Critical Success Factors in Sustainable Credit Risk Model Among Manufacturing Companies in Malaysia

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Abstract—**Credit risk is always foreseen as an analytical measurement adopted and employed by banking industry in Malaysia. It becomes critical in measuring the borrowers' financial strength before the loan can be granted. In order to get a deep analysis, overview from different aspect is recommended. Financial and non-financial factor including the sustainable criteria are adopted in credit risk model. This pilot study was conducted to investigate critical success factor towards successful sustainable credit risk model among manufacturing companies in Malaysia. The questionnaires were design and distributed to the respondents. The result of reliability test shows that profitability is a critical factor influencing the successful of measurement of credit risk analysis compare to others factor. This study recommends that the future research to explore the influence of sustainable credit risk model to other different industry by considering more variables.**

Keywords—sustainable credit risk, credit risk model, profitability, risk measurement

I. INTRODUCTION

Malaysia's manufacturing sector is predicted to continue growing in year 2018 after a growth of 5.7% in 2017 (Department of Statistical Malaysia). According to Purchasing Managers' Index (PMI), manufacturing sector performance has decreased to 49.9 in December 2017. It's been a greatest growth in over the past three years. Based on the SME's Corporation Report, the manufacturing sector contributed 23% to GDP in 2017, although the percentage is decreasing but still it gives a remarkable contribution to Malaysia GDP.

The manufacturing sector remains a significant sector in the Malaysian economy. In the first quarter of 2018, the sector was the second-largest contributor to Malaysia's gross domestic product (GDP) at 22.8%. The Malaysia budget on 2017 announced Malaysia logged a total of RM1.07 trillion of accepted investments in the manufacturing sector. Manufactured goods are the main factor contributing to more than 80 per cent to Malaysia's total exports. Therefore, the study on manufacturing sector is vital in giving more references and analysis on their performance.

II. LITERATURE REVIEW

Credit risk measurement becomes a critical discussion focusing on providing a vital effect in measuring the company's financial performance. Essentially, most creditors measured the credit risk from two elements. First is financial factors (FF) include profitability and leverage ratio, and second element is non-financial factors (NFF). In addition, the model is strengthening by adding sustainability development criteria. Researcher believes that, additional sustainability criteria will add more value in credit risk measurement process.

According to Norlida et al [9] credit risk depends on the ability of borrower to generate adequate cash flows through operation, earnings, or asset sales to meet their future interest and principle payment of the outstanding debt.

One of the objectives of Basel Standard is involving all banks and deposit taking

institution to secure their capital (required reserve). Although they are permissible to use their in-house model of risk measurement, but the model should deliberate all resilient characteristics that led to massive impact of risk measurement [12]. They recognized financial variables with high numerical explanatory power [7]. Traditional model was founded by Altman [4].

After the subprime crunch knock worldwide, Basel I have been reviewed and BIS (Bank of International settlement) condition and requirement became stricter [11]. Existing credit risk model is no longer creating prudent result, therefore many scholars found that, high explanatory variable such as non-financial factors need to be measured along with financial factors, [3], [4]. According to Guotai & Zhipeng [5] financial data is insufficient, support from non-financial data makes the model even more reliable.

A. *Economic Sustainability Criteria in Credit Risk Measurement*

In years 2000 during the improvement of sustainability development, government was driving companies to take part in their policy to inspire the sustainability development in their business operation. As for some credit to companies who consider sustainability criteria in their business operation, credit institution welcomes the effort by giving extra point. Therefore, all parties including bank and the companies' staff and supervisors should improve their understanding of sustainability risks [8].

There are three criteria (economic, environmental and social) in sustainability to be embedded in the measurement model. Economic sustainability discussing on skill of business in producing effective profit, the payback loan and interest should come from the return on investment from the investment loan. Previous study has recommended that firms engaging in eco-efficient activities are more valued than those just involve in the traditional way of business [1].

B. *Environmental Sustainability Criteria in Credit Risk Measurement*

A second criterion in sustainability is environmental, businesses need to encourage and involve in handling green innovation. Lately, the understanding to create green environment in business condition is very high, they attach environmental and sustainability issues in their business strategy. Therefore, further research should be led to evaluate the consequence of environmental sustainability with the company's performance financially and non-financially [14]. Incorporating environmental standards improve the value of model. In order to support sustainability among the company, policies and system regarding how to integrate these criteria is very crucial. According to Bauer et al [2], the outcomes imply that banks incorporate environmental criteria into the rating phase even though not in all phases of the credit forecasting is recommendable because these risks affect all phases of the credit risk forecasting [10].

C. *Social Sustainability Criteria in Credit Risk Measurement*

A third criterion under sustainability is social, it's mentioning to the business accountability to encourage the workforce right. Businesses must deliver training, fairness in appraisal, provide safe and conducive workplace. Besides, generating a job prospect also one of the business's responsibility in supporting social sustainability. Previous analysis proven that; the social sustainability is straightly connected to business's financial performance [6].

In order to incorporate the social criteria, firm must obey with all policies concerning the human resource and labour act. This is very essential to ensure the labour value deliver to the right person.

III. RESEARCH METHODOLOGY

In this research data was gathered from primary and secondary data. Financial statement of the company is used to calculate the ratio for financial factor; meanwhile questionnaires were distributed to gather the non-financial factors.

There are 150 respondents from manufacturing companies. This study closed the gap by develop a model to measure the company credit assessment considering both financial and non-financial factor. The assessment includes three categories of financial ratio, while, non-financial factors are represented by sustainability criteria consist of environmental, economic and social.
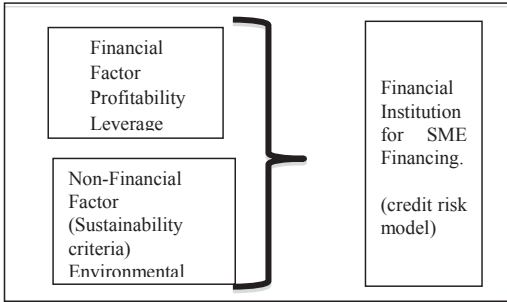

Fig. 1. Theoretical Framework of Credit Risk Measurement

This study examines the critical factor in designing a sustainable credit risk measurement model. Based on a review of the theoretical literature, the following equation is constructed.

$$CRFit = \beta0 + \beta4ROAit + \beta5ROEit + \beta6DARit + \beta1ENVit + \beta2ECOit + \beta3SOCit + \varepsilon it$$

CRF = Credit risk forecasting, DAR = Debt to equity Ratio, ENV = Environment, SOC = Social, ROA = return on Asset, ECO = Economics, ROE = Return on Equity

This study used 15 common financial ratio represents financial factor and 12 items to represent the sustainability criteria namely environmental, economic and social. Questionnaires were circulated to the enterprise under manufacturing sector.

IV. RESULT AND DISCUSSION

Reliability tests constructs is between 0.850 until 0.783 (refer Table 2). The Cronbach's for all variables chose under this study was larger than 0.700. This indicates that 0.7000 is acceptable level of reliability test. This study employed Cronbach's alpha in order to check the homogeneity of the items. The entire group marked Cronbach's alpha of 0.82, which is concluded to be satisfactory after study conducted the reliability test. The results of reliability analysis show that 17 variables under both factors are valid and reliable for measurement of credit risk in manufacturing industry in Malaysian. This can be validated to the fact that all the items were empirically verified.

Multiple linear regression and linear discriminant analysis is used to model the incorporation of sustainability criteria into the credit controlling process. This study attempted to foresee the existing ratings from the dependent variable. The dependent variables for this study are financial factor, which include the profitability, leverage and liquidity.

The linear discriminant analysis for the existing credit scoring, which is also known to be the z-score model for the independent variable is used to give an extensive analysis. The independent variables for this study are the non-financial factor, which include the economic, environmental and social factors in measuring the sustainability factors. The control variables for this study are size and types of the company.

TABLE I. RELIABILITY ANALYSIS

Factor	Number of item	Cronbach alpha
Profitability	5	0.850
Leverage	5	0.823
Liquidity	5	0.801
Environmental	4	0.796
Economic	4	0.803
Social	4	0.783

The z-score is higher than zero signifies that the borrower fits to the cluster of performing loans and a z-score worse than zero indicates that the borrower belongs to the group of non-performing loans. It indicates that the higher the z-score, the higher the risk of loan.

TABLE II. DESCRIPTIVE STATISTIC

Variables	Group	N	Mean	Std. Deviation
Financial factors (Traditional criteria)	All	122	3.19	0.58
	Non-Performing	43	3.02	0.41
	Performing	99	3.37	0.39
Non-financial factors (Economic sustainability)	All	140	3.01	0.43
	Non-Performing	129	3.28	0.32
	Performing	48	3.14	0.35
Non-financial factors (Environmental sustainability)	All	118	3.18	0.49
	Non-Performing	30	3.12	0.59
	Performing	64	3.24	0.57
Non-financial factors (Social sustainability)	All	124	3.19	0.63
	Non-Performing	30	2.74	0.2
	Performing	95	3.32	0.52

Table II indicates the descriptive statistics for the ratings. The impact of covariates by using chi-square tests are to appraise whether there is a substantial relation between the organization of a loan as performing or non-performing and this study found that no covariate to be considerably related to the organization of a loan as performing or non-performing. Moreover, this study also analyses whether there are significant differences between the covariates and the ratings of financial and nonfinancial factors by using three 2 x 4 ANOVAs for repeated measurement and did not find that the type of company, the size and types of the company had a significant effect on the ratings.

By using a multiple regression analysis, it also analysed the influence of the sustainability ratings on the financial performance of the borrower using the three-sustainability rating (non-financial factors) as an independent variable and the existing rating (financial factors) as a dependent variable in a stepwise regression model.

The r-square is equal to 0.780 and adjusted r square is equal to 0.585 and it indicates that the independent variables were capable to foresee an important amount of the variance of the credit risk operationalized by the traditional ratings.

V. CONCLUSION

This study provides lender and borrower a better reference in credit risk forecasting. The borrower will follow the standard fix by the lender in order to be granted the loan. Adopting the sustainability elements is very crucial to ensure the high score for the credit risk assessment. Sustainability factors include the economics; environment and social factors are significant in aggressive pushing more score to credit risk factors. Considering both financial and non-financial factors have strengthened the analysis of the firm credit standing. Therefore, the developed model is significant to the lender to consider before loan can be granted.

Besides the study is expected to contribute a massive idea to industry and government and policy maker. The model is estimates to provide lender in analyzing business strength for financial and non-financial view before making important decisions in giving out loan to business.

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