

MACROECONOMIC VARIABLES ON BANKS'
NON-PERFORMING LOANS IN MALAYSIA

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DECLARATION

We hereby declare that:

- (1) This undergraduate research project is the end result of our own work and that due acknowledgement has been given in the references to ALL sources of information be they printed, electronic, or personal.
- (2) No portion of this research project has been submitted in support of any application for any other degree or qualification of this or any other university, or other institutes of learning.
- (3) Equal contribution has been made by each group member in completing the research project.
- (4) The word count of this research report is 13,828.

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LIST OF ABBREVIATIONS

AIC	Akaike Information Criterion
ARCH	Autoregressive Conditional Heteroscedasticity
BLUE	Best Linear Unbiased Estimator
BNM	Bank Negara Malaysia
CDRC	Corporate Debt Restructuring Committee
CESEE	Central and Eastern and South-Eastern Europe
DSU	Deficit Spending Unit
EViews	Econometric Views
GMM	Generalized Method of Moments
LM	Lagrange Multiplier
NPL	Non-Performing Loan
OLS	Ordinary Least Square
PVAR	Panel Vector Autoregressive
RESET	Regression Equation Specification Error
SIC	Schwartz Information Criterion
SSU	Surplus Spending Unit
VIF	Variance Inflation Factor

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PREFACE

This paper is conducted under the title of “MACROECONOMIC VARIABLES ON BANKS’ NON-PERFORMING LOANS IN MALAYSIA.” Non-performing loan (NPL) is a continuing issue that every country concerns. If the NPL problem is not well-managed, it would lead to cost inefficiency, bank failure or even financial crisis. Thus, this paper is essential to outline the determinants that might give impact to NPLs. Besides, a siren signal is also given to the regulatory authorities and bank management to reduce the NPL rate. In the context of banking information in this paper, readers are able to enhance their knowledge in banking industry even more.

ABSTRACT

This research paper holds a purpose to identify the significance of each macroeconomic variable that could affect non-performing loan. Lending interest rate, unemployment rate, inflation rate and exchange rate are the macroeconomics variables selected to conduct the research. The data was collected on monthly basis and the period begins from January 2005, while ends at December 2009. The total sample size is 60. Ordinary Least Square regression method is practiced to evaluate the regression. EViews program is being used to diagnose the econometric problems. There are few solutions adopted to solve the problems encountered during the research. The results turned out to be convincing and problems are being solved. The final results obtained from every tests in this paper matches with the findings.

CHAPTER 1 : RESEARCH OVERVIEW

1.1 Overview

Generally in every country, commercial bank contributes as an essential to the economic development. As a financial intermediary, it provides a wide range of services to the individuals, corporations as well as government entities. Channeling the fund from surplus spending unit (SSU) to deficit spending unit (DSU) is one of the core functions they offered to improve efficiency (Catalan, 2004). Through lending, banks mobilize and lend the surplus fund received from the depositors to the borrowers who have a deficit. Banks are entitled to gain profit for this service provided. However, most of the loans may not be retrieved. These loans are categorized under non-performing loans (NPLs), is one of the banking issues faced by every commercial bank in Malaysia. To minimize banks' earning volatility, banks are required to reserve a certain percentage of the profits for loan loss provision (Norden and Stoian, 2013). All banks are required to keep a high provision for high quantity and amount of loans granted. As a result, it would limit the earning return of the bank. This study emphasizes on the determinants that might give impact to NPLs. In this chapter, it will reveal the macroeconomic variables that probably affect banks' NPLs in Malaysia. In addition, other segments such as problem statement, objectives, research questions, significance of study and chapter layout is comprised in this chapter too.

1.2 Research Background

Commercial banks play an important role in mobilizing the deposits from surplus unit to deficit unit through lending (Kwambai and Wandera, 2013). Lending is a process that the

commercial banks receive surplus deposit from depositor and grant loans to their customers in order to gain a profit. According to the Bank Negara Malaysia (BNM) customer credit report, it is considered a loan when the customer has applied for borrowings to fulfill certain demands or for other purposes such as businesses. However, not every institution is eligible to grant credit facilities. In Malaysia, there are only 27 licensed commercial banks and 16 licensed Islamic banks that are eligible to grant loans to the community. By charging certain interest on the loans, granting loans contribute large profit to the banks, however, some of the factors should be taken into account before granting loans.

Besides loan loss provision, the credit activities involve some risks to the banks. They are liquidity risk, market risk, default risk and so on. Default risk is the major concern in banking sectors. NPLs represent the loans which have high risk of default or the collection in full is impossible. A loan is listed as non-performing based on three situations, (i) when interest payment and principal are unpaid and overdue for 90 days or more, (ii) at least 90 days of interest payments have been capitalized, refinanced or delayed by agreement, or (iii) there is other sufficient or reasonable evidence doubting the payments will be settled in full, even the unpaid payments are below than 90 days overdue (Bloem and Freeman, 2005).

In order to reduce persecution caused by NPLs, many researches from different countries had been done to better understand the determinants of NPLs. Based on the results from different researchers, the general obstacles of NPLs resolution are relatively similar. According to Huang (2006), lacking of the information of NPL and methodology used to manage losses arises from NPLs are the most common barriers in managing NPLs. In addition, there are no any regulations or guidance for banks to follow in order to reduce NPLs and protect their capital adequacy.

In Malaysia, there were some bank scandals happened in the past 20 years, which either affect the NPLs or affected by the NPLs. According to Tan (n.d.), the banks must write

off the outstanding balance of NPLs according to the percentage in different category and sell off the collateral of borrower to recover the loan. However, NPLs only can be recovered less than 50%. Thus, NPLs become one of the main elements representing the economic conditions of Malaysia (Lum and Philip, n.d.). Therefore, this study aims to determine the elements that will affect NPLs in Malaysia to better understand causes of NPLs and manage economic conditions in Malaysia.

1.3 Problem Statement

According to Khemraj and Pasha (2009), either in developed or developing countries, NPLs are often correlated with financial crisis and bank failure. NPLs become one of the main issues in banking sector due to the fact that impaired assets affecting the financial vulnerability. It can be explained that the NPLs have brought huge impacts to financial crisis during 1990 in many countries. Besides, default of loans increased rapidly through the effect of the recent global financial crisis which originated in United States. Therefore, Badar and Javid (2013) commented that a great and sound financial system can only be achieved by maintaining a low level of NPLs performance. However, higher NPLs would bring dilemma to the banks management and regulatory authorities. The probability of financial crisis will rise if the risk caused by NPLs could not be eliminated (Bonin and Huang, 2001).

According to Inoguchi (2012), the economic condition in the world is still unstable due to the attack of Asian Financial Crisis 1997 and United States Subprime Mortgage Crisis 2007. Although two crises happened 10 years apart from each other, both have had serious impacts on many financial and banking sector institutions. Not only that, these incidents even shook many other countries in the world, leading to financial crisis and recession. All the major capital markets were distressed.

Unlike the other countries that have been examined, the NPL problems in Malaysia were not triggered directly by these crises. According to the statistics retrieved from BNM, NPL ratio in the Malaysian banking system has steadily declined from 9.4% in 2005 to 3.6% in 2009 due to government intervention of NPL recovery strategies. In Malaysia, a sound banking system is particularly important because a significant number of companies rely heavily on bank loans for financing. NPL problems are often quoted as reasonable risks causing the Malaysian economic and financial instable. In fact, bad loans promote NPLs, thus every bank should manage their bad loans effectively. If bad loans are well managed, banks will earn for their profitability and sustainability in the future. On the other hand, it will be a serious threat to their performance if there is no solution to recover their bad loans. Therefore, addressing the NPL is a continuing challenge.

According to Tan (n.d.), Malaysian banking sector has experienced the highest NPL ratio in 1998, which was 20.4%. Bad economic situation during 1997 was the main reason for high NPLs for that year. Malaysian government spent a total of RM12 billion to rescue a number of troubled banks. Subsequently, Malaysian government have taken respective actions to solve the financial problems through the creation of the Corporate Debt Restructuring Committee (CDRC), Danamodal, an agency for contributing government funds and Danaharta, an agency for acquiring NPLs (Farradila, Irwan and Maizura, 2009). These measures have contributed to the reduction in the number of NPLs.

Unfortunately, these measures were simply insufficient to bring about a huge and radical resolution of excessive NPL problems. Moreover, a delay process of NPL disposal is associated to the risk of rising costs while managing process (Farradila et al., 2009). The authors informed that Malaysia was the newest hot NPL market in Asia. For instance, Bank Islam Malaysia, a largely government-owned bank, was in 2005 reported a loss of RM456 million and total NPLs of RM2.2 billion. Sime Bank, formerly United Malayan Banking Corporation, also suffered huge losses with provisions for NPL totaling RM1.8 billion (Tan, n.d.). As a result, NPL has become the main concern for every bank in Malaysia.

Although the NPL ratios in Malaysia have fallen recently, still, the reduction in NPLs subsequently had leave an impact on cost efficiency of the banks (Zaini, Chan and Sallahudin Hassan, 2010). Their study has shown that problem loans are negatively related to the cost efficiency of the banks. There are some costs that are necessary to incur to manage or deal with those problem loans. For instance, additional managerial effort and costs such as monitoring cost on the delinquent borrowers and their collateral value, expenses on restructuring and rescheduling of repayments and cost of auctioning and maintaining the collateral in the event of disposal. Thus, the existence of NPLs tends to result cost inefficient in banking sector.

According to Farradila et al. (2009), higher level of NPLs reduces banks' aspiration to increase lending. However, as a developing country, Malaysian banks are currently experiencing fast growth in banking industry. In fact, the lending behaviors of borrowers are difficult to be predicted. Therefore, in this particular study, certain variables such as lending rate, unemployment rate, inflation rate and exchange rate are taken into account explaining the relationships that exist between these factors with NPLs.

1.4 Research Objectives

The research objectives will be achieved after this study is completed. It provides more in-depth knowledge and better understanding on the purposes of this research. The purposes of this research are to conduct comprehensive analysis of the factors and figure out the solutions to the NPL issues. Following are the motives of this study.

1.4.1 General Objective

By understanding the research problems, NPLs is indeed a continuing issue detaining every country's attention. Besides, it incurs costs and affects the cost efficiency of the whole banking system in order to deal with those problem loans. Hence, this study aims to examine how macroeconomic variables affecting the NPLs in Malaysia.

1.4.2 Specific Objectives

This research has narrowed down its scope to only focus on Malaysian credit-granting institutions, regardless of conventional or Islamic. The major interest is to determine the relationship between the NPLs and macroeconomic variables including lending interest rate, unemployment rate, inflation rate and exchange rate. Thus, the specific objectives of the research are as below:

- i) To examine the relationship between lending interest rate and NPLs.
- ii) To examine the relationship between unemployment rate and NPLs.
- iii) To examine the relationship between inflation rate and NPLs.
- iv) To examine the relationship between exchange rate and NPLs.

1.5 Research Questions

In order to achieve the specified objectives above, a few research questions are formed. The research questions are as below:

- i) Does the lending interest rate significantly affect the NPLs?
- ii) Does the unemployment rate significantly affect the NPLs?
- iii) Does the inflation rate significantly affect the NPLs?
- iv) Does the exchange rate significantly affect the NPLs?

1.6 Hypotheses of Study

A hypothesis is the logically hypothesized relationship between two or more variables in the form of a statement. In this study, the null and alternate hypotheses of each independent variable are being identified as below:

1.6.1 Lending interest rate

H_0 : There is no relationship between lending interest rate and NPLs.

H_1 : There is a relationship between lending interest rate and NPLs.

1.6.2 Unemployment rate

H_0 : There is no relationship between unemployment rate and NPLs.

H_1 : There is a relationship between unemployment rate and NPLs.

1.6.3 Inflation rate

H_0 : There is no relationship between inflation rate and NPLs.

H_1 : There is a relationship between inflation rate and NPLs.

1.6.4 Exchange rate

H_0 : There is no relationship between exchange rate and NPLs.

H_1 : There is a relationship between exchange rate and NPLs.

1.7 Significance of Study

In previous studies, there are only a handful of researches studied about the macroeconomic variables of NPLs in Malaysia. This study mainly focuses on the investigation of the effects of lending interest rate, exchange rate, inflation rate and unemployment rate on NPLs. After the completion of this study, it is believed that the results can be beneficial to several parties.

This research is important to explain the phenomena and nature of NPLs, where fewer loan losses indicate a relatively sound banking system while high level of NPLs is an indicator of unsecured financial system. In addition, it also provides some general information to the readers as well as the borrowers on the issues and information about NPLs in Malaysia. Thus, it enables the readers and other researchers to further broaden the knowledge related to this topic. Besides, it also encourages more researchers to further discover and explore on this topic concerning the NPL issues in Malaysia context.

In addition, siren signal is given to the bank management as well as the regulatory authorities. This research is one of the important sources to understand the causes of the

NPL and major problems for banks in Malaysian banking system. The banks are able to adjust their strategies especially on lending activities and take possible actions to overcome the problem. As a result, it enables banks to sustain their competitive advantage and profitability. It also shows the significance of assessing customer's creditworthiness, satisfactions and other elements before a loan is being approved. Furthermore, it deepens the bank's understanding of the macroeconomics variables that bring substantial impact on the bank's NPLs. The useful interpretations of the results will contribute beneficial information that might help in decision making of the bank management and regulatory authorities to overcome this banking issue.

1.8 Chapter Layout

This research project consists of five major segments. This chapter mainly focuses on the general information regarding idea of the project. Following chapter consists of literature reviews of related journals done by previous researchers. Next, chapter three describes how the data is collected and the methods that applied. Coming up is chapter four; a series of empirical testing will be carried out as well as the results of the tests will be clearly interpreted. Lastly, the research will be wrapped up by finalizing the overall research paper with conclusion. Some recommendations and suggestions of future implications also will be discussed in chapter five.

1.9 Conclusion

Referring to the previous studies done by other researchers, most of the studies emphasized on the topics related to banks' profitability and liquidity. However, there are still a handful of researches discussing on the macroeconomic variables that affect the banks' NPLs especially for the credit-granting institutions in Malaysia. It shows that this topic is still investigable since NPL is a major and continuing issue for all countries.

Moreover, it is also important to examine the causes of NPLs in Malaysia since this research provides significant contributions to the other researchers, bank management as well as the regulatory authorities. The following chapter will investigate in detailed the empirical results by previous researchers in order to examine whether the determinants significantly affect the NPLs.

CHAPTER 2 : LITERATURE REVIEW

2.1 Overview

In this chapter, it contains all review of the studies that have done by previous researchers that are related to this research. According to previous chapter, there are a number of macroeconomic variables that will be examined in response to the bank's NPLs. They are lending interest rate, unemployment rate, inflation rate and exchange rate. Thus, studies on all relevant journals are summarized in this chapter to provide a clearer picture about the determinants of a bank's NPL. However, most of the researches concentrated mainly on Central and Eastern and South-Eastern Europe (CESEE) countries. Hence, this study will focus on Malaysia's banking perspective. To strengthen the reliability of this theoretical model and the relevant variables, empirical researches were taken into consideration and reviewed as well. Besides, this chapter also provides a foundation of knowledge to develop a better conceptual framework, following up with further investigation and hypothesis testing.

2.2 Review of Literature

In this section, it will describe, summarize, evaluate and clarify the previous studies related to this research. It provides a theoretical basis and helps in determining the nature of this research.

2.2.1 Non-performing Loans

Recent years, banks' NPLs have been a popular research topic since the empirical literatures studying on the determinants of banks' NPLs are rather broad. Reviews found that there are many researches have been covered for different countries. There are empirical literatures that solely focus on one country, such as Nigeria (Nezianya and Izuchukwu, 2014), Greece (Louzis, Vouldis and Metaxas, 2011), Malaysia (Lean and Smyth, 2011), Japan (Li and Uchida, n.d.), France (Pouvelle, 2012) and others. Adding on, there are also researchers who used a few countries' data as their research observations, such as CESEE countries (Škarica, 2013; Klein, 2013; Jakubik and Reininger, n.d.).

2.2.2 Lending Interest Rate

According to Beck, Jakubik and Piloiu (2013), they found that growth on lending interest rates tends to increase the volume of NPLs. From the lending interest rate point, NPL can be affected by an increasing price of debt servicing between a borrower and variable rate of contracts. In the case of lending interest rates, NPL is likely to be affected by a rise of debt servicing costs of borrowers with variable rate contracts. Louzis et al. (2011) stated that there is a positive coefficient between the lending interest rates and NPLs. NPLs are sensitive to the changes in lending interest rate which especially the floating rate loans, interest rate varies based on market situation.

Bandar and Javid (2013) and Adebola, Yusoff and Dahalan (2011) provided evidence proven that interest rates is positively associated with NPLs too. They found out that interest rates of Malaysian Islamic banks have significant positive long run impact on NPLs. On the other hand, for Malaysian commercial banks, it shows a strong

relationship between interest rates and NPLs in long run while interest rates do not influence NPLs in short run.

In addition, Farhan, Sattar, Chaudhry and Khalil (2012) provided evidence that lending rate has positive effect to NPLs where banks that charge higher interest rate is more likely to have high volume of NPLs. Based on data from commercial banks in the United States during 1984-1987, log-linear regression is conducted. The result shows that high interest rate has impact on NPLs. According to Nkusu (2011), NPLs and bad loans are positively correlated with interest rates because growth on interest rates weakens the capacity of borrowers to repay loan.

Interest rate policy plays an important role in NPLs growth rate in a country or economy. According to Hoque and Hossain (2008), high interest rates will broaden the debt burden of borrower eventually causing loan defaults. Additional explanation by Bloem and Gorter (2001) on interest rate policy, frequent changes in interest rate policy may increase bad loans. As a result, increase in loan defaults may lead to asset corrosion of banks and capital erosion. (Asari, Muhammad, Ahmad, Latif, Abdullah and Jusoff, 2011).

Lending policies that charge high interest rates increase the rate of NPLs. This means that when there is a rise in interest rate, it can increase the number of NPLs immediately. This is because higher interest rate reduces the ability and capability of borrowers to meet their obligations. According to Collins and Wanjau (2011), interest rate is a primary factor boosting NPLs. The study said that increase in cost of loans charged because it increases in the interest rate, regulation on interest rates is an important factor affects NPLs. In addition, Espinoza and Prasad (2010) examined the macroeconomic determinants of NPLs in a banking system. They said high interest rates increase loan defaults but they did not find a statistically significant relationship.

Rawlin, Sharan and Lakshmipathy (2012) also agreed that there is a strong positive relationship between the loan-loss rates and high interest rates. This means, high real interest rates contribute to high NPL rate. Fofack (2005) found evidence that interest rates have significantly impact on NPLs. A fragile banking system can transform into a financial crisis due to high interest rates, especially through the accumulation of NPLs and the moral hazard channels.

Based on the findings from all the researchers above, consistent result is obtained between NPLs and interest rates. The result shows NPLs and interest rates are positively correlated.

2.2.3 Unemployment rate

Unemployment rate is simply defined as the percentage of entire labor force that is unemployed but keenly looking for a job and willing to contribute (Bernstein, 2014). As unemployment rate increases, many people may want to give a try on starting their own business. However, not all loans given out guarantee a 100% payback, especially during economic recessions.

Thailand, confronted with economic crisis during the year 1998. Their economy continues to shrink while unemployment rate spikes. Their NPLs amounted 46% of overall debt (Punyaratabandhu, 1999). Punyaratabandhu (1999) added that the country might face even worst situation if the unemployment rate continues to escalate, eventually NPL multiplies and zero economic intensification. On the other hand, Japan, in the year 2000, faced the worst economy ever. Their NPL amount was unimaginable and partly was due to the unemployment rate (Lincoln, 2001). Another paper prepared by Uriu (2003) stated that Japan's unemployment rate remains above 5% and their NPLs totaled up to \$395 billion.

There is evidence proving that problem loans are strongly affected by unemployment in the Nordic banking system during the period of 1993-2005 (Joseph, Edson, Manuere, Clifford and Michael, 2012). When the borrowers, regardless of individuals or businesses are unemployed, they have less capability to cope with debt payment. Thus, unemployment and NPLs are relatively sensitive to each other, especially in business sector. As business is not doing well, firm might sack their employees to reduce their operating costs, hence causing unemployment rate to be increased (Louzis et al., 2011). Increasing unemployment rate will become one of the indicators where NPL is happening.

Another research prepared by Vatansever and Hepsen (2013) contributed that there is positive effect between unemployment rate and NPL ratio. NPL ratio rises together when the unemployment rate increases (Jakubik, 2007). Iuga and Lazea (2012) completed a research about this topic in the case of Romania. To determine the impact of NPLs in Romania banking system, Vogiazas and Nikolaidou (n.d.) used the univariate regression, given that unemployment is one of the variables which influences. The results indicated there is a clear-cut relationship where NPL ratio increases due to growth of unemployment rate.

Louzis et al. (2011) have completed their research on the 9 largest banks in Greek. They found that unemployment rate is one of the macroeconomic factors that affect the level of NPLs. It indirectly affects NPLs in the form of performance and quality of management as well as system (Badar and Javid, 2013). The bank management should monitor their problem loans closely, otherwise too high of default rate may lead to bank bankruptcy as well as economy downturn.

Unemployment is one of the strongest factors affecting NPLs (Louzis et al., 2011). Hence, it is important to include this variable in order examining how the effect of unemployment rate on NPLs.

2.2.4 Inflation rate

According to Greenidge and Grosvenor (2009), inflation has positive effect to the NPLs. In the findings, higher inflation rate leads to economic climate, eventually level of NPLs rises. Fofack (2005) further supported the statement. As inflation increases, the costs of borrowing get more expensive and eventually worsen the quality of the loan portfolios.

Badar and Javid (2013) and Moinescu and Codirlasu (2012) also stated that inflation has a positive correlation with NPLs. Both inflation rate and short-term interest rate are equally influencing the ability of borrowers to repay their borrowing. When the county is experiencing high inflation rate, customers find it difficult to pay their existing loans due to rising cost of capital.

In addition, similar results had been obtained by Babouček and Jančar (2005). The authors reported the evidence of positive correlation of NPLs with consumer price inflation. In the research done in Europe, Skarica (2013) discovered that increased inflation reduces the real income, indirectly affects the capability of borrowers. Neziyanya and Izuchuku (2014) studied the implications of NPLs on Nigeria which results found that inflation appeared in Ordinary Least Square (OLS) with a positive sign and significant coefficient. They explained that there is significant relationship between inflation and NPLs.

Saba, Kouser and Azeem (2012) studied determinants of NPLs in United States banking sector, the relationship between NPLs and inflation is positive. On the other hand, Shajari and Shajari (2012) analyzed the financial soundness indicators the banking system in Iran, also found that inflation indeed has strong positive effect on NPLs. Rinaldi and Sanchis-Arellano (2006) concluded that, when the economy slows

down, the GDP has a lower increase, the level of NPLs increases as well. There is a direct connection between the NPLs and the inflation rate.

However, Nkusu (2011) stated that inflation can influence a borrowers' debt servicing capability through various channels and NPLs can be either positively or negatively affected. Kalirai and Scheicher (n.d.) supported the negative effect of inflation on NPLs. Due to higher inflation rate, the costs of borrowing may arise. However, it can also assist borrowers as inflation also reduces the real value of debt. Moreover, Khemraj and Pasha (2009) indicated banking sector should see a reduction in NPLs during the current period of a high inflation. Kasselaki and Tagkalakis (2013) also provided evidence where inflation rate has a significantly negative impact on the ratio of provision for NPLs.

Chang (2002) examined the Hong Kong banking experience between 1995Q1 and 2002Q2 and found that inflation leads to erosion in the real value of repayment. Shingjergji (2013) completed a research about the impact of macroeconomic variables on NPLs in Albanian banking system have matching results with Chang (2002) which inflation rate indicates a negative relationship with NPLs. This means there is a reduction of NPLs if the inflation is high in the actual period. Inflation reduces the real value of debt and hence makes debt servicing easier. Also, Guy and Lowe (n.d.) proved that increased inflation reduces the proportion of bad loans. In other words, higher inflation leads to lower delinquency.

Based on the findings from previous researchers, mixed results were produced between NPLs and inflation. Therefore, the ambiguous result raised the interest of examining the relationship between NPLs and inflation.

2.2.5 Exchange rate

According to Shingjergji (2013), the relationship between foreign exchange rate Euro/ALL and NPL ratio is positive. It is because borrowers always exposed to foreign exchange rate of Euro/ALL and it could increase the NPL ratio. Moinescu (2012) also proved that NPL is significantly adjusting to economic development while exchange rate changes exercise positive effects on it. Besides that, Khemraj and Pasha (2009) also found that in the Guyanese banking sector, the real effective exchange rate has a positive effect on NPLs by referring to Jimenez and Saurina (2005) model.

In addition, there is positive relation between the ratio of total loans and total assets. It also supported by Beck et al. (2013) as they stated that exchange rate depreciation is correlated with lower quality of bank assets, especially in countries with widespread currency mismatches. It is further supported by Klein (2013) and Beck et al. (2013) as they found that exchange rate brings negative impact to banks' asset quality.

Real effective exchange rate is one of the main causes of the NPLs and it is statistically significant during sustainable economic downturns (Fofack, 2005). Furthermore, Klein (2013) suggested that exchange rate depreciation (against the euro) contribute to higher NPLs. It is supported by De Bock and Demyanets (2012), they found that economic activity turns slow when NPLs increases, while exchange rate tends to depreciate.

Based on Beck et al. (2013) finding, the exchange rate is considered as possible determinants of NPLs. In particular, exchange rate depreciation increases the NPLs in countries with a higher degree of lending in foreign currencies to non-hedged

borrowers. Besides that, a solution using the simple pair-wise regressions, it suggests NPLs has had a significant impact on the nominal effective exchange rate.

The real exchange rate is positively connected with the NPLs according to which a country's international competition is an important determinant of the credit risk. (Shingjergji and Shingjergji, 2013) On the contrary, Beck et al. (2013) mentioned that exchange rate has no significant impact on NPLs in Latvia, as they managed to maintain its currency board during the crisis.

Badar and Javid (2013) wrote a positive increase in exchange rate is related with NPLs. Depreciation in the value of home currency will result a higher cost for imported goods which directly shakes the confident of all commercial bank as default risk rises together. However, it is observed that the short run dynamics is weak between the NPLs and exchange rate as a vector error connection model. In simple, long run relationship is due to the weak relationship between NPLs and exchange rate.

Most of the findings show that exchange rate positively affects NPLs but there is still some researchers proved that exchange rate does not significantly affect NPLs in different situation. Therefore, this study intended to examine the relationship of NPLs and exchange rate in Malaysia.

2.3 Review of Relevant Empirical Models

2.3.1 Ordinary Least Square (OLS)

Shingjergji (2013) and Badar and Javid (2013) used OLS to examine the relationship of exchange rate and NPLs. In the results, it shows positive relationship and significant coefficient of exchange rate. To further understanding the models, they use Vector Auto Regression to further investigate the long run relationship and also implied Granger Causality test to determine the direction of variables.

In the study of Neziyana and Izuchukwu (2014), they examined the implication of NPLs on economic growth in Nigeria by using OLS regression. The Johansson co-integration test was conducted on the selected variables. The results show that the variable inflation appeared in OLS with a positive sign and significant coefficient.

Saba et al. (2012) noted that every bank concerns NPLs rate because it is an important information that could tell if the banks could survives. There are a bunch of factors responsible for this ratio including inflation. They used descriptive statistics, Pearson's correlation analysis and OLS regression in their research. The empirical results supported the view that macroeconomic factors have association with NPLs rate.

2.3.2 Generalized Method of Moments (GMM)

Besides, the study of Nkusu (2011) also use the one-step GMM developed by Arellano and Bond (1991) in model. Specifically, the authors stated that the signs of

the explanatory variables in all models are intuitive. This was further supported by Shajari and Shajari (2012) who used GMM estimation in analyzing the financial soundness level in Iran's banking system. They stated that GMM is a robust estimator because it is not necessary to include the information of the exact disturbances. The result obtained stated that effect of inflation on profitability is strongly positive.

To examine the relationship between NPLs and stock price, Škarica (2013), Beck et al. (2013) and Jakubik and Reininger (n.d.) have adopted GMM approach including the lagged logarithmic difference of NPLs (dependent variable) in their study. By transforming the data to first differences, fixed effect and the lagged level of independent variables would be removed (Klein, 2013). As a result, autocorrelation problem is arisen causing the estimator biased and inconsistent. On the other hand, Jakubik and Reininger (n.d.) obtained the problem of heteroscedasticity happened in the estimator.

2.3.3 Panel Data Analysis

In the study of Louzis et al. (2011), they used dynamic panel data methods to examine the macroeconomic variables of NPLs in 9 largest Greek banks which nearly about 90% of Greece's banking sector for the period from 2003Q1 to 2009Q3. They note that macroeconomic variables such as interest rates have a strong positive effect on the NPLs.

Louzis et al. (2011) used the panel data analysis to find out the elements of NPLs in the banking sector of the country, Greek. Initially, they formed a few hypotheses to test which suits the Greek banking system. After various analyses, they found that

their 'bad management' hypothesis supports their studies. The method also revealed the actual sign and statistical significance of the coefficients.

Rinaldi and Sanchis-Arellano (2006) used the cross-section and time series approach in investigating household financial fragility in euro area countries. They performed the test both on the unbalanced panel and balanced panel. The results showed the existence of a cointegrating relationship linking household NPLs and inflation. Also, the authors concluded that worsen financial condition could due to the climbing rate of inflation and lending interest rate, hence, monetary condition is crucial information.

Nkusu (2011) investigated the feedback between NPLs and its macroeconomic determinants in a Panel Vector Autoregressive (PVAR) model. Inflation, interest rates, and changes in the housing and stock price indices are included as additional indicators of the state of the macroeconomic and financial environment that affect loan quality.

In general, according to the researches, panel data analysis can be applied for all of the independent variables (lending interest rate, unemployment rate, inflation rate and exchange rate).

2.3.4 Other Methods

According to Bofondi and Ropele (2011), they used single-equation time series approach to examine the main macroeconomic determinants on NPLs which is also the bank losses in Italy over the period 1990Q1–2010Q2. Bank's NPLs are measured by the ratio of new bad loans over the outstanding amount of loans in the previous

period. They said that NPL is positively related with the interest rate and also unemployment rate.

Pearson correlation coefficient is also another method to test the relationship between unemployment rate and NPLs. Iuga and Lazea (2012), stated that this measure shows the expansion of the relating degree using the number ranging from -1.00 to 1.00. The result obtained from the research shows a strong correlation between unemployment rate and NPL, which means both variables are positively affecting each other (Iuga and Lazea, 2012).

2.4 Proposed Theoretical Framework

Figure 2.1 : Framework for the Determinants of Non-Performing Loan

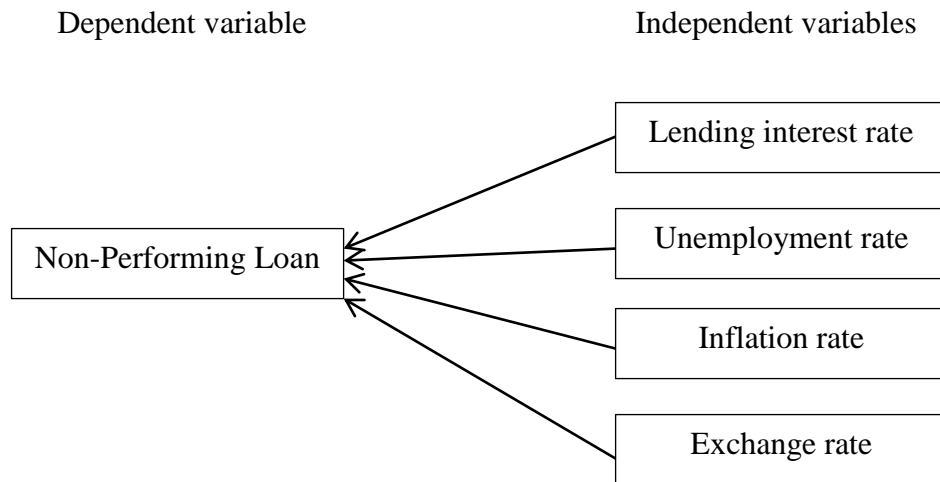


Figure 2.1 shows that there are four independent variables may affect the dependent variable. This study is to examine the effect of lending interest rate, unemployment rate, inflation rate and exchange rate to NPL in Malaysia.

2.5 Conclusion

In general, there are a number of researches have been done to examine the NPLs. Different sets of independent variables have been hypothesized in investigating the NPLs. However, lending interest rate, unemployment rate, inflation rate, exchange rate and stock price have found to be greatly influencing NPLs. Besides, several models have been employed such as OLS, GMM, panel data analysis, Single-Equation Time Series Approach and Pearson correlation coefficient. Based on the review of relevant theoretical models, it is understood that the Panel data analysis is the most popular model in determining NPLs by the researchers. However, there are some findings showing ambiguous result to the reader. Therefore, the actual methodology for this research including research design, measurement scales, methods of data analysis and others, will be further discussed in the following chapters.

CHAPTER 3 : METHODOLOGY

3.1 Overview

This chapter describes the discussion on the overall research methodology. The research is carried out by obtaining necessary data for empirical testing with suitable methodology in order to ensure sound results.

3.2 Data Collection Method

The intention of this research is to analyze the determinants of NPLs in Malaysia. To examine the effect of macroeconomics variables, this paper employs lending interest rate, unemployment rate, inflation rate and exchange rate as its independent variables. To examine the relationship among the variables, hypothesis testing will be carried out and results will be generated.

Quantitative research consists of studies in which the data concerned can be analyzed and its results are more readily interpreted. In secondary data analysis, the researchers analyze the data without directly involving themselves in the data collection process (Russell, 2001). Hence, secondary data is more preferable than primary data in this study.

Besides, the target population constituted all the financial institutions in Malaysia that hold a license to grant loans to the customers. This credit facility refers to both conventional and Islamic principles. According to the BNM customer credit report, loan indicates customer who has applied borrowings of its own or other business interests such

as joint-accounts, sole proprietorship, partnerships, and professional bodies. Based on the latest reported figures on BNM official webpage, there are 27 licensed commercial banks and 16 licensed Islamic banks in Malaysia that are eligible to grant loans to the community. Hence, the data obtained in this study is referring to these financial institutions.

Narrowing the population, a sampling frame was created. Research acquires the data of borrowers who have at least 3 month installments in arrears with Malaysian licensed banking institutions. Besides, it also takes into account the variables affecting the NPLs such as banks' lending interest rate, unemployment rate, inflation rate and exchange rate.

To obtain the secondary data, various resources are referred for support. The table below clearly illustrated the data sources of each variables and its unit measurement.

Table 3.1 : Sources of Data

Variable	Data source
Non-performing loans (in RM'million)	BNM official website
Lending interest rate (in percent)	Data Stream Navigator
Unemployment rate (in percent)	Data Stream Navigator
Inflation rate (in percent)	Data Stream Navigator
Exchange rate (in RM/\$)	Data Stream Navigator

The sampling period of the study covers a total of 5 years, starting from year 2005 to 2009. To investigate this study more accurately, data is collected on monthly basis. As a result, a total of 60 observations are to be examined in this study and the samples are randomly selected from this population. Basically, all the data obtained was from two main sources, BNM official website and Data Stream Navigator. After sorting and

arranging the raw data into a spreadsheet, the data is ready to use for further investigation.

3.3 Methodology

In this study, OLS regression is the choice of research instrument in this paper. According to Saba et al. (2012), the OLS regression analysis is a simple estimation strategy for NPLs. This regression enables to estimate the empirical model with some adjustments to generate sound results. Besides, OLS regression is useful for diagnostic checking for all data and appropriate remedies for those detected problems (Jung and Lei, 2012).

In addition, OLS regression analysis is suitable to be used for time series data. Jung and Lei (2012) used OLS method to verify the key determinants of NPLs for banking system in the United States. The paper complements its literature by examining both macroeconomic and bank-specific determinants over 2 time periods, economy stability (2002-2006) and recession (2007-2010).

According to Gauss-Markov theorem, few assumptions must be fulfilled in order to employ OLS regression model. First of all, the model must be linear in parameters. Specifically, the dependent variable is considered as a linear function of a specific set of independent variables plus an error term. Then, it is important to make sure that the observations are randomly selected. The number of observations should not be lesser than the number of estimated parameters in order to generate valid results. To ensure there is a unilateral causal relationship between dependent variable and independent variables, the independent variable must be nonstochastic. In another words, the values of the independent variable are fixed. Other assumptions such as error terms are normally distributed and have constant variance (normality of error terms), no perfect collinearity among independent variables (no multicollinearity), error terms are independently and identically distributed (no autocorrelation), error terms have zero mean value

(homoscedasticity) and model is correctly specified (model specification) must be fulfilled.

It is important to fulfill all the assumptions above in order to achieve BLUE properties of the true parameters, where it stands for Best Linear Unbiased Estimator. The Gauss-Markov theorem explains every each of them. First of all, best indicator of regression model is where it achieves the minimum variance or the smallest variance in the empirical results, thus leads to accurate and consistent outcomes. Next, the model is linear if the estimated parameter, $\hat{\beta}_i$ is equal to the true parameter, β_i , $\hat{\beta}_i = \beta_i$. When the assumptions are met, the $\hat{\beta}_i$ is the unbiased estimator of β_i , $E(\hat{\beta}_i) = \beta_i$. In simpler words, the average value of estimator in repeated sampling is equal to the true parameter describing the relationship between x and y.

Based on the Gauss-Markov theorem, OLS method can be applied to examine the relationship between the dependent variable (NPLs) and independent variables (lending interest rate, unemployment rate, inflation rate and exchange rate). Thus, the OLS regression model is generated in simple manner as below:

Model 3.1

$$\ln NPL_t = \beta_0 + \beta_1 LR_t + \beta_2 UR_t + \beta_3 IR_t + \beta_4 \ln ER_t + \varepsilon_t$$

Where,

$\ln NPL_t$	=	Non-performing loans (in logarithm)
β_0	=	Constant coefficient
β_1	=	Coefficient of lending interest rate
LR_t	=	Lending interest rate (in percent)
β_2	=	Coefficient of unemployment rate
UR_t	=	Unemployment rate (in percent)

β_3	=	Coefficient of inflation rate
IR_t	=	Inflation rate (in percent)
β_4	=	Coefficient of exchange rate
$\ln ER_t$	=	Exchange rate (in logarithm)
ε_t	=	Error term

Since the data falls under time series data, Econometric Views (EViews) is the most suitable program to investigate the relationship between NPLs and the independent variables such as lending interest rate, unemployment rate, inflation rate and exchange rate. The results from EViews tend to be more accurate and reliable compared to other programs.

Besides, there are a number of tests can be carried out using this program to identify problems of multicollinearity, heteroscedasticity, autocorrelation, specification bias and normality.

3.3.1 Multicollinearity

Multicollinearity means that there are at least two independent variables in the model are correlated and provide redundant information about the response. The existence of this problem causing a larger variances and covariance therefore affect the significant of t-statistics. It reduces the reliability of the data information and leads to confusing and biased results. There is no unique method to detect the multicollinearity but there are few rules of thumbs:

The very first sign of multicollinearity is high R-square but few significant t-ratios. Although most of the explanatory variables are insignificant, but the test obtained a high R-squared, it means that there are some correlated between those explanatory variables.

In order to determine which explanatory variables are correlated, the high Pair-Wise Correlation coefficients test will be conducted. It is practiced to determine which explanatory variables have the highest covariance from result. Usually, coefficient that is more than 0.8 is considered high risk of collinearity.

Lastly, the study estimates the relationship between the explanatory variables by taking the highest coefficient among other independent variables. Then, obtain their value of R-squared. Variance Inflation Factor (VIF) is conducted to test the severity of multicollinearity. VIF is defined as below:

$$VIF = \frac{1}{1 - R_{x_1x_2}^2}$$

As a rule of thumb, if the value of VIF is equal or more than 10, both variables are said to be highly correlated. It also means that there is serious multicollinearity problem in the model.

3.3.2 Normality of Error Terms

Normality Test is used to determine how likely the data set is to be normally distributed. In order to fulfill the assumption of “normality”, Jacque-Bera test, is the most widely test used by econometricians, will be conducted. Jacque-Bera test is asymptotically chi-squared distributed with two degrees of freedom because it is just the sum of squares of two asymptotically independent standardized normal. It is based on the sample of skewness and kurtosis of normal distribution. In order to make sure the variables that were omitted are small and at best random, the Jacque-Bera test will be carried out as below:

Assume that:

H_0 = Error terms are normally distributed

H_1 = Error terms are not normally distributed

The test statistic of Jacque-Bera is defined as below:

$$JB = \frac{n}{6} \left[S^2 + \frac{1}{4} (K - 3)^2 \right]$$

Where,

n = Number of observations

S = Sample of Skewness

K = Sample of Kurtosis

Hence, the null hypothesis is rejected if the p-value is less than significance level of 0.05, otherwise do not reject the null hypothesis. The error terms are not normally distributed in the model if the null hypothesis is untrue.

3.3.3 Model Specification

Model Specification test is to make sure the regression is correctly specified. Normally, model is incorrectly specified due to omitting relevant variables, including irrelevant variables, using wrong functional form and others. As a result, the model might also face the problems of heteroscedasticity or autocorrelation and it will lead to biased and inconsistent outcome. To determine whether the model is a good or bad regression, the Ramsey RESET test will be applied. The functions of Ramsey RESET test is to examine if non-linear combinations of the fitted values can explain the endogenous variable. The Ramsey RESET test will be conducted as below:

Assume that:

$H_0 =$ Model is correctly specified

$H_1 =$ Model is incorrectly specified

The following step is estimate the restricted model, $Y = \beta_0 + \beta_1X + e$ and the unrestricted model, $Y = \beta_0 + \beta_1X + \beta_2Y^2 + \beta_3Y^3 + e$. From the model estimated, the R^2 obtained from both model act as the purpose of determine the test statistic. The test statistics of Ramsey RESET test is defined as below:

$$F = \frac{(R_{unrestricted}^2 - R_{restricted}^2) \div (k_{unrestricted} - k_{restricted})}{(1 - R_{unrestricted}^2) \div (n - k_{unrestricted})}$$

Where,

k = Number of explanatory variables

n = Number of observations

The critical value of Ramsey RESET test could be found from F table:

$$F_{\alpha,2,n-3}$$

Where,

α = Significance level

n = Number of observations

If the value obtained from test statistics is greater than the critical value, study will reject the null hypothesis. Therefore, there is sufficient evidence to conclude that the model specification is incorrect.

3.3.4 Autocorrelation

Autocorrelation is assumed that the error terms for different observations are independently and identically distributed. In the other words, an independently distributed error term for a particular period is not related to the error term of previous period, regardless in term of sign of size of the error term. Otherwise, the assumption of independence of error term is violated. Usually, the autocorrelation problem is most common in time series data. For instance, the exchange rates are often positively correlated because they have minimal changes through periods. As a result, misleading result will be generated as it affects the distribution of the coefficient increasing the variance of the distribution. The variances are to be underestimated and overestimated.

There are two categories of autocorrelation, namely pure serial correlation and impure serial correlation. Pure serial correlation is caused by distribution of error term while impure serial correlation is caused by specification bias such as omitting important variables or using incorrect form. In order to determine autocorrelation problem is under which category, study chose to apply the Durbin-Watson test. Durbin-Watson test is carried out as below:

Assume that:

H_0 : $\rho = 0$ (There is no autocorrelation between error terms)

H_1 : $\rho \neq 0$ (There is autocorrelation between error terms)

The test statistic of Durbin-Watson is defined as below:

$$\hat{\rho} = \frac{\sum(\mu_t - \mu_{t-1})}{\sum \hat{\mu}_t^2}$$

Where,

$\hat{\rho}$ = Estimated serial correlation coefficient

μ_t = Error term

$\hat{\mu}_t$ = Estimated error term

When the p-value is less than the significant level of 0.05, the null hypothesis is rejected. In the other words, the problem of autocorrelation does exist in the regression model. If there is autocorrelation problem, it shows that this regression model is categorized under pure serial correlation. To identify the type of the serial correlation, Durbin-Watson statistic could produce the result to refer. The test statistic is as below:

$$d = \frac{\sum(\mu_t - \mu_{t-1})^2}{\sum \hat{\mu}_t^2} , \quad d = 2(1 - \hat{\rho})$$

Where,

d = d test statistic

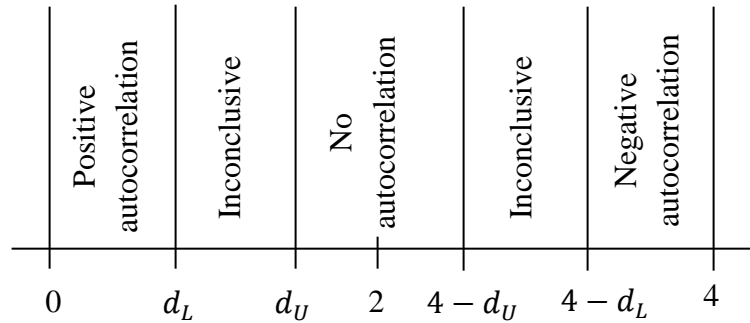
μ_t = Error term

$\hat{\mu}_t$ = Estimated error term

$\hat{\rho}$ = Estimated serial correlation coefficient

The figure below clearly shows the type of serial correlation in relation to Durbin-Watson test statistic:

Figure 3.1 : Regions of the Durbin-Watson test



Where,

d_L = Lower d critical value

d_U = Upper d critical value

To determine the lower and upper critical value from the table of Durbin-Watson, few items are identified such as k (number of explanatory variables, excluding intercept), n (number of observations) and α (significant level of 0.05). Then, figure 3.3 is to be made. The null hypothesis is to be rejected if d test statistic is less than d_L or more than $4 - d_L$. Besides, null hypothesis is accepted if d test statistic falls between d_U and $4 - d_U$, otherwise inconclusive.

However, it is difficult for Durbin-Watson test to detect higher order autoregressive model of dependent variable and error term. For instance, time series data is commonly considered as higher order of correlation because the error term for a particular period may be affected by the errors from previous periods. Besides, results obtained are inconclusive result from Durbin-Watson test. Hence, it is decided to proceed using Breusch-Godfrey LM test for detailed diagnostic checking. The procedure is as follows:

Assume that:

H_0 : There is no autocorrelation problem

H_1 : There is autocorrelation problem

The critical value of Breusch-Godfrey LM is obtained as below:

$$X_u^2 = X_{\alpha, p}^2$$

X^2 = Chi-squared

α = Level of significance

p = Fitted lagged lane

The test statistic of Breusch-Godfrey LM is obtained as below:

$$Test\ statistic = (n - p)R^2$$

Where,

n = Number of observations

p = Fitted lagged lane

R^2 = R squared

One of the advantages of using Breusch-Godfrey LM test is it is applicable for higher order of serial correlation. First move will be the determination of the best fitted lagged lane (p) by identifying the lowest Akaike Information Criterion (AIC) and Schwartz Information Criterion (SIC). The formulas are as below:

$$AIC = \left(\frac{2n}{n-k-1} \right) k - 2 \ln(L)$$

$$SIC = k \ln(n) - 2 \ln(L)$$

Where,

n = Number of observations

k = Number of explanatory variables

L = Maximized value of Log-likelihood

After identifying the lowest AIC and SIC, critical value can be determined by using the Chi-squared table. If the test statistic is higher than critical value, the autocorrelation problem does exist, otherwise do not reject the null hypothesis.

3.3.5 Heteroscedasticity

In a linear regression model, homoscedasticity is assumed that the error term is normally distributed with zero mean and has variance of σ^2 , i.e.

$$Var(\mu_t) = \sigma^2$$

On the other hand, the assumption is violated when the error term does not have constant variance, is called heteroscedasticity, i.e.

$$Var(\mu_t) = \sigma_t^2$$

The only difference for both is the subscript t attached to the σ_t^2 , meaning that the variance varies for every different observations in the sample, i.e. t=1,2,3,4,...,n.

This problem might occur due to several reasons. First, the sample is obtained from a diverse background. It means that there will be a great variability among the

observations selected, resulting in presence of outliers. For instance, there is mixture of high and low income household in a sample. High income household tends to spend more, vice versa. As a result, there will be a great gap among the observation, eventually resulting in heteroscedasticity.

In addition, measurement error and model misspecification can produce heteroscedasticity too. Inaccurate responses received from the respondents might cause the variables wrongly measured. There is pattern of heteroscedasticity when the model is wrongly specified, such as incorrect data transformation, wrong functional form and omitted important variables.

When the model consists of the problem of heteroscedasticity, the OLS estimator is no longer BLUE. The usual tests such as T test and F test are likely to have larger variance than the actual variance. Besides, the presence of heteroscedasticity causes standard errors to be biased. As a result, the confidence interval and test hypothesis tend to be biased, eventually the overall results may be misleading.

To detect the heteroscedasticity problem, it is best to apply the Autoregressive Conditional Heteroscedasticity (ARCH) test, the most effective method for time series data. The diagnostic checking procedure is as below:

Assume that:

H_0 : There is no heteroscedasticity problem

H_1 : There is heteroscedasticity problem

The critical value of ARCH test is obtained as below:

$$X_u^2 = X_{\alpha, k}^2$$

X^2 = Chi-squared

α = Level of significance

k = Number of explanatory variables

The test statistic of ARCH test is obtained as below:

$$\text{Test statistic} = nR^2$$

Where,

n = Number of observations

R^2 = R-squared

The study rejects the null hypothesis if the test statistic is more than critical value or p-value is less than significant level of 0.05. Otherwise, the heteroscedasticity problem is absent.

3.4 Conclusion

All significant statistical tests and measurements are determined in this chapter. Data is assembled from two main sources, BNM official website and Data Stream Navigator. The sample size of 60 is appropriate and sufficient. OLS regression model is formed for the empirical testing and diagnostic checking and will be conducted following the methodologies discussed earlier. All interpretation of the empirical testing results generated from EViews program will be explained in the following chapter.

CHAPTER 4 : RESULTS AND INTERPRETATIONS

4.1 Overview

Based on the initial objectives of this research, all relevant data is accumulated to fulfill the need for all series of testing and the empirical testing has been carried out as well. In this chapter, it contains the interpretation of all empirical results that previously extracted from the EViews program.

4.2 Model Estimation and Interpretation

In this part, study used an econometric model to explain and evaluate the relationship between NPLs with lending interest rate, unemployment rate, inflation rate and exchange rate. The model used for all empirical testing is as below:

Model 4.1

$$\ln NPL_t = \beta_0 + \beta_1 LR_t + \beta_2 UR_t + \beta_3 IR_t + \beta_4 \ln ER_t + \varepsilon_t$$

Where,

$\ln NPL_t$ = Non-performing loans (in logarithm)

β_0 = Constant coefficient

β_1 = Coefficient of lending interest rate

LR_t	=	Lending interest rate (in percent)
β_2	=	Coefficient of unemployment rate
UR_t	=	Unemployment rate (in percent)
β_3	=	Coefficient of inflation rate
IR_t	=	Inflation rate (in percent)
β_4	=	Coefficient of exchange rate
$lnER_t$	=	Exchange rate (in logarithm)
ε_t	=	Error term

Model 4.1 is the basic model where NPLs is estimated by using the macroeconomic variables, they are lending interest rate, unemployment rate, inflation rate and exchange rate. In this economic model, lending interest rate, unemployment rate and inflation rate are measured in percent while exchange rate is measured in Ringgit Malaysia per United States Dollar. Since that, the study needs to transform the data of NPLs and exchange rate into logarithm form to avoid huge variance in measurement. Below is the result extracted based on the econometric model:

Table 4.1 : Empirical Result of OLS Regression Model

Variable	Coefficient
Intercept	3.139280
Lending Rate	0.114987
Unemployment Rate	0.002908
Inflation Rate	-0.006336
Exchange Rate	1.187186

Table 4.1 shows the initial regression output obtained from EViews 6.0. Then, the results were interpreted as below manner:

Model 4.2

$$\ln NPL_t = 3.1393 + 0.1150LR_t + 0.0029UR_t - 0.0063IR_t + 1.1872 \ln ER_t$$

Based on Model 4.2, the study is able to interpret the estimated parameters in useful way. Assuming all the independent variables are equal to zero, the estimated NPL in Malaysia is equal to 3.1393%. By holding other variables constant, every 1% increase in lending rate, on average, the NPL will increase by 0.1150%. On the other hand, the NPL is estimated to increase by 0.0029% for every 1% increase in unemployment rate in Malaysia, other variables remain constant. However, there is a negative relationship between NPLs and inflation rate. On average, Malaysian NPLs will reduce by 0.0063% for every 1% increase in inflation rate, holding other variables constant. For every 1 percentage point increases in exchange rate, on average, the NPL in Malaysia will increase by 1.1872 percentage point, holding other variables unchanged.

Based on the result above, it is also possible to interpret the expected signs of each independent variable to examine whether they are consistent with the theories and findings done by other researchers. The results show that lending rate, unemployment rate and exchange rate are positively related to NPLs while there is negative relationship between NPLs and inflation rate.

According to Louzis et al. (2011), the coefficients for the lending interest rates must be positive with NPLs. This is because NPLs are sensitive to the changes of lending interest rate. When lending interest rate increases, NPLs will subsequently increases due to high cost of debt servicing (Beck et al., 2013). In addition, Fofack (2005) found evidence that interest rates have significantly positive impact on NPLs. Too high of lending rate may

cause financial crisis especially through the accumulation of NPLs and the moral hazard channels. In short, study has obtained the consistent results as previous researches.

According to the coefficient obtained from the test earlier, the result matches the theories published, unemployment and NPLs have positive relationship. Iuga and Lazea (2012) published their research on the same topic but a different country perspective. Their conclusion is parallel to the initial findings. Unemployment will result in loss of income of an individual which he or she may need it to support their daily needs and monthly commitments. When an individual could not contribute to their commitments for a specific range of time, it is where banks will take action and decision whether the loan is considered default. Another research done for Italian banks by Bofondi and Ropele (2011) has written that unemployment will cause a great impact not only to household consumptions but also the economy of banking industry.

On the other hand, the result indicates negative expected sign, which is consistent with the findings from other researchers. According to Kalirai and Scheicher (n.d), greater inflation benefits the borrowers while repaying their debt because the future real value has depleted. It further supported by Khemraj and Pasha (2009), inflation decreases the real value of debt and hence motivates the borrowers to clear their debt faster. In other words, higher inflation level in the current period should result in a reduction in the level of NPLs in the whole banking sector. In addition, Kasselaki and Tagkalakis (2013) also found similar result where depreciation of currency will make the debt servicing easier, subsequently lower delinquency. Several studies also found that increased inflation reduces the proportion of bad loans.

According to Shingjergji (2013), he stated that the relationship between foreign exchange rate Euro/ALL and NPLs ratio is positively correlated. He found that high credit risk is the main cause of NPLs during the economic and banking crises. This is because the foreign and local borrowers are always exposed to the foreign exchange rate. During economic downturns, high credit risk increases the NPLs. This viewpoint is supported

with similar analysis and findings in the studies from Shingjergji and Shingjergji (2013). In addition, Beck et al. (2013) stated that the exchange rate is positively affects the NPLs because depreciation in exchange rate will lead to a lower quality of bank asset or loans. Thus, the empirical results are tied with the findings.

4.3 Hypothesis Testing

Hypothesis testing is used to test how significant the independent variables affecting the NPLs. This study has conducted few hypotheses testing based on the results obtained from Table 4.1.

4.3.1 T-test

T-test is used to test how significant the independent variables individually affecting NPLs. Thus, another table is used to summarize the information from Table 4.1 as below:

Table 4.2 : Summary of T-test

Independent variable	P-value	α	Decision	Conclusion
Lending interest rate	0.0000	0.05	Reject H_0	Significant relationship
Unemployment rate	0.0000	0.05	Reject H_0	Significant relationship
Inflation rate	0.0001	0.05	Reject H_0	Significant relationship
Exchange rate	0.0000	0.05	Reject H_0	Significant relationship

Table 4.2 shows the p-value, decision making and conclusion for each independent variables at significance level of 0.05. The decision is made by comparing the p-value with significance level 0.05. The null hypothesis in T-test is there is no significant relationship between NPL and each independent variable. Thus, analysis states that study should reject the null if the p-value is less than 0.05. Based on the result, it is clear that all the independent variables included in the regression model are significant to explain NPL in Malaysia. Hence, it can foresee that the model is less likely to commit specification bias.

4.3.2 F-test

F-test is used to examine the significance of the regression model. In the other words, it shows how appropriate this study formed the regression model and how significant the overall independent variables affecting NPLs in Malaysia. Analysis has gathered the information for F-test based on the result obtained in Table 4.1.

Table 4.3 : Summary of F-test

F-statistic	171.2509
P-value	0.000000

Table 4.3 shows the result of F-test based on the initial OLS regression model. The null hypothesis assumes that the overall independent variables are not significant while alternative hypothesis indicates there is at least one independent variable is different from zero. When p-value is less than the significance level of 0.05, it indicates that the null hypothesis is untrue. Based on Table 4.3, study rejects null hypothesis because p-value of 0.0000 is less than 0.05. Thus, there is sufficient

evidence to conclude that there is at least one independent variable is significant in explaining NPLs in Malaysia.

4.3.3 Goodness of Fit

Table 4.4 : Summary of Goodness of Fit

R-squared, R^2	0.925676
Adjusted R-squared, \bar{R}^2	0.920271

R^2 is 0.9257 based on Table 4.4. This indicates that there is about 92.57% of the total variation in the NPL can be explained by the total variation in the independent variables, including lending rate, unemployment rate, inflation rate and exchange rate. On the other hand, the \bar{R}^2 in this regression model is 0.9203. Meaning that, there is about 92.03% of the total variation in the NPL can be explained by the total variation in the independent variables after taking into account of the degree of freedom. Based on the results above, there is sufficient evidence to conclude that the model is considered a good fit model.

4.3.4 Standard Error of Mean

Standard error of mean refers to the standard deviation of the distribution of sample means taken from a population. In simpler definition, the smaller the standard error, the more representative the sample will be in a population. Following are the procedures that study employed to test how representable is the sample from the population.

Table 4.5 : Summary of Standard Error of Mean

Standard Error of regression	0.078924
Mean dependent variable	4.626972

The summary of standard error of mean in Table 4.5 is extracted from the result generated in Table 4.1. The calculation of error-to-mean ratio is as below:

$$\begin{aligned}
 \text{Standard error-to-mean ratio} &= \frac{\text{Standard error of regression}}{\text{Mean dependent variable}} \\
 &= \frac{0.078924}{4.626972} \\
 &= 0.0171
 \end{aligned}$$

Based on the result above, small error-to-mean ratio of 0.0171 indicates the sample in this study is representable to the population. In other words, sample size of 60 is sufficiently large to obtain minimum standard error, eventually accurate empirical results. Hence, the observations are sufficiently to explain NPLs in Malaysia.

4.4 Diagnostic Checking

As mentioned earlier, a total of five diagnostic checking will be conducted using the regression model 4.2. Following are the results obtained from EViews program.

4.4.1 Testing of Multicollinearity

In order to test whether there is correlation among the independent variables, this research has a series of diagnostic checking. First of all, it is expected to have multicollinearity problem if there is high R^2 but few significant T-ratio. The result is as below:

Table 4.6 : Empirical Result of OLS Regression Model

R^2	0.925676
Independent variable	P-value
Lending interest rate	0.0000
Unemployment rate	0.0000
Inflation rate	0.0001
Exchange rate	0.0000

Table 4.6 shows the empirical result generated after running the data. Based on the table, it is clear that all of the independent variables, including unemployment rate, lending rate, inflation rate and exchange rate, significantly influence the NPLs. Besides, high R^2 of 0.9257 shows that the NPL can be strongly explained by the independent variables it employed. Thus, high R^2 and all significant T-ratio show there is no multicollinearity problem in the regression model. To deepen this study on the multicollinearity problem, Pair-Wise Correlation test will be run and the result is as below:

Table 4.7 : Empirical Result of Pair-Wise Correlation test

	LOGNPL	IR	LOGER	LR	UR
LOGNPL	1.000000	0.143947	0.483041	0.781520	0.722663
IR	0.143947	1.000000	0.022445	0.419611	-0.015734
LOGER	0.483041	0.022445	1.000000	-0.002832	0.578594
LR	0.781520	0.419611	-0.002832	1.000000	0.346144
UR	0.722663	-0.015734	0.578594	0.346144	1.000000

Based on Table 4.7, it can be observed that there is low correlation happened between unemployment rate and exchange rate at 0.5786. To test the seriousness of multicollinearity among these variables, it is decided to conduct VIF test. The multicollinearity problem is serious if VIF is greater than 10. The empirical result is as below:

Table 4.8 : Empirical Result of VIF test

Revised R^2	0.334771
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The analysis set unemployment rate as its dependent variable while exchange rate as its independent variable. Based on Table 4.8, VIF is calculated using R^2 of 0.3348. The result is as below:

$$VIF = \frac{1}{1 - R^2}$$

$$VIF = \frac{1}{1 - 0.3348}$$

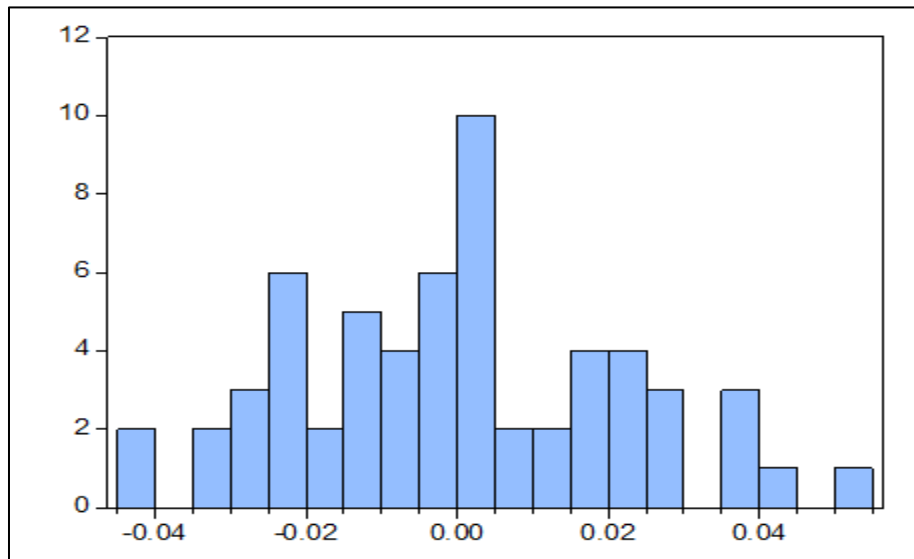
$$VIF = 1.5033$$

Based on the result, VIF of 1.5033 is below the rule of thumb at 10. Thus, it indicates there is no serious multicollinearity problem in this regression model.

4.4.2 Testing of Normality of Error Terms

Next, study examined whether the assumption of normality of error term is fulfilled. Thus, Jarque-Bera test is conducted and the result is as below:

Graph 4.1 : Normality Graph of Jarque-Bera test



Graph 4.1 shows the result on the normality distribution of all the data. At the first sight, it is expected to have normal distribution of error terms by looking the graph above. Statistically, Table 4.9 below shows the error terms in the model are normally distributed.

Table 4.9 : Empirical Result of Jarque-Bera test

Skewness	0.224240
Kurtosis	2.556967
P-value	0.608495

Skewness indicates how symmetrical is the distribution. Skewness of 0.2242 shows the distribution is approximately symmetric because it falls between -0.5 and 0.5. On the other hand, kurtosis represents the “peakedness” of the distribution of random variable. In the other words, it indicates the height and sharpness of the central peak of the standard bell curve. As the rule of thumb, kurtosis of 3 indicates normal distribution of error terms. Based on the result, kurtosis of 2.5570 shows an approximate normal kurtosis of the distribution.

While looking to the hypothesis testing, this study rejects null hypothesis if p-value is less than 0.05. It will not reject the null hypothesis since the p-value of Jarque-Bera test is at 0.6085, greater than 0.05. Thus, there is sufficient evidence to conclude that the error terms in this regression model are normally distributed.

4.4.3 Testing of Model Specification

The study run the model specification test to check whether its model is correctly specified. Incorrect specied model may due to omission of important variable, inclusive of irrelevant variable or wrong functional form. Thus, it conducted the Ramsey RESET test to examine if the model is specified correctly. The empirical result is as below:

Table 4.10 : Empirical Result of Ramsey RESET test

P-value	0.9534
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The table above shows the result of Ramsey RESET test. The null hypothesis is rejected when the p-value is less than significance level of 0.05, otherwise do not reject the null hypothesis. Based on the result generated, p-value of 0.9534 is greater than 0.05. Thus, there is sufficient evidence to conclude that the regression model is correctly specified at significance level of 0.05.

4.4.4 Testing of Autocorrelation

In order to examine whether the error terms in the regression model are independently and identically distributed, several tests have been carried out. The Durbin-Watson test is used to test whether there is autocorrelation problem in the model as well as identify which category the problem belongs to. The procedure of Durbin-Watson test is as below:

First of all, with 60 observations (n), 4 explanatory variables (k) and significance level of 0.05, it has identified the lower critical value (d_L) is 1.37 and upper critical value (d_U) is 1.65. Then, the figure below shows the categories of autocorrelation:

Figure 4.1 : Categories of Autocorrelation

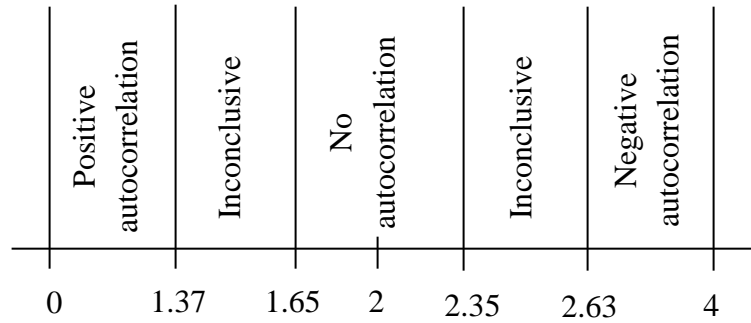


Figure 4.1 shows the types of autocorrelation based on the critical values. To identify autocorrelation problem is under which category, it is necessary to compare it with the OLS regression result.

Table 4.11 : Empirical Result of OLS Regression Model

Durbin-Watson test statistics	0.713260
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Based on the result from Table 4.11, the problem of autocorrelation does exist in this model. It is also clear to identify that the positive autocorrelation is present in the model because the test statistic of 0.7133 falls under the range between 0 and 1.37 (d_L). In order to double-check the result generated, another diagnostic checking called Breusch-Godfrey Serial Correlation LM test is carried out to check on the effect. The result is as below:

Table 4.12 : Empirical Result of Breusch-Godfrey Serial Correlation LM test

P-value	0.0000
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Based on Table 4.12, the null hypothesis is rejected since the p-value of 0.0000 is less than the level of significance of 0.05. Thus, there is sufficient evidence to conclude that there is positive autocorrelation problem does exist in the regression model. Since the problem of autocorrelation is undesirable in any model, this study intends to solve it using following procedures. First of all, it estimates and restructures the regression model in the EViews program as below manner:

Model 4.3 : New Estimation of Regression Model

$$D(\log NPL) = c + D(LR) + D(\log NPL(-1)) + D(UR) + D(IR) + D(\log ER)$$

Where,

- D(logNPL) = First difference of log NPL
- c = Intercept
- D(LR) = First difference of lending rate
- D(logNPL(-1)) = First difference of lagged log NPL
- D(UR) = First difference of unemployment rate
- D(IR) = First difference of inflation rate
- D(logER) = First difference of log exchange rate

The above model shows the restructured regression model of this study. All variables had been employed to first difference level, regardless independent variable or dependent variable, i.e. D(ur) indicates first difference of unemployment rate. Besides, this paper has made the dependent variable, i.e. lognpl, into first difference of lagged independent variable, i.e. D(lognpl(-1)). Then, the test was run again on the new regression model and the new result of Breusch-Godfrey Serial Correlation LM test is as below:

Table 4.13 : New Empirical Result of Breusch-Godfrey Serial Correlation LM test

P-value	0.4416
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Obviously, it can be observed that the p-value has risen from 0.0000 to 0.4416 after restructuring the regression model. Hence, this study does not reject the null hypothesis since the p-value is more than the significance level of 0.05. Thus, it can conclude that there is sufficient evidence to prove that the autocorrelation problem is free from the regression model.

4.4.5 Testing of Heteroscedasticity

To detect the heteroscedasticity problem, ARCH test was practiced. The empirical result is as below:

Table 4.14 : Empirical Result of ARCH test

Observation x R-squared (nR^2)	8.201346
P-value	0.0042

Based on Table 4.14 above, the null hypothesis is rejected if p-value is less than 0.05. Thus, there is sufficient evidence to conclude that there is heteroscedasticity problem in the model since p-value of 0.0042 is less than the significance level of 0.05.

In order to solve the heteroscedasticity problem in the model, Breusch-Pagan-Godfrey test is chosen for trial to solve the problem. The empirical result is as below:

Table 4.15 : Empirical Result of Breusch-Pagan-Godfrey test

Observation x R-squared (nR^2)	7.457487
P-value	0.1136

Based on Table 4.15 above, it is clear to see that the observed R-squared has reduced from 8.2013 in ARCH test to 7.4574 in Breusch-Pagan-Godfrey test. It shows that the regression model has stronger reliability of the NPLs can be explained by the explanatory variable. On the other hand, the p-value of 0.1136 obtained from Breusch-Pagan-Godfrey test is more than the significance level of 0.05. As a result, it shows that the residuals are now homoscedastic and this regression model is free from heteroscedasticity problem.

4.5 Conclusion

In short, all the hypothesis testing and diagnostic checking has been run through completely in this chapter. Based on the result generated from EViews program, the regression model has included all important and significant independent variables including lending rate, unemployment rate, inflation rate and exchange rate, to explain NPLs. Besides, the results also show that all of these macroeconomic variables have consistent econometric points of view with the other researchers. For diagnostic checking, a number of tests were run to examine the problems in the regression model formed. As a result, the problems of autocorrelation and heteroscedasticity are being detected. Subsequently, these problems are solved by using different solutions. The following chapter will discuss about some limitations of this study and recommendations for future researches.

CHAPTER 5 : DISCUSSION, CONCLUSION AND POLICY IMPLICATIONS

5.1 Overview

This chapter summarizes the empirical results in Chapter four and major findings will be discussed. Moreover, the policy implications, limitation of this study and recommendations for future research will also be included in this chapter. The conclusion for overall research will be at the last session of this chapter.

5.2 Summary of Statistical Analyses

The major concern problem in banking sectors could be the high default risks. In this case, the variations of NPLs tend to be everyone's attention, including the government, financial institutions, as NPLs bring negative impacts to the economy in all over the world. That is the reason why many researchers tried to understand the effect of NPLs in different countries.

In order to understand precisely about the causes of NPLs, this research is totally meant to determine whether exchange rate, unemployment rate, lending rate and inflation rate are significantly playing important role in affecting NPLs in Malaysia. Besides, it is also part of the research's interest to know that those macroeconomics variables bring whether positive effects or negative effects to NPLs.

Based on the previous chapters, this research has successfully proven that those macroeconomics variables have significant relationship with NPLs and the expected signs for each independent variable are consistent with the theories discussed in Chapter two. Firstly, exchange rate affects NPLs because borrower always exposed to the foreign exchange rate during economic downturn. NPLs is significantly adjusting to economic development, therefore it has been affected when exchange rate is depreciated and indirectly lower down bank asset quality.

Besides, results indicate that unemployment rate also plays important role in affecting NPLs. Borrowers have less capability to repay their debt when they are unemployed. Some of them even try to start their own business as they lost their job, but not everyone can be successful in operating a business. It requires lots of business knowledge and skills to sustain in the industry. They might sack their employee if the business is facing problems and it becomes a bad cycle of unemployment rate.

Moreover, the changes on lending rate affect NPLs by the rise of debt service costs of borrowers. It also weakens the capacity of borrower to repay the debt. In addition, the frequent changes in the lending rate may transform the banking system into financial crisis. Thus, the lending rate is a strong determinant of NPLs.

Lastly, the empirical result shows a negative relationship between inflation rate and NPLs. The higher inflation rate could reduce the real value of debt. It is easier for borrower to repay the debt, eventually reduce the cases of NPLs. Inflation is the only explanatory variables that bring negative effects to NPLs in this research project.

All the data collected are secondary data, from two different sources which are BNM official website and Data Stream Navigator. Those data obtained is based on financial institution which includes commercial and Islamic banks. The sampling period started

from year 2005 to 2009 which is total 5 years. As the type of data gathered is on monthly basis, there are 60 observations to be tested in this research.

In order to examine the empirical studies, many tests are conducted using the EViews software. First of all, study had set a significance level at 0.05 for the overall diagnostic checking. Then, the multicollinearity problem is checked through the high Pair-Wise Correlation coefficients and VIF formula. Results have proven that there is no collinearity among the independent variables. On the other hand, there is sufficient evidence to prove that the residuals in the model are normally distributed based on the results obtained after conducting the Jacque-Bera test. Perfect result of the Ramsey RESET test indicates the regression model is correctly specified.

However, unsatisfactory results were observed from both Breusch-Godfrey LM test and ARCH test that detected the problems of autocorrelation and heteroscedasticity in the regression model. In this case, the OLS estimator will be inefficient due to the underestimated variances. It will also affect the estimator to become biased and inconsistent therefore it is no longer BLUE.

To solve the autocorrelation problem, it is decided to restructure the regression model by placing the dependent variable as lagged independent variable at the right hand side. Besides, action to employ of all the variables into first difference is also taken. For instance, $D(\log npl(-1))$ indicates the first difference of lagged independent variable of NPLs. Then, Breusch-Godfrey LM test was run again. The result shows that the problem of autocorrelation is free from the regression model. On the other hand, the Breusch-Pagan-Godfrey test is used to solve the heteroscedasticity problem. As a result, the observed R-squared is reduced while p-value is improved. Thus, there is sufficient evidence to conclude that the residuals are homoscedastic. In short, the conclusion will be OLS estimators are BLUE and regression model is representable to the real results.

5.3 Policy Implications of Study

Based on previous chapter, the empirical studies gave signals to obtain a clearer picture in developing suitable implications of this study. Various factors such as unpredictable government policy, poor credit policy in the banking system, actions of management and board members will contribute to the incidence of NPLs in Malaysian financial system. NPLs cripple the activities of financial system, banks would not have sufficient fund to supply to deficit sector of the economy. This tends to hinder the efficient performance of the economy.

As mentioned earlier, increase in NPLs will adversely affect economic growth because NPLs are the deteriorating assets of the bank and negatively affect the performance of the bank in terms of liquidity and profitability. Despite the depleting economic condition and the collapse of many financial institutions in United States and European countries, Malaysia banking sectors manage to hold on tight with improvement in the net performing loans. Malaysia seems to use lesser time to pull out from the crisis as the financial sector is insignificantly affected compared to that Asian Financial Crisis 1997. The reason behind Malaysia's success in prevention from falling to deeper recession is the great performance of the banking sector.

BNM's major concern of responsibility is to ensure that the whole financial system, specifically the banking system, is safe, sound and strong. Thus, BNM should put in continuous effort and steps to revise and improve its regulatory guidelines, aiming to enhance the market discipline's effectiveness by providing clearer picture and disclosure, as well as transparency of financial information in the banking industry. Also, BNM should be proactive and anticipatory in policy formulations by removing tax, legal and regulatory impediments to help banks speed up the cleanup process of their portfolios in a non-disruptive manner while minimizing the absorption of losses and accounting global trends into consideration.

Government actions, credit culture and management decisions are the major factors that cause NPLs. As a result, NPLs cuts down banks' earning profitability, capital and causes stagnation of economic resources, such as labor and capital. In addition, higher rate of NPLs will also decline the confidence of financial system. Therefore, government should invest in growth-enhancing sectors of the economy and pay their loans on time to ensure early payments of contractors and other suppliers. Other than that, both public and private sectors of the economy should be encouraged to repay their loans to financial institutions, so that the process of financial intermediation can yield practical and positive results for the economy.

5.4 Limitations of Study

This study has been working through over the past few months. Limitation problem is often unavoidable after all. The first problem faced was finding data resources. In order to get accurate results, theoretically stated the standard sample size for statistic testing must be more than 30. The study commenced with a concept to collect latest data on yearly basis (30 years). Unfortunately, there were many missing data lie within that period. Efforts have been poured to search in various databases, however turn out negative. Soon after that, a solution was formed by combining data from different data sources in order to complete the set. Unfortunately, this solution was not workable as it will lead to an inaccurate result due to different measurement used. Besides, the latest data for NPLs in Malaysia is not available during the research period. As a result, it is decided to collect a sample size of 60 from year 2005 to 2009 on monthly basis to determine the significant differences between NPL and other variables. On the other hand, fewer researchers have conducted research relating to NPLs in Malaysia. Hence, it is difficult to obtain information and journals based on Malaysia studies. However, there are many overseas studies found in the internet such as studies based on United States and European countries. Fortunately, these studies are useful and strong enough to support this research project especially in literature review.

5.5 Recommendations for Future Research

Here, this study would like to suggest a few alternatives for future researchers' reference. Firstly, it is advisable to lengthen the period of studies. This research took about a year time to complete. The period of time is spent evenly on each chapter. Due to time constraints, monthly data was used to run the analyses. Perhaps, if weekly or daily data is used for tests, the results are more accurate. Different period of observation could result in different outcomes as well. Future researchers are encouraged to use bigger sample size in future researches. Besides, if time permits, researchers may look for more relevant journals to support findings. With more proven and precise review, results will be extra convincing and firm.

Secondly, this research is carried out based on data accumulated within a country, Malaysia only. Future researchers may expand studies to analyze the sensitivity of same factors and variables in other countries. Then, a comparison could be done to see which country performs better and their factor of success. Besides that, majority of researchers focus only either on developed countries or developing countries. Thus, it is recommended to future researchers to investigate the underdeveloped countries. This could help another country to revolve if there are guides to improve.

Other than external factors, future researchers may also take into account of internal factors that could lead to increment of NPL such as loan management, credit analysis, lending policies and lending behavior. It is believed that these internal factors are also key determinants contributing to the NPLs in Malaysia. Moreover, these factors are categorized under qualitative factors, thus requiring researchers to conduct it with different methodologies. Hence, in future researches, researcher may be aware of the significance of these important factors.

5.6 Conclusion

This paper has achieved its main objective of this study which is to investigate how macroeconomic variables, including lending rate, unemployment rate, inflation rate and exchange rate, affect the NPLs in Malaysia. This study uses OLS regression to analyze all data obtained from the BNM official website and Data Stream Navigator. The data refers NPLs for both conventional and Islamic credit-granting institutions from year 2005 to year 2009, on monthly basis. Hence, a total of 60 sample size is being used in this research project. EViews program is useful to analyze the data for hypothesis testing and diagnostic checking. The results generated show consistency with the theories and finding of other researchers. It is understandable that this study has its limitations, however, future researchers may further improve this study based on the suggested recommendations.

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APPENDICES

Appendix 4.1 : Empirical Result of OLS Regression Model

Dependent Variable: LOGNPL				
Method: Least Squares				
Date: 01/19/15 Time: 14:07				
Sample: 2005M01 2009M12				
Included observations: 60				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
IR	-0.006336	0.001451	-4.366554	0.0001
LOGGER	1.187186	0.165276	7.183062	0.0000
LR	0.114987	0.006913	16.63353	0.0000
UR	0.002908	0.000588	4.943952	0.0000
C	3.139280	0.089874	34.92969	0.0000
R-squared	0.925676	Mean dependent var	4.626972	
Adjusted R-squared	0.920271	S.D. dependent var	0.078924	
S.E. of regression	0.022285	Akaike info criterion	-4.690138	
Sum squared resid	0.027315	Schwarz criterion	-4.515609	
Log likelihood	145.7041	Hannan-Quinn criter.	-4.621870	
F-statistic	171.2509	Durbin-Watson stat	0.713260	
Prob(F-statistic)	0.000000			

Appendix 4.2 : Summary of T-test

Dependent Variable: LOGNPL				
Method: Least Squares				
Date: 01/19/15 Time: 14:07				
Sample: 2005M01 2009M12				
Included observations: 60				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
IR	-0.006336	0.001451	-4.366554	0.0001
LOGGER	1.187186	0.165276	7.183062	0.0000
LR	0.114987	0.006913	16.63353	0.0000
UR	0.002908	0.000588	4.943952	0.0000
C	3.139280	0.089874	34.92969	0.0000
R-squared	0.925676	Mean dependent var	4.626972	
Adjusted R-squared	0.920271	S.D. dependent var	0.078924	
S.E. of regression	0.022285	Akaike info criterion	-4.690138	
Sum squared resid	0.027315	Schwarz criterion	-4.515609	
Log likelihood	145.7041	Hannan-Quinn criter.	-4.621870	
F-statistic	171.2509	Durbin-Watson stat	0.713260	
Prob(F-statistic)	0.000000			

Appendix 4.3 : Summary of F-test

Dependent Variable: LOGNPL				
Method: Least Squares				
Date: 01/19/15 Time: 14:07				
Sample: 2005M01 2009M12				
Included observations: 60				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
IR	-0.006336	0.001451	-4.366554	0.0001
LOGGER	1.187186	0.165276	7.183062	0.0000
LR	0.114987	0.006913	16.63353	0.0000
UR	0.002908	0.000588	4.943952	0.0000
C	3.139280	0.089874	34.92969	0.0000
R-squared	0.925676	Mean dependent var	4.626972	
Adjusted R-squared	0.920271	S.D. dependent var	0.078924	
S.E. of regression	0.022285	Akaike info criterion	-4.690138	
Sum squared resid	0.027315	Schwarz criterion	-4.515609	
Log likelihood	145.7041	Hannan-Quinn criter.	-4.621870	
F-statistic	171.2509	Durbin-Watson stat	0.713260	
Prob(F-statistic)	0.000000			

Appendix 4.4 : Summary of Goodness of Fit

Dependent Variable: LOGNPL				
Method: Least Squares				
Date: 01/19/15 Time: 14:07				
Sample: 2005M01 2009M12				
Included observations: 60				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
IR	-0.006336	0.001451	-4.366554	0.0001
LOGER	1.187186	0.165276	7.183062	0.0000
LR	0.114987	0.006913	16.63353	0.0000
UR	0.002908	0.000588	4.943952	0.0000
C	3.139280	0.089874	34.92969	0.0000
R-squared	0.925676	Mean dependent var	4.626972	
Adjusted R-squared	0.920271	S.D. dependent var	0.078924	
S.E. of regression	0.022285	Akaike info criterion	-4.690138	
Sum squared resid	0.027315	Schwarz criterion	-4.515609	
Log likelihood	145.7041	Hannan-Quinn criter.	-4.621870	
F-statistic	171.2509	Durbin-Watson stat	0.713260	
Prob(F-statistic)	0.000000			

Appendix 4.5 : Summary of Standard Error of Mean

Dependent Variable: LOGNPL				
Method: Least Squares				
Date: 01/19/15 Time: 14:07				
Sample: 2005M01 2009M12				
Included observations: 60				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
IR	-0.006336	0.001451	-4.366554	0.0001
LOGER	1.187186	0.165276	7.183062	0.0000
LR	0.114987	0.006913	16.63353	0.0000
UR	0.002908	0.000588	4.943952	0.0000
C	3.139280	0.089874	34.92969	0.0000
R-squared	0.925676	Mean dependent var		4.626972
Adjusted R-squared	0.920271	S.D. dependent var		0.078924
S.E. of regression	0.022285	Akaike info criterion		-4.690138
Sum squared resid	0.027315	Schwarz criterion		-4.515609
Log likelihood	145.7041	Hannan-Quinn criter.		-4.621870
F-statistic	171.2509	Durbin-Watson stat		0.713260
Prob(F-statistic)	0.000000			

Appendix 4.6 : Empirical Result of OLS Regression Model

Dependent Variable: LOGNPL				
Method: Least Squares				
Date: 01/19/15 Time: 14:07				
Sample: 2005M01 2009M12				
Included observations: 60				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
IR	-0.006336	0.001451	-4.366554	0.0001
LOGER	1.187186	0.165276	7.183062	0.0000
LR	0.114987	0.006913	16.63353	0.0000
UR	0.002908	0.000588	4.943952	0.0000
C	3.139280	0.089874	34.92969	0.0000
R-squared	0.925676	Mean dependent var		4.626972
Adjusted R-squared	0.920271	S.D. dependent var		0.078924
S.E. of regression	0.022285	Akaike info criterion		-4.690138
Sum squared resid	0.027315	Schwarz criterion		-4.515609
Log likelihood	145.7041	Hannan-Quinn criter.		-4.621870
F-statistic	171.2509	Durbin-Watson stat		0.713260
Prob(F-statistic)	0.000000			

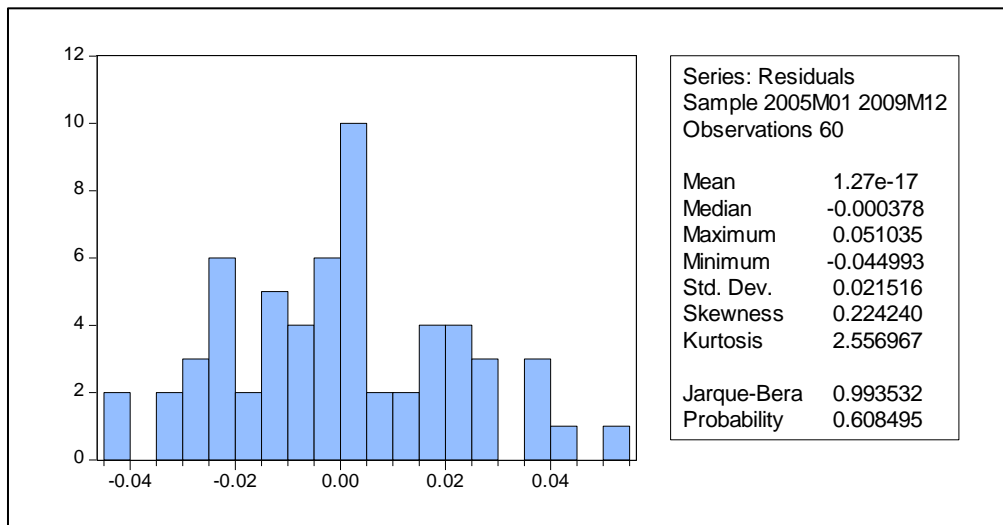
Appendix 4.7 : Empirical Result of Pair-Wise Correlation test

	LOGNPL	IR	LOGER	LR	UR
LOGNPL	1.000000	0.143947	0.483041	0.781520	0.722663
IR	0.143947	1.000000	0.022445	0.419611	-0.015734
LOGER	0.483041	0.022445	1.000000	-0.002832	0.578594
LR	0.781520	0.419611	-0.002832	1.000000	0.346144
UR	0.722663	-0.015734	0.578594	0.346144	1.000000

Appendix 4.8 : Empirical Result of VIF test

Dependent Variable: UR				
Method: Least Squares				
Date: 01/19/15 Time: 14:12				
Sample: 2005M01 2009M12				
Included observations: 60				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOGER	176.4197	32.65466	5.402589	0.0000
C	-40.41961	17.94684	-2.252185	0.0281
R-squared	0.334771	Mean dependent var	56.45833	
Adjusted R-squared	0.323301	S.D. dependent var	6.926131	
S.E. of regression	5.697553	Akaike info criterion	6.350716	
Sum squared resid	1882.803	Schwarz criterion	6.420527	
Log likelihood	-188.5215	Hannan-Quinn criter.	6.378023	
F-statistic	29.18797	Durbin-Watson stat	0.354114	
Prob(F-statistic)	0.000001			

Appendix 4.9 : Empirical Result of Jarque-Bera test



Appendix 4.10 : Empirical Result of Ramsey RESET test

Ramsey RESET Test:				
F-statistic	0.003448	Prob. F(1,54)		0.9534
Log likelihood ratio	0.003831	Prob. Chi-Square(1)		0.9506
Test Equation:				
Dependent Variable: LOGNPL				
Method: Least Squares				
Date: 01/19/15 Time: 14:10				
Sample: 2005M01 2009M12				
Included observations: 60				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
IR	-0.009174	0.048358	-0.189704	0.8503
LOGER	1.717287	9.029702	0.190182	0.8499
LR	0.166007	0.868946	0.191044	0.8492
UR	0.004202	0.022044	0.190609	0.8495
C	3.509653	6.308486	0.556338	0.5803
FITTED^2	-0.048211	0.821089	-0.058716	0.9534
R-squared	0.925681	Mean dependent var		4.626972
Adjusted R-squared	0.918799	S.D. dependent var		0.078924
S.E. of regression	0.022490	Akaike info criterion		-4.656868
Sum squared resid	0.027313	Schwarz criterion		-4.447434
Log likelihood	145.7060	Hannan-Quinn criter.		-4.574947
F-statistic	134.5191	Durbin-Watson stat		0.715634
Prob(F-statistic)	0.000000			

Appendix 4.11 : Empirical Result of OLS Regression Model

Dependent Variable: LOGNPL				
Method: Least Squares				
Date: 01/19/15 Time: 14:07				
Sample: 2005M01 2009M12				
Included observations: 60				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
IR	-0.006336	0.001451	-4.366554	0.0001
LOGGER	1.187186	0.165276	7.183062	0.0000
LR	0.114987	0.006913	16.63353	0.0000
UR	0.002908	0.000588	4.943952	0.0000
C	3.139280	0.089874	34.92969	0.0000
R-squared	0.925676	Mean dependent var	4.626972	
Adjusted R-squared	0.920271	S.D. dependent var	0.078924	
S.E. of regression	0.022285	Akaike info criterion	-4.690138	
Sum squared resid	0.027315	Schwarz criterion	-4.515609	
Log likelihood	145.7041	Hannan-Quinn criter.	-4.621870	
F-statistic	171.2509	Durbin-Watson stat	0.713260	
Prob(F-statistic)	0.000000			

Appendix 4.12 : Empirical Result of Breusch-Godfrey Serial Correlation LM test

Breusch-Godfrey Serial Correlation LM Test:				
F-statistic	19.20693	Prob. F(2,53)	0.0000	
Obs*R-squared	25.21315	Prob. Chi-Square(2)	0.0000	
Test Equation: Dependent Variable: RESID Method: Least Squares Date: 01/19/15 Time: 14:10 Sample: 2005M01 2009M12 Included observations: 60 Presample missing value lagged residuals set to zero.				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
IR	-0.000139	0.001130	-0.122873	0.9027
LOGGER	0.108475	0.133396	0.813179	0.4198
LR	0.002378	0.005441	0.437038	0.6639
UR	-0.000497	0.000492	-1.010473	0.3169
C	-0.045708	0.071363	-0.640503	0.5246
RESID(-1)	0.736748	0.136101	5.413226	0.0000
RESID(-2)	-0.111919	0.144756	-0.773156	0.4429
R-squared	0.420219	Mean dependent var	1.27E-17	
Adjusted R-squared	0.354584	S.D. dependent var	0.021516	
S.E. of regression	0.017286	Akaike info criterion	-5.168576	
Sum squared resid	0.015836	Schwarz criterion	-4.924236	
Log likelihood	162.0573	Hannan-Quinn criter.	-5.073001	
F-statistic	6.402309	Durbin-Watson stat	1.956314	
Prob(F-statistic)	0.000041			

Appendix 4.13: New Empirical Result of Breusch-Godfrey Serial Correlation LM test

Breusch-Godfrey Serial Correlation LM Test:				
F-statistic	0.725118	Prob. F(2,50)	0.4893	
Obs*R-squared	1.634855	Prob. Chi-Square(2)	0.4416	
Test Equation:				
Dependent Variable: RESID				
Method: Least Squares				
Date: 04/06/15 Time: 16:20				
Sample: 2005M03 2009M12				
Included observations: 58				
Presample missing value lagged residuals set to zero.				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.001136	0.002765	0.410829	0.6830
D(LR)	-0.000544	0.020383	-0.026675	0.9788
D(LOGNPL(-1))	0.263923	0.596389	0.442535	0.6600
D(UR)	-4.06E-05	0.000495	-0.082042	0.9349
D(LOGER)	-0.045761	0.237431	-0.192736	0.8479
D(IR)	0.000402	0.001784	0.225176	0.8228
RESID(-1)	-0.266734	0.600096	-0.444486	0.6586
RESID(-2)	-0.212176	0.176981	-1.198865	0.2362
R-squared	0.028187	Mean dependent var	-6.06E-19	
Adjusted R-squared	-0.107867	S.D. dependent var	0.011253	
S.E. of regression	0.011844	Akaike info criterion	-5.906526	
Sum squared resid	0.007014	Schwarz criterion	-5.622327	
Log likelihood	179.2892	Hannan-Quinn criter.	-5.795824	
F-statistic	0.207177	Durbin-Watson stat	1.978976	
Prob(F-statistic)	0.982313			

Appendix 4.14 : Empirical Result of ARCH test

Heteroskedasticity Test: ARCH				
F-statistic	9.202541	Prob. F(1,57)	0.0036	
Obs*R-squared	8.201346	Prob. Chi-Square(1)	0.0042	
Test Equation: Dependent Variable: RESID^2 Method: Least Squares Date: 01/19/15 Time: 14:09 Sample (adjusted): 2005M02 2009M12 Included observations: 59 after adjustments				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.000288	8.95E-05	3.220397	0.0021
RESID^2(-1)	0.378460	0.124757	3.033569	0.0036
R-squared	0.139006	Mean dependent var	0.000456	
Adjusted R-squared	0.123901	S.D. dependent var	0.000578	
S.E. of regression	0.000541	Akaike info criterion	-12.17383	
Sum squared resid	1.67E-05	Schwarz criterion	-12.10341	
Log likelihood	361.1281	Hannan-Quinn criter.	-12.14634	
F-statistic	9.202541	Durbin-Watson stat	1.937520	
Prob(F-statistic)	0.003635			

Appendix 4.15 : Empirical Result of Breusch-Pagan-Godfrey test

Heteroskedasticity Test: Breusch-Pagan-Godfrey				
F-statistic	1.951571	Prob. F(4,55)	0.1148	
Obs*R-squared	7.457487	Prob. Chi-Square(4)	0.1136	
Scaled explained SS	4.878257	Prob. Chi-Square(4)	0.3000	
Test Equation: Dependent Variable: RESID^2 Method: Least Squares Date: 04/06/15 Time: 16:13 Sample: 2005M01 2009M12 Included observations: 60				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.001582	0.002239	-0.706621	0.4828
LR	-4.31E-05	0.000172	-0.250305	0.8033
UR	-3.27E-05	1.47E-05	-2.233867	0.0296
LOGER	0.007468	0.004118	1.813665	0.0752
IR	1.48E-05	3.61E-05	0.408642	0.6844
R-squared	0.124291	Mean dependent var	0.000455	
Adjusted R-squared	0.060604	S.D. dependent var	0.000573	
S.E. of regression	0.000555	Akaike info criterion	-12.07480	
Sum squared resid	1.70E-05	Schwarz criterion	-11.90027	
Log likelihood	367.2441	Hannan-Quinn criter.	-12.00653	
F-statistic	1.951571	Durbin-Watson stat	1.249476	
Prob(F-statistic)	0.114846			