

Impacts of Diversification on Operational Efficiency of Vietnam Commercial Bank

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Abstract—This research has focused on the assessment the impacts business diversification can have on the operational efficiency of commercial banks on the basis of regression of array data of 24 Vietnamese commercial banks in the period 2010 - 2020. The findings signify the important benefits of diversification in banking. By diversifying business activities, it is possible for banks to assert their position in the market, improve competitiveness, and thereby have many opportunities to find new incomes from non-traditional activities. Diversification is also a way for banks to limit risks and improve operational efficiency. This is reflected in the fact that the diversification index has positive influences on the bank's operating efficiency both before and after risk adjustment. On the basis of research results, the author gives some policy implications.

Index Terms—Business diversification, Operational efficiency, Commercial banks.

I. INTRODUCTION

BANK is a financial institution, conducting business activities based on monetary funds formed from deposit and non-deposit sources. Banks act as intermediaries between savers and borrowers, and their main activities are accepting deposits and making loans [6]. Commercial banks – financial intermediaries play an important role in connecting the savings and investment of the economy. However, the process of international economic integration has created increasingly fierce competitive pressure on commercial banks.

Income from traditional activities of commercial banks is strongly affected by economic fluctuations. Besides, the application of science and technology has helped to diversify banking products and services. Therefore, instead of mainly focusing on traditional products and services, commercial banks diversify their activities in order to increase operational efficiency as well as increase the bank's profitability. However, whether diversification is really effective for commercial banks or not, there is still no satisfactory answer.

First, the views in favor of diversifying banking activities

Based on market power theory, modern portfolio theory, economies of scale and scope, the studies signified the benefits of diversification in improving operational efficiency of commercial banks: Diversification of banking activities brings certain advantages for banks, because it helps banks reduce costs thereby increasing profits, increasing the value of the bank or reducing particular risks and then improving bank performance ([2];[7];[15];[18]).

Second, the views not in favor of diversifying banking activities.

Contrary to the benefits found when commercial banks diversify their business activities, several studies [8];[16]; [13], based on the agent theory, the issue of moral hazard, have demonstrated the adverse effects of diversification on bank performance. This group argues that the greater involvement of banks in non-profit activities, though can bring about higher profits, also exposes banks to greater risks, resulting in the bank's low operational efficiency.

Third, several recent studies have focused on explaining inconsistencies in conclusions about the impact of business diversification on bank performance: [9] claimed that this relationship is influenced by a number of factors such as: risk management ability; the bank's ownership structure; market structure; competition level; changes in the macroeconomic and institutional environment.

It can be denied by the fact that Vietnamese commercial banks have chosen the strategy of diversifying banking activities in recent years. Since the opening of the economy, the entry of foreign banks and financial companies into the market has increased competition for banks. Banks' traditional activities, especially lending activities, are increasingly difficult due to the increase in the size of banks, and volatilities in the economy (natural disasters, epidemics...). Therefore, most banks seem to choose a diversification strategy rather than a strategy of focusing on traditional activities. However, whether diversification really increases operational efficiency for Vietnamese commercial banks has not been answered satisfactorily.

Studies in Vietnam also show two opposing opinions, according to [10]; [14] diversification has a positive impact on profitability of Vietnamese commercial banks. However, according to [20], the more diversified the bank's business activities, the higher the profit, but because the risk level tends to increase, the risk-adjusted profit is reduced. Hence, income diversification is not beneficial for Vietnamese commercial banks.

The reason for the difference in the results of the above study can be attributed to: The study of [10] while considering the effects of diversification on the earnings power of banks has not taken into account the risks that banks may face upon diversification, while the research of [14] has considered the effects of risks but has not paid attention to the endogenous factor in the research model. As a consequence, their research findings are incompatible with those of [20]. In addition, these studies were carried out in the period from 2006 to 2013, in which Vietnamese commercial banks have

not really developed as strongly as currently in terms of both quantity and scale as well as types of banking services. .

Therefore, the study has been conducted to reaffirm the influences of operational diversification on the performance of commercial banks in the current period, when Vietnamese commercial banks have grown dramatically in size, quantity and quality of banking services... Therein, the business results of commercial banks will be adjusted according to the bank's risk level to ensure the operation efficiency of the bank most accurately. Simultaneously, the Generalized Method of Moments (GMM) method is used to regress the research model, ensuring the reliability of the research results when the research model is endogenous. The research results will be useful for bank administrators in narrowing or expanding diversification effectively, for banking authorities in controlling their business activities, for investors and stakeholders in analyzing and evaluating bank performance and ultimately providing empirical evidence to answer the controversial question "Does diversifying business activities bring benefits to commercial banks?"

II. LITERATURE REVIEW AND THEORETICAL FRAMEWORK

A. Literature review

Operational Efficiency is always a matter of concern of businesses as well as banks, which depends on the level of organization, management and use of resources to create value for the bank. Thus, there have been many studies on banking operational efficiency such as:

The research by [2] indicated a very positive impact of non-interest income from non-traditional activities (stocks, insurance and other financial activities) on the value of banks and potential to improve the bank's performance in the future. In terms of risk, the study found a nonlinear relationship between bank-specific risks and diversification. Most of the banks in the sample are able to reduce their individual risk and operate more safely thanks to income diversification; whereas, only a few large banks have higher systematic risk upon diversification due to their extensive exposure to the market or business cycle shocks. Similar results to the study of [2] are also found in the study of [10] and [14]. Expanding business activities to help commercial banks reduce bankruptcy risk and increase profits is also the core finding of [18] while examining the impact of income diversification on operational efficiency and bank risk. The research results signified the good points of income diversification in emerging economies. Diversification of non-interest income and interest income were both found to have the effect of increasing the operational efficiency of banks and reducing the risk of bankruptcy for banks. However, this finding is only found in case non-interest income of banks is at low level. Four basic reasons why the potential benefits and actual benefits of diversification may be different [18]: First, the benefits from diversification depend on the actual investment portfolio of each bank, this benefit would be limited if the bank did not hold an efficient risk portfolio. Second, banks will have to cope with higher risks if they expand their operations into new areas, especially in areas with high competition or inexperienced banks. Over-diversification is also the cause of increased individual risk

and "distorts" the real relationship between diversification and bank risks. Third, diversification does not reduce systemic risks for banks when they diversify excessively. Finally, the "indiscriminate" application of versatile bank standards to banks of all asset sizes also limits the benefits of diversification. The research by [8]; [20] also found evidences of adverse effects of diversification on bank performance such as: Reducing the safety of banks; increasing the bankruptcy risk and thereby exacerbating the bank's risk-return trade-off.

III. THEORETICAL FRAMEWORK

A. Diversification of banking activities

The basic functions of a commercial bank are: (i) Financial intermediaries, (ii) Payment intermediaries and (iii) Money creation for the economy. However, the process of globalization along with revolutionary changes in banking technology has created an increase in fierce competition among commercial banks, forcing commercial banks to change in operations and management. Instead of maintaining the traditional banking model, the bank's operations are growingly modern, diversified and innovative in order to provide customers with many utilities and satisfy the increasingly diverse needs of customers. It is the fact that commercial banks has shown strong changes in the functions and forms of operation. In addition to credit, savings and payment, the functions of investment planning, fiduciary cash management, insurance, brokerage, investment, and guarantee are progressively developed so that commercial banks can become a "financial department" conducting business activities on a large scale with a diverse portfolio of banking services.

As for the banking and finance sector, back to the 80s since financial barriers were removed, the banking systems of countries, especially Western countries, had a lot of great changes reflected in increased competition, centralization and restructuring [13]. In the new environment, banks have responded by actively applying different business strategies, in which diversification is considered an important strategy with the expectation that it can help banks increase profits or reduce bankruptcy risk [5].

Commercial banks can implement diversification in many different ways such as: (i) Diversifying financial products and services; (ii) Diversifying the scope of activities; (iii) Diversifying income; (iv) Diversifying asset classes; (v) Diversifying funding sources or (vi) Diversifying investment portfolio. Regardless of the form of diversification, its goal is to help commercial banks' business activities gradually expanded, leading to rapid changes in the asset structure and income structure of banks. Basically, the bank's overall performance with all its financial inputs and outputs is shown on the balance sheet and income statement. The assets on the balance sheet generate most of the operating income for the bank while liabilities generate most of the expenses. Therefore, when studying diversification in banks, considering asset structure and income structure is a common approach to assess the level of diversification in business activities of commercial banks.

First, the approach is based on the bank's asset structure: With the concept that all activities in which banks participate are reflected in the assets held by banks, most studies consider the degree of diversification of banks based on the proportion of different types of profitable assets in total assets or consider the ratio of off - balance sheet assets to total assets of the bank [4].

Second, based on the bank's income structure.

A bank is considered concentrated if its operating income is determined only from interest income or considered fully diversified if its overall income is equally divided into interest income and non-interest income [7];[18]. With these approaches, the bank's diversification degree depends on the ratio of interest income (generated by traditional activities) and the ratio of non-interest income and its components (generated by non-traditional activities) to total operating income of the bank [7];[13];[16];[18].

According to research by [9];[12] to determine the level of income diversification, it is necessary to use the value of total income to calculate. The use of value pooling avoids the "excessive distortions" caused by the activity related to the income bank.

Thus, a diversified bank can be considered in terms of income diversification or asset diversification. However, in terms of operational efficiency, regardless of the degree of asset diversification, it is ultimately necessary to consider the bank's performance or the benefits that assets bring. Therefore, in this study, the author mainly evaluates the degree of diversification in banking activities based on the level of income diversification.

B. Operational Efficiency in Banking

Banks' operating efficiency has been one of the main concerns of regulators, market makers, investors and researchers over the past decades in the midst of growing uncertainties in the globalized environment.

Operational efficiency is the ability to transform scarce inputs into earnings or reduce cost compared to competitors. According to this approach, the operational efficiency of an organization can be assessed through two groups of criteria: (i) The absolute efficiency criteria group allows to evaluate the operational efficiency in both breadth and depth. However, in some cases it is difficult for this criterion to compare banks of different sizes; (ii) Relative efficiency criteria can be expressed in static form (Operational Efficiency = Economic Outcome/Cost to achieve these outcomes). This indicator makes it convenient for comparison in time and space as well as between organizations of different sizes, in various periods.

Banking operations efficiency can be approached in one of two directions: structured approach and unstructured approach [11]. While the structured approach considers operational efficiency as a function of costs or profits and at the optimal point, the bank achieves the goal of cost minimization or profit maximization, the unstructured approach primarily considers operational efficiency based on financial ratios or market value adjusted for the bank's own risk factors.

C. Measuring the operational efficiency of commercial banks

In relation to the diversification of banking business activities, most of the research works consider operational efficiency in banking in the unstructured approach as [11]. Accordingly, a group of financial ratios or market value measures will be selected to directly or indirectly evaluate the bank's operating efficiency. It depends on the type of data the researcher collects such as accounting data, market data and mixed data to select the ratios.

Most studies use accounting data, measuring operational efficiency by the following ratios: Return on assets (ROA); Return on Equity (ROE); Risk-adjusted return on assets (RAROA); Risk-adjusted return on equity (RAROE).

ROA and ROE depend on the efficiency of using assets and the decisions of the bank. On the other hand, ROE can also be amplified by the equity multiplier or leverage ratio. The level of debt use in banks can also be the reason for the increase in returns on per dollar of equity. ROE is the most important measure of the bank's earnings power and growth potential [6]. Therefore, in this study, ROE is applied to measure the banks' operating efficiency.

IV. RESEARCH METHOD AND METHOD MODEL

A. Research sample

(i) Research sample: consisting of 24 commercial banks, the period of research is from 2010 to 2020. The commercial banks mentioned in the study include 4 state-owned commercial banks - which means any enterprise of which 100% charter capital is held by the State, and 20 domestic joint stock commercial banks. In the research sample, branches of foreign commercial banks in Vietnam and joint venture banks are excluded due to insufficient database to carry out the research. The total assets of the 24 commercial banks account for about 80% of the total assets of the bank system, thus ensuring the representativeness of the sample.

(ii) Data collection sources: Macro-economic variables are collected from the website of IMF, World Bank. Micro variables are collected from annual reports and financial statements posted on the websites of commercial banks.

B. Research model

Research model:

$$ROE_{i,t} \text{ (or RAROE}_{i,t}) = \beta_0 + \beta_1 DIV_{i,t} + \beta_2 DEP_{i,t} + \beta_3 LOAN_{i,t} + \beta_4 NPL_{i,t} + \beta_5 VAMC_{i,t} + \beta_6 LLR_{i,t} + \beta_7 LEV_{i,t} + \beta_8 LIQ_{i,t} + \beta_9 SIZE_{i,t} + \beta_{10} OWNER_{i,t} + \beta_{11} GDP_t + \epsilon_{i,t}$$

Including: β_0 is a constant; β_j are the regression coefficients corresponding to the independent variables; $\epsilon_{i,t}$ is the random error.

(i) Dependent variable

- $ROE_{i,t}$: calculated by dividing net income by the average equity of commercial bank i in year t

$ROE = \text{Net income} / \text{Average equity}$

- $RAROE_{i,t}$: is the ratio of risk-adjusted return on equity of bank i in year t . RAROE indicates the amount of return a bank achieves on per unit of risk. A higher RAROE reflects greater risk-adjusted returns or better banking operational efficiency.

$RAROE = ROE/SDROE$

Therein, SDROE is the standard deviation of ROE, the volatility of return on equity, thereby showing the level of risk in the bank's operations.

(ii) *Independent variable* - $X_{i,t}$: the X factor affecting the performance of commercial bank i in year t, including:

(1) Income diversification index – DIV:

DIV is calculated based on the bank's income including: Interest income from credit activities, fee income from service activities, income from investment activities and others. This index is calculated by the following formula:

$$DIV = 1 - [(INT/TOI)^2 + (COM/TOI)^2 + (TRAD/TOI)^2 + (OTH/TOI)^2]$$

- INT is the total interest income of commercial banks: deposit interest; loan interest; profit from business; investment in debt securities; income from guarantee operations; income from finance lease and others.

- COM is fee income from service activities of commercial banks: payment services; treasury services, entrustment and agency operations; consulting services; insurance business and services; discount operations; asset preservation services; locker rental and others.

- TRAD is the total income of the bank from business activities: Forex trading; business securities trading and investment securities trading.

- OTH is the total income from other business activities of commercial banks: income from capital contribution, share purchase and others besides all mentioned above.

- TOI is the total operating income of the bank, calculated by summing the absolute values of INT, COM, TRAD, OTH, which ensures that the income diversification measure is properly calculated, showing that the bank still implements diversification even in the event of a loss [9].

DIV can take the value [0,1]. However, $DIV = 0$ or $DIV = 1$ is very unlikely. $DIV = 0$ when the bank is completely centralized, the total operating income TOI has been solely derived from credit activities; and $DIV = 1$ if the bank does not generate any income in a specified time period. Normally, DIV takes positive values with a maximum of 0.75. A low DIV indicates that the bank's business is mainly focused on traditional activities, while a high DIV implies that non-traditional activities are attentively implemented to generate non-interest income for banks. An increase in DIV reveals a rise in the level of banking business diversification. $DIV = 0.75$ shows that the bank is engaged in all operations, the total operating income is equally categorized into all 4 components INT; COM; TRAD; OTH.

(2) Control variables: Control variables include variables related to bank operations and macroeconomic variables, which are summarized in the table below.

V. DATA ANALYSIS METHOD

It is necessary to choose an appropriate estimation method to ensure that the results of the regression model are reliable. The estimation method is considered suitable if the defects of the research model can be overcome. Therefore, with an aim to conducting regression of the research model as well as selecting the appropriate estimation method, the author performs the following steps sequentially:

TABLE 1. LIST OF CONTROL VARIABLES IN THE RESEARCH MODEL

Code	Name of the variable	Measure	Expected sign
Control variables			
DEP	Deposit growth rate	The difference between year t and year (t-1) customer deposit balance on the customer deposit balance year (t -1)	+
LOAN	Loan balance growth rate	The difference between year t and year (t-1) customer outstanding loan balance on the customer outstanding loan balance year (t -1)	+
NPL	Non-performing loan	Non -performing loan/Gross loans	-
VAMC	Bad debt sold to VAMC	Bad debts to Vietnam Asset Management Company	-
LLR	Loan-loss reserve	Ratio of loan loss provision to total loans	-
LEV	Leverage ratio	Ratio of total liabilities to equity	+
LIQ	Liquidity	Liquid Asset to Total Asset Ratio	+
SIZE	Size of the bank	Logarit Total Assets	+
OWNER	Government ownership level	Dummy variable takes the value 1 for commercial banks with state-invested capital and takes the value 0 for other commercial banks	+
GDP	Economic growth rate	GDP growth (decrease) rate	+

Source: Author's synthesis from previous studies

- Step 1: Regress the research model by OLS method, determine the model's defects and choose an appropriate estimation method:

The table of Variance Inflation Factors (VIF) (Appendix – Table 2) shows that the VIFs of the independent variables are all less than 10. Thus, there is no possibility of multicollinearity among the independent variables in the research model.

Besides the multicollinearity, in order to determine whether heteroskedasticity (referring to the error variance) exists in the research model or not, the author performed Preusch - Pagan test, the results (Appendix - Table 3.1; Table 3.2) showed that $Prob > Chi^2 < 0.05$, rejecting the hypothesis H_0 : The model has heteroskedasticity. Similarly, in order to check whether the model has autocorrelation, Wooldridge test was performed, the results (Appendix - Table 4.1; Table 4.2) showed $Prob > F < 0.05$, rejecting the hypothesis H_0 .

The regression model has the problem of autocorrelation among independent variables, it is necessary to overcome this phenomenon to ensure the reliability of the regression results. In addition, most of the studies on the effect of diversification on banks' operating efficiency, such as: Research by [2] emphasize the need for endogenous control in the diversification decision because banks can diversify in strategic responses to the banks' business opportunities. The endogenous phenomenon occurs when the diversification decision can affect and be affected in return by the past and present efficiencies of banking operations. Therefore, similar to previous studies, the Generalized Method of Moments (GMM) method is used in this study to regress the research

model so as to solve the endogenous phenomenon and the defects of the research model.

- Step 2: Regress the research model by GMM method

VI. RESULT AND DISCUSSION

The results of GMM model regression show that the Hasen test index has Prob > chi2 = 1,000 > 0.05, which means that the model has overcome the endogenous phenomenon. The AR(1) and AR(2) indexes have Pr > z > 0.05, revealing that the model has no first-order and second-order autocorrelation. The regression model has handled the shortcomings of the research model, making sure the research results are reliable.

It can be seen from the descriptive statistics of the DIV index (Appendix - Table 2), the DIV index fluctuates in the range (0.2462 , 0.7033) with an average value of 0.35595, which means that during the research period most commercial banks in Vietnam have diversified their business activities. However, there is a large divergence when the standard deviation reaches 0.1340. This shows that there is a big difference in the degree of business diversification among commercial banks over the period.

TABLE 2. RESULTS OF REGRESSION ANALYSIS OF THE RESEARCH MODEL BY GMM METHOD (ROE)

Group variable: NAME		Number of obs = 240			
Time variable : year		Number of groups = 24			
Number of instruments = 54		Obs per group: min = 10			
Wald chi2(12) = 24449.69		avg = 10.00			
Prob > chi2 = 0.000		max = 10			
ROE	Coef	Std. Err.	z	P> z	[95% Conf.Interval]
DIV	0.19312	0.05014	3.850	0.0000	0.09485 0.29139
NPL	-1.43480	0.25014	-5.740	0.0000	-1.92507 -0.94453
LLR	-1.03974	0.44857	-2.320	0.0200	-1.91893 -0.16055
LEV	-0.00679	0.00160	-4.230	0.0000	-0.00994 -0.00365
LIQ	0.35718	0.11178	3.200	0.0010	0.13810 0.57625
VAMC	-1.29E-06	8.16E-08	-15.800	0.0000	-1.45E-06 -1.13E-06
DEP	0.02432	0.02400	1.010	0.3110	-0.02272 0.07135
LOAN	0.04189	0.03341	1.250	0.2100	-0.02358 0.10737
SIZE	0.07277	0.04277	1.700	0.0890	-0.01106 0.15660
OWNER	0.05694	0.03890	1.460	0.1430	-0.01930 0.13318
GDP	1.25465	0.46979	2.670	0.0080	0.33387 2.17543
_cons	-0.36694	0.19041	-1.930	0.0540	-0.74013 0.00625
Arellano-Bond test for AR(1) in first differences: z = -1.3			Pr > z = 0.198		
Arellano-Bond test for AR(2) in first differences: z = -1.98			Pr > z = 0.194		
Sargan test of overid. restrictions: chi2(102) = 76.75			Prob > chi2 = 0.001		
Hansen test of overid. restrictions: chi2(102) = 17.34			Prob > chi2 = 0.999		

Source: Data processing results on Stata software 14

The results demonstrates that income diversification has a positive impact on the operational efficiency of commercial banks in both pre and post risk-adjusted cases. This result is inconsistent with those of some previous studies such as: [8];[16];[20]... According to these studies, diversification has negative effects on banking operations efficiency, reducing safety and increasing bankruptcy risk, thereby exacerbating the risk-reward trade-off.

However, the research results are favored by market theory, modern portfolio theory, and the perspectives on economies of scale and scope. Accordingly, business diversification can enable the banks to reduce costs, increase profits and the bank's value, or reduce individual risks or improve operational efficiency [2];[18].

In addition to the impact of income diversification, the banks' operating efficiency is negatively influenced by some factors: Non-performing loan ratio (NPL); Leverage ratio;

TABLE 3. RESULTS OF REGRESSION ANALYSIS OF THE RESEARCH MODEL BY GMM METHOD (RAROE)

Group variable: NAME		Number of obs = 240			
Time variable : year		Number of groups = 24			
Number of instruments = 41		Obs per group: min = 10			
Wald chi2(12) = 4013.42		avg = 10.00			
Prob > chi2 = 0.000		max = 10			
RAROE	Coef	Std. Err.	z	P> z	[95% Conf.Interval]
DIV	3.36663	0.890268	3.78000	0.00000	1.62174 5.111530
NPL	-23.06065	11.75428	-1.96000	0.05000	-46.09862 -0.022681
LLR	-16.94380	11.87081	-1.43000	0.15300	-40.21016 6.322552
LEV	-0.11273	0.022744	-4.96000	0.00000	-0.15731 -0.068152
LIQ	9.33737	1.767305	5.28000	0.00000	5.87352 12.801220
VAMC	-0.00002	0.000010	-1.75000	0.08100	-0.00004 0.000002
DEP	0.120920	0.506090	0.24000	0.81100	-0.87010 1.112838
LOAN	0.90494	0.626893	1.44000	0.14900	-0.32375 2.133628
SIZE	1.40093	0.641256	2.18000	0.02900	0.14409 2.657768
OWNER	2.13162	0.992809	2.15000	0.03200	0.18575 4.077484
GDP	29.86953	7.915406	3.77000	0.00000	14.35562 45.383440
_cons	-8.06362	3.098377	-2.60000	0.00900	-14.13633 -1.990915
Arellano-Bond test for AR(1) in first differences: z = -1.77			Pr > z = 0.063		
Arellano-Bond test for AR(2) in first differences: z = -2.17			Pr > z = 0.096		
Sargan test of overid. restrictions: chi2(102) = 132.19			Prob > chi2 = 0.000		
Hansen test of overid. restrictions: chi2(102) = 16.35			Prob > chi2 = 0.952		

Source: Data processing results on Stata software 14

TABLE 4. IMPACT OF FACTORS ON THE OPERATIONAL EFFICIENCY OF VIETNAMESE COMMERCIAL BANKS

Variable	Sign expectation	Realistic sign		Significance level	
		ROE	RAROE	ROE	RAROE
DIV	+	+	+	1%	1%
NPL	-	-	-	10%	5%
LLR	-	-	-	5%	Insignificant
LEV	-	-	-	1%	1%
LIQ	+	+	+	5%	1%
VAMC	-	-	-	5%	10%
DEP	+	+	+	Insignificant	Insignificant
LOAN	+	+	+	Insignificant	Insignificant
SIZE	+	+	+	10%	5%
OWNER	+	+	+	Insignificant	5%
GDP	+	+	+	1%	1%

Source: Author's synthesis from research results

NPLs sold to VAMC; whereas, Liquidity level; total asset size and the growth rate of the economy have a positive impact on the operational efficiency of the bank.

Most studies suggest that commercial banks with a larger scale are more operationally efficient because the advantages of scale allow banks to reduce operating costs and increase profitability. At the same time, in the event of economic growth and stability, the operations of banks become more beneficial, thus the bank operational efficiency is enhanced and vice versa.

On the other hand, when the quality of assets is not controlled, the banks will exhibit operational efficiency in an

undesirable way. Specifically, when NPL ratio goes up, the customers lack ability to repay the principal, which will erode the bank's profit and make the bank's operations less efficient. In particular, the NPLs sold to VAMC increase, which means that the NPL ratio of banks has exceeded the safe limit, showing the seriousness of bad debts, credit activities as well as less efficient banking operations.

It is desirable to see from the research results that in the model of assessing the impact of factors on the bank's operational efficiency without risk adjustment, the state ownership factor has a positive effect but no statistical significance; on the contrary, in such model after risk adjustment, this factor favorably affects the performance of banks with the p-value significance level < 5%. This suggests that state-owned banks appear to operate more safely and efficiently than private banks. This is completely compatible with the reality in Vietnam, in which state-owned banks are large-scale, long-standing, reputable and most valuable banks brands of the market. These banks are at the forefront of the industry in compliance with market discipline and international safety and operational standards. As a result, state-owned commercial banks operate more efficiently and profitably.

VII. SOME POLICY IMPLICATIONS

Commercial banks are increasingly under pressure to compete with other commercial banks, especially in emerging markets like Vietnam. The growth rate of loan outstanding balance has a downward trend, the demand for non-credit financial services of customers is highly increasing, forcing banks to constantly innovate technology, provide convenient services with the support of modern technology. Therefore, it is not suitable for market requirements if focusing only on traditional activities.

According to the theory of market power built from the ideas of [19], diversification is one of the ways that companies in general and banks in particular can improve their competitiveness with competitors, and gain competitive power in the market. Diversification allows banks to find new sources of income to increase profits and improve operational efficiency. However, under no circumstances do the banks escape from risks, in order that diversification is really beneficial for the banks, it is desirable for them to ensure effective risk management, diversification in accordance with the size and management capacity of the bank because over-diversification can increase individual risks and "distort" the benefits of diversification. At the same time, the banks need to expand the scale of total assets, product quality, scope of activities and product diversification to achieve efficient diversification.

In contrast, according to Modern Portfolio Theory, diversification is a way by which a bank can minimize market risks for an expected return through creating a diversified portfolio. Accordingly, the diversification of the investment portfolio and portfolio components is expected to reduce the risks for the bank, the risk-adjusted operational efficiency can therefore be improved, and the value of the bank is raised.

It should also be noted that currently Vietnamese commercial banks are mostly small-sized banks, so it is essential

to expand their asset and capital scale to take advantage of the size of the bank in business diversification. Besides debt capital, equity is also an important factor for Vietnamese commercial banks in ensuring capital adequacy requirements according to international standards.

Additionally, from the perspective of regulatory agencies, it is also necessary to propose policies to limit the high degree of concentration in banking operations through regulations on lending limits and ratios. Because according to the structure-behavior-efficiency theory, the company's behavior has a decisive effect on market efficiency [17]. Accordingly, the more concentrated the market is, the more banks tend to centralize their business activities to enjoy the significant difference between lending interest rates and capital mobilization interest rates. On the contrary, when the market is less concentrated or increasingly highly competitive, banks show a tendency of diversifying their business activities in search of new sources of income to increase profits and improve operational efficiency.

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APPENDIX

TABLE 1. DESCRIPTIVE VARIABLE STATISTICS

Variable	Obs	Mean	Std. Dev.	Min	Max
RAROE	240	2.1088	1.8393	-2.4539	10.2116
ROE	240	0.0992	0.0827	-0.5633	0.2912
DIV	240	0.3595	0.1376	0.0246	0.7033
NPL	240	0.0237	0.0173	0.0002	0.1221
LLR	240	0.014	0.0105	0.0028	0.1083
LEV	240	12.134	4.8754	2.9000	33.4426
LIQ	240	0.1789	0.0892	0.0191	0.5031
DEP	240	0.2338	0.2470	-0.1740	2.1070
LOAN	240	0.2306	0.2122	-0.2986	1.1309
SIZE	240	245407	300006	12577	1489957
GDP	240	0.0620	0.0075	0.0500	0.0700
VAMC	240	4069.05	9964.77	0.0000	91715.3

Source: Data processing results on Stata software 14

TABLE 2. VARIANCE INFLATION FACTOR

Biến	VIF	1/VIF
SIZE	3.23	0.309483
OWNER	2.08	0.481527
LEV	1.98	0.506006
DEP	1.85	0.539454
LOAN	1.68	0.596080
GDP	1.47	0.679850
VAMC	1.37	0.730064
NPL	1.28	0.780593
LIQ	1.25	0.796871
LLR	1.25	0.803164
DIV	1.16	0.860442
Mean	1.69	

Source: Data processing results on Stata software 14

TABLE 3.1 BREUSCH AND PAGAN LAGRANGIAN MULTIPLIER, TEST: RANDOM EFFECTS (ROE)

$$roe[NAME,t] = Xb + u[NAME] + e[NAME,t]$$

Estimated results:

	Var	sd = sqrt(Var)
ROE	0.006833	0.0826604
e	0.004082	0.0638913
u	0.000287	0.0169304

Test: Var(u) = 0

$$chibar2(01) = 11.19$$

$$Prob > chibar2 = 0.0004$$

Source: Data processing results on Stata software 14

TABLE 3.2 BREUSCH AND PAGAN LAGRANGIAN MULTIPLIER, TEST: RANDOM EFFECTS (RAROE)

$$roe[NAME,t] = Xb + u[NAME] + e[NAME,t]$$

Estimated results:

	Var	sd = sqrt(Var)
ROE	3.382949	1.839280
e	0.824134	0.907818
u	2.494429	1.579376

Test: Var(u) = 0

$$chibar2(01) = 418.77$$

$$Prob > chibar2 = 0.0000$$

Source: Data processing results on Stata software 14

TABLE 4.1 TEST: FIRST-ORDER AUTOCORRELATION (ROE)

H0: no first-order autocorrelation
F(1, 23) = 6.9140
Prob > F = 0.0150

Source: Data processing results on Stata software 14

TABLE 4.2 TEST: FIRST-ORDER AUTOCORRELATION (RAROE)

H0: no first-order autocorrelation
F(1, 23) = 93.343
Prob > F = 0.0000

Source: Data processing results on Stata software 14