

DETERMINANTS OF CREDIT RISK IN CONVENTIONAL BANKS: AN EMPIRICAL STUDY IN MALAYSIA

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1. INTRODUCTION

In every economy in the world, financial system plays an essential role in facilitating financial intermediation process that oversees the funds flow between savers and borrowers. Therefore it is essential to ensure financial intermediation process operate smoothly to promote financial stability in an economy. In Malaysia, basically there are two group of licensed financial institutions which promote financial stability in the country, they are; Licensed financial institutions and licensed insurance companies and Takaful operators. Licensed financial institutions consist of conventional banks, Islamic banks, International Islamic banks, Investment banks and other financial institutions while licensed insurance companies and Takaful operators consist of life business, life and general reinsurance business, life reinsurance business, general reinsurance business, Takaful operators and Retakaful operators. For the purpose of this study only one aspect of the licensed financial institutions which is conventional banks are focused on.

There are 26 conventional banks that are licensed to be operated in Malaysia (Bank Negara Malaysia, 2019). All these banks operate in Malaysia with some based in Kuala Lumpur and also operate in other places around Asia Pacific region such as Singapore, Indonesia and Thailand. These banks provide full range financial products with some specialize on certain services such as personal banking, conventional banking, Islamic banking, investment banking, stockbroking, loans, and cash deposits among many other services. In the course of providing services to its clients, banks are exposed to various risk such as credit risk, market risk, operational risk and liquidity risk (Ali et al., 2011).

Though credit risk has been proven over time to be one of the critical bank risk that affect the growth of a country's financial system, yet little studies have been conducted to examine factors triggering credit risk (Tehulu and Olana, 2014). Therefore this study focuses on credit risk to determine factors that contribute to this particular risk. According to Bank for International Settlement (BIS), banks are exposed to credit risk when borrower fail to repay their loan in accordance with the agreed terms. Credit risk is triggered by loans, acceptances, interbank transactions, trade finance, foreign exchange transactions, financial futures, swaps, bonds, stocks, options and extended commitments and guarantees, as well as settlement of transactions.

One of the major factor that lead to credit risk is the escalation in the Non-Performing Asset

(NPA) also known as Non-Performing Loans (NPL) which directly affects the performance of the bank. Bank with high NPA indicates there is high possibility for defaults in huge number of credits which consequently will affect the net-worth of the bank by eroding the bank's asset value (Thiagarakan, et al., 2011). For instance, if a person get a loan from a bank but due to certain circumstance he did not earned sufficient income, or his business goes going concern, death, unwillingness or for any other reason that he is unable to repay the loan, the bank will face credit risk. Similarly, if client did not pay their credit card bill, the bank also faces credit risk. Therefore, in order to minimize the credit risk, bank imposes high loan interest rate to borrowers with high credit risk. Banks' exposure to credit risk begin once borrower accepted the loan's term and condition because there is a possibility for the borrower to default the loan. Therefore it is vital for banks to take preventive measures to minimize the exposure to credit risk.

Banks are prone to absorb larger risk when its size is big under the presumption of "too big to fail" (Stern and Feldman, 2004) which have play a critical role in few crises in the banking industry around the world. Big size banks are prone to take larger risk because, special treatment is given by its creditors to them, because there is an expectation that government will bail out the banks should it fails in the future (Stern and Feldman, 2004). With this confidence, banks willing to provide loans to those with low credit scores (bad borrowers) which eventually could lead to higher NPL (Louzis et al., 2012). However, another stream of literature suggest that, the bigger the bank size the lower the credit risk because as the size of the bank increases the risk are diversified and therefore reduces its exposure to credit risk (Cebenoyan et al., 1999 and Megginson, 2005). The mix findings by previous studies have motivated this study to further examine the role of bank size in banks' credit risk.

Another main contributor to credit risk is the volatile rate of return of bank which increases the bank's risk exposure. Looking from the perspectives of portfolios, banks attempt to minimize its exposure to risk by combining various loans with different level of risk in portfolios with the aim to diversify the risks. Following Markowitz (1952) portfolio theory, Ahmad and Ariff (2007) suggest that, banks charge a premium to the loan to compensate themselves for absorbing additional risk related to that particular loan. This approach indicates that, banks try to reduce their exposure to credit risk by imposing certain amount (in this case premium) to cover the potential loss that they might face in the future. Therefore, as the rate of return of bank increases it indicates that the credit risk faced by the bank is high (Hanweck and Ryu, 2004). Though rate of return is seem to have an effect on banks' credit risk, however there was less studies examining this factor against credit risk was conducted.

Bank performance is commonly measured by return on equity and return on asset, whereby they are ratios used to determine profitability of a business. According to Ishak et al., (2016) credit risk and bank performance (profitability) is negatively related. However, Marshal and Onyekachi (2014) found that there is a positive relationship between NPL (one of the measures of credit risk) and banks performance. They explained that, an increase in NPL generates higher interest income which increases the bank performance. The mix reviews of bank performance effect on credit risk triggered a need for further examination on this factor to further determine its role in causing credit risk.

To sustain its survival in the banking industry, one of the major bank's management task is to maintain adequate capital to meet the needs and demand of its clients. The Basel II accord has been a driving force in developing relevant credit risk model and capital adequacy requirements (Poudel, 2012). Banks must optimally allocate its resources and effectively implement policies to minimize its exposure to risk so that it could sustain in the competitive market. Cuthberston and Nitzsche (2003) implied that, banks need a good knowledge on risk management, how to price loan in a competitive market, determining adjusted rate of return and monitoring the economic capital in order to effectively compete in the competitive market.

The Basel Accord has been focusing on issues pertaining to the lack of specific credit risk model to account for personal loans' portfolios (Malik and Thomas, 2010). Theoretically, as the number of personal loan issued to clients increases, the risk for loan amount to get default also increases (Wachira, 2017). This is why the willingness and ability of the borrower to meet his obligation to repay the loan is an essential part in appraising the borrower's credit score (Chapman, 1940 and Stepanova and Thomas, 2002).

It is vital to consider macroeconomic factors in determining the credit risk because the volatility in the macroeconomic indicators such as any unfavorable changes occur in inflation and unemployment rate may lead to banking crisis (Chaibi and Ftiti, 2015). Although banking crisis occur in most countries due to common factors however each country has specific factors that elevate the risk contributing to banking crisis. Therefore in this study, inflation and unemployment rate are selected to determine their strength in affecting credit risk in Malaysia's conventional bank.

According (Waemustafa and Sukri, 2015), inflation plays a significant role in conventional bank's credit risk. They further describe that, when inflation increases, credit risk decreases signifying a negative relationship between inflation and credit risk. However, surprisingly in Islamic Banks there is negative insignificant relationship between inflation and credit risk. The mix findings between these two types of banks have triggered the interest for this study to examine further the effect of inflation on credit risk. Besides that, a high inflation rate cause borrowers to delay their loan repayment in order to meet the basic necessities of goods and services which is much more expensive when inflation is high (Mkukwana, 2013). In addition to that, as proposed by (Castro, 2013) a high inflation can reduce the outstanding loans' real value.

Another factor that is seen to affect the banking industry is the unemployment rate. Employment rate is said to be contributing to banking crisis because when unemployment is high, it indicates that consumers are losing the means of generating enough cash flow to meet their necessities as well as their obligations (Chaibi and Ftiti, 2015). This in return will increase the possibility of loans or credits being default because borrowers have insufficient fund to pay back their loans (Nkusus, 2011). As a result, the credit risk increases which will place the bank in a very difficult position. Though the effect of unemployment rate on credit risk can be clearly defined, however the magnitude of its effect on each country's banking industry is different depending on its structure. Therefore this study attempt to examine the link between unemployment rate and credit risk in Malaysia's conventional banks and the strength of the relationship between these two crucial factors.

This study aim to examine bank specific and macroeconomic factors' effect on credit risk in Malaysia's conventional banks. The rest of the paper is organized as follows; Section

2 provides an overview of the research topic literature, Section 3 outlines the data and methodology adopted in this study to achieve its objective, Section 4 presents the findings of the analysis conducted and finally Section 5 summarized the findings and conclusions are drawn for this study.

2. LITERATURE REVIEW

2.1 Factor affecting credit risk in conventional bank

Banking industry plays an essential role in promoting financial stability in a country. It is crucial to ensure the banking industry is stable and strong in dealing with various risk in order to sustain. According to Goyal (2010), among major risk faced by banks includes credit risk, market risk, operational risk, interest rate risk, liquidity risk, and exchange rate risk. Goyal (2010) further emphasize that the major risk most banks are exposed to is credit risk. Banks are mostly exposed to credit risk when borrowers are unable to fulfill their contractual obligations of repaying the loan as per contract agreement. Consequently, the deterioration in the credit collection level will put banks at risk since interest from loan are one of major income for banks.

Credit risk is defined as the risk faced by the bank when borrowers unable to meet the contractual obligations in repaying the credit, in other word the credit becomes default (Saunders and Cornett, 2008). Credit risk plays a crucial role in most bank failures and the most obvious risk that bank managers must deal with (Gup et al., 2007). Some of the common techniques used to measure risk include retro analysis, scenario analysis, stress testing, integrated risk management, internal rating methods, standard methods, legal barriers, company ratings, credit policies, and credit needs assessments (Yariz, 2011).

Besides that, credit default payment is not the only reason why credit increases, increase in money supply in the market causing the value of the credit diminishes which increases the credit risk faced by banks (Bernanke, 1993). Bank also face credit risk when there is continuous decline in asset value especially loans which eventually becomes worthless (Rose and Hudgines, 2008). Moreover, credit risk has seriously affected the bank's profitability and the rising in credit risk has led to the economic downturn. Although credit risk is seen as one of the risks that every bank will encounter but if the bank is stable or the bank performance is good it will be a good precautionary measure to prevent the bank from facing unfavorable effect of credit risk.

2.2 Bank Size

According to Salas and Saurina (2002) and Hu et al., (2004) bank size and credit risk has a negative relationship. As the bank's size increases the credit size decreases. This is because, larger banks will have more reserves to support the credit provided to clients. Should in the case of loan default, the bank will not be affected much as it has larger reserve

to support smooth operations of its daily banking activities. Besides that, larger banks have more funds to offer loans to clients and are able to accept high interest rate risk.

In addition to that, bank size affects bank performance. It is because larger banks have more funds to expand its banking activities by offering different types of services to its clients. By diversifying the products offered to its clients it can improve its performance. However, it can only happen when clients are loyal and honest in meeting their contractual obligations. Should the client fail to meet its contractual obligations by means of defaulting on the payment due, it will negatively impact the bank. This attests to the statement by (Stiroh, 2004) that larger banks have larger risk to its total revenue even though it has sufficient funds to secure its non-interest income.

Louzis et al., (2012) found that the relationship between bank size and credit risk is unclear. While Bardhan and Mukherjee (2016) establish that larger banks are more exposed to default risk than smaller banks. According to Laeven et al., (2016), bank size plays a strong significant determinant in banks' systematic risk. Nevertheless, regardless of the size of the bank, the risk will always be there, the higher the bank offers credits to its clients the higher the risk it needs to bear.

2.3 Rate of Return

Macaulay (1988) established that, credit risk management is the best method used to examine banks' credit risk which most banks presently have been practicing. The main role of credit risk management policy must be to maintain the credit risk within the acceptable range of the bank's interest rate in order to project the rate of return of the bank. Kang and Kang (2009) found that, both credit risk and rate of return affect stock market performance. One of the main focuses of credit management is to maximize bank's risk-adjusted rate of return by maintaining the exposure of credit risk at an acceptable range (Musyoki and Kdubo, 2011).

Credit risk also can be defined by the variability of actual default rates relative to expected default rates (Neal, 1996). For instance, a lender expected a certain rate from a high-risk debt portfolio. Should the default rate be somewhat closer to the rate expected by the lender, the portfolio is said to have a low credit risk. In short, the lender's exposure to uncertainty related to the portfolio is low and earned a high return on the loans. This signifies that there is a negative relationship between rate of return and credit risk.

2.4 Bank Performance

The existence of banks are not only to accept deposits but also lending out credit services to its customers which as a result expose them to credit risk. One of the ways banks generate profit is through interest income generated from the loans granted to its customers. Therefore, the higher the loan amount given out, the higher the interest income generated by the bank which will increase the profitability of the bank. However, higher loans granted means higher exposure to credit risk because the probability for loans to get default is also higher.

Based on the literature, the most common measure for the performance of banks are returns on assets (ROA) and return on equity (ROE). Based on the examination of relationship

between bank performance (measure by ROA and ROE) and credit risk (measured by non-performing loan) by Felix and Claudine (2008), they found a negative relationship. For instance, an increase in non-performing loan will lead to a decline in the bank's profitability. On the other hand, Boaheme et al., (2012) found that there is positive correlation between credit risk and bank performance.

2.5 Capital Adequacy

As defined by Central Bank of Malaysia, capital adequacy refers to the minimum level of capital that banks need to maintain as their reserves. Capital adequacy is the measure of the financial stability of banks which is used to protect depositors from unexpected losses. Besides that, banks must maintain minimum amount of capital to ensure it able to repay debts and deposits as needed and prevent the bank from banking distress.

Diamond and Rajan (2000), establish that by maintaining adequate amount of capital it can reduce the banks distress and risk for bank failures. By maintaining sufficient capital level, bank can reduce the exposure to credit risk. Bank capital adequacy ratio is an indicator to banks' ability in dealing with exposure to credit risk.

In addition to that, an adequate level of capital needed to be maintain by all banks in order to allow them to trade. Banks are required to maintain at least 10% of the bank capital in order to cushion any bank failure to meet its obligation towards its clients. Therefore, should situation as such arises, the reserves (10%) maintained by the banks will be utilized to cover whatever obligations the banks have towards its clients. According to Basel Committee on banking supervision (2015), there are two types of capital that banks must maintain. First is Tier 1 capital whose function is to absorb bank losses without needing the bank to cease its trading. Second is Tier 2 capital which absorbs losses but requires banks to cease operation or provide protection to the depositors.

2.6 Personal Loan

Credit worthiness of a potential clients are determine through their ability to repay the loan within the stipulated repayment period. Though procedures were conducted to determine credit worthiness of a potential client, however the decisions made might not be correct because information provided by clients might not be accurate. Therefore, normal practices in banks is based on the probability for loan being default and also by relying on loan officials' experience to determine the credit worthiness of the clients.

According to Swaren (1990), those clients with high level of debts or had an unfavorable credit record may expose the banks to potential credit default because the possibility for the client to fail in meeting his obligations is high. Therefore, to reduce the credit risk banks normally determine average income ratio, credit history, credit repayment performance records and client's job in order to decide the financial ability of the potential client. This is essential to ensure clients has the ability to repay the loan together with its interest on time.

Basel committee on Banking Supervision (1999) established that, those credit debts unrecoverable by banks within the stipulated time period must be recognized as debt in bank's financial report. Hence, it is essential to ensure the banks able to maintain its credit default level to a very minimum level in order not to affect its financial performance. This is

because a high level of debt reported on the financial statements, will not bring a good image to the banks.

2.7 Rate of Inflation

The depreciation in monetary value in the money market is due to inflation (Santoni, 1986). Kaminsky and Reinhart (1999) found that, there is an interaction between inflation and interest rate which eventually will affect the credit risk. Further they explained that, an increase in interest rate is caused by an increase in inflation.

According to Lipsey (2009) money supply directly affects the inflation level in the market. Besides that, inflation is also found to be one of the macroeconomic factors that affects conventional banks performance (Murerwa, 2015). Generally, when the inflation level is high, conventional banks raise the interest rates on borrowing in order to generate higher profits. However, whether or not the impact of inflations on banks performance is favorable to banks' performance is subject to the predictability of the inflation. A bank may able to grasp favorable result on its performance should it able to adjust its interest rates based on predicted inflation level.

Inflation will lead to higher cost and also higher profit (Vong and Chan, 2009). This only can happen when banks able to generate profits much faster than its operating expenses. If this happen, it can be said that the inflation has positive impact on bank's performance. However, if the operating expenses increases faster than the profits, it is said that inflation has negative impact on bank's performance. It is essential to consider inflation as part of factors affecting credit risk. This is relevant because when the inflation level is high, it may cause the potential clients to transfer their focus from the investing or savings to spending because during high inflation purchasing power erodes. Therefore clients may not able to repay back their loans to the bank and this will increase the banks' exposure to credit risk.

2.8 Unemployment Rate

Salas and Jesus (2002) and Jakubik (2007) found that unemployment is one of crucial macroeconomic factor that affects credit risk in Spanish and Czech banking industries. While, Aver (2008) found that, the credit risk of Slovenian bank loan portfolio is entirely affected by unemployment rate. Similarly, Kattai (2010) and Fainstein and Novikov (2011) found unemployment rate to have an effect on credit risk.

An increase in unemployment rate will reduce consumers' ability to generate cash flow and to service debt (Castro, 2013 and Nkusus, 2011). Therefore, the impact of unemployment on NPLs is expected to be positive. An increase in unemployment will increase NPL since the clients have insufficient fund to meet their credit obligations. Accordingly, Chaibi and Ftiti (2015) found that unemployment to have a significant positive effect on credit risk.

3. METHODOLOGY

3.1 Theoretical Framework

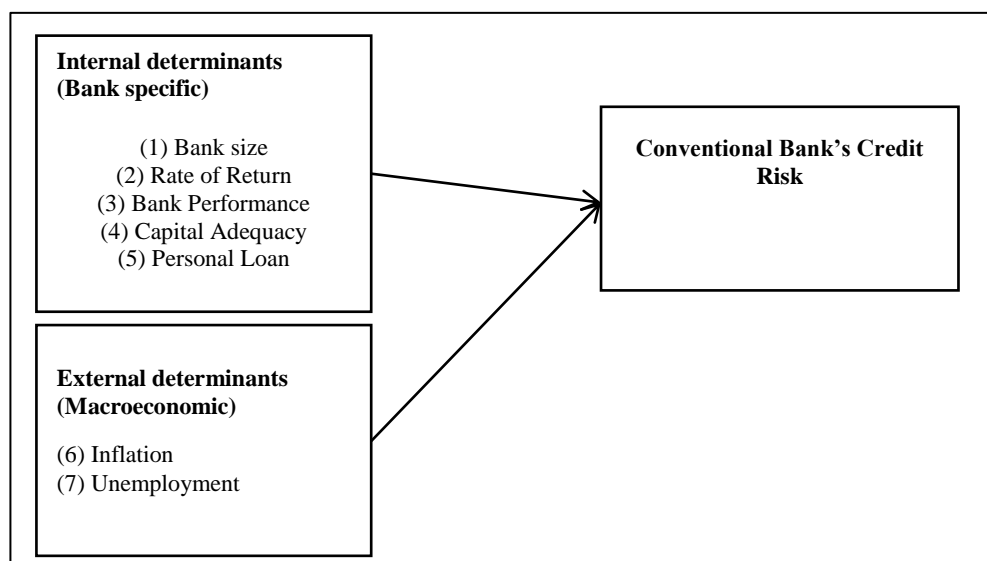


Figure 1: Theoretical Framework

The observed variable of this study is conventional bank's credit risk which are proxied by non-performing loan to total loan ratio. The theoretical framework of this study is depicted in Figure 1. The explanatory variables are group into two main group; internal and external determinants. Internal determinants consist of bank specific determinants such as bank size, rate of return, bank performance, capital adequacy and personal loan. While external determinants consist of inflation and unemployment level in the country. The subsequent paragraphs define the variables, their effect on credit risk and how they are derived based on past studies.

Credit risk is defined as the capability of borrowers to meet his obligations to repay loan on time according to contractual agreement (Elgari, 2003). The loans disburse to clients becomes a risk to bank when the loans become default due to failure of repayment by borrowers causing the bank to unable to recover the principal amount and interest. The most common measure of credit risk is non-performing asset (NPA) which is also known as non-performance loan (NPL) (Beck et al., 2013). Bank with high NPA indicates there is high possibility for defaults in huge number of credits which consequently will affect the net-worth of the bank by eroding the bank's asset value (Thiagarakan et al., 2011).

According to Chaibi and Ftiti (2015) though the factors that affect credit risk are common in most countries however each country has specific elements depending on it banking structure, micro and macroeconomic environment among many others. This is the main motivation of this study which attempt to examine credit risk determinants in conventional banks in Malaysia. Credit risk used in this study is derived based on the following formula.

$$\text{Credit Risk} = \frac{\text{Non Performing Loan}}{\text{Total Loan}}$$

One of the explanatory factor identified through literature to have significant effect on credit is bank size. Past studies Saunders et al., (1990), Cebenoyan et al., (1999), Chen et al.,(1998) and Megginson (2005) have suggested that there is inverse relationship between bank risk and bank size. The justification behind this finding is that, larger size banks are

more experienced in risk management and have a better diversification opportunities as compared to smaller banks (Zribi and Boujelbene, 2011). In another study by Menicucci and Paolucci (2016) found that, even though larger bank tend to generate higher profit and economic of scale but increase in diversification lead to hike in risk which as a result diminishes economic of scope.

Therefore in order to measure the bank size of each conventional banks in Malaysia, the total asset of each banks is used as proxy to evaluate bank's size. For the purpose of this study natural logarithm of total asset (Zribi and Boujelbene, 2011) is used as follows.

$$\text{Logarithm of Total Asset} = \ln(\text{total asset})$$

One of major focus of credit risk management is to maximize bank's risk adjusted rate of return through maintaining the exposure of credit risk within acceptable range (Poudel, 2012). According to Capital Asset Pricing Model (CAPM) by (Sharpe, 1964) rate of return is derived by considering the risk free return and risk premium for absorbing additional risk.

$$\begin{aligned} &\text{Rate of Return} \\ &= \frac{\text{Ending value of investment} - \text{Beginning value of investment}}{\text{Beginning value of investment}} \times 100 \end{aligned}$$

Banks' main income generating unit is through credit creation. However the more credit granted to clients, the risk exposure to credit default increases as well. According to Boaheme et al., (2012) there is positive significant relationship between credit risk and bank profitability. Similarly, Ameer and Mhiri (2013) also found that credit risk proxied by non-performing loans to total loans has positive effect on profitability. Two most common measures of bank's profitability are return on asset and returns on equity. ROA reflects the bank's ability to generate profit from its asset however it might be biased due to off-balance sheet transaction. While ROE refers to return generated by shareholders on their equity holdings. Banks normally reported a high ROA when it has high equity and low leverage in its capital structure; while the ROE is low. Though ROE able to reflect the banks performance, however it ignores high leverage risk and bank financial leverage determined by monetary authorities (International, 2002)

Therefore for the purpose of this study, ROA is adopted to measure the performance of the bank. ROA is calculated as the following.

$$\text{Rate of Assets} = \frac{\text{Net Income}}{\text{Total Assets}} \times 100$$

Generally capital reflects the financial strength and wealth of banks which is made of cash and assets owned by the banks. A well-capitalized bank is found to usually be exposed to lower bankruptcy cost and thus enhance its earnings (Kosmidou and Pasiouras, 2005). Capital adequacy refers to the equity and other reserves held by banks against its risky assets (Gizaw et al., 2015). The main purpose for maintain such reserves is to protect depositors from unexpected loss. Capital adequacy is computed based on the formula stipulated as below.

$$\text{Capital Adequacy} = \frac{\text{total capital}}{\text{RWA}}$$

Where:-

RWA = Risk Weighted Asset

As mentioned earlier, banks generate income through credit offering to its clients. Bank begin bearing for risk once its loan offer accepted by borrower because there is possibility that the borrower might fail to honor the loan agreement especially on repayment of the principal and interest. Personal loan is one of the services provided by the banks to its individual clients after screening for clients' credit background and ability to pay. The problem that banks face in the form of Non-performing loans are related to both internal and external factors affected by borrowers (Muniappan, 2002). Bank lending policy is found to contribute to an increase in riskiness in loan assets (Sergio, 1996). While Bloem and Cornelis (2001), suggest that, the reason behind personal loan becomes default are due to wrong economic decisions taken by individual borrowers and also might due to plain bad luck (such as bad weather, unexpected changes in price in the market, etc) which may cause borrowers to delay in honoring their loans. Therefore it is essential to examine the effect of personal loan on credit risk to ensure credit risk can be maintain at favorable level to sustain long run performance. Personal loan for this study will calculated based on the following formula.

$$\text{Debt to Income Ratio} = \frac{\text{Total Monthly Debt Payments}}{\text{Gross Monthly Income}}$$

Besides internal determinants, external factors also plays essential role in affecting credit risk. This is because any changes that occur in micro and macroeconomic level will affect the banks' ability to perform as well as the borrower's ability to meet its obligation towards the bank. One of the factors identified through the literature to be affecting the level of credit risk is the inflation rate. Inflation generally refers to general hike in the price of commodity goods as compared to its base year. During inflation consumers' purchasing power decreases causing them to pay more for the same product and services (San and Heng, 2013). As a consequences, consumers are left with lesser money to meet their obligations towards bank which might lead them to default the loan repayment. Once the consumer default the loan repayment, banks' non-performing loan also will increase. Awan et al., (2015) found that inflation has positive significant relationship with bank's non-performing loans.

Hence it is essential to examine for inflation in assessing for bank's credit risk to ensure banks able to plan and implement appropriate policies to protect itself from unexpected downturn. This study use the following formula to derive inflation rate to be used in the analysis.

$$\text{Rate of Inflation} = \frac{\text{CPI } x + 1 - \text{CPI } x}{\text{CPI } x}$$

Unemployment plays a critical role in bank's credit risk level. According to Castro (2013) credit risk is significantly affected by high level of unemployment. Besides that, Aver (2008) found that credit risk in Slovenian banking loan portfolio is affected by the economic environment that borrowers are in. For instance, should the borrowers are employed they will receive fixed monthly income which means they will have the means to meet their

obligations to the bank. On the other hand, when the borrowers are unemployed there will be no fixed monthly income and thus unable them to payback to principal and also interest due to the bank. Similarly, Louzis and Vouldis (2012) found that unemployment has a strong effect on the non-performing loans level.

Therefore, this study attempt to examine the effect of unemployment on bank credit risk in the context of Malaysian Conventional Banks. The unemployment rate used for analysis in this study is calculated as follows;

$$\text{Labor Force Participation Rate} = \frac{\text{Labor Force}}{\text{Adult Population}}$$

No.	Malaysia Banks
1.	Public Bank Berhad
2.	Hong Leong Bank
3.	RHB Bank Berhad
4.	Malayan Banking (Maybank)

Based on the discussion above, the following hypotheses are developed to be tested in this study:-

H1A: Bank size has significant effect on credit risk.

H1B: Rate of return has significant effect on credit risk.

H1c: Bank performance has significant effect on credit risk.

H1D: Capital adequacy has significant effect on credit risk.

H1E: Personal loan has significant effect on credit risk.

H1F: Rate of inflation has significant effect on credit risk.

H1G: Unemployment rate has significant effect on credit risk.

3.2 Samples and Data source

To be included in this study, the banks must fulfill certain conditions. The conditions are specified as below.

Table 1: List of Conventional Banks

5.	CIMB Group Holding Berhad
6.	AmBank (M) Berhad
7.	Alliance Bank Malaysia Berhad
8.	Affin Bank Berhad

- The conventional banks should be resident in Malaysia
- The similar business activities are carried out by the banks
- All the conventional banks have branches
- The conventional banks have the capability to generate income through credit creation
- The conventional banks must have high level of non-performing loans
- All the credit products and services offered by the banks are similar to each other

Based on requirement stipulated above, eight conventional banks are selected to be examined in for credit risk in this study. The list of the banks selected are as Table 1. All the data are extracted from the banks' annual report for ten consecutive years from year 2008 to 2017. All the annual reports are extracted from the banks official websites while macroeconomic data are extracted from World Bank data. A total 80 observations have been conducted for this study.

3. RESEARCH METHODOLOGY

Based on the discussion above, an econometric model is proposed to study the relationship between dependent variables and independents variables by using ordinary least square model (OLS) and fixed effect model. The econometric is as Equation 1.

Equation 1:

$$CR_{it} = \beta_0 + \beta_S Size_{it} + \beta_R RoR_{it} + \beta_P Perfor_{it} + \beta_C CA_{it} + \beta_L Loan_{it} + \beta_I Inf_{it} + \beta_U UE_{it} + \epsilon_{it}$$

Where:-

i = number of local Malaysian Conventional banks ($i=1,2,3,\dots,8$)

t = time indicator ($t=2008-2017$)

CR = Credit risk measured by non-performing loan to total loan ratio

Size = Bank size measured by logarithm of total asset

RoR = Rate of return measured by (ending value of investment-beginning value of investment)/

beginning value of investment

Perfor = Bank performance measured by return on asset

CA = Capital adequacy measured by total capital to risk-adjusted asset ratio

Loan = Personal loan measured by total monthly debt payment to gross monthly income ratio

Inf = Inflation rate measured by annual inflation growth

UM = Unemployment rate measured by labor force to adult population ratio

4. FINDINGS

4.1 Descriptive Statistics

Table 4.1: Summary Statistic

Variable	Mean	Median	S.D.	Min	Max
Credit Risk	1.4800	1.2500	1.1500	0.1060	7.1000
Bank Size	25.800	25.900	0.8500	24.100	27.400
Rate of Return	0.0862	0.0740	0.7120	-3.9500	3.4900
Bank Performance	0.0140	0.0115	0.0083	0.0063	0.0490
Capital Adequacy	0.1920	0.1540	0.1500	0.0968	0.7760
Personal Loan	1.4300	1.2500	4.5400	-15.400	13.900
Rate of Inflation	0.4300	0.3790	0.8350	-0.8900	1.8800
Unemployment Rate	0.0322	0.0311	0.0022	0.02870	0.0369

Based on table 4.1, the mean of credit risk is 1.48 with standard deviation of 1.15. The credit risk result indicate that the credit risk of the eight conventional banks in Malaysia rate on average at 1.48. The standard deviation indicates that the mean value of every bank's credit risk disperse by 1.15 from its mean value over the ten years. The maximum mean value of 7.1 was recorded by Affin Bank Berhad while the minimum value for credit risk is recorded by RHB Bank Berhad both in year 2010.

The mean for bank size is 25.8; which is the highest among other variables, with standard deviation of 0.85 where arithmetical calculation of natural logarithm was applied to measure the bank size. The result shows that some of the conventional banks in Malaysia are relatively large in size while some are smaller in size. The standard deviation indicates that on average the bank performance deviates from its mean by 0.85. The conventional banks in Malaysia maintain a bank size with total asset at the level of RM25.8 billion on average.

The rate of return's mean is among the lowest among other variable at 0.0862 with standard deviation 0.7120. The result indicates that on average banks are generating returns at the rate of 0.0862. Besides that, the standard deviation shows that the mean value deviates from its value by 0.7120. The highest rate of return was recorded by Maybank in year 2010 at 3.49. While on the other hand, the lowest rate of return was reported by AmBank at -3.95 in year 2008.

Bank performance has the lowest mean value at 0.0140 with standard deviation 0.0083 which also the lowest compared to other variables. The result shows that, the mean value deviates by 0.0083 on average. Additionally the result also indicates that the eight banks on average generates 1.4% income by utilizing its assets. Maybank recorded the highest bank performance in year 2012 at 0.0490 while CIMB Group Holding has the lowest bank performance at 0.0063 in year 2015.

Based on the examination of capital adequacy dataset, the analysis shows that on average capitalization of eight Conventional Banks in Malaysia is 19.2%. As required by the Central Bank of Malaysia, conventional banks in Malaysia must maintain a total capital ratio of 8.0% at all time. In the cases of these eight conventional banks, all of them have achieved the minimum requirement set by the monetary authority. The standard deviation of 0.15 indicates that on average the mean value deviates from its value by 0.15. The maximum capital adequacy ratio was recorded by Maybank at 0.78 in year 2012 while Alliance Bank recorded the lowest capital adequacy ratio at 0.0968 in year 2010.

Personal loan recorded a mean value of 1.43 with the highest standard deviation among all at 4.54. The mean value suggest that, on average the banks generates 1.43 income from its gross monthly income. The high standard deviation indicates that the mean value deviates quite far away from its population value. The bank with highest income from personal loan was Public bank in year 2009 at 13.92. While the lowest income from personal loan was recorded by RHB Bank in year 2012 at -13.9.

As mentioned earlier, inflation rate refers to the general hike in level of commodity goods and services in the market. The highest inflation recorded in the sample period is in year 2010 at 1.881%. This indicates that the general price level will increase by 1.881% in year 2010. The lowest inflation rate was in year 2009 where the inflation was -0.89%. This indicates the price level of commodity goods and services for that year drops by 0.89% on average.

Lastly, the mean value unemployment rate in Malaysia during the 10 years sample period is 0.0322 which are among the lowest among other variables. The standard deviation is 0.0022 which is the lowest compared to other variables. The highest unemployment rate was recorded in year 2009 at 0.0369 while the lowest is 0.0287 in year 2014.

4.2 Correlation Analysis

Table 4.2 Correlation Coefficients
Correlation coefficients, using the observations 1:01 - 8:10
(Missing values were skipped)
5% critical value (two-tailed) = 0.2199 for n = 80

Bank Size	Rate of Return	Bank Performance	Capital Adequacy	Personal Loan	Rate of Inflation	Unemployment Rate	
1.0000	-0.0312	0.3791	0.2957	0.0356	-0.1155	-0.0063	Bank Size
	1.0000	-0.0455	0.1874	-0.0064	0.0591	-0.0283	Rate of Return
		1.0000	0.4831	-0.0621	-0.1170	0.0150	Bank Performance
			1.0000	-0.0569	0.0370	0.0852	Capital Adequacy
				1.0000	0.0624	-0.0378	Personal Loan
					1.0000	-0.0640	Rate of Inflation
						1.0000	Unemployment Rate

Table 4.2 shows that, none of the independent variables have a correlation value more than 0.7 indicating that all the independent variables are not highly correlated. Hence, all the seven independent variables are examined in the analysis.

4.3 Ordinary Least Square

Table 4.3 Ordinary Least Square

	<i>Coefficient</i>	<i>Std. Error</i>	<i>t-ratio</i>	<i>p-value</i>
const	6.3827	4.0047	1.594	0.1550
Bank Size	-0.3615	0.1878	-1.925	0.0956*
Rate of Return	0.2548	0.2051	1.242	0.2542
Bank Performance	9.2738	11.8009	0.7859	0.4577
Capital Adequacy	-0.2625	0.4348	-0.6037	0.5651
Personal Loan	-0.0291	0.0264	-1.105	0.3057
Rate of Inflation	0.1628	0.1844	0.8833	0.4064
Unemployment Rate	133.707	58.3175	2.293	0.0556*

Mean dependent var	1.4775	S.D. dependent var	1.1487
Sum squared resid	80.0222	S.E. of regression	1.0848
R-squared	0.1913	Adjusted R-squared	0.1081
F(7, 7)	3.7621	P-value(F)	0.0508
Log-likelihood	-109.7990	Akaike criterion	235.5980
Schwarz criterion	254.2439	Hannan-Quinn	243.0498
rho	0.3269	Durbin-Watson	0.9013

Note: *** Significant at 1% level, ** Significant at 5% level and * Significant at 10% level.

From table 4.3, the R-squared is 19.13% which indicate that only 19.13% of the credit risk are explained by the seven independent variables that this study covers. The coefficients indicates the type of the relationship that the dependent and independent variables have (either positive or negative).

The bank size is significantly affecting the credit risk at 10% level of significant value since the p-value is only 0.0956 or 9.56% Based on the coefficient value of -0.3615, it can be said that bank size is negatively affecting the credit risk. This negative relationship means that, as the bank size increases, the credit risk will decrease. This result supported the hypothesis H1A which is bank size significantly affects credit risk.

Based on table 4.3, the rate of return does not significantly affects credit risk since the p-value is 0.2542 or 25.42% is higher than 10% level of significant value. The result also shows that, rate of return positively affecting the credit risk since the coefficient value is 0.2548. This positive relationship shows that, the higher the rate of return the higher the credit risk. This result rejects the H1B and accepts the H0B that the rate of return does not significantly affect the credit risk.

Bank performance does not significantly affects the credit risk as the p-value is 0.4577 or 45.77% which is higher than the 10% significant level value. The coefficient value of 9.2738 indicates that the relationship between bank performance and credit risk is positive. It implies that, an increase in bank performance will increase the credit risk as well. This result rejects the H1c and accept the H0c that bank performance does not significantly affect the credit risk.

Similarly capital adequacy was also found to not significantly affect credit risk since the p-value is 0.5651 or 56.51% which is higher than the 10% level of significant. Besides

that, capital adequacy seems to have negative relationship with credit risk since the coefficient value is -0.2625. This suggests that when the capital adequacy is low, the credit risk is high. The result rejects the H1D and accept the H0D that capital adequacy does not affect the credit risk.

Personal loan was also found to be not significantly affects the credit risk as the p-value is 0.3057 which is higher the 10% significant level value. The negative coefficient value of -0.0291 implies that, personal loan negatively affects credit risk. It means that, when personal loan increases credit risk decreases. The result accept the HOE analysis that is the personal loan does not affect the credit risk in the conventional bank in Malaysia.

Based on the result, it indicates that inflation rate does not significant affects the credit risk because the p-value is 0.4064 or 40.64% which is higher than the 10% level of significant value. Table 4.3 showed that inflation rate positively affects credit risk which means that an increase in inflation rate will increase the credit risk. Nevertheless, the result had to reject the H1F and accept H0F that inflation rate does not significantly affect credit risk.

Finally, unemployment rate is found to significantly affect credit risk since its p-value is 0.0556 or 5.56% which is lower than the 10% significant value level. The coefficient also suggest that, unemployment to positively affect credit risk. This implies that when unemployment increases, credit risk will also increases. This result accepts that hypothesis H1G that Unemployment rate significantly affects credit risk.

4.4 Fixed Effect Analysis

Table 4.4 Fixed Effect Analysis

	Coefficient	Std. Error	t-ratio	p-value	
const	19.8383	10.7197	1.851	0.1067	
Bank Size	-0.837 0	0.4344	-1.927	0.0953	*
Rate of Return	0.0626	0.1821	0.3436	0.7412	
Bank Performance	-20.0994	23.4429	-0.8574	0.4196	
Capital Adequacy	-1.0108	0.5104	-1.981	0.0881	*
Personal Loan	-0.0285	0.0144	-1.979	0.0883	*
Rate of Inflation	0.0858	0.1908	0.4496	0.6666	
Unemployment Rate	116.1190	51.6533	2.248	0.0594	*

Mean dependent var	1.4775		S.D. dependent var	1.1487	
Sum squared resid	57.9998		S.E. of regression	0.9751	
LSDV R-squared	0.4139		Within R-squared	0.2306	
Log-likelihood	-97.5682		Akaike criterion	225.1364	
Schwarz criterion	260.0974		Hannan-Quinn	239.1085	
Rho	0.1055		Durbin-Watson	1.2850	
Joint test on named regressors -					

Test statistic: $F(7, 7) = 13.0673$

With p-value = $P(F(7, 7) > 13.0673) = 0.00154798$

Robust test for differing group intercepts -

Null hypothesis: The groups have a common intercept

Test statistic: Welch $F(7, 27.9) = 9.03232$

With p-value = $P(F(7, 27.9) > 9.03232) = 8.5153e-006$

*** Significant at 1% level, ** Significant at 5% level and * Significant at 10% level.

The hypothesis of deciding which models are more appropriate for this study is as follows:

H0: Ordinary least square is appropriate.

H1: Fixed effect analysis is appropriate.

From table 4.4, the R-square implies that, 41.39% of the credit risk is explained by independent variables that are covered in this study. The p-value $P(F(7, 27.9) > 9.03232) = 0.000$ implies which model provide better result. Since the p-value is less than 1, therefore hypothesis H1 are accepted that fixed effect analysis is appropriate for this study.

The bank size is significantly affecting the credit risk at 10% level of significant value since the p-value is only 0.0953 or 9.53%. Based on the coefficient value of -0.8370, it can be said that bank size is negatively affecting the credit risk. This negative relationship means that, as the bank size increases, the credit risk will decrease. This result supported the hypothesis H1A which is bank size significantly affects credit risk.

Based on table 4.3, the rate of return does not significantly affects credit risk since the p-value is 0.7412 or 74.12% is higher than 10% level of significant value. The result also shows that, rate of return positively affecting the credit risk since the coefficient value is 0.0626. This positive relationship shows that, the higher the rate of return the higher the credit risk. This result rejects the H1B and accepts the H0B that the rate of return does not significantly affect the credit risk.

Bank performance does not significantly affects the credit risk as the p-value is 0.4196 or 41.96% which is higher than the 10% significant level value. The coefficient value of -20.0994 indicates that the relationship between bank performance and credit risk is negative. It implies that, an increase in bank performance will decrease the credit risk as well. This result rejects the H1c and accept the H0c that bank performance does not significantly affect the credit risk.

Capital adequacy was found to significantly affect credit risk since the p-value is 0.0881 or 8.81% which is lower than the 10% level of significant. Besides that, capital adequacy seems to have negative relationship with credit risk since the coefficient value is -1.0108. This suggests that when the capital adequacy is low, the credit risk is high. The result accept the H1D that capital adequacy does significantly affect the credit risk.

The result in Table 4.4 suggest that, Personal loan to significantly affects the credit risk as the p-value is 0.0883 or 8.83% which is lower than 10% significant level value. The negative coefficient value of -0.0285 implies that, personal loan negatively affects credit risk.

It means that, when personal loan increases credit risk decreases. The result accept the hypothesis of H1E that the personal loan significantly affect the credit risk in the conventional bank in Malaysia.

Based on the result, it indicates that inflation rate does not significant affects the credit risk because the p-value is 0.6666 or 66.66% which is higher than the 10% level of significant value. Table 4.4 showed that inflation rate positively affects credit risk which means that an increase in inflation rate will increase the credit risk. Nevertheless, the result had to reject the H1F and accept H0F that inflation rate does not significantly affect credit risk.

Finally, unemployment rate is found to significantly affect credit risk since its p-value is 0.0594 or 5.94% which is lower than the 10% significant value level. The coefficient also suggest that, unemployment to positively affect credit risk. This implies that when unemployment increases, credit risk will also increases. This result accepts that hypothesis H1G that Unemployment rate significantly affects credit risk.

5. CONCLUSION

Bank size is found to be significantly affecting the conventional banks' credit risk in Malaysia and negative relationship existed between bank size and credit risk. This inverse relationship implies that the larger the bank size the lower the credit risk is. This result is similar to the findings by Salas and Saurina (2002) and Hu et al., (2004) whom also found that bank size and credit risk has a negative relationship. While Bardhan and Mukherjee (2016) establish that larger banks are more expose to default risk than smaller banks. Besides that, larger banks will have more capital to buffer the risk related to credit as compared to smaller size banks.

Rate of return is found to be insignificantly affecting the credit risk of conventional banks' credit risk in Malaysia. There exist a positive relationship between rate of return and credit risk implying that, an increase in rate of return will increase credit risk. The result is similar to findings by Janssen (2012) who establish there is no significant relationship between rate of return and credit risk.

Bank performance was also found to be insignificantly affecting the credit risk of conventional banks in Malaysia. An inverse relationship was depicted to exist between bank performance and credit risk. It implies that, an increase in bank performance will decrease the credit risk. Understanding behind this is that, an increase in bank performance means the bank is generating more income from it business activities which includes from credit issued to clients. When clients honor the loan agreement and make repayment of loans' principal and interest on time, this will reduce the risk for loans from becoming default and thus decrease the credit risk. This result echo past studies findings by Felix and Claudine (2008) who also found negative relationship between bank performance and credit risk. However, Boaheme et al., (2012) found a positive correlation between credit risk and bank performance.

On the other hand, Capital Adequacy was found to be significantly affecting credit risk with a negative relationship between capital adequacy and credit risk. This implies that, a well-capitalized conventional banks will have lower credit risk. This result is similar to past studies by Kosmidou and Pasiouras (2005) and Diamond (2000) who established that well-capitalized banks have lower rate of bankruptcy cost and can reduce bank distress and bank

failure. On the contrary, Flamini et al., (2009) and Sufian and Habibullah (2009) found there is positive relationship between capital adequacy and credit risk.

The Fixed Effect Model analysis also found that personal loan significantly affect the credit risk with a negative relationship. The negative relationship implies that, personal loan negatively affects credit risk. It means that, when personal loan increases credit risk decreases. It is essential to examine the personal loan against the credit risk because one of main contributor and increase in bank risk is through loans given out to clients. Should the clients default the payment, the banks have to bear stagnant loan asset that bring no monetary benefits to the banks.

Inflation rate is used as one of the proxy for external determinants for credit risk. From the findings, it is found that inflation rate insignificantly affects credit risk. It is also found that there is positive relationship between inflation risk and credit risk. During inflation consumers' purchasing power decreases causing them to pay more for the same product and services San and Heng (2013). As a consequences, consumers are left with lesser money to meet their obligations towards bank which might lead them to default the loan repayment. Once the consumer default the loan repayment, banks' non-performing loan also will increase. The finding was similar to Awan, Nadeem, and Malghani (2015) who also found that inflation has positive relationship with bank's non-performing loans.

Finally the second external determinants used to test against credit risk is unemployment. From the fixed effect model analysis, it is found that unemployment rate significantly affects the credit risk. There is positive relationship between unemployment rate and credit risk. This is because when unemployment is high it indicates the number of unemployed population is high and thus increases the credit risk as people are now jobless and have no fixed income to meet their debt obligations. This findings attest to findings by Castro (2013) who found that credit risk is significantly affected by high level of unemployment. Accordingly Louzis and Vouldis (2012) found that unemployment has a strong effect on the non-performing loans level.

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