Impacts upon Non-Performing Loans in Commercial Banks: A Vietnamese Case Study

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This article examines and builds a model of the factors affecting non-performing loans in Vietnam's joint-stock commercial banks from 2009 through 2017. The theory and empirical research related to some macro and microeconomic factors affecting non-performing loans are also mentioned, in this research paper. System generalised method of moments (SGMM) is used to model the major impacts on non-performing loans. The results demonstrate two models with the following results. The first model has six statistically significant variables. The second has only five statistically significant variables.

Introduction

The financial crisis of 2009 in the United States has similarities in the direct cause of the Asian financial and monetary crisis. From late in the 1990s, Thailand experienced similar conditions with an excessive concentration of low-interest investments (loans to customers) and conditions of easy credit "below the standard" into the real estate market. There was also an explosion of derivative debt instruments in the market, to collect opportunity profits, thereby creating a situation where debts lost the ability to mature as the real estate market fell. This has led to rapid, and predictable disruptions in the credit market. The collapse of the

Lehman Brothers and Goldman Sachs banks in 2008 and 2010 was mainly related to credit operations and credit risk, despite their being big banks and having extensive operating experience in the global market. Non-performing loans (NPL) or credit risks in banks still occur, and are the obsession of the banking system for many.

Based on previous research, the main objective of this work is to develop a model demonstrating the major factors affecting NPL in Vietnam's joint-stock commercial banks. To achieve this goal, the study aims to explore the major factors that have affected NPL.

The contribution of the work will be presented as follows: (i) Firstly, the statistically significant variable is the leverage ratio (one of the indicators mentioned in Basel III). Contrary to previous studies, the coefficient between NPL and leverage ratio is negative. That will be explained by corporate governance theory. (ii) Also, the correlation between bank performance and NPL is negative while in other research studies, this correlation was found positive. Portfolio theory, profits, and risks (high risk, high return) are used to explain the difference between the results of this work and previous empirical studies.

Literature Review and Empirical Research Studies
Literature Review

According to the International Monetary Fund (IMF), a non- performing loan is any loan in which interest and principal payments are more than 90 days overdue (IMF, 2009). NPLs often refer to loans that extend for a relatively long time without generating income, and it is the principal and/or interest on these loans that have been left unpaid for at least 90 days. Typically, the majority of bad loans are often associated with bank failures and financial crises in both the developing and developed countries (IMF, 2009).

In this paper, NPL is understood to be a loan overdue for several months, or a loan that fails to pay interest and principal. This may be as a result of economic difficulties, and the non-performing loan is an indicator of the borrower's inability to repay the loan. According to the State Bank of Vietnam (Decision 493/2005), a non-performing loan or bad debt is classified and includes Group 3 (substandard debt), Group 4 (doubtful), and Group 5 (non-performing loan or non-performing loan) debts. In the study they will be considered as non-payment of principal and interest due in the process of lending to customers.

The increase in NPL in the banking sector may occur due to external factors, such as an unfavourable economic situation (Berger and DeYoung, 1997). Berger and DeYoung (1997) also argue that the efficiency of banks can contribute to inefficient loans (NPLs) in the banking system. A bad management hypothesis was offered to explain this relationship. Berger and DeYoung (1997) argued that the ineffectiveness of banks will lead to decreasing

performance and be reflected in the quality of their assets, and hence the loan process will be influenced. With poor management leading to poorly managed lending processes and procedures, the banks may not effectively evaluate credit records due to poor appraisal skills. Besides, asymmetric information issues between lenders and borrowers continue to complicate matters. As a result, a lower credit rating for approved loans will often lead to a higher probability of NPLs.

Applying the following theory, this research identifies which macro and microeconomic factors have affected NPL.

Theory of Asymmetric Information

Information asymmetry is the disproportionate distribution of information. It may impact on the decision-making process of both parties in the loan agreement (borrowers and lenders). Under asymmetric information, when risks associated with the borrowers arise, the bank's profits are likely to be affected. The banks (lenders) in this instance are likely to lack adequate data and information concerning the borrowers, to accurately assess the current situation (Edwards and Turnbull, 1994).

Due to a lack of available information, banks often require customers to mortgage their assets as surety for the loan. If asset prices fall, it will affect the balance sheet and net worth of the business. This reduces the business's ability to repay and negatively affects the investment. The channel operates through an external balance, reflecting the difference in the cost of external and internal capital. Derived from asymmetric information theory, this work has applied a similar approach to assess the relationship between macro factors as well as internal specificities (bank-specific factors) concerning a non-performing loan. The work will be further supported by empirical evidence from the literature.

Financial Accelerator Effect

Research has demonstrated that macroeconomic conditions or business cycles have had a significant impact on non-performing loans. For example, Carey (1998) argued that changes in macroeconomic conditions are the most important system factor affecting bank losses. Based on banking in Italy, Quagliarello (2007) reported and provided empirical evidence that the business cycle affected non-performing loans. At the same time, researchers added dummy variables into their regression to capture the business cycle. Moreover, the global financial crisis in 2008 had a strong negative impact on the financial sector. To control the impact of the global crisis, time trends were also added to regression models.

When a macroeconomic shock occurs, the net asset value of the firm decreases. The direct effect will be caused by the change in the collateral of the borrower, resulting in a change in the credit provision. As banks rely on this collateral to secure loans, the banks are then facing reduced value in that collateral. Thus, from the initial shock within the economy, the credit market is affected and reduces credit activity. These factors can lead to non-performing loans due to reduced net asset values and reduced values within security assets.

The Quantity Theory of Money

The theory of monetary quantity suggests that in the long run the amount of money does not depend on the size of the gross domestic product (GDP), but depends on the change in price or change in the general price level of the economy (inflation). Economists have argued that money works as a store of wealth and a means of giving exchange. Within this theory, the term cash balance is understood to be the amount of money individuals wish to hold rather than actual savings. For that reason, GDP and inflation should affect the taking of loans by customers.

The total amount of money available in any economy in a given time is called the money supply; there are many different forms. M0 is the total amount of cash issued by the central bank and is circulating (base money; narrow money; cash which can be spent immediately). M1 is equal to M0 plus money that commercial banks deposit with the Central Bank. M2 is M1 plus standard currency (such as savings deposits, term deposits, etc. within credit institutions, which are funds that cannot be immediately converted, such as money wide and savings deposits). M2 is the chosen target of the money supply including two types before M0 and M1. The reserve shows the total amount of money available in a tangible form while the narrow amount includes the reserve and all deposits required and the central bank's time. Bank loans and credit also increase money supply in the economy (Felix and Cloudine, 2008).

The Bad Luck Hypothesis

The bad luck hypothesis suggests that external circumstances (such as a decline in the economy) will make non-performing loans increase. Bank cost efficiencies then decrease, due to increased operating costs, to cope with the higher NPLs. The importance of the bad luck hypothesis is the inverse relationship between a non-performing loan and the calculated cost-effectiveness. Once non-performing loans become non-recoverable debts, banks will incur additional operating costs to settle and handle those debts. These additional costs may include (1) additional monitoring of borrowers with non-performing loans and collateral; (2) cost analysis and negotiation of feasible solutions; (3) final seizure, maintenance, and handling costs for collateral in case of default; (4) costs of continuing to protect the bank's

credit records in subsequent evaluations; and (5) diversion of management away from core business operations. These costs will increase as the bank's non-performing loans increase, and thereby reduce the cost management efficiency of the bank.

The Bad Management Hypothesis

The poor management hypothesis suggests that low-cost efficiency can represent poor management skills in managers' monitoring, supervision, and control, which could lead to higher non-performing loans. Therefore, the poor management hypothesis implies a negative relationship between non-performing loans and cost-effectiveness. Low efficiency is a sign of poor management performance and will result in a large amount of undesirable loans (Podpiera and Weill, 2007). According to this hypothesis, Berger and DeYoung (1997) argue that poor management on behalf of banks will lead to ineffective quality control of the bank, and impact on the lending process. This may also lead to lower credit ratings for approved loans, and the high probability of non-performing loans leading to a higher rate of non-performing loans. Inefficiencies in the credit management of banks can lead to ineffective loans or will result in non-performing loans.

Skimping Hypothesis

Another hypothesis called skimping, extended by Berger and De Young (1997), relates cost efficiency and non-performing loans positively. This is based on the fact that high cost-efficiency can reflect how much of the bank's resources are allocated to tracking credit risk, and thus leads to a situation that can increase bad debts in the future. This hypothesis originates from the original idea proposed by Berg et al., (1992) and was further developed by Hughes and Moon (1995). Specifically, the amount allocated to loan guarantees and monitoring can be significant for both the quality of the loan portfolio and the estimated cost-effectiveness.

Too Big to Fail Hypothesis

The term "too big to go bankrupt" refers to organisations, the financial-banking system, and businesses that are large and significantly influence the economy. This influence allows them to lobby governments to strengthen their positions. They were not allowed to collapse when any financial instability occurred, to avoid the implications for the economy. Stern and Feldman (2004) in a report on banks, "Too big to fail", discussed this issue in the context of government policy and bankruptcy. They analysed the moral hazard problems that endanger the large financial institutions that policymakers consider too big to go bankrupt. More specifically, if a large bank has many customers and these banks play an important role in the financial system, the collapse of that bank could threaten the solvency of other organisations.

This can lead to a domino effect. The failure of one bank can become a major event that can then threaten to paralyse the entire economy. To avoid such a scenario, governments set up what Stern and Feldman (2004) describe as a "defines policy" for the so-called too big for bankruptcy. As an example, after the financial crisis in 2008 - 2009 in the US, the Federal Government needed to consider sponsoring some financial institutions to avoid collapse. Large financial institutions, therefore, are monitored and monitored closely. Some credit institutions are important in the larger financial system and gain a certain competitive advantage, provided that the economy is booming and growing strongly. A subsequent collapse in the housing market will threaten their activities and potentially lead to their bankruptcy. That is when they become too big to collapse.

Empirical Research Studies

The empirical research studies taken by many researchers in the world have some limitations. Most studies have concentrated on the causes of NPL, as well as assessing some factors affecting the NPLs of the commercial banks studied. However, there are still gaps in research on NPL. Currently no research has experimented and examined all macro and micro factors affecting NPLs, in terms of the entire banking system of a country, due to access restrictions and transparency of information.

In the studies that the author explored, the leverage ratio factor is rarely mentioned, except in the studies of Pham & Nguyen (2018); Louzis et al. (2010); Chaibi and Ftiti (2015) and Muratbek (2017). Although using the same research methods and objectives, there is a difference in the direction of the impact between leverage and NPL. That created the motivation for this research. Empirical studies of factors affect NPL, as follows:

Year	Author(s)	Independent variables/ results	Limitations
1980	The US banks	Capital adequacy ratio (CAR)	Only CAR is considered
	Japanese banks	Implement well management of capital and efficient internal control → sufficient capital to control credit risk	Macro factors are not considered
2002	Deutsche Bank	Improve ROE → Reduce credit risk	Only ROE is considered
2004	Godlewski	ROA → non-performing loan	Only ROA is considered
2008	Garsiya and Fernandez (2008); Mesai and Jouini (2013)	ROE → non-performing loan. The higher ROE, the higher the risk. The profit maximization policy is accompanied by a high level of risk	Only ROE is considered

2013 2010 2013	Messai and Jouini (2013) Louzis et al. (2010); Klein (2013)	Macro and micro factors impact on non-performing loan	
2010	Louzis et al (2010)	A set of basic macroeconomic indicators, namely, real GDP growth rates, unemployment rates and real interest rates	The study of macro factors, not considering the impact of factors inside the banks
2011	Zribi and Boujelbène (2011)	(1) Bank characteristics: types of ownership; (2) regulation on CAR; (3) macro factors matrix; and (4) bank size.	
2015	Baholli et al. (2015)	Albania and Italy: GDP, lending interest rates, inflation, real exchange rates are four independent variables. The models had explained the variation of NPLs in Italy is around 99% and 88% for Albania.	The impact of CAR, ROE, Basel 3 factors has not been considered.
2016	Nguyen (2016)	The average cost efficiency of Vietnamese commercial banks is measured by DEA data in the research period reaching 69.3%. Research for the first time examines the negative relationship between non-performing loan and cost effectiveness of Vietnamese commercial banks. The study found evidence of the group had positive and negative effect on NPL	
2018	Pham & Nguyen (2018)	NPL in previous year, loan loss provision, ratio between operating costs and income, leverage ratio, NIM, bank size, ROA, GDP, CPI, unemployment ratio, exchange rate.	There is no separation between endogenous and exogenous variables.

Based on the studies of Pham and Nguyen (2018); Louzis et al. (2010); Chaibi and Ftiti (2015) and Muratbek (2017), the paper explored the relationship between leverage ratio and NPL, besides some other specific macro and micro factors.

The leverage ratio of the bank is an important indicator. It predicts the optimal capital structure that indicates that the institution has the equity ratio and the rest of the creditors. Because, leverage ratio involves the selection of debt ratio and equity ratio, which are the two main sources of funding for any business, including the banks.

In the research study of Pham and Nguyen (2018), the leverage ratio was an insignificant variable. However, in the studies of Louzis et al. (2010); Chaibi and Ftiti (2015) and Muratbek (2017), it was a statistically significant variable, and the coefficient between the leverage ratio and NPL was positive. The paper applies the corporate governance theory to explain the negative relationship between leverage ratio and NPL ratio, instead of the "Too big to fail" hypothesis used by the above authors.

Research Methodology and Proposed Model

Based on the analysed theory, this work combines quantitative methods with a case study, to propose the model. The work includes a lag of the dependent variable (NPLit-1) in the model, which becomes an independent variable according to theoretical research (Pham and Nguyen, 2018; Louzis et al., 2010; Chaibi and Ftiti, 2015; Muratbek, 2017). It is important to include a lag of the dependent variable in the model, if the study expects the results of the model to be unbiased and reliable.

By using the SGMM method, the model with the existence of instrument variables combined with exogenous variables and specific variables as endogenous variables, is built. Moreover, the model includes the NPLit-1 variable. This means an existence of dynamic panel data, in which the NPLit-1 variable is correlated with the residual. In other words, the model has an endogenous phenomenon in the NPLit-1 variable. In this case, the least squares estimation methods such as Pooled OLS, FEM (fixed effects model) and REM (random-effects model) are unstable and biased. With unstable and biased estimates, the results of the model cannot be interpreted accurately and reliably. To solve this phenomenon, the research should use a system generalised method of moments (System GMM), according to Arellano and Bond (1991). By this method, the endogenous variation will be determined in the model. Therefore it is no longer correlated with the residual of the model.

Thirty-two commercial banks, including four state-owned commercial banks and 28 joint-stock commercial banks, were therefore investigated. The work intends to focus on both state-owned commercial banks and joint-stock commercial banks in Vietnam. Thus, both are represented in the sample. The number of samples is 9 * 32 = 288 observations. From the research results, the work will generalise and propose important management implications to help the whole banking system within Vietnam operate more effectively. At the same time,

the work uses a case presented in a research project published by the author in the Science Journal of the Open University of Ho Chi Minh City as the basis for analysis. From analysis of the theories and previous research studies, the work builds the following model as:

$$NPL_{it} = \beta_1 + \beta_2 * NPL_{it-1} + \beta_3 * CAR_{it} + \beta_4 * SIZE_{it} + \beta_5 * COSO_{it} + \beta_6 * ROA_{it} + \beta_7 * ROE_{it} + \beta_8 * LDR_{it} + \beta_9 * LLP_{it} + \beta_{10} * \text{Leverage ratio}_{it} + \beta_{11} * CIR_{it} + \beta_{12} * INF_{it} + \beta_{13} * GDP_{it} + \beta_{14} * GR\_LOAN_{it} + \beta_{15} * M2 + \varepsilon$$

Where NPL_{it} = Non-performing loan of bank i at time t
NPL_{it-1} = the latency of non-performing loan of bank i at time t-1
CAR = capital adequacy ratio
SIZE = bank size
COSO = internal control
ROA = bank efficiency
ROE = bank efficiency
LDR = loan to deposit ratio
LLP = loan loss provision
GR_LOAN = loan growth
CIR = operating cost to income ratio
INF = inflation ratio
GDP = gross domestic product's growth
M2 = money supply's growth

Both ROE and ROA measure the bank efficiency, so to avoid multicollinearity, two models are considered:

nplrit = f(nplr$_{it-1}$, inf, gdp, m2, roe, coso, llp, car, growth_loan, leverage, size, cir) [1]
nplrit = f(nplr$_{it-1}$, inf, gdp, m2, roa, coso, llp, car, growth_loan, leverage, size, cir) [2]

Summary of variables, hypotheses, and related studies

Variable	Code	Hypotheses	Sign	Related studies
Dependent variable				
Non-performing loan	NPLR			
Independent variable				
Latency of NPL	NPLR$_{t-1}$	latency of NPL has positive effect on NPL	+	Kastrati (2011)
Capital adequacy ratio	CAR	CAR has negative effect on NPL	-	
Bank size	SIZE	Bank size has negative effect on NPL	-	Jensen & William (1976)
Internal control	COSO	Internal control has negative effect on NPL	-	Lakis and Giriunas (2012); Ellis & Jordi (2015)

Operational efficiency	ROA ROE	Operational efficiency has effect on NPL	+/-	
Loan to deposit ratio	LDR	LDR has negative effect on NPL	-	
Loan loss provision	LLP	LLP has positive effect on NPL	+	Radivojevic and Jovovic (2017)
Leverage ratio	LEVERAGE	Leverage ratio has positive effect on NPL	+	Radivojevic and Jovovic (2017); Muratbek (2017)
Loan growth	GR_LOAN	Loan growth has positive effect on NPL	+	Khemraj and Pasha (2009)
Cost to income ratio	CIR	LLP has negative effect on NPL	-	Karim et al. (2018); Lin and Zhang (2009), Louzis et al. (2010)
Inflation ratio	INF	INF has positive effect on NPL	+	
GDP growth	GDP	GDP growth has negative effect on NPL	-	
Money supply (M2)	M2	M2 has negative effect on NPL	-	Berhani and Ryskulov (2014)

Research Results and Discussion

The paper tests the defects of the function form, including autocorrelation, multicollinearity, and heteroscedasticity. Table 1 presents the Collinearity Test Results of model 1.

Table 1: Collinearity Test Results of model 1

Variable	VIF	1/VIF
m2	6.27	0.1596
inf	3.86	0.2589
size	3.06	0.3271
leverage	2.92	0.3424
gdp	2.58	0.3883
roe	2.45	0.4080
cir	2.15	0.4643
car	1.93	0.5194
gr_loan	1.47	0.6793
llp	1.35	0.7387
ca_compliance	1.09	0.9191
Mean VIF	2.65	

The general principles suggest that if any VIF value exceeds 10, the relevant regression coefficients are estimated to be ineffective, due to a multicollinearity phenomenon (Montgomery, 2001). However, in the research, the VIF coefficients are all smaller than 10, so multicollinearity does not exist in the model.

Table 2 presents Correlation matrix of model 1.

Table 2: Correlation matrix (model 1)

	nplr	roe	ca_compliance	llp	car	gr_loan	inf	size	m2	cir	leverage
nplr	1										
roe	-0.2628	1									
ca_compliance	-0.0286	0.0020	1								
llp	0.5697	0.0204	-0.1919	1							
car	0.1859	-0.2586	0.0032	-0.1248	1						
gr_loan	-0.2403	0.2336	-0.0078	-0.2991	0.0973	1					
inf	0.0731	0.2790	0.1376	0.0184	0.0743	-0.0303	1				
size	-0.1337	0.3049	-0.0408	0.2685	-0.5946	-0.2106	-0.1797	1			
m2	-0.1697	-0.1972	-0.0943	-0.0968	-0.1196	-0.1328	-0.7714	0.2854	1		
cir	-0.2721	0.6954	0.0287	-0.0356	-0.0702	0.2677	0.2450	0.1149	-0.1895	1	
leverage	-0.1846	0.2380	-0.0785	0.1032	-0.6546	-0.0352	-0.1661	0.7370	0.2605	0.0009	1

According to the results of the correlation matrix (Table 2), after eliminating the variables with a correlation coefficient greater than 0.8 and the remaining correlation coefficients are smaller than 0.8, the model is free of multicollinearity. Therefore, the next phase was to test the variance change phenomenon with the results shown in Table 3:

Table 3: Test for heteroscedasticity (model 1)

Breusch-Pagan / Cook-Weisberg test for heteroscedasticity
H_0: Constant variance
Variables: fitted values of nplr
chi2(1) = 94.80
Prob > chi2 = **0.0000**

According to Table 3, p-value = 0.0000 less than 5%, so H0 is rejected. This suggests that the variance is not constant. After testing for heteroscedasticity, the work continued to test the autocorrelation with the results presented in the Table 4.

Table 4: Test for autocorrelation in panel data (model 1)

Wooldridge test for autocorrelation in panel data
H0: no first-order autocorrelation
$F(1, 27) = 7.616$
Prob > F = **0.0103**

Table 4 shows that the p-value in the autocorrelation test is 0.0103 which is less than 0.05. Therefore, H0 is rejected, suggesting an autocorrelation in Model 1. When the model has autocorrelation, the work proposes using dynamic panel data to remove it. This means the dependent variable of the NPL of this year will be affected by other independent variables, which are the lag variables (the NPL of the previous year) and the instrument variables. To solve the defects of Model 1 (the autocorrelation phenomenon and the endogenous phenomenon), SGMM method is applied.

Table 5: Sargan test for Model 1

Sargan test of over-identifying restrictions
H0: over-identifying restrictions are valid
chi2(97) = 105.7848
Prob > chi2 = **0.2546**

As the model has a lag variable, SGMM estimation with instrument variables is used, instead of OLS estimation. The dynamic model is estimated by SGMM, introduced by Arellano and Bond (1991). This selection of estimation is consistent with empirical studies by Louzis et al. (2010). According to Arellano and Bond (1991), the autocorrelation phenomenon between the lag of the dependent variable and the error can be solved by adding instrument variables to the dynamic panel data model. At this point, the model has been completely free of defects such as multicollinearity, heteroscedasticity, and autocorrelation due to the use of SGMM model. According to Table 5, p-value in the Sargan test (with the assumption H0: over

identifying restrictions are valid) is large (p-value = 0.2546), so there is not enough evidence to reject the hypothesis H0. Therefore, the SGMM estimation method is valuable.

Table 6: Results for Model 1 from SGMM

Variable	Coefficient	p-value
nplr L1.	-0.1446	0.021*
inf	-0.0110	0.687
gdp	-0.9767	0.000***
m2	0.0001	0.429
roe	0.0481	0.020*
ca_compliance	0.0018	0.4500
llp	1.4855	0.000***
car	-0.0093	0.7200
gr_loan	0.0044	0.3150
size	0.0003	0.8860
cir	-0.0232	0.025*
leverage	-0.0008	0.048*
_cons	0.0376	0.595

legend: * p<.05; ** p<.01; *** p<.001

With the results from Table 6, the model has six statistically significant variables. By the estimation of the parameters of the model using general least squares, the total number of squares cannot be broken down by ordinary least square (OLS), because it will make the statistics of R-squared less useful when choosing the diagnostic tool that allows GLS regression. Specifically, for a statistic of R-squared calculated from GLS, the sum of squares does not need to be limited between 0 and 1; and does not represent the percentage of variation of the dependent variable in the model. Also, removing or adding variables in a model does not always increase or decrease the calculated value of R2. Since the SGMM method can be used to estimate the dynamic panel model with instrument variables, R2 is not meant to evaluate the research results.

The same process and tests applied for model 2, the results are displayed as follows:

Sargan test for Model 2

Sargan test of over-identifying restrictions
H0: over-identifying restrictions are valid
chi2(97) = 103.7316
Prob > chi2 = **0.3015**

Results for Model 2 from SGMM

Variable	Coefficient	p-value
nplr L1.	-0.1418	0.025*
inf	-0.0110	0.692
gdp	-0.9432	0.000***
m2	0.0001	0.494
roa	0.5167	0.040*
ca_compliance	0.0018	0.463
llp	1.4771	0.000***
car	-0.0122	0.646
gr_loan	0.0043	0.33
size	0.0001	0.949
cir	-0.0246	0.028*
leverage	-0.0004	0.25
_cons	0.0389	0.582

legend: * $p<.05$; ** $p<.01$; *** $p<.001$

The result shows that, for a significance level of 0.05, there are five significant variables, include the latency of NPL, return on total asset, loan loss provision, operating cost to income ratio, and gross domestic product growth. Model 2 is a less significant variable than model 1, so model 1 is chosen and discussed.

Discussion

The rationality of the instrument variables used in the SGMM was proved through two tests including the endogenous test of Sargan (1958) and the autocorrelation test of Arellano - Bond (1991). The endogenous test in Sargan's model (1958) with the hypothesis H0: instrument variables are exogenous (not correlated with error). The larger the result of the p-value of Sargan statistics, the better. Test of autocorrelation in the model of Arellano - Bond (1991) with hypothesis H0: there is no autocorrelation with the error. In this work, the p-value in the Sargan test was large (p-value = 0.2546 in model 1 and p-value = 0.3015 in model 2) so the estimation method SGMM was valuable.

Most banking systems have emphasised the profitability related to ROE and ROA, because two indicators are used to evaluate bank performance based on equity and total assets. High bank performance places less pressure on banks to depend on venture capital in finding high-risk projects. On the other word, low ROE within ineffective banks is related to a high NPL ratio. Many studies have shown a negative relationship between ROA, ROE, and NPLs (Warue, 2013; Makri et al., 2014; Radivojevic and Jovovic, 2017; Kumar et al., 2018). However, the research results show that ROE and ROA have a positive relationship with

NPLs. The results of this work are consistent with the findings of Godlewski (2004) and Stakic (2014). Several other studies conducted by Garsiya and Fernandez (2008) had the same conclusion, that higher ROA and ROE lead to a higher level of risk. When investors make decisions on their investment, they often consider the relationship between profit and risk. If two investment opportunities offer the same expected rate of return, the investor will choose the lower risk. However, if two investment opportunities have the same level of risk, the investor will choose to invest in the one with the higher expected returns. Finally, for risk-averse investors, if they invest in projects with high risks, in addition to the rate of profit received, they will require an additional risk premium (risk premium) to offset the perceived risk.

In Model 1, the variable of the leverage ratio is statistically significant at 95% confidence level. Leverage ratio (as required by Basel III) can advantage banks in mobilising shareholders' capital to raise capital. The Basel Committee continued to verify the minimum requirement of 3% for leverage ratio from January 1, 2013, to January 1, 2017. According to Basel III, Tier 1 capital must have at least 3% of total assets without risk. The leverage ratio of the banking industry also has a significant impact on NPLs. There is a positive and significant correlation between leverage and non-performing loans (Chaibi and Ftiti, 2015; Louzis et al., 2010 and Muratbek, 2017). It is argued that the debt-to-asset ratio is a factor of NPLs in the "too big to bust" hypothesis that significantly affects the bank's risk (Sargan, 1958). However, the results of this work demonstrate differences in the correlation between leverage ratio and NPLs. According to the results of the research model, the correlation is negative, and the result of this relationship is contrary to previous empirical studies. This relationship can be explained by the corporate management mechanism. Corporate management is a part of the mechanism to describe and evaluate the performance of an organisation, as well as the reliability of organisational management, especially in the current dynamic and globalised economic environment where organisations need to constantly seek new business opportunities to improve their competitiveness and performance (Suhaimi et al., 2017). Poor corporate management, for example, lack of responsibility for work, lack of risk management skills, low corporate social responsibility, tax non-compliance, and weak internal control, increase risks to organisations, reduces their reputations, and can increase the risk of fraud and moral hazard behaviours (Nawawi et al., 2018; Karim et al., 2018).

This suggests that good corporate management will lead to more effective economic and investment decisions, and indirectly increase company value (Chen et al., 2011). Previous empirical studies have demonstrated the importance of the corporate management mechanism, which is important in managing NPLs (Ahmad et al., 2016). The Basel Committee on Banking Supervision (BCBS) (2010) emphasised that effective corporate management is essential, to achieve and maintain public confidence in the banking system. To date, most research has focused on developed countries and few have discussed the role of

corporate management in the banking industry. Donaldson (1990) asserts that corporate management is the mechanism by which the highest level of management within an organisation belongs to the board management, and is controlled through monitoring programs and other binding policies.

Conclusion

Based on quantitative research methods, this paper has demonstrated a model that includes the major factors affecting NPLs in Vietnam's joint-stock commercial banks, from 2009 to 2017. The research results in the main model have six statistically significant variables, include the non-performing loan ratio of the previous year, GDP growth, ROE, loan loss provision, operating cost to income ratio, and leverage ratio.

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