DETERMINANTS OF NON-PERFORMING LOANS IN ASIA: IS SOUTHEAST ASIA DIFFERENT?

Amirudin Mohd Nor
Universiti Teknologi MARA

Shafinar Ismail♣
Universiti Teknologi MARA

Nur Hayati Abd Rahman
Universiti Teknologi MARA

ABSTRACT

In this paper, we explore the determinants of non-performing loans (NPLs) in Asia using a panel data set across 9 countries covering the Middle East, Southeast Asia (SEA) and South Asia countries over a period of 2000 to 2014, and test whether those determinants affect the Southeast Asia differently. The two-step System GMM results indicate that the GDP growth and liquid assets to total assets significantly affect NPLs in a negative manner, while the Southeast Asia is no different from the other regions despite their successful management in NPLs during 2008 crisis. It suggests that other regions may adopt the successful strategies implemented by the SEA countries. Apart from the above, the regulatory variables show mixed results with supervisory power significantly and positively affect the NPLs while the capital stringency requirement is insignificant, contrary to the theoretical expectations. The results are robust to model specification.

Keywords: Non-Performing Loans, Two-Step System GMM, Regulatory Variables.

1. INTRODUCTION

When the 2007-2008 global financial crisis occurs, it was a disaster for the financial world. However, despite the deteriorating bank asset quality, the rate of deterioration was uneven across countries (Beck, Jakubik, & Piloiu, 2015). Malaysia and Indonesia as one of the countries in the Southeast Asia were pretty stable with a strong balance sheet. Malaysia's non-performing loans (NPL) only accounted for 2% of overall loans and the loan-deposit ratios were well below 90% (Abidin & Rasiah, 2009). The NPLs to the share of the financial assets in the nation was in fact one of the lowest among Asian economies in 2008 (World Bank, 2008). Indonesia, was also reported to survive the 2008 economic crisis. The NPL was less than four percent by the end of 2008, the loan-deposit ratio was less than 80 percent and the capital adequacy ratio was

---

♣ Corresponding author: Shafinar Ismail, Faculty of Business and Management, Universiti Teknologi MARA Cawangan Melaka, 110 Off Jalan Hang Tuah, 75300 Melaka, Malaysia; Email: shafinar138@gmail.com

approximately 17 percent (Basri & Rahardja, 2010). The financial institutions in both nations did not feel the threat of collapse as they did survive the 2008 global financial crisis. Then the big question arises: is there any regional effect when it comes to the NPL? If yes, what makes Southeast Asia different? Alternatively, if there is no regional effect, what makes the Southeast region different as evidenced by the low NPLs during the crisis in 2008? Is Southeast Asia different?

Following the recent global crisis, regulators in many parts of the world are considering to increase or tighten the capital of financial institutions with a view to prepare these institutions for the worst in times of crisis. The role of the regulators was further strengthened by way of increasing supervisory power. It is hoped that tightening the capital and supervisory power would provide stability during crisis. However, some argues that such action would increase cost of funds and subsequently deteriorate profitability. Tighter capital requirement would increase the lending rate as the costs are transferred to the customers. Hence, another objective of the study is to investigate the regulatory variables that drive bank's NPLs. Specifically, what is the impact of the regulatory variables on the banks' NPLs?

For many decades, NPLs is like a thermometer to economic health. It can be used to signal the beginning of banking crisis (Louzis, Vouldis, & Metaxas, 2012). A rising NPL signifies a less healthy economic condition and greater risks in terms of liquidity and profitability for banks, corporations and even individuals. The deterioration of banks asset quality is not only financial destabilizing for the banking system but may also reduce economic inefficiency, impair social welfare and decline economic activity (Ghosh, 2015). The global financial crisis in 2008 which started in the US is a result of mass defaults and non-performing subprime loans. In relation to this, previous literatures are unanimously in favor of an inverse relationship between the NPLs and Gross Domestic Products (GDP) which is a common proxy for economic activity. Can NPLs continue to serve as the economic health thermometer?

To recap, the objectives of this paper is threefold: (1) to empirically assess whether GDP still maintains its negative relationship with non-performing loans as previous studies unanimously in favour of an inverse relationship, (2) In terms of non-performing loans determinants, is Southeast Asia different? and (3) to empirically explore the regulatory effect on non-performing loans. Regarding item (2) and (3), these issues were derived from the literature review and they have yet to be addressed.

Understanding the influence of macroeconomics variables on non-performing loans at the current scenario assists corporations and individuals to develop business strategies along the economic cycles. For the policymakers, understanding macroeconomics behaviour such as exchange rate, interest rate and share price add to a better policy formulation.

We begin the study by making a baseline model at the methodological level, applying only the general macroeconomic variables in addition to the real GDP. It is not uncommon to include a variable for economic activity, a lending interest and additional variables for empirical models for non-performing loans (Beck et al., 2015). We follow the selection of variables with some modification in three aspects. First, we added a dummy variable, Southeast Asia Dummy to look at the geographical difference on non-performing loans, specifically SEA if any. Second, we run a dynamic panel data using System GMM Two-step regression method and third, we add a not so common variable, the regulatory variables to look at regulatory effects on the non-performing loans.

The rest of the paper is structured as follows. In the next section, we highlight related empirical literature. Section 3 outlines our empirical approach and data. We employ the dynamic panel Two-Step System GMM to determine the relationship between macroeconomics variables and NPL. Section 4 presents the estimation results and robustness check. Lastly, section 5 concludes with a summary of the main findings and some concluding remarks.

2. LITERATURE REVIEW

The economic stages determine the probability of default and non-performing loans. It is the fluctuation deriving from the macroeconomic environment that causes these defaults (Kavkler, Repina, & Festic, 2011). When the economy is in the expansion phase, businesses prosper resulted in individuals and firms having surplus cash flow. This in turn increases their ability to serve their debt obligation and hence translate into lower NPLs. As the economy starts to boom, so is the credit growth. Credit is extended to lower quality debtors and when the economy starts to reach its peak and recession take place, the NPL increases (Louzis et al., 2012). When economy expands, the level of credit risk is higher because risk is built up in a boom but materializes in downturn (Borio & Lowe, 2002). Hence, the link between the phase of the macroeconomic cycle and credit default exists.

GDP growth has been the main driver of the non-performing assets in the past decades. Many studies have recognized its main contribution in different economic setting throughout the world. On a common belief, the higher real GDP growth increases income which subsequently strengthens debt servicing ability of individuals and corporations and vice versa. Our literature pointed to a unanimous negative relationship between GDP growth and NPLs as studied by Louzis et al., (2012), Klein (2013), Abid, Ouertani, and Zouari-Ghorbel (2014), Beck et al., (2015), Chaibi & Ftiti (2015), Florin (2015), Ghosh (2015), Dimitrios, Helen, & Mike (2016). Majority of the above studies agree that the economic activity and other macroeconomic variables influence the NPLs in many parts of the world.

The body of literature can be broken down into two groups: cross-country analysis and country specific studies. The first group of the relevant studies consists of the study on groups or country studies. Klein (2013) examined the determinants of NPL and the impact of macroeconomic performance for 10 largest banks in 16 central eastern and south eastern Europe (CESEE) and finds negative influences of GDP, exchange rate and share price on NPLs. The study confirmed the strong macroeconomics and financial linkages in the CESEE area. Other studies in Europe include the study of Florin (2015) and Dimitrios et al., (2016). Florin (2015) applied the ordinary least square regression on Romania and EU for 2001 to 2012 period and revealed highly significant positive correlation between the real GDP and the NPL. Dimitrios et al., (2016) used quarterly panel data of 15 euro area countries from 1990 to 2015, concurred the negative sign of the real GDP of both Klein (2013) and Florin (2015). In a different region and in a much recent study, Beck et al., (2015) regressed NPL with macroeconomic studies to observe the determinants of non-performing loans. Beck et al., (2015) studies the role of economic in 75 countries for 2000 to 2010 dataset. Applying the NPL to the total gross loans, he discovered real GDP, nominal effective exchange rate, real lending rate and share price to significantly affect the NPLs.

The second group of the studies focuses on country specific analysis. Louzis et al., (2012) uses 2003 to 2009 data for nine Greek commercial banks to study the consumer, business and farm loans NPLs. He found a negative and positive relationship between NPLs and real GDP growth rate and real lending rates respectively. In line with the life cycle consumption model, default is lower at the expansionary phase owing to the good ability via steady income stream, to pay debt obligation. On the same note, Abid et al., (2014) and Chaibi & Ftiti (2015) found similar results on both variables for Tunisian and French/ German banks respectively. Abid et al., (2014) studied dynamic panel data method over 2003-2012 to observe the determinants of household's NPLs in Tunisian banks and concurred that the macroeconomic variables explained the NPLs. Nevertheless, the insignificant real interest rate revealed by Ghosh (2015) on his study on 50 commercial banks and savings institutions in 1984 to 2003 data contrasts the panel study of (Louzis et al., 2012; Abid et al., 2014; Chaibi & Ftiti, 2015). Using GMM estimation on 147 French and 133 German banks between 2005 to 2011, Chaibi and Ftiti (2015) also evidenced both the positive and negative relationship between exchange rate and NPLs. Our literature reveals the country specific study revolves around Greece, Tunisia, French, German and USA.

The foregoing discussions revealed two potential gaps. Firstly, the concentration on specific geographical area namely USA, Europe, Africa and mixed international setting suggest the potential to explore other geographical area to understand better the studies in hand. Asian countries for instance are possible explorations. Secondly, majority of the studies includes either macroeconomic variables or bank-specific variables as their explanatory variables. Very few have included the regulatory variables in their estimations.

This paper considers the determinants of the NPLs particularly in Asia as we wish to add to the existing NPL literature. Based on the aforesaid literature, we use the GDP growth as the focal variable, the credit to public sectors and inflation as our macroeconomic variables. We proceed to test the robustness of the models by adding SEA dummy and bank-specific variables and lastly introduced supervisory power and capital stringency requirement as the regulatory variables.

3.   METHODOLOGY

In this empirical study, we adopt the two-step System GMM model to observe the relationship between the NPLs and the macroeconomic, bank-specific and regulatory variables. In this study, we used a dynamic panel regression specifically on the unbalanced panel data set of nine Asian countries from 2000 to 2014 for a maximum of 1773 observations.

As shown in Table 1, nine countries were derived from three regions namely Middle East Asia (6 countries), Southeast Asia (2 countries) and South Asia (1 country). The selection of these countries is due to high level of NPLs recorded by each individual country from 2000 to 2014. Besides, only specific countries were selected for each region due to data availability. Looking at the Southeast Asia, we were focusing much on this region since the two countries selected (namely Malaysia and Indonesia) were excellent in managing the NPLs issue after the 1997 economic crisis (World Bank, 2008). In opposite, the rest of the countries in other regions did not show the drastic decline of the NPLs during the period of investigations.

Even though the dataset were outdated (from 2000 to 2014), it is still relevant to investigate this issue since it helps the researchers to understand how the selected regions managed this issue after they were facing with the 1997 economic crisis. Their ability to survive the crisis and handle the NPLs issue can be used as a benchmark for other countries to confront with global economic recession which is expected to occur in 2020 due to the pandemic of COVIC-19.

Summing up together, total observations for this research is 1773 observations, which were derived from 139 banks in nine countries from 2000 to 2014. Since the number of time period if relatively small (15 years) while the number of cross-sections is large (139 banks), Arellano and Bond (1991) have suggested to use the Generalized Method of Moments (GMM) to cater for this kind of data. Since there are various types of GMM, we are comfortable with the Two Step System GMM model, with robust standard error (Arellano & Bond, 1991) as it helps to resolve the issues of autocorrelation, correlations among the errors and endogeneity in the variables. The Arellano-Bond takes the lags of the dependant variables and the lag values of the exogenous variables as regressors while the endogenous variables are also instrumented using its own lag values (Beck et al., 2015). The said instruments assist to resolve the abovementioned issues. The inclusion of the lag dependant variable as one of the explanatory variables makes the model dynamic as we will see later in the analysis of the results that the NPL lag dependant variables is significant and thus helps to explain itself. Upon running the estimation, we finally run several diagnostic tests. We apply the standard Arellano-Bond test for autocorrelation AR1 and AR2 and the Sargan test to validate the instruments used in the regressions. Passing both tests, as we did for all our regressions means that the model is adequately specified and makes the model comfortably used for inferences and policy recommendation later on.

Table 1: Country Sample

Middle East Asia	Southeast Asia	South Asia
Saudi Arabia	Malaysia	Bangladesh
United Arab Emirates	Indonesia	
Qatar		
Bahrain		
Jordan		
Kuwait		

Table 2: Descriptions of the Variables and Expected Relationship

Dependent Variable	Symbol	Expected Sign
Non-Performing Loans	*npl*	
Macroeconomic variables		
GDP Growth	*gdpg*	-ve
Credit to private sector(ratio of GDP)	*fmd*	-ve
Inflation rate	*inf*	+ve/ -ve
Bank Specific Controlling Variable		
Total liquid asset to Total Asset Ratio	*liqta*	-ve
Net Interest Margin	*nim*	-ve
Total Asset	*lnta*	+ve
Independent Main Variables (Regulatory Variables)		
Supervisory Power	*sup*	+ve/ -ve
Capital Stringency Requirement	*cr*	+ve/ -ve

The followings are the dynamic panel regression models specified for estimation. In the said models, we have incorporated the individual specific effect denoted by v_i and error term by e_{it}, while the α is the coefficient of the independent variables. We include in the specification a once-lagged NPLs to gross loan ratio to capture the dynamic in banks' non-performing loans to gross loan ratio. If significant, it shows that the dependent variables also rely on its lag value and hence making it dynamic in nature. In addition, some variables (fmd and inf) are lagged one period to address the endogeneity issue (Ibrahim & Rizvi, 2017).

$$npl_{it} = \alpha_0 + \alpha_1 npl_{it-1} + \alpha_2 gdpg_{it} + \alpha_3 fmd_{it-1} + \alpha_4 inf_{it-1} + \boldsymbol{v_i} + e_{it} \tag{1}$$

$$npl_{it} = \alpha_0 + \alpha_1 npl_{it-1} + \alpha_2 gdpg_{it} + \alpha_3 fmd_{it-1} + \alpha_4 inf_{it-1} + \alpha_5 SEADummy_{it} + \boldsymbol{v_i} + e_{it} \tag{2}$$

$$npl_{it} = \alpha_0 + \alpha_1 npl_{it-1} + \alpha_2 gdpg_{it} + \alpha_3 fmd_{it-1} + \alpha_4 inf_{it-1} + \alpha_5 SEADummy_{it} + \alpha_6 liqta_{it} + \alpha_7 nim_{it} + \alpha_8 lnta_{it} + \boldsymbol{v_i} + e_{it} \tag{3}$$

$$npl_{it} = \alpha_0 + \alpha_1 npl_{it-1} + \alpha_2 gdpg_{it} + \alpha_3 fmd_{it-1} + \alpha_4 inf_{it-1} + \alpha_5 SEADummy_{it} + \alpha_6 liqta_{it} + \alpha_7 nim_{it} + \alpha_8 lnta_{it} + \alpha_9 sup_{it} + \boldsymbol{v_i} + e_{it} \tag{4}$$

$$npl_{it} = \alpha_0 + \alpha_1 npl_{it-1} + \alpha_2 gdpg_{it} + \alpha_3 fmd_{it-1} + \alpha_4 inf_{it-1} + \alpha_5 SEADummy_{it} + \alpha_6 liqta_{it} + \alpha_7 nim_{it} + \alpha_8 lnta_{it} + \alpha_9 sup_{it} + \alpha_{10} cr_{it} + \boldsymbol{v_i} + e_{it} \tag{5}$$

where,

npl	*:* non-performing loans to gross loan ratio
npl$_{it-1}$	*:* non-performing loans to gross loan ratio
gdpg	*:*GDP growth
fmd	*:*Credit to the private sector (ratio of GDP)
inf	*:* inflation rate
SEADummy	*:* Southeast Asia Dummy
liqta	*:* Total liquid assets to total asset ratio
nim	*:* net interest margin
lnta	*:* natural log of Total Asset
sup	*:* Supervisory power
cr	*:* capital stringency requirement

The first model as stated in Eq. 1 is the baseline model, following the life cycle consumption model. It is used to answer the first research objective, on how the GDP affects the NPL. The second model integrates a dummy variable (SEADummy) with a purpose to examine whether the NPL level for the Southeast Asia and other regions are different or not (the second research objective). Meanwhile, the third model includes three variables corresponding to the bank-specific variables. The inclusion of these variables is to ensure the robustness of the results for the first and the second research objectives. Finally, in answering the third objective, the fourth and the fifth models incorporate the regulatory variables separately (sup and cr) to avoid any multicollinearity problem. The expected sign for the respective coefficients can be found in table 2. The following is the expected outcome with regards to the selected variables:

GDP: Negative outcome is expected between GDP and NPF. Majority of the studies confirmed that GDP is the main influence and is a major challenge to loan quality. A favourable economic

condition translates into a better repayment capability and a lower non-performing assets (Kavkler et al., 2011). During recession, the capability to service debt repayment decline and credit is extended to lower quality client that subsequently increase NPLs (Chaibi & Ftiti, 2015). Non-performing asset is also procyclical in nature with economic growth. In many cases, the expansion of the economy relates to the rapid credit growth, high investments and growing consumer demand. This increases credit risk as defaults often occurs when economy started to falter (Borio & Lowe, 2002). We expect the relationship to be negative, indicating that an increase in the GDP reduces the NPL and vice versa.

Credit to private sector: In theory, credit to private sector is assumed to increase in the period before the crisis. However, the lending boom in the pre-crisis period is generally followed by a decrease in domestic credit in the outbreak of the crisis (Fofack, 2005). As the economy starts to boom, so is the credit growth. Credit is extended to lower quality debtors and when the economy starts to reach its peak and recession take place, the NPL increases (Louzis et al., 2012). When the economy expands, the level of credit risk is higher because risk is built up in a boom but materializes in downturn (Borio & Lowe, 2002). Hence, the link between the phase of the macroeconomic cycle and credit default exists. Hence, we expect a negative relationship between the variables.

Inflation: Inflation is normally associated with lower purchasing power due to an increase in the price. Klein (2013) stated that the effect of inflation to the NPL is still inconclusive. Higher inflation makes the true values of the loan decrease and hence can make debt repayment easier. Contrary, inflation can reduce one's income when wages are reduced and lead to difficulties to serve loan instalments. We expect the results to be positive or negative.

Supervisory power and capital stringent requirement: The effect of regulatory variables is inconclusive with positive and negative results. The negative link between capital ratio and NPL was found in a few studies. Stringent banking regulation and increase in the regulatory power (for instance, mandatory requirement to maintain higher capital ratio) forces banks to charge higher net interest margin. Contrary, it can be the opposite as stricter regulations is perceived as more prudent and less risky resulting in lower NPLs.

4. RESULTS AND DISCUSSION

In Table 3, we report the results of the two-step system GMM with the estimated coefficients and the p-values of the Arellano-Bond and Sargan tests There are five reported regressions where each column is differentiated by the different categories of independent variables as the following columns: regression (1) includes only the macroeconomic variables (gdpg, fmd, inf), regression (2) include the Southeast Asia dummy variable, regression (3) incorporates the bank specific variables (liqta, nim, lnta) while regression (4) and (5) incorporate the regulatory variables (sup and cr) alternately one at a time in the regression to avoid multicollinearity problem.

Table 3: Estimation Results for Two-Step System GMM

	(1)	(2)	(3)	(4)	(5)
cons	1.122	2.246	-5.023	-14.287*	-6.269
	(0.442)	(0.208)	(0.515)	(0.073)	(0.419)
npl_{it-1}	0.774***	0.771***	0.817***	0.815***	0.817***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
gdpg	-0.217***	-0.208***	-0.188***	-0.182***	-0.195***
	(0.001)	(0.001)	(0.00)	(0.002)	(0.00)
fmd_{it-1}	0.021	0.032	0.023	0.037	0.022
	0.388)	(0.187)	(0.354)	(0.16)	(0.399)
inf_{it-1}	-0.036	-0.039	-0.034	-0.046	-0.035
	(0.561)	(0.532)	(0.505	(0.401)	(0.505)
SEA Dummy		-6.449	-5.5997	-5.394	-5.72
		(0.146)	(0.224)	(0.214)	(0.217)
liqta			-0.035***	-0.039***	-0.035**
			(0.037)	(0.024)	(0.047)
nim			-0.005)	-0.021	-0.002
			(0.959)	(0.822)	(0.980)
lnta			0.519	0.831	0.649
			(0.263)	(0.072)	(0.185)
sup				0.361***	
				(0.006)	
cr					-0.117
					(0.235)
Arellano Bond test for AR1	-4.325***	-4.288***	-4.127***	-4.068***	-4.113***
	(000)	(0.00)	(0.00)	(0.00)	(0.00)
Arellano Bond test for AR2	-1.230	-1.231	-1.240	-1.225	-1.224
	(0.218)	(0.218)	(0.215)	(0.220)	(0.221)
Sargan Test	116.97	110.15	113.81	118.65	117.82
	(0.164)	(0.273)	(0.199)	(0.124)	(0.135)
# of instruments/ # of groups	108/139	108/139	111/139	112/139	112/139

Notes: Coefficients and p-values in parentheses from Arellano-Bond two-step difference GMM estimation with robust standard errors.
***Significant at 0.01 level, ** Significant at 0.05 level, *Significant at 0.10 level.

The relevant diagnostic tests including Arellano-Bond autocorrelation test together with the Sargan test statistics are presented at the bottom of the table. The results from the two tests are quite stable with a passing rate for all the diagnostic tests, suggesting that all models are adequately specified. Upon running the Arellano Bond test for autocorrelation AR1, we find the absence of first order correlation is rejected (H_0: no autocorrelation). The absence of the second order correlation is not rejected suggesting that the regressions do not suffer from the autocorrelation problem at the second order. We also note that the number of instruments were smaller than the number of banks in the sample, suggesting the chance of instrument proliferation problem is low. This is supported by the Sargan test statistics which are insignificant and hence fail to reject the over-identification of restriction in all regressions. It indicates that the instruments are valid. Throughout the analysis, the number of instruments is kept lower than the number of groups in all the estimations.

Firstly, we look at the coefficient of the dynamic variable (npl_{it-1}). It is worth to mention that the lagged dependent variable is positive and significant at 1% level in all regressions. It implies the persistence of the non-performing loans across time, justifying the decision to use the dynamic

panel model. The significant values also show the importance of the previous npl in determining the current value of npl. The finding is consistent with Beck et al., (2015) who found a positive and significant npl lag value for a dynamic panel estimates on 75 countries. The relation of lag values most probably because the way to calculate the npl is based on the number of months in arrears, say six month and the previous months in arrears of five months will fall to npl status the next following month if the customer fails to settle the arrears.

Prior to presenting the results and discussion, to recall, the aims of the research are as follows: (1) to empirically assess whether the GDP still maintains its negative relationship with the non-performing loans as previous studies unanimously in favour of inverse relationship, (2) In terms of non-performing loans determinants, is Southeast Asia different? and (3) to empirically explore the regulatory variables effect on non-performing loans.

4.1 *What is the relationship between GDP and NPL?*

Taking the above in mind, we begin our empirical study by looking at the baseline model (model 1) with the inclusion of only the macroeconomics variables. Here, we assume a contemporaneous effect of GDP on NPLs. The results in column (1) suggest that the gdpg is significant and negatively affect the non-performing loans, in line with the expected results by Louzis et al., (2012), Klein (2013), Abid et al., (2014), Beck et al., (2015), Chaibi & Ftiti (2015), Florin (2015), Ghosh (2015) and Dimitrios et al., (2016). A 1 percent increase in the gdpg will lower the NPL by 0.771 to 0.817 percent. The coefficient is statistically significant at 1 percent significant level for the baseline as well as other models. The results suit well with the theoretical model of business cycle discussed in the literature. Assets quality improves during expansion owing to the improved cash flows of companies and individuals which directly increase repayment capability and thus reducing NPLs. The opposite occurs when the economy is in recession. NPLs move in tandem with the economic and business cycles. The results can also be considered robust as the coefficients are significant and the negative sign remains throughout all models specified. Hence, the GDP maintain its negative relationship with the NPL in line with the previous studies. In addition, the NPL is still relevant to be used as the financial health thermometer. Surprisingly, the results in column (1) indicate that the past value of credit to the private sectors (fmdit-1) and the past value of inflation (infit-1) are not statistically significant suggesting that both variables have no impact on NPLs.

4.2 *Is Southeast Asia different?*

We add the Southeast Asia Dummy in column (2) to answer the earlier question: is Southeast Asia (SEA) different? We wish to find out whether SEA region is significantly different from the other regions in the samples and if yes, whether the difference is substantial or otherwise. SEA equals to 1 if a country is located in the SEA and 0 for other regions. The dummy variable is interesting as it measures the average difference in NPL between the SEA countries and the non-SEA countries with the same levels of GDP growth, credit and inflation. The results show that the SEA dummy is insignificant suggesting that there is no regional difference between the SEA and the non-SEA countries in terms of their effect on NPL. It indicates that other regions may adopt the successful strategies implemented by the SEA countries when dealing with the high cases of NPLs.

One plausible explanation is that the financial market and the banking industry is now borderless and inter-link among all countries in the world as the regional specific consideration is not the case in this study. In addition, the advancement of international trade and the easy fund flows between countries including the Southeast Asia contributes to the non-differentiation among regions. We also prefer to say that the SEA countries were affected same as the rest of the world. However, the government response towards the crisis in this region is better due to appropriate government policies. Malaysia, for instance is reported to register a non-performing loan (NPLs) as a share of financial assets in the country had been one of the lowest registered among Asian economies for 2008 (World Bank, 2008). Malaysia and Indonesia have learnt so much from the Asian financial crisis 1997 and thus have managed the 2008 crisis well.

4.3   *Robustness check*

Next, we proceed to add the bank-specific variables in the regression as reported in column (3). We treat this exercise as a robustness test as finding the effect of bank-specific variables is not one of our objectives in this research. If the results in all models are robust, the signs and coefficients for all key variables under investigation are consistent. Therefore, we will only highlight the significance or otherwise. The gdpg, fmd, inf and SEA dummy coefficients maintain its relationship and significance after adding the three bank-specific variables. Total liquid assets are significant with negative relationship indicating an inverse relationship between liqta and npl. When the total liquid asset to total asset ratio increased, the NPL will decrease suggesting the lower risk in accumulating liquid assets in the banks. The results are consistent in regression (3), (4) and (5). In addition, the net interest margin (nim) has no effect to the NPL level as indicated by the insignificant coefficients throughout the three models. These results seem to suggest that the basic model is robust to specifications. The addition of SEA Dummy in regression (2) earlier can also be considered as a robustness check as well. All variables in the 5 regressions once again maintain its sign and significance supporting the notion that the results generated by the models are robust.

4.4   *What is the effect of regulatory variables on NPLs?*

In order to evaluate the impact of the regulatory variables, we incorporated the supervisory power (sup) and the capital stringent requirement (cr) as the regulatory variables. Both variables are added alternately in the model to avoid multicollinearity problem (with sup and cr in model 4 and 5 respectively). The results for the regulatory variables are rather mixed. Supervisory power is significant and positively related with the NPL. A one percent increase in sup will increase the NPL rate by 0.361 percent, suggesting that too much involvement of the supervisory or regulatory bodies is not suggested as it increases the default rate. This is attributable to the usage of power for mandatory regulation which resulted in additional cost to the banks and these costs are quickly transferred to the customer instead of being absorbed by the banks. Such situation will make the default situation worst. Thus, the increase in the supervisory power will only lead to the inefficient economic outcomes (Boudriga, Taktak, & Jellouli, 2009), in this case, high default situation. Thus, it is advisable if the market is running on its own with less intervention and supervisory power in hand.

On the other hand, in the last regression reported in column (5), the capital stringent requirement is found to be insignificant suggesting that the variable has no impact on the NPLs. The

insignificant of this variable does not means that the capital stringent requirement is not important in controlling the NPL level. Instead, due to the panel data setting of nine countries, the central banks and the governments for each country assist their banks differently in time of crises. For instance, Malaysia has established the Small Debt Resolution Scheme to assist problematic SMEs by restructuring and rescheduling the defaulted loans and improve the access to financing on order to make on-going business continue to survive the crisis. The other countries may not have similar mechanism to improve the NPL, thus leading to the insignificant of this variable when the positive and negative effects are being cancelled out.

5. CONCLUSION

This paper analyzed the non-performing loans and its macroeconomics, bank-specific and regulatory variables in Asia using the two-step System GMM method. A Southeast Asia dummy variable was incorporated to see whether the SEA region is different in terms of the NPLs. The supervisory powers and capital stringency requirement variables were also introduced to explore the effect of the regulatory to the NPLs.

Overall, the significant NPL lag value supports our decision to adopt the two-step System GMM method in this analysis. In addition, the model passed all the diagnostic tests, the Arellano-Bond test for autocorrelation and the Sargan test for the instrument validity, suggesting adequately specified regressions. The inclusion of the dummy variable and other controlling variables shows that the results are robust to all model specifications. GDP remains its negative relationship with the NPL, indicating that the role of the NPL as a financial health thermometer is still relevant up to date. The result also revealed that the Southeast Asia has no different from other regions in Asia in terms of regional influence on the NPLs, thus suggesting that other regions may adopt the successful strategies implemented by the SEA countries However, we are quite comfortable to state that the government of the SEA individual countries has managed the 2008 crisis well due to quick policy response learnt from the previous Asian financial crisis. The regulatory variables, however, were having mix results. The increase in supervisory power would lead to an increase in the NPL, suggesting a moderate and friendly policy is preferred while the capital stringent requirement has no impact on the NPLs.

For the policy maker, the results suggest that each affected country should formulate their own policies based on the individual country requirements. Perhaps, the policy that would encourage the on-going survival of the businesses by way of extending easy financial assistance and provide proper debt management assistance. In addition, the formulation of policies in relation to the NPL management should be moderate. It is highly advisable if there is less supervisory power in control of the NPL issue as it will only leads to a higher default situation. Instead, let the market works on its own. The regulators will only interfere when it is highly needed to avoid any interruption in the financial market.

REFERENCES

Abid, L., Ouertani, M. N., & Zouari-Ghorbel, S. (2014). Macroeconomic and bank-specific determinants of household's non-performing loans in Tunisia: A dynamic panel data. *Procedia Economics and Finance, 13*, 58–68. doi: 10.1016/S2212-5671(14)00430-4

Abidin, M. Z., & Rasiah, R. (2009). *The global financial crisis and the Malaysian economy: Impact and response*s. Kuala Lumpur: UNDP.

Arellano, M., & Bond, S. (1991). Some tests specification for panel data: Monte Carlo evidence and an application to employment equations. *The Review of Economic Studies, 58*(2), 277-297.

Basri, M. C., & Rahardja, S. (2010). The Indonesian Economy amidst the global crisis: Good policy and good luck. *ASEAN Economic Bulletin, 27*(1), 77-97.

Beck, R., Jakubik, P., & Piloiu, A. (2015). Key determinants of non-performing loans: New evidence from a global sample. *Open Economies Review, 26*(3), 525–550. doi:10.1007/s11079-015-9358-8

Borio, C., & Lowe, P. (2002). *Asset prices, financial and monetary stability: exploring the nexus.* BIS Working Papers No. 114.

Boudriga, A., Taktak, N. B., & Jellouli, S. (2009). Banking supervision and nonperforming loans: A cross-country analysis. *Journal of Financial Economic Policy, 1*(May), 286-318, doi: 10.1108/17576380911050043

Chaibi, H., & Ftiti, Z. (2015). Research in international business and finance credit risk determinants: Evidence from a cross-country study. *Research in International Business and Finance, 33*, 1–16. doi: 10.1016/j.ribaf.2014.06.001

Dimitrios, A., Helen, L., & Mike, T. (2016). Determinants of non-performing loans: Evidence from Euro-area countries. *Finance Research Letters, 18*, 116–119. doi: 10.1016/j.frl.2016.04.008

Florin, B. (2015). The quality of bank loans within the framework of globalization. *Procedia Economics and Finance, 20*(15), 208–217. doi:10.1016/S2212-5671(15)00067-2

Fofack, H. L. (2005). *Non-performing loans in Sub-Saharan Africa: Causal analysis and macroeconomic implications*. Policy Research Working Paper No WPS3769. doi: 10.1596/1813-9450-3769

Ghosh, A. (2015). Banking-industry specific and regional economic determinants of non-performing loans: Evidence from US states. *Journal of Financial Stability, 20*, 93–104. doi: 10.1016/j.jfs.2015.08.004

Ibrahim, M. H., & Rizvi, S. A. R. (2017). Do we need bigger Islamic banks? An assessment of bank stability. *Journal of Multinational Financial Management, 40*, 77–91. doi: 10.1016/j.mulfin.2017.05.002

Kavkler, A., Repina, S., & Festic, M. (2011). The macroeconomic sources of systemic risk in the banking sectors of five new EU member states. *Journal of Banking and Finance, 35*(2), 310–322. doi: 10.1016/j.jbankfin.2010.08.007

Klein, N. (2013). *Non-performing loans in CESEE: Determinants and impact on macroeconomic performance.* IMF Working Papers No 13/72. doi: 10.5089/9781484318522.001

Louzis, D. P., Vouldis, A. T., & Metaxas, V. L. (2012). Macroeconomic and bank-specific determinants of non-performing loans in Greece: A comparative study of mortgage, business and consumer loan portfolios. *Journal of Banking and Finance, 36*(4), 1012–1027. doi: 10.1016/j.jbankfin.2011.10.012

World Bank (2008). *Review and outlook of the East Asia Pacific region*. Washington DC: World Bank.