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## Impact of Covid-19 pandemic on factors affecting profitability of commercial banks in Vietnam

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### Abstract

This study evaluates the impact of the COVID-19 pandemic on the profitability determinants of commercial banks in Vietnam by comparing the pre- and post-pandemic periods. Employing Feasible Generalized Least Squares (FGLS), the study analyzed data from 15 commercial banks in Vietnam over 11 years, from 2012 to 2022, focusing on Return on Assets (ROA). Results reveal that equity size, demand deposits, and bank size significantly and positively influenced ROA, whereas expense management negatively affected profitability. Specifically, the pandemic intensified the influence of equity size and increased the importance of demand deposits and bank size, while reducing the significance of inflation rates. The exchange rate consistently showed an insignificant impact across both periods. Thus, the pandemic distinctly shifted the relative importance of factors influencing bank profitability, emphasizing equity management and deposit mobilization strategies. These insights suggest that effective expense control and strategic adjustments in equity and asset management are essential for banks to enhance resilience and profitability during economic disruptions.

**Keywords:** Banks' profitability, Commercial banks, Covid-19 pandemic, Factors affecting profitability.

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**Transparency:** The authors confirm that the manuscript is an honest, accurate, and transparent account of the study; that no vital features of the study have been omitted; and that any discrepancies from the study as planned have been explained. This study followed all ethical practices during writing.

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### 1. Overview of Empirical Researches on Banks' Profitability

The factors influencing the profitability of commercial banks have been studied in many domestic and international research papers. Some of the relevant international studies include Gazi et al. [1], Ichsan et al. [2], Xiazhi and Shabir [3], Li et al. [4], HakizakubanaNgoboka and Gatawuwa [5], Artha and Mulyana [6], Fuadi et al. [7], Affandi and Simarmata [8], Ali et al. [9], Bhattarai [10], Apriyanti et al. [11] and Jamel and Mansour [12]. In addition, some domestic studies have been conducted by research groups such as Nguyen and Dang [13], Nga et al. [14] and Lam and Anh [15].

Gazi et al. [1] conducted a study on the impact of the CAMELS model and macroeconomic factors on the profitability of commercial banks in Bangladesh from 2010 to 2021. The study used the Fixed Effects Model (FEM) to compare the impact of factors on profitability before and during COVID-19 by observing two periods: 2010-2019 and 2010-2021. The research took ROA, ROE, and NIM as dependent variables and found that the non-performing loan ratio (NPLR) and bank size significantly and negatively affected ROA, ROE, and NIM in both the pre-pandemic and pandemic periods. The capital adequacy ratio (CAR), however, only affected ROA and ROE in the same ways as NPLR and bank size did, and the loan-to-deposit ratio (LDR) only negatively affected ROA during the COVID-19 period (2010-2021). The study also found that the total equity to total assets ratio (EAR) and inflation rate (INFR) significantly and positively affected ROA in both periods. The results showed that the liquid asset to total assets ratio (LATAR) significantly and negatively affected both ROA and ROE during the COVID-19 period; however, that relationship was insignificant during the pre-pandemic period. It is also notable that Bangladesh's GDP growth rate negatively and significantly affected banks' ROA and ROE in the pre-pandemic period, but during the COVID-19 period, the relationship was insignificant. In contrast, the GDP growth rate significantly positively affected banks' NIM during the pandemic period. Moreover, the real interest rate (INTR) significantly and positively affected banks' NIM; however, the results did not show any relationship between INTR and the two dependent variables of ROA and ROE.

Ichsan et al. [2] additionally, a study was conducted on the determinants of Indonesian Sharia banks' financial performance during the COVID-19 pandemic, utilizing data from multiple Islamic banks spanning 2011 to 2020. The research employed multiple linear regression testing and linearity testing of the model using the Ramsey test. The findings indicated that the capital adequacy ratio (CAR) has a positive and significant effect on the ROA index. Furthermore, unexpectedly, the operating costs to operating income ratio (BOPO), which typically exhibits an inverse relationship with ROA, also demonstrated a positive and significant impact on the financial performance of Sharia banks. Conversely, non-performing financing (NPF) showed a negative and statistically insignificant effect on financial performance as measured by ROA.

In October 2022, Xiazhi and Shabir [3] published a study to examine the effects of COVID-19 on banks' performance using data from 1,575 banks across 85 countries from 2020Q1 to 2021Q4. The models used in the study were the Fixed Effects Model (REM) as the baseline model and the Generalized Method of Moments (GMM) as the alternative model to address potential endogeneity issues such as reverse causality, omitted variables, and control variables. Generally, the findings illustrated that the COVID-19 pandemic significantly and negatively affected bank performance. Specifically, the outbreak of COVID-19 most negatively impacted the performance of smaller, undercapitalized, and less diversified banks. In contrast, banks with better financial development and institutional environments are likely to experience less negative impacts of the COVID-19 pandemic on their performance.

Li et al. [4] have conducted research on the effects of revenue diversification on bank profitability and risk during the Covid-19 pandemic using a regression model. The research suggested that noninterest income positively affects the performance of banks (which is measured by using ROA and ROE as dependent variables). In contrast, other results showed that noninterest income negatively and significantly affects bank risk measures. Moreover, the research indicated that the best-performing banks are likely to continue performing well during the pandemic, and the riskiest banks are likely to face more risks under the pressure of COVID-19.

Hakizakubana Ngoboka and Gatauwa [5] conducted a study on the effectiveness of the CAMEL model in assessing the performance of commercial banks in Rwanda from 2014 to 2018. The study used descriptive statistics and a panel regression model to evaluate the correlation between the explanatory variables (measured by capital adequacy, asset quality, earnings management, liquidity management, and bank size) and the outcome variable (measured by ROA). The study indicates that capital adequacy significantly and positively impacts the financial performance of financial institutions. Similar results were observed in the correlation between asset quality and financial performance. In contrast, the management efficiency ratio negatively and significantly affects the performance of banks. Interestingly, the study demonstrated that earnings management in commercial banks in Rwanda has a negative correlation with financial performance. This implies that a decrease in net interest margin will increase the banks' ROA index. Moreover, liquidity management was concluded to have a negative correlation with ROA, implying that an increase in liquidity management reduces banks' financial performance. The concept of "bank size" was also added as a mediator variable to better analyze the relationship between the independent and dependent variables. The results showed that when bank size was used as a moderator, it did not have a significant effect on financial performance.

Artha and Mulyana [6] conducted a study to determine the impact of internal and external factors on state-owned banks in Indonesia from 2012 to 2017 using the Fixed Effects Model (FEM). Notably, the study demonstrated that the Current Account Saving Account (CASA) has a positive and significant effect on the Return on Assets (ROA) of the banks, and the same relationship is also found between the Net Interest Margin (NIM) and ROA. Surprisingly, the capital adequacy ratio (CAR) was found to negatively affect the ROA of state-owned banks; however, the effect was not significant. In contrast, the study indicated that external factors such as the inflation rate and economic growth affect the ROA index negatively and significantly. Meanwhile, another external factor, the Bank Indonesia Reference Interest Rate (BI Rate), was found to have a positive and significant effect on ROA.

Additionally, Fuadi et al. [7] conducted a study on the impact of inflation, Bank Indonesia rate (BI rate), and exchange rate on the profitability of Islamic banks in Indonesia from 2009 to 2019. The method of data analysis used by the researchers was Vector Auto-Regressive (VAR) analysis. The study found that inflation has a negative relationship with the ROA index; however, the ability of inflation to affect the ROA was found to be only 0.62%, indicating that the effect is insignificant. The BI Rate has the ability to affect the ROA by 0.13%, which suggests that this relationship is also

insignificant, and the BI rate might only have indirect effects on the ROA. These findings differ from the results shown by Artha and Mulyana [6], which indicates that the inflation rate and BI rate have a significant impact on the ROA index of banks in Indonesia. The explanation for these inconsistent results might be due to differences in the types of banks targeted in the two studies. Specifically, Artha and Mulyana [6] have conducted a study on state-owned banks, while Fuadi et al. [7] study with data from Islamic banks.

Ali et al. [9] conducted a study on the impact of macroeconomic factors on the profitability of Islamic banks in Brunei from 2012 to 2016 using the fixed effects panel regression model. The study found that factors such as GDP growth rate, inflation rate, exchange rate, oil prices, and money supply had a positive impact on the profitability of Islamic banks. Among the indicators, oil prices, GDP growth rate, and inflation rate have the greatest impact.

The study by Bhattarai [10] aimed to evaluate the impact of credit risk on the performance of commercial banks in Nepal by applying the pooled data regression model on the dataset of 14 commercial banks in Nepal. The research used ROA as the dependent variable, while capital adequacy ratio, non-performing loan ratio, cost per loan assets, cash reserve ratio, and bank size are independent variables. The results indicate that the capital adequacy ratio had a positive but insignificant relationship with the ROA index. The non-performing loan ratio, as expected, had a strong negative relationship with the ROA of the banks. However, surprisingly, the cost per loan assets significantly and positively affected bank performance, and the author indicated that this variable is the influencing credit risk variable that determines bank performance. While the cash reserve ratio had a negative and insignificant association with ROA, the bank size, in contrast, had a significant and positive relationship with bank performance, which indicates that larger Nepalese banks have better profitability than smaller ones. The study stated that this result could be explained by the general theory that large banks have more opportunities to grow, develop better products, and have better loan diversification.

Jamel and Mansour [12] conducted a study on the factors affecting the profitability of banks in Tunisia from 1999 to 2016 using the General Least Squares (GLS) technique. The results showed that independent variables such as the ratio of owner equity to total assets and bank size had a positive and strong impact on the ROA of banks in Tunisia. In contrast, credit risk had a strong negative impact on the ROA of banks. Additionally, macro variables such as the inflation rate and GDP growth rate were evaluated as having no impact on the performance of banks in Tunisia.

In Vietnam, Nguyen and Dang [13] and Dang et al. [16] studied the factors affecting the profitability of commercial banks in Vietnam from 2014 to 2020. The research applied the adjustment model on the FEM model and found that the total equity to total assets ratio had a positive relation with ROA of commercial banks in Vietnam. The bank size also affected the profitability of commercial banks; however, the effect was insignificant. In contrast, as expected, the results showed that the operating expense to total assets ratio, tax expense, and credit risks significantly and negatively affected the banks' performance. The study concluded that the total loans to total assets ratio and total loans to total deposit ratio both had positive but insignificant correlations with the ROA of banks. Noticeably, the regression results showed that macroeconomic variables such as GDP growth rate and inflation rate did not have any statistical relation with the ROA of commercial banks in Vietnam.

Moreover, Hang [17] conducted a study on the impact of COVID-19 on the business performance of 21 commercial banks in Vietnam during the period 2012-2021, using a Random Effects Model and Feasible Generalized Least Squares (FGLS) method. The study used the independent variable "Covid-19," with the method of determination being that if a bank was affected by the Covid-19 pandemic, the value of this variable would be 1, and conversely, if the bank was not affected by Covid-19, the value would be 0. The results of the study showed that COVID-19 had a negative impact on both ROA and ROE, with a significant level of impact. In particular, the results showed that when banks were affected by COVID-19, the return on equity (ROE) decreased by up to 4.066 times. The authors concluded that the significant negative impact of the COVID-19 pandemic on bank profitability was consistent with the theory of economic shocks and the situation in Vietnam. Specifically, the COVID-19 pandemic has seriously affected the operations of businesses in the Vietnamese economy, leading to difficulties in paying principal and interest to banks. As a result, commercial banks were also significantly affected by COVID-19. Additionally, the study's results showed that variables such as cost management ability (CIR) and non-performing loan ratio (NPL/TL) had significant negative impacts on the ROE of banks. However, the results also showed that the TE/TA variable had a positive impact, but it was not significant, on the ROA of banks.

Additionally, Lam and Anh [15] conducted a study on the factors affecting the profitability of listed commercial banks in Vietnam from 2010 to 2020 using the Feasible Generalized Least Squares (FGLS) model. The results showed that the size of the bank, liquidity risk, economic growth rate, and inflation had a positive impact on profitability. Conversely, the expenses-to-income ratio, financial leverage, and credit risk had a negative impact on the profitability of commercial banks in Vietnam. The study clearly stated that the profitability of commercial banks in Vietnam is influenced not only by internal factors within the banks but also by external macroeconomic variables. Moreover, the study indicated that bank size has a positive correlation with profitability and is applicable to most bank groups in the Vietnamese banking sector, as larger banks tend to have advantages in product diversification and brand building for competitiveness. Especially in Vietnam, where clients tend to have more reliance and trust in larger banks.

Overall, numerous studies from both domestic and international sources have been conducted to identify and evaluate the factors affecting the profitability of commercial banks. However, most of these studies were carried out on banking systems in various countries and during different periods. In Vietnam, the issue of evaluating the factors influencing the profitability of commercial banks has not yet been addressed in the current situation of the COVID-19 pandemic.

Therefore, the study conducted by the authors will provide more valuable insights into this topic. We will evaluate the current state of profitability of commercial banks before and after the COVID-19 pandemic. This will involve measuring and assessing the factors that impact bank profitability and comparing the differences between the two periods.

Additionally, proposed solutions will be provided to improve and optimize the operational efficiency and profitability of commercial banks in Vietnam.

## 2. Data and Research Methods

### 2.1. Research Data

The study was conducted using a dataset of financial report indicators from 15 commercial banks in Vietnam during the period from 2012 to 2022, including An Binh Commercial Joint Stock Bank, Asia Commercial Joint Stock Bank, Vietnam Investment and Development Bank, Vietnam Joint Stock Commercial Bank for Industry and Trade, Vietnam Export-Import Commercial Joint Stock Bank, Ban Viet Joint Stock Commercial Bank, Ho Chi Minh City Development Joint Stock Commercial Bank, LienVietPostBank, Military Commercial Joint Stock Bank, Vietnam Maritime Commercial Joint Stock Bank, Saigon - Hanoi Commercial Joint Stock Bank, Saigon Thuong Tin Commercial Joint Stock Bank, Vietnam Technological and Commercial Joint Stock Bank, Joint Stock Commercial Bank for Foreign Trade of Vietnam, and Vietnam International Commercial Joint Stock Bank.

The data was collected from the annual reports and financial statements of each bank published on their official websites. Additionally, data was also collected from the SSI iBoard, the website of SSI Securities Company.

### 2.2. Research Methods

The research will be divided into two phases, including the pre-COVID-19 period from 2012-2019 and the COVID-19 period from 2020-2022. Some studies with similar topics used the period from 2020-2022 or included a few years before to evaluate the impact of COVID-19 on bank performance. However, in this study, we believe that dividing it into two different phases to conduct quantitative models will produce more accurate and intuitive results in assessing the impact of COVID-19 on the profitability of banks.

The data will be analyzed using Stata 14.1 software in the following order: (i) descriptive statistics, (ii) pooled, fixed effects, and random effects regression models, (iii) model selection tests, (iv) tests for heteroscedasticity and autocorrelation, and (v) correction of model biases using the FGLS (Feasible Generalized Least Squares) method to clarify the research objectives.

### 2.3. Hypotheses

**Table 1.**

Previous results on factors affecting commercial banks' ROA

Variables	Symbol	Formulas	Expectation	References
Size of equity (Capital)	EAR	EAR = Shareholders' Equity/Total assets	+	Jamel and Mansour [12]
			+	Nguyen and Dang [13]
			+	Gazi et al. [1]
Credit risk	ALLL	ALLL = Loan loss provision/Total loans	-	Gazi et al. [1]
			-	Bhattarai [10]
Expense management	OEsOI	OEIOI = Operating Expense/Net Operating Income	-	HakizakubanaNgoboka and Gatauwa [5]
			-	Apriyanti et al. [11]
Demand deposit	CASA	CASA = Total demand deposit/Total deposit	+	Artha and Mulyana [6]
			+	Affandi and Simarmata [8]
Bank size	SIZE	SIZE = Ln(Total assets)	+	Nguyen and Dang [13]
			+	HakizakubanaNgoboka and Gatauwa [5]
			-	Gazi et al. [1]
Exchange rate	EXR	EXR = Average USD/VND exchange rate each year	+	Ali et al. [9]
			+	Fuadi et al. [7]
Inflation rate	INF	INF = (This Year's Price Index - Last Year's Price Index)/Previous Year's Price Index	+	Gazi et al. [1]
			+	Lam and Anh [15]

### 3. Measuring the Affections of Factors Affecting Profitability of Commercial Banks in Vietnam

#### 3.1. Descriptive Statistics

##### 3.1.1. Pre-pandemic period (2012-2019)

**Table 2.**

Descriptive statistical results (2012-2019).

Variable	Obs.	Mean	Std. Dev.	Min	Max
ROA	120	0.0076065	0.0053353	0.0000852	0.0266516
EAR	120	0.0831886	0.0245221	0.0407649	0.1617744
ALLL	120	0.0140649	0.0044205	0.007752	0.0276347
OEOI	120	1.41162	1.044202	0.4132459	7.374722
CASA	120	0.170955	0.0774454	0.0293968	0.4121753
SIZE	120	12.18792	0.9545562	9.936552	14.21436
EXR	120	21820.55	767.8615	20828	23050.24
INF	120	0.041125	0.0245639	0.006	0.091

The average return on assets (ROA) of 15 commercial banks during the period from 2012 to 2019 used in the model is 0.0076, with a standard deviation of 0.0053, indicating that the difference in profitability among banks is not significant. The variable EAR, with an average value of 0.0832, shows that the ratio of average total equity to total assets is approximately 8.3%. The variable ALLL has an average value of 0.014, representing the ratio of total loan loss provisions to the total loan portfolio, reaching an average level of 1.44%. The variable OEOI has an average value of 1.41, indicating that the operating expenses to operating income ratio has an average of 141%. The variable CASA, with an average value of 0.17, shows that non-term deposits account for 17% of the total deposits of the bank. The variable SIZE, with an average value of 12.19 and a range from 9.9 to 14.21, indicates that the total asset scale of banks is not homogeneous. The variable EXR represents the average USD/VND exchange rate over 12 years, which is 21,820.55 VND, with a variation range from 20,828 to 23,050.24 VND. The variable INF represents the average inflation rate in Vietnam over 11 years, which is 4.11%, with a standard deviation of 2.4%.

##### 3.1.2. Including Pandemic Period (2012-2022)

**Table 3.**

Descriptive statistical results (2012-2022).

Variable	Obs.	Mean	Std. Dev.	Min.	Max.
ROA	165	0.0093453	0.0066001	0.0000852	0.0323752
EAR	165	0.0838834	0.0255851	0.0407649	0.1697322
ALLL	165	0.0143834	0.0046087	0.007752	0.0276347
OEOI	165	1.232765	0.9574695	0.293764	7.374722
CASA	165	0.1795703	0.0882249	0.0293968	0.4697695
SIZE	165	12.39068	0.9981791	9.936552	14.56718
EXR	165	22214.3	920.565	20828	23424.8
INF	165	0.0373636	0.0220847	0.006	0.091

The average return on assets (ROA) of 15 commercial banks during the period 2012-2022 used in the model is 0.0093, with a standard deviation of 0.0066 compared to the mean value, indicating that the difference in profitability among banks is not significant. The variable EAR has an average value of 0.0838, indicating that the ratio of average shareholder equity to total assets is approximately 8.4%. The variable ALLL has an average value of 0.014, indicating that the ratio of total loan loss reserves to total loans is approximately 1.44%. The variable OEOI has an average value of 1.23, indicating that the ratio of operating expenses to net operating income is approximately 123%. The variable CASA has an average value of 0.18, indicating that non-term deposits account for 18% of total deposits on average. The variable SIZE has an average value of 12.39, with a range of variability from 9.9 to 14.57, indicating that the scale of total assets of the banks is not uniform. The variable EXR represents the average USD/VND exchange rate over the 12-year period, which is 22,214.3 dong, with a range of variability from 20,828 to 23,424.8 dong. The variable INF represents the average inflation rate in Vietnam over 11 years, which is 3.74%, with a standard deviation of 2.2%.

### 3.2. Reliability Validation of the Measurement Scale

#### 3.2.1. Pre-pandemic period (2012-2019)

**Table 3.**

Regression model results for the period 2012-2019.

Variables	Pool OLS	FEM	REM	FGLS
EAR	0.0767*** (4.12)	0.106*** (4.83)	0.0925*** (4.70)	0.0880*** (4.94)
ALLL	-0.214** (-2.18)	-0.128 (-1.16)	-0.148 (-1.47)	-0.101 (-1.51)
OEOI	-0.00178*** (-4.29)	-0.00144*** (-3.42)	-0.00149*** (-3.73)	-0.00148*** (-5.06)
CASA	0.0146** (2.50)	0.0130 (1.49)	0.0133* (1.90)	0.00736* (1.74)
Size	0.00119** (2.13)	0.00484** (2.03)	0.00181** (2.15)	0.00151*** (3.00)
EXR	0.00000258*** (4.09)	0.00000153 (1.45)	0.00000259*** (4.30)	0.00000289*** (5.25)
INF	0.0860*** (4.56)	0.0822*** (5.25)	0.0838*** (5.32)	0.0739*** (4.61)
_cons	-0.0699*** (-4.51)	-0.0953*** (-5.64)	-0.0802*** (-5.64)	-0.0819*** (-6.18)
N	120	120	120	120
R-sq	0.501	0.505	0.4932	

Note: \*\*\* shows 1% level of significance, \*\* shows 5% level of significance, and \* shows a 10% level of significance.

As a result of the REM model, the outcome of the regression analysis indicates that the model is statistically significant. The Wald chi-square test shows that the model has a significant impact on the dependent variable. The chi-square statistic demonstrates that the REM model is more appropriate than the Pool regression model for this analysis, as it considers individual unit effects and unobserved heterogeneity. After performing the estimation using both the FEM and REM models, the results indicate that both models produce suitable outcomes. Therefore, a Hausman test will be conducted to determine whether to select the FEM or REM regression model.

The Hausman test is a statistical test used to compare the efficiency and consistency of two or more estimators in econometrics, particularly in panel data analysis. It is used to determine whether the Fixed Effects Model (FEM) or the Random Effects Model (REM) is more appropriate for a given set of data. Based on the Hausman test, REM is preferred over FEM. Therefore, we will choose to use the REM model in our analysis.

However, when conducting tests for autocorrelation and heteroscedasticity in the REM model, it was found that the model exhibited both issues. This would diminish the effectiveness of the REM model. Therefore, we employed the Feasible Generalized Least Squares (FGLS) regression model to address the variance differences between observation units and the autocorrelation problem identified in the previous model, which would help ensure unbiased and reliable estimation results [18].

#### 3.2.2. Including Pandemic Period (2012-2022)

First, the results of FEM estimation suggest that the FEM is a more suitable model than the pooled model. This implies that the variation in the dependent variable can be better explained by the unique characteristics of each unit in the panel data, rather than by a uniform set of coefficients applied to all units in the pooled model. Hence, it is recommended to use FEM for further analysis instead of the pooled model.

**Table 4.**

Regression model results for the period of 2012-2022.

<b>Variables</b>	<b>Pool OLS</b>	<b>FEM</b>	<b>REM</b>	<b>FGLS</b>
EAR	0.104***	0.113***	0.111***	0.118***
	(6.59)	(6.90)	(6.96)	(7.70)
ALLL	-0.223***	-0.225***	-0.198***	-0.0689
	(-2.92)	(-3.07)	(-2.77)	(-1.24)
OEOI	-0.00191***	-0.00146***	-0.00149***	-0.00139***
	(-4.74)	(-3.85)	(-3.95)	(-5.11)
CASA	0.0178***	0.0152**	0.0155***	0.00894**
	(3.77)	(2.59)	(2.87)	(2.25)
Size	0.00135***	0.00652***	0.00256***	0.00184***
	(2.82)	(4.20)	(3.24)	(3.91)
EXR	0.00000299***	0.000000787	0.00000262***	0.00000260***
	(6.36)	(0.98)	(5.23)	(5.74)
INF	0.0865***	0.0832***	0.0854***	0.0547***
	(4.56)	(5.25)	(5.32)	(4.61)
_cons	-0.0834***	-0.0992***	-0.0911***	-0.0819***
	(-7.46)	(-10.04)	(-9.36)	(-8.15)
N	165	165	165	165
R-sq	0.645	0.664	0.6280	

**Note:** \*\*\* shows 1% level of significance, \*\* shows 5% level of significance, and \* shows a 10% level of significance.

The estimation results obtained from the REM indicate statistical significance, with the Wald chi-square test confirming REM as preferable to the pooled regression due to its accommodation of individual effects and unobserved heterogeneity. Subsequently, estimations performed using both FEM and REM yielded appropriate results; hence, the Hausman test was conducted to determine the optimal model choice. The outcome suggested FEM as superior to REM, providing more robust coefficient estimates by effectively capturing individual unit characteristics. Nevertheless, diagnostic tests revealed autocorrelation and heteroscedasticity within the FEM estimations, compromising model efficiency. Consequently, the feasible generalized least squares (FGLS) approach was implemented to resolve these issues, enabling unbiased and efficient estimates by accounting for varying variances across observations [18].

**Table 5.**

Comparison of the regression models' results between the two periods.

Variables	2012-2019 (Pre-pandemic period)				2012-2022 (Including pandemic period)			
	Pool OLS	FEM	REM	FGLS	Pool OLS	FEM	REM	FGLS
EAR	0.0767*** (4.12)	0.106*** (4.83)	0.0925*** (4.70)	0.0880*** (4.94)	0.104*** (6.59)	0.113*** (6.90)	0.111*** (6.96)	0.118*** (7.70)
ALLL	-0.214** (-2.18)	-0.128 (-1.16)	-0.148 (-1.47)	-0.101 (-1.51)	-0.223*** (-2.92)	-0.225*** (-3.07)	-0.198*** (-2.77)	-0.0689 (-1.24)
OEOI	-0.00178*** (-4.29)	-0.00144*** (-3.42)	-0.00149*** (-3.73)	-0.00148*** (-5.06)	-0.00191*** (-4.74)	-0.00146*** (-3.85)	-0.00149*** (-3.95)	-0.00139*** (-5.11)
CASA	0.0146** (2.50)	0.0130 (1.49)	0.0133* (1.90)	0.00736* (1.74)	0.0178*** (3.77)	0.0152** (2.59)	0.0155*** (2.87)	0.00894** (2.25)
SIZE	0.00119** (2.13)	0.00484** (2.03)	0.00181** (2.15)	0.00151*** (3.00)	0.00135*** (2.82)	0.00652*** (4.20)	0.00256*** (3.24)	0.00184*** (3.91)
EXR	0.00000258*** (4.09)	0.00000153 (1.45)	0.00000259*** (4.30)	0.00000289*** (5.25)	0.00000299*** (6.36)	0.000000787 (0.98)	0.00000262*** (5.23)	0.00000260*** (5.74)
INF	0.0860*** (4.56)	0.0822*** (5.25)	0.0838*** (5.32)	0.0739*** (4.61)	0.0865*** (4.56)	0.0832*** (5.25)	0.0854*** (5.32)	0.0547*** (4.61)
_cons	-0.0699*** (-4.51)	-0.0953*** (-5.64)	-0.0802*** (-5.64)	-0.0819*** (-6.18)	-0.0834*** (-7.46)	-0.0992*** (-10.04)	-0.0911*** (-9.36)	-0.0819*** (-8.15)
Observations	120	120	120	120	165	165	165	165
R-sq	0.501	0.505	0.4932		0.645	0.664	0.6280	

Note: \*\*\* shows 1% level of significance, \*\* shows 5% level of significance, and \* shows 10% level of significance.



### 3.3. Discuss The Result

Based on Table 5, it can be observed that during the COVID-19 period (2012-2022), the correlation coefficient between the independent variable EAR and the dependent variable ROA is 0.118, which is 34.1% higher than in the pre-pandemic period (2012-2019). This indicates that, under the impact of the COVID-19 pandemic, the significance of the equity-to-assets ratio has increased considerably. The reason may be that during the COVID-19 period, society and the economy experienced lockdowns, leading to the suspension of income and business activities for individuals and businesses. This resulted in many difficulties for bank customers in repaying principal and interest, causing banks to bear more risks and allocate more credit risk provisions. Therefore, when banks maintain a larger cushion of shareholder equity, they have a better capacity to absorb losses, enhancing their safety during economic hardships. Additionally, a high equity-to-assets ratio means the bank's asset composition relies less on debt and more on self-owned capital, which helps to significantly reduce borrowing costs and thereby increase profitability. This is reasonable because, during the COVID-19 pandemic, the demand for borrowing in the economy decreased, leading to a decline in the bank's interest income. Consequently, managing and controlling borrowing costs became more critical and had a greater impact on the bank's profitability.

This result is consistent with the findings of Jamel and Mansour [12] and Nguyen and Dang [13] and many other researchers. However, in the study by Gazi et al. [1], the results showed that the impact of EAR on ROA of commercial banks during the COVID-19 period had decreased compared to the pre-pandemic period. The difference in results may be due to geographical differences, as Gazi's study was conducted on data from commercial banks in Bangladesh, where banks have different business operations from Vietnamese commercial banks. Moreover, the study period was from 2012 to 2021, so it can be said that the study period did not cover the year 2022, when the global pandemic situation began to decline and the economy gradually resumed operations. Additionally, the impact of COVID-19 on each country is different, which may also contribute to the differences in the results of the two studies.

#### 3.3.1. OEOI - Operating Expense to Net Operating Income Ratio

The OEOI variable has a negative and insignificant impact on the ROA index of banks in Vietnam in both periods. This result shows that as the ratio of operating costs to net income from business activities of the bank increases, the ROA index or the bank's profitability will decrease. This is consistent with the actual operation of banks, as operating costs are one of the largest expense categories; therefore, when this cost increases, it will reduce the bank's profitability. This result is consistent with the findings of HakizakubanaNgoboka and Gatawa [5] and Apriyanti et al. [11]. The impact of this variable on ROA is not significant, and the difference in the degree of impact on ROA is also similar in both periods, 2012-2019 and 2012-2022.

#### 3.3.2. CASA - Current Account Savings Account Ratio

The CASA variable shows a positive impact and statistical significance on the ROA index of banks in the 2012-2022 period. In other words, as the ratio of non-term deposits to total deposits of the bank increases, the bank's profit reflected through ROA will increase. In theory, this result is reasonable when the cost of capital for non-term deposits is very low, causing the overall cost of capital mobilization of the bank to decrease, thereby helping to increase the overall NIM of the bank and improve its profitability. This result is consistent with the findings of Artha and Mulyana [6] and Affandi and Simarmata [8].

Based on the results from the table, the impact of the CASA variable during the COVID-19 period was 0.00894, which is 21.47% higher than the 0.00736 level during the pre-pandemic period. This indicates that during the COVID-19 pandemic, the CASA ratio in banks became significantly more important for the efficiency of bank operations. This may be due to the fact that during the pandemic, economic risks increased significantly, and therefore, banks needed to minimize risks by increasing the CASA ratio, which is a highly liquid deposit with low or almost zero funding costs. Additionally, under the impact of Covid-19, online payment methods through current accounts have become more popular than ever in Vietnam, significantly increasing the amount of non-term deposits in banks. Consequently, banks have access to numerous funding sources with low funding costs, enabling them to balance interest rates for lending, attract more customers, and increase profitability.

Moreover, many commercial joint-stock banks in Vietnam have gradually shifted their customer structure towards individual customers and SMEs, which are believed to have the potential to attract the largest CASA funds. Therefore, the digital transformation process of banks becomes necessary to attract more CASA funding from these entities. Effective digital transformation and technology upgrades not only increase the short-term funding ability of banks but also enhance their position, reputation, and brand positioning in the market. Consequently, the profitability of banks will also increase significantly.

#### 3.3.3. SIZE - The Scale of Total Assets

The SIZE variable, representing the total asset scale of a bank, has a significant positive impact on the bank's ROA index during the studied period. Specifically, as the total asset scale of the bank increases (with credit outstanding being the main asset generating income), the ROA of the bank tends to increase as well. The Size variable has a relatively large impact on the profit-generating ability of banks in both pre-pandemic and pandemic periods. Additionally, during the COVID-19 period, the variable has a stronger impact on ROA, with a level of impact of 0.00184 compared to 0.00151 in the pre-pandemic period.

The reason for the 22% difference between the two periods before and after the pandemic could be that during the pandemic, many different industries that the banks funded faced difficulties, causing the banks' loan portfolios to focus on these industries and leading to a decrease in income. However, larger banks with a higher ability to diversify their income across many different industries will have lower exposure to industry risks. As a result, their profitability will be more stable and secure than that of smaller banks. Additionally, during the COVID-19 period, when the trend of digital transformation in the banking industry was growing strongly, scale became more important than in the previous period. Specifically, larger banks benefited from factors such as reputation and brand recognition. Furthermore, these banks had more resources to invest in researching and developing new technologies to serve the upgrading and improvement of products such as internet banking. Some benefits for these banks include increasing the ratio of CASA deposits, enhancing brand recognition and market reputation, improving competitiveness, and attracting new customers. These benefits all have the potential to bring significant value to the bank and thereby improve the bank's profitability.

This result is consistent with HakizakubanaNgoboka and Gatauwa [5] and Nguyen and Dang [13] studies, but the research of Gazi et al. [1] produced the opposite result. Specifically, Gazi et al. [1] indicated that the bank size of Bangladesh's commercial banks has an insignificant negative impact on the banks' return on assets. Moreover, the results also showed that the impact of bank size on banks' ROA during the pandemic period has become more negative, from -0.00004 in the pre-pandemic period to -0.0035 during the pandemic period. The contrast in the results might be due to differences in the banking operational systems between Bangladesh and Vietnamese commercial banks. The banking sector's growth rate in Bangladesh is also slower than that of Vietnam. Additionally, the commercial banking system in Bangladesh is considered to have a more limited product range compared to the banking system in Vietnam. For example, while both countries' banks offer basic deposit and lending products, Vietnamese banks also offer more advanced products such as insurance, wealth management, and investment banking services. In comparison, Bangladeshi banks have a relatively limited range of product offerings, with a greater focus on traditional banking services. Therefore, banks in Bangladesh may not be able to optimize product development as in Vietnam, making the use of assets still limited.

#### *3.3.4. EXR - Exchange Rate*

The EXR variable, representing the average USD/VND exchange rate during the period 2012-2022, has a positive impact; however, the impact of this variable is insignificant in both the pre-pandemic period and including the pandemic period. Specifically, when EXR increases by 1%, ROA only increases by 0.00026%. Moreover, the difference in the impact of this independent variable on ROA in both periods remains unchanged. This positive but insignificant impact is reasonable, as bank business activities in Vietnam mainly focus on credit operations, while activities related to foreign exchange trading have a relatively low proportion.

This result of positive impact is consistent with the findings of Ali et al. [9] and Fuadi et al. [7]. However, in Ali's study, the impact of the exchange rate on the ROA of Bruneian Islamic banks is much more significant. Moreover, Fuadi's research also showed that the exchange rate tends to significantly affect the ROA of the Islamic banking system in Indonesia. The difference in the significance of the impact might be because the customer base of Islamic banks may be more diverse, with a larger proportion of customers engaged in international trade and foreign currency transactions. Therefore, this increases the exposure of Islamic banks to exchange rate fluctuations. In contrast, Vietnamese banks have a more domestically focused customer base, which may reduce the impact of exchange rate fluctuations on their profitability. Moreover, the exchange rate risk management practices of Islamic banks may differ from those of Vietnamese banks. Islamic banks are required to follow Shariah principles, which may limit the use of derivative products such as currency forwards and swaps for hedging purposes. This means that Islamic banks may be more exposed to exchange rate risks than Vietnamese banks.

#### *3.3.5. INF - Inflation Rate*

The result of Table 5 indicates that the INF variable has a positive and significant correlation with the ROA index of Vietnamese commercial banks in both the pre-pandemic and pandemic periods. In other words, when the inflation rate increases, the profit-generating ability of the bank also increases. The impact of the INF variable on the profit-generating ability of commercial banks is significant in both periods. However, during the period including the pandemic from 2012-2022, the impact of the INF variable on ROA decreased, with an impact level of 0.055 compared to 0.074 in the pre-pandemic period. This difference indicates that the effect of COVID-19 changed the impact of the inflation rate on ROA of commercial banks in Vietnam in a more insignificant way. The explanation for this decrease of 25.7% might be because, during the Covid-19 period, the unpredictability of inflation rates has made it more challenging for banks to manage their portfolios and interest rates effectively to maintain their profitability, making the earnings of banks harder to control.

This result is consistent with the research of Gazi et al. [1] and Lam and Anh [15], which also indicated that inflation rates have a positive and significant impact on commercial banks' ROA.

#### *3.4. Suggestions to Improve the Profitability of Commercial Banks in Vietnam*

Based on the results of the research as well as the current situation of commercial banks in Vietnam, it can be observed that the variables of EAR, CASA, and INF have significant and positive impacts on the profitability of banks, with EAR and INF having the strongest positive effects. Furthermore, the results also indicate that the impact of the COVID-19 pandemic has made the influence of EAR on ROA more powerful, while the impact of INF on ROA has become less significant. Moreover, the SIZE variable also has a rising trend in its positive impact on banks' ROA. Conversely, the results show that the variable OEI has a significant negative impact on ROA, although it is not heavily influenced by the

COVID-19 pandemic. Therefore, we can propose some solutions and recommendations for Vietnamese commercial banks to improve their operational efficiency and profitability as follows:

*Firstly*, commercial banks need to focus on maintaining a healthy capital adequacy ratio, specifically by raising additional capital through equity issuance or retaining earnings to bolster their capital base and increasing owners' equity through attracting capital contributions from domestic and foreign investors, especially from the issuance of shares to foreign shareholders. In addition, a balanced policy should be developed in the process of distributing financial results for paying dividends to shareholders and retaining appropriate profits to supplement owners' equity to increase the scale of capital for the purpose of reinvestment, because this is a low-cost source of funds that affects the interests and rights of shareholders. On the other hand, it is necessary to increase the activity of buying, selling, and merging (M&A) of banks, while restructuring the functions of commercial banks towards separating the functions of investment banks and commercial banks to prevent excessive risk accumulation, leading to bank collapse as seen in many countries around the world.

*Secondly*, banks need to promote the mobilization of non-term deposits (CASA) as this is a factor that helps banks access abundant capital sources with low capital costs. Especially during the COVID-19 period, when society is in a state of lockdown, the use of non-cash payment services has become more popular and necessary. This is a solid foundation for banks to rely on to promote the development of online banking services, such as digital banking applications. Based on the low capital cost nature of CASA, commercial banks can reduce the pressure on net interest income that has decreased due to declining interest rates. In other words, banks can use low-cost capital sources to balance out the decrease in lending interest rates, thereby maintaining a reasonable NIM for the bank. However, to promote CASA, banks must also have personalized banking services and innovative digital banking solutions to incentivize customers to maintain a higher proportion of their funds in CASA accounts.

*Thirdly*, addressing the negative impact of the OEOI ratio on the return on assets (ROA) of commercial banks requires a focus on optimizing operational efficiency. By improving operational efficiency, banks can enhance profitability, reduce costs, and improve their ROA. First of all, banks should focus on managing costs effectively. This can involve conducting regular cost reviews, identifying areas of inefficiency, and implementing cost reduction initiatives. By optimizing resource allocation, renegotiating vendor contracts, and implementing cost-saving measures, banks can improve their cost-to-income ratio and enhance ROA. Moreover, effective risk management practices contribute to operational efficiency. Banks should have robust risk management frameworks in place to identify, assess, and mitigate risks. This includes credit risk management, operational risk management, and compliance with regulatory requirements. By proactively managing risks, banks can reduce the likelihood of costly operational disruptions and enhance overall operational efficiency. Last but not least, embracing digital transformation can lead to increased operational efficiency. This involves digitizing paper-based processes, implementing online and mobile banking platforms, and offering digital self-service options. By providing customers with convenient digital channels, banks can reduce costs associated with physical branch networks and improve overall operational efficiency.

*Fourth*, given the noticeable impact of the inflation rate (INF) on the return on assets (ROA) of commercial banks, it becomes crucial for banks to develop effective asset-liability management strategies to mitigate the adverse effects of inflation. This can involve adjusting loan and deposit pricing structures, adopting inflation-linked financial products, and employing hedging instruments to manage inflation risks. Specifically, banks can adjust their loan pricing structures to account for inflationary expectations. This can involve incorporating inflationary components in loan interest rates, such as utilizing floating rates that adjust with changes in inflation indices. By doing so, banks can protect their interest income against inflation and maintain profitability. Moreover, banks can utilize hedging instruments, such as inflation swaps or inflation futures contracts, to manage inflation risks. These instruments allow banks to transfer or mitigate the impact of inflation on their assets and liabilities, thus reducing potential volatility in their ROA.

*Lastly*, given the rising importance of bank size (SIZE) during the COVID-19 pandemic, commercial banks should focus on pursuing efficient growth strategies while maintaining prudent risk management practices. First, it is crucial for banks to have an efficient expansion of lending activities. Commercial banks can focus on expanding their lending activities to increase their total assets. This can involve targeting underserved market segments, such as small and medium-sized enterprises (SMEs) or rural communities, and providing them with access to credit. Banks can also develop specialized loan products tailored to the needs of specific industries or sectors to attract a diverse range of borrowers. Second, commercial banks can explore strategic partnerships and collaborations with fintech companies, non-bank financial institutions, or other industries. These partnerships can help banks tap into new customer segments, leverage innovative technologies, and diversify their revenue streams. By joining forces with complementary organizations, banks can enhance their product offerings and expand their customer base, ultimately boosting total assets.

#### 4. Conclusion

This study utilized a panel dataset from 2012 to 2022, covering 15 commercial banks in Vietnam. The years 2012-2019 were considered the pre-pandemic period, while 2020-2022 represented the pandemic period. To estimate the effects of the COVID-19 pandemic on banks' profitability, measured by ROA, various independent variables were used, grouped into two categories: bank-specific factors and macroeconomic factors. Specifically, the variables included EAR, ALLL, OEOI, CASA, SIZE, and EXR, INF as independent variables, with EXR and INF representing macroeconomic factors.

We found that EAR, CASA, SIZE, and INF have a significant impact on the ROA of commercial banks, all exhibiting positive correlations. Specifically, EAR and INF have the most significant impact among them, and their changes in the two periods are also most noticeable. The COVID-19 pandemic intensified the impact of EAR on the ROA; however, the

impact of INF became less significant. Moreover, we also found that CASA and SIZE gained increasing importance to the ROA index of commercial banks as their coefficients rose during the COVID-19 pandemic. In contrast, the results showed that the OEOI variable is the only factor that has a negative impact on the ROA of commercial banks, and this impact remained almost unchanged between the two periods. The results also indicated that the EXR variable has an insignificant impact on the ROA, with no difference in the impact during the COVID-19 pandemic.

Based on the quantitative results, we propose some solutions and recommendations for Vietnamese commercial banks to improve their operational efficiency and profitability. Given the significant impact of the size of equity and inflation rate on banks' ROA, commercial banks in Vietnam should closely manage earning asset ratios by optimizing credit portfolios and increasing lending efficiency, especially amid volatile economic periods such as the COVID-19 pandemic. Inflationary pressures must be proactively monitored through effective hedging and asset-liability management strategies. Moreover, banks should actively enhance demand deposits by innovating digital savings products, alongside strategic expansions to capitalize on economies of scale. Concurrently, operational efficiency should be improved by controlling the operating expense-to-income ratio, utilizing automation, and streamlining processes to enhance profitability sustainably.

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