis contributes to new knowledge to the discipline and is on the appropriate academic standard for publication as part of the scientific literature in the field.

It is my respectful submission that the Doctoral thesis is worthy of being publicly defended for the Ph. D degree without any major changes. The thesis is considered worthy of defense since it is considered as an independent and comprehensive scientific work of international standard and to my opinion the doctoral student satisfies the requirements for research competence. In general, I can say that:

- The Doctoral Candidate shows familiarity with, and understanding of, the relevant intellectual and creative context.
- The thesis provides a sufficiently comprehensive study of the topic.
- The research findings are suitably articulated and accompanied by adequate exposition.
- The command and the quality of the English language and the general presentation are satisfactory.
- The thesis makes an original contribution to the subject with which it deals, and the candidate understands the relationship of the thesis to the wider context of knowledge in which it belongs.
- The methods and techniques applied in the execution of the thesis are appropriate to the subject matter and are aesthetically effective, and properly applied.
- The research questions have been identified and explored through the thesis, as appropriate.

Thesis Evaluation Summary

Evaluation Scale					
<u>Scientific Quality:</u>	Excellent	Very Good	Good	Fair	Poor
Originality of thesis results		X			
Remarkability of results in the scientific context	X				
Technical and scientific level		X			
Methodological rigour	X				
Description of procedure		X			
Literature Review			X		
<u>Clarity and Synthesis of the Presentation:</u>	Excellent	Very Good	Good	Fair	Poor
Clarity of the thesis document		X			
Rationality of presentation		X			
Clarity of results presentation	X				
Clarity and completeness of figures and tables	X				
Appropriate length of thesis		X			
Completeness of references	X				
Table of content	X				
Figures	X				
Tables		X			
<u>Overall Evaluation of the Thesis:</u>		X			

Comments regarding Chapter 1:

The first part of this dissertation begins with the author explaining the basic elements of this dissertation. There is a reference to the purpose of the dissertation followed by which were the primary and the secondary reasons the academic community start to investigate this topic and who are the main stakeholders who are affected by crises and bankruptcies. I believe that the introduction goes fast to the purpose. I would suggest maybe to have 1-2 paragraphs before the purpose so the reader of the paper would gradually understand what the topic is about, which are the main problems where there was limited research and why there is a need for an author to investigate in detail this topic and come up with unique contribution for academia and public policers and practitioners. I must mention though that for someone who has knowledge on the topic is easier the way the introduction is developed.

In the introduction the author decomposes the purpose of the dissertation in four distinct objectives which created seven research questions. Author explains why each research question was developed based on existing literature:

1. Review of international literature on existing bankruptcy prediction models and variables used
 - a. RQ1: What are the different terms and definitions of business failure that are used in international literature when studying bankruptcy prediction models
 - b. RQ2: What are the most popular models used in bankruptcy prediction modelling in international literature?
 - c. RQ3: What are the most popular financial variables used in bankruptcy prediction modelling in international literature?
2. Systematization of model's financial variables, and data used for bankruptcy prediction and variables used
 - a. RQ4: What are the most popular models used in bankruptcy prediction modelling in Greek literature?

- b. RQ5: What are the most popular financial variables used in bankruptcy prediction modelling in Greek literature?
3. Compare the effectiveness of development in this study models
 - a. RQ6: What is the most effective model to be used for bankruptcy prediction of micro, small, and medium Greek private companies in times of financial crisis?
4. Examination of different variable selection approaches on the effectiveness of bankruptcy prediction models
 - a. RQ7 What is the most effective approach to variable selection among the examined ones?

I verily believe that the author explains very well the logic behind each research question and each objective. I would suggest although that she could explain more the logic behind developing a research question regarding bankruptcy prediction models in Greece. It needs to be clear why investigating the most popular models for the international literature is not enough and there is a need to investigate which are the differences for a specific country. Is clearer for example for me that it is natural to know the variables for each country as they have significant differences what is important for each country but for the use of model I think that it is a very interesting point that we need also specific modeling for each country. Although author don't notice that this could be another contribution for the academic community. As it is clear from the results of the study that it is important for each country to investigate first which are the most important variables (usually this is what authors in other studies do) and which is the best method for each country to follow (usually this is not something authors in other studies do).

More of that two hypothesis were the result of those research questions

- H1: Logistic regression is the most effective model to be used for bankruptcy prediction of micro, small, and medium Greek private companies in times of financial crisis.
- H2: Statistical (data driven) approach to variable selection leads to more effective models than experts' approach when predicting bankruptcy for micro, small, and medium Greek private companies in times of financial crisis.

The two hypotheses were well developed, and they were well supported by the author.

Comments regarding Chapter 2:

The literature review regarding international studies about bankruptcy prediction in Chapter 2 is broad but it could be more sufficiently deep. In general, my perspective is that although the chapter is really interesting it is quite long and it is difficult for the reader to follow it well. From my perspective it would have been more interesting to have 3 different chapters instead of having them all (together) in one like the author is doing in the present dissertation. It would be better to have one chapter dedicated only to bankruptcy definition, while the other one about bankruptcy prediction techniques and another one about ratios used for bankruptcy prediction. Author starts the chapter with an introduction where she explains what this chapter will be about. Then there is a very interesting section where the definition and the terminology are explained. For this case I think that the author neglect to say that this is one of the contributions of this study. Her summary explains why there is so much confusion about the terms business failure, financial distress and business insolvency and bankruptcy. More of that she comes out with the suggestion derived from literature review on how is better to define the companies to be included in sample. It is very important in my opinion to make understandable for academia which is the right way to use each term because as author explains it affects the development and evaluation of the model (therefore is important for authors to not use terminology without thinking).

Next two sections are focusing on forecasting methodologies and evaluation metrics. I would prefer first to speak about the models and then to explain the importance of evaluation metrics during models' development. The last section focusses on ratios used on bankruptcy prediction models. I think that they are explained well. At large, I can say that there is always room for improvement on a literature review but generally speaking I am satisfied on how informative the work is developed by the author. I would suggest the author to look on page 15 specifically on table 2.1. where the author refers to bankruptcy definitions given in previous studies. The last reference is about entrepreneurship failure, and it is not in accordance with the rest of the references that describe the definition given to bankruptcy of failed companies to be considered in bankruptcy prediction modeling.

Comments regarding Chapter 3:

Like the rest of the chapters the author begins with an introduction about the topics this chapter will deal with. First section is focusing on the crisis in Greece and the importance of bankruptcy prediction while the conditions are uncertain. This section could also be much longer as there is such a variety of studies about crisis, but I think it is good that the author is not wide-ranging the topic as readers might have the misconception that bankruptcy is related to crisis while bankruptcy is a natural phenomenon which is happening even if there is no crisis in a country. Covid and the future of economics worldwide after the end of the pandemic will provide a nice field for studies in the future. In the next section the author discusses about the new bankruptcy code of Greece. I think that the author in the future could look more extensively on bankruptcy codes around the world and in Greece of course and try to identify what kind of advantages or disadvantages each code has and try to create or discuss the optimum law that can be applied in several countries. I think that this can be one of the suggestions the author could have done for future research regarding public policy, but she hasn't focus much on this point and I hope that she will in the future.

Following that the author of this dissertation is investigating the Greek literature by finding out which are the most significant studies in Greece that are related with the topic, which are the most well-known bankruptcy models for Greek companies and which ratios are more well used for the country. I think it is very good that the author decided to use forecasting techniques which were already used as this could give her an opportunity to verify and compare her results with other authors while the fact that she tried to apply forecasting techniques that were never used in Greece could give additional knowledge for future studies. My only problem with this chapter is that the section where the author examines bankruptcy prediction models estimated on Greek companies is extremely detailed. It is difficult for a simple reader to follow what is the percentage of accuracy, and type I or type II errors along with which formula was developed for each of the models estimated in each single Greek paper examined in this dissertation. I would prefer this section to be much smaller and with a use of 2-3 tables all those results could be easily understandable. On the contrary for someone who is familiar with the topic and not a simple reader is much more interesting to see which formulas were used etc.

Comments regarding Chapter 4:

Methodology section is a really detailed section indicating which kind of methods the author is going to follow. Initially there is a detailed explanation on the sample criteria. I really like the fact that the criteria are well justified either from the previous chapters, specific laws (for example EU law) or from the characteristics those type of studies have. Most interesting issue is the fact that no companies listed in stock market exchange are used which I think in my opinion is a huge challenge for every researcher who deals with this kind of topic. Subsequent, there is an explanation of the 16 steps the author uses to conceptualize and implement the study. It would have been nice if those steps were compared with other studies that investigated the same topic. It could be valuable to see which steps are commonly followed from most of the studies in the field and which ones are unique. I find very interesting the expert approach for variable selection that the author presented in the following section, and it looks like it is a method that it is applicable in other type of studies. Of course, the term experts, is always difficult to define and very difficult to justify who is an expert and who is not and why. I am really satisfied on the way statistical approach is developed and the explanation for the techniques used for models' development and their evaluation metrics.

Comments regarding Chapter 5:

In the fifth chapter the author explains the results of her work. She first indicates which variables were selected for experts' approach and then she develops 4 different models (multiple discriminant analysis, logistic regression, decision trees and neural networks. With the same way she follows the same methodology regarding the results of her statistical approach. Both sections are really detailed and there are almost 70 tables explaining the results. I would like to mention that it was a little bit confusing with so many tables but at least the author is comparing at the end of this chapter the results and that makes much easier for the reader to understand what the most significant results was. The chapter is finalized by a comparison of effectiveness of estimated models and a comparison of experts' and statistical approaches for variable selection and there it is examined if the two hypotheses are accepted or no.

Comments regarding Chapter 6:

The final chapter of this dissertation thesis is a summative one. In the beginning of this chapter the author developed a nice discussion where it is presented how objectives, research questions and

hypotheses were examined and what were the answers to them. Afterwards the author discuss the most significant theoretical and managerial implications and she identifies the main contribution of the study. As I mention on my report, I think that the study had more contributions than the author claims. This chapter is closing with the study limitations. I find it very nice and interesting that the author knows what limitations exist for her study and she is making an attempt to find a solution to each of them. Finally, the thesis is finalized with the necessary suggestions for further study. I find this chapter very good and very well structured.

Questions to be asked:

What is an expert for the author? Can she define what is an expert for her and how she selected them?

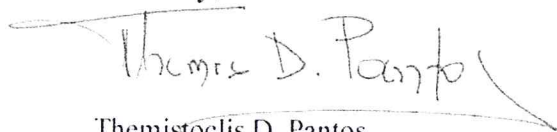
Does she believe that the paper has more contributions that she hasn't identified yet?

What kind of studies is she going to do now that pandemic will end, and a financial crisis is expected?

Final Decision:

In summary, my conclusion is that the Ph.D., thesis of Ms. Anastasia Spyridou presents original research results of large importance and I recommend without hesitation that the candidate is awarded the doctoral degree.

Sincerely,



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