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Determinants of Liquidity of Commercial Banks: Empirical Evidence from the Vietnamese Stock Exchange

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Abstract

The objective of this study is to examine the determinants of the liquidity of 17 commercial banks listed on the Vietnamese Stock Exchanges, HOSE, HNX and UPCoM. The study uses the quarterly audited financial statements from the first quarter of 2006 to first quarter of 2020; it includes 496 observations. Data on GDP and inflation are compiled from the International Monetary Fund and the General Statistics Office of Vietnam. Once collected, the data were organized along the line of unbalanced panel data. The results show that total asset size, return on total assets, and credit growth are positively associated with the liquidity of the listed banks; whereas the interaction between the bank size and the return on total assets has a negative impact on the liquidity of commercial banks listed on the HNX, HOSE, UPCoM. In order to maintain good liquidity, commercial banks need to focus on effective credit growth, ensure a high rate of profit over total assets, and at the same time focus on developing the scale of total assets. However, the development of the size of the total assets should be noted in the balance between the total assets and the rate of return on the total assets.

Keywords: Liquidity, Banking Liquidity, Listed Commercial Banks, Vietnamese Stock Exchange

JEL Classification Code: G21, G30, G32, N22

1. Introduction

Commercial banks play a particularly important role in the economic development of each country, being one of the actors helping the economy to effectively use idle capital, and providing many modern banking services. In the process of implementing their financial intermediary function, commercial banks have to face many risks, because they provide both short, medium and long-term credit, but must also ensure liquidity at all times.

Researching on the causes of the banking system crisis, the Basel Committee on banking supervision (2004) pointed out one of the important causes of the crisis of commercial

banks, which is liquidity problem. A bank with good liquidity will generate prestige and trust from customers, thereby promoting its business activities such as raising capital, lending, and other activities (Gambacorta & Mistrulli, 2004). Conversely, a bank having liquidity problems can weaken the bank's capital as well as its assets (Diamond & Rajan, 2001).

For commercial banks listed on Vietnamese stock exchange, their liquidity is not only affected by activities inside banks, but also by trading status on the stock exchange. Because, the stock exchange will be a channel providing long-term capital on a large scale, listing on the stock exchange helps commercial banks create more opportunities to invest, convert assets, etc., thus contributing to improve liquidity for the bank.

Up to now, there have been many studies on liquidity and factors affecting the liquidity of commercial banks. However, most studies were done for the entire Vietnamese commercial banking system, there are no studies focusing specifically on commercial banks listed on the stock exchange, although by the end of 2019 there were 17 out of 31 commercial banks listed and registered for trading on the HNX, HOSE, UPCoM exchanges. Moreover, previous studies on factors affecting liquidity only examine the impact of each individual factor

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on liquidity, but not the interaction between factors on bank liquidity. Therefore, this study is necessary to supplement the theoretical and empirical research gaps.

The remainder of the paper is organized in four sections. Part 2 presents the theory and overview of documents related to the research problem. Part 3 describes the data and research methods. Part 4 presents the experimental results and discussion. Conclusions and some policy implications are proposed in Part 5.

2. Literature Review

2.1. Theories

Carrying out the function of financial intermediation, commercial banks mobilize capital and provide loans with different terms, so commercial banks always face liquidity problems. In order to meet the banks' maturity obligations without incurring significant losses, commercial banks must perform well the conversion of assets in order to improve their liquidity.

2.1.1. The Commercial Lending and Liquidity Theory

The commercial lending theory (Smith, 1776) states that commercial banks mobilize capital mainly from short-term capital, so banks need to invest in short-term assets through lending short-term trading, this will help the bank to balance the term between assets and capital sources, thereby ensuring the bank's liquidity. This theory has important implications in clarifying the role of commercial lending, at the same time it implies that commercial banks need to focus on commercial loans to ensure liquidity. However, this theory also has a certain limitation, firstly, it is limited in assessing the term of the mobilized capital, although most of the mobilized capital has a short or indefinite term, but in commercial banks, capital mobilization is continuous, creating consecutive cash flows. The next limitation of commercial lending and liquidity theory is that the importance of non-commercial lending for medium and long-term is not properly assessed. Today, real estate loans, loans to purchase fixed assets, and medium and long-term consumption loans account for a high proportion of lending activities of commercial banks. The solution to limit non-commercial lending can help commercial banks ensure liquidity, but inevitably leads to the decline in interest income of banks.

2.1.2. The Convertibility Theory

The convertibility theory (Moulton, 1915) proves that liquidity is convertibility. Banks can ensure liquidity by increasing their earning capacity and their ability to convert their assets without overemphasizing short-term commercial loans. The theory has made important contributions by

suggesting that banks hold a large amount of government bonds as this is a highly convertible, profitable asset with little losses. The theory also clearly shows that, with participation in the stock exchange, commercial banks can hold highly convertible assets for more liquidity financing without necessarily ignoring non-commercial loans with long term. Ignoring non-commercial loans will impair income generation. In addition, the theory also brings about evidence about the systemic risks of short-term commercial lending and the consequences of focusing on commercial lending. However, the convertibility theory still has some limitations, such as increasing liquidity by holding a large amount of government bonds would conflict with increasing accumulation of income, because government bonds are risk-free and have a low rate of return. Although today the stock exchange is developed, the integration capacity of the commercial banking systems in different countries is different. In fact, interest income still accounts for a large proportion in the income structure of banks.

2.1.3. The Financial Intermediation Theory

The financial intermediation theory emphasizes the role of commercial banks as an intermediary in the financial sector. In this role, commercial banks provide credit to the economy, including bad loans. However, the bank must also ensure liquidity to meet withdrawal requirements for demand deposits or early withdrawal of deposits. The theory has affirmed the important role of banks in the economy to always provide short-term liquidity, while providing long-term asset financing.

Each of these theories explain the practice of operating of Vietnamese commercial banks. Commercial lending theory is applied through the fact that commercial banks in Vietnam today always focus on developing commercial loans by diversifying loan products with short terms of week, month, and quarter (Dao & Nguyen, 2020; Le & Diep, 2020). Applying this theory, not only helps commercial banks reduce the term difference between capital mobilization and lending to ensure liquidity, but also contributes to increase the bank's interest income. The limitations of the theory are also reflected in the loan structure in most of the Vietnamese commercial banks providing commercial and non-commercial lending. Non-commercial loans often have high loan balances, while short-term commercial loans are usually small loans with a low value per loan, if only commercial loans are considered the bank's credit market share narrowed, and competition for credit was poor (Le & Diep, 2020).

The convertibility theory is also demonstrated in banking operations through the increasing number of commercial banks listed on Vietnam's stock exchange. Up to now, there have been 17 listed banks. Listing on the stock exchange facilitates commercial banks to increase their ability to convert assets and increase liquidity. However, it is suggested that banks should own many high convertible assets that have

certain limitations. In fact, most of Vietnam's commercial banks only hold the amount of government bonds required by the State Bank because government bonds are risk-free, so their profitability rates are low (Tran & Nguyen, 2020). Owning large amounts of this asset will not increase the bank's ability to accumulate and generate income.

According to the financial intermediation theory, the bank's lending activities also face poor liquidity loans, while the bank must ensure its solvency at any time for customers to deposit money. With the current status of credit activities of commercial banks in Vietnam, overdue debt ratio is still high, and commercial banks are facing challenges of large liquidity risks. Therefore, the role of commercial banks in the theory of financial intermediation can only be maintained through improving the efficiency of credit activities and making provisions for credit risks in accordance with regulations.

In short, commercial lending theory emphasizes asset management in order to increase liquidity. Accordingly, the bank needs to build the structure of its assets focusing on short-term assets. This means that the bank can increase its liquidity from the reorganization of its own internal operations. The convertibility theory and financial intermediation theory show that liquidity management depends, not only on internal factors of commercial banks' operations, but also on factors outside the macro economy such as the ability and attitude of debt repayment of borrowers, depositors, efficiency level of stock exchange, investors in the market, etc.

The common standpoint of the three aforementioned theories is the same explanation for the liquidity of commercial banks. The theories explain the internal causes of commercial banks (assets and capital sources) and explain that the cause belong to the economy. Therefore, these theories are the foundation for the analysis of factors affecting the liquidity of banks.

2.2. Empirical Findings

Liquidity is the bank's ability to meet its obligations and finance any increase in assets without incurring unacceptable losses (BCBS, 2008). The ability to finance all contractual obligations at the maturity of liquidity is clarified by Amengor (2010), including loan and investment commitments, deposit withdrawal and liability maturity, in the course of business.

With the function of mainly being financial intermediaries, commercial banks have liquidity problems mainly due to the time imbalance between assets and liabilities. So, the measure of liquidity is often done based on some criteria of assets and liabilities. Vodova (2011) studies the liquidity determinants of Czech commercial banks using four indicators from the balance sheet to measure bank liquidity: the ratio of liquid assets to total assets, ratio of liquid assets to deposits and short-term loans, ratio of loans to deposits, ratio of loans to deposits, and other short-term financing. In later studies, Wójcik-Mazur and Szajt (2015), Mazreku et al. (2019), and

Aldeen et al. (2020) also used the above ratios to measure the liquidity of commercial banks. However, many studies suggest that the use of ratios on the balance sheet only reflects one side of the balance sheet (assets or capital sources), so they have used a combination of criteria from both sides of the balance sheet. Tehranian et al. (2006) confirmed that liquidity of a bank depends on the difference between assets and liabilities during the implementation of its financial intermediary function, thus using a financial gap (FGAP) to measure liquidity. FGAP is the ratio of the difference between loans and deposits to total assets, so the higher the gap, the lower the liquidity of the bank. With this same point of view, Chen et al. (2018) applied the FGAP to measure bank liquidity. In addition, the Basel III Committee (2013) finalized the previous regulatory refinements by stricter regulation of liquidity requirements by specific deadlines: Liquidity Coverage Ratio (LCR) with a push for the ability to recover short-term liquidity, ensuring the bank has enough high-quality liquid assets to survive under stress for one month; Net Stable Funding Ratio (NSFR) to promote resilience over a longer period of time by creating more incentives for banks to fund their operations with stable funding more determined.

In the process of implementing lending and investment activities, banks' liquidity is directly affected by internal factors. Total assets size (SIZE) is one of the key factors contributing to a good branding for a bank. The bank has a large-scale, easy-to-attract mobilized capital, has the opportunity to select borrowers, develop banking services, etc. The larger the size of the bank's total assets, the higher the bank's liquidity (El-Khoury, 2015; Umar, 2016; Pham & Nguyen, 2019). According to the convertibility theory, commercial banks can increase liquidity by converting assets such as treasury bonds and derivative contracts on the stock exchange. With a large scale of total assets, the bank can diversify its investment activities, not focus on credit investment, so that the bank has good asset conversion ability and high liquidity.

Return on total assets (ROA) is one of the financial indicators showing the performance of banks. With a high ROA, the bank generates a good reputation and attracts depositors and borrowers, reduces early withdrawals, and increases working capital from retained earnings. Therefore, an increased ROA increases liquidity (El-Chaarani, 2019; Aldeen et al., 2020).

Equity to total assets (CAP) is an important source of capital that shows the degree of autonomy in the bank's operation. The higher the ratio of equity to total assets, the less the bank uses other funding sources, thereby reducing the cost of capital. In addition, the high ratio of equity to total assets also helps the bank to build trust and attract customers in all aspects of its operations. Bunda and Desquilbet (2008) and Waemustafa and Sukri (2016) said that CAP has a positive relationship with liquidity; whereas Moussa (2015) and Nguyen (2019) found a negative one.

The theory of trade and liquidity has been clarified because the difference between the term of the mobilized capital and the term of the loan makes commercial banks less liquidity. With a high equity-to-total asset ratio, a bank will have less time discrepancies due to active capital. Large proportion of equity, increase in liquidity of the bank.

Credit concentration (CRE) Although gradually diversifying investment, capital invested in credit still accounts for a large proportion of the total capital of commercial banks in Vietnam. The high level of credit concentration has helped commercial banks gain large interest income. Studying the relationship between credit concentration and liquidity, Cucinelli (2013) argued that the higher the credit concentration, the lower the bank liquidity for both short-term liquidity (LCR) and long-term liquidity (NSFR). Meanwhile, Moussa (2015) did not find a relationship between these two problems.

Credit growth (CGR) is the percentage change in total outstanding loans of this year (t) compared to the previous year ($t - 1$). Credit growth helps banks increase interest income, but excessive credit growth will have a negative impact on bank liquidity (El-Khoury, 2015). For Vietnamese commercial banks, credit expansion has always been one of the most important goals. Therefore, most banks are always competing on lending interest rates, especially in real estate loans. Credit growth with a large medium and long-term loan structure will lead to the difference in terms of term between loans and mobilized funds, which in turn affects liquidity.

Provision for credit risks (FCRER) In credit activities, overdue debts and bad debts are a big challenge for banks. The higher the ratio of overdue and bad debts to total outstanding loans, the greater the credit risk. Overdue debt reduces capital turnover and reduces business efficiency. Provision for credit risks will be the supporting financial source, helping the bank to cope with its payment obligations when the bank encounters credit risks. Increased provision for credit risks increases the liquidity of the bank (Mai & Bui, 2018; Nguyen, 2019). However, with a large amount of capital retained as a risk reserve fund, it means a decline in income, affecting performance and impairing liquidity (Rashid et al., 2017).

In addition, today, the macroeconomic context affects almost all actors in the economy. High economic growth (GDP) shows that investment is expanding, in which the need for loans to expand production and investment increases credit growth of commercial banks, and credit risks and liquidity risks also increased. With the above argument, Chen et al. (2018) confirmed that economic growth has a negative relationship with the liquidity of commercial banks.

Inflation (INF) Inflation makes the economy unstable, affecting the savings of the economy and reducing the mobilized capital of banks. For the operations of commercial banks, inflation makes the cost of using loans high, thereby limiting the need for loans. Research by Mazreku

et al. (2019) demonstrated that inflation has a positive relationship with liquidity. In contrast, Chen et al. (2018) found a negative relationship.

Commercial banks are a special monetary business; the theory of performance changes according to the appropriate scale to reason for the operations of banks, in which the input factors are represented by the total working capital, and the output factors are represented by the profit on the total assets. Applying the scaling performance theory to explain the relationship between the rate of change of ROA versus the rate of change of SIZE, with the law of the performance that increases with scale when SIZE increases, ROA increases. While the law of performance decreases with scale that an increase in SIZE leads to a decrease in ROA. In parallel, many empirical studies have demonstrated the relationship between ROA and bank liquidity is a positive one (El-Chaarani, 2019), a negative one (Wójcik-Mazur & Szajt, 2015) and non-linear (Vodova, 2011). Thus, in the interaction between SIZE, ROA and bank liquidity, there exists an intermediate role of ROA factor.

3. Research Methodology

3.1. Data and Sample

The study uses data of 17 commercial banks listed on HOSE, HNX and UpCom from the financial statements that have been audited quarterly, from the first quarter of 2006 (the first quarter has two listed commercial banks on the Vietnam stock market – Saigon Thuong Tin Commercial Joint Stock Bank and Asia Commercial Joint Stock Bank) to the first quarter of 2020, including 496 observations. Data on GDP and inflation are collected from the International Monetary Fund IMF and the General Statistics Office of Vietnam. Once collected, the data were organized as unbalanced panel data.

3.2. Measurement of Variables

The estimation equation of the study is generalized in equation (1).

$$\begin{aligned} FGAP_{i,t} = & \beta_0 + \beta_1 * SIZE_{i,t} + \beta_2 * ROA_{i,t} \\ & + \beta_3 * CAP_{i,t} + \beta_4 * CRE_{i,t} + \beta_5 * CGR_{i,t} \\ & + \beta_6 FCRER_{i,t} + \beta_7 * GDP_{i,t} + \beta_8 * INF_{i,t} \\ & + \beta_9 * SIZE_i * ROA_{i,t} + \varepsilon_{it} \end{aligned} \quad (1)$$

In which: i represents banks, t is the quarters in each year of the study, β is the estimated coefficients and ε is the error in the model. Measurements of all variables in the study are described in Table 1.

Table 1: Measurement of Variables in the Model

Variable	Variable name	Label	Measurement method	Expected sign
Dependent variable	Liquidity	FGAP	(Loans – deposits) / total assets	
Independent variables	Total assets	SIZE	Log (total assets)	+
	Profit rate	ROA	Profit / total assets	+
	Proportion of equity	CAP	Equity / total assets	+
	Loan rate	CRE	Loan / total capital	–
	Loan growth rate	CGR	(Loan year t – loan year $t-1$) / Loan year $t-1$	–
	Fund for credit risks	FCRER	Provisions / loans	+
	Interaction between the size of total assets and the rate of return on total assets	SIZE*ROA	SIZE*ROA	–
	Economic growth	GDP	Percentage	–
	Inflation	INF	Percentage	–

3.3. Estimation Method

Given an unbalanced panel data, the correlation between the independent variables is tested. Next, the variance inflation factor was used to estimate the degree of multicollinearity between the independent variables. The study performed regressions by applying Fixed-Effect Model (FEM) and Random-Effect Model (REM), employing Hausman test to detect the relevant model. In order to evaluate the suitability of the regression model, the variance of variable error is measured by Wald test and corrected by Robust standard error to arrive at the results of measuring the factors affecting the liquidity of commercial banks listed on Vietnam's stock exchange. Additionally, the study also applied GMM regression method for endogenous treatment in the model. Sargan test to check the suitability of the instrumental variables, quadratic correlation is also used in the study. The results of such tests allowed to conclude the robustness of the GMM regression model.

4. Results and Discussions

4.1. Descriptive Statistics

Table 2 shows that there is a big difference in terms of the liquidity of banks, the lowest liquidity ratio is -65.4% and the largest is 66% . For the independent variables, bank size has the highest standard deviation of 40.05% . This implies that the total capital size has a big difference between listed commercial banks. Additionally, the credit growth variable (CGR) also has a big difference in observations, the maximum value of this variable is over 100% , while the minimum value is very low at -68.9% .

Regarding macro variables, economic growth (GDP) has little variation in the sample. While the inflation variable (INF) is very different, the highest value of this variable is 29.77% , the lowest value is only -0.05% .

4.2. Correlation Analysis

According to Gujarati (2004), if the correlation coefficient between the independent variables in the regression model has values exceeding 0.8 , the possibility of multicollinearity among the variables in the model is high. Results in Table 3 show that the relative absolute value of the pairs of independent variables and the relative absolute value of the dependent variable (FGAP) with the independent variables are both less than 0.8 . Furthermore, the test results indicate that the VIF of all variables in the model is less than 3 . These test results confirm that there is no multicollinearity phenomenon between the independent variables in the research model.

4.3. Regression Results

For REM and FEM regression, the Hausman test provides $\text{Prob} > \text{Chi}^2 = 0.000 < 5\%$ statistic value, with 95% confidence, thus there is enough basis to reject the null hypothesis, which means that results of the fixed-effect model is selected. The Wald test results also show that the selected research model has variable variance, so the study has been overcome by robust adjusted standard error. Additionally, GMM regression is used for endogenous treatment in the model. The instrumental variable group is tested by the Sargan Test, the quadratic correlation of the model residue is also tested, the P -value results of these two tests are 0.05 .

Table 2: Descriptive Statistics of the Variables in the Model

Variable name	N	Mean	Standard deviation	Minimum	Maximum
FGAP	496	-0.063	0.177	-0.654	0.660
SIZE	496	8.307	0.405	7.135	9.173
CAP	496	0.080	0.028	0.019	0.248
CRE	496	0.590	0.100	0.076	0.756
CGR	496	-0.044	0.126	-0.689	2.278
ROA	496	0.004	0.008	-0.016	0.077
FCRER	496	0.003	0.003	-0.010	0.024
GDP	496	0.062	0.010	0.031	0.085
INF	496	0.008	0.029	-0.054	0.298

Table 3: Correlation Matrix ($n = 496$)

	FGAP	SIZE	CAP	CRE	CGR	ROA	FCRER	GDP	INF
FGAP	1.000								
SIZE	0.118	1.000							
CAP	-0.011	-0.387	1.000						
CRE	0.166	0.492	-0.137	1.000					
CGR	-0.117	0.058	-0.007	-0.001	1.000				
ROA	0.110	0.006	0.049	-0.013	0.008	1.000			
FCRER	0.036	0.284	0.045	0.139	0.090	-0.024	1.000		
GDP	0.045	0.073	-0.139	0.174	-0.094	0.075	0.028	1.000	
INF	0.076	-0.153	0.039	-0.183	-0.060	0.014	-0.088	0.093	1.000

This result shows that the instrumental variable group is used. The remainder does not have a quadratic relationship. Therefore, the results of the GMM regression are consistent. The regression results of FEM and GMM methods are quite similar for the dam variables with statistical significance in the model (Table 4).

Total assets variable (SIZE) has a negative coefficient of estimation for the financial gap FGAP, with statistical significance of 5% and 10%, respectively, in the two models. This means that the larger the bank's total assets, the smaller the FGAP financial gap, the higher the bank's liquidity. This result is consistent with the study's initial expectation; the size of the bank's total assets has a positive relationship with the bank's liquidity, and is consistent with Umar (2016), Pham and Nguyen (2019). However, this findings is contrary to the study by El-Chaarani (2019) and Aldeen et al. (2020). Indeed, commercial banks with large total assets will have the opportunity to diversify investments, not focusing on

credit. According to the convertibility theory, commercial banks can invest in government bonds and derivative contracts on the stock market to increase convertibility and increase liquidity. In addition, listed commercial banks have the advantage of large-scale total assets, attracting a large number of customers to deposit, borrow money, etc. From there, these commercial banks have the opportunity to filter customers for loans to limit credit risks and increase bank liquidity. The size of a bank's total assets (SIZE) has a positive impact on bank liquidity.

Return on total assets (ROA) has negative coefficients in both models, with statistical significance of 5% and 1%, respectively. ROA reduces FGAP's financial gap, which increases bank liquidity. The ratio of profit to total assets has a positive relationship with the liquidity of the bank. This result is contradictory to that of Rashid et al. (2017), but consistent with Abdul-Rahman et al. (2018) and Mai and Bui (2018) and consistent with the study's initial expectations.

Table 4: Regression Results with FEM and GMM Models

Variable	FEM	GMM
SIZE	−0.425* (0.208)	−0.550** (0.229)
CAP	−1.296 (1.148)	0.146 (0.749)
CRE	0.158 (0.407)	−0.133 (0.203)
CGR	−0.139*** (0.043)	−0.244*** (0.078)
ROA	−260.05** (116.52)	−668.274*** (185.93)
FCRER	−7.455 (5.721)	3.360 (4.788)
GDP	1.172 (0.676)	1.946*** (0.589)
INF	0.040 (0.502)	−0.298 (0.239)
SIZE*ROA	32.326** (14.049)	81.329*** (22.641)
R^2	0.2127	20.37
F	20.64***	19.36***
Number of observations	496	496

Notes: *, **, *** the Coefficients are Statistically Significant at the 10%, 5% and 1% Significance Levels, respectively. The Adjusted Standard Error Values are in Parentheses.

For Vietnamese commercial banks listed on the stock market, with a high ROA, commercial banks' shares will be traded in large volume, increasing market liquidity. At the same time, with high ROA, commercial banks have more conditions to supplement their working capital, be more proactive in capital, less dependent on mobilized capital, thereby reducing liquidity stress due to withdrawing deposits before maturity, etc. Return on total assets (ROA) has a positive impact on the liquidity of Vietnamese commercial banks listed on the stock market.

The credit growth variable (CGR) has a negative estimate coefficient with statistical significance of 1% in both models, showing that credit growth is an important factor affecting the liquidity of commercial banks. The regression results show that the credit growth decreases the FGAP financial gap, which increases the liquidity of banks. This result confirms that credit growth has an impact on liquidity, but the impact is contrary to the initial expectation of the study and contrary to the research results of El-Khoury (2015).

Increased credit growth increases the bank's liquidity. The commercial lending theory emphasizes the important role of short-term lending in relation to liquidity, banks can maintain good liquidity if they focus on short-term commercial loans. For now, Vietnamese commercial banks always focus on short-term loans, short-term commercial loan products that are increasingly diversified, weekly and monthly loans, market loans, etc. Credit growth runs in parallel with focusing on short-term commercial loans; commercial banks can still ensure good liquidity. Credit growth (CGR) has a positive impact on bank liquidity.

The credit risk variable reserve of the bank (FCRER) is not statistically significant in both models. The regression results show that the credit risk provision has no impact on the liquidity of the bank, this result is consistent with Mahdi and Abbes (2017). In Vietnam, commercial banks are required to make provision for risks in accordance with Consolidated Document No. 03-VBHN dated January 7, 2019 of the State Bank of Vietnam, under which general provisions and specific provisions for each group of debt is set a specific setting level, in order to help commercial banks have a certain source of funds to cope with losses in credit activities, if any. However, the credit risk reserve of the bank (FCRER) that has no impact on the liquidity of the bank can be explained with the following cases: firstly, the operation of commercial banks is highly efficient, the rate of overdue debt and bad debt were under control, the bank's liquidity remained well without the support from the risk reserve fund; second, compliance with the rate of provisions, reducing the working capital of commercial banks, leading to the decline in profits, so commercial banks often reevaluate the repayment capacity of customers and transfer debt groups with high rate of setting up funds to groups with low rate of provisioning, from which the value of the risk reserve fund decreases compared to the requirements for setting up.

The economic growth rate variable (GDP) has a positive sign in both models that increases the financial gap FGAP and reduces the bank liquidity. With the GMM model, GDP is statistically significant by 1% in the model, i.e., GDP increases the financial gap and reduces liquidity. This result is in line with research expectations and is consistent with Mahdi and Abbes (2017). In the context of economic growth, the demand for loans will increase. If commercial banks do not properly expand credit growth, it will negatively affect their liquidity. The national inflation variable (INF) is not statistically significant in both models. This result is contrary to research expectations, but consistent with El-Khoury (2015) and Mahdi and Abbes (2017). The high national inflation rate destroys the socio-economy, however, listed commercial banks can still maintain good liquidity if they make provisions according to regulations or respond well to other liquidity assurance plans.

The interaction variable SIZE*ROA has a positive coefficient, with the statistical significance of 5% and 1%, respectively, in the two models showing that this interaction variable increases the financial gap, which reduces the liquidity. This result is consistent with the expectation of the study, a bank with large total assets and a small ROA has lower liquidity than a bank with large total assets and a large ROA. According to the law of performance increasing to scale when SIZE increases, ROA increases, while the law of performance decreases with scale shows that an increase in SIZE makes ROA decrease. These two rules are suitable to explain the practical operations of listed commercial banks. When banks have large total assets, banks have a wide opportunity to invest, if the structure of investment activities is appropriate, effectively, banks' profits will increase. However, currently listed commercial banks in particular, and commercial banks in general, are facing fierce competition in technology, services, and extensive branch network transactions, in the context of an increasing number of foreign banks operating in Vietnam. In case the size of total assets increases, but operating costs increase at the same time, it will lead to declining profits, and reduced liquidity of the bank. Transparent information about ROA will be an important base for investors; the low ROA of the bank reduces the volume of bank shares traded, thereby reducing the market liquidity of bank shares. The interaction between SIZE and ROA has a negative impact on the liquidity of listed commercial banks.

5. Conclusion

Liquidity plays a really important role in commercial banks' operations. High liquidity helps the bank increase its ability to mobilize capital, thereby having wide opportunities for lending and other investments. Conversely, a bank that is exposed to liquidity risks can weaken its capital sources as well as damage its assets. In Vietnam, liquidity is one of the top concerns of listed commercial banks and related regulatory and supervisory agencies. The study was performed by FEM fixed-effect regression and GMM regression with unbalanced panel data on a quarterly frequency of 17 commercial banks listed on the stock market of Vietnam, in the period from Q1 2006 to Q1 2020. The results show that the liquidity of listed commercial banks depends on the size of total assets (SIZE), credit growth (CGR), return on total assets (ROA), and the interaction between bank size and total assets (SIZE*ROA). Except for the interaction factor that has a negative impact, the remaining three factors have a positive impact on the liquidity of Vietnamese commercial banks listed on the HNX, HOSE, and UpCom. The study did not find impacts of equity ratio (CAP), credit concentration (CRE), credit risk reserve ratio (FCRER), economic growth (GDP) and inflation (INF) on the liquidity of listed banks.

The results of this study have important implications for managers at listed commercial banks, policymakers, customers, and investors related to commercial banks listed on Vietnam's stock market. In order to maintain good liquidity, commercial banks need to focus on effective credit growth, ensure a high rate of profit over total assets, and at the same time focus on developing the scale of total assets. However, the development of the size of the total assets should be noted in the balance between the total assets and the rate of return on the total assets. At the same time, the results of this study also have important academic implications, proving that the liquidity of listed commercial banks is not only affected by individual factors, but also affected by the interaction between factors within the operations of banks. However, this study has limitations. Firstly, although it has been shown that the interaction between SIZE and ROA has a negative impact on listed commercial banks, banks with high total assets, but low ROA will reduce the bank's liquidity. However, the specific values of these factors have not been determined yet. Secondly, the study is only concerned with the interaction between two factors within the bank's operations; it has not studied the interaction between a factor inside the bank and a factor outside the bank, or between factors outside the economy. Therefore, this study is the basis for important further studies.

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