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Loan Growth, Inefficiency, and Credit Risk in Asia Pacific Banking Sector

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ABSTRACT

This study examines the effect of growth of public listed banks in Asia Pacific and their credit risks during 2005-2015. Using random effect estimation, evidence shows the effect of loan growth on credit increase in low middle- income countries during pre- and post-crises. This finding implies the possibility of *moral hazard hypothesis* in the banking sector. Furthermore, bank inefficiency contributes to the rise in credit risk, except in low middle-income countries. This supports *bad management hypothesis*, where the bank's inability to reduce their inefficiency worsens credit risk. There is significant impact of *loan loss provision* and exchange rate on increases in credit risk. In addition, credit risk is also affected significantly by gross domestic product (GDP) in high-income and high middle-income countries. It is recommended the government improves its economic performance to reduce non-performing loans (NPL). These results highlight the importance of a study risk management policy and an effective cost management system to evaluate banking performance.

Keywords: Asia Pacific Banks, credit risk, GDP, inefficiency, loan growth, NPL

INTRODUCTION

Theoretically, increases global investment in search for higher expected returns and lessens the risk by diversifying it internationally are among the important factors that enhance economic inter-connectedness in the globalization era (Agenor, 2003). However, the reciprocal

relationship also increases the risk of spill-over effects, as witnessed during the global financial crisis of 2008.

The crisis saw a dramatic increase in *non-performing loans* (NPL) in the US banking sector caused by the debtors' inability to repay their loans due to low lending standards on mortgage loans. As a result, the world's GDP decreased by 57.28%: from 4.26% in 2007 to 1.82% in 2008. Furthermore, the situation worsened after the crisis in 2009 when the GDP growth was at its lowest (-1.74%) (www.worldbank.org).

After the crisis, the banking sector had a difficult task finding the determinants of credit risk, which would affect the country's financial stability. As suggested by Berger and DeYoung (1997); Hoose (2010), a *moral hazard hypothesis* is based on a possibility of debtors increasing their credit risks due to an *asymmetric-information problem*, thus, increasing NPL. Therefore, it suggests that credit growth has a sensitive relation with NPL. Keeton (1999) suggested that banks with excess credits tend to loosen lending standards, thus increasing the possibility of defaults or NPL. However, if banks want to loosen their lending standards to raise profits, there must be a positive relation between credit growth and NPL (Foos, Norden, & Weber, 2010). In contrast, the relation is negative if banks depend on NPL in the long term.

The *Basel Committee on Banking Supervision* (BCBS) via Basel Accord sets 8% as the minimum capital requirement in each bank in order to prevent credit defaults (BCBS). However, asymmetric *information* between banks and their creditors push banks to be more productive and efficient to prevent credit defaults. Berger and DeYoung (1997) proposed an *efficiency-risk hypothesis* to analyse three causes of credit risk due to banks' inefficiency. First, management's inability to evaluate and supervise bad loans, known as a *bad management hypothesis*. Second, unexpected events that lead to credit default, called a *bad luck hypothesis*. Third, when the bank's reduces resources used to monitor the collateral may deteriorating the loan quality, this hypothesis is called *skimping*. Using a dynamic panel GMM, Podpiera and Weill (2008) found proof of *bad management hypothesis* due to inefficiency, which increases NPL in the long run. Furthermore, Chaibi and Ftiti (2015) suggested that macroeconomics variables such as GDP growth, interest rate, unemployment rate, and exchange rate also affect NPL.

Many studies have examined how to reduce the effect of loan growth and inefficiency by evaluating factors that may affect its knowledge. However, none has done so by examining the country's GDP. Thus, this study aims to evaluate and analyse the impact of loan growth and inefficiency as well as specific and macroeconomic factors on credit risk.

The remainder of the paper is organised as follows: In Section 2, we present a brief review of literature. Section 3 describes data and methods used in the study while Section 4 analyses findings of this study. Section 5 summarises and concludes the paper.

LITERATURE REVIEW

The important question in managing NPL is "Why has the loan defaulted?" As proposed in earlier studies (Berger & DeYoung, 1997; Hoose, 2010), this issue is related to an *asymmetric information problem*. That is, as the bank does not have control over how the loan is used, it increases its loan portfolio risk, which is known as the *moral hazard hypothesis*.

As suggested by (Keeton, 1999), higher loan growth will increase credit risk by lowering their credit standard, which often happens when the objective is to boost profits. However, when banks have a prudent lending strategy, the relation between loan growth and credit risk is negative (Foos, Norden, & Weber, 2010).

Any shock to its financial system may be due to the bank's specific or macroeconomic factors. For example, the global financial crisis has always been associated with credit default, which affects a country's business cycle. Thus, the country's income has an impact on a non-performing loan (Ghosh, 2015). In addition, in a period of expansive economy, it is expected that debtors have the ability to repay their loans, but they have difficulties during recessions (Chaibi & Ftiti, 2015). Therefore, the first hypothesis is:

H1: Loan growth has a positive impact on credit risk in pre- and post-crisis periods. Four hypotheses relate to loan quality, cost efficiency, and bank capital (Berger & DeYoung, 1997). First, the *bad luck hypothesis*. When creditors cannot repay their loans, banks must bear more operational costs. This condition increases the bank's cost inefficiency. Second, the hypothesis related to inability of bank management to perform credit scoring, which causes bad portfolio management. This is known as *bad management hypothesis*. The third hypothesis has a trade-off between inefficiency and allocated sources used to oversee the loan (Louzis, Vouldis, & Metaxas, 2012). Chaibi and Ftiti (2015) found that inefficiency of banks in Germany and France contributes significantly to non-performing loans, which supports the *bad management hypothesis*.

Therefore, the following hypothesis is proposed:

H2: A bank's inefficiency has a positive impact on credit risk in pre- and post-crises periods.

Previous studies had investigated the effect of bank's specific and macroeconomic variables on non-performing loans as a measure of credit risk. For example, Ghosh (2015) found that credit quality as measured by capitalisation ratio, operational efficiency, diversification, and size of the industry influence credit risk in the US banking sector. This supports the *too big to fail* hypothesis.

Unlike previous studies which only considered the effect of loan growth on credit risk of banks in a single country or a group of countries, this paper examines a larger sample, namely banks in Asia Pacific in order to get more comprehensive picture.

In addition, this study also classifies the sample banks into three groups of countries: high income countries; upper high middle-income countries, and low middle-income countries (Dietrich & Wanzenried, 2014). Furthermore, this study also examines the effect of the pre and post global financial crisis of 2007/2008.

METHODS

In this study, panel data analyses were used to estimate the impact of loan growth and inefficiency, as well as some specific variables on credit risks of 152 banks in 10 countries in the Asia Pacific region during the period of 2005-2015. Data from each bank's annual report were retrieved from Thompson-Reuters Data stream database.

First, the data was classified the data based on the country's economic status: high-income, upper middle-income, and low middle-income countries (Dietrich & Wanzenried, 2014). The impact before and after the global financial crisis of 2008 was also examined. The analysis was made using two types of estimation models. The first employs the full model, which estimates the impact using non-performing loans as a dependent variable during the global financial crisis period. This model is tested for all sample countries and based on each income classification with total of four estimations. In this model, a country's classification is presented as a dummy variable. The full model is written as follows:

$$NPLTA_{i,j,t} = \alpha + \beta_1 BCG_{i,j,t-1+} + \beta_2 INEF_{i,j,t-1} + \beta_3 BCON_{i,j,t-1} + \beta_4 MAC_{j,t-1} + \beta_5 DClass_i + \beta_6 DCrisis_{i,t} + \varepsilon_{i,j,t} \qquad (1)$$

The second analysis is based on partial model estimation that divided the data into two periods: before and after the global financial crisis. This applies for all the classifications. The model is presented as follows:

$$NPLTA_{i,j,t} = \alpha + \beta_1 BCG_{i,j,t-1+} + \beta_2 INEF_{i,j,t-1} + \beta_3 BCON_{i,j,t-1} + \beta_4 MAC_{j,t-1} + \beta_5 DClass_i + \varepsilon_{i,j,t} \qquad (2)$$

where:

$NPLTA_{i,j,t}$ = *Non-performing loans* of bank i in country *j* at period *t*

$BCG_{i,j,t-1}$ = loan growth of bank *i* in country *j* at t-1

$INEF_{i,j,t-1}$ = *inefficiency* of bank *i* in country *j* at t-1

$MAC_{j,t-1}$ = Macroeconomic variables of country *j* at t-1

$BCON_{i,j,t-1}$ = Bank's specific variable of bank *i* in country *j* at t-1

$DClass_i$ = *Dummy* variable for country classification

$DCrisis_{i,t}$ = *Dummy* variable for crisis period

$\varepsilon_{i,j,t}$ = Error term

To check the robustness of the model, in addition to NPL to total assets, the estimation using other measures of credit risk, NPL to total loans, was also done (Vithessonthi, 2006).

RESULTS AND DISCUSSION

Table 1 is a summary of the variables and their corresponding statistics of the bank's variables: mean, standard deviation, minimum, and maximum values. Data shows the average value of credit risk, which measured by NPL of all samples is 2.2% with standard deviation of 3.2%. In addition, the highest NPL is 6.61%, and the least mean value is 0.022%. The highest mean value is found in a bank in Australia, probably due to the weakening of the Australian dollar to the US dollar in 2015, thus affecting the quality of its assets. Meanwhile, the least mean value is 0.022%, found in an Indonesian bank, as the effect of a sharp increase in growth of the bank's operating profit by 21.8%, which consists of 269.7% growth of net interest margin in 2006. For bank inefficiency that is measured by the ratio of *bank operating expense to bank operating income*, the full sample mean is 67.1% with standard deviation from mean of 3.61%.

Table 1
Descriptive statistics

Variable	Mean	Standard Deviation	Maximum	Minimum
Non-performing loans	0.0217	0.0317	0.6606	0.0002
Loan growth	0.1215	0.4810	14.2645	-0.6479
Inefficiency	0.6708	0.3165	8.8610	0.0326
Size	17.0243	0.1.8460	21.9237	7.8075
Capitalisation ratio	0.0717	0.0401	0.7732	-0.2749
Income diversification	0.3385	0.1603	2.7004	-1.5567

Using a random effect model, results of the study based on the estimation results of the full sample after considering country classifications (Model 1) and periods before and after the global financial crisis (Model 2) are presented in Table 2, along with the coefficients of the explanatory variables and their corresponding p value.

The results of estimating Model 1 used *low middle income* as a base for country classification. The results show that loan growth has a negative but insignificant impact on credit risk. We find the same impact in Model 2, before the crisis period. These findings confirm that when loans are managed prudently, the credit risk is reduced

(Foos, Norden, & Weber, 2010). The results are the same when we estimate Model 2. However, although insignificant, a positive loan growth increased credit risk after the crisis. This implies that when banks Increase loan supply, they tend to lower interest rates and lending standards. This phenomenon shows that when lowering lending standard as an effort to increase a bank's profit, credit risk rises, which is consistent with the *moral hazard hypothesis*.

The results also show a positive but insignificant impact of inefficiency on credit risk after the crisis period, in Model 1 and Model 2, which indicates that lower cost efficiency causes higher credit risk, which is consistent with the *bad management hypothesis* (Berger & DeYoung, 1997). Furthermore, a reverse result was found when estimating Model 2 with full sample before the crisis. The result shows that although not significant, banks' inefficiency

Table 2
Estimation results

Dependent Variable	Non-Performing Loans					
Independent Variable	Model 1		Model 2			
	Random Effect Model		Random Effect Model			
	Coef.	Prob.	Coef. Before Crisis	Prob.	Coef. After Crisis	Prob.
Constant	0.0519***	0.005	0.0803***	0.000	0.0132	0.576
Loan growth	-0.0015	0.319	-0.0005	0.447	0.0012	0.784
Inefficiency	0.0012	0.765	-0.0002	0.951	0.0127**	0.016
Size	-0.0038***	0.000	-0.0034***	0.001	-0.0032***	0.009
Capitalisation ratio	-0.0257	0.452	-0.0545**	0.034	-0.0408	0.445
Income diversification	0.0075	0.272	-0.0051	0.468	0.0408***	0.000
Loan loss provision	0.0974***	0.003	0.4205***	0.001	-0.0482	0.241
GDP growth	-0.0191	0.505	-0.1449**	0.021	-0.0185	0.543
Real interest rate	0.0280	0.359	0.0331	0.417	0.0517	0.120
Unemployment rate	0.2896***	0.000	0.0621	0.549	0.5159***	0.000
Exchange rate	0.0276***	0.000	-0.0236***	0.004	0.0369***	0.000
Upper middle income	0.0261***	0.000	0.0321***	0.001	0.0279***	0.002
High income	0.0178***	0.001	0.0089	0.180	0.0155**	0.039
Crisis	0.0031	0.186				
R-squared						
- within	0.0501		0.0330		0.0695	
- between	0.0617		0.3119		0.0868	
- overall	0.0525		0.2831		0.0766	
Prob (chi2)	0.0000		0.0000		0.0000	
No. Observation	1672		456		1216	

has a negative impact on credit risk. This implies a trade-off between inefficiency and resource allocation that was used to hide the loan, which proved the *skimping hypothesis* (Louzis, Vouldis, & Metaxas, 2012). This implies that before the crisis, banks with less control over their loans are more cost efficient, but after the crisis they tend to lose sight of the loans, which increases default risks. Additionally, credit risk is significantly higher in low middle-income countries. These results imply that economic activities of a country represent its business cycle, which in turn affects credit risk (Ghosh, 2015).

However, in full sample estimation model, crisis increases credit risk but the effect is insignificant. This finding implies that bad credit acts as the inception of a crisis, a result consistent with Reinhart and Rogoff (2010). In terms of control variables, in estimating Model 1 and Model 2, we find that large banks have lower credit risk both in pre- and post-crises periods. This suggests that large banks have more diversified loans and better risk management; therefore, they can select the best debtors to serve (Zribi & Boujelbene, 2011). In addition, we found that after the crisis (Model 2), banks with higher income diversification face greater credit risk, probably due to an increasing portion of non-traditional activities (Ghosh, 2015). This implies that efforts to increase profit through diversification after the crisis turned out to slide it down. Consistent with Chaibi and Ftiti (2015), *loan loss provision,* which represents banks' buffer to bad loans, has significantly increased credit risk in

Model 1 and before the crisis period (Model 2). This indicates that banks ensure high reserves to anticipate credit default in crises times. In terms of the macro-economic related variables, we find significant impact of exchange rate in full period sample and pre- and post-crises times. Although the influence is indirect, this indicates that appreciation of local currency may weaken competitive advantage of local products in the global market, therefore halting their ability to make their loan payments (Castro, 2013).

Based on country classifications, in high-income countries, when banks distributed more loans they became more prudent which reduced credit risk. In contrast, although insignificant, the more loans channelled to low middle-income countries, of the higher the credit risk. Furthermore, the impact is similar in upper middle-income countries in full sample period and after the crisis. Cost inefficiency has a significant credit rise risk in high- and upper middle-income countries, which support the existence of *bad management hypothesis* in the countries. This result is consistent with Berger and DeYoung (1997); Chaibi and Ftiti (2015). However, different results were found in low middle-income countries where the effect was negative and insignificant. This implies that banks were conscientious in giving loans, which resulted in lower credit risk (Foos, Norden, & Weber, 2010).

Regarding bank size, the larger the bank, the bigger its credit risk. However, the impact was significant only in high-income

and upper middle-income countries. This phenomenon indicates that size decreases as a problem due to credit defaults in those countries. This result is consistent with Rajan and Dhal (2003) in the case of commercial banks in India. Furthermore, the opposite prevailed in upper middle-income countries before the crisis period, when larger banks tended to have higher credit risk, consistent with the assumption of *too big to fail* in banking industry (Rajan, 1994).

Capital ratio negatively and significantly affects credit risk in high-income countries, which supports *moral hazard hypothesis* (Berger & DeYoung, 1997). This finding is consistent with Klein (2013); Makri, Tsagkanos and Bellas (2014). Similar effects of income diversification on credit risks in all countries are noted, where the incremental proportion of non-interest income ends with an upsurge in credit risk. The diversification strategy to reduce credit risk works only in pre-crisis periods, except for banks in high-income countries and low middle-income countries where the effect is insignificant. The impact of *loan loss provision* on credit risk was similar to the impact when we estimated the full sample, where an increase in the reserve boosted credit risks (Chaibi & Ftiti, 2015). Among macroeconomic variables, real interest rate had a negative and significant impact on credit risk in high-income countries before crisis, and upper middle-income countries in full sample period and after the crisis. This result confirms (Vithessonthi, 2006) that banks tend to loosen their lending standard, thereby increasing their risks of non-

performing loans. In addition, the effect was positive in the low middle-income countries after the crisis period. This implies that the debtors have difficulty repaying their loans with an increase in interest rate during the crisis period (Castro, 2013; Louzis, Vouldis, & Metaxas, 2012; Nkusu, 2011). Furthermore, variations were discovered with the impact of exchange rates on credit risk. For example, it significantly increased credit risks of banks in high-income countries in full sample period and after the crisis, and in low-income countries after the crisis. The positive impact indicates that appreciation of local currency weakens global competitiveness of export goods which makes loans difficult to pay.

In order to check the robustness of the model, we estimated all the models using different measures of credit risk: NPL to total loans. We find that all results are consistent with the model using non-performing loans to total assets as measures of credit risk. Thus, it can be concluded that the models are robust, since we can draw similar conclusion.

CONCLUSION

We investigated the effects of loan growth and inefficiency of banks in Asia Pacific countries. This paper extends the scope of previous studies by grouping the samples into (1) full bank sample, (2) banks in high-income countries, (3) banks in upper middle-income countries, and (4) banks in low middle-income countries. In addition, the model was estimated based on (1) full period, (2) pre-crisis period, and (3) post-

crisis period. Furthermore, to check the robustness of the model, we employed an alternative measure of credit risk to draw a conclusion.

The results support the *moral hazard* hypothesis, where loan growth increases credit risk, measured by NPL. Furthermore, this study found evidence to support the *bad management* hypothesis where the banks' inefficiency caused NPL to increase, and the *skimping* hypothesis of banks in Asia-Pacific countries, especially after the crisis period when banks often lose their oversight on loan, thus, increasing their credit risk. Furthermore, when examining the impact of bank size, there is evidence to support the *too big to fail* hypothesis where larger banks tend to face higher credit risks.

Based on country classifications, findings showed banks in high-income countries were very prudent in managing their loans, thus reducing credit risk before and after the financial crisis. Meanwhile, there was no impact of loan growth on credit risk in upper middle- and low middle-income countries in the same periods. Furthermore, the banks' inefficiency had significant impact on credit risk after the financial crisis (2008), which implies that they need to better manage their cost related to loans. Similar result obtained in upper middle-income countries before and after the crisis 2008. However, the opposite result was seen for low middle-income countries for the same period.

In terms of regulation and policy implications, the findings of the study indicate a need for a risk management regulation to avoid an enormous effect of credit default, which would alter banking sector stability. In addition, since credit risk was affected significantly by GDP in high-income and high middle-income countries, it is recommended that the government improve its economic performance to reduce NPL.

The study has limitations which can be addressed in future research. First, this study does not separate banks from *bank-based economy* and *market-based economy*. Therefore, the findings are confined to only sample countries. Thus, further study may include other classifications to be able to draw a general conclusion of the similarity or differences of the findings. Second, this study considers only the effects of loan growth and inefficiency in pre- and post-crisis periods. It is suggested that further studies involve the effects of loan growth and inefficiency during a crisis period. Third, to check robustness of the model, this study used only a variation of NPL as a credit risk measure. Further study may use the lag of NPL to capture the impact of previous conditions.

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