EVALUATING THE OPERATING EFFICIENCY OF JOINT-STOCK COMMERCIAL BANKS IN VIET NAM THROUGH THE RESTRUCTURING PERIOD

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ABSTRACT

This article assesses the performance of joint-stock commercial banks in Vietnam throughout a two-phase restructuring project according to Decision No. 254 / QD-TTg and No. 1058 / QD-TTg of the Prime Minister. The data is mainly collected from consolidated financial statements and annual reports of 31 joint-stock commercial banks from the period of 2011–2020. The study approaches data envelopment analysis measurement – DEA and Tobit censored regression models - to evaluate operational efficiency. The results illustrate that banks utilize their input resources effectively with an average technical efficiency index of 90.7%. Moreover, considering scale-down efficiency (DRS) is essential, leading to the need to diversify banking services (especially the non-credit segment) to disperse risks in the operation process instead of only concentrating on traditional credit activities.

Keywords - Joint Stock Commercial Bank, Technical Efficiency, Restructuring, DEA, Malmquist Index

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INTRODUCTION

The financial crisis in 2008 not only affected operational productivity but also impaired Vietnam's banking system. In the context of credit growth prevailing over the GDP level, banks created an ample money supply leading to high inflation in 2011 and 2012. Businesses who could borrow easily tended to out-of-control their investment funds, then generated bad debts as a result. For a "modest" economy like Vietnam, the number of banks operating at that time is considered too many. Besides, the rapidly increasing number of small-sized banks had led to the weakness of the whole system. To solve these problems, the Prime Minister approved two restructuring projects, including: "Restructuring the system of credit institutions for the period 2011 - 2015" (Decision No. 254 / QD-TTg) and "Restructuring Credit institutions system associated with bad debt handling in the period of 2016-2020" (Decision No. 1058/QD-TTg). Due to different research scopes in space and time, many previous governance recommendations no longer conform to reality (Nguyen, 2008; Tran et al., 2015). Besides, the existing lag in macro policies worsens the performance of the banking sector during the very first years (Duong et al., 2020; Phan, 2013; Tran et al., 2015). Due to market volatility in recent years and evaluating whether a

restructuring project is effective, reassessing the operating condition in the post-restructuring stage is essential. From the witnessed research gap, this paper uses the DEA method to analyze the performance of 31 banks from 2011 to 2020 through technical efficiency measurements and total factor productivity growth (Malmquist index). The censored regression model – Tobit - is also applied to quantify the factors affecting the performance. The final results will be an objective reference source for Vietnamese commercial banks to enhance their capacity. Moreover, the research also asserts that technological change is one of the main factors contributing to operational efficiency, thereby defining the vital role of financial technology (Fintech).

LITERATURE REVIEW

In Vietnam, Nguyen (2008) measured the effectiveness of 32 commercial banks during the restructuring period (2001-2005). Besides, the author also approaches the Tobit censored regression model to evaluate the impact of 11 component quantitative variables on bank performance. The average total efficiency of the whole sample is 0.791, showing that banks can only utilize 79.1% of their input resources. Moreover, due to differences in the research period, its governance recommendations are likely to be outdated. According to Phan (2013), the research period from 2003 to 2012 focused only on restructuring phase 1 (Decision No. 254 / QD-TTg). The result shows that due to fluctuations in the number of banks in the merger process, the correlation of efficiency and restructuring is unidentified.

Nguyen (2017) analyzed 21 commercial banks in the Thai Nguyen province using a DEA 2-stage method combined with a Tobit regression model. Research results conclude that during 2011-2015, commercial banks used relatively effective input resources that are proved by the technical efficiency index of 94%. However, the research scope is based on a specific province, so the results will not reflect the general banking condition.

Lin et al. (2009) divided 117 bank branches in Taiwan into five different groups based on the scale of the charter capital and then evaluated each group separately following the input minimized assumption. The results show that total technical efficiency is only 54.8%, and the scale efficiency of 82% is reflected by increasing the number of branches. Compared with the scaling-up strategy in Taiwan, the merger progress in Viet Nam is the opposite. Okoye et al. (2020), who evaluated the performance of commercial banks in Nigeria from 1996-to 2016, concluded that the restructuring policy from 2004-to 2005 was effective. The author pointed out that the larger the bank, the less profitable it is

Yeh (1996) combined the DEA method and traditional analysis to evaluate the Taiwan banking case. The author also concludes that external conditions also affect bank performance, as evidenced by observing the DEA trend over years when business cycle fluctuations occur. Eken & Kale (2011) evaluated 128 bank branches in Turkey, concluding that 53 branches achieved relatively high technical efficiency at 89.6%, while the remaining 76 branches were ineffective. Halkos & Tzeremes (2013) analyzed 45 banks in Greece participating in the merger or acquisition process from 2007 to 2011. The results showed that banks could not reflect effective performance in the short term as expected.

Duong et al. (2020) collected data from 28 Viet Nam commercial banks from 2008 to 2018. The results show that up to 2018, the restructuring project has adversely affected banking performance, but to conclude whether the project is effective depends on the surveyed time and data length. According to Tran et al. (2015), restructuring adversely affected bank productivity in 2012-2013 and made the efficiency scores fall sharply after banks were merged with weak small banks. Besides, a broader research period is essentially needed.

All of the above studies have a common conclusion that bank effectiveness requires a long research period.

METHODOLOGY

Data sources are mainly collected from consolidated financial statements and annual reports of 31 joint-stock commercial banks during 10 years from 2011 to 2020. As a result of reformation and M&A, the database in some years was left blank. The scope of the article only focuses on the joint-stock commercial banks' segment, which excludes state-owned commercial banks and joint-venture banks because of data shortage in terms of these kinds

of banks.

The traditional assessment method, which investigates banks' performance through some financial indicators, is still widely used in Viet Nam. Because the illustrated indicators are too monotonous and generally presented, their tendency is mostly inclined to the financial reporting objectives rather than analyzing the bank's performance in depth. To complement the restriction of traditional analytical methods, DEA - Data envelopment analysis - is approached to measure efficiency and quantify factors impacting operational effectiveness. This paper selects the "Intermediary approach" because this method also takes into account interest payment, which often accounts for the majority of total operating expenses.

After consulting previous research using a similar approach (Lin et al., 2009; T. Nguyen, 2017; V. Nguyen, 2008; Yeh, 1996), this article proposes input elements including three variables: interest expense (X1), non-interest expense (X2) and total deposits (X3), respectively; Output variables are: interest income (Y1), non-interest income (Y2) and loans (Y3). In addition, the Malmquist index (MI) is also one of the essential aspects of the DEA method. Total Technical Efficiency (TE) is decomposed into Scale Efficiency (SE) and Pure Technical Efficiency (PE). Total Technical Efficiency is estimated under the CRS condition (constant return to scale), while the Pure Technical Efficiency is estimated under VRS conditions (variable return to scale). MI, which is reflected by the change in total factor productivity (TFPCH), is estimated through a change in total technical efficiency (EFCH) and change in technological advances (TECHCH) in which EFCH includes PECH (change of pure technical efficiency) and SECH (change of efficiency by scale). The increase in total factor productivity (TFP) will be indicated by a Malmquist index greater than 1. A decrease in TFP yield is associated with a Malmquist index that is less than 1.

The limitation of DEA is that it does not account for error or noise, so there is no confidence interval. Therefore, the Tobit regression model, known as the censored regression model, is approached as a complement for DEA to enhance the model's validity. Because the efficient technical index is blocked within the range [0 1], the original regression model cannot be used in this study. If researchers use OLS (Ordinary Least Squares) regression, the estimation of the parameters may be biased (Nguyen, 2008).

This paper conducts a quantitative analysis in two phases: Phase 1 analyzes the efficiency of utilizing input resources of commercial banks following the method of non-parametric analysis (DEA) with the support of DEAP 2.1 software; Phase 2 inherits the results of pure technical efficiency (PTE) from Phase 1 to investigate the effect of some specific featured factors on operating performance following the Tobit censored regression model with the support of STATA 14.0 software.

The Tobit model looks like this:

$$\varepsilon_{it} = \gamma_0 + \sum_{j=1}^{n} \gamma_j D_{jit} + \sum_{j=1}^{m} \gamma_j Z_{jit}$$

In which, ε_{it} is the technical efficiency of bank i in year t estimated by the DEA method; D_{jit} is a dummy variable (such as type of bank ...), and Z_{jit} is the variable reflecting independent elements. This article will not deal with any occurrence or influence of dummy variables.

After reviewing the following research (Duong et al., 2020; Muhammad et al., 2011; Paradi et al., 2011; T. Nguyen, 2017; T. Nguyen & Q. Nguyen, 2019; V. Nguyen, 2008), the expected variables that can be selected in the Tobit regression model to assess the impact on the performance of commercial banks are summarized in Table 1.

Table 1: The way of calculating and expected effects

Variables	Calculating	Expectation	
		Expected effects	Related research
Dependent variable			
PTE	DEA method		
Independent variables			

Table 1: Continued

ROA	$\frac{\text{Net income}}{\text{Total assets}}$	+	T. Nguyen (2017); T. Nguyen & Q. Nguyen (2019)
NPL	$\frac{\text{Nonperforming loans}}{\text{Total loans}}$	-	Muhammad et al. (2011); T. Nguyen (2017); V. Nguyen (2008)
SIZE	Logarithm of the total assets	+	Duong et al. (2020); Muhammad et al. (2011); Paradi et al. (2011); T. Nguyen (2017)
TETR	$\frac{\text{Total expense}}{\text{Total revenue}}$	-	Paradi et al. (2011); V. Nguyen (2008)
DLR	$\frac{\text{Total deposits}}{\text{Total Loans}}$	-	V. Nguyen (2008)
ETA	$\frac{\text{Total equity}}{\text{Total Assets}}$	+ or -	Duong et al. (2020); V. Nguyen (2008)
LTA	$\frac{\text{Total loans}}{\text{Total assets}}$	+ or -	V. Nguyen (2008)
GDP	Increasing/Decreasing percentage of Gross domestic product	+	Duong et al. (2020); T. Nguyen (2017); T. Nguyen & Q. Nguyen (2019)
UNP	$\frac{\text{Total unemployed persons}}{\text{Total labor force}}$	_	T. Nguyen (2017)
INF	Increasing/Decreasing percentage of Consumer price index	+	Duong et al. (2020); T. Nguyen & Q. Nguyen (2019)

Source: Summary of authors from empirical research.

RESULTS AND DISCUSSION

Analysis of technical efficiency results

Table 2: Summary of descriptive statistics results for total technical efficiency, pure technical efficiency and scale efficiency of banks in the period 2011-2020

Year	Observation	Efficiency	Max	Min	Mean	Standard deviation
2011-2020	294	TE	1	0.545	0.903	0.020
		PTE	1	0.545	0.907	0.021
		SE	1	0.901	0.996	0.011

Source: Author calculated based on the estimated result.

The average total technical efficiency (TE) under the CRS terms of the whole sample during the 2011-2020 period reached 0.903. This figure illustrates that commercial banks in Vietnam, which tend to produce the identified output level, currently utilize only 90.3% of the input amount. In other words, banks have wasted about 9.7% of the remaining inputs. Comparing to **Nguyen (2008)**, the effectiveness of 32 commercial banks from 2001 to 2005 was not as

good as the period from 2010 to 2020 (only 79.1%). Based on the results of **Duong et al. (2020) and Tran et al. (2015)**, the poor performance during the early years (2012 to 2018) proved that the researched period from 2011 to 2020 was more conformable because the lag in effect of macro policy was to a lesser extent (Post-period of Decision No. 254 / QD-TTg and No.1058 / QD- TTg). According to **Okoye et al. (2020)**, the long research term is a key element that provides an overall perspective, and a brief period can mislead the results (Halkos & Tzeremes, 2013). Research scope is also an essential issue because a narrow data scale will not lead to a general conclusion. This paper solves the limitation of **Nguyen (2017),** which only focused on a specific province instead of a larger studied scope.

Overall, the observed remarkable limitations of these studies are: 1) Evaluating the effectiveness of the restructuring requires a long period, 2) The early stage often brings negative results due to lag factors existing in every macro policy. This article, which is based on a long research period, provides an improved result at the later stage of restructuring (90.3%). Moreover, inheriting the research result of **Phan (2013)** (in which performance was unidentified and focused only on restructuring Phase 1 - Decision No. 254 / QD-TTg), this article provides a general outcome for both restructuring phases (Decision No. 254 / QD-TTg and No. 1058 / QD-TTg).

Besides the CRS condition of TE, another measure of efficiency by scale is the variable return to scale (VRS) according to PTE, in which VRS includes increasing return to scale-IRS and decreasing return to scale-DRS. Since total efficiency is the multiplication of pure technical efficiency versus scale efficiency, the magnitude of the performance indicators (PTE and SE) will also reflect banks' performance. From Table 2, the average pure technical efficiency of the sample in the survey period is 0.907, which is smaller than the average scale effect (0.996). Thus, it can be concluded that in the sample period, the factor which reflects the scale of banks contributing to the total technical is greater than the pure technical efficiency. According to **Lin et al. (2009),** restructuring in Taiwan consisted of scaling up and branch expansion, which was opposite to the merger strategy used in Viet Nam. Although scale efficiency in Taiwan was as good as Viet Nam, its total technical efficiency was poor (only 54.8%)

Table 3: Number of banks with the return that is reducing (DRS) and constant (CONS) in comparison to bank size during the 2011-2020 period

	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
DRS	6	9	6	8	1	0	1	2	1	2
CONS	22	20	23	22	29	30	29	28	29	26
No result	3	2	2	1	1	1	1	1	1	3
Total	31	31	31	31	31	31	31	31	31	31

Source: Authors calculated based on the estimated results

According to Table 3, decreasing return to scale (DRS) means that if banks try to expand their operation (increase bank branches or chartered capital), overall efficiency will be reduced. In terms of DRS, the bank cannot focus on scaling up existing products but should invest in new products and services that can improve the productivity of its inputs. In general, the number of banks facing DRS decreases year by year during the research period, which means commercial banks have developed proper management strategies and appropriate scales to improve operational efficiency.

Analysis of the estimated results of the Malmquist Index

Table 4: Estimated results of the Malmquist Index (tfpch) and its component indexes for the period 2011-2020

Year	Effch	Techch	Pech	Sech	tfpch
2011-2012	0.989	0.969	1.011	0.979	0.959
2012-2013	0.979	0.903	0.989	0.989	0.884
2013-2014	0.976	1.046	0.964	1.013	1.021
2014-2015	0.926	0.759	0.966	0.958	0.702
2015-2016	1.088	1.328	1.036	1.051	1.445
2016-2017	0.994	1.039	0.989	1.005	1.032
2017-2018	0.994	0.985	0.995	0.999	0.979
2018-2019	1.016	1.000	1.026	0.991	1.016
2019-2020	0.974	1.075	0.978	0.996	1.047
Average 2011-2020	0.992	1.002	0.992	1.001	0.994

Source: Authors estimated from the Malmquist Index result.

The Malmquist Index (MI) is expressed through the change in total factor productivity (tfpch), and also the multiplication between the change in total technical efficiency (effch) and changes in technological advances (techch). The results of MI and its components over the years are demonstrated in Table 4, in which the geometric mean calculates the average for the whole period. The average amount the MI index decreased for the whole period 2011-2020 was 0.6%. The technological advances index increased slightly by 0.2%, while the technical efficiency decreased by 0.8%. Although scale efficiency improved by more than 0.1%, this result is not enough to compensate for the 0.8% decrease in total technical efficiency. The change of pure technical efficiency (pech) can be thought to be the leading cause of the reduction of MI in the research period.

From observing the results of average MI over the years, MI in the period 2014-2015 had the strongest declining tendency (29.8%). The cause of the decrease in MI is due to the change in the technological advance index, which is only 75.9% (declines by 24.1%). Technical efficiency was higher than technological advances (16.7%), which indicates that commercial banks paid more attention to technical efficiency during the period. Investing in technology requires a significant source of capital that only large banks in Vietnam can afford. Moreover, this stage was also one of the difficult times for the entire Vietnam banking system; it focused more on risk management. That is why technological progress was not adequate from 2014 through 2015.

However, the efficiency of technological applications improved enormously (increasing from 75.9% to 132.8%) in the period 2015-2016. The result explains why MI in 2016 increased by 44.5%. It partly reflects that banks have paid more attention to new technologies during the latter stage to enhance their operational efficiency. The technology improvement index still rises over the following years. In conclusion, it can be said that Fintech (financial technology) is one of the driving forces in promoting the index of technological progress.

Analysis of the estimated results of the Tobit regression model

Table 5: Estimated results of the Tobit censored regression model

Variables	Coefficient	Standard error	t	P> |t|	Confident interval 95%	
ROA	0.0466	0.0101	4.58	0.000	0.0265	0.0666
LTA	0.0039	0.0006	6.09	0.000	0.0026	0.0052
SIZE	0.0490	0.0055	8.77	0.000	0.0380	0.0600
INF	0.0119	0.0016	7.41	0.000	0.0087	0.0151
GDP	0.0092	0.0043	2.15	0.032	0.0008	0.0177
UMP	-0.1794	0.0518	-3.46	0.001	-0.2814	-0.0774
_CONS	0.0019	0.0252	0.08	0.937	-0.0477	0.0517
Observations	310					
LR chi2 (6)	473.81					
Prob > chi2	0.0000					
Pseudo R2	1.8268					
Log likelihood	107.2228					

Source: Author's estimation results from Tobit model

After processing the regression model for the first time (including 1 dependent variable: pure technical efficiency - PTE and 10 independent variables), the results show that 4 independent variables, including ETA, DLR, NPL, TETR have a p-value all greater than 0.05. This means that the relationship among these four independent variables with the dependent variable PTE is not statistically significant, and as a result the paper excludes these elements from the regression model. After running the second regression (Table 5) with the remaining 6 independent variables, the results indicate that this model is reasonable. After blocking 1 bound for the dependent variable PTE (blocking right with upper limit equals to 1), out of 310 samples 203 samples were not blocked, and 107 samples were.

The regression results of the independent variable ROA are similar to the expected sign. When the ROA ratio is higher, pure economic efficiency increases. The estimated coefficient of the loan-to-total assets (LTA) variable has a positive impact on pure technical efficiency; this result indicates that the more banks tend to lend, the higher the efficiency they have. However, the regression coefficient is not high (only 0.0039), which shows that credit growth is not a priority for banks in terms of efficiency enhancement.

The coefficient of the scale variable (SIZE) is 0.049. Although it shows a positive correlation with the independent variable, banks should consider expanding chartered capital carefully. According to the above research results (Table 3), some banks in Vietnam are currently facing DRS or constant return to scale situations, so scaling up will not always lead to operational efficiency improvements. Two macro variables - inflation rate (INF) and economic growth rate (GDP) - both positively affect banking performance. However, the relationship between inflation and economic growth is always a controversial backlog. Whether the effect between these two variables is positive or negative depends on the standard inflation threshold used to determine this correlation. Finally, the last variable is the unemployment rate (UNP), which shows an inverse relationship with PTE, as expected. Unemployment issues can adversely affect bank performance; however, a moderate level will balance society. **Yeh (1996)** also emphasized that macro factors are indispensable elements because business cycle fluctuations and bank performance are inter-correlated.

CONCLUSION AND RECOMMENDATION

Bank performance has improved throughout the restructuring period, (Decision No. 254 / QD-TTg 2011-2015 and Decision No. 1058 / QD-TTg 2016-2020), which can be observed through the results from the DEA model and the Malmquist Index. Changes in technology advances are one of the main factors contributing to the improvement of operational efficiency, thereby defining the critical role of Fintech. Commercial banks utilize relatively effective input resources. The status of the information technology system of Vietnam's banking industry has gradually reformed over the years. However, compared to the international context, there are still many limitations that Viet Nam needs to overcome. Based on the DEA model's descriptive statistics, the source of revenue is mainly dependent on traditional credit activities. Although LTA (the ratio of loan to total assets) is proportional to performance, if banks only pay attention to developing traditional credit activities without investing more in non-credit activities, it is very difficult to enhance comprehensive efficiency. Credit activity is considered a pure service that is being fiercely competed in the market. Due to this acrimonious competition, the interest rate spread between output and input has risen and, as a result, can reduce bank income. The scale variable (SIZE) also indicates a positive relationship with operational efficiency, but banks who are facing the case of scale-down efficiency (DRS) should consider it when expanding their size.

Whether the solutions to improve operational efficiency are feasible or not depends not only on the efforts of joint-stock commercial banks but also on the legal support and administrative reform of the Government. This article proposes some implications such as reducing input costs, modernizing financial technology, building a satisfactory remuneration regime for employees, and quickly consolidating with international standards in terms of management and operations.

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