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The Effect of Credit Risk on the Financial Performance of Commercial Banks in Vietnam

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Abstract

Creating credit is the main income-generating activity for banks. However, granting credit always comes with risks. Credit risk is the risk of losing part or all of a debt due to failure to pay on time or default. Credit risk is considered the most important risk affecting banking performance. Therefore, this study measured the effect of credit risk on the financial performance of Vietnamese commercial banks. The research sample was made up of 30 commercial banks in Vietnam during the period from 2017 to 2022. There were a total of 180 observations in the balanced data panel. To control for unobserved individual effects, this study used a fixed effects model (FEM) with adjusted standard errors. Return on equity (ROE), return on asset (ROA), and net interest margin (NIM) were the indicators for bank financial performance. The non-performing loan (NPL) rate variable represented credit risk. The control variables were cost to income ratio (CIR), equity to asset (ETA), total loans to total assets (LTA), GDP growth (GDP), and Covid. The research results showed that credit risk had a negative and statistically significant effect on the banks' financial performance. This can be explained by the increase in the NPL ratio, causing banks to increase provisions for loan losses, thereby reducing profits. Reduced profits were also because of poor risk management, information asymmetry, and moral hazards. The study also provided a number of solutions and recommendations to improve bank financial performance.

Keywords

Credit risk, commercial bank, non-performing loan, FEM, Covid-19, financial performance

Introduction

A commercial bank serves as a vital financial intermediary providing a range of products and services crucial for maintaining liquidity within the economy. The stability of the banking system,

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therefore, is essential for economic stability and growth (Kodongo *et al*., 2014). Banks act as a bridge between the capital sources from depositors and the provision of credits to borrowers. Their functions include accepting deposits, creating credit, managing payments, and treasury, as well as several other financial advisory and agency services function (Rose & Hudgins, 2013). Among these, creating credit is the primary income-generating activity for banks. However, this activity can impose risks to both depositors and borrowers. Credit risk emerges when a counterparty fails to fulfill its contractual obligations on time or at any time thereafter (Gadzo *et al*., 2019). In other words, as defined by the Basel Committee on Banking Supervision (2016), credit risk is the possibility of losing part or all of a debt due to failure to pay on time or default. Increased credit risk is associated with the marginal cost of debt and capital, thereby increasing a bank's capital mobilization costs. Consequently, a heightened credit risk amplifies the likelihood of banks encountering financial crises.

The pursuit of profits by commercial banks and credit institutions is inevitably associated with exposure to various risks. According to Rose & Hudgins (2013), typical risks that banks usually face are credit risk, liquidity risk, market risk, interest-rate risk, operational risk, legal and compliance risks, reputation risk, strategic risk, and capital risks. Among them, credit risk is considered the most significant, affecting bank operations profoundly (Kodongo *et al*., 2014). With the expansion of the economy, the increase in the number of borrowers has amplified the occurrence of credit risks within commercial banks (Twum *et al*., 2022). Numerous international studies have highlighted that losses in banking operations often stem from non-performing loans (NPLs) (Noman *et al*., 2015; Isanzu, 2017; Gadzo *et al*., 2019). An increased non-performing loan rate is often interrelated with the breakdown of bank credit policies. This was demonstrated by the financial crisis that originated in the US in the late 2000s and subsequently spread worldwide. This incident resulted from the lending of substandard loans from banks that eventually led to the collapse of loans and mortgages. Hence, the imperative for banks to effectively manage credit risk, predominantly resulting from non-performing loans, is indispensable for their survival and profitability (Isanzu, 2017).

Vietnam's financial market exhibits a unique structure of a debt-oriented capital market that heavily relies on credit capital from commercial banks. This is different from other developed markets such as the US where bank-derived capital only accounts for a small proportion of the economy. The World Bank has raised concerns about Vietnam's credit-to-GDP ratio, which ranks among the highest globally. According to the Vietnamese General Statistics Office (GSO, 2023), this ratio has steadily climbed from 103.5% in 2017 to over 125% in 2022 and to 133% in 2023. Therefore, the emergence of credit risks in Vietnam's commercial banks will be detrimental not only to the banks themselves but also to the economy's capital supply capacity. Furthermore, this structural framework underscores the necessity for restructuring and fostering a more diversified financial market, reducing reliance on bank credit as the sole channel for capital mobilization.

The State Bank of Vietnam (SBV) is the central bank of Vietnam. Its responsibilities encompass state management of monetary and banking activities, foreign exchange, issuance of currency, provision of banking services to credit institutions, facilitation of monetary services for the Government, and management of public services within its jurisdiction. In recent years, the SBV and credit institutions have made considerable efforts to improve the legal system on currency and banking operations. Notably, there has been some improvement in the operation of management capacity, particularly in the commercial banks' risk management, aligning gradually with international practices and standards. The SBV's issuance of new regulations such as Circular 13/2020/TT-NHNN on safety ratios in credit institutions' operations and the gradual implementation of Basel II standards in Vietnamese credit institutions underscore efforts to ensure the resilience of their business activities amidst unpredictable financial market fluctuations (SBV, 2010). However, due

to the nature of operating in a dynamic and highly competitive environment, banks, in an effort to survive and maintain profits, need to cope with these risks. Additionally, the NPLs ratio in Vietnam has increased in recent years. According to the SBV, in the period from 2016 to 2019, the on-balance sheet NPLs ratio gradually decreased from 2.5% in 2016 to 1.6% in 2019, thus, the operation of the banking system was guaranteed to be safe. However, the Covid-19 pandemic that broke out in early 2020 deeply affected the entire economy, causing negative impacts on the operations and solvency of businesses. Since then, the NPLs ratio of the entire banking system has been significantly increasing, and has seen especially sharp increases since 2022. Therefore, it is important for Vietnam's commercial banks to assess the effects of credit risk on their operations, particularly within the context of unexpected events such as the recent Covid-19 pandemic

The correlation between credit risk and financial performance of commercial banks has been demonstrated in several studies worldwide (Ruziqa, 2013; Li & Zou, 2014; Gadzo *et al*., 2019). Studies from different countries and economies have shown different results, demonstrating the complicated relationship between credit risk and the financial performance of banks. Most studies have shown a negative influence such as research by Ruziqa (2013), Ekinci & Poyraz (2019), Gadzo *et al*. (2019), and Twum *et al*. (2022). Ekinci & Poyraz (2019) examined the impact of credit risk, measured by the NPL ratio, on the profits of banks in Turkey during the period of 2005-2017. In addition to the NPL ratio as the independent variable, the study incorporated control variables such as bank specifics, industry specifics, and macroeconomic variables. The findings revealed that credit risk significantly reduced the financial performance of banks in Turkey, posing a significant challenge to the Turkish banking sector, especially during the 2007-2009 financial crisis. Similarly, Gadzo *et al*. (2019) analyzed the adverse impact of credit risk and operational risk on the financial performance of 24 banks in Ghana from 2007-2016. Credit risk was assessed using criteria such as the NPL rate and the capital adequacy ratio (CAR). They demonstrated that higher NPL rates and CAR ratios were associated with increased credit risk and decreased bank financial efficiency. In addition, when evaluating the relationship between credit risk and bank performance in China from 1990-2020, Twum *et al*. (2022) divided the situation into four phases when considering the crisis factor, including the financial crisis in 2008-2009 and the Covid-19 era in 2020. The results indicated that credit risk had a negative and statistically significant effect in all four phases. During the global crisis, the banking sector was negatively affected, and therefore had a decline in financial performance. On the other hand, other studies presented by Boahene *et al*. (2012), Li & Zou (2014), and Alshatti (2015) demonstrated a positive relationship between credit risk and bank financial performance. For instance, the study carried out by Alshatti (2015) in Jordan suggested that credit risk, measured by the NPL to total loan ratio, had a positive effect on the profitability of Jordanian banks in the period of 2005-2013 and emphasized the need of efficient management of credit risk to maximize this effect.

The impact of credit risk on the financial performance of commercial banks in Vietnam has also been extensively investigated in recent years, such as the studies of Nguyen Thanh Dat *et al*. (2021) and Nguyen Tran Thai Ha & Nguyen Vinh Khuong (2022). Nguyen Tran Thai Ha & Nguyen Vinh Khuong (2022) highlighted that increased credit risk diminishes the stability of Vietnam's commercial banks. A rise in the NPL rate signifies lower loan quality, thereby heightening the bank's risk level and leading to a decrease in profits. In contrast, Nguyen Thanh Dat *et al*. (2021) implied that the NPL ratio has a positive and statistically significant influence at the 10% level on the return on assets (ROA) and return on equity (ROE), but has no significance on the net interest margin (NIM) ratio. However, this study did not evaluate the impact of macroeconomic factors on banking operations. Notably, recent research in Vietnam concerning the effects of credit risk on banking operations under the Covid-19 pandemic has primarily focused on descriptive statistics. During this

period, the government and SBV's policies to promote economic recovery have significantly influenced banking activities, creating a research gap in the field.

This study was conducted to evaluate the effects of credit risk on the financial performance of commercial banks in Vietnam in the period from 2017 to 2022. Our research aimed to provide a scientific basis for commercial banks and the SBV to propose appropriate policies to improve the efficiency and safety of the Vietnamese banking system.

Methodology

Data collection

The study utilized secondary data from commercial banks in Vietnam during the period from 2017 to 2022. Data were from audited financial statements and annual reports published on the banks' websites, with macroeconomic data sourced from reports by the SBV and the Vietnamese General Statistics Office (GSO). Every year, the SBV releases its annual report mentioning the economic and financial issues that occurred during the year and the SBV's actions. The required reserve ratio (CAR) of all of Vietnam's commercial banks was collected along with other financial ratios such as ROE, ROA, and NPL and the bad debt ratio was sold to the Vietnam Asset Management Company (VAMC). As of 2023, there was a total of 35 commercial banks, including two banks under special control of the SBV and three restructured banks. Therefore, this study collected data from the 30 banks operating normally, creating a total of 180 observations in the balanced panel data. Because the study focused on the recent activities of Vietnam's commercial banks, 180 observations were selected in the six years from 2017 to 2022. Using panel data helped take advantage of a larger number of observations and degrees of freedom, thus making the estimator more effective (Vy & Nguyet, 2017).

Data analysis

Descriptive statistics were used to analyze the operations of the commercial banks in Vietnam, in terms of total assets, net income, total outstanding loans, and the CAR ratio.

To measure the impact of credit risk on the financial performance of the banks, multivariate regression analysis for the panel data was performed after controlling for the unobserved individual effects. Three analysis methods were used, namely the pooled ordinary least square (OLS) model, fixed effects model (FEM), and random effects model (REM).

Data were processed and analyzed via STATA 13 software.

According to Zulfikar (2018), the OLS assumes that the behavior of a firm effect is constant in various periods. Thus, the regression model is: $Y_{it} = \alpha + \beta X_{it} + \varepsilon_{it}$; where i =1,2,..N (number of individuals) and t = 1, 2,..T (number of time periods). The FEM assumes that individual specific effects can be accommodated from various intercepts, however, the intercept is constant between firms. Thus, the FE equation is: $Y_{it} = \alpha_i + \beta X_{it} + \varepsilon_{it}$. Whereas, OLS and FEM use the principal of ordinal least squares, the REM uses the principal of general least squares. The REM assumes that individual specific effects are not correlated. Thus, the REM equation is: $Y_{it} = \alpha + \beta X_{it} + u_i + \varepsilon_{it}$; where ε_{it} is the combination residuals of firms and the time series; and u_i is the individual residual, which is the random behavior of the i^{th}observation and remains at all times.

To determine which model was better, it was essential to carry out the F-test for choosing the FE model or OLS, the Breusch and Pagan Lagrangian multiplier (B&Pagan LM) test for choosing the RE model or OLS, and the Hausman test to select the FE or RE model. The model was chosen based on the criteria presented in **Table 1**.

Furthermore, to increase the efficiency of the model, the VIF tests for multicollinearity, the Wald test for groupwise heteroskedasticity, and the Wooldridge test for autocorrelation were conducted.

The variables

The variables used in the model are described in **Table 2**. These variables are given on the basis of previous research.

Accordingly, the equations of the regression models are as follows:

$ROE = \alpha + \beta_1 *NPL + \beta_2 *CIR + \beta_3 *ETA + \beta_4 *LTA + \beta_5 *GDP + \beta_6 *Covid + \mu_{it}$

$ROA = \alpha + \beta_1 *NPL + \beta_2 *CIR + \beta_3 *ETA + \beta_4 *LTA + \beta_5 *GDP + \beta_6 *Covid + \mu_{it}$

$NIM = \alpha + \beta_1 *NPL + \beta_2 *CIR + \beta_3 *ETA + \beta_4 *LTA + \beta_5 *GDP + \beta_6 *Covid + \mu_{it}$

Results and Discussion

Overview of the Vietnamese banking sector

In recent years, the economy and financial markets have encountered various fluctuations, particularly due to the impact of the Covid-19 pandemic. According to GSO (2023), Vietnam's GDP growth ranged from 6.9% to 7.2% during the period of 2017 to 2019, then decreased to 2.9% and 2.6% in 2020 and 2021, respectively, due to Covid-19. In 2022, the GDP growth rate recovered to 8.2%. Despite the occurrence of unexpected events, the banking sector has demonstrated resilience and continued growth, partly owing to its flexible and dynamic operations. The results in **Table 3** indicate that the total assets of banks increased by an average of 13% per year from 2017 to 2022. Additionally, the total deposits and credits witnessed average annual growth rates of 12% and 14%, respectively. Notably, even amid the height of the Covid-19 outbreak in 2020-2021, the GDP growth rate only experienced a modest slowdown of approximately 1-2% compared to other years.

To address the bad debt problems, the SBV has issued many documents and regulations on bad debt handling. In general, the average NPL rate of the banking sector should always be less than 2%. Furthermore, banks should maintain an average CAR that is significantly higher than the Basel II standards requirement of 8%.

The Vietnamese banking sector exhibits significant differentiation among its constituent banks. As can be seen from **Figure 1**, the sector is largely dominated by four state-owned commercial banks - Agribank, Vietcombank, Vietinbank, and BIDV- which collectively represent over 50% of the total assets, deposits, and outstanding loans within the entire banking system. As of 2022, BIDV holds the position of the bank with the largest total assets in the system, amounting to 2,120 trillion VND out of the total assets of 14,962 trillion VND across all 30 banks, accounting for 14.2% of the total. However, in terms of profitability, Vietcombank emerges as the leader, with the highest net income of approximately 29.9 trillion VND, followed by Techcombank with 20.4 trillion VND.

Overview of the Vietnamese banking sector

Descriptive statistics

Table 4 contains the descriptive statistics of the variables used in this research. The dependent variables, ROE, ROA, and NIM, which were used as indicators for the banks' financial performance, had average values of 12.76%, 1.04%, and 30.7%, respectively. Although the NPL ratio had an average value of 2%, which falls below the 3% ceiling regulation set by the SBV, some banks still exhibited high bad debt ratios. The highest NPL ratio was 17.93%.

From **Table 5**, all the correlation coefficients were relatively small. The ROE, ROA, and NIM were used in three separate regressions, so all the variables were suitable for the regression model.

Table 1. Select model in the study

F test	B&P LM test	Hausman test	Select model
P >0.05: H0 is not rejected	*P* >0.05: H0 is not rejected		OLS
P >0.05: H0 is not rejected	*P* <0.05: H0 is rejected		REM
P <0.05: H0 is rejected	*P* >0.05: H0 is not rejected		FEM
P <0.05: H0 is rejected	*P* <0.05: H0 is rejected	*P* >0.05: H0 is not rejected	REM
P <0.05: H0 is rejected	*P* <0.05: H0 is rejected	*P* <0.05: H0 is rejected	FEM

Table 2. Description of variables used in the analysis

Variable	Description	Previous Research	Expected sign
Measure of bank performance – Dependent variable			
ROE	Return on equity = Net income / Average equity ROE refers to the bank's ability to generate profits from shareholder funds, thereby reflecting the investment efficiency of shareholders	Ruziqa (2013); Isanzu (2017); Ekinci & Poyraz (2019); Gadzo *et al*. (2019); Nguyen Thanh Dat *et al.* (2021)	
ROA	Return on asset = Net income / Average assets ROA refers a bank's ability to generate profits from effectively utilizing bank assets	Ruziqa (2013); Isanzu (2017); Ekinci & Poyraz (2019); Nguyen Thanh Dat *et al*. (2021)	
NIM	Net interest margin = Net interest income / Average interest-earning assets NIM approximates the likelihood of a bank thriving over the long haul	Ruziqa (2013); Gadzo *et al*. (2019); Nguyen Thanh Dat *et al*. (2021)	
Measure of credit risk – Independent variable			
NPLR	Non-performing loan ratio = NPL/ Total loans	Ruziqa (2013); Isanzu (2017); Ekinci & Poyraz (2019); Gadzo *et al*. (2019); Nguyen Thanh Dat *et al*. (2021); Twum *et al*. (2022)	-
Measure of control variables			
CIR	Cost to income ratio = Operating expenses / Net operating income before loan loss provision	Ruziqa (2013); Ayinuola & Gumel (2023)	-
ETA	Equity / Asssets	Ruziqa (2013); Ekinci & Poyraz (2019); Gadzo *et al*. (2019)	+
LTA	Total loans / Total assets	Ekinci & Poyraz (2019)	+
GDP	GDP growth rate	Ekinci & Poyraz (2019)	+
Covid	Dummy variable; takes the value of 1 for the year 2020-2022, and 0 otherwise	Alshatti (2015); Twum *et al*. (2022)	-

Table 3. Key figures of Vietnamese commercial banks

Indicators	2017	2018	2019	2020	2021	2022
Total assets (trillions VND)	8,067.75	8,889.60	10,073.36	11,192.82	12,869.85	14,962.04
Total deposits (trillions VND)	5,781.39	6,466.84	7,368.36	8,360.31	9,218.23	10,119.87
Total credits (trillions VND)	5,236.52	6,000.53	6,863.08	7,718.28	8,787.81	10,115.29
NPL rate	1.78%	1.71%	1.54%	1.50%	1.49%	1.61%
CAR	11.82%	11.60%	10.80%	10.29%	10.72%	11.15%
Total credits of the four State-owned commercial banks (SOCBs)	58.84%	58.19%	56.96%	55.50%	54.19%	53.26%

Results of the multivariate regressions: OLS, FEM, and REM

Table 6 shows the OLS, FEM, and REM regression results. Because all the F-test values for the FE model, the B&Pagan LM test for the RE model, and the Hausman test gave P <0.05, the H0 was rejected. As such, according to **Table 1**, the FE estimator was selected to investigate the effect of credit risk on the banks' financial performance. In general, there was minimal disparity in the results across the OLS, FEM, and REM in terms of both sign and significance levels. All the independent and control variables affected the banks' financial performance.

Besides the unobserved individual effects, the VIF test, Wald test for heteroskedasticity, and Wooldridge test were conducted. The VIF test showed no evidence of multicollinearity. The

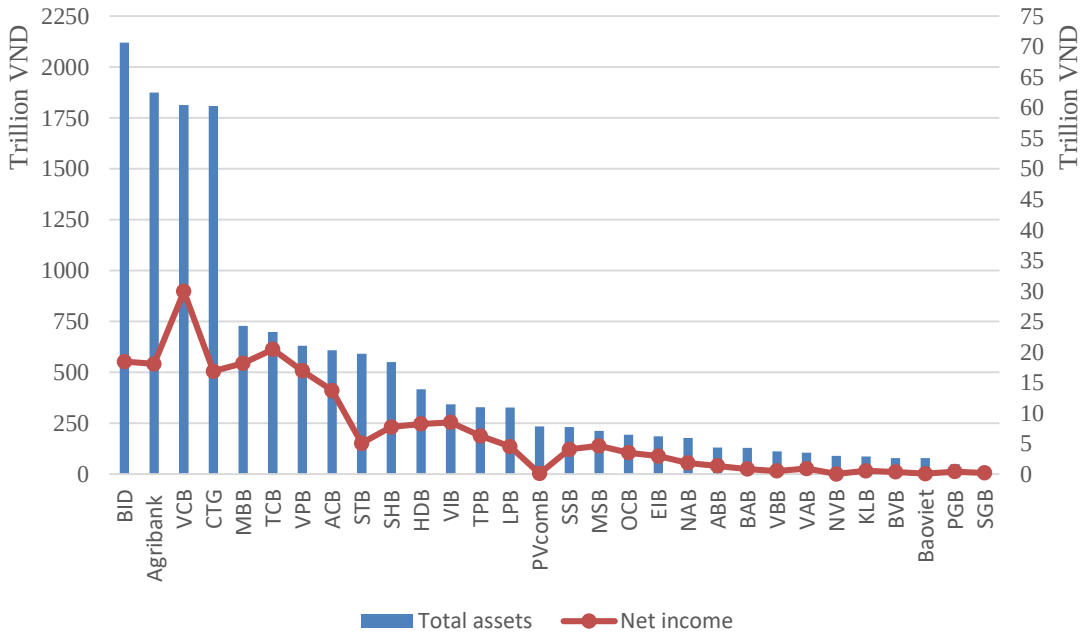

Figure 1. Vietnamese commercial banks' assets and net income in 2022

Table 4. Description of variables

Variable	Unit	Type	Ob.	Mean	S.D	Min	Max
ROE	%	Continuous	180	12.76	8.19	0.00	30.33
ROA	%	Continuous	180	1.04	0.81	0.00	3.65
NIM	%	Continuous	180	3.07	1.40	0.76	9.33
NPLR	%	Continuous	180	2.00	1.59	0.07	17.93
CIR	%	Continuous	180	128.84	120.66	29.38	742.17
ETA	%	Continuous	180	8.26	4.27	4.06	49.07
LTA	%	Continuous	180	62.28	9.73	32.26	80.06
GDP	%	Continuous	180	5.81	2.18	2.59	8.02
Covid		Dummy	180	0.5	0.50	0	1

Table 5. Correlation matrix

	ROE	ROA	NIM	NPLR	CIR	ETA	LTA	GDP
ROE	1							
ROA	0.8552	1						
NIM	0.659	0.7977	1					
NPLR	-0.3403	-0.2357	-0.0841	1				
CIR	-0.5621	-0.5134	-0.4434	0.227	1			
ETA	0.0481	0.4178	0.3888	0.0068	-0.1558	1		
LTA	0.262	0.1135	0.2411	-0.2448	-0.2651	-0.009	1	
GDP	-0.0461	-0.047	0.017	0.0307	0.0765	0.0503	0.0278	1
Covid	0.1655	0.214	0.0782	0.061	-0.1747	0.1121	0.0188	-0.5915

Table 6. Results of the multivariate regression: OLS, FEM, and REM

	ROE			ROA			NIM		
	OLS	FE	RE	OLS	FE	RE	OLS	FE	RE
NPLR	-1.152***	-0.358*	-0.442**	-0.084***	-0.037**	-0.041**	0.031	-0.071***	-0.062**
CIR	-0.032***	-0.014***	-0.019***	-0.003***	-0.001***	-0.001***	-0.004***	-0.002***	-0.002***
ETA	-0.087	-0.478***	-0.395***	0.063***	-0.004	0.007	0.110***	0.001	0.015
LTA	0.063	0.170**	0.154***	-0.003	0.019***	0.013**	0.023**	0.040***	0.035***
GDP	0.326	0.421***	0.391**	0.024	0.043***	0.040***	0.006	0.054***	0.049**
Covid	2.466*	3.668***	3.333***	0.249**	0.421***	0.391***	-0.063	0.274***	0.232**
Constant	12.958***	4.379	5.810	0.971**	-0.339	-0.023	1.232	0.520	0.779
Adj R^2	0.3625			0.3952			0.3009		
R^2 (within)		0.3575	0.3468		0.4431	0.4288		0.3974	0.3858
F-test	17.96	13.35		20.49	19.09		13.84	15.83	
Prob > F	0.000	0.000		0.000	0.000		0.000	0.000	
Wald test			84.46			103.9			80.63
Prob > Chi^2		0.000				0.000			0.000
F test that all U_i=0		17.1			26.39			53.31	
Prob > F		0.000			0.000			0.000	
B&Pagan LM test			171.94			184.73			
Prob > Chi^2			0.000			0.000			
Hausman test		24.36			35.4				52.98
Prob > Chi^2		0.0002			0.000				0.000
Wald test for heteroskedasticity		262.64			386.88				969.88
Prob > Chi^2		0.000			0.000				0.000
Wooldridge test	82.259			49.151				16.186	
Prob > F	0.000			0.000				0.0004	

*Note: No. of obs = 180; The signs ***, **, and * denote significance at the 1%, 5%, and 10% confidence levels, respectively.*

results from both the Wald test and Wooldridge test (both with Prob>Chi2 = 0.000) indicated the presence of a heteroskedasticity problem and autocorrelation in the models. To address these issues, the study opted for the FEM with adjusted standard errors. Furthermore, in line with the findings of Vy & Nguyet (2017), the autocorrelation problem could be eliminated for short panel data.

Effect of credit risk on Vietnamese bank financial performance: FEM with adjusted standard errors

Table 7 shows that there was a negative and statistically significant relationship between credit risk and bank performance. The coefficients of -0.358, -0.037, and -0.071 imply that if the NPL ratio is increased by 1%, the ROE, ROA, and NIM will decrease to -0.358%, -0.037% and -0.071%, respectively. This negative relationship is explained by the increase in NPLs, which may be due to poor management or lax appraisal of borrowers, which do not generate income. This increase in bad debts will increase the costs banks have to spend to reserve for unexpected losses, thereby, reducing banks' profits (Ruziqa, 2013; Ekinci & Poyraz, 2019). According to international standards, the safe NPL ratio is below 3%. In Vietnam, according to the regulations of the SBV, credit institutions that want to buy/sell bad debt for asset management companies (VAMC) need to maintain a NPL

Table 7. Effect of credit risk on Vietnamese bank financial performance: FEM with adjusted standard errors

	ROE	ROA	NIM
NPLR	-0.358**	-0.037***	-0.071***
CIR	-0.014***	-0.001***	-0.002***
ETA	-0.479***	-0.004	0.001
LTA	0.170	0.019**	0.040***
GDP	0.421***	0.043***	0.054***
Covid	3.668***	0.421***	0.274**
Constant	4.379	-0.339	0.520
R^2(within)	0.3575	0.4431	0.3974
F-test	16.01	9.14	13.21
Prob > F	0.000	0.000	0.000

*Note: No. of obs = 180; The signs ***, **, and * denote significance at the 1%, 5%, and 10% confidence levels, respectively*

ratio below 3%. Under this constraint, commercial banks have to increase provisions for loan losses, thereby reducing capital sources to grant credit, causing a reduction in profits. In addition, the increase in NPLs may be affected by asymmetric information between the bank and the customer, wherein inaccurate assessments of a customer's ability to repay debt and financial conditions lead to inaccurate credit decisions. In addition, the use of low-quality collateral to offset debt may ultimately deplete the banks' assets and interest income over the long term (Gadzo *et al*., 2019).

In Vietnam, Nguyen Tran Thai Ha & Nguyen Vinh Khuong (2022) demonstrated the negative relationship between credit risk and the financial performance of commercial banks during and after the 2008-2017 financial crisis period. Bad debt caused capital losses, and consequently affected bank liquidity. Commercial banks had to strike a balance between pursuing high profits, which entail higher risks of bad debts, and maintaining stability, which incurs higher operating costs. Similarly, before and during the Covid-19 era, it was evident that credit risk, which undermines the financial performance of commercial banks, was a critical concern for Vietnam's banking industry.

The cost-to-income ratio (CIR) is one of the most important indicators to evaluate banking performance. **Table 7** shows that CIR was negatively correlated with the banks' financial performance at a significance level of 1%. A 1% increase in CIR results a decrease of 0.014% in ROE, 0.001% in ROA, and 0.002% in NIM. According to Ayinuola & Gumel (2023) and Kumar & Srivastava (2021), a high CIR signifies deficiencies in productivity and competitiveness, as operating expenses outpace income. The lower the CIR, the higher the bank's efficiency, as reduced operating costs contribute to enhanced profitability. Typically, large banks tend to have lower CIR than small banks do. In Vietnam, according to 2022 data, PVcombank and NVBank reported CIR values exceeding 300%, while the four SOCBs were ranked among the top banks with lower CIRs, ranging from 42% to 56%. However, it is important to note that CIR values fluctuate over time. Initially, a bank may invest substantially in technology, leading to increased operating costs and a higher CIR. However, over the long term, effective investment strategies result in decreased operating costs and improved CIR.

Two bank specific variables, ETA and LTA, had statistically significant impacts on the banks' financial performance in some indicators. In particular, the ETA ratio had a negative effect on ROE at the 1% significance level with a coefficient of -0.479. A higher ETA ratio reflects an increase in the shareholders' capital investment ratio and a decrease in financial leverage, leading to lower profitability for the shareholders. This aligns with the findings of

Gadzo *et al*. (2019) who suggested that banks with high ETA ratios tend to face increased risks related to credit and operations, which can reduce their profitability. However, this result contrasts with studies carried out by Ruziqa (2013) and Chen *et al*. (2018). These studies argued that banks with high equity capital will have more time and flexibility when solving problems related to unexpected losses. Such banks are better equipped to navigate through difficult situations, thereby having lower bankruptcy costs and capital mobilization expenses, and consequently gaining more profits. In addition, the LTA variable had a positive and statistically significant influence on the ROA and NIM. A 1% increase in the LTA ratio corresponds to a 0.019% increase in the ROA and a 0.040% increase in the NIM. Because credit is the most income-generating activity of banks, the LTA ratio reflects the liquidity of invested capital. In other words, a high LTA ratio signifies increased interest income for the bank, thereby enhancing its prospects for profitability. This result is contrary to the findings of Ekinci & Poyraz (2019). The authors argued that an increased LTA rate is associated with an increase in the NPL, thereby reducing bank profits. However, it is worth noting that with proper management of credit risk or robust credit appraisal standards, a higher LTA ratio may not necessarily lead to higher NPL and lower bank profits.

GDP growth had a positive and statistically significant effect on the financial performance of banks at the 1% significance level. As a financial intermediary function, banks facilitate the circulation of capital within the economy, directing surplus capital to areas with a shortage, thereby promoting investment, production and business activities, and contributing to economic growth. As the economy develops, the demand for banking products and services also increases. In other words, GDP growth facilitates profit growth, as well as the stable and effective operation of banks.

Lastly, the Covid variable had a positive and statistically significant impact on the financial performance of banks in Vietnam. This means in the context of Covid-19, Vietnam's commercial banks tended to perform well. This result contrasts with several previous studies that assessed the impact of financial crises on bank efficiency, such as the research of Ekinci & Poyraz (2019) and Twum *et al*. (2022), which implied the banking system, like other economic sectors, is negatively affected during crises, thereby affecting the efficiency of banks. However, data from the SBV (2022) suggested that during the Covid-19 pandemic, banks seized the opportunity to develop and expand digital banking services when the number of customers and businesses using non-cash payment services increased sharply. Additionally, banks reduced their payrolls thanks to the use of modern technology in place of physical labor, which was heavily affected by the pandemic. Consequently, bank profits increased both before and after the onset of Covid-19. Moreover, the Vietnamese government launched Covid-19 stimulus packages to encourage individuals and corporations to borrow capital for economic development in the post-Covid era. With reduced credit interest rates leading to increased cash flow into stocks and real estate, banks have maintained their strong performance during and after the pandemic.

Proposed solutions

Commercial banks are monetary organizations that operate with the primary goal of maximizing profits. However, the pursuit of profit comes with inherent risks, especially in a competitive and dynamic sector like banking. Therefore, banks need to find a balance between risk and profit. Based on the previous discussion, some proposed solutions are given as follows:

For commercial banks

As mentioned above, credit risk imposes a negative impact on a bank's financial performance due to (1) a high number of NPLs causing high provisions for loan losses and (2) poor credit management. Therefore, commercial banks need to make adequate provisions for loan losses to enhance their ability to cope with unexpected risks, while improving their ability to manage credit manage. To do that, commercial banks should focus more on the following activities:

Strictly comply with the SBV's regulations on ensuring the CAR and NPL rates and credit limit.

Follow the roadmap to apply the international standards of Basel II and move towards Basel III to ensure the safety of the banking system.

Review and comply with the credit process to improve the quality of credit appraisals, limit information asymmetry, and properly evaluate the value of collateral assets, thereby reducing adverse selection and moral hazard possibilities.

Credit risk management needs to be consistent from credit appraisals and decision-making to loan monitoring after credit granting, and to provisioning for loan losses.

In addition, the Covid-19 had a positive effect on the performance of Vietnam's banks because of the opportunity to develop and expand digital banking services. Based on this initial success in implementing digital banking services during the pandemic, commercial banks should invest in further technological advances as well as their monitoring systems. Training should be provided to on-site staff to ensure the efficiency and security of the digital services, while managing any potential risks arising from these new forms of service.

Finally, banks need to better control operating costs by taking advantage of capital from financial leverage to increase their credit. However, this can only be properly done when banks make adequate risk provisions and have good control over credit risk management.

For State Bank of Vietnam

The SBV is responsible for managing the stability and development of the banking system, therefore the SBV needs to consider credit risk as one of the most important risks that may occur. As a result, the SBV may enforce banks to adhere to international standards in credit risk management, especially Basel II and III. Finally, the SBV needs to strengthen its supervision system in the face of the banking technology explosion.

Conclusions

Our findings showed that there was a negative and significant relationship between the NPL rate and ROE, ROA, and NIM. These results indicated that the increase in the NPL rate has caused banks to increase provisions for expected losses, thereby reducing profits. In addition, NPLs increased due to the effects of poor credit management, asymmetric information, and substandard collateral used to collateralize debt. All these caused reduced profits, thereby reducing the banks' financial performance. These results indicated that when the NPL rate increases, the loan quality decreases, causing profit and the stability of Vietnam's commercial banks to decrease.

An increase in the CIR reflects a decrease in the bank's efficiency in managing operating costs, thereby reducing profits. This ratio is typically smaller in large banks. Initial investments in advanced technology may cause this ratio to increase, but it will eventually decrease once banks operate more effectively with the help of technology.

A rise in the ETA ratio reduces the owner's profitability in terms of ROE, while a rise in the LTA rate is often associated with higher ROA and NIM. This indicates that employing financial leverage and expanding credit structures enable banks to secure more capital for granting loans, thereby boosting interest income and enhancing the efficiency of bank performance.

Macroeconomic indicators, including GDP growth and Covid, had a positive and statistically significant influence on the performance of commercial banks in Vietnam. It is noteworthy that in contrast to most of the global economy, the banks in Vietnam showed signs of development during the occurrence of the Covid-19 pandemic. This can be attributed to government policies aimed at loosening credit to stimulate production loans, as well as creating opportunities for banks to promote non-cash payments and electronic banking services.

In summary, the occurrence of credit risk is detrimental to the financial performance of banks and consequently Vietnam's economy growth, and therefore, needs to be properly addressed. Any decisions relating to the efficiency and safety of the banking system should take into account several factors, such as NPL, operating costs, and financial leverage. The results suggest

that the SBV's credit management policies and the potential of digital banking services have collectively contributed to the positive performance of banks during a difficult time such as a global pandemic.

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