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Bank Restructuring and Financial Performance: A Case Study of Commercial Banks in Vietnam

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Abstract

This study examines the impact of bank restructuring on the financial performance of commercial banks in Vietnam. The data for this study was obtained from the audited financial statements of 30 Vietnamese commercial banks from 2007 to 2019. Multiple regression analysis was used for investigation. Financial performance, as evaluated by ROAA, ROEA, and NIM, is the dependent variable. Financial restructuring, ownership restructuring, and operational restructuring are the independent variables. Pooled least squares (Pooled OLS), fixed effects model (FEM), random effects model (REM), and system generalized moment regression model (System GMM) are the estimate methods used to increase the accuracy of the regression coefficient. The research results show that the variables of financial restructuring activities such as government intervention and the ratio of equity to total assets; variables of ownership restructuring such as capital adequacy ratio, privatization of state-owned commercial banks, mergers, and acquisitions; variables of operational restructuring such as employees, branches, the cost to total assets; GDP variables and the second restructuring period have a positive impact on financial performance. Variables such as debt-to-capital ratio, bad debt ratio, state ownership ratio, expense-income ratio, and inflation have a negative effect on financial performance.

Keywords: Ownership Restructuring, Bank Restructuring, Financial Performance, Commercial Banks, Vietnam

JEL Classification Code: L25, P47, G34, G32

1. Introduction

The banking system serves as a conduit for moving idle funds to investment funds. Commercial banks' capital mobilization, lending, and investing operations, as well as their credit intermediation function, have benefited all participants and facilitated the circulation of goods through services. As a result, the growth of the commercial banking sector and the growth of the economy are inextricably linked. In 2007, Vietnam's economic growth hit an all-time

high of 8.48 percent. However, in the aftermath of the global financial crisis that began in the United States in 2008 and expanded to many other countries, Vietnam's macroeconomic position faced several challenges. In 2008 and 2009, the pace of economic growth was consistently lower. The economy showed indications of revival in 2010, but since 2011, growth has slowed again.

Along with the economy's current issues, the Vietnamese banking system's shortcomings and constraints, which have built up through time, imperil the commercial banking system's operations and harm the banking system's macro economy. In response to the economy's and banking system's limitations, as well as the demands of the current growth phase, the Vietnamese government has restructured the commercial banking system in two phases. Phase 1 was implemented in accordance with Decision No. 254/QĐ-TTg dated March 1, 2012, and phase 2 was implemented in accordance with Decision No. 1058/QĐ-TTg dated July 19, 2017, to improve the bank's financial position and operational capacity.

The following goals were pursued in this research: to investigate the impact of the general restructuring

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of commercial banks on the financial performance of commercial banks in Vietnam, as well as their link to major economic issues. (ii) present the research model and hypotheses, including study design, analysis, and discussion of the results for the years 2007 to 2019; (iii) conclude the study and suggest areas for improvement, as well as future research.

2. Literature Review

2.1. Bank Restructuring and Financial Performance

The commercial banking system has to be reformed on a regular basis to make the most use of its financial middleman function (Kithinji et al., 2017). According to Kithinji et al. (2017), bank restructuring encompasses financial, ownership, and operational restructuring.

In the context of the economic crisis, Birchil and Simmons (2010) highlighted the need to restructure the commercial banking sector to address significant flaws: When the economy is in a slump, particularly a long-term slump, the environment suffers. The performance of all businesses in general, and the banking system in particular, worsens, resulting in inefficiencies in the bank's operations, an increase in bad debts, and a higher risk of capital loss.

Banking restructuring entails a set of tightly coordinated actions intended at preserving the national payment system and access to credit services while addressing existing financial system issues that contributed to the crisis.

Efficiency is defined as the effective utilization of resources and the capacity to meet organizational objectives (Worthington, 2009). Thompson and Garbacz (2007) proposed that commercial bank efficiency may be financial or non-financial, based on their data methodology. Financial performance is a measurement of efficiency based on information from financial statements, primarily balance sheets and income statements (Rose & Hudgins, 2012; Dao & Nguyen, 2020). Employee efficiency, customer happiness, company growth and communication technologies, cost reduction, and the export of services such as human capital to foreign nations are all examples of non-financial success (Worthington, 2009). Financial success, according to Rose and Hudgins (2012) and Majeed et al. (2020), is evaluated by return-on-assets (ROA), return-on-equity (ROE), and net interest margin (NIM).

The indicators of total assets and owners' equity are taken from the balance sheet of the time period, while data for profit after tax, interest income, and interest expense, is taken from the income statement. This is period data (data of profit arising for the entire year), while the indicators of total assets and owners' equity are taken from the balance sheet of the time period (data at the end of the financial year).

According to Tran (2020), commercial banks' total assets and equity are information for the entire year, hence average total assets and average equity are necessary. Hence, financial performance based on average total assets and average equity, as measured by ROAA, ROEA, and NIM, will deliver more accurate results.

2.2. The Impact of Bank Restructuring on the Financial Performance

Thoraneenitiyan and Avkiran (2009) investigated the relationship between post-crisis bank restructuring, country-specific conditions, and bank efficiency in Asian countries from 1997 to 2001 using an approach that integrates data envelopment analysis and stochastic frontier analysis. We focus on restructuring measures related to bank ownership. The results indicated that although domestic mergers produce more efficient banks, overall, restructuring does not lead to more efficient banking systems. Banking system inefficiencies are mostly attributed to country-specific conditions, particularly, high-interest rates, concentrated markets, and economic development.

Sufian and Habibullah (2009) examined the determinants of the profitability of the Chinese banking sector during the post-reform period of 2000–2005. The empirical findings from this study suggested that all the determinants variables have a statistically significant impact on China banks' profitability. However, the impacts are not uniform across bank types. They found that liquidity, credit risk, and capitalization have positive impacts on the state-owned commercial banks' (SOCBs) profitability, while the impact of cost is negative. Similar to their SOCB counterparts, they found that joint-stock commercial banks (JSCB) with higher credit risk tend to be more profitable, while higher cost results in lower JSCB profitability levels. During the period under study, the empirical findings suggested that size and cost result in lower city commercial banks' (CITY) profitability, while the more diversified and relatively better-capitalized CITY tend to exhibit higher profitability levels. The impact of economic growth is positive, while growth in money supply is negatively related to the SOCB and CITY profitability levels.

Sanyal and Shankar (2011) investigated the effect of ownership and competition on Indian bank productivity since the 1991 reforms. They found that Indian private banks dominate the public and foreign banks both in terms of productivity levels and productivity growth, with the new Indian private banks leading the charge. For old Indian private banks, competition increases productivity, whereas competition affects all other institutions - the worst hit being new Indian private banks. A similar picture emerges on the productivity growth side, with the new Indian private bank

productivity growth being the worst affected as competition increases. An analysis of the pre- and post-1998 periods showed that the latter period displayed a much higher productivity gap between the Indian private banks and the public and foreign banks. Indian private bank productivity and productivity growth suffer due to increasing competition in the post-1998 period.

Curak et al. (2012) analyzed bank-specific, industry-specific, and macroeconomic determinants of bank profitability. Dynamic panel analysis was applied to the sample of 16 banks in the Macedonian banking system in the period between 2005 and 2010. According to the obtained results, among internal factors of bank profitability, the most important one is operating expense management. Further, profitability is influenced by solvency risk and liquidity risk. Regarding the external variables, economic growth, banking system reform, and concentration show a significant effect on bank profitability in the Republic of Macedonia.

The impacts of short-term debt to total assets, long-term debt to total assets, and total liabilities to equity on financial performance (ROA, ROE, and EPS) of 25 Pakistani commercial banks were investigated by Saeed et al. (2013). The authors came to the conclusion that although the ratios of short-term debt to total assets and long-term debt to total assets have a favorable effect on financial performance, the ratio of liabilities to equity has a negative impact on monetary performance.

In the years 2006–2013, Rahman et al. (2015) investigated the impact of variables influencing the financial performance of 25 Bangladeshi banks. ROA, ROE, and NIM are all indicators of financial success. According to empirical findings obtained using the GMM regression technique, capital strength (equity to total assets and CAR ratio) and bad debt have a positive and significant effect on financial outcomes. Cost efficiency (cost-to-income ratio) and off-balance-sheet operations have a negative and significant effect on the bank's financial performance. Non-interest income and credit risk are significant drivers of NIM in this case. ROA is influenced by size in a positive and significant way. Finally, inflation has a significant and negative effect on ROA and ROE.

The effect of bank restructuring on financial performance was investigated by Kithinji et al. (2017). Financial restructuring (long-term debt split by total assets), operational restructuring (number of branches, number of ATMs), restructuring asset structure (NPL ratio), and capital restructuring are the four variables measured by the authors (equity divided by total assets). The return on assets (ROA) of 44 Kenyan commercial banks was assessed from 2002 to 2014. The author used OLS estimation to estimate the multivariate regression model. The findings indicated that, at a 5% level of

significance, capital restructuring increases financial efficiency whereas asset restructuring has the reverse impact. Financial and operational restructuring, as well as the financial services control variables, were not statistically significant. Financial restructuring and financial services, on the other hand, improve financial efficiency at a 10% significance level, while operational restructuring decreases financial efficiency. The study model is only significant at a 10% level, indicating that the variables reflecting restructuring efforts can only explain 10% of the effect on financial performance.

Defung (2018) investigated the determinants of the relative efficiency of the Indonesian banking industry. Using panel data of 101 Indonesian commercial banks, this study employed a non-parametric frontier method, Data Envelopment Analysis (DEA), to find the efficiency score. In the second stage, the Tobit regression model is used to analyze the factors that potentially determine the variation of efficiency score. The finding indicated the bank was technically inefficient particularly during financial restructuring. The improvement was evident toward the end of the period. Bank size, macroeconomic factors, and three bank groups were strongly associated with bank efficiency levels. There was no strong evidence that merger, which is typically the form of restructuring policy output, is positively associated with bank efficiency.

The effect of restructuring on the performance of Vietnamese commercial banks was examined by Tran et al. (2014). Merger, governmental assistance, and equitization are the three restructuring methods suggested by the authors. The results showed that mergers affected the efficiency of commercial banks in 2012–2013, and efficiency scores of merged banks fell sharply after they were merged with small and weak banks. Further, the findings showed that rises and fall in banking efficiency are irregular because the restructuring process has not been completed and that some banks gain higher efficiency scores while others, especially those affected by the low performance of merged banks, witness sharp falls. With government assistance, state-owned commercial banks function inefficiently. When state-owned commercial banks are equitized, they are more efficient than when they are not.

Vo and Nguyen (2018) investigated the relationship between bank restructuring and performance in Vietnam. For the years 1999 to 2015, the data sample comprises 26 commercial banks. The DEA and SFA techniques were used by the authors. The findings of the research indicated that the Vietnamese government's early restructuring policies are unfavorable to banks undergoing restructuring. In terms of the impact of various restructuring strategies, the findings indicate that privatization of state-owned commercial banks, governmental assistance, and mergers and acquisitions have little impact on efficiency.

3. Data and Methodology

3.1. Data

For the period 2007–2019, research data was obtained from commercial banks trading on HOSE and HNX. The unbalanced panel data was used to conduct this study. Because Vietnam joined the WTO in 2007, and the global financial crisis began in 2008, the data was gathered in 2007. Since then, commercial banks in Vietnam have undergone many operational restructurings. The secondary data was obtained from commercial banks' certified financial reports.

3.2. Research Methods

3.2.1. Research Model

The research model that measures the relationship between bank restructuring and financial performance of commercial banks in Vietnam was developed (Table 1); the model is illustrated as follow:

$$\text{Model 1: } ROAA_{i,t} = f(\alpha, ROAA_{i,t-1}, FIR_{i,t}, OWR_{i,t}, OPR_{i,t}, CTR_{i,t}, CTR'_{i,t}, RE1_{i,t}, RE2_{i,t}, u)$$

$$\text{Model 2: } ROEA_{i,t} = f(\alpha, ROEA_{i,t-1}, FIR_{i,t}, OWR_{i,t}, OPR_{i,t}, CTR_{i,t}, CTR'_{i,t}, RE1_{i,t}, RE2_{i,t}, u)$$

$$\text{Model 3: } NIM_{i,t} = f(\alpha, NIM_{i,t-1}, FIR_{i,t}, OWR_{i,t}, OPR_{i,t}, CTR_{i,t}, CTR'_{i,t}, RE1_{i,t}, RE2_{i,t}, u)$$

3.2.2. Research Methods

Using Stata software, this study used multiple variable linear regression to examine the impact of bank restructuring variables on the financial performance of commercial banks in Vietnam from 2007 to 2019. We created an unbalanced panel data using data from 30 Vietnamese commercial banks (due to some empty data). The impact of bank restructuring on financial performance was investigated using the POLS regression model. The POLS regression model, on the other hand, requires constant time and factors, therefore the data in this table is insufficient. We used the FEM regression model to address the POLS model's issue.

We used Fisher's exact test with the following hypothesis: $H_0: I = 0$ with all i . (select model POLS), $H_1: \text{exist } I \neq 0 (j = 1, n)$ to choose between POLS and FEM (choose model FEM). The test's p -value was used to display the findings. If p is positive, we accept H_0 and use the POLS model; if p is negative, we reject H_0 and use the FEM model.

Because the REM model takes into account the changes in variables across time, the findings are not heteroskedastic.

Then, to determine the independence of I and select between the permanent affecting model and the random affecting model, Hausman testing was used. The following is how the hypothesis is stated: H_0 : There are no mistakes in the independent variables (select model REM), H_1 : $Cov(X_{jit}, I) \neq 0$ (choose model FEM). H_0 is ignored if the p -value is less than 0.05. If that's the case, REM isn't the best option; instead, FEM should be used.

However, since the data in the consideration model for regression is variable, we recommend adopting a model with a difference equation, hence, the System GMM was used to improve the anticipated results.

4. Results

4.1. Descriptive Analysis

We examine descriptive statistics of the variables used in the model based on Table 2 data. The maximum and lowest values of the variables ROEA and SIZ vary significantly owing to differences in commercial bank features, however they all circle around the average value of the indexes. Furthermore, the other variables, such as NPL, ETA, CAR, FOR, EXP, LAB, and CTA differ across banks, but the findings indicate no significant standard deviation. The standard deviations of the variables LTE, INT, FOR, and CTI are large, indicating a significant variance in capital structure, VAMC special bond value, foreign ownership percentage, and operational cost ratio. Commercial banks' revenue, that is, commercial banks with various restructuring methods that result in commercial banks' financial efficiency, also have significant variations.

During the study period, macroeconomic (microeconomic) variables did not change much. As a consequence, the study findings will be less influenced by these variables and will be more objective.

4.2. Correlation Analysis

Although the correlation factors between the variables are modest, certain variable pairs have a strong correlation, such as LTE - SIZ and ETA-SIZE (see Table 3). The models' variables were highly correlated, making it multi-collinear, and the findings of independent factors impacting dependent factors were inaccurate. The variance inflation factor (VIF), which has an average value of 1.95 and a range of 1.13 to 4.43, was used to detect multicollinearity in the three models. The VIF values confirmed the models' multicollinearity.

4.3. Test Results

This study used twelve regression models to assess the impact of bank restructuring on the financial performance of Vietnam's commercial banks, with four models – POLS,

Table 1: Variables, Measurement, and Symbols

Variables Name		Measurement	Symbol	
Dependent variable	Financial performance	Profit after tax/Average total assets	ROAA _{<i>i,t</i>}	
		Profit after tax/average equity	ROEA _{<i>i,t</i>}	
		(Interest Income – Interest Expense)/Earning Assets	NIM _{<i>i,t</i>}	
Independent variable	Lag financial performance	Lag(Earnings after tax/Average total assets)	ROAA_1 _{<i>i,t-1</i>}	
		Lag(Earnings after tax/Average equity)	ROEA_1 _{<i>i,t-1</i>}	
		Lag((Interest Income – Interest Expense)/Earning Assets)	NIM_1 _{<i>i,t-1</i>}	
	Group of variables of financial restructuring – FIR _{<i>i,t</i>}			
	Debt Ratio	Liability/Equity Ratio	LTE _{<i>i,t</i>}	
	Bad debt ratio	Outstanding loans from groups 3, 4, 5/Total outstanding loans	NPL _{<i>i,t</i>}	
	State Intervention	Logarithmic(VAMC Bond Value)	INT _{<i>i,t</i>}	
	Equity Ratio	Equity/Total Assets	ETA _{<i>i,t</i>}	
	Capital adequacy ratio	(Level 1 capital + Tier 2 capital)/Total risky assets	CAR _{<i>i,t</i>}	
	Group of ownership restructuring variables – OWR _{<i>i,t</i>}			
	Foreign ownership ratio rate	Foreign ownership in the bank	FOR _{<i>i,t</i>}	
	State ownership ratio rate	Total ownership of the State and State-owned enterprises and the State representative in the bank	STA _{<i>i,t</i>}	
	Mergers and Acquisitions	1: Commercial banks are involved in mergers and acquisitions 0: Commercial banks do not participate in mergers or acquisitions	MVA _{<i>i,t</i>}	
	State-owned commercial bank privatization	1: Privatize State-owned commercial bank 0: Commercial Bank_NN has not been privatized	PRV _{<i>i,t</i>}	
	Group of operational restructuring variables – OPR _{<i>i,t</i>}			
	Total number of branches, transaction offices, and ATMs	Log(Total number of branches, transaction offices, and ATMs)	EXP _{<i>i,t</i>}	
	Staff	Log(Number of bank employees)	LAB _{<i>i,t</i>}	
Cost to Income Ratio	Total Cost/Total Income	CTI _{<i>i,t</i>}		
Cost to Total Assets	Total Costs/Total Assets	CTA _{<i>i,t</i>}		
1 st restructuring period 1	1: Bank restructuring period in 2012–2015. 0: Before bank restructuring period in 2008–2011, 2 nd bank restructuring period in 2016–2018	RE1 _{<i>t</i>}		
2 nd restructuring period 1	1: Bank restructuring period in 2016–2018. 0: Before bank restructuring period in 2008–2011, 1 st bank restructuring period in 2012–2015	RE2 _{<i>t</i>}		
Group of control variables				
Unique characteristics of commercial banks - CTR _{<i>i,t</i>}	Log(Total assets)	SIZ _{<i>i,t</i>}		
Country-specific characteristics – CTR' _{<i>t</i>}	Economic growth rate	GDP _{<i>t</i>}		
	Inflation rate	INF _{<i>t</i>}		
α (intercept), <i>i</i> (bank), <i>t</i> (year), <i>u</i> (model residual)				

Table 2: Descriptive Analysis for the Variables Used in the Model

Variables	N	Mean	Std	Min	Max
ROAE	383	0.0084	0.0077	−0.0551	0.0595
ROEE	383	0.0882	0.0805	−0.8200	0.3628
NIM	383	0.0282	0.0128	−0.0198	0.0877
LTE	383	11.0089	5.0782	0.2371	33.1132
NPL	383	0.0259	0.0376	0.0008	0.6200
INT	383	2.2065	3.1070	0.0000	8.0023
ETA	383	0.1061	0.0716	0.0293	0.8083
CAR	383	0.1320	0.0682	0.0533	0.7790
FOR	383	0.0952	0.1309	0.0000	0.8230
STA	383	0.2274	0.3159	0.0000	1.0000
MVA	383	0.1593	0.3664	0.0000	1.0000
PRV	383	0.0888	0.2848	0.0000	1.0000
EXP	383	3.0134	0.5154	2.0000	4.4500
LAB	383	4.1838	0.5550	2.7623	5.6500
CTI	383	0.5303	0.1603	0.1619	1.1152
CTA	383	0.0170	0.0071	0.0001	0.0565
RE1	383	0.3916	0.4888	0.0000	1.0000
RE2	383	0.3133	0.4644	0.0000	1.0000
SIZ	383	16.4386	0.6971	14.1427	17.9543
GDP	383	0.0633	0.0083	0.0525	0.0848
INF	383	0.0849	0.0596	0.0279	0.2312

FEM, REM, and SGMM – being used to assess the impact of bank restructuring variables on the ROAA, ROEA, and NIM (Table 4).

According to the White test, the p -values of the models OLS1, OLS2, and OLS3 (Tables 5, 6, and 7) are 0.0029, 0.0034, and 0.0662 < 5%, respectively, indicating that all three models exhibit variance phenomenon change.

Fisher test is performed to select OLS or FEM model on the regression outcomes of models FEM1, FEM2, and FEM3. The test results indicate that all three models have a p -value of 0.0000, which is less than 5%, thus model FEM1, FEM2, and FEM3 are chosen.

Following that, the Wald test reveals that the models FEM1, FEM2, and FEM3 have a p -value of 0.00005%, indicating that these three models contain variance.

The REM model considers unobserved factors that change over time and have an impact on financial performance; the Breusch and Pagan Lagrangian test was performed to select models OLS1 or REM1, OLS2 or REM2, OLS3 or REM3, and the p -value results are 0.00005% for all three models, indicating that REM1 and REM2 should be chosen. REM3.

The results of the Hausman test to choose the model FEM1 or REM1, FEM2 or REM2, FEM3 or REM3 provide p -values of 0.9621, 0.9999, 0.9383 > 5%, respectively, indicating that the model REM1, REM2, REM3 has been chosen.

However, most financial data is provided in dynamic tabular form, and lagging financial performance indicators (ROAA 1, ROEA 1, NIM 1) have an impact on financial performance (Rahman et al., 2015). According to the findings of the Dubin - Wu - Hausman test, the p -coefficients of all ROAA, ROEA, and NIM models are higher than 5%, indicating that REM1, REM2, and REM3 models are endogenous. To address this issue, Curak et al. (2012) and Rahman et al. (2015) used the lagged financial performance variable as a tool variable in the system GMM model (System GMM – SGMM). This eliminates the problems of variance, autocorrelation, and endogenous, resulting in efficient and stable estimation results for the GMM1, GMM2, and GMM3 models.

The exogenousness of the model tool variables GMM1, GMM2, and GMM3 is tested using the Sargan test.

Table 3: Independent Variable Correlation Matrix

	ROAE	ROEE	NIM	LTE	NPL	INT	ETA	CAR	FOR	STA	MVA	PRV	EXP	LAB	CTI	CTA	RE 1	RE 2	SIZ	GDP	INF
ROAE	1																				
ROEE	0.76	1																			
NIM	0.58	0.39	1																		
LTE	-0.33	-0.15	-0.31	1																	
NPL	-0.09	-0.16	0.05	-0.12	1																
INT	0.21	0.05	0.02	0.27	-0.09	1															
ETA	0.36	0.15	0.33	-0.72	0.11	-0.22	1														
CAR	0.11	0.13	0.18	-0.39	-0.03	-0.03	0.38	1													
FOR	0.06	0.17	0.07	0.12	-0.01	-0.01	-0.16	0.00	1												
STA	-0.03	-0.12	-0.03	0.34	-0.03	0.12	-0.17	-0.12	-0.04	1											
MVA	-0.23	0.12	0.24	0.32	0.00	0.29	-0.20	-0.11	0.14	0.21	1										
PRV	0.05	0.26	0.01	0.28	-0.07	0.04	-0.16	-0.13	0.08	0.56	0.17	1									
EXP	-0.04	-0.32	0.07	0.59	-0.11	0.20	-0.44	-0.28	0.12	0.57	0.18	0.56	1								
LAB	0.01	0.35	0.16	0.59	-0.14	0.30	-0.50	-0.27	0.25	0.48	0.28	0.44	0.88	1							
CTI	-0.68	-0.60	-0.38	0.11	0.05	0.14	-0.11	-0.04	-0.05	-0.10	0.26	-0.13	-0.12	-0.07	1						
CTA	-0.01	-0.12	0.47	-0.15	0.09	0.08	0.12	0.01	-0.06	0.02	-0.09	0.03	0.09	0.14	0.20	1					
RE1	-0.22	-0.24	-0.07	-0.11	0.05	-0.08	-0.04	0.04	-0.05	-0.02	0.02	0.03	-0.01	-0.01	0.16	0.11	1				
RE2	0.11	0.04	0.05	0.35	-0.11	0.50	-0.26	-0.09	-0.03	0.08	0.26	0.03	0.17	0.31	0.12	0.05	-0.54	1			
SIZ	0.14	0.29	0.06	0.72	-0.10	0.33	-0.67	-0.32	0.23	0.47	0.34	0.47	0.86	0.91	-0.02	0.03	0.05	0.36	1		
GDP	0.07	0.12	-0.09	0.15	-0.13	0.19	-0.08	-0.01	0.03	0.03	0.07	-0.02	0.04	0.07	-0.20	-0.34	-0.41	0.37	0.05	1	
INF	-0.22	-0.05	0.15	-0.29	0.06	-0.44	0.35	0.11	0.03	-0.07	-0.25	-0.03	-0.16	-0.29	-0.21	0.02	0.13	-0.59	-0.38	-0.13	1

Table 4: Test Results of the Models

Variables	ROAA	ROEA	NIM
Mean VIF	1.95	1.95	1.95
White test	$\chi^2(203) = 239.02$ Prob > $\chi^2 = 0.0029$	$\chi^2(203) = 237.91$ Prob > $\chi^2 = 0.0034$	$\chi^2(203) = 211.5$ Prob > $\chi^2 = 0.0662$
Fisher test	$F(29,333) = 4.74$ Prob > $F = 0.0000$	$F(29,333) = 6.74$ Prob > $F = 0.0000$	$F(29,304) = 2749.22$ Prob > $F = 0.0000$
Wald test	$\chi^2(30) = 381.24$ Prob > $\chi^2 = 0.0000$	$\chi^2(30) = 135.59$ Prob > $\chi^2 = 0.0000$	$\chi^2(30) = 98.66$ Prob > $\chi^2 = 0.0000$
Breusch and Pagan Lagrangian test	chibar2(01) = 92.52 Prob > chibar2 = 0.0000	chibar2(01) = 197.32 Prob > chibar2 = 0.0000	chibar2(01) = 169.49 Prob > chibar2 = 1.0000
Hausman test	$\chi^2(19) = (b-B)'[(V_b - V_B)^{-1}](b-B) = 8.90$ Prob > $\chi^2 = 0.9621$	$\chi^2(19) = (b-B)'[(V_b - V_B)^{-1}](b-B) = 3.45$ Prob > $\chi^2 = 0.9999$	$\chi^2(19) = (b-B)'[(V_b - V_B)^{-1}](b-B) = 9.8$ Prob > $\chi^2 = 0.9383$
Dubin-Wu - Hausman test	$P\text{-value} = 0.2304$	$P\text{-value} = 0.5320$	$P\text{-value} = 0.4212$
Autocorrelation coefficient of order 2	Pr > z = 0.315	Pr > z = 0.542	Pr > z = 0.217
Sargan test	Prob > $\chi^2 = 0.982$	Prob > $\chi^2 = 0.995$	Prob > $\chi^2 = 0.687$
Hansen test	Prob > z = 0.667	Prob > z = 0.833	Prob > z = 0.435

Table 5: Research Results on the Influence of Bank Restructuring on the Financial Performance (ROAA) of Vietnam's Commercial Banks

Variables	OLS1	FEM1	REM1	GMM1
LTE	-0.0001**	-0.0001**	-0.0001**	-0.0001**
NPL	-0.0207*	-0.0087	-0.0025*	-0.0314*
INT	0.0001***	0.0001***	0.0001***	0.0001***
ETA	0.0111***	0.0094***	0.0099***	0.0111***
CAR	0.0076*	0.0078*	0.0076*	0.0115**
FOR	0.0033	0.0052	0.0040	0.0041
STA	-0.0020***	-0.0002	-0.0021*	-0.0027**
MVA	-0.0003	-0.0002*	-0.0002*	-0.0003*
PRV	0.0016**	0.0025*	0.0016*	0.0019*
EXP	-0.0004	-0.0002	-0.0001	-0.0001
LAB	0.0051***	0.0029**	0.0035***	0.0026**
CTI	-0.0272***	-0.0285***	-0.0280***	-0.0261***
CTA	-0.2278***	-0.2583***	-0.2470***	-0.2549***
RE1	-0.0002	-0.0005	-0.0004	-0.0005
RE2	0.0011*	0.0005*	0.0008*	0.0015**
SIZ	1.1058	1.0000	1.4294	1.2724
GDP	0.0286*	0.0417*	0.0364*	0.0879**
INF	-0.0023*	-0.0032*	-0.0030*	-0.0046*

Table 5: (Continued)

Variables	OLS1	FEM1	REM1	GMM1
ROAA-1				0.0462**
Constant	0.0186***	0.0159***	0.0175***	0.0126***
Observations	381	381	381	
R^2	73.62	74.02	73.79	
Groups				30
Instrument variables				26

t-statistics * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 6: Research Results on the Influence of Bank Restructuring on the Financial Performance (ROEA) of Vietnam's Commercial Banks

Variables	OLS2	FEM2	REM2	GMM2
LTE	-0.0016**	-0.0030***	-0.0027***	-0.0034**
NPL	-0.1731*	-0.0281*	-0.0018*	-0.1636*
INT	0.0007*	0.0010***	0.0009***	0.0007**
ETA	0.1289***	0.1226***	0.1243***	0.1058***
CAR	0.2124***	0.2043***	0.2044***	0.2117***
FOR	0.0523***	0.0645**	0.0602**	0.0348**
STA	-0.0218***	-0.0296***	-0.0257***	-0.0251***
MVA	0.0162**	0.0115**	0.0130**	0.0058**
PRV	0.0389***	0.0279*	0.0312**	0.0302**
EXP	-0.0046	-0.0004	-0.0012	-0.0071
LAB	0.0558***	0.0272*	0.0313**	0.0229**
CTI	-0.2737***	-0.2770***	-0.2760***	-0.3042***
CTA	-2.7139***	-3.2068***	-3.1331***	-3.1188**
RE1	-0.0064	-0.0088	-0.0085	-0.0182
RE2	0.0074*	0.0018*	0.0028*	0.0219*
SIZ	0.0005	0.0005	0.0004	0.0006
GDP	0.3758**	0.5511**	0.5288**	0.4112**
INF	-0.0138***	-0.0164***	-0.0152***	-0.0842***
ROEA-1				0.0007**
Constant	0.1721***	0.1397***	0.1467***	0.1344***
Observations	381	381	381	
R^2	67.87	64.95	64.90	
Groups				30
Instrument variables				25

t-statistics; * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 7: Research Results on the Influence of Bank Restructuring on the Financial Performance (NIM) of Vietnam's Commercial Banks

Variables	OLS3	FEM3	REM3	GMM3
LTE	−0.0001***	−0.0002***	−0.0002***	−0.0007***
NPL	0.0112**	0.0994***	0.0788**	0.0158***
INT	0.0000*	0.0001	0.0001*	0.0001*
ETA	0.0358***	0.0365***	0.0364***	0.0499***
CAR	0.0247**	0.0153**	0.0180**	0.0464***
FOR	0.0001	0.0066	0.0043	0.0034
STA	−0.0020*	−0.0018*	−0.0001*	−0.0012*
MVA	0.0033***	0.0017**	0.0018**	0.0035**
PRV	0.0024*	0.0036	0.0011*	0.0011*
EXP	0.0004**	0.0023**	0.0021**	0.0014**
LAB	0.0021	0.0014	0.0004	0.0016
CTI	−0.0377***	−0.0328***	−0.0340***	−0.0352***
CTA	0.9483***	0.9505***	0.9466***	0.8609***
RE1	−0.0072***	−0.0052***	−0.0057***	−0.0047***
RE2	0.0061***	0.0041***	0.0046***	0.0035**
SIZ	0.0001	0.0001	0.0000	0.0000
GDP	−0.0604**	−0.0967**	−0.0841*	−0.0686*
INF	0.0357***	0.0304***	0.0318***	0.0222***
NIM-1				0.0002**
Constant	0.0084	0.0108	0.0112	0.0156**
Observations	381	381	381	
R ²	58.61	53.35	53.14	
Groups				30
Instrument variables				25

t-statistics; * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

The p-value coefficients of the three models, GMM1, GMM2, and GMM3, are 0.982, 0.995, and 0.687, respectively, all higher than 5%, indicating that the instrumental variable included in the GMM1, GMM2, and GMM3 models is an exogenous variable. Furthermore, the Arellano Bond quadratic autocorrelation test yields p -values of 0.315, 0.542, and 0.217 for three GMM models, all of which are higher than 5%, indicating that the residuals of three GMM models do not exist. Also, it indicates there is no autocorrelation of the second order. The models' instrumental variables pass both the suggested criteria. With p -values of 0.667, 0.883, and 0.435, Hansen's test shows that models GMM1, GMM2, and GMM3 are properly specified, and representative variables are acceptable. Thus, the endogenous phenomena in the model were addressed using the System GMM model, using

the dependent's lag variable as an instrumental variable. The models' findings are both reliable and fully analyzable.

5. Discussion

We have the following comments based on the study findings of the estimate models GMM1, GMM2, and GMM3 presented in Tables 4, 5, and 6.

At the 5% significance level, the debt ratio variable (LTE) has a regression coefficient of −0.0001 (GMM1 model), 0.0034 (GMM2 model), and −0.007 (GMM3 model). According to the findings of Saeed et al. (2013) and Pinto and Joseph (2017), ownership has a negative connection with financial performance (ROAA, ROEA, NIM). Many commercial banks, in particular, have a

debt-oriented financial structure as a result of increased deposits for lending, which leads to subprime loans and higher credit risk provisioning costs, reducing efficiency.

The regression coefficients for the NPL ratio variable are -0.0314 and -0.1636 in the GMM1 and GMM2 models, respectively, with a significance level of 10%, indicating that when commercial banks restructure bad debts, the bad debt ratio decreases. The reduction in provisioning costs for credit risks and bad debt handling costs has the effect of increasing profits and reducing the risk of capital loss, so ROAA increases. This finding is in line with the findings of Rahman et al. (2015), Kithinji et al. (2017), and Defung (2018). Bad debt restructuring, on the other hand, has a positive impact on the NIM ratio, with a regression coefficient of 0.0158 at a 1% significance level. According to the offer hypothesis, commercial banks must calculate a larger profit in advance to reserve when dealing with riskier loans during a period of rapid credit expansion and high interest rates, allowing them to increase net interest income. This beneficial impact is supported by Kithinji et al. (2017).

At coefficients of 0.012 (GMM1), 0.014 (GMM2), and 0.023 (GMM3) with a significance threshold of 1%, the State Support Variable (INT) has a favorable effect on ROAA, ROAE, and NIM. Commercial banks were able to decrease the cost of credit risk provisions and debt settlement by selling bad debts to VAMC in exchange for special bonds, which helped them raise total profit and enhance financial efficiency. This study's findings are comparable to those of Thoraneenitiyan and Avkiran (2009) and Tran et al. (2015) but differ from Vo and Nguyen (2018).

At the 1% significance level, the Equity Variable (ETA) has a regression coefficient influencing ROAA, ROEA, and NIM of 0.0111 , 0.0158 , and 0.0499 , respectively. Because commercial banks with strong capital have high credibility and low deposit rates, the cost of capital is cheap. This increase in chartered capital by commercial banks indicates that financial restructuring improves the capital ratio to assist commercial banks to function more efficiently. When interest rates are low, customers borrow more, and interest income rises, resulting in an increase in NIM. This result is consistent with the findings of Rahman et al. (2015) and Kithinji et al. (2017).

The variable Capital Adequacy Ratio (CAR) has a regression coefficient of 0.0115 (significant level of 5%), 0.2117 , and 0.02464 (significant level of 1%), respectively, influencing ROAA, ROEA, and NIM, indicating the safety rate. Vietnam's total capital has a favorable effect on its financial success. Restructuring ownership via capital regulations, maintaining a capital sufficiency ratio and assisting banking operations in becoming safer and more efficient. The authors' findings are consistent with

Thoraneenitiyan and Avkiran (2009) and Rahman et al. (2015).

Variable Foreign Ownership Rate (FOR) has a regression coefficient of 0.0041 , 0.0034 , respectively, that affects ROAA, ROAA, and NIM, but this impact is not statistically significant. However, at a 5% significance level, FOR has an effect on ROEA, with a regression value of 0.0348 . This finding is comparable to that of Bokpin (2013) and Defung (2018).

STA has a negative impact on ROAA, ROEA, and NIM, with regression coefficients of -0.0027 (significant at 5%), -0.0251 (significant at 1%), and -0.0012 correspondingly (significant). The findings of the study agree with Thoraneenitiyan and Avkiran (2009) and Lin et al. (2016). Political considerations and social development goals have an impact on State Bank commercial objectives, such as network growth that surpasses real demands, promoting economic development and employment in a particular sector or geographic region. Furthermore, the State Bank's capacity to function in accordance with commercial goals is severely harmed by the requirement to fund inefficient state-owned businesses under the credit designation. All of these problems will eventually manifest themselves in poor performance in state-owned commercial banks, which will require reform by decreasing state ownership.

The Mergers and Acquisitions (MVA) variable has a regression coefficient of -0.0003 (statistical significance at 10%), 0.058 (statistical significance at 5%), and 0.035 (significant) for ROAA, ROEA, and NIM, respectively. The statistical significance of 5% indicates that restructuring via M&A operations improves financial position (ROEA, NIM), but not the bank's ROAA. This impact is supported by Thoraneenitiyan and Avkiran (2009).

The privatization of state-owned commercial banks (PRV) variable has a positive impact on ROAA, ROEA, and NIM, with regression coefficients of 0.0019 (significant at 10%), 0.0302 (significant at 10% on average), and 0.0011 (significant at 10% on average), respectively. Thoraneenitiyan and Avkiran (2009) found similar findings in many investigations.

When evaluating the effect on ROAA and ROEA, the variable of the Total Number of Branches and ATMs (EXP) is not statistically significant. This outcome differs from that of Kithinji et al. (2017). However, with a regression value of 0.0014 at the 5% significance level, EXP has a favorable impact on NIM. Commercial banks reorganize their operations by extending their operating regions and offering ATM services, which helps commercial banks better fulfil their financial intermediation duties, (according to the theory of financial intermediation) (Kithinji et al., 2017).

The variable Bank Employee (LAB) is statistically significant at 5% and has a positive relationship with ROAA

and ROEA of Vietnamese commercial banks (regression coefficients for ROAA and ROEA are 0.0026 and 0.0229, respectively). This finding is consistent with AlAli (2020), who found that the number of bank workers had a positive effect on financial performance.

Variable Cost to Income Ratio (CTI) shows regression coefficients of -0.0261 , -0.3042 , -0.0352 (model GMM1, GMM2, GMM3) with a 1% significance level, as anticipated by the theory. Restructuring activities lower the cost-to-income ratio and improve financial efficiency (ROAA, ROEA, NIM). Rose and Hudgins (2012) conducted research and found that following restructuring, commercial banks had a lower cost-to-income ratio. The cost-to-income ratio was used by Rahman et al. (2015) to represent cost-efficiency; the greater the cost-to-income ratio, the worse the cost management efficiency.

Variable Cost of Operations to Total Assets (CTA): Because the regression coefficients for this impact are -0.2549 (1 percent significance level) and -3.1188 , respectively, an increase in CTA has the effect of decreasing ROAA and ROEA (significance level of 1%). Restructuring reduces the cost-to-total-assets ratio and has a positive effect on financial efficiency (ROAA, ROEA). Sufian and Habibullah (2009) and Curak et al. (2012) came to identical conclusions (2012). When influencing NIM, however, the ratio of operating costs has a regression coefficient of 0.8609 (significant threshold of 1%), indicating the same effect. According to the efficiency wage theory (Efficiency Wage Theory), increasing operational expenses, namely pay and bonus costs for bank workers, motivates them to work more effectively, resulting in increased revenue. NIM increases when net interest income increases. This finding is in line with the research by Rahman et al. (2015).

The first reconstruction phase variable RE1 shows regression coefficients of -0.0182 , -0.0005 , and -0.0047 (GMM1, GMM2, and GMM3) respectively, although only the GMM3 model has statistical significance at the 1% level. It demonstrates that in the first restructuring phase, the financial efficiency of Vietnamese commercial banks did not increase. Because of the policy lag, some commercial banks undertake mergers and acquisitions between phases 1 and 2, indicating that this outcome is acceptable. Commercial banks need time to recover and improve efficiency. This finding is in line with the findings of Thoraneenitiyan and Avkiran (2009) and Tran et al. (2014), who found that the degree of efficiency increase in commercial banks has not been convincingly shown in the short term.

The second restructuring stage variable (RE2) has a regression coefficient of 0.0015, 0.0219, and 0.0035, respectively, influencing ROAA, ROEA, and NIM, with a significance threshold of 5%, indicating the financial

efficiency of Vietnamese designers. In the second restructuring phase, NIM improved. However, the modest regression coefficient indicates that RE2's effect on financial performance has not improved much. Restructuring has been shown to enhance bank efficiency in the long term. Hsiao et al. (2010) have similar views.

The size variable of the bank (SIZ) is not statistically significant. This result contradicts the author's beliefs and the findings of Thoraneenitiyan and Avkiran (2009), Curak et al. (2012), and Rahman et al. (2015).

The GDP growth rate variable has a regression coefficient of 0.0879 (5 percent significance level), 0.4112 (5 percent significance level), and -0.0686 (significance level) influencing ROAA, ROAE, and NIM, respectively.

6. Conclusion

GMM1 regression model: The factors of restructuring activities such as INT, ETA, CAR, PRV, LAB, RE2, GDP, have a positive impact on ROAA (ROAA_1), and variables that have a negative impact on ROAA (ROAA_1) are LTE, NPL, STA, MVA, CTI, CTA, INF. Furthermore, variables such as FOR, EXP, RE1, SIZ have no statistical significance with ROAA (ROAA_1).

GMM2 regression model: The factors of restructuring activities such as INT, ETA, CAR, FOR, MVA, PRV, LAB, RE2, GDP, have a positive effect on ROEA (ROEA_1), and variables that have the opposite effect on ROEA (ROEA_1) are LTE, NPL, STA, CTI, CTA, INF. Moreover, variables such as EXP, RE1, SIZ have no statistical significance with ROEA (ROEA_1).

GMM3 regression model: The factors of restructuring activities such as INT, ETA, CAR, MVA, PRV, EXP, LAB, CTA, RE2, INF, have a positive impact on, and variables that have the opposite effect on NIM (NIM_1) are LTE, STA, CTI, RE1, GDP. In addition, variables such as FOR, LAB, SIZ have no statistical significance with NIM (NIM_1).

The findings of this study have important implications in terms of adding strong empirical evidence on the direction of the effect of restructuring on bank financial performance in Vietnam. From the perspectives of the government, the State Bank, and commercial bank managers, this research result also contributes to the management and implementation of restructuring efforts, thereby enhancing and boosting the financial efficiency of Vietnamese commercial banks. Based on the study's findings, researchers may be able to generate further research directions. Research with longer study periods is required to analyze the effect of restructuring on financial performance or to determine how alternative restructuring strategies influence financial performance.

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