



PROCEEDINGS

THE FIFTH INTERNATIONAL CONFERENCE ON BUSINESS, ECONOMICS & FINANCE

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THE OPERATIONAL EFFICIENCY OF VIETNAMESE BANKS UNDER THE PANDEMIC COVID-19: AN APPLICATION USING A SEMI-PARAMETRIC APPROACH

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SUMMARY: *This study evaluates the efficiency of commercial banks in Vietnam during the period 2018-2021 to assess their performance amid the COVID-19 pandemic. The research utilizes the parametric approach proposed by Simar and Wilson (2007) on a balanced panel dataset consisting of 31 commercial banks to estimate the bias-corrected efficiency scores and factors influencing the operational efficiency of these banks in the Vietnamese market during the COVID-19 pandemic. The results indicate an increase in the bias-corrected efficiency scores of the commercial banks, from around 0.62 before the pandemic to 0.70 during the pandemic. Furthermore, the study identifies several determinants of operational efficiency for commercial banks in Vietnam, including bank size, three financial ratios (ROA, COA, and EOA), and market concentration. However, no evidence is found to establish a relationship between the macroeconomic environment and bank efficiency. Notably, the pandemic period of 2020-2021 did not negatively impact the operational efficiency of commercial banks as observed in other sectors worldwide.*

Keywords: *Bank efficiency, DEA bootstrap, pandemic performance, semi-parametric approach*

JEL codes: *E44, G21, G41*

1. INTRODUCTION

Since its outbreak in late 2019, the COVID-19 pandemic has had various adverse impacts across all sectors in most countries. A report by the International Monetary Fund (IMF, 2021) revealed that global economic growth declined by 3.1%, and international trade volume dropped by 8.2% in 2020. Additionally, the study emphasized that the consequences of the COVID-19 pandemic on the global economy were more severe compared to previous crises such as the Asian financial crisis (1997), the SARS outbreak (2002-2004), and the global financial crisis (2007-2008). Vietnam was also not immune to the negative effects of the COVID-19 pandemic. The country's gross domestic product (GDP) growth rate decreased from 7.2% in 2019 to 2.9% in 2020. In 2021, this rate remained low at 2.6% (according to World Bank data, 2022). This significant decline in the GDP growth rate reflected the substantial impact of the COVID-19 pandemic on the entire Vietnamese economy. However, different sectors of the economy will respond to and be affected by the pandemic in varying ways.

The financial sector, in general, and the banking industry, in particular, play a crucial role in the functioning of any country's economy. As important facilitators of capital circulation between various economic agents, the operations of commercial banks are vital to many macroeconomic financial policies. Analyzing the efficiency of banks under the COVID-19 pandemic holds paramount significance due to several compelling reasons. Firstly, the pandemic has unleashed unprecedented economic challenges, profoundly affecting various sectors, including financial institutions. Investigating the operational efficiency of banks during this critical period provides valuable insights into their ability to weather the crisis and uphold their crucial role in supporting the broader economy. Secondly, from a policy perspective, understanding the efficiency dynamics of banks during the pandemic is crucial for policymakers and regulatory authorities. Such analysis aids in assessing the resilience of

financial institutions and informs appropriate interventions and support measures to maintain financial stability amidst the crisis. Thirdly, investor confidence hinges upon banks' capacity to navigate through turbulent times successfully. By comprehending the efficiency levels of banks under COVID-19's influence, investors can gauge the sector's strength and its ability to manage risks effectively. Fourthly, the pandemic offers significant lessons for the banking sector, emphasizing the need for improved crisis management and operational resilience. Analyzing efficiency during this period can pinpoint areas for improvement, facilitating the sector's preparedness to cope with future crises. Furthermore, a comparative analysis of bank efficiency against other sectors during the pandemic provides a broader perspective on the pandemic's overall impact on the economy. Such comparisons contribute to a comprehensive understanding of the interplay between financial institutions and other industries amid unprecedented challenges. Academically, exploring bank efficiency during the COVID-19 pandemic enriches the existing body of research. It expands the knowledge base concerning bank performance in exceptional circumstances, shedding light on the implications of external shocks on the financial sector.

Therefore, delving into the efficiency of banks during the COVID-19 pandemic is of paramount importance to ascertain their operational prowess during tumultuous times, guide policy formulation, bolster investor confidence, enhance preparedness for future crises, and contribute to the academic discourse on banking resilience in the face of unprecedented challenges. More particular, analyzing the impacts of the COVID-19 pandemic on commercial banks in the Vietnamese market becomes even more urgent and significant. Clearly, the findings from studying the operations of commercial banks in Vietnam amid the pandemic are expected to contribute significantly to future policies aimed at supporting both the banking sector and the overall Vietnamese economy in its recovery from the COVID-19 pandemic.

This study will focus on evaluating the operational efficiency of commercial banks in Vietnam during the period from 2018 to 2021. Additionally, applying the semi-parametric approach introduced by Simar and Wilson (2007) will provide more accurate estimates of the operational efficiency of these banks through the use of bias-corrected efficiency scores. Moreover, this process will allow the exploration of factors influencing the operational efficiency of commercial banks in Vietnam amidst the COVID-19 pandemic. This is one of the few studies that investigate the operational efficiency of the Vietnamese banking sector during the pandemic. Furthermore, this study is the first to apply the semi-parametric approach introduced by Simar and Wilson (2007) instead of the traditional two-stage DEA method to analyze the operational efficiency of commercial banks in Vietnam during the COVID-19 pandemic.

2. LITERATURE REVIEW

The operational efficiency of an organization is the relationship between input and output factors. Input factors are measured by the resources used in the production process, such as capital, labor, costs, and time. On the other hand, business results, profits, and the quantity of products are considered output factors. Thus, operational efficiency is a metric that measures the level of effectiveness of an organization's business operations. Higher operational efficiency leads to greater profitability for the company. The study of operational efficiency in commercial banks is a highly relevant topic, especially in developing countries. Previous research has employed various methods, such as the stochastic frontier approach (SFA) and data envelopment analysis (DEA), to evaluate the operational efficiency of banks.

Hermes and Nhung (2007) examined the impact of liberalization on bank operations in nine Latin American and Asian countries. They collected a sample of over 4,000 bank observations from the period 1991 to 2000 and utilized the DEA method to assess the efficiency of each bank. The efficiency measures of individual banks were then aggregated at the national level to investigate the relationship between financial liberalization and bank efficiency. The study provided evidence of the positive effects of financial liberalization on the

operational efficiency of commercial banks in emerging economies. Similarly, in the ASEAN countries' market, Gardener, Molyneux, and Linh (2011) studied bank efficiency in Indonesia, the Philippines, Malaysia, Thailand, and Vietnam from 1998 to 2004 using DEA and Tobit regression. The results showed a significant decline in the operational efficiency of commercial banks during the study period, indicating the negative impact of the 1997 Asian financial crisis on bank operations. Moreover, the authors highlighted that foreign banks operated more efficiently than domestic banks, while state-owned banks demonstrated higher efficiency compared to private domestic banks. On a cross-country comparison basis, the development of commercial banks showed a close and positive correlation with economic growth. Shaban and James (2018) applied the SFA and Tobit regression to investigate the impact of ownership changes on bank efficiency for 60 Indonesian commercial banks from 2005 to 2012. Their study indicated that state-owned banks tended to be less profitable and more risky than private domestic and foreign banks. Furthermore, the research found evidence that investors in Indonesia tended to acquire the best-performing banks.

Since the outbreak of the COVID-19 pandemic at the end of 2019, it has caused severe disruptions to the global macroeconomy, as evident in macroeconomic indicators such as GDP, inflation, and unemployment (Long, Chang, Jegajeevan, & Tang, 2022). The pandemic has created unprecedented challenges for the economies and societies of all countries. In this context, the banking sector is also likely to be significantly affected by the pandemic. Therefore, evaluating the operational efficiency of the banking system, in general, and commercial banks, in particular, during this period has become a critical concern for scholars and researchers. Clearly, assessing the operational efficiency of banks has become a necessary requirement not only for policymakers but also for various economic entities.

The study by Mateev et al (2022) evaluated the impact of efficiency and market structure on bank performance in the Middle East and North Africa (MENA) region during COVID-19. Efficient banks showed better financial stability, but efficiency also increased risk-taking. Conventional banks were more affected by efficiency and competition than Islamic banks. Regulatory measures to boost efficiency were crucial in mitigating the consequences of crises like COVID-19. Another study by Li et al (2020) explored the impact of COVID-19 and government capital injections on banks' interest margin and efficiency gain/loss from shadow banking. The outbreak reduced interest margins, while capital injections enhanced them. Both COVID-19 and capital injections negatively affected efficiency gain from shadow banking, leading to increased risk-taking and reduced banking stability.

In summary, some scholars worldwide have conducted studies on the analysis of bank operations under the impact of the COVID-19 pandemic; however, the number of studies in this field is still limited. The results regarding the performance of banks during the pandemic vary depending on the region, country, and specific banks under investigation. Moreover, each country, especially developing ones, faces many challenges in reforming their financial systems, and understanding how the banking system operates amid the pandemic becomes increasingly crucial. Specifically, while there have been assessments of the operational efficiency of commercial banks in Vietnam using traditional approaches such as DEA (Ngo, 2010; Nguyen, 2007), there is a lack of comprehensive evaluations of operational efficiency and factors influencing it for banks in the Vietnamese market under the impact of the COVID-19 pandemic.

3. METHODOLOGY AND DATA

3.1. Methodology

Semi-parametric approach by Simar and Wilson (2007)

There are numerous methods to study the efficiency of businesses in general, and in this case, financial institutions or banks. Specifically, research on company efficiency involves evaluating financial indicators and financial reports. From a more academic standpoint, there are parameter estimation methods and non-parametric estimation methods like Data

Envelopment Analysis (DEA). DEA is considered one of the widely applied tools to evaluate the efficiency of businesses, organizations, and companies across various fields. Additionally, understanding the factors influencing this efficiency is equally important. Therefore, the traditional method often used in bank efficiency studies is Two-Stage DEA. In this approach, efficiency scores are first estimated using DEA and then regressed with environmental variables (typically done using Tobit regression). However, although widely used, this approach still has significant limitations that have been extensively discussed in previous studies (Simar and Wilson, 2007; Sufian, 2009). One of the fundamental limitations is related to the issue of the regression model in the second stage of traditional Two-Stage DEA, which may suffer from serial correlation due to the dependent variable being the estimated efficiency score rather than directly observed variables. This leads to biases and constraints in the efficiency estimation of the model.

The proposed procedure through algorithms 1 and 2 in Simar and Wilson (2007) has been demonstrated to overcome the mentioned limitations and enhance the efficiency of efficiency score estimates and the regression of factors influencing efficiency. The Monte Carlo experiments presented in Simar and Wilson (2007) provide clear evidence of this. The basic idea from Simar and Wilson (2007) is based on introducing Data Generating Process (DGP) procedures in the model's regressions. Specifically, algorithm 1 corresponds to adding a single bootstrapping procedure, while algorithm 2 introduces two bootstrapping cycles when estimating the DEA efficiency score and the regression of factors influencing this score. This study applied algorithm 2 proposed in Simar and Wilson (2007) to investigate the operational efficiency of Vietnamese commercial banks before and during the COVID-19 pandemic. This will enhance statistical efficiency and the accuracy of estimates regarding the adjusted efficiency score of Vietnamese commercial banks and the factors influencing this efficiency.

The research methodology employed to investigate the operational efficiency and determinants thereof in Vietnamese commercial banks is based on algorithm 2, as proposed by Simar and Wilson (2007). Specifically, the study supposes the true model as follows:

$$\gamma_{it} = f(z_{it}|\beta) = \beta z_{it} + u_{it}, \quad (1)$$

where γ_{it} represents the technical efficiency of bank i in year t , z_{it} signifies the set of variables considered to influence the bank's efficiency, and u_{it} denotes the stochastic error term.

In step 1, the data encompasses k outputs and j inputs for each bank i . Consider the i^{th} bank in our analysis, where we aim to maximize γ_0 as follows:

$$\text{Max} \widehat{\gamma}_0 = \frac{\sum_r^k U_r Y_{r,0}}{\sum_s^j V_s X_{s,0}} \quad (2)$$

S.t.

$$\frac{\sum_r^k U_r Y_{ri}}{\sum_s^j V_s X_{si}} \leq 1; i=1, 2, \dots, n; r=1, 2, \dots, k; s=1, 2, \dots, j \quad (3)$$

In this context, U_r corresponds to the weighting assigned to the output, and V_s represents the weighting allocated to the input.

Consequently, the efficiency score γ is determined using an Output oriented Data Envelopment Analysis (DEA) model. This model seeks to maximize the weighted sum of outputs, given the weighted sum of inputs, subject to the condition that the efficiency score is less than or equal to 1. The model estimates the technical efficiency of each bank for every year, assuming variable returns to scale, following the approach proposed by Banker, Charnes, and Cooper (1994).

In step 2, the study applies the Maximum Likelihood estimation method to obtain the estimated value of β (so-called $\hat{\beta}$) in the regression model γ_{it} with respect to environmental variables z_{it} . Additionally, the truncated regression process yields $\hat{\sigma}_u$ which is the estimated value of σ_u .

Step 3 entails the bootstrapping procedure with N_1 repetitions to generate the bootstrap set $R_1 = \{\hat{\beta}_b^*, \hat{\sigma}_{ub}^*\}_{b=1}^{N_1}$. In this step, a truncated normal distribution $N(0, \hat{\sigma}_u^2)$, with bilateral truncation at $-z_{it}\hat{\beta}$ and $1 - z_{it}\hat{\beta}$, is used to randomly draw u_{it}^* for each bank i in the sample, and for each year.

Set $x_i^* = x_i$ và $y_i^* = y_i \hat{\gamma}_i / \gamma_i^*$. The efficiency scores $\hat{\gamma}_i^*$, are then recalculated using the pseudo dataset (x_i^*, y_i^*) generated by replacing the input and output vectors X, Y in Step 1 with $[[x_1^*, \dots, x_i^*]$ và $[y_1^*, \dots, y_i^*]$.

Step 4 involves calculating the estimated bias-corrected efficiency scores $\hat{\gamma}_i$ and the corresponding level of corrected bias, \widehat{bias}_i using the bootstrap estimates. The bias \widehat{bias}_i is obtained as the average difference between the bootstrap estimates and the original efficiency scores.

In Step 5, the Maximum Likelihood method is once again applied to the truncated regression of the adjusted efficiency estimates $\hat{\gamma}_i$ on the environmental variables z_i , to obtain the final estimates $(\hat{\beta}, \hat{\sigma})$.

To enhance the robustness of the results, Step 6 is performed with N_2 repetitions to create the bootstrap set $R_2 = \{\hat{\beta}_b^*, \hat{\sigma}_{ub}^*\}_{b=1}^{N_2}$. In this step, the truncated normal distribution $N(0, \hat{\sigma}_u^2)$ is again used to randomly draw u_{it}^* for each bank i and each year, and the efficiency scores γ_{it}^{**} are re-calculated. By employing the Maximum Likelihood estimation method on the truncated regression of the efficiency estimates $\widehat{\gamma}_{it}^*$ on the environmental variables z_{it} , we obtain the estimates for $\hat{\beta}^*$ and $\hat{\sigma}^*$.

Finally, in Step 7, confidence intervals are constructed using the bootstrap values from the set R_2 and the final parameter estimates. This rigorous methodology ensures the accuracy and statistical significance of the findings regarding operational efficiency and its influencing factors in Vietnamese commercial banks.

Input and output selection

The identification of input and output factors for efficiency calculation is a critical and essential requirement in this study. Selecting an appropriate set of input and output factors is not a one-size-fits-all approach for efficiency analysis of financial institutions, particularly in the case of commercial banks. Various methods can be employed to choose these factors, each with its distinct characteristics. Typically, robust reasoning is necessary to determine the appropriate approach and variable selection for the study. In theoretical terms, two common approaches are widely considered when selecting input and output variables for efficiency analysis of financial organizations, namely the intermediate approach and the production approach.

The intermediate approach focuses on traditional banking activities, involving the conversion of deposits into loans, with the primary inputs being deposits and the primary outputs being loan amounts. Conversely, the production approach emphasizes bank efficiency related to revenue aspects. In other words, the production approach considers all income-generating activities reflected in the financial statements of banks.

Based on Okuda and Aiba's (2015) perspective, the intermediate approach is suitable for emerging and less developed financial markets with limited business liberalization. For our study on the efficiency analysis of commercial banks in Vietnam, we adopted the production approach because the banking sector in Vietnam has made significant strides in the past two decades, undergoing various reforms and experiencing substantial changes in scale, along with extensive participation from foreign stakeholders. Therefore, in line with this approach, we selected two output variables, namely interest income and non-interest income, and two input variables, namely interest expense and operating expenses, to estimate the operational efficiency of commercial banks in the Vietnamese market.

¹ The study selected the values of N_1, N_2 as 1000 and 2000 respectively (Hall, 1986)

Furthermore, it should be noted that one of the conditions for implementing algorithm 2 in the procedure proposed by Simar and Wilson (2007) is that the number of input and output variables used in the efficiency estimation must be equal. In accordance with this requirement, our study opted for two input and two output variables to satisfy the condition.

TABLE 2: INPUTS AND OUTPUT USED

Outputs	Inputs
• Interest income	• Interest expense
• Non-interest income	• Operating expense

Source: Authors' summary

In relation to the environmental variables incorporated into the model to assess their impact on the efficiency of commercial banks, this study draws upon prior research conducted by Baele, De Jonghe, and Vennet (2007), Sufian (2009), Delis, Molyneux, and Pasiouras (2011), Okuda and Aiba (2015), and Nguyen (2019) for selection purposes. The specific variables employed are outlined in Table 1. Of particular significance, we introduce a dummy variable labeled as 'COVID' into the model to investigate whether the temporal aspect of the pandemic influences the operational efficiency of commercial banks in Vietnam.

TABLE 1: DESCRIPTION OF VARIABLES USED IN THE REGRESSION MODEL FOR THE FACTORS INFLUENCING THE OPERATIONAL EFFICIENCY OF VIETNAMESE COMMERCIAL BANKS

Variable	Description
SIZE	Bank size, measured by the natural logarithm of total assets
GDP	Annual GDP growth rate
Z-score	Financial stability of the bank, computed using Ariss's (2010) proposed formula
ROA	Pre-tax profit to total assets ratio
COA	Total cost to total assets ratio
EOA	Total equity to total assets ratio
Diversification	Business diversification level, measured by the ratio of non-interest income to total income
Concentration	Bank concentration level, measured by the deposit market share of each bank within the entire sample of banks
Statetrans	Dummy variable taking the value of 1 if the bank is currently a state-owned bank or a former state-owned bank
COVID	Dummy variable taking the value of 1 for the years 2020 and 2021

Source: Authors' summary

3.2. Data

The research sample comprises 31 active commercial banks operating in the Vietnamese market. Additionally, the study was conducted in two periods: before and during the COVID-19 pandemic, specifically from 2018 to 2021. Selecting this study period allows us to assess the operational efficiency of Vietnamese commercial banks in both pre-pandemic and COVID-19 contexts. Consequently, the study constructs a balanced panel dataset for the 31 commercial banks operating in the Vietnamese market during the study period. The data used in this research were collected from audited financial reports of these 31 commercial banks throughout the study period. A detailed list of the banks included in the research sample is provided in Table A1 in the appendix section. Furthermore, macroeconomic variables such as the growth rate of Gross Domestic Product (GDP) were collected from data provided by the World Development Indicators of the World Bank to complement the analysis.

4. EMPIRICAL RESULTS

4.1. Efficiency of banks in Vietnam under COVID-19

TABLE 3: DESCRIPTIVE STATISTICS OF VARIABLES USED IN THE STUDY

Variable	Number of observations	Mean	Standard deviation	Min	Max
• Output, input variables (unit: 1,000VND)					
Interest income	124	10,377.38	12,787.84	523.59	4,7041.17
Non-interest income	124	3,454.128	4,169.827	-136.3398	16,620.68
Interest expense	124	13,761.39	16,011.74	849.53	67,353.98
Operating expense	124	5,503.777	6,031.263	449.1	2,6117.21
• Variables in regression model					
SIZE	124	12.2235	1.1028	9.9220	14.3818
GDP	124	0.0498	0.0224	0.0260	0.0720
Z-score	124	46.1329	45.8576	12.7334	319.5451
ROA	124	0.0118	0.0093	0.0000	0.0409
COA	124	0.0159	0.0049	0.0065	0.0329
EOA	124	0.0786	0.0308	0.0262	0.1697
Diversification	124	0.2568	0.1079	-0.0279	0.6610
Concentration	124	0.0325	0.0403	0.0019	0.1532
Statetrans	124	0.0968	0.2968	0	1
COVID	124	0.5000	0.5020	0	1

Source: Authors' summary

Table 3 provides information regarding the descriptive statistics of the output, input, and environmental variables used in the regression model of factors influencing the operational efficiency of commercial banks in Vietnam. The statistics include the mean, standard deviation, maximum, and minimum values for all variables. The information from Table 3 allows for an overall examination and assessment of the entire dataset used in the study. Overall, except for the two dummy variables "COVID" (indicating the year of the COVID-19 pandemic) and "Statetrans" (representing banks that were formerly state-owned), all other variables exhibit relatively high standard deviations compared to their respective means. This observation can be understood due to the diverse range of commercial banks in Vietnam included in the study, each with varying scales and management practices. Furthermore, the study successfully constructed a balanced panel data set comprising 31 commercial banks in Vietnam over the period 2018-2021, resulting in a total of 124 observations for each variable.

TABLE 4: EFFICIENCY SCORES OF COMMERCIAL BANKS IN VIETNAM IN THE PERIOD 2018-2021

Year	Number of observations	Efficiency score	Bias-corrected efficiency score
2018	31	0.6752	0.6184
2019	31	0.6938	0.6310
Pre-Pandemic		0.6845	0.6247
2020	31	0.7075	0.6454
2021	31	0.8041	0.7018
Pandemic		0.7558	0.6736
Whole period 2018-2021		0.7202	0.6491

Source: Authors' summary

Table 4 presents the bias-corrected efficiency scores of Vietnamese banks obtained using algorithm 2 proposed by Simar and Wilson (2007). The results show a slight increase in the operational efficiency of Vietnamese commercial banks from 2018 to 2021. The average efficiency of banks during the pre-pandemic period (2018-2019) and the pandemic period (2020-2021) is 0.62 and 0.67, respectively. Following the recommendations of Simar and Wilson (2007), algorithm 2 provides more reliable estimates of operational efficiency compared to traditional DEA estimates. Thus, the efficiency scores support the argument that the COVID-19 pandemic did not witness any significant decline in the operational efficiency of commercial banks in the Vietnamese market.

Despite the pandemic's impact on the overall economy and various sectors, it is evident that there was no substantial decrease in the operational efficiency of Vietnamese banks during the period 2020-2021. The banking sector, as a vital capital intermediary, maintained relatively stable operations, and the estimated operational efficiency showed a slight increase even amidst the global pandemic. Hence, this research further supports the view that banks have the resilience to withstand financial shocks related to the COVID-19 pandemic (Boubaker et al., 2022; Beck, Demirguc-Kunt, and Merrouche, 2013; Elnahass, Trinh, and Li, 2021).

Despite the disruptive nature of the COVID-19 pandemic on global economies, the efficiency of commercial banks in Vietnam has surprisingly remained resilient and largely unaffected. Despite facing unprecedented challenges, the Vietnamese banking sector has demonstrated its adaptability and robustness, enabling it to weather the storm.

In conclusion, the efficiency of commercial banks in Vietnam has displayed remarkable resilience during the COVID-19 pandemic, defying initial expectations of a significant downturn. A combination of proactive measures, government support, prudent risk management, digital advancements, and a diverse economy collectively contributed to maintaining the stability and efficiency of the banking sector during these challenging times.

4.2. Determinants of banks' operational efficiency in Vietnam

The proposed semi-parametric process by Simar and Wilson (2007) allows us to investigate the factors influencing the operational efficiency of commercial banks in Vietnam. Ten variables are used as environmental factors to examine the impact on the operational efficiency of banks during the study period. These variables include bank characteristics such as size (SIZE), business diversification (Diversification), financial stability (Z-score), market concentration (Concentration), and three financial ratio variables (ROA, EOA, and COA). Additionally, a macroeconomic variable, GDP, measured by the annual GDP growth rate, is included in the model. Furthermore, the dummy variable COVID is set to 1 for observations in the years affected by the COVID-19 pandemic (2020 and 2021) and 0 otherwise, to assess the differences in operational efficiency of commercial banks during the pandemic. The Statetrans dummy variable takes a value of 1 if the commercial bank is state-owned or if it was converted from a state-owned bank, and 0 otherwise. This variable is introduced to analyze the operational efficiency differences between the two groups of banks mentioned above.

TABLE 5: REGRESSION RESULTS OF THE FACTORS AFFECTING THE OPERATIONAL EFFICIENCY OF COMMERCIAL BANKS IN VIETNAM

Variable	31 banks, 4 years (2018-2021)	
	Estimated Coefficient	Standard Error
SIZE	-0.1458*	0.0206
GDP	-10.9996	7.9766
Z-score	0.0016	0.0013
ROA	10.5895*	1.6966
COA	-17.0634*	2.4852
EOA	1.1367**	0.4606
Diversification	0.1170	0.0806
Concentration	3.1031*	0.5956
Statetrans	-0.0004	0.0461
COVID	-0.4548	0.3544
Constant	3.1108*	0.6315

Note: ***, **, * significant at the 1%, 5% và 10% level, respectively

Number of observations: 124

Source: Authors' summary

The regression results of the factors affecting the operational efficiency of commercial banks in Vietnam during the 2018-2021 period, obtained using the parameter selling process proposed by Simar and Wilson (2007), are presented in Table 5. As shown in the table, among the 10 independent variables proposed for testing their effects on the operational efficiency of commercial banks, five factors are found to have a significant impact, namely: SIZE, ROA, COA, EOA, and Concentration.

Regarding the impact of the bank size-related variable, the study indicates an inverse relationship between the SIZE variable and the operational efficiency of commercial banks. This finding differs from previous studies (Okuda et al., 2015) that suggested larger banks tend to operate more efficiently due to their larger financial capacity. The inverse relationship with the SIZE variable implies that, currently and in the near future, commercial banks in Vietnam should not focus on expanding their size, especially in terms of total assets, to improve operational efficiency. In addition, a higher EOA is usually associated with higher operational efficiency, suggesting that banks should focus on increasing the proportion of equity capital in their capital structure. Moreover, traditional financial ratios such as ROA, COA, and EOA are found to be significantly related to the operational efficiency of commercial banks. Both ROA and EOA have a positive impact on the banks' operational efficiency, significant at the 1% level. In contrast, the COA variable shows a negative impact on the operational efficiency of banks. Furthermore, the regression results for the Concentration variable indicate a positive relationship between market concentration and the operational efficiency of commercial banks, significant at the 1% level.

The regression results for the COVID dummy variable do not show statistical significance, indicating that there is no evidence to suggest any relationship between the COVID-19 pandemic context and the operational efficiency of commercial banks in the Vietnamese market. This further supports the idea that the pandemic seems to have had no significant impact on the operations of commercial banks. Unlike other industries or sectors, the banking sector has demonstrated resilience to changes in the macroeconomic environment during the pandemic. Finally, the study does not find any significant relationship between the variables related to the macroeconomic environment (GDP), Z-score, business diversification (Diversification), and the Statetrans dummy variable with the operational efficiency of commercial banks in the Vietnamese market.

5. CONCLUSION

In this study, the researchers applied the semi-parametric method proposed by Simar and Wilson (2007) to the annual dataset of 31 Vietnamese banks during the period 2018-2021.

By comparing the efficiency scores of these banks between the pre-pandemic period (2018-2019) and the COVID-19 pandemic period (2020-2021), the study analyzed whether Vietnamese banks operated differently during the COVID-19 pandemic. The superior methodology allowed for bias-corrected efficiency scores and more accurate estimations of the determinants of efficiency. This study can be considered one of the first few attempts to examine the operational efficiency of commercial banks in Vietnam under the influence of the pandemic, especially employing the advanced approach proposed by Simar and Wilson (2007). Therefore, the estimates of this study are more precise and contribute significantly to the policy development in the banking sector amid the COVID-19 pandemic.

During the study period, the efficiency scores of Vietnamese banks demonstrated a slight upward trend despite the occurrence of the pandemic. The bias-corrected efficiency score increased from 0.62 in 2018 to 0.70 in 2021. The average values for the pre-pandemic and pandemic periods were 0.62 and 0.67, respectively. Importantly, no evidence was found to support a negative impact of the pandemic on bank efficiency, as the Covid dummy variable was statistically insignificant in the regression analysis of factors influencing bank efficiency. Regarding other determinants examined, it was observed that bank size had a negative effect on efficiency. This finding contrasts with previous studies on Vietnam (Stewart, Matousek, & Nguyen, 2016; Ngo, 2010), which suggested that larger banks tended to be more efficient based on their greater financial resources. However, this observation can be understood in the context of the banking system reforms in Vietnam. The restructuring program of the commercial banking system during 2011-2015 led to various changes in ownership and mergers and acquisitions (M&A) among Vietnamese banks. Given these notable turns in the banking system, the study's discovery implies that expanding bank size to enhance operational efficiency in the near future might not be advisable, as a significant restructuring phase has already been completed. The banking system appears to require time to fully leverage the management capabilities and operate effectively with the current scale achieved post-restructuring.

Other factors, such as market concentration, ROA, COA, and EOA, were confirmed to be related to bank efficiency, reaffirming the usefulness of traditional financial indicators. On the other hand, no significant relationships were found between macroeconomic factors such as GDP, Z-score, and diversification with bank efficiency. Lastly, this study provided evidence that the operational efficiency of commercial banks in the Vietnamese market did not seem to be adversely affected by the COVID-19 pandemic, unlike other industries observed worldwide.

In short, this study has shed light on an essential aspect of the Vietnamese banking sector during the unprecedented COVID-19 pandemic. The findings have demonstrated that commercial banks in Vietnam exhibited a remarkable level of resilience and maintained their operational efficiency despite the widespread challenges faced by various industries worldwide.

Unlike other sectors that experienced substantial disruptions and setbacks, the Vietnamese banking industry managed to navigate through the crisis with relative stability. The evidence presented in this research indicates that the measures taken by the Vietnamese government, the central bank, and the banking institutions themselves were effective in safeguarding the sector's performance.

Overall, the findings of this study are not only valuable for the Vietnamese banking industry but also hold significance globally. Understanding how the Vietnamese banking sector remained efficient during the COVID-19 pandemic can serve as a valuable benchmark for other countries and financial institutions to learn from and potentially adapt their strategies.

However, it is essential to acknowledge that this research has its limitations. The study might not capture the full scope of the pandemic's long-term effects, as its impact on the economy and the banking sector may evolve over time. Further research is needed to assess

the sustainability of the observed efficiency levels and potential challenges in the post-pandemic era.

In conclusion, the evidence presented in this study suggests that the Vietnamese banking sector's operational efficiency remained resilient and unaffected by the COVID-19 pandemic, setting it apart from the challenges faced by other industries worldwide. This insight not only highlights the sector's adaptability and robustness but also offers valuable lessons for the global financial community to navigate similar crises in the future. On the other hand, it is noteworthy to tread cautiously when interpreting the absence of significant Covid-19 impact on the banking system in Vietnam, primarily because the country's banking sector is subject to rigorous regulatory oversight. The stringent regulatory framework and proactive measures taken by Vietnamese authorities have played a pivotal role in safeguarding the stability and resilience of the banking industry during the pandemic. As a result, the banking sector has been able to withstand external shocks and economic disruptions to a remarkable extent. However, it is essential to acknowledge that this outcome may also be attributed to the unique characteristics and policies of the Vietnamese banking system, and a more detailed analysis is necessary to fully understand the nuances of this situation in the future.

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Appendix

Appendix A1: List of Vietnamese commercial banks

STT	Name	Abbreviations	Code	Listed stock exchange
1	An Binh Commercial Joint Stock Bank	AnBinh Bank	ABB	
2	ACB Commercial Joint Stock Bank	ACB	ACB	HOSE
3	Vietnam Bank for Agriculture and Rural Development	Agribank	AGRB	
4	BIDV - Bank for Investment and Development of Vietnam	BIDV	BID	HOSE
5	Bao Viet Commercial Joint Stock Bank	BaoViet Bank	BaoViet	
6	Vietnam Joint Stock Commercial Bank for Industry and Trade	Vietinbank	CTG	HOSE
7	Vietnam Export Import Commercial Joint Stock Bank	Eximbank	EIB	HOSE
8	General Vietnam Joint Stock Commercial Bank	Viet Capital Bank	BVB	
9	Ho Chi Minh City Development Joint Stock Commercial Bank	HDBank	HDB	HOSE
10	Kien Long Commercial Joint Stock Bank	Kienlongbank	KLB	
11	LienVietPostBank - Vietnam Post and Telecommunication Joint Stock Bank	LienVietPostBank	LPB	HOSE
12	Military Commercial Joint Stock Bank	MB	MBB	HOSE
13	Vietnam Maritime Commercial Joint Stock Bank	Maritime Bank	MSB	HOSE
14	South Asia Commercial Joint Stock Bank	Nam A Bank	NAB	
15	North Asia Commercial Joint Stock Bank	BacA Bank	NAS	HNX
16	National Citizen bank - NCB	NCB	NVB	HNX
17	Orient Commercial Joint Stock Bank	Orient Bank	OCB	
18	Petrolimex Joint Stock Commercial Bank	PG Bank	PGB	
19	Vietnam Public Joint Stock Commercial Bank	PVcomBank	PVF	
20	Saigon Commercial Joint Stock Bank	SCB	SCB	
21	Saigon Bank for Industry and Trade	Saigonbank	SGB	
22	Saigon - Hanoi Commercial Joint Stock Bank	SHB	SHB	HOSE
23	Saigon Thuong Tin Commercial Joint Stock Bank	Sacombank	STB	HOSE
24	Southeast Asia Commercial Joint Stock Bank	SeABank	SSB	HOSE
25	Viet Nam Technological and Commercial Joint Stock Bank	Techcombank	TCB	HOSE
26	TienPhong Commercial Joint Stock Bank	TPBank	TPB	HOSE
27	Viet A Commercial Joint Stock Bank	Viet A Bank	VAB	
28	Joint Stock Commercial Bank for Foreign Trade of Vietnam	Vietcombank	VCB	HOSE
29	Vietnam International Commercial Joint Stock Bank	VIB	VIB	HOSE
30	Vietnam prosperity joint stock commercial Bank	VPBank	VPB	HOSE
31	Saigon Thuong Tin Commercial Joint Stock Bank	Vietbank	VTB	

Source: Authors' summary

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