

# NON-PERFORMING LOANS OF COMMERCIAL BANKS, AND THEIR CAUSES: EVIDENCE FROM VIETNAM

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**Abstract.** *Non-Performing Loans (NPLs) are the significant issue for all banks in Vietnam, attracting considerable attention from scholars. Our research aims to find out the factors that affect the NPLs of Vietnamese commercial banks. The study uses Pooled Ordinary Least Square (OLS), Fixed effect, Random effect, and Generalized Least Square to examine secondary data of 28 commercial banks annually for the period 2008-2019. Consistent with previous research, the main finding shows that macroeconomic and microeconomic factors impact NPLs. Remarkably, provision for credit risk (PCR) has a significantly positive effect on the NPL ratio. Besides, foreign investor ownership (FOR) and bank size (SIZE) negatively affect the NPL ratio. Especially, for the positive correlation between foreign investor ownership and bank performance, the commercial bank should expand to enhance operational efficiency. Regarding macro factors, the results conclude that gross domestic product (GDP) growth and the unemployment rate (UEP) have a significantly negative relationship on NPLs. Therefore, the State Bank of Vietnam and the banks need to understand the leading causes as they directly relate to the banks in the context of the prevailing economic environment.*

## Keywords

*Non-performing loans, commercial banks, credit risk, assets.*

## 1. Introduction

Non-Performing Loans (NPLs) have a close relationship with bank losses, increasing NPLs is reflected in weak credit risk management, leading to credit management costs and losses [1, 2]. Louzis et al. (2012) [3] suggested that a bad debt increased due to weak credit management capacity. In addition, macro factors such as growth, unemployment also affected NPLs. NPLs also arise in different stages, when the economy falls into a state of saturation or downward trends, then NPLs tend to increase. According to Dimitrios et al. (2016) [4], the bank's operational efficiency decreased because of the impact of NPLs. Besides internal factors of banks and macro policies or financial policy also have a significant impact on NPLs [4, 5].

As the commodity economies of emerging countries have developed, the activities of their commercial banks have become more efficient and developed as indispensable financial institutions. Following Rajaraman and Visishtha (2002) [6] represents that a secure financial sector is the most important institutional foundation for the economic development of a country.

For this reason, controlling operations and risks of commercial banks - as well as the entire banking system – continues to present a top concern of the Vietnamese government.

Because of the importance of commercial banks, many studies have addressed this issue with significant empirical results [7, 8]. This paper contributes to such inquiry by examining the impact of both internal and external factors on the credit activity of the banking sector. The arising of NPLs is perhaps inevitable, representing an important issue of concern for commercial banks, even though each country's banking system has its own characteristics [9].

In Vietnam, the main activities of commercial banks rely on deposits and loans, generating revenue from four main sources as service fees, loan interest, financial investments and foreign exchange trading. While service fees and loan interest are traditional sources, commercial banks have also invested heavily in financial investments, helping to bring significant additional revenue in recent years. Also, foreign exchange trading has become more important. Nevertheless, service fees and loan interest account continue to account for the greater share of revenue for most commercial banks. Currently, competitive pressure among commercial banks has required banks to regularly loosen credit policies. In addition, Vietnam's economy is in a period of rapid development which leads to increase rapidly the credit demand for businesses and individuals. However, the increasing of bad debt due to many other reasons which has negative impacts not only on commercial banks but also on the economy. In recent years, bad debts in Vietnam's commercial banking system have climbed significantly, but most bad debts have not been completely resolved and the banks have to be further dealt with. To operate stably and sustainably, commercial banks need to find out the determinants of bad debts in order to have better solutions. The State Bank of Vietnam has supported the commercial banks to manage non-performing loans at credit institutions. Reports of the State Bank of Vietnam in recent years have stated that the promotion in restructuring of credit institutions and giving solutions to deal with the non-performing loans have been implemented in sync with new mea-

asures to prevent non-performing loans. Therefore, the stability and safety of the credit institution system has been strengthened, the charter capital increased gradually over the years; the scale of the credit institution system has increased; governance, internal audit, risk management, and transparency capacity of credit institutions have been gradually improved and approached international practices. Then, the non-performing loans are effectively controlled and handled. However, the reports only focus on the comparison of the non-performing loans year to year and the solutions in the short term. Moreover, no reports research for long period which supply enough the evidences and solutions for this issue.

According to Saba et al. (2012) [1], bad debts increased rapidly due to the growth pressure of the economy, when spending and investment demand went up rapidly which required banks to expand lending activities. When NPLs become excessive, banking activities are paralyzed as banks do not have the capital to meet the demand of their depositors, which, at an ultimate level, leads to bankruptcy. Therefore, the credit risk management, prevention, restriction and resolution of non-performing loans represent an extremely important task for commercial banks. Banks are therefore trying to implement proposed policies and control the NPL ratio at below the allowed rate.

Most previous studies are done in developed economies where banks are well-developed, such as Europe [1] and the US [2]. In this study, we identify the common features of NPLs for bank credit activities in a developing economy, Vietnam in particular. The rest of the paper is organized as follows: Section 2 offers a literature review; Section 3 describes the research methods; Section 4 presents the empirical results and a discussion, and Section 5 concludes remarks with a short discussion.

## 2. Literature Review

### 2.1. Non-Performance Loans and Loss of Bank

The basic characteristics of non-performing loans are maturity and repayment. The arising of non-performing loans is nevertheless perhaps inevitable in the banking sector, creating a challenge for all commercial banks. When the non-performing loan ratio exceed, the bank's operation is endangered due to lack of bank's capital as well as payment's capacity which can lead to higher possibility of bankruptcy [2]. Non-performing loans are therefore an essential indicator in assessing the credit quality of a bank [3, 10].

In the past, there were many criteria to assess the level of the NPLs: overdue debts, the proportion of customers with overdue debts, provisions for the NPLs; see, e.g., [11]. In this paper, we use the non-performing loan ratio of banks as a measure of the credit risk. Some previous studies analyzed this ratio to represent the NPLs [12]-[15]. As a result, a limited range of policies has been implemented to control non-performing loans levels, such as the minimum ratio of non-performing loans, restricting credit growth limit, tightening the use of short-term capital for medium and long-term loans. Thus, we recognize the importance of non-performing loans for the credit risk management at commercial banks. A non-performing loan (NPL) means a likely loss to a debt of a credit institution due to a client's failure to perform or the inability to fulfill part or all of its obligations according to its original commitment. In other words, the NPL arises because customers do not comply with the terms of the credit contract, such as customers paying late debt, paying debts inadequately, or not paying when the debt is due. Saba et al. (2012) [1] suggested that NPLs lead to financial losses and reduce the reputation of the Bank in the market. In the worst-case scenario, they may lead to serious losses and bankruptcy.

Serious NPLs can be the outcome of many causes, such as weak management, massive lending, limited institutional capacity, inappropriate credit policies, and loose status in the credit

risk assessment [16, 17]. The conditions for such causes come from outside and inside the bank.

The causes from outside the bank can be explained through the theory of financial acceleration of Bernanke et al. (1996) [18]. The authors found that, when the economy grows, micro factors must be the same direction, including credit growth for both corporate and private sectors. However, that growth process is fast and prolonged, to a certain extent, the economy move to another stage, which is the recession. However, the recession leads to lower business performance, and then individuals and businesses have to borrow at a higher cost. Therefore, pressure to pay loan costs increased rapidly, leading to insolvency. In 2008, the global financial crisis proved the theory of [18]. The financial accelerator model gets a lot of attention because it provides context to explain the actions of Fed is taking to minimize feedback loops or shorten their operating time.

The cause from inside the bank can be explained rely on the bank lending theory and lending cycles. Economists have proposed several theories of joint-liability lending that stress various aspects of its informational and enforcement advantages over other forms of lending. Ghatak and Guinnane (1999) [19] suggested that the banks that rely on joint liability to facilitate lending to the poor have a long time and are at present a common feature of many emerging economies. Hu (2017) [20] shows that in economic booms, banks lower standards by offering unscreened credit to any borrower, which results in many low-quality firms entering the pool. Dell'Araccia and Marquez (2006) [21] found that, as banks receive private information about borrowers and information asymmetries across banks decrease, banks could ease their lending standards, leading to equilibrium with deteriorated bank asset portfolios, lower profits, and expanded aggregate credit. These lower standards are associated with greater aggregate surplus and greater credit risk which could make the risk of financial instability. Asea and Blomberg (1998) [22] research the lending cycles theory suggest that lax-lending standards that tend to occur during expansions exert considerable impact on the dynamics of aggregate fluctuations.

## 2.2. The Cause of Non-Performing Loans and Credit Risk

*Macroeconomic Policy:* When the variables of the economy such as inflation (CPI), unemployment (UEP), etc. fluctuate, the government must implement suitable economic policies immediately to minimize the effects on the country's economy. Financial policies, monetary policies, development investment policies, etc. are the key and important policies affecting the country's economy in general and the banking industry in particular. These macroeconomic policies have an impact on NPLs. According to Yurdakul (2014) [23], factors such as inflation (CPI), unemployment (UEP), and GDP growth impact on the NPLs. Louzis et al. (2012) [3] found that the macroeconomic variables (GDP, unemployment, interest rates, public debt) impact on the NPLs. From the Legal Environment: The banking sector has a special impact on the economy of a country, and its business activities are related to many economic and social sectors. When the legal system is stable and healthy, the business environment of the bank will be favorable. In contrast, when the legal system has many loopholes, it is likely that the bank's operations can be manipulated, leading to the credit risk situations [24].

*From the Socio-economic Environment:* Banks are also affected by macroeconomic policies, such as monetary policy and fiscal policy. We can see this in the difficult period of Vietnam's economy during the global pandemic COVID - 19. When the State Bank followed the Government's policy, it introduced a series of adjustments related to such as interest rates, lending ceilings (interest rate ceiling), and reserve requirement ratios. The objective is to minimize risk as well as to orientate activities in keeping with the Government's guidelines. The concern is that a developing market creates an optimistic economic environment and vice versa, so that the recession is likely to create a pessimistic economic environment [25]. Following Jiménez et al. (2014) [16], when the government reduces interest rates, banks apply for riskier loans, with the outcome that banks experience a drop in income and are likely to

respond with lower loan standards with an aim to increase their customer base.

*From the Customer:* Saunders and Cornett (2007) [26] define the credit risk as a potential loss when a bank provides credit to a customer, meaning that the expected income from a bank loan is not always realized in terms of quantity and deadline. Similarly, the credit risk may be understood as losses that customers fail to repay debts together with the declining debt credit quality of their loans [27]. Unethical acts of borrowers such as frauds and law violations can also cause considerable losses for banks when borrowers use loans for concealed purposes and use them in high-risk activities. Businesses with poor business ability and organization leading to losses and being unable to repay loans borrowed from banks have also led to the rise of a non-performing loan ratio. The above discussions are the outcome of customer characteristics and behavior, and banks are often unable to accurately assess their impact, implying considerable risk exposure.

*From the Bank Itself:* Credit risk also comes from within the bank. According to Berger and DeYoung (1997) [28], the increase in non-performing loans is due to the weakness in the credit appraisal process before, during, and after lending, leading to the bank's wrong choice of lending customers (customers not eligible for loans). According to Wang et al. (2017) [29], the credit risk also occurs when the weak professional competence of employees in properly assessing the value of collaterals, businesses, and individual customers those are unqualified.

*For Credit-Granting Banks:* The results of several studies indicate that the credit risk is the main cause of bank bankruptcy [30, 31]. Credit risks cause great losses to banks such as increasing costs, decline in profits, and a reduced reputation of the bank in the market [27]. Credit risk may be both the oldest and the most important financial risk that leads to a financial crisis [30]. Credit risk increases costs and therefore reduces bank profits. Failure to recover the debt (principal, interest, and fees) results in the loss of banks' capital, while they still have to pay interest on operating capital, leading to losses. Berger and DeYoung (1997) [28] suggest that

when a bank incurs non-performance loans, it has difficulty in dealing with such as travel expenses, staff costs, and meeting expenses. In addition, the bank loses potential new loans, slowing down the credit cycle, and reducing the bank's effectiveness, with the overall outcome of deterioration in profits [32]-[35]. Credit risk reduces the reputation of banks and leads to the bank's bankruptcy. In addition, it becomes difficult for banks to provide credit when it is suffering a loss of capital from the credit risk. The outcome is that it becomes difficult to recover the credit granted to customers, at the same times as the bank must meet obligations on capital and interest on customer deposits, leading to the imbalance of the bank's revenues and expenditures. Ultimately, the bank is facing a liquidity risk, causing anxiety to customers, which reduces the reputation of the bank [30]. In this case, the bank is forced to narrow its business model as financial indicators decline, prestige and competitiveness decrease significantly. The final outcome is that the bank loses opportunities and the ability to accumulate capital, with a reduction of the bank's strength [36]-[38]. Without appropriate and timely remedies, that bank is in danger of bankruptcy [30, 31].

*For the Banking System:* A bank is a linked component of the banking system and socio-economic organization. For this reason, when a bank is insolvent and goes bankrupt, there are chain effects that adversely affect other banks and economic sectors. Following Kaufman and Scott (2003) [39] when the chain reaction and general shock caused by the systemic risk spread very quickly, there must be some direct or indirect link between the parties relating to risk. For banks, this direct relationship is expressed through deposits, loans, payment transactions on the system, and indirectly through contracts linked through the market serving function of deposits and loans [40]. Therefore, when the level of losses at a bank is sufficiently large, it will lead to the possibility of liquidity loss and create a shock to other banks following a chain effect. All of these have the potential to lead to an economic crisis as a consequence of the credit risk. We have seen the consequences of a big bank in the system having credit risk problems as an outcome of ignoring the liquidity risks

to the whole system. Many studies indicate the impact of the credit risk on the stability of commercial banks. For example, Ali and Daly (2010) [41] find that higher credit risks lead to the instability of commercial banks, and good risk management measures can help limit the bankruptcy of banks, even though a crisis period happens.

*For the Economy:* Banks play an important role in the economy. It is relevant to all economic sectors and is the channel that provides capital to the economy. Therefore, banks have a great influence on government policies such as monetary and financial policies. According to Tan [42], when the credit risk occurs, the bank's reputation and solvency are affected. Next, people and organizations that have deposited at the banks rush to withdraw money and terminate relations, resulting in a high bankruptcy risk of a bank. This, in turn, causes economic activities unstable and stagnant, with high inflation, unemployment and social evils.

In addition, when the lending policies of a bank is inappropriate, lending regulations, the credit assessment, control of lending activities, and the stages in the lending process are insufficiently managed [40]. Berger and DeYoung (1997) [28] reveal that banks using fewer resources to loan appraisal and supervision will reduce operating costs in the short term but face a trade-off with additional credit risk in the future. Clearly, banks require a strict lending process in accordance with regulations in order to reduce the credit risk and to ensure that the business activities of the bank are maintained at a high level. In short, following Das and Ghost (2007) [9], the underlying reason for the credit risk is that banks have not complied with the capital adequacy regulations.

## 3. Research Method

### 3.1. Research Model

Previous studies have examined the factors affecting the credit risk of banks represented by the non-performing loan ratio using a linear regression model. Many of these studies focus on the impact of factors on a non-performing

loan ratio. For example, Jiménez and Saurina (2018) [43] researched factors affecting the non-performing loans (NPLs), showing that the NPLs ratio is affected by credit growth, GDP growth rate, and bank size. Parab and Patil (2018) [44] investigating Indian banks report a negative relationship between NPLs and most macro variables. Baboucek & Jancar (2005) [45] highlight the impact of inflation and unemployment rates to the ratio of non-performing loans. Messai & Jouini (2013) [5] in a study of data from 85 banks in Italy, Greece, and Spain, determine a correlation between their non-performing loan ratio and other variables. Following from such studies, we consider a linear regression model as follows:

$$\begin{aligned} \text{NPL}_{i,t} = & \beta_0 + \beta_1 \times \text{PCR}_{i,t} + \beta_2 \text{LO}_{i,t} \\ & + \beta_3 \text{FOR}_{i,t} + \beta_4 \text{ROA}_{i,t} \\ & + \beta_5 \text{SIZE}_{i,t} + \beta_6 \text{GDP}_t \\ & + \beta_7 \text{UEP}_t + u_{it} \end{aligned} \quad (1)$$

where the dependent variable  $\text{NPL}_{i,t}$  represents a non-performing loan ratio of the bank  $i$  in year  $t$ ;  $\text{PCR}_{i,t}$  represents the allowance for the credit risk of the bank  $i$  in year  $t$ ;  $\text{LO}_{i,t}$  is calculated as the sum of bank loans to assets of the bank  $i$  in year  $t$ ;  $\text{FOR}_{i,t}$  represents the foreign investor ownership at the bank  $i$  in year  $t$ ;  $\text{ROA}_{i,t}$  represents the return on total assets of the bank  $i$  in year  $t$ ;  $\text{SIZE}_{i,t}$  represents the scale of bank  $i$  year  $t$ ;  $\text{GDP}_t$  represents GDP growth rate in year  $t$ ;  $\text{UEP}_t$  represents the unemployment rate in year  $t$ ;  $u_{it} = \eta_i + v_{it}$ ,  $u_{it}$  is an observed time-invariant effect; and  $v_{it}$  is a disturbance term;  $t = 1, \dots, T$  is the period time;  $i = 1, \dots, I$  is the bank observation.

The regressions allow us to analyze the factors affecting the NPLs ratio of commercial banks. Following Louzis et al. (2012) [3], when combining macroeconomic variables (GDP, unemployment rate, interest rates) with borrowing and public debt factors of the banks, we have a single dependent variable as the ratio of non-performing loans and 8 independent variables. The independent variables are divided into 2 groups, the internal factors, and the macroeconomic factors.

## 3.2. The Variables

### Dependent Variable

A non-performing loan ratio can be measured as the ratio of non-performing loans to total assets [11], or, alternatively, as the ratio of non-performing loans to total outstanding loans [46]. The former measure reflects the quality of the asset portfolio, while the latter measure reflects more exactly the quality of the loans. For this reason, in this paper, we choose to measure NPLs as the ratio of non-performing loans to total outstanding loans, reflecting the level of the credit risk measurement at commercial banks. Our research is thereby in the tradition of prior research, notably [13, 43, 47].

### Independent Variables

Loan Rate (LO): is linked with the non-performance loan ratio. Loan rate is determined by taking the total of outstanding credit in year  $t$  divided by the total annual asset in year  $t$ . Tole et al. (2019) [8], Khemraj and Pasha (2009) [48] confirmed that when credit grows, the credit risk reduce in total outstanding loans. However, Salas and Saurina (2002) [49], and Jiménez and Saurina (2018) [43] suggest a positive relationship between outstanding credit and the non-performing loans.

Provision for Credit Risk (PCR): is a provision for loans that are likely to lose capital. Allowance for credit losses is determined by the level of provision for credit losses on the total outstanding loans. Parab and Patil (2018) [44] use the credit risk contingency as their independent variable and report that the PCR has a positive effect on the NPLs. They also consider that the provision is able to reduce non-performing loans. Following Ahmad (2009) [50], when banks anticipate high capital loss, they create larger provisions to reduce income fluctuations as well as enhance their ability to make payments in the medium term. When a bank increases its risk to find a higher rate of return, it accepts the greater risk because it calculates its ability to offset those loans either through having a large reserve fund or by having a good risk management control system. In particular, Hasan and Wall (2004) [11] concluded that PCR has a particularly important correlation with the NPLs

in all countries considered, while their remaining independent variables may or may not be important.

Foreign investor ownership (FOR) is the percentage of foreign ownership in the banks. Based on the agency theory, a foreign investor's capital contribution to the banks cause two positive effects. Firstly, a positive effect on the bank's governance means that more foreign investors have better contributions to bank governance, thus creating more positive results [51, 52], especially in NPLs as well as business activities [53]. The second is the psychological effect of the investors in the market, especially emerging markets, an increasing foreign investors leads to the positive sign to the market price of the stocks because of their better knowledge in the investment decision [54]. In this article, the paper assesses whether there is a relationship between foreign ownership and bad debt of commercial banks or in other words, the increase of foreign ownership ratio in commercial banks contributes to a positive effect on non-performing loans or not.

Bank Size (SIZE): among the factors related directly to the bank that affect credit risk, bank size has also attracted a great attention [44, 55, 56]. These studies all report a negative relationship between bank size and the credit risk. It appears that the larger the bank's portfolio, the better its risk management system and management of the credit risk. Specifically, Parab and Patil (2018) [44] report that big banks often have greater expertise in managing its risk. In contrast, banks with a small portfolio of assets, tend to focus on credit growth with a higher level of risk in order to obtain higher profitability. In such studies, the bank size variable is measured as the natural base log of total assets. The scale of total assets of banks is often very large and in Vietnam, there is a significant difference between large banks and small banks and the natural base log of total assets is appropriate in capturing percentage changes between banks.

Return on total assets (ROA): Godlewski (2004) [57] finds that when banks have a high rate of return, they have an effective risk management system that minimizes the possibility of loan losses as both capital losses and settlement

costs, with NPLs and collaterals also reduced, similar findings [44, 57].

Gross Domestic Product (GDP): Tole et al. (2019) [8], Rajan and Dhal (2003) [12], Fofack (2005) [13], Touny and Shehab (2015) [14], Katuka (2017) [17], Jiménez and Saurina (2018) [43] and Dash and Kabra (2010) [58], and all find a strong inverse relationship between GDP growth and the ratio of non-performance loans. An increase in GDP indicates that the country's economy is in a period of growth, good businesses, strong consumption of goods and services, and stable investment activities, which contribute to a reduction in the risks of their loans, with a reduction in their non-performance loan ratio. In contrast, when an economy is in crisis or recession, poor business and enterprises conditions combined with a slow consumption of goods leads to bank loans at a higher risk of liquidation.

Unemployment Rate (UEP): The variable of the unemployment rate is used as an independent variable by such as [5, 45, 59]. When unemployment rises, the implication is that businesses encounter business problems and are obliged to lay off employees, combined with a reduced ability to pay their debts. In the face of such operational problem companies contract production, with the outcome of reduced borrowing for expansion. Identify the variables and hypothesis are provided in Tab. 1.

### 3.3. Data

Data for macroeconomic and bank-specific variables in this paper were collected from the State Bank of Vietnam website, the General Statistics Office of Vietnam website, the Audited financial statements, and annual reports of commercial banks from 2008 - 2019.

Data were extracted on a yearly basis, taking advantage of variables in the bank and macro variables in the economy. In particular, macroeconomic variables such as GDP growth rate, inflation rate (based on consumer price index) and unemployment rates were compiled from the website of the General Statistics Office of Vietnam. The bank-specific variables of non-

**Tab. 1:** Identify the variables and hypothesis.

Variables	Variable descriptions	Empirical Reference	Hypothesis
NPL	Non- Performance Loans: Non-performance loans / Total assets.	[13, 43, 47]	
PCR	Provision for credit risk = the level of provision for credit losses/ the total outstanding loans.	[5, 44]	+
LO	Bank loans to assets	[8, 48]	+
FOR	Foreign investor ownership	[51, 52]	-
ROA	Return on Asset = Net Income/ Total Asset.	[44, 57, 59]	-
SIZE	Size = Ln (Total Asset).	[44, 56, 57]	-
GDP	Gross Domestic Product Growth=Real GDP growth.	[8, 12, 14, 17, 43, 58]	-
UEP	Unemployment rate	[5, 45, 59]	+

**Tab. 2:** Descriptive statistics.

Variable	Mean	Median	Maximum	Minimum	Std. Dev.	Obs
NPL	0.0216	0.0195	0.1140	0.0026	0.0131	288
PCR	0.0132	0.0114	0.1049	0.0021	0.0078	288
LO	0.5516	0.5680	0.8517	0.1943	0.1284	288
FOR	0.0952	0.0259	0.3010	-	0.1115	288
ROA	0.0099	0.0080	0.1190	0.0001	0.0098	288
SIZE	32.1003	32.2336	34.8111	28.7091	1.2471	288
GDP	0.0617	0.0623	0.0708	0.0525	0.0063	288
UEP	0.0231	0.0225	0.0290	0.0199	0.0028	288

(Note: The variables NPL, PCR, LO, FOR, ROA, SIZE, GDP, UEP are given in Tab. 1)

performing loans, credit risk provision, loan rate, foreign investor ownership, return on assets, bank size were taken from the audited financial statements and annual reports of commercial banks.

We commence by applying descriptive statistical methods and correlation matrices to gain a visual view of the influence of macroeconomic and bank-specific factors on non-performing loans. We then use the common linear regression model (the pooled model - Pooled OLS), the fixed-effect model (FEM), and the random effect model (REM) to process panel data that includes cross-section data from the banks. We use the F-test to choose the more suitable model between Pooled OLS and FEM models, the Lagrange factor test (Breusch-Pagan Lagrange multiplier-LM) to select the appropriate regression model between the two models Pooled OLS and REM, and the Hausman test (Hausman-test) to choose the regression models most suitable between the FEM and REM models. With these three tests, we can choose the most suitable model among the three regression models. If the model has a variance change error (Heteroskedasticity), we will use the Generalized

Least Square (GLS) and use the results from this model to analyze and discuss research results.

## 4. Empirical Result and Discussion

### 4.1. Statistical Description

We exhibit the descriptive statistics of all variables being studied in our paper in Tab. 2. The table shows that the non-performing loans of commercial banks in the period of 2008 - 2019 remained below 3.0% with mean 2.19%, and fluctuated with a standard deviation of 1.31%. The lowest level of NPLs recorded in this period was 0.26% (Lien Viet Post Joint Stock Commercial Bank in 2009) and the highest level was 11.4% (Saigon Commercial Joint Stock Bank in 2010). We conclude that the current NPLs of the banking industry is currently at a safe level. Although a number of smaller banks may have weaker risk management systems, large banks appear to have exerted control over their risk



exposure. Descriptive statistics for variables is offered in Table 2.

## 4.2. Collinearity

The correlation between the independent variables in the model is displayed in Tab. 3. The correlation coefficient matrix reveals that the average correlation between variables ranges from 0.005 to 0.5355. The highest correlation is 0.5355 between SIZE and FOR, indicating that these variables have a positive correlation that is not significant (a significant correlation is above 0.8, and an absolute value of 0.9 or greater indicates a very strong relationship). Thus, the independent variables included in the model are appropriate for the regression model because the multi-collinearity phenomenon will be unlikely to occur.

Multi-collinearity is a phenomenon that occurs when there is a high correlation between two or more independent variables in the regression model leading to false outcomes [61]. To identify the possibility of a multi-collinear phenomena, we rely on the variance inflation factor (VIF) to determine the correlation between the independent variables in the model. VIF values commence from 1 with no upper limit. VIF values in the range 1 to 2, indicate that there is no correlation between the variables, a VIF value between 2 and 5 indicates a moderate correlation, and a VIF greater than 5 represents a high correlation leading to estimation results that are less convincing, and a  $VIF > 10$  implies a definite collinearity problem. Our multi-collinearity test provides VIF values for the independent variables in the range 1 to 2, confirming that we do not have a multi-collinearity problem with the regression model and that the P value is reliable.

## 4.3. Empirical Results

First, we use the regression model using the ordinary least squares (OLS). Based on this result, we check the suitability of the model. Next, we use the Fixed Effects Model (FEM) and a Random Effects Model (REM) method to verify whether the model has either a fixed effect

or a random effect. And finally, if the model has a change in the error variance, we use the generalized least squares (GLS) to overcome the model.

We used the Redundant Fixed Effects test to select whether the Pooled OLS or the FEM is more suitable for goals of the data. The first pair of null and alternative hypotheses is followed by:

$H_0$ : There are no differences between the observations (Pooled OLS)

$H_1$ : There are differences between the observations (FEM)

Table 4 present the results of the Redundant Fixed Effects tests for choosing between FEM and Pooled OLS. As the probability of the Cross-sectional Chi-Squared statistic is 0.0014, which is considerably lower than  $\alpha = 0.05$  (that is, a significance level of 5%), we reject  $H_0$  in prefer of  $H_1$ . Therefore, FEM is selected to be the master model.

To select the suitable model, we also use tests to choose between FEM and REM. The Hausman test is used to test the following REM null hypothesis against the FEM alternative hypothesis:

$H_0$ : There is no correlation between the independent variables and random elements (REM)

$H_1$ : There is a correlation between the independent variables and random elements (FEM)

Table 4 presents the Hausman test statistics for choosing between FEM or REM. The probability of the Chi-Squared statistic is 0.0092, which is lower than  $\alpha = 0.05$ . Hence,  $H_0$  is rejected in prefer of  $H_1$ , so that FEM is appropriate. So, FEM is more appropriate than REM, and we use FEM to analyze the results for NPL.

Besides, Tab. 4 shows that there are no significant differences between FEM and REM. Consequently, the choice of FEM is suitable.

Table 4 shows the results of testing the error variance using White's heteroskedasticity test.

**Tab. 3:** Correlation matrix.

Variable	PCR	LO	FOR	ROA	SIZE	GDP	UEP	VIF=1.257
PCR	1							1.119
LO	-0.0130	1						1.048
FOR	0.0729	0.1386	1					1.454
ROA	-0.0460	-0.0599	0.0089	1				1.102
SIZE	0.2744	0.1442	0.5355	-0.1446	1			1.702
GDP	-0.0461	0.1688	0.2348	-0.0825	0.3229	1		1.185
UEP	-0.1139	-0.1108	-0.2075	0.2690	-0.2785	-0.2173	1	1.190

(Note: The variables NPL, PCR, LO, FOR, ROA, SIZE, GDP, UEP are given in Tab. 1)

**Tab. 4:** Result of regression (Pool OLS, FEM, REM model).

Model	OLS	FEM	REM
PCR	0.463952***	0.475255***	0.463960***
LO	0.004634	0.000215	0.004198
FOR	-0.020819***	-0.043013***	-0.024228***
ROA	-0.197864***	-0.114751	-0.173294**
SIZE	-0.001310*	-0.002390	-0.001275
GDP	-0.365751***	-0.210407	-0.353867***
UEP	-0.684159**	-1.022481***	-0.728249***
Constants	0.097278	0.133764	0.096783
Obs	288	288	288
R-squared	20.77%	33.08%	20.80%
F test	10.48917	4.235452	10.50932
Redundant Fixed Effects tests	0.0014		
Hausman Test		(7) 0.0092	
White's heteroskedasticity test	(87.65981) 0.0000		

(Note: The variables NPL, PCR, LO, FOR, ROA, SIZE, GDP, UEP are defined in Tab. 1)  
 \*\*\*, \*\* and \* denote significance at the 1% 5%, 10% levels, respectively.  
 The P-values are in parentheses.

**Tab. 5:** Estimated Regression (GLS).

Variable	Coefficient	Std. Error	t-Statistic	Prob.
PCR	0.57576***	0.076707	7.505995	0.0000
LO	0.00353	0.004027	0.877350	0.3811
FOR	-0.01789***	0.005827	-3.070224	0.0024
ROA	-0.06550	0.045359	-1.444228	0.1499
SIZE	-0.00314***	0.000965	-3.263016	0.0013
GDP	-0.19170**	0.079852	-2.400771	0.0171
UEP	-0.78261***	0.151577	-5.163135	0.0000
C	0.14536***	0.029571	4.915793	0.0000
Adjusted R-squared	0.5734			
Durbin-Watson	1.395			
No. of Observations	288			
F-statistic	11.517			
Prob (F-statistic)	0.0000			

(Note: The variables NPL, PCR, LO, FOR, ROA, SIZE, GDP, UEP are defined in Tab. 1)

The probability of the Chi-Squared statistic (24) is  $0.0000 < 0.05$  (at the 5% significance level). Thus, the null hypothesis is rejected, with shows that the model has volatility in the error variance. So, the results must be re-conducted after

correcting for autocorrelation and volatilities in the error variance.

To overcome volatility in the error variance, we use generalized least squares (GLS) to es-

timate for equation (1). The final results are shown in Tab. 5.

Regression results between the FEM model (Tab. 4) and the GLS model (Tab. 5) have no difference. After correcting for variables errors variance by GLS model, the final identification of the regression equation is as follows:

$$\begin{aligned} \text{NPL} = & 0.145 + 0.5756\text{PCR} - 0.01789\text{FOR} \\ & - 0.00314\text{SIZE} - 0.1917\text{GDP} \\ & - 0.78261\text{UEP} \end{aligned} \quad (2)$$

The provision for credit risk (PCR) has a positive impact on the NPL ratio at a significant level of 1%. The regression coefficient of the PCR variable is 0.5756, indicating that when the credit risk provision ratio of commercial banks increases by 1%, the non-performance loan ratio increases by 0.5756%. This result is consistent with the results [5, 44]. Moreover, more bad loans lead to higher provision which can impact the bank performance because the provision is generated from profit. Then, the bank will get higher financial leverage which can cause financial bubbles of bank's credit risk [29].

The foreign investor ownership (FOR) negatively affects the non-performing loan ratio at a significant level of 1%. With the regression coefficient of  $-0.01789$ , when the FOR increases by 1%, the NPL will decrease by 0.01789%. In an emerging market such as Vietnam, increasing the foreign ownership ratio in banks is necessary for developing the financial market. The results of this study confirm the big role of foreign investors in the development of the financial market. This is in line with the State Bank policies when the commercial banks increase the ownership rate of foreign investors in recent years [52]. The results explain that when domestic banks have foreign institutional shareholders, these organizations ameliorate to risk management, especially credit risk.

Bank Size (SIZE) negatively impacts the non-performing loan ratio at a significant level of 1% and has a regression coefficient of  $-0.00314$ . With this regression coefficient, when the Bank Size increases by 1%, the non-performance loan ratio of commercial banks decreases by 0.314%. This result is consistent with the results [7, 9, 12, 38]. The rapid increase in bank size can

contribute to profitability, but in terms of efficiency, including the effect of bad debt which needs to be considered. This result helps managers to decide between short-term benefits and long-term benefits. This means that the banks can increase the scale, but they must pay attention to operational efficiency and ultimately financial efficiency [48, 51].

The GDP growth rate negatively impacts the non-performing loan ratio at a significant level of 5% and has a regression coefficient of  $-0.1917$ . With this regression coefficient, when the GDP growth rate increases by 1%, the non-performance loan ratio of commercial banks decreases by 0.1917%. This result is consistent with the results [9, 12, 38]. Growth pressure has always existed in developing countries [48]. However, from a micro perspective, banks also need to pay attention to governance efficiency. In developing countries, including Vietnam, the expansionary of credit policies can be applied in the developing periods which may cause the increase of bad debts. Then, the governments and central banks in developing countries need to trade-off between growth and micro factors [12]. Furthermore, commercial banks need to have better policies to control bad debt, when the economy grows.

Unemployment rate (UEP) has a negatively impact on the NPL ratio at a significant level of 1%. The regression coefficient of the variable UEP is  $-0.78261$ , so that when the unemployment rate increases by 1%, the non-performance loan ratio will tend to decrease by 0.78261%, and vice versa. This result is contrary to the results of [5, 41, 45]. This is a great difference between Vietnam's economy and other economies. Although unemployment increased, bad debt decreased, the reason could be explained that most loans focus on doing small business and real estate investment. Then, these reasons can be interpreted for different the results of this paper from previous studies.

## 5. Conclusions

To identify the factors associated with the credit risks of commercial banks, we have used

the NPL ratio to represent such credit risks. Thereby, we seek to offer appropriate policy solutions aimed at stabilizing the banking system and the economy. In addition to offering a theoretical foundation, we have synthesized domestic and foreign studies related to the issue of the non-performing loan ratio in commercial banks; which means the impact of factors relating to the bank directly as well as the factors of the prevailing macroeconomic.

Although a number of previous studies show that non-performing loans relate to micro and macro variables, very few papers have been researched in a developing country such as Vietnam. Nevertheless, the characteristics of the economy in Vietnam differ considerably from those of the majority of countries that have been considered in previous papers. It is therefore noteworthy that our empirical findings regarding the factors that affect the non-performing loans are generally consistent with those of previous studies, despite differences in the levels of impact.

Following the methodology of previous studies, the results indicate that all the independent variables in the model affect the non-performing loan ratio (the variables having a positive impact on the NPL are PCR, and the variables having a negative impact on the NPLs are FOR, SIZE, GDP and UEP), revealing that NPLs at commercial banks in Vietnam are affected by many factors both internal and external factors of the bank. Thus, in order to manage and minimize risks, the SBV as well as the banks themselves need to understand the core causes as they directly relate to the bank in the context of the prevailing economic environment. Especially, related to the new factor that is foreign investor ownership, the State Bank should promote commercial banks to restructure their ownership and expand the room to a maximum of 30% foreign ownership according to current regulations (Decree No. 01/2014/ND-CP). In near future, the State Bank should increase the foreign ownership limitation or tend to remove the foreign ownership limitation to promote efficiency and reduce non-performing loan.

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