UNIVERSITI TEKNOLOGI MARA

CREDIT SCORING MODEL ENHANCEMENT FOR PERSONAL BANKRUPTCY PREDICTION IN MALAYSIA: TOWARDS ACHIEVING DEBT SUSTAINABILITY

AQILAH NADIAH BINTI MD. SAHIQ

Thesis submitted in fulfillment
of the requirements for the degree of
Doctor of Philosophy
(Business and Management)

Faculty of Business and Management

February 2023

ABSTRACT

"Bankruptcy is perhaps the greatest and most humiliating calamity which can befall an innocent man. The greater part of men, therefore, are sufficiently careful to avoid it. Some, indeed, do not avoid it; as some do not avoid the gallows."

Adam Smith, Wealth of Nations Book II, p.363

Generally, the idea of getting bankrupt never crosses our minds, but being declared bankrupt can happen to anyone with some form of debt. Several critical issues warrant great attention such as the prevalence of personal bankruptcy incidence, high enrolment in the Debt Management Program (DMP), and high debt service ratio (>30%) among Malaysians. These indicate that many Malaysians are in financial distress, lack financial preparedness, and are in high need of debt repayment assistance. If these issues are left unaddressed, they may lead to many Malaysians going into bankruptcy. These key issues underscore the importance of developing an efficient credit scoring model to address the concern that majority of Malaysians are in financial distress. In this context, the objectives of this study are to identify the key determinants capable of predicting the likelihood of personal bankruptcy in the future, develop personal bankruptcy credit scoring models, and compare the models' performance. This study focused on microeconomic indicators using 31,200 samples of the DMP dataset for a period between 2016 to 2020. Using RapidMiner software, the methodology for this study consisted of the application of logistic regression (LR) and support vector machine (SVM) models through the adoption of Cross-Industry Standard Process for Data Mining (CRISP-DM) framework. The identification of key determinants of personal bankruptcy was performed using multi-stage feature selection via the filter and forward selection approach. Next, Synthetic Minority Oversampling Technique (SMOTE) was used to compare the models based on predictive accuracy, misclassification, precision, specificity, and sensitivity rates. Finally, the model with the best predictive ability was proposed to be adopted. The findings from this study revealed that the LR is the best model, with a predictive capability of 73.43%. Meanwhile, SVM is a promising alternative model for personal bankruptcy prediction with a predictive capability of 71.41%. This study extends and provides new insights in several important ways. Firstly, this study contributes to the body of knowledge in the personal bankruptcy and data mining literature. Secondly, the application of SMOTE and multi-stage feature selection technique gives significant contributions to improving the models' performance. The results show the virtues of the proposed SMOTE technique based on a balanced dataset are more effective than the original dataset. The multi-stage feature selection technique helps to identify the optimal set of predictors without increasing the complexity of the method. Finally, this study assists AKPK and financial institutions to determine the creditworthiness of individuals, to ensure their debt sustainability and reduce the probability of loan default.

ACKNOWLEDGEMENT

Finishing this thesis amid the global pandemic and social distancing, I realize more than ever I am only capable of intellectual effort when exchanging ideas and impressions with others. In this regard, I have been extremely grateful and privileged to be surrounded by wonderful minds and hearts during these years (2019 - 2023). This thesis would not be possible without the help from many amazing people. Let me start with the most important thing in life. I would like to first and foremost praise the Almighty Allah for His blessings and guidance, giving me the opportunity to embark on my PhD, and for completing this long and challenging journey successfully. It was a very humble and valuable experience, full of ups and downs. Alhamdulillah.

With regards to the university, I am honoured to write the thesis under the guidance of my supervisor, Prof. Ts. Dr. Shafinar Ismail. I am eternally grateful for her continuous motivation and benevolence in guiding me from the beginning of the study until the completion of this thesis. Her extensive experience in research, her professional guidance helps to smoothen the research progress, providing me with a good learning experience, thus making this journey worthwhile. I would like to express deepest gratitude to my co-supervisor, Dr. Sharifah Heryati Syed Nor, for her support and constructive feedbacks throughout my PhD journey. Her meticulous nature of work and inquisitive ways of discussing my research helped me to grow intellectually towards becoming an independent researcher. It was a great honor to have them working with me on my thesis. Alhamdulillah.

Next, my appreciation goes to the AKPK who provided the facilities and assistance during the data collection stage and interviews. I am also deeply grateful to the DMP Department who had provided me with a large and unique dataset, generated exclusively for this research. I am grateful for the openness of professionals in AKPK who were willing to set aside hours to answer the questions of a curious postgraduate student. Alhamdulillah.

I would also like to acknowledge the Faculty of Computer and Mathematical Sciences fraternity: Assoc. Prof. Dr. Ahmad Zia Ul-Saufe Mohamad Japeri, Ms. Nurbaity Sabri, and Dr. Wan Fairos Wan Yaacob for their generosity in sharing their knowledge and providing valuable insights on data analysis. Special thanks to my research team members, colleagues, and friends for their readiness and willingness to assist me at any time. Alhamdulillah.

On the heart side of my life, this thesis is dedicated to my family. To my beloved parents, Md. Sahiq and [redacted] and my siblings, thank you very much for your unconditional support, prayers, and encouragement. To my mother-in-law, [redacted] thank you for helping me to take care of my children. Finally, sincere appreciation for my amazing husband, Azwan Azim, and wonderful kids, Afrina Marissa and Afran Umar - thank you for being by my side throughout this journey with constant love, support, and inspiration, which made this journey endurable. We shared part of this PhD journey and I believe that is the most memorable time of our life, as we appreciated the joy, and we endured the pain, and the long hours of work. I dedicate this work to all of you. Thank you very much from the bottom of my heart. Alhamdulillah….it is finally finished.

TABLE OF CONTENTS