

## The Relationship between Credit Risk and Bank Financial Stability: The Mediating Role of Bank Profitability

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**Abstract:** This study aims to investigate the influence of credit risk on bank financial stability of Vietnamese commercial banks, understanding the impact channels and patterns of Vietnamese commercial banks in particular by proposing implications for solutions to reduce credit risks and promote financial stability for banks. We employed the POOL, FEM, REM, GMM techniques, and Monte Carlo approach and used secondary data collected from 2005 to 2019. The findings reveal a direct relationship between bank credit risk, profitability, and bank financial stability, as well as a partly indirect association. The above suggests that bank credit risk and bank profitability can explain the stability of the Vietnam commercial banking sector. In the first step, we examine the relationship between bank credit risk and bank profitability. The findings reveal that size and previous period profitability positively affect bank profitability, while non-performing loans, loan loss provision, non-interest income, efficiency, and bank credit growth positively correlate with bank profitability. Bank profitability does not affect bank credit risk. In the second phase, we examine the effects of bank profitability on bank stability. Regression results demonstrate that previous-period profitability and bank stability impact current-period bank financial stability. We test the impact of bank credit risk on bank financial stability in the third step, and the results suggest that non-performing loans, non-interest income, loan loss provision, and prior bank stability positively impact current bank financial stability. This study offers a new understanding of the channel's effect of credit risk on bank financial stability. The results indicated that the credit risk had a direct and partly indirect impact on bank financial stability.

**Keywords:** profitability, financial stability, bank credit risk, Monte Carlo approach, commercial bank.

### 信用風險與銀行金融穩定的關係：銀行盈利能力的中介作用

**摘要：**本研究旨在調查信用風險對越南商業銀行金融穩定的影響，了解越南商業銀行的影響渠道和模式，特別是通過提出降低信用風險和促進銀行金融穩定的解決方案的啟示。我們採用了水池、有限元法、快速眼動、GMM技術和蒙特卡羅方法，並使用了2005年至2019年收集的二手數據。研究結果揭示了銀行信用風險、盈利能力和銀行金融穩定性之間的直接關係，以及部分間接的關係。協會。以上表明銀行信用風險和銀行盈利能力可以解釋越南商業銀行業的穩定性。第一步，我們考察銀行信用風險與銀行盈利能力之間的關係。研究結果表明，規模和前期盈利能力正向影響銀行盈利能力，而不良貸款、貸款損失準備金、非利息收入、效率和銀行信貸增長與銀行盈利能力正相關。銀行盈利能力不影響銀行信用風險。在第二階段，我們考察了銀行盈利能力對銀行穩定性的影響。回歸結果表明，前期盈利能力和銀行穩定性影響本期銀行金融穩定性。我們在第三步中檢驗了銀行信用風險對銀行金融穩定性的影響，結果表明不良貸款、非利息收入、貸款損失準備金和之前的銀行穩定性對當前銀行金融穩定性有正向影響。本研究為信用風險對銀

行金融穩定的渠道影響提供了新的認識。結果表明，信用風險對銀行金融穩定性有直接和部分間接的影響。

**关键词：**盈利能力、金融穩定性、銀行信用風險、蒙特卡洛方法、商業銀行。

## 1. Introduction

Financial stability is the foundation of any country's long-term economic growth. As a result, governments, international institutions such as the World Bank and the International Monetary Organization, and all regions worldwide are paying attention. Money and banking are very sensitive field that is influenced by various factors. As a result, bank and monetary stability are crucial aspects in achieving financial stability.

A commercial bank is one of the largest financial institutions in the financial system, providing capital to firms, households, individuals, and other organizations. This type of bank serves as the economy's primary financial intermediary. Their operations have a significant impact on other entities, particularly corporations, and hence impact economic growth. Since then, the bank's operations have received much attention from the economy's subjects, especially when it comes to bank efficiency. There was a relationship between profitability and liquidity in 12 European, North American, and Australian banks [8, 9]. American banks' profitability and capital ratio had a positive relationship [6]. Non-performing loans are one of the most critical aspects that directly impact bank profitability, and this relationship has been established in numerous studies [17].

Theoretically, credit risk is the most significant risk resulting from the operational nature of commercial banks. Credit risk is caused by adverse selection and moral hazards. Commercial banks' profitability is affected by this risk. Commercial banks must recover all loans to clients to earn high profits; only a small percentage of non-performing loans can cause commercial bank failures [1]. Because of its significance, the banking system is governed by various laws. The Basel Accord, produced by the Basel Committee, is one of the principles used by the global commercial banking system in its governance process. Up to now, Basel has undergone three revisions, helping banks to maintain a stable position in the complicated fluctuations of the financial market. Credit risk management is one of the contents identified by the Basel Committee because effective credit risk management will help banks increase profitability, which will help the bank system to become more stable, contribute to financial system stabilization, and better allocate capital in the economy.

After the recent financial crisis, the number of bankrupt banks grew, resulting in a slew of complex and challenging issues. These issues are clearly stated in bank financial statements, from which the global financial market has placed a greater emphasis on the commercial banking system's business performance, particularly credit risk [4].

As the main source of capital in the economy, the profitability of Vietnam's commercial bank system greatly impacts the operation of corporations and the stability of the financial system. From 2015 to 2018, profitability improved markedly, increasing from 6.42% in 2015 to 9.06% in 2018. Since the global financial crisis in 2008, the profitability of Vietnam commercial banks has improved at a faster rate than the rest of Southeast Asia. According to the National Financial Supervisory Commission, non-performing loans and growing costs are important challenges for the banking industry. The total value of non-performing loans of 22 banks to March 2019 was about VND 84 trillion, an increase of more than VND 4.6 trillion, about 5.9% compared to the end of 2018, while the growth of outstanding loans was only 3.46%, of which 15 banks have increased NPLs. Among the non-performing loan groups, the owe losses-loss loans account for a high proportion, affecting credit growth; the credit growth of this period was lower than in 2017 and 2018.

The owe losses-loss loans account for a large share of non-performing loans, which impacts credit growth; credit growth in this period was lower than in 2017 and 2018. The decline in bank credit growth and the high level of non-performing loans significantly impact the income and efficiency of the Vietnam commercial banking system. For example, due to high non-performing loans, the Bank for Investment and Development of Vietnam (BIDV), the largest bank in Vietnam in 2019, has to make provision, and profit after provisioning has fallen by nearly 80% compared to the original. The State Bank has selected as a stage in developing a safe, healthy, competitive, and sustainable banking system in its banking sector development strategy. As a result, bank stability has been identified as a critical goal for the banking system. In order to strengthen bank stability, improve efficiency, and reduce bank credit risk in the future, Vietnam's banking system will need to implement effective and appropriate

management measures, as well as identify overall factors, including internal and external factors, to make appropriate forecasts and strategies for hedging the increasingly complex macroeconomic developments.

## 2. Literature Review

Credit risk is a potential change in net income and market value of capital resulting from a client's failure to pay or make a late repayment and the biggest risk in an accounting book of a bank. If not properly managed, it can weaken a bank's financial state [17]. The Basel Accord issued in 1999 defined credit risk as a potential risk in which the customer can not meet its obligations under the agreed terms. In 2001, Basel identified additional credit risk as to the main risk in the operation of commercial banks, the risk associated with the bank's key activities, related to capital mobilization and lending. So, credit risk is the risk arising in the process of credit extension of banks, in which customers cannot repay debts or repay debts on time.

The impact of credit on bank profitability received great interest from researchers. The results showed that credit risk impacted bank profitability of the commercial banks in the emerging market from 2007 to 2015 [18]. Internal factors such as loan loss provision, the ratio of equity to total assets, and operating costs impact bank profits with high significance in Greek banks from 1985 to [17]. After the financial crisis in 2008, the credit risk of the British commercial banking system remained at an acceptable level, and the commercial banks were still performing optimally, gaining interest income and non-interest income. The results also show that bank size, financial leverage, and bank credit growth positively impact the dependent variables. When conducting a study on ten banks listed in Nigeria from 2007 to 2011, the results show the opposite results, non-performing loans hurt the profitability, the coefficient of loans has no impact on the bank profitability. Bank profitability is also affected by Capital Adequacy Ratio, and the previous research shows that CAR is negatively correlated with ROA and ROE with high significance [16].

Bank profitability is defined as the ability to minimize costs or maximize banks' profit, reflected in the relationship between output and input of commercial banks. Commercial banks generate the largest output with the smallest input. Bank profitability is interested in managers and investors because high profitability will help banks preserve capital, increase market share and attract investment. Bank profitability is the net income after tax of commercial banks, which is the bank's net profit, involving the return on the initial investment, which is an increase in profit compared to operating costs. This ratio is used to measure the profit made by the

bank based on revenue, capital, assets, and earnings per share. Bank profitability is one of the indicators showing growth and success in banking operations, which is the final goal of investment, demonstrating the efficiency of resource management, expressed in two ways, including accounting and economic profit. Corporations often have more benefits when profitability increases. Theoretically, ROE is favored more than other indicators [15]. In an increasingly competitive environment, bank profitability is one of the key factors that help the bank operate smoothly continuously and directly impact its development process.

Bank financial stability is the status of effective implementation of important economic functions such as resource allocation, dispersion, and risk handling, which can fully absorb the shock the system faces, assess changes in financial risks, and effective allocation of resources. Bank financial stability shows the flexibility of all financial-related activities and sectors to minimize losses and bank crises. Bank instability comes from inefficient banks leading to liquidity risk, which leads to shocks and economic efficiency is likely to be reduced due to financial fluctuations. Z-score is considered an indicator of bank financial stability and is widely used by many scholars. A higher Z-score indicates a more stable bank [5].

Because of this importance, some studies have been carried out to test and identify signs of instability to take countermeasures. The research on the agricultural banking system in Ghana shows that when the bank size increases, the financial stability of the bank also increases, the risk of capital mobilization and the stability of the bank also tend to fluctuate in the same direction [3]. The research on determinants of bank stability identified the differences between 13 commercial banks and a cooperative bank; the results show differences between 13 commercial banks and cooperative banks [10].

In order to study the relationship between bank credit risk and bank profitability, the research used theories including Efficiency Theory, The Agency Cost Theory, Signaling Theory, and Asymmetric Information Theory.

Efficiency theory states that well-managed and efficient banks give more profit. Efficient management not only increases profits but also helps banks increase market share and improve market concentration. For the banking industry, the efficient theory said that large banks have better governance and management experience, reducing operating costs and increasing profit more than small banks. Besides, the efficiency theory also suggests that efficient operation affects bank profitability by reducing operating costs.

The agency cost theory assumes that managers use the financial structure as a means of dealing with cash flow problems. In the organizational structure of joint-stock enterprises, managers and owners are two different objects in which managers represent the owner to manage the company, and they may take actions that are inconsistent with the owner's goal resulting in agency costs. This cost is divided into three sub-groups: management supervision, bond, and the remaining costs [2].

Theoretically, agency costs and profitability tend to fluctuate in opposite directions. Signaling theory says that the best performing or profitable firms often provide good and positive information to the market. This theory confirms the relationship between profit and capital structure because low debt ratio capital growth signals positive bank operations. Many scholars have provided various information about this effect. Macao's research results showed that capital has a strong influence on profitability, asset quality is negatively correlated with profitability, and the profitability of large banks is not higher than small banks. Among macro variables, only inflation shows a relationship with profitability. The research conducted in Nigeria found that factors affect the bank's profitability, including loan quality, bank size, capital adequacy, and operating cost [12]. The research in Western European banks shows that capital ratio and credit risk are the two main determinants of profitability. Liquidity and GDP rate has a positive relationship with profitability; inflation is negatively correlated with the profitability of the bank [14].

Asymmetric Information Theory says that it is difficult to identify whether the customer is good or bad in marketing financial services. Asymmetric information occurs when one party has more information about the partner in the loan agreement. The theory also states that people with more information will negotiate better in transactions. Moral hazard and the adverse selection results from the asymmetric information between borrowers and lenders create credit crises, thus affecting the efficiency and bank financial stability [7].

The purpose of this study was to investigate the relationship between credit risk and bank financial stability in the Vietnam commercial banking system and to provide management implications to improve bank financial stability.

The specific goal is to examine the relationship between credit risk and bank profitability, credit risk and bank financial stability, and the relationship between bank profitability and bank financial stability in a Vietnamese commercial bank. Then, provide strategies to reduce bank credit risk and increase bank financial stability for commercial banks in Vietnam.

### 3. Data and Methodology

#### 3.1. Research Data and Estimation Methodology

The study employs a panel of 286 observations gathered from financial statements from 2005 and 2019, with some data from Bankscope and some microeconomic data from the ADB Indicators. The data is solved using the BK approach because there is a mediation link between credit risk and bank financial stability.

According to the BK approach

, to measure all relationships between variables in the model. The first step will establish the model's direct relationship between variables. There is no mediating if the measurement result has a model that is not statistically significant, then the researcher should end. On the other hand, if all models are statistically significant, move on to the next step. The outcome of Sobel's coefficient will be used in the second step to conclude the model's intermediate relationship. The research employs time-series data to check the direct relationship, and the model estimation methods used are Pooled OLS, FEM, REM, GLS, and GMM.

#### 3.2. Model and Hypotheses

Empirical studies on credit risk and bank performance, with three primary study trends: examining the relationship between profitability and bank financial stability, credit risk and bank profitability, and credit risk and bank financial stability. The above is the foundation for selecting the right research models. Multivariate regression models with panel data for commercial banks in each nation or many countries are used in most empirical research models. There are two explanations for this study's approach to model selection research. First, use panel data from Vietnam commercial banks from 2005 to 2019 to construct a multivariate regression model. Second, the authors used a multi-collinear test, variance change, and autocorrelation to check that the regression model estimation was accurate and that the proper variables were chosen. Furthermore, to assess the hypotheses proposed, pooled OLS, FEM, REM, GLS, and GMM methods are used; this approach is consistent with research trends.

The selection of basic variables and making research hypotheses are mainly based on empirical evidence, mainly from the previous research [18].

The thesis proposes three models for three phases: the first will determine the factors that affect a bank's credit risk, the second will investigate the impact of profitability on bank profitability, and the third will

examine the impact of credit risk on bank financial stability. In the first phase, create the following model:

$$ROE = \alpha_0 + \sum_{j=1}^J \beta_j X_{it}^j + \varepsilon_{it} \quad (1)$$

where ROE is the bank profitability of bank  $I$ ,  $\alpha_0$  is a constant,  $X$  are independent variables, group  $j$  includes internal factors of the bank (liquidity, non-performing loan, loan loss provision, bank size, leverage, non-interest income, efficiency, bank credit growth).  $\beta_j$  is the effect of the lag variable on the bank performance.  $\varepsilon_{it}$  is the disturbance. Variables of the model are shown in Table 1.

Table 1 Variables of the model (1) (Summary of previous studies)

Variables	Description	Expected effect	Authors
Non-performing loan (NPL)	Non-performing loan/ Total Loans	-	[18]
Loan loss provision (LLR)	Loan loss provision/ Total Loans	-	[18]
Leverage (LEV)	Liabilities / Total Asset	+	[1]
Non-interest income (NII)	Non-interest income/ Total income	+	[11]
Bank Size (SIZE)	Natural log total assets	+	[18]
Efficiency (EFF)	Operation cost /Operation income	-	[18]
Liquidity (ETA)	Equity/ Total asset	-	[18]
Bank credit growth (CRG)	(Total loans at year t – Total loans at year t-1)/ Total loans at year t-1	-	[18]

The research uses a model in the second phase to analyze the relationship between bank financial stability and bank profitability:

$$y_{it} = \bar{\theta}_0 + \bar{\theta}_1 y_{i,t-1} + \bar{\theta}_2 y_{i,t-2} + \theta_1 x_{i,t-1} + \theta_2 x_{i,t-2} + u_t + \delta_i + m_{it} \quad (2)$$

where  $y$  is bank profitability (ROE) or bank stability (Z-score),  $i$  and  $t$  represent the bank  $i$  in year  $t$ ,  $\bar{\theta}_0$  is the intercept,  $\bar{\theta}_1, \bar{\theta}_2, \theta_1, \theta_2$  are the coefficients to be estimated,  $u_t$  is the time effect,  $\delta_i$  stands for individual bank effect, and  $m_{it}$  is the error term,  $m_{it}$  is the error term.

$$Z\text{-score} = [E(\text{ROAA}) + \text{Ebq}/\text{Abq}] / \sigma(\text{ROAA})$$

where ROAA is the return on average of total assets, Ebq/Abq is the average equity ratio to an average of total assets,  $\sigma(\text{ROAA})$  is the standard deviation of ROAA

Model in the final phase used to study the impact of profitability on bank financial stability.

$$Z\text{-score} = \bar{\theta}_0 + \sum_{j=1}^J \theta_j X_{it}^j + e_{it} \quad (3)$$

where ROE is bank performance  $i$ ,  $\bar{\theta}_0$  is a constant,  $X$  are independent variables, group  $j$  includes internal factors of

the bank (liquidity, credit risk, capital ratio, bank size, operating expenses),  $\theta_j$  is the effect of the lag variable on the profitability of the bank,  $e_{it}$  is the disturbance. Independent variables of the model are shown in Table 2.

Table 2 Variables of the model (3) (Summary of previous studies)

Variables	Description	Expected effect	Authors
Liquidity (ETA)	Total Loans/ Total Assets	+	[13]
Non-performing loans (NPL)	Non-performing loans / Total Loans	-	[13]
Loan loss provision (LLP)	Loan loss provision/ Total Loans	-	[13]
Efficiency (EFF)	Operation cost / operation Income	+	[13]
Bank size (SIZE)	Natural log total assets	+	[11, 13]
Non-interest income (NII)	Non-interest income/ Total income	+	[13]
Bank credit growth (CRG)	(Total loans at year t – Total loans at year t-1)/ Total loans at year t-1	-	[13]

#### 4. Empirical Analysis of the Results

Table 3 displays the research's descriptive data that implies that the mean, maximum, minimum, and standard deviation represent the dispersion between observations in the sample. The values of variables are distributed unevenly using the mean and standard deviation. The data is unbalanced.

Table 3 Descriptive statistics (Calculating from Stata)

Variables	Obs	Mean	Standard deviation	Min	Max
NPL	349	.0198	.0135	.0002	.1032
ROE	384	.0986	.0829	-.82	.3714
SIZE	384	17.9505	1.5500	11.8835	20.9956
NII	383	.2199	.6205	-2.1087	11.6503
LEV	384	.8897	.1341	-.422	1.7112
EFF	375	.5024	.1916	.1741	2.2091
CRG	380	.4343	1.0205	-1	11.3268
ETA	380	.1023	.0616	.0041	.4624
LLR	386	.3474	4.3915	-.0071	86.3019
Z_score	371	2.2626	1.8040	.0528	12.5477

The correlation coefficient matrix in the three models reveals that the correlation coefficients are relatively small, indicating no serious multi-collinear phenomena due to the low correlation coefficient value and that the comparison standard is 0.8. Checking the multicollinearity phenomenon with the VIF coefficient shows that the VIF of all independent variables is less than 10.

Firstly, the research used a regular panel data regression model with the Pooled OLS method to estimate regression equations and evaluate some OLS model hypotheses. The research then estimated all three models: pooled, FEM, and REM, but due to the variance change, the REM model was chosen. White test results with Prob> chi2 = 0.0000, less than 1%, so the research will eventually regress according to the GMM method. The results of the regression of model 1 are shown in Table 4.

Table 4 Regression results of the model (1) (Calculating from Stata)

Variables	POOL ROE	FEM ROE	REM ROE	GMM ROE
SIZE	0.0123*** [4.39]	0.0102*** [2.70]	0.0113*** [3.42]	0.0153*** [4.81]
NII	-0.0750*** [-17.88]	-0.0770*** [-19.55]	-0.0765*** [-19.83]	-0.0827*** [-28.98]
LEV	0.0840*** [2.74]	0.0832*** [2.81]	0.0830*** [2.88]	0.0552 [1.45]
LLR	-1.456*** [-4.17]	-1.909*** [-5.29]	-1.818*** [-5.24]	-1.980*** [-7.88]
EFF	-0.318*** [-15.63]	-0.306*** [-14.02]	-0.312*** [-15.17]	-0.283*** [-19.06]
CRG	-0.00177 [-1.09]	-0.00125 [-0.84]	-0.00127 [-0.87]	-0.00307*** [-3.26]
NPL	-0.425 [-1.51]	-0.326 [-1.17]	-0.322 [-1.19]	-0.756* [-1.67]
ETA	-0.0879 [-1.18]	-0.122* [-1.71]	-0.111 [-1.59]	-0.0700 [-0.99]
L.ROE				0.197*** [2.59]
_CONS	0.00518 [0.08]	0.0440 [0.58]	0.0232 [0.34]	-0.0468 [-0.57]
N	317	317	317	274
R-SQ	0.672	0.696		

Notes: t statistics in brackets  
\* p < 0.1  
\*\* p < 0.05  
\*\*\* p < 0.01

The data was processed using four methods in model 2, including Pooled OLS, FEM, REM, and GLS, but due to the variance change, the White test results Prob> chi2 = 0.0000, less than 1%, therefore the research will regress using the GLS method. The result is shown in Table 5.

Table 5 Regression results of the model (2) (Calculating from Stata)

Variables	Pooled OLS Z_score	FEM Z_score	REM Z_score	GLS Z_score
ROE	-4.585*** [-4.26]	-4.202*** [-3.45]	-4.433*** [-3.94]	-1.775* [-1.66]
L.Z_score				0.391*** [27.97]
_cons	3.626*** [26.13]	3.588*** [24.23]	3.616*** [21.44]	2.228*** [28.26]
N	382	382	382	324
R-sq	0.046	0.033		

Notes: t statistics in brackets; \*p < 0.1, \*\* p < 0.05, \*\*\* p < 0.01

The research employs four estimation methods: Pooled OLS, FEM, REM, and GMM to test model 3. Autocorrelation phenomena, variance change, and multicollinearity are not observed, and the estimation results in Table 6 show that the GMM approach is the most appropriate.

Table 6 Regression results of the model (3) (Calculating from Stata)

Variables	Pool OLS zscore	FEM zscore	REM zscore	GMM zscore
CRG	9.534*** [3.32]	15.37*** [5.31]	12.75*** [4.48]	-14.48 [-0.74]
EFF	2.572*** [3.85]	0.890 [1.21]	2.032*** [2.98]	-0.505 [-0.69]
LLR	30.43** [2.39]	28.11** [2.02]	30.81** [2.33]	26.83* [1.87]
NPL	-19.26*** [-2.64]	-19.85*** [-2.81]	-20.33*** [-2.88]	-20.97*** [-3.54]
LEV	0.00749 [0.01]	0.156 [0.13]	0.0240 [0.02]	-33.51 [-1.56]
NII	-0.964 [-1.55]	-1.231* [-1.85]	-1.208* [-1.89]	-2.613*** [-4.36]
SIZE	0.266*** [2.60]	0.853*** [6.24]	0.502*** [4.38]	0.0269 [0.05]
L.zscore				0.121*** [3.24]
_cons	-4.479* [-1.84]	-14.95*** [-5.27]	-8.734*** [-3.44]	34.07 [1.60]
N	326	326	326	270
R-sq	0.100	0.207		

Notes: t statistics in brackets; \*p<0.1, \*\* p<0.05, \*\*\* p<0.01

The indirect relationship between bank stability, credit risk, and bank stability is verified using Sobel's test in the final step, and the estimated results in Table 7 reveal a partial mediation relationship between the three variables.

Table 7 The result of Sobel's test (Calculating from Stata)

Estimates	Delta	Sobel	Monte Carlo
Indirect effect	9.065	9.065	9.110
Std. Err.	2.680	2.680	2.790
z-value	3.383	3.383	3.265
p-value	0.001	0.001	0.001
Conf. Interval	3.814 , 14.317	3.814 , 14.317	3.807 , 14.606

Baron and Kenny approach to testing mediation  
STEP 1 - roe:npl (X -> M) with B=-1.5e+03 and p=0.000  
STEP 2 - zscore:roe (M -> Y) with B=-0.006 and p=0.000  
STEP 3 - zscore:npl (X -> Y) with B=-17.602 and p=0.008  
As STEP 1, STEP 2 and STEP 3 as well as the Sobel's test above are significant, the mediation is partial.

The findings of model 1 suggest that the previous year's bank size and profitability positively impact bank profitability. Bank profitability is negatively correlated with non-interest income, loan loss provision, bank credit

growth, and non-performing loans. These results are consistent with the previous study [3, 11, 6].

Non-performing loans, loan loss provision, non-interest income, and bank stability in the previous period all have an impact on bank stability, according to research findings. These results are consistent with the study [18, 13].

The research findings after three steps and the Sobel test demonstrate that the mediation relationship is partial, implying that credit risk impacts bank financial stability through bank profitability. Credit risk and bank profitability are both important factors in the stability of the Vietnam commercial banking system:

- Non-performing loans influence bank profitability, but bank profitability does not influence non-performing loans;

- Bank profitability impacts bank financial stability;

- Non-performing loans impact bank financial stability;

- Non-performing, bank profitability, and Z-score are partial relationships; bank stability is explained by two variables: non-performing loans and bank profitability.

## 5. Conclusion and Policy Implications

### 5.1. Conclusion

The findings of the research models show that NPL has a direct impact on ROE and Z-score and that ROE has a one-way impact on Z-score. Because the first model does not reveal that the ROE is negatively correlated with the NPL, the investigation of the contrary effect will end immediately. The relationship between NPL, ROE, and Z-score is a partial mediation relationship of indirect effects. By combining these relationships, it is possible to say that the bank's financial stability is explained by both variables, including credit risk and bank profitability. Credit risk directly relates to bank stability; as credit risk increases, so does bank financial stability. As a bank's profitability improves, its stability tends to decline. When credit risk increases with improved bank profitability, bank volatility is expected to rise. Recommendations for decreasing credit risk and increasing bank financial stability have been based on this finding. The research novelty lies in the impact of credit risk on bank stability. A bank's operations are affected by many different types of risks, which directly impact a bank's profitability. Besides, risks also have an indirect impact on bank operation; if these risks are well controlled, profitability will create an indirect impact on bank stability. If credit risk is effectively managed, other risks such as liquidity risk, market risk, and operational risk are well managed, the bank's stability will increase.

The research was done on the case of Vietnam, but no comparisons were made with other countries.

### 5.2. Policy Implications

The study's findings suggested implications for managing a Vietnam commercial bank's credit risk management strategy.

Firstly, banks must improve credit risk governance to minimize the loan loss provision ratio. Commercial banks should focus more on lending to reduce non-performing loans rather than extending to consumers with weak financial capability.

Secondly, banks must classify loans and make provisions for credit losses based on the combination of internal credit ratings according to existing requirements, enhancing inspection and supervision in the debt classification process. The bank should accept a reduction in profits due to the provision, as this income will be used to handle loans when non-performing loans occur, avoiding a bank crisis based on bad debt and excess liquidity.

Finally, banks must develop and enhance their risk management systems to meet Basel II requirements. One of the most important steps in the credit risk management process is identifying risk indications. The bank's most important and least expensive is identifying the warnings for a loan with a risk of exceeding the acceptable threshold. One of the areas that need to be improved and carried out regularly and continuously is credit risk identification and forecasting.

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