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## THE IMPACT OF CAPITAL STRUCTURE, OPERATIONAL EFFICIENCY, AND NON-INTEREST INCOME ON BANK PROFITABILITY IN VIETNAM

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### SUMMARY

Profitability is considered an important indicator for the safety, efficiency, and sustainability of banking systems. The aim of the study is to remove the confusion concerning the effect of capital structure, operational efficiency, and non-interest income on the profitability of commercial banks in Vietnam. Utilizing quantitative research methods, dynamic table data modelling, and estimation through the systematic general moment method (sys-GMM). In this regard, the data has been gathered from 31 commercial banks in Vietnam, accounting for 451 observations during 14 years from 2010 to 2024. The results from the estimation of the research models apply the GMM method of the system that is relevant and reliable, as in both tests of Arellano–Bond and Hansen are fulfilled. The new findings reveal that both models have a positive and statistically significant sign of the coefficient of the first-order delay variable of the dependent variable in terms of the dynamics of the return. The coefficient of  $ROA(t - 1)$  is 0.322 with a p-value of 0.010, while the coefficient of  $ROE(t - 1)$  is 0.435 with a p-value of 0.007. This implies that the profitability of the bank is hereditary, that is, the past profitability has a positive impact on the current profitability. Interestingly, there is a nonlinear relationship between capital structure and profitability (U-shaped) and between non-interest income and profitability (U-shaped), but not particularly strong and stable across models, and the indirect relation between capital structure and profitability through operational efficiency is not identified. The bad debt ratio has a significant negative effect on profitability and indicates that asset quality is an important determinant of the profitability of the bank, thereby reflecting the credit risk.

**Key words:** *capital structure, operating efficiency, non-interest income, profit, commercial banking, Vietnam.*

## INTRODUCTION

In the banking sector, profit is seen as a key measure that signifies the efficiency of a business, its financial security, and overall sustainable growth. For this reason, many studies have examined the factors influencing the profitability of the banks on micro and macro levels. In this group, it was found that the capital structure is an important variable in financial governance. It is the ratio of equity and liability that makes up the capital structure, which affects the cost of capital, risk, and efficiency of operation. The academic dispute regarding the effect of capital structures was the result of the foundational research, which has been the basis for further investigations of the neutrality or actual effect of capital structures on bank profits. The experience indicates that it is possible to achieve an optimal capital structure to increase the profit margin of banks by controlling risk and effectively using financial leverage.

The bank's operational efficiency is also a key contributor to improving profitability, in addition to the capital structure. Operational efficiency is the most efficient use of resources to maximize revenue and to minimize costs. A more efficient operation and good cost management can lead to better returns for the good banks than for the underperforming banks. Furthermore, with rising competition, many banks have begun to offer non-credit financial services. The bank's reliance on traditional lending will also be reduced, and its profit stability will be enhanced with non-interest income generated by services like payments, guarantees, foreign exchange trading, and securities investment.

Although there have been many studies analyzing the factors affecting bank profitability, the empirical results are inconsistent, especially for the role of non-interest income and capital structure in improving the financial performance of banks. A few studies indicate that a diversification of revenue sources can lead to higher profits and lower risk; others indicate that non-traditional sources of revenue can lead to higher volatility of profits. Moreover, most existing studies are conducted in developed economies or at the major financial markets, and the empirical evidence for emerging economies is not extensive.

In this context, Vietnam's banking system is undergoing a strong restructuring process and, at the same time, is fostering business diversification to increase the efficiency and competitiveness of the bank. However, studies to simultaneously assess the impact of capital structure, operating efficiency, and non-interest income on bank profits in Vietnam are still relatively limited. Based on this, this study aimed to analyze the effects of the above factors on the commercial banks' profitability in Vietnam. The findings from the study are likely to contribute to the body of empirical evidence in the debates on banking and finance and offer some policy recommendations for enhancing operational efficiency and financial governance of commercial banks.

### Research Objectives

- To examine the impact of capital structure on the profitability of commercial banks in Vietnam.
- To analyze the effect of operational efficiency on bank profitability during the study period.
- To evaluate the influence of non-interest income on the profitability of commercial banks in Vietnam.
- To investigate the nonlinear relationship between capital structure, operational efficiency, non-interest income, and bank profitability.
- To assess the impact of bank-specific and macroeconomic control variables on the profitability of commercial banks in Vietnam.

The entire paper is divided into five main parts. Section 2 covers the literature review, theoretical framework, and hypotheses. Section 3 describes the methodology, which includes the data gathering procedure, variables, and analysis technique used in the research. Section 4 involves the presentation of the empirical results and their interpretations. Finally, Section 5 offers policy recommendations, and Section 6 concludes the discussion on future research.

## RESEARCH OVERVIEW AND THEORETICAL BASIS

The bank's capital structure is the allocation and proportion of its capital between equity, mobilized capital (deposits), and other sources of loans and financing for business activities and credit. Specifically, the mobilized capital can be the major part, and is usually the most important to allow the bank to expand its activities.

In terms of the impact mechanism, capital structure can directly or indirectly affect the bank's profitability.

This study focuses on the direct effect of capital structure on bank profit.

The capital structure theory that he started is regarded as one of the important bases of modern corporate finance. The original argument holds that the value of the enterprise is not dependent on capital structure under perfect market conditions. Once taxes, financial exhaustion costs and information asymmetries are considered, however, capital structure is found to have the potential to directly influence the value and profitability of a business.

In a positive sense, leverage can enhance return, develop a discipline of using cash flow efficiently, and increase the rate of return. Empirical evidence also indicates that there is a positive relationship between the amount borrowed and the profit of corporations. For banks, low deposit rates make low-cost capital available that can boost profit as risks are properly managed.

If leverage is above the optimal level, however, financial risk may increase and lead to representation costs and exhaustion costs, reducing the returns, especially for the banking sector, where it is related to financial stability and capital adequacy.

Based on the foregoing arguments, the capital structure – bank profit relationship may be two-way or non-linear. Hence, the research hypothesis is given as:

**H1a: Financial Leverage Has a Negative Impact on Profits at a Low Level**

**H1b: Financial Leverage Has the Opposite Impact on Profits When It Exceeds the Optimal Threshold**

\* The second indirect effect of capital structure on profitability is via its effect on operational efficiency.

The capital structure can influence profitability not only because of the direct impact channel, but also because of the operational efficiency channel. Financial leverage puts additional pressure on market discipline and forces managers to make an effort to lower costs and increase the efficiency of their operations. As the efficiency of the Bank improves (e.g., cost to income ratio is reduced), profits tend to rise for the Bank.

Based on the empirical findings of the study, which were conducted at banks in Indonesia, it was found that the capital structure is able to affect the operational efficiency, which has a meaningful effect in Indonesia, while it does not affect the profitability directly. This finding suggests that performance can be an intervening variable in the capital structure-profit relationship.

The adjustment of capital structure may first of all impact the ability to control costs, risk management, and operational efficiency, which consequently has an indirect impact on profits, in the context where Vietnamese banks are restructuring and improving the capital adequacy requirements.

Thus, the next research hypothesis is put forward:

## **H2: The Capital Structure Impacts the Bank's Profitability Through Operational Efficiency**

Bank's financial results and Profits are believed to be impacted by Operational efficiency. In banking and finance, performance is defined as the ability of a bank to leverage its resources and achieve cost optimization, productivity, and business outcomes. Hence, operational efficiency and bank profitability are subjects of interest to many empirical studies.

The first study on this relationship is a study that employed statistical cost accounting methods to examine the link between the bank profits and the two measures of operational efficiency, namely pricing efficiency and operational efficiency. The findings indicate that, once other factors are included, such as market structure, regional supply/demand conditions, and macroeconomic conditions, the profit margins of high-profit and low-profit banks are more similar across asset classes and across liability classes. The study also did not discover obvious evidence that high-margin banks outperform low-margin banks.

However, there have been many studies since that indicate that bank efficiency is also a critical factor in bank profitability. Analyzing the relationship between efficiency and profitability of banks in major European Union economies was done by data envelopment analysis (DEA) methodology, along with regression methodology. The findings indicate that the higher the profits, the more technically efficient banks are compared to their competitors. Furthermore, the study also reveals a high level of impact of the structure and concentration of financial markets on the financial performance of banks [19].

Empirical studies over recent years still validate the contribution of operational efficiency to bank profits. The study indicates that the ratio of operating expense to operating income has a negative and statistically significant effect on bank profitability, which suggests that bank profitability can be improved by operating with low costs and high efficiency [6]. Likewise, it is found that the intrinsic factors of banks, such as management efficiency and operational efficiency, are also significant factors that affect bank profitability.

Moreover, in Spain, banks that have high profits tend to be related to good performance, low NPL, high loan-to-asset ratio, and can mobilize large customer deposits [14][15]. Moreover, there are other studies that indicate that financial and governance issues can also impact bank performance. For instance, in the previous study, the relationship between capital structure and performance of banks in Pakistan is found to be positive [17].

Besides the financial concerns, there are also a lot of studies that emphasize the role of organizational factors and knowledge resources in enhancing the efficiency of operations. The studies reveal a positive and meaningful relationship between the intellectual capital, comprising human capital, relational capital, and process capital, and the performance of financial firms [9]. Meanwhile, this study points out that process restructuring and reducing operating costs are important factors that improve operational efficiency [13]. On the macro level, it underscores the importance of enhancing the efficiency of the banking sector to enhance the performance of the bank's business and foster economic development [12][18].

By summarizing the results of the previous studies, it can be noted that operational efficiency is an important aspect to increase the profitability and financial performance of the bank. To what degree operational efficiency will affect bank profitability, however, can vary depending on the nature of the banking system, the market structure, and macroeconomic conditions. Hence, further research into the relationship between the operational efficiency and the bank profits in various contexts is still required to elucidate the mechanism of the effect that this factor has the bank profit.

### **H3: Operational Performance Has a Positive Impact on the Profitability of Commercial Banks**

With the escalating competition and dynamic interest rate climate, many commercial banks have changed their traditional business model, which was driven primarily by interest income to multiple-income generation activities, under the title of non-interest income generation. The other income is mostly service fees and commissions, income from stock trading, foreign exchange trading, asset management, and other financial services. This change is anticipated to enable banks to lower their reliance on conventional credit activities, enhance profits, and stabilize their income sources.

Theoretically, numerous studies have shown that the non-interest income may be useful to the banking operation in terms of the diversification effect. Previous studies show that when banks carry out credit activities gather significant data about their customers. The information can be used to deliver other financial services, like securities underwriting, asset management, sales of investment funds, or insurance products. This, in turn, can enable banks to benefit from information, economies of scale, and operational efficiency by diversifying their operations beyond the traditional ones.

There are many empirical studies that have documented the positive association between non-interest income and bank returns. The study is based on the data of the banks in the Middle East and North Africa (MENA) area from 2010 to 2022, which indicates that the non-interest income has a positive and statistically significant effect on bank profitability [2]. Likewise, this study, commercial banks in Kenya similarly found that revenue sources like fees and commissions, transaction income, and foreign currencies have a significant positive effect on the financial performance of the bank. The findings indicate that additional income sources can minimize banks' reliance on interest income and enhance operational efficiency.

Furthermore, some studies have confirmed that there are complementarities between traditional and non-traditional banking activities arising from the non-interest income generated in the banks. It has been found that non-interest rate activities do not lead to an increase in credit risk and in fact, can lead to a positive resonant effect on the lending activity for medium-sized banks [1]. Likewise, studies have found that non-interest income enhances the operational efficiency of Ghanaian banks and, to a certain degree, creates economies of scale [3].

But there are some other studies that reveal that there is no direct positive relationship between non-interest income and bank profits. The study indicates that in China, some non-interest income, particularly trading income, can be effectively used to dampen returns because of the constraints of the regulations and investment opportunities [5]. In the same way, for private banks in Liechtenstein, it was discovered that high non-interest income ratios were negatively associated with the return on assets (ROA), and there was no association found between non-interest income ratios and return on equity (ROE).

In addition to the effects on profits, many studies investigate the effect of non-interest income on banking risk. The study, based on information from almost one thousand banks in 22 Asian nations, concluded that non-interest activities can be used to mitigate banking risk, but the increase in the effect on returns is not clear [11]. The study, however, indicates that non-interest income could be a source of banking risk in Asian countries [4]. On the contrary. The same was concluded in a study on U.S. banks, which considered non-interest income a risk increase factor, particularly after the global financial crisis [7].

Besides, some of the research shows that the effect of non-interest income on the efficiency of banking is dependent on the characteristics of each type of bank and its income structure. It is revealed that retail-oriented banks are more stable with more non-interest income, whereas the investment-oriented bank is riskier [10]. Likewise, in this study Australian banking system, it was concluded that the banks with low non-interest income ratios and high revenue concentration are generally less risky [16].

Further, numerous factors, including bank size, market structure, macroeconomic conditions, and institutional factors, have been found to have an impact on the development of non-interest income. For example, it has been found that small banks are more likely to be involved in non-traditional activities

to earn non-interest revenues. Meanwhile, research shows that a bank's ability to generate profits from service fees is also influenced by factors at the national level, such as the macroeconomic environment, financial industry characteristics, and cultural factors.

A consideration of the studies conducted would show that the importance of non-interest income in commercial banks is increasing. However, the effects of non-interest income on the bank's profitability have varied in different studies because the market structure, type of banking, the size of the banking operations, and the economic climate differ. Thus, further research is required into the relationship between non-interest income and the profitability of banks in particular contexts to achieve clarity on the role of revenue diversification in bank performance in commercial banks.

#### **H4: Non-Interest Income Has a Positive Impact on Commercial Banks' Profits**

#### **H5: Macro Factors Have a Positive Impact on the Profitability of Commercial Banks**

### **RESEARCH METHODS AND MODELS**

This research is related to the commercial banking system in Vietnam. In particular, the research focuses on 31 commercial banks in Vietnam, such as state-owned, joint-stock commercial banks, and listed commercial banks. Vietnam is chosen as the study area because the banking sector has experienced a lot of restructuring, financial liberalization, and diversification of income sources in the period 2010-2024. The Vietnamese banking sector is also suitable to examine the link between capital structure, efficiency, NII, and profitability in an emerging economy.

The sampling frame is commercial banks that exist in Vietnam from 2010 to 2024. The final sample consists of 31 commercial banks for which available and consistent financial data is available. Newly established banks and banks that had financial statements that were not completed were not included to answer the question about data comparability and reliability. The sample consisted of banks listed on the Vietnamese stock market and banks having annual reports and audited financial statements published in public.

#### **Data Collection**

Secondary panel data were used in the study, and they were obtained from several valid data sources. Financial data of commercial banks were sourced from annual reports, audited financial statements, and the Vietstock (vn) provided by the banks. The data of macroeconomic indicators, including GDP growth and Consumer Price Index (CPI), were gathered from the General Statistics Office of Vietnam (GSO.gov.vn). The data span 14 years, starting in 2010 and ending in 2024, which gives a total of 451 observations.

#### **Model Details for Analysis**

The study uses the quantitative research method which is based on a dynamic panel data model. The System Generalized Method of Moments (System GMM) estimator was used because bank profitability is likely to be persistent and endogeneity might exist among variables. The model uses lagged dependent variables to reflect the dynamics of profitability.

The dependent variables include:

- Return on Assets (ROA)
- Return on Equity (ROE)

The independent variables include:

- Capital Structure (LEV)
- Operational Efficiency (EFF)

- Non-Interest Income (NII)

In addition, squared terms for LEV, EFF, and NII were used in order to analyze the non-linear effects. The control variables included bank size (SIZE), loan-to-assets ratio (LTA), capital adequacy ratio (CAR), non-performing loans (NPL), loan-to-deposits ratio (LDR), loan loss provision (LLP), GDP growth rate, and inflation (CPI).

The empirical model is expressed as equation 1:

$$Y_{it} = \alpha_1 Y_{i(t-1)} + \alpha_2 Y_{i(t-2)} + \beta_1 LEV_{it} + \beta_2 LEV_{it}^2 + \beta_3 EFF_{it} + \beta_4 EFF_{it}^2 + \beta_5 NII_{it} + \beta_6 NII_{it}^2 + \beta_7 C_{it} + \lambda_t + \eta_i + \varepsilon_{it} \quad (1)$$

where:

- $Y_{it}$  represents bank profitability indicators (ROA and ROE),
- $C_{it}$  denotes control variables,
- $\lambda_t$  represents time effects,
- $\eta_i$  represents unobserved bank-specific effects,
- $\varepsilon_{it}$  is the random error term.

Validity and reliability of the models were assessed through the following:

- Arellano–Bond AR (1) and AR (2) autocorrelation tests,
- Hansen over-identification test,
- The variance Inflation Factor (VIF) test for multicollinearity is performed.

To examine the existence of a nonlinear relationship between capital structure, operational efficiency, non-interest income, and bank profits, the study added the square variable of leverage ( $LEV^2$ ),  $EFF^2$ ,  $NII^2$  to the model.

If  $\beta_1 > 0$  and  $\beta_2 < 0$  The U-shaped relationship is inverse, and there is an optimal level of leverage. At this time, the optimal leverage level will be determined according to the equation 2

$$\text{Optimal } LEV/EFF/NII = -\frac{\beta_1}{2\beta_2} \quad (2)$$

If  $\beta_1 < 0$  and  $\beta_2 > 0$ , then the U-shaped relationship.

If  $\beta_2$  has no statistical significance (P-Value>5%), then there is no nonlinear relationship, but a linear relationship.

In figure 1 shows how capital structure (LEV), efficiency (EFF), non-interest income (NII), and bank performance (ROA, ROE) are related to each other. There are both direct and indirect effects suggested in the model, wherein efficiency is the mediating effect between capital structure and bank performance. Nonlinear relations are captured by using squared terms, and bank-level as well as macroeconomic variables like SIZE, CAR, NPL, GDP, and CPI are considered.

The presence of nonlinear relations is compatible with the trade-off theory originating from the base of according to which the enterprise exists an optimal capital structure to enable the balance between tax benefits and financial exhaustion costs.

The data utilized is secondary data from pages (Vietstock.vn), annual reports of banks and General Statistics Office (Gso.gov.vn). The study will not include the financial statements of newly established or consolidated banks as it will not be financially comparable with the others and these banks do not provide sufficient amount of information required for the study. According to Bollen (1989), when

analyzing a model with a linear structure, the sample size is calculated according to the formula  $n = 5 * 2i$  (i is the variable observed in the model) According this study the sample size in multiple linear regression analysis is calculated according to the formula  $n = 50 + 8q$  (q is the number of independent variables in the model).

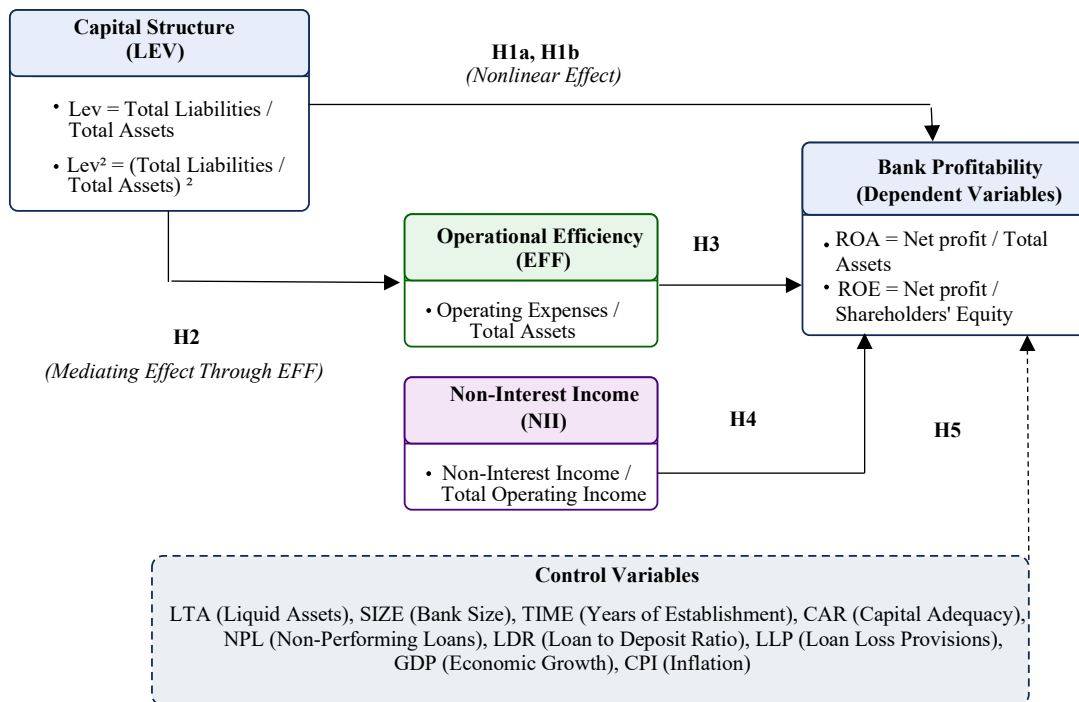


Figure 1. Conceptual framework of the impact of capital structure, operational efficiency, and non-interest income on bank profitability

The variables that were used in the research model are shown in table 1, which contains the names of the variables, the symbols of the variables, and the formulas defined by each variable. In addition to this, variables are also described by statistical indicators, like mean, standard deviation, smallest value, and maximum value of the variables, which are also given in table 1.

Table 1. Descriptive statistics of variables in the research model

No.	Variable name and symbol	Formula
<b>Independent variables</b>		
01	Capital structure (LEV)	Total liabilities / Total assets
02	Operational efficiency (EFF)	Operating expenses / Total assets
03	Non-interest income (NII)	Non-interest income / Total assets
04	Bank size (SIZE)	Ln (Total assets)
05	Credit risk (LTA)	Total loans / Total assets
06	Firm age (TIME)	Ln (Year of observation – Year of establishment)
07	Capital adequacy ratio (CAR)	Equity / Risk-weighted assets (Credit risk + Operational risk + Market risk)
08	Non-performing loan ratio (NPL)	Total non-performing loans / Total outstanding loans
09	Loan-to-deposit ratio (LDR)	Total outstanding loans / Total customer deposits
10	Loan loss provisions (LLP)	Loan loss provisions / Total outstanding loans
11	Gross domestic product (GDP)	Growth rate of gross domestic product
12	Consumer price index (CPI)	Growth rate of consumer price index

Source: Compiled by the author based on the literature review.

RESULTS OF REGRESSION MODEL INSPECTION

The data for this study are panel data from 31 commercial banks in Vietnam from 2010 to 2024, with a total of 451 observations. The data in this study is panel data from 31 commercial banks operating in Vietnam for the period from 2010-2024, excluding 6 banks that did not provide complete financial data. Financial measures pertaining to profitability, capital structure, operational efficiency, non-interest income, and macroeconomic indicators are included in the data set. The analysis was carried out with the use of statistical software "Stata 14", which was used to build descriptive statistics, correlation analysis, testing of the multicollinearity of variables and estimation of "System Generalized Method of Moments" (System GMM). Prior to model estimation, the model initialization and diagnostic processes were carried out to guarantee the reliability and validity of the models. The features of the dynamic nature of bank profitability were accounted for by the use of lagged dependent variables. Nonlinear relationships were explored by including quadratic terms in the model, including  $LEV^2$ ,  $EFF^2$ , and  $NII^2$ . The study then performed the Arellano–Bond AR(1) and AR(2) tests, Hansen over-identification tests, and Variance Inflation Factor (VIF) analysis to ensure the robustness and suitability of the estimated models.

The statistical analysis is described in table 2 about the distribution characteristics of the variables used in the study model, with a total of 451 observations. The results showed that the variables had different levels of volatility, reflecting differences in the operational efficiency and financial characteristics of the banks in the study sample, which are shown in figure 2 and table 2.

Table 2. Statistics describe the variables in the research model

Variable	Obs	Mean	Std. Dev.	Min	Max
ROA	451	0.0079	0.0102	-0.1385	0.0323
ROE	451	0.1299	0.7588	-0.8417	16.0915
LEV	451	0.9108	0.0379	0.7435	1.00861
EFF	451	0.0159	0.0051	0.0058	0.0519
NII	451	0.0067	0.0049	-0.026	0.0279
LTA	451	0.5690	0.1230	0.1448	0.7880
SIZE	451	32.6002	1.24996	2.97382	35.5542
TIME	451	2.96091	0.6902	0.0000	4.20469
CAR	451	0.0921	0.0716	0.0000	0.42
NPL	451	0.0222	0.0268	0.0000	0.3584
LDR	451	0.9022	0.1938	0.3718	1.80500
LLP	451	0.0139	0.0066	0.0054	0.1061
GDP	451	0.0613	0.0158	0.026	0.085
CPI	451	0.0508	0.0442	0.0064	0.1868

Source: Statistics on Stata 14 software

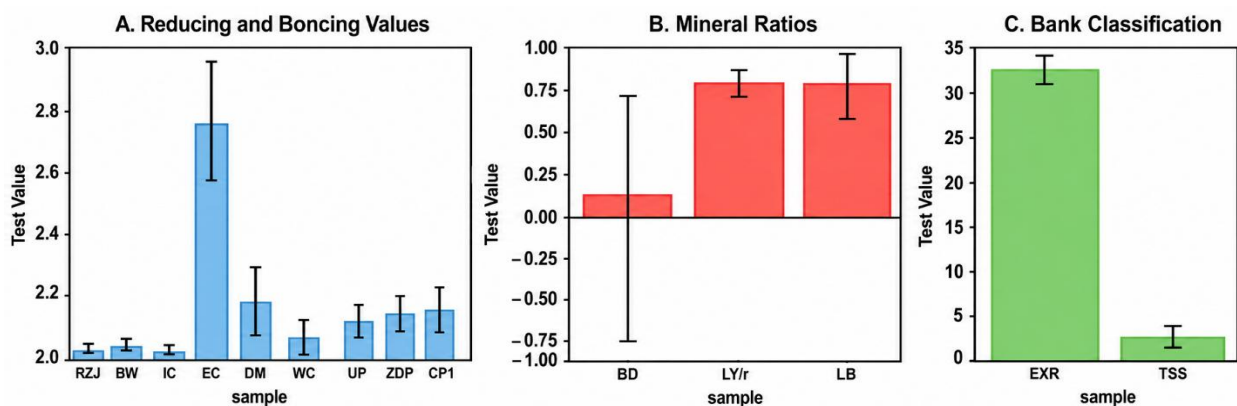


Figure 2. Mean distribution of research variables with standard deviation

The average value of the dependent variables was 0.0079; thus, the return on total assets of the banks in the sample was relatively low. ROA had a minimum value of -0.1385 and a maximum value of 0.0323, which indicates a substantial difference in profitability among banks. ROE is averaging 0.1299 with a fairly large standard deviation (0.7588), which shows that there is a lot of volatility in the ROE of banks.

The financial leverage ratio (LEV) for independent variables averaged 0.9108, which means that most of the assets of the banks are funded by their liabilities. The operating efficiency (EFF) averaged 0.0159 with a standard deviation of 0.0051, showing that overall, banks' operating efficiency remained fairly consistent. The average ratio of non-interest income to total assets (NII) is 0.0067, which means that non-interest income is relatively small in banks' balance sheets.

The bank's average ratio of outstanding loans to total assets (LTA) is 0.5690, suggesting that the share of credit activities in the asset structure of banks remains high. There were some differences in asset size between the banks in the sample, with the average Bank Size (SIZE) being 32.6002. The age of the bank (TIME) had an average value of 2.9609, indicating that the banks in the sample had relatively different operating times.

In addition, the indicators reflecting the level of risk and financial safety of banks are also significantly different. The average capital adequacy ratio (CAR) is 0.0921, which means that most of the financial institutions have a fairly acceptable equity ratio. The average value of the non-performing loans (NPL) ratio is 0.0222, indicating good credit quality. The loan-to-deposit ratio (LDR) stood at an average of 0.9022; thus, most of the mobilized money was utilized in lending operations. The average credit risk provision (LLP) is 0.0139, showing that banks still have some levels of provisions to protect credit risks.

The average GDP growth rate over the study period was 0.0613, showing that the GDP growth rate was relatively stable for macroeconomic variables during that period. Meanwhile, the consumer price index (CPI) is averaging at 0.0508, which is a moderate level of inflation for this period.

Overall, the descriptive statistical results in this study indicate that the research data have some fluctuations between the banks and from year to year, which means that it provides an important empirical basis for further analysis of the relationship between capital structure, operating efficiency, etc., non-interest income, and bank profits in regression models in the following sections.

Table 3. Pearson correlation coefficient

	ROA	LEV	EFF	NII	LTA	SIZE	TIME	CAR	NPL	LDR	LLP	GDP	CPI
ROA	10.000												
LEV	-0.3153*	10.000											
EFF	-0.0389	-0.3057*	10.000										
NII	0.5086*	-0.1829*	0.1937*	10.000									
LTA	0.2001*	0.1229*	0.1225*	0.1291*	10.000								
SIZE	0.2631*	0.4996*	-0.1359*	0.3482*	0.4624*	10.000							
TIME	0.1708*	0.2809*	-0.0038	0.1749*	0.4101*	0.5229*	10.000						
CAR	0.2620*	-0.3482*	0.1713*	0.0854	-0.0184	-0.0713	0.0417	10.000					
NPL	-0.5441*	0.0450	0.1751*	-0.1934*	-0.0777	-0.1257*	0.0430	0.0251	10.000				
LDR	0.4147*	-0.2788*	0.1065	0.1779*	0.5235*	0.1643*	0.2353*	0.1380*	-0.1263*	10.000			
LLP	-0.4186*	0.1685*	0.1817*	-0.0460	-0.0032	0.2689*	0.2086*	-0.0256	0.5269*	-0.0813	10.000		
GDP	-0.0206	-0.0025	0.0365	-0.0924	0.0077	-0.0474	-0.0375	-0.0584	-0.0349	0.0290	-0.0765	10.000	
CPI	0.0207	-0.2491*	0.0821	-0.1860*	-0.3998*	0.3040*	-0.1804*	0.1580*	0.0107	0.1027	0.0657	0.0375	10.000

Notes: \*  $p < 0.1$ , \*\*  $p < 0.05$  \*\*\*  $p < 0.01$ . Source: Statistics on Stata 14 software

The correlation between the variables is presented in table 3 as presented above, which shows that there is no different relationship between bank return (ROA) with non-interest income (NII), lending ratio (LDR), and bank size (SIZE); this means that an increase in lending activities and diversifying the revenue sources can help to increase the profitability of the bank. Contrarily, ROA's negative

correlations with the non-performing loans (NPLs), credit risk provisions (LLPs), and financial leverage (LEV) show that credit risk and cost of capital have a negative effect on bank profits. Bank-specific variables and macro variables generally have a low to moderate correlation. Specifically, all the correlation coefficients were below 0.8, suggesting that little risk of multilinear integration in the model existed. Thus, the data is appropriate to be further used for regression analyses to evaluate the influence of factors on bank profitability.

Firstly, the relationship of return on investment (ROA) with non-interest income (NII) and loan-to-deposit ratio (LDR) is quite moderate at the bank. This is in line with the diversification of income of modern banks, where financial services income, payment fees, or investment income is a factor in enhancing profitability. On the other hand, the efficient utilization of funds raised from the lending activities also contributes to the enhancement of interest income, which consequently leads to improving the bank's profit. The result obtained is in line with the view that rational credit expansion and diversified sources of revenue are key factors in enhancing banking operations' efficiency.

On the other hand, the non-performing loans (NPLs) and credit risk provisions (LLPs) have fairly high negative correlations with profits. If credit quality gets worse, then, in theory, banks will have to raise their risk provisions, which will raise costs and lower profits. This relationship is an illustration of how important credit risk management is in ensuring the financial performance of the bank. On the other hand, financial leverage (LEV) is negatively correlated with ROA and indicates that excessive dependency on debt capital may lead to higher capital costs and financial risks, thus having a negative impact on profitability.

Furthermore, there is a positive correlation between bank size (SIZE) and profitability, as well as between TIME and profitability, meaning that large banks with long operating histories tend to have an advantage in terms of their size, operating system, and management experience, and thus the ability to generate more stable profits. However, macro variables like GDP and CPI are not very correlated with bank profit, indicating that the influence of the macroeconomic environment may be less direct and more apparent in a multivariate regression model.

More significantly, however, the correlation coefficients among the independent variables are average, and in no case exceed the threshold considered likely to cause severe multilateralism. This implies that the explanatory variables in the model are relatively independent of one another, making subsequent regression analyses with the aim of isolating the actual effect of each explanatory variable on the profitability of banks easier to conduct.

Table 4. Multi-integration testing

Variable	VIF	1/VIF
SIZE	3.17	0.315154
LTA	2.54	0.393257
LEV	2.34	0.427067
LDR	2.01	0.498718
LLP	1.90	0.526926
NII	1.68	0.594255
NPL	1.65	0.607746
CPI	1.60	0.625919
TIME	1.53	0.652785
EFF	1.38	0.726794
CAR	1.21	0.824795
GDP	1.03	0.971856
Mean VIF	1.84	

*Source: Statistics on Stata 14 software*

From the results obtained in table 4, the VIF coefficient in the multilinear test indicates that the variables in the model have low linear correlation, and do not have serious multi-linear problems. Specifically,

the largest VIF value is 3.17 (SIZE), and the smallest is 1.03 (GDP), with an average VIF value of 1.84 (which is lower than the common warning VIF value of 10, and even lower than the tighter warning value of 5). Simultaneously, the Tolerance values (1/VIF) are all above 0.1 (ranging from 0.315 to 0.972), suggesting that the independent variables do not measure highly linearly with each other. Hence, the concern of multilinear is not an issue in the model, and the explanatory variables that have been used could be trusted for future regression analysis.

Table 5. Models estimation results

Variables/Test	Model (1) ROA	Model (2) ROE	Model (3) EFF
L. Dependent variable	0.322*** (0.010)	0.435*** (0.007)	0.413** (0.041)
L2. Dependent variable	0.056 (0.740)	0.052 (0.375)	0.081 (0.346)
LEV	-0.563 (0.618)	-23.603* (0.085)	-0.530 (0.549)
LEV <sup>2</sup>	0.291 (0.645)	13.146* (0.080)	0.281 (0.566)
EFF	-0.593 (0.540)	-5.435 (0.508)	-
EFF <sup>2</sup>	19.705 (0.486)	186.032 (0.438)	-
NII	0.366 (0.615)	13.812** (0.014)	-0.966* (0.100)
NII <sup>2</sup>	9.720 (0.812)	-558.303* (0.092)	64.744* (0.061)
LTA	-0.003 (0.729)	-0.033 (0.722)	0.014* (0.059)
SIZE	0.001* (0.088)	0.003 (0.785)	-0.0002 (0.787)
CAR	0.009* (0.098)	0.070 (0.414)	-0.004 (0.575)
NPL	-0.074*** (0.000)	-1.365*** (0.000)	0.012 (0.244)
LDR	0.005 (0.263)	0.061 (0.254)	-0.005* (0.064)
LLP	-0.100 (0.343)	0.444 (0.732)	-0.013 (0.865)
GDP	0.007 (0.484)	0.169 (0.158)	0.020* (0.057)
CPI	0.004 (0.851)	-0.085 (0.772)	0.023 (0.207)
_cons	0.228 (0.653)	10.472 (0.104)	0.259 (0.509)
Observations	385	385	385
Instruments	36	36	26
AR(1) p-value	0.020	0.018	0.034
AR(2) p-value	0.286	0.378	0.234
Hansen test p-value	0.415	0.764	0.218
F-statistic	56.97***	42.85***	24.41***

Notes: \* p < 0.1, \*\* p < 0.05 \*\*\* p < 0.01. Source: Statistics on Stata 14 software

The three System GMM models (Table 5) were used to estimate, and the results of the post-estimation test show that the System GMM model constructed is suitable and reliable. The results of the Arellano Bond AR(1) test indicate that there is first-order autocorrelation in the error variables for both models: ROA model with a p-value of 0.020 and ROE model with p value of 0.018. This is a typical problem that arises in dynamic GMM and is not a problem for the validity of the model. Most importantly, both the AR(2) tests result in p-values greater than 5%, and therefore, there is no quadratic autocorrelation in the error. This is an indication that the tool variables used in this model are relevant. Furthermore, the

p-values of the two Hansen tests can be obtained as 0.415 and 0.764, respectively, both of which are greater than 0.05, which suggests that the instrument variables are not correlated with the errors and, hence, such a model does not suffer from over-identification problems. The two-step System GMM method is thus suitable for this purpose, and the estimation results can be used for analyzing the factors that affect the profitability of the bank.

From the perspective of the dynamics of the return, both models result in a positive coefficient of the first-order lag of the dependent variable, and both are statistically significant. The coefficient of the ROA(t-1) term is 0.322, and the p-value is 0.010. Similarly, the coefficient of the ROE(t-1) term is 0.435, and the p-value is 0.007. This indicates that the profitability of the bank is inherited over time; this suggests that the profitability of the bank in the past influences the current profitability. Meanwhile, the quadratic lag variable of return was not statistically significant in both models, with a coefficient of 0.056 ( $p=0.740$ ) for ROA and 0.052 ( $p=0.375$ ) for ROE. This indicates that the impact of past profits is primarily in the short term; in the longer term, the impact is unclear. Notably, the capital structure shows a nonlinear relationship with profitability, but the impact is not really strong and stable between models. The bad debt ratio has a significant negative impact on profitability, which indicates that asset quality is an important determinant of the profitability of the bank and, thus, credit risk is reflected in this ratio. Some macro variables, as well as non-interest income, also play a certain role in influencing the profitability of the bank.

**With the H1a and H1b hypothesis:** The results show that for the capital structure, the LEV variable has a coefficient of -0.563 in the ROA model with a p-value of 0.618, indicating that the impact of financial leverage on ROA is negative but not statistically significant. In the ROE model, the coefficient of LEV is, however, -23.603 with a p-value of 0.085, which is statistically significant at 10%. The implication of this result is that an increase in the financial leverage ratio leads to a fall in the return on equity. This can be explained by the increase in debt, which increases costs thereby reducing the efficiency of equity use. Besides, the LEV<sup>2</sup> variable has a coefficient of 0.291 ( $p=0.645$ ) in the ROA model and 13.146 ( $p=0.080$ ) in the ROE model. This variable is statistically significant at 10% level and has a positive coefficient in the ROE model, although it is not significant in the ROA model. This implies that the capital structure-performance link may be U-shaped and non-linear, with the use of debt funds leading to a decline in profitability at lower levels, but to an increase at higher levels, until a specific point of optimal leverage is reached, where the use of debt can benefit banks to increase their credit activities and thus profitability.

Post estimation tests for model (3) confirm the model's appropriateness. The p-value of the Arellano Bond AR(1) test is 0.034, which is below the 5% significance level, suggesting that there is a first-order error autoregressive relationship, which is typical in dynamic GMM models. More importantly, the p-value of the AR(2) test is equal to 0.234, which is higher than 5%, indicating that there is no quadratic autocorrelation in the error term and the instrumental variables employed in the model are valid. Also, the Hansen test p-value is 0.218, which is larger than the significance level of 0.05, implying that the instrument variable is not correlated with the errors in the model and there are no over-identification issues. Hence, the output of the model can be trusted to examine the factors that impact the bank's performance. The results revealed that the LEV variable was found to have a coefficient of -0.530 with a p value of 0.549, and the LEV 2 variable was found to have a coefficient of 0.281 with a p value of 0.566. Both the variables were found to be non-significant, which indicates that the capital structure did not significantly influence the performance of the bank in the study sample. This suggests that changes in the financial leverage ratio have not been significant to the bank's operational management capacity or cost-use efficiency.

**With the H2 Hypothesis:** None of the variables in the two models (EFF and EFF<sup>2</sup>) are statistically significant for performance. Specifically, the coefficient of EFF in the ROA model is -0.593 ( $p=0.540$ ) and in the ROE model is -5.435 ( $p=0.508$ ). Similarly, the coefficient of EFF<sup>2</sup> is 19.705 ( $p=0.486$ ) for ROA and 186.032 ( $p=0.438$ ) for ROE. The result indicates that there is no significant effect of operational efficiency on the bank's profitability in the research sample.

The coefficient of the variable NII in the ROA model is 0.366 ( $p= 0.615$ ) while in the ROE model the coefficient of the variable NII is 13.812 ( $p = 0.014$ ) with the hypothesis H3. ROA is not statistically significant, while this variable is significant at 5% with a large positive coefficient with ROE. Any rise in non-interest income from payment services, insurance, or investments can add very much to a bank's return on equity. However, the NII<sup>2</sup> variable has a factor of 9.720 ( $p = 0.812$ ) in the ROA model and 558.303 ( $p = 0.092$ ) in the ROE model. The presence of NII<sup>2</sup> with a negative coefficient in the ROE model suggests that the relationship between NII and profitability might be inverse U shaped, wherein an increase in the proportion of non-interest income will help to improve profitability at the initial stage, but as NII increases further, the proportion of non-interest income may become too large, leading to an increase in operating costs or market risk and consequently a decline in profitability.

LTA variable has a coefficient of -0.003 ( $p = 0.729$ ) on ROA and coefficient of -0.033 ( $p = 0.722$ ) on ROE when included in the group of bank-characteristic variables, which means that the LTA ratio does not seem to have a significant impact on profitability in the model. The SIZE variable has a factor of 0.001 ( $p= 0.088$ ) in the ROA model, which is significant at 10%, indicating that a larger bank size can help slightly improve return on assets thanks to economies of scale. But the same variable is not statistically significant in the ROE model with a factor of 0.003 ( $p = 0.785$ ).

In the ROA model, the factor of the CAR variable is 0.009 ( $p = 0.098$ ), which is a positive factor but of low significance. This means that the bank's equity, which could be useful for its risk tolerance and its efficiency, will be higher. The coefficient of CAR in the ROE model is 0.070 ( $p = 0.414$ ) and not statistically significant, though.

Interestingly, profitability is negatively influenced by not only the NPL variable but also its associated models in both cases. That is, the coefficient of NPL is -0.074 ( $p = 0.000$ ) with respect to ROA and -1.365 ( $p = 0.000$ ) with respect to ROE, which are statistically significant at 1%. This indicates that the higher the bad debt ratio, the higher the cost of credit risk provisions, which will in turn lead to lower profits for banks. This is in tune with various previous studies that have proposed that credit risk is one of the most crucial factors that influence the performance of a bank.

The other variables, namely LDR, LLP, GDP, and CPI, are not statistically significant in either model. The coefficients of the LDR are 0.005 ( $p= 0.263$ ) on ROA, and 0.061 ( $p= 0.254$ ) on ROE, indicating that the loan-to-deposit ratio was not a significant factor affecting profitability in the sample of banks studied. Likewise, macro indicators like the growth of the economy and inflation rate were also not found to have a meaningful impact on the bank's profitability in the study period.

Based on the empirical results, it can be concluded that the internal factors, namely, the credit risk and income structure are major factors affecting the Bank's profit. However, the impact of capital structure seems to be nonlinear on the ROE, and this impact is not really strong; at the same time, there is no evidence of indirect relationships between capital structure and profit through operational efficiency. These findings suggest that banks should pay attention to credit risk management, bad debt control, and diversification of non-interest income sources to boost profitability in the long run and enhance their operational efficiency.

## POLICY IMPLICATIONS

From the empirical results, some policy recommendations are suggested to be adopted for enhancing the profitability and sustainability of commercial banks in Vietnam. First of all, the banks should diversify and improve their capital structure, and expand medium- and long-term funding while reducing dependence on public short-term deposits. Improving funding stability and liquidity management can be achieved through the issuance of certificates of deposit, long-term bonds and the expansion of digital payment services. Furthermore, banks need to improve equity capital to meet Basel III capital adequacy standards and ensure sustainable business growth. Second, banks must be able to take better care of their credit risk management, which involves reassessing their investments and placing priority on safer options. The activities of lenders, especially those in speculative real estate and fluctuating securities markets, need to be closely watched to minimize financial risk and enhance asset quality.

Thirdly, the banks need to improve their strategies for dealing with bad debts. Proper classification of the debt, proper documentation of the NPLs, and proper provision for possible losses are essential to ensure financial stability. The banks also need to enhance their internal control systems and credit appraisal systems, as well as take proactive debt restructuring steps to avoid bad debts. Lastly, banks must diversify into non-interest income streams through greater fee-based services, investment, insurance products, and digital financial services. Good portfolio management and investment diversification can help to increase profits and minimize reliance on traditional lending income. Banks are also needed to deepen cooperation with domestic and international financial institutions and apply sophisticated financial analysis techniques to enhance the efficiency of investments and risk control. Overall, the results indicate that there is a need to further improve capital management, control credit risk, decrease bad debts, and increase non-interest income, which are all important measures to boost bank profitability and ensure sustainable banking development in Vietnam.

## CONCLUSION

The study applies panel data analysis of 31 banks in Vietnam during 15 years (2010–2024) with 451 observations to examine the impact of capital structure, operational efficiency, and non-interest income on the profitability of commercial banks in Vietnam. The methodology used in the study was the System Generalized Method of Moments (System GMM) model in order to overcome the problems of endogeneity and dynamic relationships in bank profitability. The empirical results supported the statistical soundness of the estimated models as evidenced by the results of the AR(1) and AR(2) tests of Arellano–Bond and the Hansen over-identification tests. The results revealed that the profitability of banks is found to be dynamically persistent. The profitability of the previous period (lagged profitability variables) was statistically significant with ROA and ROE, with coefficients of 0.322 ( $p < 0.01$ ) and 0.435 ( $p < 0.01$ ), respectively, indicating that the past profitability has a positive influence on the current profitability. Further, the study showed that for some of the product of this relation, the capital structure coefficient was negative and for some positive and significant at 10% level, for example, in the case of ROE. The income from non-interest also positively affects ROE with a value of  $\beta = 13.812$  and  $p < 0.05$ . This means that if the sources of income are diversified, then the ROE will increase. The squared non-interest income term was significant to illustrate the inverse U-shaped patterns, indicating that having too much or too little of non-interest income can result in a reduction in profitability. The operational efficiency variables were not statistically significant in both profitability models, however. Credit risk management is very important as the non-performing loans (NPL) variable had a strong negative relationship with profitability ( $ROA = -0.074$  and  $ROE = -1.365$ ,  $p < 0.01$ ). Future research could include additional variables (such as corporate governance, the use of fintech, and environmental risk factors) and use the bank size, bank ownership, and digitalization as classifications for a more comprehensive picture of the determinants of bank profitability.

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