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Article

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BANKING & FINANCE | RESEARCH ARTICLE

The relationship between internal control and credit risk – The case of commercial banks in Vietnam

Nguyen Kim Quoc Trung^{1*}

Abstract: This study examines whether the agency problem regarding credit risk is a useful corporate governance mechanism for controlling credit risk. For this purpose, we estimate the impact of internal control and agency problems on credit risk in commercial banks in Vietnam from 2009 to 2018. First, in line with corporate governance theory, we find that the agency problem is a statistically significant variable in the model. This result expands the existing literature. Second, we show that internal control is a mechanism to resolve the conflict of interest between the principal and agent. The author especially emphasizes the unchanged correlation of each independent variable to the dependent variable during the merger and restructuring of Vietnamese commercial banks in 2015.

Subjects: Business, Management and Accounting, Banking; Credit & Credit Institutions

Keywords: credit risk; internal control; agency problem; leverage ratio; Bank

Subjects: M1; G32; E51; E58; G21

1. Introduction

Following the global financial crisis, many banks, investors, and other financial sector stakeholders are more cautious and have a deeper understanding of risk, particularly credit risk. Credit risk is the obsession of the banking system in the world. Surprises involved in credit risk always happen, even for the best banks, the most experienced are hard to predict, such as Lehman Brothers and Goldman Sachs Banks. The collapse of the two above banks in 2008 and 2010 showed the evidence related to credit information and credit risk.

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Nguyen Kim Quoc Trung is currently a lecturer of the Faculty of Accounting - Auditing; the University of Finance – Marketing, Vietnam. He is interested in researching the banking sector and finance and accounting. His fields of research and teaching are banking, finance, and governance. He has written a total of some articles in various international journals and conferences, including Productivity management, etc., and has served as a reviewer of the international journal listed in Scopus, such as Cogent Economics and Finance.

PUBLIC INTEREST STATEMENT

The Bank is also a particular category of businesses in which shareholders invest in the banks to maximize profits or increase the earnings per share. Credit risk will occur at any time in lending activity, and it influences on banks' performance. This study uses five components of internal controls to analyze and macro factors that are put into the research model. However, the methodology used in this research study is the Generalized method of moments (SGMM) with the existence of NPL latency. Moreover, corporate governance theory explains the negative relationship between leverage ratio and credit risk, agency theory, and credit risk. The findings in this study imply that credit risk should be managed and supervised by stakeholders.

A post-crisis study involving the European banking sector, such as the research study conducted by Caselli et al. (2016) illustrated how internal control affects credit risk. The management objective of banks is to maximize risk-adjusted returns by maintaining credit risk at an acceptable level. The regulatory approach to credit risk management (CRM) is not always perfect; therefore, the banks need to enforce the managers' self-management rules to increase the owners' and investors' value. One of these management tools is internal control.

A fundamental activity that brings remarkable returns to the commercial banks is investment activities, particularly lending activity. Commercial banks, the crucial financial intermediary, their operation, and efficiency will significantly affect stakeholders' benefits. Therefore, when making investment activities, such as lending, leasing, commercial banks need to ensure the interests of related parties, especially owners, managers, and other parties.

The bank is also a particular category of businesses in which shareholders invest in the banks to maximize profits or increase the earnings per share. Meanwhile, the manager is designated for the bank's management and operation tasks in the interest of personal benefits, increased individual income, and bonuses. This problem is considered the relationship between the principal and the agent mentioned in the agency theory. In the context of this research, the author will highlight the effect of internal control elements on credit risk, and the agency problem will consider whether it is an effective mechanism to control credit risk or not.

The credit risk will occur at any time in lending activity, and it influences banks' performance. Credit risk is defined as the risk of borrower fails to pay principals and interests on time. According to Kolapo et al. (2012) "credit risk plays an important role in banks' financial performance since a large chunk of banks' revenue accrues from loans from which interest margin is derived". This risk includes the level of non-performing loans, problem loans, or provision for loan loss (Jimenez & Saurina, 2006).

The next section of the research will present the theoretical framework that establishes indices for measuring the research model variables. Hence, the proposed model and research method designed to estimate the effect of internal control and agency problems on credit risk. Based on the research results, the conclusions are drawn. Finally, there are some limitations in this research, which creates orientation for future research.

Research questions: How do internal control and agency problems impact credit risk in commercial banks in Vietnam?

Hypotheses: Internal control and agency problems positively influence credit risk in commercial banks in Vietnam.

The study proceeds with a brief discussion of Vietnamese background on the research objects, theoretical framework, literature review and hypothesis development, research methodology, and research findings. Section 5 will conclude the paper.

2. Theoretical framework

2.1. Theoretical framework

Basel focuses on the rule and regulations on credit risk management and set up a requirement of minimum capital adequacy ratio strictly. The Committee of Sponsoring Organizations of the Treadway Commission (COSO) establishes more essential principles to cover risks in the whole industries, including the banking sector. In this paper, the author adapts COSO as the framework and guidance for credit risk management because it is crucial in the bank operation. However,

COSO does not address any minimum capital requirements for banks and timely disclosure; these frameworks aim to benefit the investors and managers. COSO presents five elements: control environment, risk assessment, control activities, information and communication, and monitoring. Becoming more effective in detecting errors and fraud, the banks use these components as a combination and interaction to ensure the banks' efficient performance (Ellis & Gené, 2015).

From the practical point of view, owners' constraints have related to management and operation ability. It is compulsory to hire managers to deal with entity activities, including increasing performance and earning per share steadily. The managers' presence in the entity has accelerated the conflicts of interests between owners and managers (Shah, 2014). That is considered a platform of agency theory found by Jensen and Meckling (1976) and developed later by Fama and Jensen (1983).

Moreover, Jensen and Meckling (1976) have empirically demonstrated how to assign shares between managers and owners. It means the managers must reconcile the shareholders' different interests. The shareholders have two categories: insider shareholders who control the company with exclusive voting rights and non-voting shareholders. Besides, these categories were entitled to equal dividends per share. However, the insider shareholders always take a higher percentage of shares that make disparities between insiders and outsiders' interests under insiders control for accentuating their benefits (Han & Suk, 1998). High equity stake of insiders (institutional and individual investors) create more influential and vital voting rights speeding up their freedom to achieve personal goals. Managers focus on allocating the organization's resources to maximize their strength, prestige, and perquisites. So, these elements lead to causes of misalignment's interest between internal and external shareholders. In comparison, the ownership of insiders as a second function to settle disputes with those agencies.

However, representatives' problem is not only limited to the relationship between the owner and the manager, but it also involves other parties (stakeholders). So, finding out actual causes and remedies for this problem is a concern by researchers. Jensen and Meckling (1976) argued that the agency problem could be minimized if the owners and managers can cooperate for supervision and closely control the organizational operations; otherwise, this problem can negatively impact corporate value (Ang et al., 2000). Eisenhardt (1989) emphasized that an appropriate governance system can reduce conflicts that belong to the agency problem. Some of the regimes are applied to minimize inconsistencies in the relationship between owners and managers includes: leverage ratio and debt (Frierman & Viswanath, 1994); executive compensation (Core et al., 1999); Blockholders (Burkart et al., 1997); and dividends (Jensen, 1986; Myers, 2000; Park, 2009). One of the significant regimes to deal with agency problems that the author uses for this research study is the convention of third-party (leverage or debtholders) because it can reduce the agency costs, which affect the stakeholders' benefits.

According to Letza et al. (2008), managers focus on maximizing shareholder value if it does not conflict with their interests. Therefore, this pushes managers obviously to violate business ethics and frauds during their management. To prevent such events, the banks need to enforce internal control rigidly. When this system works effectively, the losses and risks that occur in the bank can be minimized.

Both principals and agents have different interests in the corporation, and this issue could be minimized by using appropriate mechanisms to limit the conflict of interest between the two parties. The banks can also establish appropriate remedies for managers and set up effective monitoring mechanisms to restrict the managers' abnormal behaviors and self-interest. Most research studies about credit risk in the banking sector focus on CRM with different models to evaluate credit risk rather than internal control mechanisms (Ellis & Gené, 2015).

The benefit of stakeholders could be ensured in case the internal control is implemented effectively. It means using a combination of the five components of internal control could enhance information more reliably and transparently. In addition, stakeholders must be more cautious about their investments to avoid losing the owners' value in a case lacking reliable information disclosure because of the existence of fraud, error, or collusion in any organization (Rittenberg & Schwieger, 2001).

In 1992, COSO mentioned an internal control framework. The internal control provides a reasonable assurance of achievements, efficient operations, reliable financial reporting, and compliance with laws and regulations influenced by the board of directors, managers, and other organization staff (COSO, 1992).

Both Basel (2010) and Lakis and Giriunas (2012) emphasized risk management. According to Basel (2010), internal control is the process of establishing and maintaining efficient internal control systems that are installed and maintained by top management. These systems' procedures belong to internal control should be designed to ensure all the banking activities to be complied with and monitored by the board of directors. Based on Basel, Lakis and Giriunas (2012) defined internal control as part of corporate governance systems that enhanced the organization's success and eliminated fraud and mistakes in the Bank. Overwhelming, the number of unintentional and fraudulent errors in organizations, all five internal control components such as environment control, risk assessment, control activities, information and communication, and monitoring become useful instruments.

International auditing standards have stated internal controls as a process developed by the board of directors, executives' officers, managers, and authorities. The approach has ensured all organization objectives relating to preparing the financial statements and other reports accurately, reliable, and useful. More importantly, all activities and all staff in the banks must comply with laws and regulations (Briciu et al., 2014).

Generally, internal control aims to minimize revenue loss, waste of resources, and unforeseen losses in the future (Abbas & Iqbal, 2012). Internal control can reduce information asymmetry, promote transparency, and provide shareholders' protection against managers' power (Salhi & Boujelbene, 2012). Ellul and Yerramilli (2013) argued that institutions with substantial internal risk control could survive financial crises. Banks' managers often aim to follow and invest in risky assets (such as credit activities) to obtain higher expected returns. According to the rule of thumb, higher expected returns are associated with higher investment risks (Cowen & Tabarrok, 2018). Particularly in the banking sector, lending activity is considered as one of the highest risky investment businesses. When credit risk has occurred in various forms, it will affect the banks' performance at different levels. Although many solutions overcome and mitigate credit risk implemented by commercial banks, credit risk is still existing. Therefore, the efficient way bank managers limit and control credit risk is to implement the internal control protocols strictly. Internal control will also become a valuable tool to alleviate an organization's agency problem in several fields, including the banking sector.

2.2. Previous research studies

Olatunji's (2009) study in Nigeria focused on the impact of internal control systems in the banking sector. The center of the article is internal control and frauds found to be related to operational risk. Lakis and Giriunas (2012) did a similar study and concluded that internal control is a measure to deal with fraud.

The research conducted by Ellis and Gené (2015) outlined the impact of internal controls on credit risk at banks listed in Spain. This study examines internal controls' effectiveness, seeking default risk in Spanish banks, stemming from the internal control system, thereby establishing the relationship between internal controls and credit risk. Afterward, they concluded that internal control systems were applied, but their effects were not guaranteed. This made banks listed in Spain fall into a serious default debt scenario. The impact of internal controls on credit risk is

statistically significant, especially in controlling the environment, managing risks, and governing activities. At the same time, the banks in Spain are still having problems with Agency theory.

After the study was conducted in 2015, Ellis and Gené (2016) continued to research a broader scope in European banks to investigate the relationship between internal control and credit risk. This study aimed to look for the effectiveness of internal control mechanisms and make the investigation whether there is evidence of agency problems that occur in banks in Europe or not. How is credit risk affected? Research results showed that credit risk had remained high, though the European Central Bank has applied various solutions. Research has also identified the effectiveness of internal controls. Moreover, internal controls have been identified as a useful tool to reduce credit risk. Furthermore, it was confirmed the statistically significant positive relationship between agency problems and credit risk.

The difference between this study and the previous studies is that the preceding one looked at the impact of internal controls on commercial banks' performance. These studies usually use primary data (Lakis & Giriunas, 2012). In Olatunji's study (Olatunji, 2009), the data obtained were analyzed using descriptive and inferential statistics. The descriptive analysis involves the use of percentages, tables, and graphical representations. The functions of fraud prevention, detection, and control are linked together, and when all three of them are coordinated, the bank eliminates fraud or gains at a lower level of deception. Therefore, internal control is crucial in detecting and preventing fraud in the banking sector in Nigeria. Ellis and Gené (2015 & 2016) examined the effectiveness of internal control on credit risk, investigated evidence of agency problems in the model, and explored how agency problems impact credit risk.

The similarities between this study and previous studies are the use of five components of internal controls to analyze and macro factors that are put into the research model. However, the methodology used in this research study is SGMM with the existence of NPL latency. Moreover, corporate governance theory explains the negative relationship between leverage ratio and credit risk, agency theory, and credit risk.

3. Research method and proposed model

The research paper applies a quantitative approach to empirically examine the possible nexus between internal control and credit risk. Based on the earlier research, e.g., Ellis and Gené (2015 & 2016), the author constructs a model in which credit risk is a function of internal control and other explanatory variables. In addition to internal control, the author also includes the factors that may affect credit risks, such as agency problems, bank-specific factors, and macroeconomics factors. The proposed model is built on previous researches of Olatunji's (2009) and Ellis and Gené (2015, 2016), as follows:

$$\text{Creditrisk}_{it} = \alpha_0 + \sum \alpha_1 \text{Internalcontrol}_{it} + \alpha_2 \text{Agencyproblem}_{it} + \sum \alpha_3 \text{Bankcharacteristics}_{it} + \sum \alpha_4 \text{Macroeconomics}_{it} + \varepsilon \quad (1)$$

In the above function, credit risk is measured by the ratio of non-performing loans. Internal control elements are five components: control environment, risk assessment, control activities, information and communication system, and monitoring. The bank characteristics include its size and its level of leverage. For macroeconomic factors, inflation and gross domestic product are included. The variable details are presented in Appendix 1.

In the empirical literature on determinants of credit risk, a dynamic specification is adopted. The lag of the dependent variable is included to capture the persistence of the credit risk. When adding the lag, equation (1) is modified as follows:

$$\text{Creditrisk}_{it} = \beta_0 + \beta_1 \text{Creditrisk}_{it-1} + \sum \beta_2 \text{Internalcontrol}_{it} + \beta_3 \text{Agencyproblem}_{it} + \sum \beta_4 \text{Bankcharacteristics}_{it} + \sum \beta_5 \text{Macroeconomics}_{it} + \varepsilon_{it} \quad (2)$$

Table 1. Descriptive statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
npl	229	0.023	0.015	0.000	0.110
ce	229	8.009	2.437	3.000	17.000
ra	229	6.746	1.617	3.000	11.000
ca_compliance	229	0.856	0.736	0.000	10.410
ca_limit	229	0.751	0.206	0.330	1.520
timeliness	229	87.439	33.658	25.000	200.000
aq	229	0.724	0.448	0.000	1.000
io	229	0.229	0.293	0.0001	0.963
leverage	229	11.282	4.501	2.010	27.880
size	229	32.210	1.298	29.000	35.000
inf	229	0.070	0.049	0.010	0.190
gdp	229	0.060	0.008	0.050	0.070

Source: Results from Stata

In the presence of the lagged dependent variable, the least square estimator becomes biased and inconsistent. Moreover, a two-way relationship may exist between the dependent variable and explanatory variables. This endogenous phenomenon will lead to an endogenous problem. These above issues can be overcome using the Arellano-Bond two-step difference SGMM estimation, with robust standard errors (Arellano & Bond, 1991). The inclusion of the lagged dependent variable also assumes that the number of groups (temporal observations) is greater than the total number of explanatory variables included in the model. The Arellano Bond estimation uses the available lags of the dependent variables and the lagged values of the exogenous variables as instruments. The variables considered endogenous are instrumented with SGMM-style instruments, precisely the lagged values of the variables. The number of instruments is always kept below the number of groups in all our SGMM specifications. AR (1) and AR (2) are the Arellano-Bond tests for first and second-order autocorrelation of the residuals. One should reject the null hypothesis of no first-order serial correlation and not reject the null hypothesis of no second-order serial correlation of the residuals. In our case, the requirements are met as suggested by the p-values of the AR (1) and AR (2) tests. The Hansen test of overidentifying restrictions indicates that the instruments used in all the specifications are appropriate.

At the beginning of 2019, the Vietnamese commercial banking system included 4 State-owned commercial banks, 28 joint-stock commercial banks, nine full-foreign owned banks, two joint-venture banks. However, this research only focuses on the commercial banks, so the sample size used for the regression model is 32 banks compared to 43 banks in Vietnam. Because the dataset involves a large number of banks ($N = 32$) and a small number of years ($T = 10$), the Arellano Bond estimation is also suitable for $T < N$.

Besides, the endogenous phenomena exist in the model as discussed above, the estimation by OLS, FEM, and REM methods will not be effective and stable. Therefore, the author uses an estimation model by the SGMM method adopted and developed by Blundell and Bond (1998). Before estimating the model, the following model's defects need to be tested: the multicollinearity phenomenon, the heteroscedasticity phenomenon, the autocorrelation, and the endogenous phenomenon. After the first was the Arellano-Bond (1991) estimator, the second version was demonstrated by Arellano & Bover (1995) and developed by Blundell & Bond in 1998. The second

estimators designed for dynamic “small-T, large-N,” panels and xtabond2 regression can fit two closely related dynamic panel data models.

The advantage of the quantitative research method (SGMM) is to find strong instruments that have better Sargan p-value and Hansen p-value- significantly to solve the endogenous and test the validity of the model specifications. Therefore, an efficient two-step SGMM estimator is suitable for obtaining reliable and unbiased results in small samples. However, the quantitative research method’s disadvantage is to spend more time designing the research process and finding the true instrument variables.

There is a significant change in the number of commercial banks from 2009 to 2018. In 2009, the number of commercial banks was 42. After the first restructuring period of 2011, there are only 35 banks in Vietnam. As a result of the merger and restructuring of the Vietnamese banking system in 2015, the current commercial bank system’s existence is 32. Concretely, MHB¹ merged with BIDV, DaiABank is merged with HDBank, MEKONGBANK merged with MSB, and Southern Bank is merged with Sacombank. That leads to the change in the disclosed information on those banks’ annual reports. Therefore, testing before and after the restructuring period is quite necessary to explore whether any changes in those correlations between independent and dependent variables.

4. Research results and discussion

The first section is dealing with the descriptive statistics and shown in the below table:

The table of descriptive statistics of all the variables is summarized in Table 1. The mean value of *npl* is 0.023, its standard deviation, minimum and maximum value is 0.015, 0.000, and 0.110, respectively. Regarding the Agency problem (*io*), its mean value is 0.229; its standard deviation is 0.293, its minimum is 0.0001, and the maximum is 0.963.

The multicollinearity phenomenon occurs when two or more predictors in the model are correlated. Multicollinearity was measured by variance inflation factors (VIF) and tolerance. According to Hair et al. (2011), if VIF value exceeds 4.0, or by tolerance less than 0.2, there is a multicollinearity problem. However, some other authors argued that the multicollinearity would occur when the VIF value exceeds 10 (Montgomery et al., 2001). In this paper, VIF is less than 4.0, hence in the model, the estimates of regression coefficients are reliable and stable. That means there is no multicollinearity problem in the model. (Appendix 2)

To deal with those problems in dynamic panel data models, according to Hsiao (1986), the instrument variables’ estimator that consists of taking the first difference of the model is used to remove the individual effects, and apply the dependent variable lagged once as an instrument variable. A crucial assumption for the validity of SGMM is that the instruments are exogenous. If the model is exactly identified, invalid instruments’ detection is impossible (Roodman, 2006). In this case, the Hansen test coincides with the Sargan (1958) test. Also, Sargan and Hansen’s tests are used to test the instruments’ overall validity in a statistical model. However, suppose non-sphericity is suspected in the errors, as in robust one-step SGMM. In that case, Sargan/Hansen statistics can also be used to test the validity of subsets of instruments, via a “difference-in-Sargan” test. Of course, the difference-in-Sargan test is only feasible if this unrestricted regression has enough instruments to be identified (Roodman, 2006). However, it is essential to pay attention that with a dynamic panel data model, the pooled OLS, FEM, and REM estimates are biased and inconsistent. Therefore, the interpretation result is better based on the SGMM estimates.

Where,

npl: Non-performing loan

npl L.1: Non-performing loan lag1

Table 2. Regression results by using SGMM

Group variable: BANK		Number of obs =			177
Time variable: year		Number of groups =			32
Number of instruments = 24		Obs per group: min =			1
Wald chi2(12) = 104.98		avg =			5.53
Prob > chi2 = 0.000		max =			9
		Robust			
	Coef.	Std. Err.	z	P>z	[95% Conf. Interval]
npl					
npl l1.	-0.1482	0.0509	-2.9122	0.0041	-0.2481 -0.0482
ce	-0.0010	0.0005	-1.9900	0.0470	-0.0019 0.0000
ra	0.0011	0.0008	1.4900	0.1370	-0.0004 0.0027
ca_compliance	0.0018	0.0040	0.4600	0.6470	-0.0060 0.0096
ca_limit	0.0066	0.0067	0.9900	0.3230	-0.0065 0.0196
timeliness	0.0000	0.0000	-0.0100	0.9890	0.0000 0.0000
aq	-0.0022	0.0028	-0.7900	0.4290	-0.0077 0.0033
io	-0.0084	0.0041	-2.0700	0.0390	-0.0165 -0.0004
leverage	-0.0007	0.0002	-3.5000	0.0000	-0.0012 -0.0003
size	-0.0007	0.0016	-0.4600	0.6450	-0.0039 0.0024
inf	0.0699	0.0067	8.5213	0.0000	0.0451 0.0727
gdp	0.0354	0.1958	0.1800	0.8570	-0.3485 0.4192
cons	0.0437	0.0519	0.8400	0.4000	-0.0581 0.1455

Source: Results from Stata

ce: Control environment

ra: Risk Assessment

ca_compliance: Control activities (Credit Compliance)

ca_limit: Control activities (Credit limit)

timeliness: Information and communication systems

aq: Monitoring

io: Agency problem

leverage: Leverage ratio

size: Bank size

inf: Inflation

gdp: Gross domestic product

Table 2 shows that the model has five statistically significant variables because their p-values less than 5%: the one-year lag of NPL, control environment, insider ownership, leverage, and inflation. Robust standard errors in parentheses. For the diagnostic tests: Arellano-Bond test for serial correlation and the Sargan test of overidentification restriction, p-values are reported, and both p-values are larger than 5%. The null hypothesis of the Sargan test is H_0 : "Overidentifying restrictions are valid", while the null hypothesis of the Arellano-Bond test for serial correlation is H_0 : "no autocorrelation". As a result of that, there are no problems with overidentification and autocorrelation.

The author uses Arellano and Bond tests to check the condition of no correlation in the error term. The AR(2) error test is rejected in the Arellano-Bond model because p-value = 0.310 larger than 0.05 with the Null hypothesis is H_0 : "Autocorrelation does not exist". This result means that the probability of AR(2) is not significant at 5% and also, AR(1) is significant at 5% (AR (1) (p-value = 0.019 < 0.05). So, it can be confirmed that there is the absence of serial autocorrelation in the errors in the model.

The table in Appendix 3 shows the difference-in-Hansen tests of the exogeneity of instrument subsets under the null hypothesis of the joint validity of a specific instrument subset. The test statistics are asymptotically chi-square distribution with degrees of freedom equal to the number of questionable instrumental variables. Roodman (2009) about good practices in implementing System GMM estimation and applying the difference-in-Hansen test to the subsets of System GMM-type instruments and standard instrumental variables for the levels equation. Table 3 presents difference-in-Hansen tests of the exogeneity of instrument subsets under the null hypothesis (H_0) of the joint validity of a given instrument subset. As a result of statistical evidence at 5%, the null hypothesis cannot be rejected. This leads to the suggestion that the subsets of instruments are econometrically exogenous.

Roodman (2009) stated that having too many instruments can overfit the endogenous variables and inadequately deal with the endogeneity, leading to extensive Hansen statistics. Therefore, the rule of thumb in Roodman (2009) required that the number of instruments is less than the number of observations (Al Marzouqi et al., 2015).

As illustrated in Table 3, five variables in the model significantly affect credit risk at commercial banks in Vietnam. Firstly, the NPL variable's one-year lag harms credit risk at 5% significant level. Secondly, among the internal control elements, the control environment is a statistically significant variable. Moreover, agency problems measured by insider ownership variables; and leverage, inflation variables all also have a considerable effect on credit risk.

Regarding the one-year lag of the NPL variable, it hurts credit risk. The result is contrary to earlier studies, such as Makri et al. (2014); Radivojevic and Jovovic (2017), and so on. But this research result is similar to the study of Louzis et al. (2012) in the negative relationship between the one-year lag of NPL and credit risk.

The control environment variable, which is one of the internal control elements, negatively influences credit risk. This result entirely differs from what the author found in the previous research. In the previous study (Nguyen, 2018), the author conducted only five internal control elements, control variables, without considering the endogenous problem and agency problem. When the banks implement internal control, especially the control environment, the credit risk will decrease because of the negative relationship between the control environment element and credit risk. The control environment is the number of standards, procedures, and structures that provide the basis and premium rules for implementing internal control throughout the organization. The board of directors and senior management will focus on the importance of internal control, including expected standards of conduct and code of ethics in business to protect the owners' interest and limit the credit risk level at an acceptable level.

Using the insider ownership index as a proxy of the agency problem, the conflict in principals' and agents' interests can be aligned (Lee, 2011). Lee (2011) has demonstrated that insider ownership will reduce risk-taking behavior by the managers and increase the firm's value. Insider investors will follow and control the Bank's activities more accurately and efficiently than external investors. So, internal investors can access information and financial reports of the bank easily, and hence they can make well-informed investment decisions before all information and reports are published in the market. Obviously, if corporations are governed and controlled efficiently, shareholders' value will increase significantly; hence, the other stakeholders' expectations will be obtained more. In other words, Arun and Turner (2002) mentioned corporate governance is considered the mechanism through which shareholders are assured that managers will act in their interests. That also suggests that corporate governance will lead to more effective ways for managers to increase firm value by making economic and investment decisions (Chen et al., 2011). Corporate governance is a modern theory used by the author to explain the inverse relationship between credit risk and leverage at a 5% significance level.

Regarding the inflation variable, the earlier studies of Rinaldi and Sanchis-Arellano (2006) have the same conclusion in the positive relationship between inflation and credit risk. Inflation is an essential macro factor affecting NPL. When inflation appreciates, NPL also increases because the consumer price index measures inflation. That leads to an increase in the price of goods and services, creating economic and financial difficulties for consumers and businesses. As a result of the rise in inflation, the NPL increases accordingly.

5. Conclusion

This paper draws some issues that are quite different from earlier studies in the author's research. Firstly, the agency problem is a statistically significant variable in the model. This result differs from the analysis of Ellis and Gené (2016) The difference is explained by using corporate governance theory. Secondly, to describe the negative relationship between leverage and credit risk, corporate governance theory (agency theory, stakeholders theory) also is used. Thirdly, internal control is a mechanism to deal with the conflict in the principal and agent's interest.

Meanwhile, the control environment, which is the internal control element, is a statistically significant variable at 5%. Finally, Sargan & Hansen tests to check the number of instruments adequately, and the model will not produce overidentification. Therefore, the endogenous model is estimated unbiased and reliably.

The management effectiveness needs to improve in the internal control system of credit operations of commercial banks. So, creating a culture of comprehensive control in the organization is quite necessary. Specifically, special attention should be paid to business ethics when the frequency and severity of violations in the banking sector ethic increase dramatically in Vietnam.

Commercial banks in Vietnam need to build a centralized data warehouse that contains full information about credit activities such as all internal documents on credit activities, Bank's regulations, state laws. There should also be a department responsible for synthesizing, screening, and analyzing information on credit activities necessary to support the job. Then, the department proactively sends it to credit operations staff can access.

Despite obtaining the specific results, the research still suffers the certain limitation. Specifically, this study does not consider the existence of bank control variables, for example, no profit measurement. Therefore, future research needs to clarify the bank control variables in order to get more reliable and unbiased. Besides, solving agency problems mentions the conflicts of interests between insider ownerships and managers in this research. So, institutional ownerships and other regimes should be added into the agency problem's relationship to clarify the agency theory to establish internal control and credit risk improvement in future research. It means that institutional ownerships have a significant effect to ensure efficiency of bank operation to satisfy these partner interests.

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Note

1. MHB: The Housing Development Bank of Mekong Delta; BIDV: Bank for Investment and Development of Vietnam; DaiABank: Great Asia Commercial Joint Stock Bank; HDBank: Ho Chi Minh City Development Joint Stock Commercial Bank; MEKONGBANK: Mekong Development Joint Stock Commercial Bank; MSB: Vietnam Maritime Joint-Stock Commercial Bank; Southern Bank: Southern Commercial Joint Stock Bank; Sacombank: Sai Gon Thuong Tin Commercial Joint Stock Bank

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APPENDIX

APPENDIX 1 Variables in the proposed model

Variables' name		Index	Previous studies	Sign expectation
Dependent variable	Creditrisk _{it}	Non-performing loan —NPL _{it}	Ellis and Gené (2015 and 2016)	
Independent variable	Creditrisk _{it-1}	NPL _{it-1}	Jovovic (2014); Radivojevic and Jovovic (2017); Muratbek (2017); Mohanty (2018)	
	Control environment —ce _{it}	Size of board of directors	Baysinger (1985); Lipton and Losch (1992); Jensen (1993); Gugong (2011); Angahar and Mejabi (2014); Ahmad et al., (2015); Lestari (2018)	-
	Risk Assessment—ra _{it}	Management experiences—Number of board members with background in finance and banking	Burak et al., (2008); Ellis and Gené (2015 and 2016)	-
	Control activities —ca_compliance _{it}	Credit limit— $\frac{\text{Totalloans}}{\text{Totalassets}}$	Casu et al., (2006); Ellis and Gené (2015 and 2016)	-
		Credit Compliance — $\frac{\text{Totalloans}}{\text{Totaldeposits}}$	Mishkin (2006); Ellis and Gené (2015 and 2016)	-
	Information and communication systems—timeliness _{it}	Reliability of Financial Statement—Measured by the end of the fiscal year to the date of signing the audit report	Zhang et al., (2007); Ellis and Gené (2015 and 2016)	-
	Monitoring—aq _{it}	Audit quality aq = 1 if audit firms are big four aq = 0 otherwise	Zhang et al., (2007); Ellis and Gené (2015 and 2016)	-
	Agency problem—io _{it}	Insider ownership— ratio of Shares held by Insiders investors to total number common shares issued	Ellis and Gené (2016)	-
	Leverage ratio—lv _{it}	Financial leverage ratio refers to the combination of debt and equity in the management of a bank's financial policy. $lv_{it} = \frac{\text{Totaldebts}}{\text{Totalequity}}$	Altman (1968); ; Hillegeist et al., (2004); Boudriga et al. (2010); Nguyen (2018).	+
	Bank Size—size _{it}	Bank size	Ellis and Gené (2015 and 2016)	-

(Continued)

Variables' name		Index	Previous studies	Sign expectation
	Inflation— inf_{it}	The rate of increase of the price level of the economy.	Festic et al. (2011); Hamerle et al. (2004); Alexandri and Santoso (2015); Ellis and Gené (2016);	+
	Gross domestic product— gdp_{it}	The increase in gross domestic product annually, is a macroeconomic determinant of the profitability of banks.	Mileris (2012); Alexandri and Santoso (2015); Chaibi and Ftiti (2015); Reddy (2015); Ellis and Gené (2016); Mohanty (2018)	-

Source: author's collection

APPENDIX 2 VIF Value

Variable	VIF	1/VIF
ra	1.59	0.630
ce	1.57	0.637
leverage	1.55	0.644
size	1.48	0.675
gdp	1.39	0.718
inf	1.21	0.825
aq	1.15	0.869
ca_credit	1.15	0.869
timeliness	1.10	0.911
ca_compliance	1.06	0.946
io	1.03	0.970
Mean VIF	1.30	

Source: Results from Stata

APPENDIX 3 Difference-in-hansen tests of exogeneity of instrument subsets

SGMM instruments for levels

Hansen test excluding group: $\chi^2(5) = 3.60$ Prob > $\chi^2 = 0.608$

Difference (null H = exogenous): $\chi^2(6) = 6.07$ Prob > $\chi^2 = 0.416$

iv(L.npl)

Hansen test excluding group: $\chi^2(10) = 9.58$ Prob > $\chi^2 = 0.478$

Difference (null H = exogenous): $\chi^2(1) = 0.09$ Prob > $\chi^2 = 0.762$

iv(ce)

Hansen test excluding group: $\chi^2(10) = 9.59$ Prob > $\chi^2 = 0.478$

Difference (null H = exogenous): $\chi^2(1) = 0.08$ Prob > $\chi^2 = 0.774$

iv(ra)

Hansen test excluding group: $\chi^2(10) = 8.74$ Prob > $\chi^2 = 0.557$

Difference (null H = exogenous): $\chi^2(1) = 0.92$ Prob > $\chi^2 = 0.336$

iv(timeliness)

Hansen test excluding group: $\chi^2(10) = 9.66$ Prob > $\chi^2 = 0.471$

Difference (null H = exogenous): $\chi^2(1) = 0.01$ Prob > $\chi^2 = 0.932$

iv(aq)

Hansen test excluding group: $\chi^2(10) = 9.58$ Prob > $\chi^2 = 0.478$

Difference (null H = exogenous): $\chi^2(1) = 0.08$ Prob > $\chi^2 = 0.772$

iv(io)

Hansen test excluding group: $\chi^2(10) = 9.13$ Prob > $\chi^2 = 0.520$

Difference (null H = exogenous): $\chi^2(1) = 0.54$ Prob > $\chi^2 = 0.462$

iv(leverage)

Hansen test excluding group: $\chi^2(10) = 9.28$ Prob > $\chi^2 = 0.506$

Difference (null H = exogenous): $\chi^2(1) = 0.39$ Prob > $\chi^2 = 0.532$

iv(L.size)

Hansen test excluding group: $\chi^2(10) = 9.61$ Prob > $\chi^2 = 0.475$

Difference (null H = exogenous): $\chi^2(1) = 0.06$ Prob > $\chi^2 = 0.812$

Source: Results from Stata



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