

LENDING INTEREST RATE AND CREDIT RISK: EMPIRICAL EVIDENCE IN VIETNAMESE COMMERCIAL BANKS

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Abstract

The study was conducted to determine and measure the impact of interest rates on the credit risk of Vietnamese commercial banks. Research data is collected from 17 Vietnamese commercial banks in the period 2010 to 2021. The dependent variable of the model is RISK (credit risk), and the independent variable includes RATE (Lending interest rate), CAP (Capitalization rate), LG (Credit Growth Rate), ROA (Profitability), SIZE (Size), CAR (Capital Adequacy Ratio). To process data, this study uses Pooled OLS, FEM, REM, and FGLS methods. The results show the influence of interest rates on the credit risk of banks, which ROA has the strongest impact on credit risk, and LnSIZE has the strongest impact on credit risk. second, GDP has the third strongest impact, CAP has the fourth strongest impact, CAR has the fifth strongest impact, RATE has the sixth strongest impact, and LG has the seventh strongest impact on the credit risk of banks.

Keywords: interest rate, commercial bank, credit risk

1. Introduction

Banks are an important source of capital for the economy through credit activities (Linh et al., 2019). Credit activities are the main activities of commercial banks, the total revenue from this activity accounts for a large proportion of the total income from the Bank's operations and brings great profits to most of them (Fred Nelson, 2020). However, because credit activities are closely related to all sectors of the economy, all risks of all sectors are hidden in the credit activities of commercial banks. The consequences of credit risk for commercial banks are very heavy such as loss of loan capital, and increased costs for the Bank while profits are reduced, greatly affecting the financial situation and results (Ekinçi, R., & Poyraz, 2019). The overall business results lead to a decrease in the income of employees and ultimately damage the reputation and position of the Bank. But credit risk always goes hand in hand with credit activities and cannot be eliminated, so it is necessary to take measures to limit and prevent risks so that risks are always controlled and within allowable limits. Therefore, credit risk is the top concern in the field of currency trading and most commercial banks (Odonkor, 2018).

The lending rate is the nominal interest rate, regardless of the effects of inflation. Nominal interest rates are usually announced officially on credit contracts (Rizvi et al., 2018). According to Kosanke (2019), high lending rates will increase the amount of bad debt in the bank, affecting its profitability of the bank. When the bad debt ratio increases, the bank's credit risk provision ratio also increases to offset possible risks (Kidane, 2020).

One of the outstanding features of a bank is short-term borrowing and long-term lending (Jason, 2010). Maturity mismatch is also the main driver of interest rate risk in the bank's balance sheet. Credit risk is the second most important source of risk to the capital adequacy of these institutions (Bülbül et al., 2019). Banks and regulators are aware of the importance of both

risks. But they tend to manage these risks separately although, as Jarrow & Turnbull (2000) have pointed out, “economic theory tells us that markets and credit risk are intrinsically linked interrelated and inseparable”.

This article aims to identify and measure the impact of interest rates on the credit risk of Vietnamese commercial banks. The author proposes some recommendations to help Vietnamese commercial banks limit credit risk for commercial banks through lending interest rates.

2. Literature Review

Interest is the cost of the right to use a unit of loanable funds for a unit of time (Kosanke, 2019). This is a unique price that is determined by use value rather than value. Movements in interest rates have a direct impact on the daily life of each economic entity. It affects the decisions of individuals and households (Aliu et al., 2019). The lending rate is the interest rate calculated in nominal terms, regardless of the effects of inflation. Nominal interest rates are usually announced officially on credit contracts (Kosanke, 2019).

Studies on this topic so far have confirmed that low-interest rates maintained for a long time through monetary policy easing not only encourage banks to extend credit to customers as described in the traditional credit extension channel. system but also encourages banks to accept higher levels of risk (Altunbas et al., 2009).

Previous scholars have shown four main ways in which low-interest rates can encourage excessive risk-taking (Holton & Rodriguez d’Acri, 2018); (Kosanke, 2019); (Rizvi et al., 2018); (Ali & Puah, 2019). First, low-interest rates promote risk-taking through the effect of interest rates on valuations, earnings, and cash flows. Second, low-interest rates create incentives for bank managers and businesses to seek profits. Third, low-interest rates increase equity value and encourage financial institutions to take on more risk. Fourth, the increased level of information transparency and policy commitment of the central bank reduces instability, causing market participants to underestimate risks, thereby increasing the desire to accept bank risk (Holton & Rodriguez d’Acri, 2018)

3. Research model and research hypothesis

Based on the study of Holton & Rodriguez d’Acri (2018), the proposed research model is as follows:

$$\text{Risk}_{i,t} = \beta_0 + \beta_1 \text{RATE}_{i,t} + \beta_x X_{i,t} + \beta_y Y_t + \varepsilon_{i,t}$$

Where, the dependent variable is Risk, which represents credit risk (measured by the rate of overdue debt). The independent variable includes RATE, which represents the lending interest rate (measured by Interest Revenue/Average outstanding balance). The control variable includes $X_{i,t}$, representing the bank's characteristics, including the capitalization rate; Profitability; Credit growth rate; Bank size; Capital adequacy ratio; Y_t represents macro factors such as GDP growth rate, this data is obtained from the Worldbank database.

3.1. Lending interest rate (RATE)

The impact of lending interest rates on banks' risk-taking behavior has many different and inconsistent views. Bikker & Vervliet (2018) suggest that the origin of the behavior of loosening lending standards and increasing holdings of risky assets can be from the low-interest rate environment. The low nominal interest rates are often associated with reduced margins between banks' lending and deposit rates, and that increases the incentive for banks to seek returns through the mechanism. Sari (2022) uses the data of Islamic banks in Indonesia for the period from 2014 to 2018 over a relatively long period and finds that an expansionary monetary policy is indeed associated with higher-risk credit.

Hypothesis H1: Lending interest rate (rate) has a positive (+) effect on the credit risk of Vietnamese commercial banks.

3.2. Capitalization rate (CAP)

The capitalization rate is the weight of an equity or debt class to the total market capitalization of a company. Large companies often have a variety of shares, such as common stock, preferred stock, and debentures. The use of these ratios shows the relative importance of each in the structure (Sari, 2022).

Capitalization Ratio = Equity/Total Assets

Holton & Rodriguez d'Acrici (2018) demonstrated that higher capital regulations discourage banks from increasing risky assets, and argue that strict regulations and supervision can dampen external shocks and reduce risk. In contrast, the results (Sari, 2022) show that capital has a relatively low level of medium-risk assets, reducing the risk of bank default.

Hypothesis H2: Capitalization ratio (CAP) has a positive (+) effect on the credit risk of Vietnamese commercial banks.

3.3. Credit growth rate (LG)

$LG = (\text{Total outstanding balance in year } t - \text{Total outstanding balance in the year } (t-1)) / \text{Total outstanding balance in the year } (t-1)$

Credit growth is considered one of the factors affecting an early warning of credit risk in the banking business. When the economy grows, under competitive pressure to develop, banks can relax credit approval conditions. This will accumulate risks and explode into an economic downturn.

Muhammad et al. (2018) also demonstrated that credit growth has a positive influence on the bad debt of emerging market commercial banks. Thi & Nguyen (2022) also proves that credit growth affects the liquidity risk of Vietnamese commercial banks.

Hypothesis H3: Credit growth rate (LG) has a positive (+) effect on the credit risk of Vietnamese commercial banks.

3.4. Bank profitability (ROA)

$ROA = \text{Profit after tax} / \text{Total assets}$

Regarding the relationship between risk-taking behavior and the profitability of banks, Sari (2022) shows that credit risk positively affects bank profitability. Holton & Rodriguez d'Acri (2018) also supported the moral hazard hypothesis, finding evidence that highly profitable banks are generally less vulnerable than low-margin banks. This implies that there exists a negative relationship between bank profitability and the risk-taking behavior of banks. Bikker & Hu (2002) show that a low-interest rate environment reduces bank performance and net profit margins.

Hypothesis H4: Profitability (ROA) has a positive (+) positive effect on the credit risk of Vietnamese commercial banks.

3.5. Bank size (Size)

$\text{Size} = \text{Ln}(\text{Total asset})$

Bank size refers to the market power of a bank. Research by Holton & Rodriguez d'Acri (2018) has demonstrated that in the banks of major eurozone countries, this effect is less obvious for French institutions, which have a high level of financial relatively low average risk assets. The authors found a positive influence of bank size on risk-taking behavior. They argue that the larger the banks, the better the diversification strategy will be and thus reduce the bank's risk. In addition, large-scale banks are said to have good risk management mechanisms, so they will have lower risk-taking behavior than small-sized banks.

Hypothesis H5: Bank scale (Size) positively affects the credit risk of Vietnamese commercial banks.

3.6. Capital adequacy ratio (CAR)

$\text{Capital adequacy ratio} = (\text{Tier 1 Capital} + \text{Tier 2 Capital}) / \text{Risk-Weighted Assets}$

The capital adequacy ratio (CAR) shows the bank's compliance with the government's minimum capital regulations, thereby partly showing the banks' compliance with government regulations. Sari (2022) proves that the capital adequacy ratio affects credit risk at commercial banks. Holton & Rodriguez d'Acri (2018) also show that the capital adequacy ratio has a negative effect on the bank's risk-taking.

Hypothesis H6: Capital adequacy ratio (CAR) has a negative (-) effect on the credit risk of Vietnamese commercial banks.

3.7. Economic growth rate (GDP)

Previous studies have suggested that the economic growth rate is a factor that has a significant influence on the risk-taking behavior of banks (Holton & Rodriguez d'Acri, 2018); (Sari, 2022); (Kosanke, 2019); (Atiso et al., 2020). In general, there has not been a consensus in studies on the relationship between economic growth rate and bank risk. (Holton & Rodriguez d'Acri, 2018) demonstrate that economic growth negatively affects credit risk.

Hypothesis H7: Economic growth rate (GDP) has a positive (+) effect on the credit risk of Vietnamese commercial banks.

Table 1: Variables' description

Symbol	Variable	Measurement	Citation	Expected sign
Dependent variable				
RISK	Credit risk (%)	(Non-performing loan/ Total loan) x 100%		
Explanatory variable				
RATE	Lending interest rate	Interest income/Total loan	(Bikker & Hu, 2002); (Sari, 2022)	+
CAP	Capitalization ratio	Equity/ Total asset	(Sari, 2022); (Holton & Rodriguez d'Acari, 2018)	+
LG	Credit growth rate	(Total loan in year t – Total loan in the year (t-1))/Total loan in the year (t-1)	(Ali & Puah, 2019); (Thi & Nguyen, 2022)	+
ROA	Profitability	Profit before tax/Total assets	(Bikker & Vervliet, 2018); (Holton & Rodriguez d'Acari, 2018)	+
SIZE	Bank scale	Bank scale = Ln (Total asset)	(Holton & Rodriguez d'Acari, 2018)	+
CAR	Capital adequacy ratio	(Tier 1 Capital + Tier 2 Capital)/ Risk-Weighted Assets	(Sari, 2022); (Holton & Rodriguez d'Acari, 2018)	-
GDP	Economic growth rate	Economic growth rate	(Kosanke, 2019); (Sari, 2022)	+

3.8. Methodology

First, the author uses the Pooled OLS regression method to identify the impact of the independent variables on the dependent variable. First, the author uses the Pooled OLS regression method to identify the impact of the independent variables on the dependent variable. However, ignoring the temporal and spatial factors of the panel data of this method can lead to autocorrelation or erroneous models. In addition, Pooled OLS does not take into account the influence of each sample in the study population. Therefore, FEM and REM methods are used to determine the appropriate method (Baltagi, 2008). The study employs the VIF test to ensure the model's robustness. In addition, the article also performs a multicollinearity test, variable variance. If the model's tests are violated, the FGLS method will be used for correction (Saeed et al., 2016).

3.9. Results

3.9.1. Descriptive statistics

Descriptive statistical results show the mean, standard deviation, and minimum and maximum values of the variables in the research model.

Table 2: Estimated results

Symbol	Mean	Minimum	Maximum	Std. Deviation	N
RISK	2.392	0.1	8.81	1.368	204
RATE	14.911	1.064	62.541	7.743	204
CAP	8.978	3.82	23.84	4.081	204
LG	21.904	-23.33	108.2	18.994	204
ROA	0.821	0.01	2.54	0.520	204
LnSIZE	32.524	30.162	34.955	1.098	204
CAR	13.410	4.09	38.37	4.891	204
GDP	5.716	2.58	7.075	1.441	204

Credit risk (RISK) of 17 Vietnamese commercial banks in the period from 2010 to 2021 has an average value of 2.39%, a minimum value is 0.1% and a maximum value is 8.81%. The lending interest rate (RATE) has an average value of 14.91%, a minimum value is 1.06% and a maximum value is 62.54%. The capitalization rate (CAP) has an average value of 8.97%, a minimum value of 3.82%, and a maximum value of 23.84%. Credit growth rate (LG) has an average value of 21.90%, a minimum value is -23.33% and a maximum value is 108.2%. Return on equity (ROA) has an average value of 0.82%, a minimum value of 0.01%, and a maximum value of 2.54%. Bank size (LnSIZE) has an average value of 32.52 units, a minimum of 30.1, and a maximum of 34.95. The capital adequacy ratio (CAR) has an average value of 13.41%, a minimum value is 4.09% and a maximum value is 38.95%. The economic growth rate (GDP) has an average value of 5.71%, the minimum value is 2.58% and the maximum value is 7.07%.

3.9.2. Correlation analysis results

Table 3: Correlation analysis of variables

	RISK	RATE	CAP	LG	ROA	LnSIZE	CAR	GDP
RISK	1							
RATE	0.1309	1						
CAP	0.1665	0.0856	1					
LG	0.1426	-0.0571	-0.108	1				
ROA	0.2752	0.1128	0.2502	0.1807	1			
LnSIZE	0.005	-0.2947	-0.5781	-0.1119	-0.0499	1		
CAR	-0.1679	0.149	0.2728	-0.1001	-0.0127	-0.3496	1	
GDP	-0.1748	0.0526	-0.0993	0.1323	-0.063	0.0223	-0.0117	1

According to Kenedy et al. (2017), when the correlation coefficient between the independent variables in the model is 0.8 or greater, multicollinearity occurs. Based on the correlation matrix results, the correlation coefficients of the model's independent variables are all less than 0.8, indicating that the variables are suitable for running the regression model.

3.9.3. Regression analysis results

Table 4: Regression analysis results using Pooled OLS, FEM, and REM

Variables		Pooled OLS	FEM	REM
RATE	Beta	0.034	0.038	0.036
	Standard deviation	0.012	0.013	0.012
	t value	2.8	2.95	2.98
	p-value	0.006(***)	0.004(***)	0.003(***)
CAP	Beta	0.091	0.137	0.115
	Standard deviation	0.028	0.034	0.0309
	t value	3.17	3.98	3.74
	p-value	0.002(***)	0.000(***)	0.000(***)
LG	Beta	0.013	0.013	0.013
	Standard deviation	0.0050	0.0055	0.0051
	t value	2.61	2.44	2.63
	p-value	0.01(**)	0.016(**)	0.009(***)
ROA	Beta	0.387	0.556	0.486
	Standard deviation	0.183	0.190	0.183
	t value	2.11	2.92	2.65
	p-value	0.036(**)	0.004(***)	0.008(***)
LnSIZE	Beta	0.232	0.463	0.341
	Standard deviation	0.110	0.156	0.127
	t value	2.09	2.97	2.69
	p-value	0.038(**)	0.003(***)	0.007(***)
CAR	Beta	-0.052	-0.054	-0.053
	Standard deviation	0.019	0.019	0.019
	t value	-2.72	-2.79	-2.78
	p-value	0.007(***)	0.006(***)	0.005(***)
GDP	Beta	-0.169	-0.159	-0.164
	Standard deviation	0.061	0.059	0.058
	t value	-2.75	-2.7	-2.81
	p-value	0.006(***)	0.008(***)	0.005(***)

(***) p_value < 0.01, (**) p_value < 0.05, (*) p_value < 0.1

The analysis results show that all three estimation methods of Pooled OLS, FEM, and REM models are statistically significant at the 5% level. All are suitable in explaining the impact of factors on the credit risk of 17 Vietnamese commercial banks from 2010 to 2021, according to

the analysis. To determine which model is best, the author compares the Pooled OLS model to FEM using the F-Test and the FEM model to REM using the Hausman - Test.

The P-Value is 0.0009 0.05 based on the processing results. As a result, hypothesis H0 must be rejected. That is, the FEM model outperforms the Pooled OLS model. After performing the Hausman test, the P-value is 0.5065, which is greater than 0.05, indicating that the REM model is better suited to the data sample than the FEM model.

3.9.4. Multicollinearity analysis results

According to the VIF test results, the variance coefficients of the independent variables are all less than 10, indicating that multicollinearity has no significant impact on the results.

With a p-value of 0.000 0.05 (significant level 5%), the Breusch-Pagan test results should reject hypothesis H0 and accept hypothesis H1. This indicates that the model is heteroskedastic. To overcome this phenomenon, the author employs Feasible Generalized Least Squares (FGLS) estimation.

Table 5: Regression analysis results using FGLS

	Regression coefficient	Sig
Prob > chi2	0.000(***)	
RATE	0.035	0.000(***)
CAP	0.088	0.000(***)
LG	0.0079	0.042(**)
ROA	0.421	0.002(***)
LnSIZE	0.297	0.001(***)
CAR	-0.037	0.027(**)
GDP	-0.163	0.001(***)
Constant	-7.811	0.015(**)

(***) p_value < 0.01, (**) p_value < 0.05, (*) p_value < 0.1

From the results, the research model regression equation has the form:

$$\text{RISK} = -7.811 + 0.035\text{RATE} + 0.088\text{CAP} + 0.0079\text{LG} + 0.421\text{ROA} + 0.297\text{LnSIZE} - 0.037\text{CAR} - 0.163\text{GDP}$$

At the 5% level of significance, the results show that all factors influence credit risk. Furthermore, negative regression coefficients in CAR and GDP factors have a negative impact on the credit risk of 17 Vietnamese commercial banks from 2010 to 2021. The remaining factors have a positive sign in the regression system, so they all have a positive impact on the credit risk of 17 Vietnamese commercial banks from 2010 to 2021. As a result, the obtained results support the research hypotheses.

4. Implications for solutions

ROA has a positive effect on the credit risk of Vietnamese commercial banks with a Beta coefficient of 0.421. This shows that the more profitable commercial banks are, the lower the

credit risk of commercial banks and vice versa. Therefore, commercial banks need to focus on and further improve business efficiency, contributing to increased profitability of commercial banks. To do this, banks need to find solutions to reduce operating costs, diversify capital mobilization and use operations, and focus on developing banking technology applications.

Bank size has the second strongest impact on the credit risk of Vietnamese commercial banks with a Beta coefficient of 0.297. This shows that for commercial banks with larger scale, the credit risk is lower and vice versa, because commercial banks have large scale, large total assets, the financial situation is strong, credit risk is lower, but commercial banks have less credit risk. To increase the scale and total assets of commercial banks, commercial banks need to improve the efficiency of using capital commercial banks, reduce service and product fees, and improve their qualifications, personality, knowledge, and personal experience.

GDP has the third strongest impact on the credit risk of Vietnamese commercial banks with a Beta coefficient of -0.163 and this factor negatively affects the credit risk of commercial banks. Vietnamese commercial banks need to have solutions to adapt to the market economic situation, and help commercial banks control their credit risk well, specifically:

- Flexible management of credit solutions to control scale and growth of reasonable credit directed to the fields of production and business, priority areas according to the policy of the Government;
- Continue to evaluate credit activities for industries, fields, roles, resilience, and sustainable development of sectors and fields in the economy to direct commercial banks to have priority policies support and focus credit to contribute to economic recovery and development;
- Direct commercial banks to continue to create favorable conditions for people and businesses to access credit, meet people's legitimate needs, and contribute to limiting "black credit";

The capital adequacy ratio has the fourth strongest impact on the credit risk of Vietnamese commercial banks with a Beta coefficient of 0.088. This shows that the higher the capital adequacy ratio of commercial banks, the safer the credit risk of commercial banks and vice versa. Therefore, commercial banks need to build for themselves a capital adequacy ratio suitable to the actual operation of each bank. The author suggests governance implications for bank administrators to maintain the capital adequacy ratio at an appropriate level, comply with legal regulations, and be safe for depositors but still ensure benefits for shareholders. as follows:

- Maintaining the bank's size at an appropriate level, the increase in size through increasing credit activities should be controlled;
- Effectively using the financial leverage ratio, the capital source to meet the credit growth should have a balance between debt and equity;
- Consideration between maintaining the capital adequacy ratio at an appropriate level by increasing or decreasing profits.

The capitalization ratio has the fifth strongest impact on the credit risk of Vietnamese commercial banks with a Beta coefficient of -0.037 and this factor negatively affects the credit risk of Vietnamese commercial banks. This factor shows that the higher the equity/total assets ratio of commercial banks, the lower the credit risk of commercial banks and vice versa.

Lending interest rates have the sixth strongest impact on the credit risk of Vietnamese commercial banks with a Beta coefficient of 0.035. This shows that the more commercial banks lend with higher interest rates, the higher the credit risk of commercial banks and vice versa, although high lending interest rates will bring commercial banks great profits, it easily leads to customers' insolvency, and credit risk of commercial banks also increased.

Credit growth has the seventh strongest impact on the credit risk of Vietnamese commercial banks with a Beta coefficient of 0.0079. This shows that the higher credit growth, the higher the possibility of credit risk when the outstanding loans and loans of commercial banks increase.

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