Factors affecting the profitability of listed commercial banks in Vietnam: Does agriculture finance matter?

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The aim of this study is to examine the factors affecting the profitability of listed commercial banks in Vietnam. The data is collected from balance sheets and income statements (audited financial statements) over the period of five years, spans from 2015 to 2019. The sample consists of 12 commercial banks listed on Ho Chi Minh Stock Exchange. The findings from the analysis are as follows. First, equity is positively related with bank profitability indicating that higher equity leads to better performance. Second, operating cost is inversely related with bank profitability suggesting higher operating can be detrimental to bank performance. Finally, agriculture financing is positively and significantly related with bank performance. This indicates that a high share of agricultural finance in the total financing can positively impact the banks' profitability. The findings have several policy implications which are provided in the last section. The directions for future research are also clearly identified towards the end of the paper.

Key words: commercial banks, equity, operating expenses, agriculture finance, profitability, Vietnam

1. INTRODUCTION

Financial institutions, especially in the emerging economies have undergone significant transformation in the last decade or so. The transformation is so apparent that it has become difficult to exaggerate the size and the extent of encouraging changes that had been effective in the price discovery of the financial products. This strong growth, in a sense, is led by easy access to finance conditions in the global financial markets. More importantly, bank lending to the private sector has rose multiple times and this can be attributed to low interest rates and high liquidity. The easy liquidity and access to funds fueled the banking-led growth in many economies, especially emerging economies. In fact, emerging economies benefitted a lot from liquidity as the firms in these countries rely heavily on bank funds due to limited alternative sources of funding. However, the rapid growth led by excessive credit also created the issue of extreme leverage and corporate debt in the economy.

The factors mentioned above coupled with frequent business cycles and the fluctuations in the interest rates across the globe have made it mandatory to deeply examine bank profitability especially in the context of emerging markets. The mentioned phenomenon has directly increased the risk level of disbursed loan by the banks. Increased level of risk in the bank lending influences the profitability. Broadly speaking, this has also led to the probability of an increase in the overall bank instabilities in the economy. These factors have prompted many to assess the factors affecting the level of bank profitability in emerging economies.

Moreover, given the fact that governments in emerging economies devise policies whereby they require banks to allocate a share of total lending to a preferred sector, it is imperative to investigate how the forced or preferred sector lending contributes to the bank profitability. The study deliberately uses agricultural financing as one of the determinants as Vietnam is primarily an agriculture-based economy. Though the share of agriculture sector as a contribution to Gross Domestic Contribution (GDP) is decreasing in Vietnam, the agriculture sector remains strategically important for the Vietnamese economy. It not only contributes significantly to the GDP but also employs a substantial share of the workforce. The interesting fact is that almost 40% of the land in the Vietnam is dedicated to agriculture and given the climatic conditions, rice production forms the largest proportion of total agriculture produce.

Third, as extensively used in the paper, it is also important to test certain key variables as potential determinants of bank profitability of listed commercial banks in Vietnam. These potential determinants or factors are agricultural finance, total assets, equity, lending liability, deposit liability, operating cost, and the income diversification. As is the case with previous literature on similar topics, certain macro-economic variables such as economic growth and inflation are also tested and assessed as potential factors in deterring bank profitability in emerging economies.

To provide a summary of the arguments presented above, it can be stated that the profitability is one of the most important measures to evaluate not only the financial

results of commercial banks but to provide an indication of overall banking stability in any economy, especially emerging ones. Profitability is an important foundation for banks to innovate in terms of their banking practices, diversify their financial products and services, and conduct business efficiently and effectively. Therefore, assessing banks' profitability as well as influencing factors are not something new in the literature, but the significance of this topic is well-established among researchers, banking managers, industry players and policymakers.

In this study, we assess the bank profitability of listed commercial banks in Vietnam, an emerging economy in the ASEAN region. The data is collected from the balance sheets and the statement of business results (audited financial statements) of 12 commercial banks listed on Ho Chi Minh Stock Exchange (HoSE) for over a period of 5 years which spans from 2015 to 2019.

HoSE is established in July 2000 as a unit of the State Securities Commission and manages the listed securities trading system of Vietnam. HoSE is the highest standard stock market in Vietnam. Commercial banks listing on HoSE are eligible for margin trading, thereby improving their stock liquidity. The transparency and reliability of corporate information disclosed at HoSE will bring higher credibility to banks. There have been some domestic studies on the profitability of commercial banks in the past but no studies on factors affecting the profitability of listed commercial banks on HoSE in Vietnam. Therefore, the study on factors affecting the profitability of listed commercial banks in Vietnam is necessary to propose policy implications to improve the profitability of listed commercial banks in the future.

Findings based on the results from the analysis reveal that the bank profitability in Vietnam is affected by various bank level as well as the macro-economic factors. In other words, bank level and macro variables can be used as predictive variables to project profitability of listed commercial banks in Vietnam. The key findings of the analysis are as follows: first, the coefficient of equity is positive and significant. The positive relation bank profitability and the equity indicates that higher equity leads to better performance. Second, the coefficient of operating cost is negative and highly significant. The results imply that bank profitability and the operating cost is inversely related and hence, suggesting higher operating can be detrimental to bank performance. Finally, agriculture financing is positive and significantly related with bank performance. This indicates that high share of agricultural finance in the total financing can positively impact the banks' profitability. These findings have several policy implications.

This research adds to the extant literature in several ways. First, although the existing research focuses on identifying the factors affecting bank profitability, unfortunately most of these empirical academic papers relied on data from the developed markets and there is not enough literature on the ban profitability in emerging markets. By focusing on an emerging market or economy, this paper makes a significant and novel contribution to the literature on the subject.

Second, this research adds an important variable of agricultural financing as one of the determinants of bank profitability and hence, adds an important dimension of study to the literature. Given the fact that Vietnam is predominantly an agricultural economy, the inclusion of agricultural financing as one of the determinants in the regression analysis is a key addition to existing literature on bank profitability determinants.

Third, this research also adds to the literature on the listed banks, especially banks in emerging markets and economies. The current trend in the bank profitability literature fails to differentiate between listed and the unlisted banks. By focusing only on the listed banks, this paper presents findings and develops clear policy implications that can be used by regulators as a basis to devise policies that can not only be more relevant but also prove to be very effective.

Finally, this research also adds broadly to the literature on bank stability as healthy profits are one of the key predictors of financial stability. In other words, lower profitability can make commercial banks more prone to financial distress and in worst the case, can also lead to bankruptcy. Moreover, most of the financial crises have occurred due to lower profit margin and profitability.

The findings presented have several implications, especially for emerging markets. For instance, the results indicate that better capitalized banks can be more profitable. This is not surprising as well-capitalized banks are in a better position to select multiple profitable projects. More importantly, better capitalized banks can diversify their portfolios not only in different sectors but can also avail and benefit from other investment opportunities in the market. In other words, banks with healthy equity can diversify into buying securities and by venturing into investment opportunities that is not with interest rates. In this way, they can also generate non-interest income which can be complimentary to their interest income generated through disbursement of loans. Second and equally important, the banks in emerging markets with a focus on agriculture sector can take cue from this paper. By showing that the agricultural finance could make banks more profitable, the paper demonstrates that banks can also look to focus on this sector which contributes significantly to GDP. For instance, in countries like India, banks can gain a head start by allocating a certain percentage of their total credit to the agriculture sector.

This paper comprises 5 sections including this one. The following section presents the overview of the extant literature on the determinants or the factors that affect bank profitability. In Section 3, an overview of the research approach is provided. This is followed by the results and the discussions in Section 4. Finally, Section 5 concludes

the paper with the implications of the current study. More importantly, this section also provides a clear direction for future research.

2. LITERATURE REVIEW

Athanasoglou et al. (2008) have examined the profitability of Greek banks from 1985 to 2001. They explored several factors such as banking characteristics, industry characteristics, and macro-economic characteristics on bank profits. The results show that all internal factors, except the bank's scale, had a statistically significant impact as expected (equity, labor productivity had a positive impact while credit risk and operating costs had a negative impact). The business cycle has a statistically significant impact on bank profits. In other words, bank profits are shown to be procyclical in nature.

Dietrich et al. (2009) examine how bank-specific characteristics, macroeconomic variables, and industry-specific factors affect the profitability of 453 commercial banks in Switzerland over the period from 1999 to 2008. To consider the impacts of the recent financial crisis, the authors separately consider the years before and during the crisis, namely the period up to 2006, and the crisis years 2007 and 2008. The finding based on the return on average assets, indicates that better-capitalized banks seem to be more profitable. While the cost-income ratio is relevant for the return on assets before the crisis only, the negative impact of the loan loss provisions relative to total loans is much stronger during the crisis. In addition, if a bank's loan volume is growing faster than the market, the impact on bank profitability is positive, at least before the crisis. Looking at the effect of the interest income share (the interest income over total income), a variable not considered in previous studies, the authors find that banks with a higher interest income share are less profitable, which holds again for the pre-crisis period only. Furthermore, the negative effect of state ownership on bank profitability does not hold any more during the crisis, and the same holds for foreign bank ownership.

Anbar et al. (2011) explore the influence of internal factors and macro factors that affect the business performance of 10 commercial banks listed on the Istanbul stock exchange in Turkey in the period from 2002 to 2010. Research results show that ROA has a positive correlation with the size of total assets and non-interest income index and a negative correlation with bank loans. ROE has a positive correlation with bank size and a negative correlation with real interest rates.

Petria et al. (2015) study the effects of 3 groups of factors: banking intrinsic, industry factors, and macro factors on bank profits for 1098 banks from 27 EU countries from 2004 to 2011. Research results indicate that liquidity risk, credit risk, governance efficiency, income diversification, industry concentration/competition, and GDP have an impact on bank profits showing in both variables ROAA and ROAE. There was an interesting finding of the positive effect of competition in the banking industry on profitability. Bank size has no effect on ROAE and a weak effect on ROAA.

In the context of Vietnam, there have been several studies with a variety of research methods when considering the factors affecting profitability.

Nguyen, V.H. (2008) study 32 Vietnamese commercial banks in three groups: state-owned commercial banks, joint-stock commercial banks, and joint-venture banks from 2001 to 2005. By using the marginal efficiency analysis method, the results show that banks which continue to increase their size will experience a decrease in operational efficiency, especially for state-owned commercial banks. However, when using the Tobit econometric model, the results indicate that the operational efficiency of commercial banks from 2001 to 2005 increased as total assets increased, whereas the deposit to loan ratio was negative correlated with technical efficiency which means if the bank used well-mobilized capital, it could increase its operational efficiency. The results are similar for the loan to total assets ratio, and the interest income to total income ratio. The equity to total assets ratio has a positive impact on technical efficiency. Finally, changing the macro environment as well as changing technology over time have been positively correlated with business performance.

Trinh, Q.T. and Nguyen, V.S. (2013) stud factors affecting the performance of commercial banks (through ROA, ROE ratio) in Vietnam by using the Tobit regression model based on data of 39 Vietnamese commercial banks from 2005 to 2012. The study shows that the total operation cost over revenue was negatively correlated with both ROA and ROE. The higher the ratio of equity on total assets, the higher the return on total assets, but it reduces the return on equity; The higher the ratio of loan on total assets was, the higher the profit was, the higher the non – performing loan was, and the lower the performance of commercial banks.

According to Nguyen, T.T.H. (2017), profitability is an important indicator of the bank's existence and sustainable development. This study uses regression analysis to identify the internal factors that affect the ROA and ROE of commercial banks in Vietnam in the period 2006 - 2015. The results show that loan on total assets ratio, allowance for credit losses to loan, interest expenses to liabilities, and non-interest income to assets have a positive impact on the bank's profitability. Meanwhile, NPLs, operating costs to income ratio, and board size have a negative impact on profitability. The study found that there is no statistically significant evidence about the effects of the variables representing liquidity risk management, capital structure, cost control, and size on the bank's profitability.

To exist and develop, commercial banks must operate effectively, therefore, profitability is the top concern. Through literature review, measuring to improve profitability is a particularly important and necessary issue for commercial banks.

Although there have been some studies on the profitability

of commercial banks, there are currently no studies assessing the impact of factors on the profitability of commercial banks listed on the Vietnamese stock market. Based on this research gap, the author finds that this topic is practical and of theoretical significance, and the research results are expected to have more bright spots compared to previous studies.

3. RESEARCH METHODOLOGY

3.1 Research hypothesis

Zeitun et al. (2014), (Pouraghajan et al., 2012) both show their results that enterprise size has a positive and significant impact on business performance. Mitchell et al. (1996) reach the same finding with the data from 1986 to 1990 of commercial banks with total assets of $100 million in the US. The results show that large-scale commercial banks are often cost-effective. Other researchers like Stever (2007) suggest that large commercial banks often have the advantage in diversifying their asset portfolio as well as their operations, while small commercial banks often do not have that advantage, which makes they must try to reach borrowers who have low credit risk or require more collateral. The proposed hypothesis H1 is:

H1: The size of total assets (TA) has a positive impact on the profitability of commercial banks.

Berger (1995) show that raising the equity ratio increases risk tolerance, especially credit risks, thereby, can promote credit growth to earn revenue on higher returns Berger (1995). In addition, Molyneux, P. (1993) based on the cost perspective demonstrate that raising the equity ratio increases credit ratings, thereby helping commercial banks reduce capital costs. The proposed hypothesis H2 is:

H2: Equity(E) has a positive impact on the profitability of commercial banks.

Non-interest income includes revenue from services (money transfer payments, cards, treasury services, custodial banking services, etc.), income from foreign exchange business, trading and investing in securities, venture capital, payment for import and export. The positive results on non-interest income show that promoting non-interest activities leads to higher profitability (Chiorazzo et al., 2008), higher operating efficiency (Landskroner et al., 2005), or reduction in the overall risk for commercial banks (Allen et al., 2000). Hughes et al. (2013) argue that large commercial banks have high efficiency of scale because they increasingly know how to optimize costs based on technology and take advantage of costs that do not increase proportionally with scale. This implies the application of information technology to enhance non-traditional activities, and high non-interest income to help large commercial banks become more and more efficient. The increase in total non-interest income represents a higher degree of income diversification, the bank's income does not depend much on the traditional activity of lending. The correlation is expected to be positively related to profitability. The proposed H3 hypothesis is:

H3: Income diversification (NoII) has a positive impact on the profitability of commercial banks. (Income diversification is measured by non-interest income NII)

Operating expenses (Operation Expenses) is a factor that is deducted from total operating income to form net profit from commercial banks' activities. A negative relationship between operating costs and profitability of commercial banks is often expected. The proposed H4 hypothesis is:

H4: Operating Cost has a negative impact on the profitability of commercial banks. (Operating cost is measured by Operating Cost on Income ratio: OCI)

Vietnam is primarily an agriculture-based economy. Though the share of agriculture sector as a contribution to Gross Domestic Contribution (GDP) is decreasing in Vietnam, the agriculture remains a strategically important sector for a Vietnamese economy. It not only contributes significantly to the GDP but also provides employment opportunities for Vietnamese people. The interesting fact is that almost 40% of the land in the Vietnam is dedicated to agriculture and given the climatic conditions, rice production forms the largest proportion of total agriculture produce. The proposed H5 hypothesis is:

H5: Agricultural Financing (AF) has a positive impact on the profitability of commercial banks.

Lending ability refers to the ability to use mobilized capital for lending. If banks effectively use their capital, it will increase interest income and increase the banks' profit. The proposed H6 hypothesis is:

H6: Lending ability (LA) has a positive impact on the profitability of commercial banks.

If banks can mobilize capital well, they can limit their ability to borrow from interbank or central banks. As the cost of mobilizing is more active than the cost of borrowing, the banks conduct business more efficiently. The proposed H7 hypothesis is:

H7: Deposits ability (DA) has a positive impact on the profitability of commercial banks

Business results of commercial banks are often affected by macroeconomic factors. Some macroeconomic factors, such as GDP growth rate or inflation rate…, are often considered when assessing their impact on the profitability of commercial banks, (Athanasoglou et al., 2008).

GDP growth rate is included in the research model as an external factor representing the impact of the socioeconomic environment on bank profitability. High economic growth reflects good business prospects for businesses, including banks. When economic growth is high, the demand for credit and banking services increases, increasing bank profits. The relationship is expected to be positive. The proposed H8 hypothesis is:

H8: Economic growth (GDP) has a positive impact on the profitability of commercial banks.

The inflation rate is measured by the increase in the consumer price index (CPI). The inflation rate is included

in the model to examine the impact of the socioeconomic environment on profitability. The rate of inflation affects a bank's income and expenses. When inflation is high, banks tend to raise credit lending rates to be higher than deposit rates, increasing profits for banks. Therefore, the correlation here is expected to be positive. The proposed H9 hypothesis is:

***H9:** Inflation (INF) has a positive impact on the profitability of commercial banks.*

The profitability measures in previous studies are mainly used as ROA (Return on Asset) and ROE (Return on Equity). Kosmidou (2008), Abbasoglu et.al (2007) used ROA as the dependent variable for profitability. ROA shows how banks generate their profit by using management's ability to utilize banks, real and financial investment (Hassan et al., 2003). Furthermore, ROA is a good measure of profitability which is not much affected by high equity multipliers and banks can earn the maximum return on their asset portfolio (Rivard et al., 1997). On the other hand, ROE represents bank efficient management in utilizing its shareholder's investment. Hassan et al. (2003) suggest that most banks increase their ROE by getting more financially leverage to competitive levels. Within the context of the above arguments, this study uses both ROA and ROE for profitability measures of Vietnamese commercial banks listed on HOSE.

3.2 Research models

The proposed research models are as follows:

Model 1: ROA and factors

$$ROA_t = \alpha_0 + \alpha_1 TA_t + \alpha_2 E_t + \alpha_3 NoII_t + \alpha_4 OCI_t + \alpha_5 AF_t + \alpha_6 LA_t + \alpha_7 DA_t + \alpha_8 GDP_t + \alpha_9 INF_t + u \quad (1)$$

Model 2: ROE and factors

$$ROE_t = \beta_0 + \beta_1 TA_t + \beta_2 E_t + \beta_3 NoII_t + \beta_4 OCI_t + \beta_5 AF_t + \beta_6 LA_t + \beta_7 DA_t + \beta_8 GDP_t + \beta_9 INF_t + u \quad (2)$$

3.3 Research data

The data in this study is collected from secondary sources for 12 commercial banks listed on HoSE. The data covers a period of 5 years which spans from 2015 to 2019. Specifically, data used in this study is sourced from the Balance Sheet and the Statement of Business Results (Audited Financial Statements) The authors have collected a time series of 60 observations of 12 commercial banks to ensure the requirements in time series analysis (minimum 30 observations). The data collected will be encoded, examined, and processed by Eviews 10. A description of how to collect the variables is shown in Table 1 of the Appendix.

4. RESEARCH RESULTS

4.1 Descriptive statistics

Table 1 shows the descriptive statistics. Descriptive statistics of our measures of bank profitability and determinants of the bank's profitability show that the average ROA of the Vietnamese commercial bank is 0.009670. The ROA values range from 0.000234 to 0.025222, with a low standard deviation of 0.006144, which implies a weak variability in bank profitability. The ROE value ranges from 0.003404 to 0.243609, with the higher standard deviation of 0.061546. The values of two independent variables, namely TA and GDP have a high deviation of 3.88E+08 and 6.43E+14, respectively while the remaining variables' standard deviation is lower, fluctuating from 0.010718 to 0.124217.

Table 1: Descriptive statistics

Variable	Mean	Median	Maximum	Minimum	Variance
Return on Asset (ROA)	0.009670	0.007648	0.025222	0.000234	0.006144
Return on Equity (ROE)	0.126819	0.127383	0.243609	0.003404	0.061546
Total Asset (TA)	4.23E+08	2.35E+08	1.45E+08	76220834	3.88E+08
Agriculture Financing (AF)	0.1974333	0.192769	0.239876	0.1286363	0.139474
Equity on Total Asset (E)	0.075999	0.071974	0.152673	0.037844	0.022731
Lending Ability (LA)	0.602614	0.591410	0.742721	0.367061	0.079731
Deposits Ability (DA)	0.921242	0.928026	0.962156	0.705754	0.035632
Operating Cost on Income (OCI)	0.477193	0.442155	0.876323	0.253774	0.124217
Income diversification (Non–interest income NoII)	0.220897	0.222566	0.457295	-0.163389	0.116172
Economic Growth (GDP)	5.03E+15	5.01E+15	5.92E+15	4.19E+15	6.43E+14
Inflation (INF)	0.026180	0.027300	0.035400	0.006300	0.010718

Correlation coefficients between variables represent linear dependence between variables. The coefficients are presented in Table 2. The correlation coefficient is 1 in the case of the covariance linear correlation and -1 in the case of the inverse linear correlation. The closer the correlation coefficient is to -1 and 1, the greater the correlation between the variables are. The correlation matrix is shown in Table 2. It shows that most of the variables do not have a strong correlation with other variables. However, the pair of variables R (GDP, INF) = 0.645560 has a quite strong correlation. Therefore, multicollinearity may be a problem with the regression model. We run the regression model and test its diagnostics in the next tables.

Table 2: Matrix of correlation coefficients between variables

	TA	E	AF	LA	DA	OCI	NoII	GDP	INF
TA	1.000000								
E	-0.490062	1.000000							
AF	0.337320	-0.068176	1.000000						
LA	0.491029	-0.230129	0.082289	1.000000					
DA	0.320978	-0.822373	0.210933	0.336112	1.000000				
OCI	-0.355188	-0.123970	-0.632726	0.031480	0.175786	1.000000			
NoII	0.074530	0.240077	0.475221	-0.044145	-0.249635	-0.216974	1.000000		
GDP	0.206505	0.104079	0.073797	0.324151	-0.128135	-0.239620	0.291965	1.000000	
INF	0.147464	-0.060057	-0.235561	0.197448	-0.029317	-0.142876	0.313698	0.645560	1.000000

4.2 Regression Results

To examine the impact of the independent variables on the overall bank profitability, the study runs the regression model with nine independent variables and two dependent variables (ROA and ROE), which correspond to two models. The results are shown below in Table 3.

Table 3 : Results of the regression models

Independent variables	Model 1 (ROA)	Model 2 (ROE)
Constant (C)	-0.006365	0.034744
Total Asset (TA)	-2.59E-12	-3.47E-11*
Equity on Total Asset (E)	0.102916***	-0.375824
Agricultural Finance (AF)	0.353882***	0.5294649***
Lending Ability (LA)	-0.011334*	-0.102658
Deposits Ability (DA)	0.014952	0.215921
Operating Cost on Income (OCI)	-0.030023***	-0.386976***
Income Diversification (NoII)	-0.001251	-0.001983
Economic growth (GDP)	2.59E-18***	3.35E-17***
Inflation (INF)	0.053522	0.554001
R-squared	0.800468	0.757811
Adjust R-squared	0.769169	0.719821
Prob (F-Statistic)	0.000000	0.000000

*Note: Statistically significant at * 10%, ** 5%, *** 1%*

Model 1 with the dependent variable is ROA. Three variables E (Equity), AF (Agricultural Finance), OCI (Operating Costs), GDP (Economic growth) are strongly correlated with the ROA at a significance level of 1%; LA (Lending ability) has a strong correlation with ROA at a significance level of 10%. In specific, Variable E has a positive relationship with ROA. If E increases (decreases) by 1%, ROA will increase (decrease) 0.102916% at a significant level of 1%. Variable AF has a positive relationship with ROA. If AF increases (decreases) by 1%, ROA will increase (decrease) 0.353882% at a significant level of 1%. Variable LA has a negative relationship with ROA. If LA increases (decreases) by 1%, ROA will decrease (increase) by 0.011334% at a significant level of 10%. Variable OCI has a negative relationship with ROA. If OCI increases (decreases) by 1%, ROA will decrease (increase) by 0.030023% at a significant level of 1%. Variable GDP has a positive relationship with ROA. If GDP increases (decreases) by 1%, ROA will increase (decrease) 2.59E-18 at a significant level of 1%. The other independent variables namely C, TA, DA, NOII having P-value is higher than 0.05, therefore, these variables are not statistically significant. R-squared is 0.800468 so the regression model can explain 80.05% of the change of the dependent variable. For the explanatory model, the fit of this model is very high. Pro (F-statistic) is 0.00000, less than 0.05, so the regression model is statistically significant.

Model 2 with the dependent variable is ROE. Three variables TA (Total asset), AF (Agricultural Finance), OCI (Operating Costs), GDP (Economic growth) are strongly correlated with the ROE at a significance level of 10%, 1%, 1%, and 1% respectively. Variable TA has a negative relationship with ROE. If TA increases (decreases) by 1%, ROE will decrease (increase) 3.47E-11 % at a significant level of 10%. Variable AF has a positive relationship with ROE. If AF increases (decreases) by 1%, ROE will increase (decrease) 0.5294649% at a significant level of 1%. Variable OCI has a negative relationship with ROE. If OCI increases (decreases) by 1%, ROE will decrease (increase) 0.386976% at a significant level of 1%. Variable GDP has a positive relationship with ROE. If GDP increases (decreases) by 1%, ROE will increase (decrease) 3.35E-17% at a significant level of 1%. The other independent variables namely C, E, LA, DA, NOII and INF having P-value is higher than 0.05, therefore these variables are not statistically significant. R-squared is 0.757811 so the regression model can explain 75.78 % of the change of the dependent variable, which is lower than R-squared of Model I.

Pro (F-statistic) is 0.00000, less than 0.05, so the regression model is statistically significant.

Use Akaike (AIC) and Schwartz (SC) information criteria:

Table 4: AIC and SC values of two models

	Model 1	Model 2
Akaike (AIC)	-8.675318	-3.872923
Schwarz (SC)	-8.361167	-3.558772

AIC and SC in Model 1 are lower than them in Model 2

We can see that Models 1 and 2 are statistically significant and explain 80.05% and 75.78% of the changes of the dependent variable, respectively. R-squared and adjust R-squared show the strength of Model 1 compared to Model 2. Besides, AIC and SC in Model 1 are lower than them in Model 2 as reported in Table 4. So, we choose Model 1 as the model explaining the factors affecting the profitability of Vietnamese commercial banks listed on HoSE.

4.3 Model test

Table 5: The result of regression model

ROA	Coefficient
Constant (C)	-0.006365
Total Asset (TA)	-2.59E-12
Equity on Total Asset (E)	0.102916***
Lending Ability (LA)	-0.011334*
Agricultural Financing (AF)	0.353882***
Deposits Ability (DA)	0.014952
Operating Cost on Income (OCI)	-0.030023***
Income Diversification (NoII)	-0.001251
Economic growth (GDP)	2.59E-18***
Inflation (INF)	0.053522
R-squared	0.800468
Adjust R-squared	0.769169
Prob (F-Statistic)	0.000000

*Note: Statistically significant at * 10%, ** 5%, *** 1%*

4.4 Test the appropriateness of the regression model

Table 5 shows the results of regression. The model has 3 independent variables with statistical significance, namely E, AF, OCI, and GDP at the 1% significance level: LA at the 10% significance level. P-values of the other variables such as variables C, TA, DA, NoII, INF are higher than 0.05, so these independent variables are not statistically significant, so we doubt the model is redundant.

We used the Wald test to check the appropriateness of the model:

Table 8: Correlation coefficient matrix

Variables C, TA, DA, NoII, INF have Prob greater than 0.05. The coefficients are so large that the corresponding coefficients C(1), C(2), C(5), C(7), C(9) may be zero. Therefore, the hypothesis is as follows:

$$H_0: C(1) = C(2) = C(6) = C(8) = C(10) = 0$$
$$H_1: \text{There is any of } C(1), C(2), C(6), C(8), C(10) \neq 0$$

Table 6: Wald Test result

Equation: Untitled			
Test Statistic	Value	df	Probability
F-statistic	1.510975	(5, 51)	0.2029
Chi-square	7.554875	5	0.1825

In Table 6, Wald Test results show that P-value = 0.2029 > 0.05, therefore, we reject the hypothesis H1, and accept hypothesis H0. We remove the variables TA, DA, NoII, INF from the model

Table 7: Regression result after removing the variable TA, DA, NoII, INF

Dependent variable: ROA	Coefficient
Equity (E)	0.112093***
Agricultural Finance (AF)	0.715383***
Lending Ability (LA)	-0.012058***
Operating cost on Income (OCI)	-0.024473***
Economic growth (GDP)	3.98E-18***
R-squared	0.770911
Adjust R-squared	0.758638
Prob (F-Statistic)	0.00000

*Note: Statistically significant at * 10%, ** 5%, *** 1%*

Conclusion: Based on the results presented in Table 7, the probability coefficients of E, AF, LA, OCI, and GDP are all <0.01. So the above coefficients are 99% significant. Lending Capacity (LA), Operating Cost (OCI) are negatively correlated with ROA; Equity (E), Agricultural Finance (AF), Economic Growth (GDP) have positively correlated with ROA of Vietnamese commercial banks.

P-value (F-statistic) is 0.000000 <0.05 so regression model is statistically significant. And this regression model explains 77.09% of the change of the dependent variable.

4.5 Model's defect test

- *Multi-collinearity*

Correlation	ROA	E	LA	OCI	GDP	AF
ROA	1.000000					
E	0.531469	1.000000				
LA	-0.186560	-0.230129	1.000000			
OCI	-0.678654	-0.123970	0.031480	1.000000		
GDP	0.471895	0.104079	0.324151	-0.239620	1.000000	
AF	0.499912	-0.068176	0.082289	-0.632726	0.073797	1.000000

Based on the correlation coefficient matrix shown in Table 8, we realize that the pairs of variables understudy have relatively low correlation coefficients, so it is unlikely that the model does not have multi-collinearity. We used the Rule of Thumb principle to test multi-collinearity problem. The result is showed in Table 9.

Table 9: R-squared of sub-models

Model	Original Model	R-squared
	LS ROA E AF LA OCI GDP	$R^2 = 0.7709$
	Submodels	**R-squared**
1	LS E AF ROA LA OCI GDP	$R^2 = 0.4071$
2	LS AF E ROA LA OCI GDP	$R^2 = 0.4399$
3	LS LA AF ROA E OCI GDP	$R^2 = 0.0422$
4	LS OCI AF ROA E LA GDP	$R^2 = 0.4753$
5	LS GDP AF ROA E LA OCI	$R^2 = 0.4037$

We found that the R-Squared of the sub-regression models is less than that of the original regression, so the model does not have multi-collinearity defects.

- *Heteroskedasticity test*

Using White test to check with the hypothesis:

H_0: Model has Heteroskedasticity

H_1: Model doesn't have Heteroskedasticity

The result of Table 10 shows that Prob (F-statistic) = $0.9982 > 0.05$. Therefore, the hypothesis H_0 is rejected, and the hypothesis H_1 is accepted. In other words, the model does not have Heteroskedasticity problem.

Table 10: White Test result

Panel Period Heteroskedasticity LR Test

Null hypothesis: Residuals are homoscedastic
Equation: UNTITLED
Specification: ROA E LA OCI GDP

	Value	df	Probability
Likelihood ratio	2.494264	12	0.9982

LR test summary:

	Value	df	
Restricted LogL	265.1154	56	
Unrestricted LogL	266.3625	56	

- Autocorrelation test

Using Serial Correlation LM test with the hypothesis:

H_0: Model has autocorrelation

H_1: Model doesn't have autocorrelation

Table 11: Serial Correlation LM test result

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	10.66958	Prob. F (2,143)	0.0000
Obs*R-squared	19.32673	Prob. Chi-Square (2)	0.0001

The result of Table 11 shows that Prob (F-statistic) = $0.0000 < 0.05$ reject H_1, accept H_0. Model has autocorrelation problem.

We use the AR (p) to overcome the autocorrelation defect by adding the variable AR (1) directly into the command prompt. We have result as follows:

Table 12: Regression model after fixing defects

Dependent variable: ROA	Coefficient
Equity (E)	0.122809***
Agricultural Finance (AF)	0.692817***
Lending Ability (LA)	0.007199
Operating cost on Income (OCI)	-0.013553***
Economic growth (GDP)	1.31E-18
AR(1)	0.812398***
R-squared	0.878936
Adjust R-squared	0.867674
Durbin-Watson Statistic	1.527018
Prob (F-Statistic)	0.00000

*Note: Statistically significant at * 10%, ** 5%, *** 1%*

After re-testing the model, the study has found two independent variables which affect the profitability of Vietnamese listed commercial banks on HoSE.

Only four variables E, AF and OCI have an impact on ROA as the original authors' expectation, the other variables have no impact. This impact is shown as follows: E increases by 1%, profitability of commercial banks increases by 0.1228% while increase in 1% of AF leads to 0.6928% increase in ROA. Finally, if OCI increases by 1%, profitability of commercial banks decreases by 0.0135%. The impact of E is greater than OCI on profitability. Adjust R-squared of the model is 0.867674, so the regression model can explain 86.76 % of the change of the dependent variable. This result is consistent with the result of Athanasoglou et al. (2008), Nguyen, V.H. (2008), Trinh, Q.T and Nguyen, V.S (2013), Nguyen, T.T.H (2017). However, this result is inconsistent with Dietrich et al. (2009) when studying determinants of the profitability of the commercial banks in Switzerland over the period from 1999 to 2008. Dietrich et al. (2009) conclude that the cost-income ratio is relevant for the return on assets before the crisis only. The difference in the research result may be due to differences in the rate of development of the banking system across countries.

5. CONCLUSION AND POLICY IMPLICATIONS

The main aim of this research is to predict bank profitability of listed banks in Vietnam for 12 commercial banks from 2015 to 2019. The research conducted in this paper shows that there are three main determinants of bank profitability of commercial banks in Vietnam, namely Equity, Agriculture Financing, and the Operating Cost. The results suggest that the Equity and the Agriculture Financing positively impacts ROA. The operating costs variable has a negative impact on the bank profitability measure of ROA.

Based on the study results, we highlight certain policy implications with a view to improve the profitability of commercial banks listed on HoSE in Vietnam. In the next 5 years, commercial banks in Vietnam are required to increase Equity in compliance with the current regulations of the State Bank of Vietnam in Circular 22/2019 / TT-NHNN to meet the minimum CAR requirement according to Basel II. Therefore, increasing equity and equity

management are the goals which each bank has placed as a top priority for stable and sustainable development. To increase equity, commercial banks listed on HoSE must weigh both, the advantages and disadvantages when raising equity through retained earnings or issuing new stocks or issuing debt through either bonds or debentures based on their financial status.

The operating cost of commercial banks is highly varied. Most of the operating cost is the deposit interest, which is hard to cut down, so it is necessary to determine the expenses accurately and manage them effectively. To manage operating costs effectively, the banks can: (1) Implement the assignment of revenue and expenditure targets to each department; (2) Taking form of the awareness of saving costs from employees; (3) Build relationships between employees and managers; (4) Encourage employees to be involved in operating cost management, motivating them to make suggestions to reduce costs and respect employees' proposals, and provide an appropriate reward for effective proposals and feedbacks for ineffective proposals.

Finally, the results indicate that agricultural financing can be a stable source of income for banks and, hence improving the overall facility. As only a limited number of banks are willing to provide agricultural financing facilities to the farmers, it is a good opportunity for banks to employ experts in the sector so that the good financial due diligence can be done to approve or disapprove the financing request of agricultural projects. By stashing a department with agriculture experts, banks can gain the advantage and benefit from this hugely profitable sector. It bears to note that the agricultural sector is probably the only sector which is relatively immune to crises. In other words, people would not stop eating irrespective of how severe the crisis is and hence gaining expertise can help banks to unlock huge profits.

In addition to the implications highlighted above, several proposed support solutions are as follows: modernizing banking technology, building sales strategy, diversifying products, and services towards improving communication service quality and developing modern services, establishing a capital department, standardizing credit processes, and adopting a flexible credit policy, improving management capacity, and improving staff quality.

In this paper, we made use of aggregate agricultural financing of total financing as one of the explanatory variables, but it is unclear as to which crops are more profitable as compared to others. In future research, scholars can delve deeper by looking at the disaggregate of the agricultural finance. For instance, disaggregating data into specific financing crop type can reveal the profitable ones and highlight the ones not profitable as well as those which are under losses.

Moreover, this research has utilized ROA and ROE as performance measures. As an extension of this research, future research can use market-based measure of Tobin's Q as a measure of performance as accounting measures of ROA and ROE are more prone to manipulation compared to market-based measure of Tobin's Q.

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