

## Determinants of Credit Risk: Evidence from Commercial Banks in Malaysia

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Received Date: 2 December 2020

Accepted Date: 30 December 2020

Published Date: 31 January 2021

### ABSTRACT

*The purpose of this study is to determine the relationship between microeconomic factors with credit risk among selected commercial banks in Malaysia. For this purpose, a sample of seven out of 27 commercial banks in Malaysia was selected and the microeconomic factors affecting credit risk with six measurements of return on asset (ROA), bank size, leverage, the ratio of capital, interest income and return on equity (ROE) were examined by applying Panel Regression Fixed Effect (FE) Model for a period 20 years from 1998 to 2017. The scope of the study covers seven selected commercial banks in Malaysia namely: Affin Bank Berhad, Alliance Bank Malaysia Berhad, CIMB Bank Berhad, Hong Leong Bank Berhad, Malayan Banking Berhad, Public Bank Berhad and RHB Bank Berhad. This study is using credit risk proxy by non-performing loan for dependent variable while independent variables that have been selected were Returned on Asset (ROA), bank size, leverage, Ratio of Capital, interest income and Return on Equity (ROE). The findings of the study managed to reject the null hypothesis for return on asset, bank size, leverage, interest income and return on equity which indicates the five microeconomic variables give a significant relationship with credit risk. There are positive relationships between leverage, interest income and return on equity with credit risk while return on asset, bank size and ratio of capital are negatively related to credit risk. However, the study fails to find any significant relationship between the ratio of capital and credit risk for commercial banks in Malaysia.*

**Keywords:** Credit Risk, Non-Performing Loan, Commercial Bank, Microeconomic Factors

### INTRODUCTION

A commercial bank is a place where most people do their banking activities. Commercial bank can be defined as one of the financial institutions where the main activities provided such accepts deposits, offers checking account services, makes various loans and offers basic financial products like certificates of deposit and savings accounts to individuals and small firms. The sources of income for commercial banks come from loans provided and interest income earned from the loans. By providing loans like mortgages, auto loans, business loans and personal loans, the commercial bank has the potential to involve with credit risk. Credit risk is the most critical risk looked by banks and the

achievement of their business is relies upon how precise the estimation and how productive of their administration handling on the risk issue (Gieseche, 2004).

Credit risk can occur when an account holder default or disappointment in making instalment on their obligation toward loan repayment, where it is additionally called as a default chance. According to Takayasu, Yosie, Sufian and Ronnie (2000), among the factor that been utilized to distinguish risk are non-performing loan (NPL) or weakened advance loan which is a factor that has been getting a crucial concentration in the examination of how credit risk developed after the episode of 1997 Asian Financial Crisis. While, as indicated by Coyle (2000), credit risk represents a default from the borrowers or failure of credit clients to reimburse payment over the required funds at the time that been concurred. Ahmad and Ariff (2007) had mentioned that most banks in Thailand, Indonesia, Malaysia, Japan and Mexico experienced high non-performing loan which bringing about the shutting down of a few banks in the countries. Moreover, the issues related to credit risk will affect the banks as well as the entire economy of the countries. This circumstance happens when credits and advances that had been made by commercial banks had turned out as non-gainful. Consequently, it will make this circumstance to create a large number of non-performing loans which had been characterized as a benefit or a record of a borrower that the bank needed to arrange as sub-standard or suspicious resource (Bank for International Settlements, 2005).

There are many studies conducted on credit risk among banks worldwide, however, a very little examination has been done in Malaysia involving the banking sector by focusing on the commercial bank. Among the past study that had been conducted by Funso, Kolade and Ojo (2012), Zribi and Boujelbene (2011), Fiordelisi, Marques-Ibanez and Molyneux (2010), and Ahmad and Ariff (2007) they just concentrated on the business particular and focused on macroeconomic variables. Demircuc-Kunt (1998); Detragiache (1998) and Llewellyn, Lakstutiene, Breitereyte and Rumsaite (2002) had conveyed several macroeconomic factors such gross domestic product, high loan fee, high rate of joblessness and increment in expansion affect the bank non-performing loan performance. Besides macroeconomic factors, microeconomic variables also play a huge part in the credit risk. Castro (2013) on his study had been overlooking toward the microeconomic factors that can influence a bank's credit risk. He suggests leverage as one of the microeconomic variables that can be used to analyse. Thus, this study uses microeconomic variables to analyse the drivers of credit risk for commercial banks in Malaysia. The dependent variable is credit risk as a proxy by non-performing loan while the chosen microeconomic variables such return on asset, bank size, leverage, the ratio of capital, interest income and return on equity are used as independent variables. Therefore, the objectives of this study are as follow: -

- 1) To choose the optimal model.
- 2) To determine the relationship between microeconomic variables and credit risk for commercial banks in Malaysia.
- 3) To identify the most significant variable that influences credit risk for commercial banks in Malaysia.

## LITERATURE REVIEW

### Non-Performing Loan

Commonly, financial institutions such as commercial banks are facing with high credit risk issues because of low administration practices of credit risk among banks (Takayasu et al., 2000). One of the main considerations that make credit risk for each bank is a non-performing loan. This proxy had been generally utilized as credit risk estimation. As indicated by Herring (1999), non-performing loan in Indonesia, Malaysia, South Korea and Thailand had risen to 30 per cent or more of the aggregate resources after the Asian Financial Crisis. Along these lines, a non-performing loan may cause a

substantial number of bank disappointments and having money related pain. Thiagarajan (2011) had measured the performance of credit risk by utilizing the proportion of non-performing loans (NPL). In his study, he had done the broad writing audit clarified that non-performing loans will be utilized to quantify credit risk. Non-performing credit (loan) can be described when the banks don't get any premium or portion instalment as expected from the monetary resources. They are being perceived as a non-performing loan because of the disappointment in producing income for the banks (Adhikary, 2012.). Other than that, Idris and Nayan (2016) guaranteed that when non-performing loan have been left unpaid for at any rate more than 90 days, the loan will be considered as a weakened loan.

### **Return on Asset**

Kargi (2011) defined return on assets (ROA) as a monetary proportion that demonstrates the level of profit that an organization gains in relation to its general assets. It is commonly characterized as the net income to the aggregate assets. Net income is gotten from the pay articulation of the organization after deducted all expenses. Epure and Lafuente (2012) showed that execution enhancements take after administrative changes and that risk clarifies the distinctions in banks and non-performing loans are adversely influence proficiency and return on assets. Meanwhile, Felix and Claudine (2008) convinced from their discoveries that the return on assets (ROA) has a negative relationship with credit risk because when the proportion of non-performing loan increased to total credit-related institutions, it leads to a decrease in profitability. In addition, Al-Khourri (2011) had discovered that credit risk is the main considerations that influence bank execution when the profitability is estimated by using a return on asset. Meanwhile, Ben-Naceur and Omran (2008) showed that credit risk has positive huge effects on a bank's profitability.

### **Bank Size**

Bank size is one of the most generally acknowledged as determinants in credit risk. Numerous researchers' trust that bigger bank is more averse to have high credit risk and it is expected a positive connection between bank size and credit risk (Jong, 2002). However, Megginson (2005), Cebenoyan, Cooperman and Register (1999) and Chen, Steiner and Whyte (1998), they had stated that there is a negative connection between bank size and credit risk. The result also supported by Salas (2002) which found a negative connection between bank size and NPLs. They clarify that the bigger bank size takes into consideration, the more expansion it's become in the long run, this will encourage the lessening of credit risk that been intermediaries by NPLs. Other than that, Fischer, Gueyie and Ortiz (2002) and Hu, Yang and Yung-Ho (2004) had found that bank size (estimated by the normal logarithm of a total asset) is adversely significant related towards the credit risk of U.S. banks.

### **Leverage**

Leverage is generally been described as the utilization of obtained cash to make a venture and profit for the speculation. It is more unsafe for an organization to have a high proportion of money related to leverage (Jong, 2002). Commercial banks consider high leveraged credits as a higher danger of default and leveraged loan for organizations will leads to higher financing costs than a common loan. These rates reflect the larger amount of credit risk associated with issuing the advance. Fischer *et al.* (2002) found that in Canada and Mexico, leverage is significantly positively related to bank credit risk. Furthermore, Baker (1973) measures leverage as the proportion of value to add up to resources for the main firms in an industry over a multi-year time frame and he clarified that at the business level, leverage raises industry income rates and more leverage can contribute to more serious dangers especially on credit risk.

## Ratio of Capital

The Ratio of Capital is a measure of a bank's budgetary quality communicated by the ratio of value capital to add up to total asset to its hazard weighted credit called as loans (Economic Times Bureau, 2010) and Chen, Cheng and Wu (2005) found that ratio of capital is non-statistically significant with credit risk. Meanwhile, Zribi and Boujelbene (2011) found an alternate significant about the connection between ratios of capital toward credit risks. It also supported by Vong and Chan (2009) which found that capital ratio significantly affects credit risk in five commercial banks in Macao SAR.

## Interest Income

Interest income from bank resources is an essential part of a bank's net income. Interest income is the measure of interest that has been earned by bank in a particular period of lending activities. Brock and Suarez (2000) stated that there is a negative connection between bank income and NPLs over aggregate loans for most Latin American countries. In addition, Beck *et al.* (2013) in their on-going investigation found that the increments in interest rates tend to cause an expansion in non-performing loans. It also supported by Ahmed and Khan (1999), Betty, Chamberlain and Magliolo (1995) and Collins, Shackelford and Wahlen (1995) that expressed a positive relationship between interest income and loan loss provision.

## Return on Equity

Return on equity (ROE) is an estimation of benefit that represents how many dollars that an organization can produce with every dollar of investors' money. Using ROE as an estimation to evaluate credit risk is being shared by other researchers such as Felix and Claudine (2008). The outcomes showed that there is a particular relationship between the return on equity of the bank and its credit risk level (De Nicolo, 2000). In contrast, Francesca and Maria (2014) found no particular indication of the relationship between return on equity and bank risk. Meanwhile, Athanasoglou, Appiah and Arthur (2005) found that there is a negative relationship between bank equity and credit risk.

## METHODOLOGY

This paper aims to determine the relationship between microeconomic factors with credit risk among selected commercial banks in Malaysia. The sample consists of seven selected commercial banks that actively operated in Malaysia for 20 years period from 1998 until 2017. This study is causal as it refers to testing cause and effect between independent variables and dependent variables whether one variable cause another to change or not. Hence, this study examined the relationship between return on asset, bank size, leverage, the ratio of capital, interest income and return on equity with credit risk in commercial banks at Malaysia. There are 27 commercial banks in Malaysia but only seven banks are chosen because of data information missing issues. The selected commercial banks are Affin Bank Berhad, Alliance Bank Malaysia Berhad, CIMB Bank Berhad, Hong Leong Bank Berhad, Malayan Banking Berhad, Public Bank Berhad and RHB Bank Berhad. The balanced panel data comprises of 140 observations of seven selected commercial bank in Malaysia are analyzed.

The dependent variable is credit risk that used non-performing loan as a proxy while the independent variables consist of return on asset, bank size, leverage, the ratio of capital, interest income and return on equity. All the data used in this study was collected from DataStream and measured in percentage from the year 1998 to 2017. Table 1 shows a list of dependent and independent variables together with an explanation and sources of data used in this study.

**Table 1: List of Variables**

<b>Variables</b>	<b>Proxy</b>	<b>Explanation</b>	<b>Source of Data</b>
<b>Dependent</b> Credit risk	Non-performing Loan (NPL)	Non-Performing Loan to Total Loan (%)	DataStream
<b>Independent</b> Return on Asset		Net income to Total Asset (%)	DataStream
<b>Independent</b> Bank Size		Natural Logarithm of Total Asset (%)	DataStream
<b>Independent</b> Leverage		Total Liability to Total Asset (%)	DataStream
<b>Independent</b> Ratio of Capital		Total Equity to Total Asset (%)	DataStream
<b>Independent</b> Interest Income		Interest Expenses + Non-Interest Expenses to Total Asset (%)	DataStream
<b>Independent</b> Return on Equity		Net income to Total Equity (%)	DataStream

This study used Panel Specification Test, F-Test, Breusch and Pagan Lagrange Multiplier (BP-LM) Test, Diagnostic Test, Multicollinearity Test, Serial Correlation and Heteroscedasticity Test by using Statistic/Data Analysis (STATA) software application version 14. The study employs a Fixed Effect (FE) model as the best fit model. The panel data estimation with interaction effect presented in Eq. (1).

$$CR_{it} = \beta_0 + \beta_1 ROA_{it} + \beta_2 BSIZE_{it} + \beta_3 LEV_{it} + \beta_4 CAP_{it} + \beta_5 INTI_{it} + \beta_6 ROE_{it} + \varepsilon_{it} \quad (1)$$

Where, credit risk (CR) is the dependent variable while ROA, BSIZE, LEV, CAP, INTI and ROE representing a return on asset, bank size, leverage, the ratio of capital, interest income and return on equity acts as independent variables. The main objective of the study is to identify the important determinants of credit risk in Malaysian commercial banks. Furthermore, it also concerned to find if there is any different effect of microeconomic factors towards credit risk for commercial banks in Malaysia. In achieving the objectives, the study states the following hypotheses:

- H<sub>1</sub>: There is a significant relationship between return on asset and credit risk for commercial banks in Malaysia
- H<sub>2</sub>: There is a significant relationship between bank size and credit risk for commercial banks in Malaysia
- H<sub>3</sub>: There is a significant relationship between leverage and credit risk for commercial banks in Malaysia
- H<sub>4</sub>: There is a significant relationship between the ratio of capital and credit risk for commercial banks in Malaysia
- H<sub>5</sub>: There is a significant relationship between interest income and credit risk for commercial banks in Malaysia
- H<sub>6</sub>: There is a significant relationship between return on equity and credit risk for commercial banks in Malaysia

## RESULTS AND DISCUSSIONS

### Panel Specification Test

The initial step is to choose which statistic panel model to apply. There are three accessible models which are pooled ordinary least squares (POLS), fixed effect (FE) and random effect (RE) that can be used to choose the best statistic panel. In this examination, the decision of a suitable model among POLS or FE or RE exclusively relies on the three types of test that has been recommended. The tests are comprising of F-test, Breusch-Pagan Lagrange Multiplier (BP-LM) test and Hausman test.

As been presented in Table 2 below, the consequences of the F-test (p-value < 0.05), BP-LM test (p-value > 0.05) and Hausman test (p-value < 0.05), it is recommending that FE is the most fitting model estimator to be utilized. Along these lines, for the consequent section, the investigation and discussion on the determinants of credit risk for a commercial bank in Malaysia were based on the FE model.

**Table 2: Panel Specification Test**

	<b>F-Test</b>	<b>BP-LM Test</b>	<b>Hausman Test</b>	<b>Appropriate Model</b>
Credit Risk	0.0000	1.0000	0.000	Fixed Effect (FE)

### Diagnostic Tests

Once the fitting model had been resolved, which is the FE model, various diagnostic tests than were performed to check for the nearness of multicollinearity, heteroskedasticity and serial correlation issue. Based on Table 3 below, the value of variance inflation factor (VIF) is 0.000117 which mean that there is no multicollinearity problem because VIF is less than 10. This means that multicollinearity does not appear to be a severe problem in the study. Meanwhile, the diagnostic demonstrates that there is a nearness of heteroskedasticity (p-value < 0.05) on the FE model. To rectify this issue, a remedy technique has been done by utilizing fixed effect regression (within) FE cluster option. Lastly, the diagnostic result shows there is no serial correlation problem exist in this study due to (p-value > 0.05).

**Table 3: Diagnostic Test**

<b>Model</b>	<b>Multicollinearity Test</b>	<b>Heteroskedasticity Test</b>	<b>Serial Correlation Test</b>
Credit Risk	VIF = 0.000117	p-value = 0.0065	p-value = 0.2107

### Fixed Effect Model Estimation

Table 4 presents the Fixed Effect (FE) model estimation of the study. The results can be as in Eq. (2):

$$CR_{it} = -1705.408 - 1.937ROA_{it} - 0.567BSIZE_{it} + 0.027LEV_{it} - 0.003CAP_{it} + 0.754INTI_{it} + 0.053ROE_{it} \quad (2)$$

As appeared in Table 4, the regression had recommended that the model fits the data well at the 5% significance level. The adjusted R-squared value of the model is 88% which indicates 88% of the variability in credit risk for Malaysian commercial banks can be explained by the six independent

variables chosen while another 12% remains unexplained due to other determinants that are not included in this model.

**Table 4: Fixed Effect (FE) Model Estimation**

	<b>Model 1</b>
ROA	-1.937*** (-5.54)
BSIZE	-0.567** (-5.36)
LEV	0.027* (4.16)
CAP	-0.003 (-0.09)
INTI	0.754*** (11.82)
ROE	0.053* (2.15)
Constant	-1705.408 (-0.53)
N	140.00
r2	0.89
r2_a	0.88
r2_w	0.85
r2_b	0.56
r2_o	0.80
F	162.03
p	0.00
chi2	1085.41

T-statistics in parentheses \* p < 0.1, \*\* p < 0.05, \*\*\* p < 0.01

Notes: (1) ROA = Return On Asset, BSIZE = Bank Size, LEV = Leverage, CAP = Ratio of Capital, INTI = Interest Income and ROE = Return On Equity. (2) Figures in parenthesis are t-statistic. (3) Model 1 = Original Data.

The FE model estimation identifies five variables that are statistically significant in determining credit risk for commercial banks in Malaysia. The five variables are returned on asset (ROA), bank size (BSIZE), leverage (LEV), interest income (INTI) and return on equity (ROE). Return on asset is significant at 1 per cent level and negatively related to credit risk. This means for every 1 per cent increase in return on asset, credit risk will decrease by 1.937 per cent. This outcome consistent to the study conducted by Epure and Lafuente (2012); Felix and Claudine (2008) that mentioned the higher return on asset, the lower non-performing loan (credit risk) in banks. This is due to the bank management action that avoided potential risk with all the more precisely dealing with their credit risk by expanding their return on asset to counterfeit the high number of credit risk. Meanwhile, interest income also significant at 1 per cent level and have a positive relationship. Thus, an increase of interest income by 1 per cent will increase credit risk by 0.754 per cent. This result is consistent with Ahmed and Khan (1999); Betty *et al.* (1995); Collins *et al.* (1995). Bohachova (2008) stated that the expansion in interest income will expand the return of bank straightforwardly and by it likewise will cause the credit risk to be expanded fundamentally.

The result also managed to reject the null hypothesis for leverage and return on equity. Hence, there is a significant relationship between leverage and return on equity with credit risk at 10 per cent level. Both variables indicate a positive relationship with credit risk for commercial banks in Malaysia. The positive relationship between the variables implies that the greater leverage and return on equity lead to greater credit risk. A positive significant relationship between leverage and credit risk consistent with the previous research conducted by Fischer *et.al* (2002); Cebenoyan (1999); Baker (1973). This

shows when a bank has high leverage, this will turn into an abnormal state of credit risk because of their positive relationship that had been affirmed by the test been conducted. According to Baker (1973), leverage raises industry profit rates at a business level and more leverage signifying more serious dangers. Hence, when banks are having high leverage, their additionally will appearances of weight high credit risk because of the leverage is specifically connected with the banks' capacity to produce a profit.

Another important factor that affects credit risk for commercial bank is bank size. At a 95 per cent confidence level, the study rejects the null hypothesis thus accept the alternate. The result shows a negative significant relationship between bank size and credit risk. This result also supported by Megginson (2005); Chen *et al.* (1998); Hu *et al.* (2004). The negative relationship demonstrates that when banks have bigger size, the credit risk that the bank will confront conclusively will turn out to be less because of the negative relationship. These situations happen because the banks with huge size are having a greater chance to diversification their portfolio and the diversification will assist the bank with maximizing their profit, to continue keeping up the credit risk at the protected level.

However, the study fails to find any significant relationship between the ratio of capital (CAP) with credit risk but there is a positive relationship between the two variables. Zribi and Boujelbene (2011) showed the same result of a negative relationship between the ratio of capital with credit risk. They clarified that the larger amount ratio of capital for the bank will bring about lower non-performing loans (credit risk) in banks. When banks having a high ratio of capital they will less have a non-performing loan because of their capacity to boost their lending activities to the borrowers that need their money. Additionally, interest income carries out as the most variables that influence on the level of credit risk among commercial banks in Malaysia, which is clarified by the highest t-estimation value of 11.82.

## CONCLUSION

The main objective of this paper is to determine the relationship between microeconomic factors with credit risk among seven selected commercial banks in Malaysia. The period of the study covers for 20 years from 1998 until 2017. The results managed to reject the null hypothesis for return on asset, bank size, leverage, interest income and return on equity which indicates the five microeconomic variables give a significant relationship with credit risk proxy by non-performing loan for commercial banks in Malaysia. There is a positive relationship between leverage, interest income and return on equity with credit risk while return on asset, bank size and ratio of capital are negatively related to credit risk. However, there is no significant relationship between the ratio of capital and credit risk, therefore the null hypothesis is accepted for this variable. Moreover, the outcomes also demonstrate that the Fixed Effect (FE) model is the most suitable model to be utilized as a part of the estimation. Other than that, interest income is chosen as the most influencing variables toward credit risk performance among commercial banks in Malaysia due to the highest t-value score which is 11.82 compared with the other microeconomic factors. It is demonstrated that interest income has a high positive relationship among the other microeconomic factors that had been used as a part of this exploration.

As a conclusion, this paper had achieved its objectives which is to explore the relationship between the six chosen indicators (microeconomics factors) with the credit risk for seven selected commercial banks in Malaysia over the period beginning 1998 until 2017. Other than that, future researchers as well can make a comparison between a local and foreign bank or a comparison between Islamic and Conventional bank. Additionally, for a better outcome, they also can extend the study to investigate credit risk performance on other industry, for example, producing and manufacturing, construction, agribusiness or tourism. It will help the researchers to gain more information.



## ACKNOWLEDGEMENTS

The authors would like to express their gratitude to the team members for the assistance and constant support provided by them. The authors also would like to thank the opportunity provided by The International Social Science Conference: Business, Management and Entrepreneurship (BizMENT) 2020.

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