

INTEGRATION OF SUSTAINABILITY CRITERIA IN CREDIT RISK FORECASTING

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ABSTRACT

Credit risk forecasting is very crucial and widely studied as it provides a significant impact in forecasting the company's performance. It needs to be evaluated from various aspects to ensure the validity and accuracy of the process. The existing model considered solely on financial factors is less adequate, therefore, this paper attempts to integrate the sustainability factors in order to improve and strengthen the forecasting ability of credit risk performance since the role of suitability criteria is drawing more attention by financial provider. This paper attempts to study the correlation between the three sustainability criteria and financial performance by testing the relationship using multiple regression model. The result strengthens the forecasting process and add more remarkable finding to credit risk management model as a whole.

Keywords: credit risk model; risk management; sustainability criteria.

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1. INTRODUCTION

Credit risk forecasting is play an important role in providing a significant impact in analyzing the company's financial performance. It assists lender in decision-making process, the measurement of company's financial performance is taken from different aspects. It is suggested by previous research to not only focus on one aspect, precise measurement should be considered from different view [16]. Initially, most lender embedded two elements in their credit risk model. First is common financial factors (FF), for instance profitability and leverage ratio, and second element is non-financial factors (NFF). In common situation, lender normally includes types of industry the company operating in and the size of the company in NFF. In order to improve the existing model and appreciate the policy to boost the sustainability development, this study will consider an additional factor namely, sustainability criteria into credit risk forecasting model. Sustainability criteria is commonly represented by economic, environmental and social. In addition, this study proposes to investigate the relationship of two main elements namely financial factors and non-financial factors.

Business financing is always the main issue discussed among financial institution or lender. The business role in raising the country's economic is never denied, the contribution to the country income is always critical. In the Eleventh Malaysia Plan covering 2016 until 2020 wanted all parties to support in enhancing their capability to stay competitive and resilient to the domestic market as well as discover a new opportunity in global market.

In order to expand the business, company need financially and non-financially support. Financial institutions are now offering a lot of product to fund the business. In addition, SME Bank is established to fully offer funding for SME. Besides that, the commercial bank nowadays provides a competitive rate for business loan.

The existing of competitive business loan purposely to support the financial standing of borrower, although the non- performing loan percentage is mostly come from business loan, but the lender still play a vital role in assisting the business operation in order to make sure the numbers of national income remain strong. According the SME bank annual report for 2017, they are suffering with high non-performing loan (NPL) at 12.3% compare to other commercial banks that perform as lower as 3.15%.

Resulting from the high percentage of NPL, lender needs to improve the credit risk assessment by considering the robust variable or factor to be included in the assessment model. Credit risk forecasting is another alternative to forecast the creditworthiness of the company.

1.1. Credit Risk Management

Credit risk is defined as possibility of loss due to default in financing. It involves the borrower's failure to repay or meet a contractual obligation. According to [12], 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. Credit risk is widely review and draw attention from Basel Committee in establishing policies for financial institution guidance. The committee identified credit risk as the dominant risk for banking and firms related to lending and deposit activities. Therefore, Credit risk assessment system is very crucial in determining a capability of the company to pay the loan. Lack of skill and knowledge on predicting credit assessment will cause wrong interpretation, as a result it causes inaccurate findings.

Although every bank has their own model in measuring the company's performance, loan default is still happen. Therefore, in this study, two main elements are embedded in order to have the most valuable assessment. Introducing the sustainability criteria as non-financial will give a massive impact to the credit risk assessment.

During the introduction of Basel Standard, banks and deposit taking institution are required to secure their capital. Although they are allowed to use their internal model of risk forecasting but the model must consider all strong aspects lead to high impact risk measurement. Examples of existing model are credit migration approach suggested by JP Morgan with Credit Metrics, option pricing or structural approach originated by KMV and which is based on the asset value model and the actuarial approach recommended by Credit Suisse Financial Products (CSFP). These models emphasize on financial factors which means assessing the financial strength by considering profit, leverage and efficiency level.

Traditional or existing models of credit risk measurement concentration on valuing probability default which referring to event of bankruptcy or insolvency. They identified financial variables with high statistical explanatory power [10]. Traditional model was

founded by [5].

In year 1998 after the subprime crisis hit global financial economics, Basel I have been reviewed and BIS (Bank of International settlement) requirement became stricter [15]. Existing credit risk model is no longer producing prudent result, therefore many researchers found that, high explanatory variable such as non-financial factors need to be considered [4-5]. Although the references on model which embedded both financial and non-financial factors are limited but many parties involve in credit risk forecasting have putting huge effort. Furthermore, Basel Standard II and III have requested all banks and deposit taking institution to heavy view the assessment from different angle in order to produce high quality of credit assessment.

Building a multi criteria credit rating model based on qualitative and quantitative criteria is very crucial especially in evaluating small enterprise. According to [6], financial data is inadequate, support from non- financial data makes the model even more reliable.

1.2. Economic Sustainability Criteria in Credit Risk Forecasting

In years 2000 during the boost of sustainability development, government was forcing companies to take part in their policy to encourage the sustainability development in their business operation. As for some credit to companies who embedded sustainability criteria in their business operation, credit institution appreciates the effort by giving additional point to those companies which consider green and sustainable criteria in their work operation. In addition, improvement of the existing credit risk assessment need to be done. Sustainability criteria in business operation will encourage companies to better align their operations with economic, social and environmental needs. Therefore, all parties including bank and the companies' staff and supervisors should improve their understanding of sustainability risks [11].

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

economic sustainability also referring to the borrower's capacity and effort to interact with environmental and society in business activity.

1.3. Environmental Sustainability Criteria in Credit Risk Forecasting

Second criteria in sustainability is environmental, business needs to support and involve in managing green innovation. Other than that, business operation should comply green and environmental standard. Recently, the awareness to create green environment in business condition is very high, they connect environmental and sustainability issues in their business strategy. Therefore, the further research should be conducted to assess the effect of environmental sustainability with the company's performance financially and non-financially [19].

Integrating environmental criteria add a high value to the model. In order to support sustainability among the company, policies and system regarding how to integrate these criteria is very crucial. It deeply concerns on low operational cost. According to [2], positive environmental practices are associated with a lower cost of debt, furthermore it provides support for the view that the credit standing of borrowing firms is influenced by legal, reputational, and regulatory risks associated with environmental incidents.

About 10 years ago, banks began to combine environmental risks into their credit risk controlling procedures. The integration of the criteria is presented in various phase of credit risk forecasting including rating, costing, pricing, monitoring and workout. The integration of environmental risks into the credit risk forecasting is significant due to it encourage sufficient risk management guaranteed. The outcomes indicate that banks incorporate environmental criteria mainly 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 [13].

Among the critical criteria concerning on environmental on credit risk forecasting is threat to human health. The project done should particularly focus on the threat of loss [7]. According to [3], strategy methodology is required in order to develop a new measurement tools especially in a new area such as sustainability development. The developed model must embed both theory and practical practice and bring to critical analysis process consist of guideline, factor and established standards.

1.4. Social Sustainability Criteria in Credit Risk Forecasting

The third criteria under sustainability is social, it's referring to the business responsibility to promote the labor right. Business or company must deliver training, fairness in appraisal and salary, provide safe and conducive workplace. Other than that, creating a job opportunity also one of the business's responsibility in supporting social sustainability. Previous study proven that, the social sustainability is directly connected to business's financial performance [8]. In order to integrate the social criteria, firm must comply with all policies regarding the human resource act and labor act. This is very crucial to ensure the labor benefit deliver to the right person.

2. METHODOLOGY

All data in this research is gathered from both primary and secondary data. Financial statement of the company is used to calculate the ratio for financial factor, meanwhile questionnaires were distributed to assemble the non-financial factors.

Other than that, in developing the model, information was collected from different sources such as journals, books, magazines, newspaper and relevant web sites contributed to better understanding of research.

From literature review, it helps the researcher to set direction and determine relevant variables that in turn led to the recognizing the accurate variable. Statistical analysis is employed to analyze the accuracy of the model in order to assess company's capacity in securing loan.

This study will close the gap by develop a model to forecast the company credit assessment with considering both financial and non-financial factor. The assessment includes five categories of financial ratio, while non-financial factors are represented by sustainability criteria consist of environmental, economic and social.

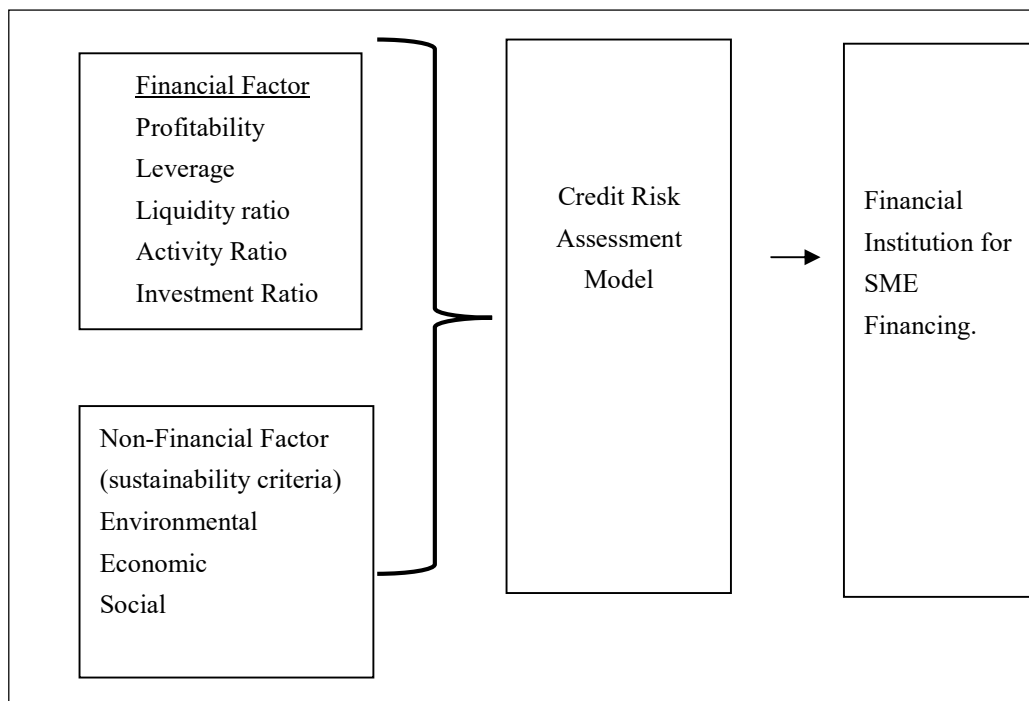


Fig.1. Theoretical framework of credit risk forecasting

This study investigates the correlation between the sustainability criteria and financial factors in forecasting the credit risk of the company. Based on a review of the theoretical literature, the following equation is formed.

$$\begin{aligned}
 CRFit = & \beta_0 + \beta_1TAit + \beta_2TLoanit + \beta_3TDepit + \beta_4ROAit + \beta_5ROEit + \beta_6DARit + \beta_1ENVit \\
 & + \beta_2ECOit + \beta_3SOCit + \epsilon_{it}
 \end{aligned}
 \tag{1}$$

CRF = Credit risk forecasting DAR = Debt to equity Ratio

TA = Total Asset ENV = Environment

TL = Total Loan ECO = Economics

ROA = return on Asset SOC = Social

ROE = Return on Equity

While, β_0 is a constant and β is a coefficient of the variables while ϵ_{it} is the residual error of the regression.

This study used 25 common financial ratio represents financial factor and 12 items selected to represent the sustainability criteria namely environmental, economic and social. Questionnaires were distributed to the enterprise under service and manufacturing sector. The selection of the sector is based on the numbers of enterprise registered. In addition, service and manufacturing sectors are the largest sector enterprise which mostly contributed to

massive gross domestic product. Table 1 indicates the statistic of SME contribution to Malaysia GDP and market share.

Table 1. Statistic SME by sector contribution to Malaysian SME [17]

Sector	Market Share (%)	Number of SME	GDP Contribution (%)
Service	89	809,126	58.9
Manufacturing	5.3	47,698	21.7
Construction	4.3	39,158	5.7
Agriculture	1.17	10,128	12
Mining and Quarrying	0.1	865	0.4

This study employed Cronbach's alpha in order to checked the homogeneity of the items. All of the group marked Cronbach's alpha of 0.69 which is concluded to be satisfactory after study conducted the reliability test.

3. RESULTS AND DISCUSSION

This study used multiple linear regression and linear discriminant analysis to model the integration of sustainability criteria into the credit management process. By using multiple regression analysis, this study tried to predict the existing ratings from the dependent variable. The dependent variables for this study are financial factor which include the profitability, leverage, liquidity, activity, and investment ratio.

The linear discriminant analysis for the existing credit scoring, which is also known to be the z-score model for the independent variable. The independent variables for this study are the non-financial factor which include the economic, environmental and social factors. The control variables for this study are size and types of the company. The z-score bigger than 0 indicates that the borrower belongs to the group of performing loans and a z-score lower than 0 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 2. Descriptive statistic

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

Table 2 indicates the descriptive statistics for the ratings. The influence of covariates by using chi-square tests are to evaluate whether there is a significant relation between the classification of a loan as performing or non-performing and this study found that no covariate to be significantly related to the classification of a loan as performing or non-performing. Furthermore, this study also analyzed 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 analyzed 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 able to

predict a significant amount of the variance of the credit risk operationalized by the traditional ratings.

4. CONCLUSION

Aft 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.

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 financial and non-financial view before making important decisions in giving out loan to business. Early sign can be traced to anticipate the event of default. Prudent measurement will improve effectiveness in the banking system in operating with low cost and low NPL.

This model provides in depth information to financial institution, creditor and investor and act as an additional tool in assessing company performance. In short will reduce a probability of default and convince all parties to invest.

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