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Impact of foreign ownership and foreign bank presence on liquidity risk: Evidence from Viet Nam

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Abstract

Purpose: This study examines the impact of foreign ownership and foreign bank presence on the liquidity risk of Vietnam commercial banks.

Design/Methodology/Approach: We use Pooled Ordinary Least Square Model, Fixed Effects Model, and Random Effects Model to analyze the panel data. Additionally, to overcome the limitations of the model, the Generalized Least Squares method is applied.

Findings: The study found that an increase in the foreign ownership ratio reduces the liquidity risk of Vietnam commercial banks, which means that it can help reduce the liquidity risk. Conversely, an increase in foreign bank presence has a positive effect on the liquidity risk of Vietnam commercial banks, leading to higher liquidity risk. The study also highlights the positive impact of credit risk on the liquidity risk of commercial banks.

Research limitations/implications: Research data is limited because some Vietnam commercial banks did not fully disclose information over the period that we do not study in our paper. Therefore, a few factors have not yet been considered in the research model, so future research could expand the scope of the study by increasing the sample size to get better reliability of the research results. Furthermore, future research should include other commercial banks in other countries for comparison.

Practical implications: This study has several significant practical implications for commercial banks regarding the impact of foreign ownership and foreign bank presence liquidity risk to maintain stability in the bank's operations. The inference from our findings to investors is that they should consider the risk management activities of commercial banks to make reasonable decisions. Finally, the State bank of Vietnam should monitor the activities of commercial banks in order to have support policies that can prevent major risks to the banking system.

Originality/value: The findings in our paper provide empirical evidence of the role of foreign shareholders in the liquidity risk management in commercial banks and the presence of foreign banks has an impact on the liquidity management of commercial banks in Vietnam. Our findings are news in the literature.

Keywords: Foreign Ownership, Foreign Bank, Liquidity Risk, Commercial Bank, Credit Risk

JEL: G2, G20, G21, G32, G33

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1. Introduction

The commercial banking system plays a crucial role in the economy. Therefore, effective management of commercial banks is an urgent topic. There are many factors affecting profitability, credit risk as well as liquidity risk. Many previous studies have examined liquidity risk, which is affected by internal and external factors (Cornett *et al.*, 2011; Cetorelli & Goldberg, 2012; Wójcik-Mazur & Szajt, 2015; İncekara & Çetinkaya, 2019). Research documents the importance of liquidity risk from external factors, such as foreign ownership (Saunders *et al.*, 1990; Micco *et al.*, 2007) and foreign bank presence (Schinasi & Teixeira, 2006; Schoenmaker & Oosterloo, 2007; Dinger, 2009).

In some emerging economies, foreign ownership and foreign bank play an important role in developing the financial market. Moreover, developed economies have been interested in this issue, while emerging economies are cautious about increasing foreign ownership and foreign banking presence. In some countries, including Vietnam, the rise in foreign ownership ratio in the banking industry is also being considered and studied more thoroughly. Because there are opinions that foreign ownership positively affects liquidity risk – one of the most significant risks of commercial banks, while some state that there is a negative relationship between foreign ownership and bank liquidity risk. Lee (2008) discussed the bank ownership structure and risk with high rates of domestic ownership, which can be lower-risk credit activities, safer liquidity, financial structure, and asset portfolio compared to foreign-owned banks. In addition, the competitive pressures stemming from foreign banks also partly affect domestic banks in liquidity management and risk management. Buch and Goldberg (2015) found that foreign banks have better liquidity (lower liquidity risk) than domestic banks. On the other hand, Correa *et al.* (2015) argued that the presence of foreign banks contributes to reducing the holding of liquid assets under competitive pressure in credit activities, leading to higher liquidity risk.

In addition, liquidity risk is also one of the specific risks of the banking business (Ivanov, 2010; Munteanu, 2012; Cucinelli, 2013), along with other types of risks such as credit risk, interest rate risk, market risk, operational risk... Derived from the closeness of banking relationships, a bank facing liquidity risk will affect the regular operation of other banks, more broadly, and threaten the safety of the operation of the entire banking system (Berger & Sedunov, 2017). Assessing the importance of liquidity risk management, the issue of foreign ownership has received more attention in recent years and is evaluated from different aspects, both positive and negative effects. The empirical result shows that foreign banks play a stable role in emerging economies' banking systems. Primarily, liquidity risk has been controlled due to the fact that a stabilizing role is attributed to transnational banks' access to more diversified sources of liquidity (Dinger, 2009).

In Vietnam, the issue of foreign ownership in commercial banks and foreign bank presence has recently received more attention. The regulation of foreign ownership restrictions for commercial banks is one of the most discussed contents. According to current regulations, the government-adopted Decree 01/2014/ND-CP stipulates that the shareholding ratio of any one strategic foreign investor must not exceed 20 percent of the charter capital of one Vietnam credit institution. The total shareholding ownership of foreign investors must be under 30 percent of the charter capital of any Vietnam commercial bank. With the current regulations, many commercial banks have reached the ceiling on foreign ownership. Foreign investors and some experts agree that this limit is still low, so the investment market is not attractive. Therefore, there are many

opinions that the percentage of foreign investors' ownership in Vietnam credit institutions will be increased in the future as a necessity in the context of economic integration to attract more capital. Circular No 22/2019/TT-NHNN on limits and prudential ratios of banks and foreign bank branches, such as capital resource limit, capital contribution limit, government bond purchase rate, etc., also partly affects the operation of foreign banks in Vietnam. However, the limits may contribute to reducing competition for domestic banks and ensuring safety in banking activities.

The foreign ownership ratio in commercial banks is increasing, which may affect the management role, thus affecting risk management, including liquidity risk. Increasing the presence of foreign banks will increase competitive pressure on domestic and commercial banks. Competitive pressure on lending may affect liquidity management and liquidity risk in Vietnam commercial Bank. Studying the impact of foreign ownership and foreign bank presence on liquidity risk helps investors, bank managers, and policymakers to evaluate the importance of the presence of foreign banks in Vietnam. The rest of the paper is organized as follows. Section 2 reviews the relevant literature. Section 3 shows the data collection and research methodology. Section 4 reports our main findings and discusses them. Section 5 concludes this paper and gives policy implications.

2. Literature Reviews

2.1 Liquidity Risk

Diamond and Rajan (2001) and Duttweiler (2009) noted that liquidity risk occurs when commercial banks cannot pay debts or lack the reserve required at a specific time, or have to mobilize capital sources at high costs to meet their liquidity needs, or due to other reasons causing the insolvency of commercial banks, which leads to negative impacts on the financial performance of commercial banks. Through the banks' data after the 2008 financial crisis, Drehmann and Nikolaou (2013) confirmed that liquidity risk is usually low during stable operating periods but extremely high in the periods with special events, and typically the period of 2008 when lending activities increased rapidly, especially subprime lending and real estate bubble.

According to the Basel Committee on Banking Supervision (BIS, 2010), liquidity risk is the risk that a financial institution cannot find sufficient capital to meet its due obligations without affecting its daily operations and financial standing. Liquidity risk is a typical and common type of risk in commercial banks' operations. Liquidity risk is the risk that the bank cannot pay due to the inability to convert assets into cash or the inability to mobilize and borrow to meet previously committed contracts (Diamond & Rajan, 2001; Drehmann & Nikolaou, 2013).

There are a variety of determinants of liquidity risk, and the first cause is capital risk (Duttweiler, 2009). The liquidity risk means a bank lacks cash flow to meet depositors' withdrawal needs or pay due debts, especially large debts from credit institutions or interbank. High risk occurs when creditors simultaneously withdraw capital. At that time, the bank has to find other sources of capital or convert investment assets into cash to supplement capital for regular operations. This risk also arises because the bank optimizes its business by shifting most of its cash into profitable assets. According to Cucinelli (2013), the risk of commercial banks is often high because commercial banks maximize business activities by limiting cash holdings. Moreover, due to the confidence in predicting customers' withdrawals and balancing the current account, commercial banks tend to be confident in meeting customers' withdrawal needs, which results in higher

liquidity risk (Diamond & Rajan, 2011). The following reason is that the banks keep very few liquid assets or accounts with low liquidity. Thus, when converting into cash, the banks cannot meet the payment needs. The last cause is the significant withdrawal of creditors in a short time which leads to the bank's failure.

Liquidity risk was measured in the liquidity transformation model of Bryant (1980) and Diamond and Dybvig (1983) by converting short-term deposits into long-term loans. The difference between short-term deposits and long-term loans is known as Liquidity Transformation Gap (LT gap). Deep and Schaefer (2004) used the LT gap to measure and evaluate the liquidity of each bank. According to Vodová (2013), the liquidity gap is the difference between projected future balances of existing assets and capital. Saunders and Cornett (2008) suggested the concept of the “Financing Gap” to measure liquidity risk. The financing gap represents a warning sign of a bank's future liquidity risk. If the bank has a significant and positive financing gap, the total credit balance is much higher than the total mobilized capital. Then the bank is forced to reduce cash reserves and liquid assets or borrow additional funds in the money market, leading to high liquidity risk. The financing gap method is considered the most appropriate method in quantitative analysis, and the financing gap index reflects the most essential characteristics of the bank's liquidity.

2.2 Foreign Ownership and Liquidity Risk

Ownership of capital by foreign investors is the percentage (%) of the value of shares that total foreign investors own (Suu *et al.*, 2021). Depending on the regulations of each country, allowing foreign investors to hold the maximum value of shares is how much. The foreign ownership ratio is defined as the equity held by foreign investors or by any organization, of which a limited percentage of its charter capital is owned by foreign investors. Each country has its own regulations allowing foreign investors to hold the maximum value of shares (Chang *et al.*, 2020, Darsono *et al.*, 2022, Wong *et al.*, 2022).

In some industries, foreign investors, through their subsidiaries in different countries, hold a higher-than-permitted dominant ownership rate in the domestic enterprise, spoiling the whole industry. If this happens in a sensitive industry like banking, it will affect the financial stability of the whole economy.

The legal approaches followed by countries in shaping their foreign investment regimes vary widely depending on domestic political considerations, economic theories, developmental objectives, and perceived national interests. Developed countries generally do not have specific laws for the encouragement and promotion of foreign investment, although such laws exist in countries such as Australia, Canada, and New Zealand. Legislation and regulations dealing generally with investment matters in these countries do exclude, however, foreign investment in certain areas. By contrast, specific laws regulating foreign investment abound in developing countries such as VietNam, Thailand, Malaysia, and Indonesia... Based on the policies they reflect, the national foreign investment drastically differs in two general groups of countries.

Chen *et al.* (2017) find that foreign ownership takes on the governance behavior of commercial banks, especially in liquidity management. So it explains that the agent problem is still suitable for liquidity risk management and consistent with the agent theory of Jensen and Meckling (1986) and Jensen (1976). The authors' results also prove that the presence of foreign

banks impacts liquidity risk management at commercial banks. Many previous studies have examined the relationship between foreign ownership and liquidity of commercial banks with opposite results. Saunders *et al.* (1990) found that the higher the foreign ownership ratio, the higher the bank's risk, which is consistent with Lee (2008) and Chen & Sriphon (2022). By contrast, other papers documented that a higher rate of foreign ownership reduces the risks of the bank because of positive effects from foreign investors (Micco *et al.*, 2007).

Hypotheses: According to Dinger (2009), foreign ownership has a positive impact on liquidity risk management at commercial banks in three situations. Firstly, foreign strategic shareholders invest in banks with low liquidity risk and the prospect of high returns for their portfolios. Secondly, the participation of foreign strategic shareholders in the bank helps to improve the bank's governance, including liquidity risk management. Thirdly, a foreign strategic shareholder participates in the investment of owning capital in the bank which helps banks to improve their prestige positions, thereby reducing liquidity risk for the bank. Besides, Sensoy (2017) showed that domestic banks have foreign investors who have positive impacts on liquidity risk management. Therefore, this study follows their findings to conjecture that there is a negative relationship between liquidity risk and Foreign ownership ratio as in the following hypothesis:

H₁: Foreign ownership of commercial banks is negatively related to liquidity risk.

2.3 The Presence of Foreign Banks and Liquidity Risk

Most countries allow or license foreign subsidiaries and branches to operate. Foreign bank participation can improve the efficiency of productive resource allocation, especially financial resources for a country, and enhance the banking competition in currency business activities. Thus, domestic banks are urged to build appropriate business strategies by improving or increasing their operational efficiency to gain targets.

Some studies suggest that foreign banks accelerate liquidity risk for domestic banks (Schinasi & Teixeira, 2006; Schoemaker & Oosterloo, 2007). However, there are scholars who argue that foreign bank entry forces domestic banks to compete, especially in terms of sustainability and liquidity risk reduction (Freixas & Holthausen, 2005).

The presence of foreign banks affects the activities of domestic banks, such as credit risk management, liquidity risk management, and so on. According to Buch and Goldberg (2015), foreign bank has an influence on the liquidity risk of domestic banks under competitive pressure in lending activities. Dietrich and Vollmer (2010) said that most multinational banks have more financial potential than domestic banks. Thus, their liquidity risk is lower. Pawłowska and Zajączkowski (2015) argued that it is easier for foreign banks to receive capital funding. Hence, they have more advantages in lending activities, thus exerting competitive pressure on domestic banks and forcing them to loosen lending policies. Gajewski (2021) shows that the existence of foreign banks impacts the governance of domestic banks. Especially the presence of foreign banks impacts operational efficiency and risks, including liquidity risk. He also pointed out that the agency problem also affects the efficiency of bank governance. Liu and Sickles (2021) find empirical evidence of market power theory and contribute to the literature on efficiency and management.

Hypotheses: Pawłowska *et al.* (2015) argue that domestic banks with higher competitive pressure for capital compared to foreign banks which causes liquidity risk. Similarly, Wong *et al.*

(2015) investigated that when liquidity risk occurs, domestic banks are more sensitive than foreign banks because branches overseas have more possibilities to access capital. Under competitive pressure on services, lending, and mobilizing, domestic banks have changed their goals to increase liquidity and decrease credit risks such as loosening lending policy and lower interest rates. increase liquidity and credit risks, increase liquidity and credit risks. Thus, we construct the hypothesis that the presence of foreign banks positively affects liquidity risk.

H₂: The presence of foreign banks is positively connected to liquidity risk

2.4 Credit Risk and Liquidity Risk

The relationship between credit risk and liquidity risk in the financial sector is supported by theories of microeconomics, especially in the banking sector. Industrial organization models of banking developed by Bryant (1980) suggested that a bank's asset and liability structures are closely connected, especially with involve to borrower defaults and withdrawals of the fund. Setting on these models, a body of literature has recently developed focusing on the interaction of credit risk and liquidity risk and the implications for bank stability such as Acharya & Viswanathan (2011), Gorton & Metrick (2012), Adebayo *et al.* (2022).

Acharya and Viswanathan (2011) suggest that credit risk and liquidity risk have a positive relationship, similar to the results of the research from Diamond & Rajan (2005), Gorton & Metrick (2012), He & Xiong (2012). However, Dinger (2009) found that credit risk and liquidity risk have a negative relationship. In the Vietnam context, banks mainly focus on lending activities and have high non-performance loans ratio. Then, this study expects a negative connection between credit risk and liquidity risk. This is explained by the fact that when credit risk increases, it leads to an increase in risk provisions and a decrease in profit. To compensate for the decline in profits, banks tend to reduce their liquid assets and increase the bank's liquidity risk. Thus, we construct the hypothesis that credit risk positively affects liquidity risk.

H₃: The credit risk is positively connected to liquidity risk

3. Data and Methodology

3.1 Data

The research database is gathered from different sources. We calculated the financial ratios from the year-end financial statements of 28 commercial banks in Vietnam over the period from 2009 to 2019. Foreign ownership is collected from the report of commercial banks; The presence of foreign banks is recorded in the annual report of the State bank of Vietnam; Economic growth (GDP) is obtained from the IMF (International monetary fund). After collecting data, we calculate variables and conduct the tests before applying appropriate statistical software to estimate models. Next, we follow Duong *et al.* (2021) to winsorize all variables at the 5th and 95th percentile to solve the outlier issue. The final sample is a balanced panel with 308 annual observations of 28 commercial banks in Vietnam.

3.2 Variables and Measures

3.2.1 Dependent Variables

Liquidity Risk ($LR_{i,t}$): Similar to previous studies, Liquidity Risk is measured by the bank's loans to assets ratio (Demirgüç-Kunt and Huizinga, 1999; Vodová, 2011; Delechat *et al.*, 2012; Bonner *et al.*, 2015, Trang *et al.*, 2021, Nhan *et al.*, 2021). Following the theory, if this ratio is higher, the liquidity risk of the bank would be higher. It means that the higher the loan ratio, the higher the potential liquidity risk.

$$\text{Liquidity Risk (LR}_{i,t}) = \frac{\text{Loans}}{\text{Total Assets}} .$$

3.2.2 Independent Variables

Foreign ownership ratio ($FOWN_{i,t}$): is calculated by rate of share ownership of foreign investors (Dinger, 2009; Vinh & Duc, 2017; Sensory, 2017).

$$\text{Foreign ownership ratio (FOWN}_{i,t}) = \frac{\text{The number of shares of foreign shareholders}}{\text{Total number of shares issued by commercial banks}} .$$

The presence of foreign banks ($FBANK_{i,t}$): The presence of foreign banks, it is measured by the size of the charter capital of foreign banks, branches and representatives of foreign banks in Vietnam (Dietrich and Vollmer, 2010; Acharya and Viswanathan, 2011).

$$FBANK_{i,t} = \text{Ln (charter capital of foreign banks)}$$

Credit risk ($CR_{i,t}$) is the probability that a debtor would fail to execute its financial obligations. Therefore, the creditor faces the risk of losing at least a part of its loan money. Credit risk is calculated as the ratio of loan loss provision to total loans (Tarus *et al.*, 2012; Suu *et al.*, 2020). Earlier research represented credit risk as the ratio of total debts to total assets (Valverde and Fernández, 2007). In this paper, credit risk is measured by the provisions for credit risk to total assets (Vinh & Duc, 2017) and defined as

$$\text{Credit risk (CR}_{i,t}) = \frac{\text{Loan loss provision}}{\text{Total Asset}}$$

Bank size ($SIZE_{i,t}$) is considered to be a very important factor for a bank's liquidity because of the costs and is interbank market, or receive the support from defined as

$$\text{Bank size (SIZE}_{i,t}) = \text{Log (total assets)}.$$

Theoretically, the banks with higher total assets have liquidity better. In addition, bigger size of banks has more advantages to access the interbank market or receive support from the "Lender of last resort" (Vodová, 2013). The impact of bank size on liquidity risk is a significantly positive correlation, it implies that larger banks tend to be riskier (in terms of liquidity risk) and to realize the 'too-big-to-fail' argument in terms of liquidity risk as well (Fadare, 2011; Imbierowicz and Rauch, 2014.).

Equity to total assets ($EA_{i,t}$) is used with the implication that the bank's capitalization affects the liquidity of that bank and is defined as

$$\text{Equity to total assets (EA}_{i,t}) = \frac{\text{Equity}}{\text{Total assets}} .$$

Bank capital helps liquidity risk to reduce (Vodová, 2013; Abbas *et al.*, 2022). If this ratio is low, it means that the bank uses high financial leverage, which carries a lot of risks. Equity plays

an extremely important role to ensure the financial capacity of the bank against the competition of foreign banks and ensure capital adequacy ratios (CAR) to meet the needs of growth. Some empirical studies on the effect of EA on liquidity found that equity over total assets has a positive relationship with liquidity (Thakor, 1996; Bunda, 2008; Gorton & Huang, 2004; Laurine, 2013; Gorton & Winton, 2017). Meanwhile, the research results of Bonfim and Kim (2012) and Vodová (2013) show that equity on total assets has a negative relationship with liquidity. For Vietnam commercial banks, the capital is low compared to other banks in the developed markets. When the bank integrates, equity plays an extremely important role to ensure the financial capacity of the bank.

GDP growth rate (GDP_t) represents a macro factor of a bank's operation, namely liquidity risk, and is defined as

$$\text{GDP growth rate (GDP}_t) = \frac{GDP_t - GDP_{t-1}}{GDP_{t-1}}.$$

The relationship between GDP growth rate and liquidity is considered in terms of specific economic conditions. Moreover, the banks hold more liquid assets in the economic downturn period, in contrast, banks tend to reduce their liquid asset reserves to be able to lend more than during a period of strong economic growth when investors often decide to invest in other sectors with expected to have higher returns than bank deposits (Dinger, 2009; Gasbarro *et al.*, 2012; Alghalith *et al.*, 2016; Shen *et al.*, 2018).

Table 1. Summarizing and measuring variables

Variables	References	Expectations
Liquidity Risk (LR _{i,t})	Demirgüç-Kunt & Huizinga (1999), Cifuentes <i>et al.</i> (2005); Vodová (2013); Cucinelli (2013); Chagwiza (2014)	
Foreign ownership ratio (FOWN _{i,t})	Dinger (2009); Vinh & Duc (2017); Sensoy (2017)	-
The presence of foreign banks (FBANK _{i,t})	Dietrich & Vollmer (2010); Acharya & Viswanathan (2011); Caccavaio <i>et al.</i> (2015)	+
Credit risk (CR _{i,t})	Acharya & Viswanathan (2011); Diamond & Rajan (2005); Gorton & Metrick (2012), He & Xiong (2012); Vinh & Duc (2017)	+
Bank size (SIZE _{i,t})	Vodová (2013); Vo&Mai (2017);	+
Equity to total assets (EA _{i,t})	Laurine (2013), Gorton & Winton (2017); Vinh & Duc (2017)	-
GDP growth rate (GDPT)	Dinger (2009); Vinh & Duc (2017)	+

3.3 Research Models

Some studies indicated the impact of foreign ownership or ownership structure on liquidity risk (Dinger, 2009; Duqi & Al-Tamimi, 2018) but few studies have discussed the presence of foreign banks. Some research focused on the international bank's transmission to liquidity risk (Pawłowska & Zajączkowski, 2015, Kerl & Koch, 2015, Wong *et al.*, 2015; Hills *et al.*, 2015; Singh & Sharma, 2016, Kaur & Sharma, 2019). In Vietnam, Vinh and Duc (2017) concluded that foreign ownership impact on liquidity risk and did not mention the foreign banks. Therefore, the research model proposed by the authors is not only the foreign ownership variable as the internal variable of the bank, but also the presence of foreign banks. The model also has control variables such as Credit risk, Size of the bank, Equity-To-Asset ratio, and GDP growth rate. Consequently, the research model is presented in an equation:

$$LR_{i,t} = \alpha + \beta_1 FOWN_{i,t} + \beta_2 FBANK_{i,t} + \beta_3 CR_{i,t} + \beta_4 SIZE_{i,t} + \beta_5 EA_{i,t} + \beta_6 GDP_t + \varepsilon_{i,t}, \quad (1)$$

where $\beta_1, \beta_2, \dots, \beta_6$ in the model are the coefficients of the variables, ε is error terms, i and t represent cross-sectional and time dimensions of the variables, respectively, the dependent variable is liquidity risk (LR), the independent variables are foreign ownership ratio ($FOWN_{i,t}$) and the presence of foreign banks ($FBANK_{i,t}$), and the control variables are credit risk ($CR_{i,t}$), bank size ($SIZE_{i,t}$), equity to total assets ($EA_{i,t}$), and GDP growth rate (GDP_t).

3.4 Test and Selection Model

We apply the method of Pooled OLS Model, Fixed Effects model (FEM), and Random Effects model (REM) followed by Duong *et al.* (2020) and Nhan *et al.* (2021). We choose between Pooled OLS and FEM models by using tests of Redundant Fixed Effects. The paper also uses the Hausman test to select between the FEM and REM models. Further, the paper uses a range of other methods to check for collinearity, autocorrelation, and variances in the errors. Where there is a heteroskedastic error term, we use the GLS to rectify the deviation from the classical assumptions. The model is referenced to the models applied by Claeys and Vander Venet (2008), Kasman (2010), Suu *et al.* (2020), Nguyen *et al.* (2021), and Phuong & Wong (2022).

We have 5 stages including:

Step 1: We compare the findings between the Pooled Regression and the Fixed effects model. If the Pooled Regression model is more suitable, then go to Step 2; otherwise, go to Step 3.

Step 2: We compare the findings between the Pooled Regression and the Radom effects model. If the Pooled Regression is accepted, then go to Step 4; otherwise, go to Step 3.

Step 3: We compare the findings between the Fixed effects model and the Random effects model by using the Hausman test and go to Step 4.

Step 4: Model defect testing. We test heteroskedasticity by using the Breusch and Pagan Lagrangian multiplier test with the following two hypotheses:

H_0 : there is no variable variance phenomenon, and

H_1 : there is a phenomenon of variance changes.

If the test result for the P-value is less than 5%, implicitly, the null hypothesis H_0 is rejected and the H_1 hypothesis is accepted. We then use the Serial Correlation/Autocorrelation test developed by using the Wooldridge test method, with

H_0 : no autocorrelation, and

H_1 : autocorrelation.

If the test result for the P-value is less than alpha (5% significant level), the null hypothesis H_0 is rejected and the H_1 hypothesis is accepted.

Step 5: Fix defects of the model by Generalized least squares (GLS).

4. Empirical Results and Discussion

4.1 Descriptive Statistics

Table 2 shows the descriptive statistics of the variables for banks in Vietnam over 10 years from 2009 to 2019, with a total of 308 observations.

Table 2. Descriptive Statistics

Variable	Mean	Median	Maximum	Minimum	Std. Dev.	Jarque-Bera	Probability
LR	0.539	0.555	0.808	0.145	0.129	9.396	0.009
FOWN	0.086	0.000	0.300	0.000	0.111	46.687	0.000
FBANK	13.443	13.462	14.113	12.834	0.389	13.732	0.001
EA	0.092	0.081	0.255	0.029	0.043	162.926	0.000
CR	0.608	0.468	3.629	0.028	0.502	1099.51	0.000
SIZE	11.535	11.554	14.214	8.892	1.205	5.835	0.054
GDP	0.062	0.062	0.071	0.050	0.007	27.235	0.000

Note: LR = Loans/Total Assets, FOWN = The number of shares of foreign shareholders/ Total number of shares issued by commercial banks, FBANK = Ln (total assets), EA = Equity/Total assets, CR = provision for credit risk/Total assets, SIZE = Log (total assets), GDP = GDP growth rate

According to Decree 01/2014/ND-CP, the foreign strategic investor must not exceed 20% of the charter capital of a bank and the total share ownership ratio of all foreign investors must not exceed 30%. From the State Bank of Vietnam (SBV), the total charter capital of 35 commercial banks was 387,009 billion dong at the end of 2016 compared to 2015 increased by about 55,940 billion dong and 19/35 banks announced plans to increase charter capital, with a total increase of 37,135 billion dong in 2017. The requirement of increasing capital is a chance for foreign investors to own shares of Vietnam commercial banks. The situation of foreign ownership in Vietnam's commercial banks is increasingly diverse and complex. The number of foreign partners has been increasing greatly. At the end of 2020, foreign banks are operating in Vietnam which includes 60 foreign banks, branches, and representative offices operating with total assets of up to 1,345,869 billion dong and charter capital of 120.769 billion dong.

Credit risk: Table 2 shows that the average credit risk in the period 2009 - 2019 is 0.61%. Particularly, the lowest value was 0.0284%, and the highest value reached 3.629%. It means that the difference in risk value of domestic commercial banks over the years is very large and unpredictable.

Bank size: The average asset of commercial banks during the study period is 205,653 billion dong which is a large value, in which total assets of Baoviet Bank in 2009 were the lowest with total assets of 7,270 billion dong and the highest figure belongs to Investment and Development of Vietnam Bank (BIDV) in 2019 about 1,489,957 billion dong.

Equity to total assets ratio: The equity to total assets of commercial banks from 2009 to 2019 averaged 9.24%, and the highest and the lowest ratio are 25.5% and 2.9%, respectively.

GDP growth rate: Economic growth strongly increased in 2015 (6.68%) and 2016 (6.21%). The largest contributor to GDP growth is the industrial production and construction sector. However, it should also be recognized by foreign investors including the two largest contributors in the electronics and telephone industries (such as the Samsung factory), and the steel industry (such as the Formosa factory). The correlation with the growth rate of outstanding loans shows that the volatility of GDP is much more stable than what is seen in the volatility of the growth rate

of outstanding loans of commercial banks.

4.2 Correlation Analysis between Variables

In order to consider the linear correlated relationship and multicollinearity problem among the variables, we estimate the Pearson coefficient of correlation between variables and show the results in Table 3.

Table 3. Matrix of correlation coefficients between variables in the model

Variable	FOWN	FBANK	CR	EA	SIZE	GDP	VIF=1.58
FOWN	1						1.24
FBANK	0.251	1					1.98
CR	0.051	0.259	1				1.28
EA	-0.264	-0.305	0.001	1			2.15
SIZE	0.417	0.401	0.304	-0.689	1		2.63
GDP	0.161	0.649	0.114	-0.273	0.282	1	1.75

Note: LR = Loans/Total assets, FOWN = The number of shares of foreign shareholders/ Total number of shares issued by commercial banks, FBANK = Ln (total assets), EA = Equity/Total assets, CR = provision for credit risk/Total assets, SIZE = Log (total assets), GDP = GDP growth rate.

From Table 3, describes that all variables have a correlation lower than 0.8. The pair of variables with the highest correlation is only the SIZE and EA variables, which is -0.689. This result shows that VIF coefficient is lower than 5, and the average is 1.58, thereby showing that the multicollinearity phenomenon occurring in the model is not significant. Therefore, the variables included in the original model are appropriate.

4.3. The Impact of Foreign Ownership on Liquidity Risk

Table 4. Result of regression (Pool OLS, FEM, REM model)

Variables	OLS	FEM	REM
FOWN	-0.254***	-0.008	-0.056
FBANK	0.058**	0.089***	0.071***
CR	0.059***	0.034***	0.038***
EA	0.638***	0.235	0.310*
SIZE	0.032***	-0.009	0.009
GDP	1.583	1.376*	1.334
C	-0.783***	-0.679***	-0.653***
Adjusted R-squared	22.32%	66.37%	22.65%
Redundant Tests	0.000 (27)		
Hausman Test	(6) 1.000		
White's heteroskedasticity test	(113.197) 0.000		

Note: The variables FOWN, FBANK, CR, EA, SIZE, and GDP are identified in Table 1

***, ** and * denote significance at the 1% 5%, and 10% levels, respectively. P-values in parentheses.

We used the Redundant Fixed Effects test to select whether the Pooled OLS or the FEM is more suitable for the goals of the data. The first pair of null and alternative hypotheses are:

H₀: There are no differences between the observations (Pooled OLS),

H₁: There are differences between the observations (FEM).

Table 4 presents the results of the Redundant Fixed Effects tests for choosing between FEM and Pooled OLS. As the probability of the Cross-sectional Chi-Squared statistic is 0.0000, which is considerably lower than $\alpha = 0.05$ (that is, a significance level of 5%), we reject H₀ in prefer of H₁. Therefore, FEM is selected to be the master model.

To select a suitable model, we also use tests to choose between FEM and REM. The Hausman test is used to test the following REM null hypothesis against the FEM alternative hypothesis:

H₀: There is no correlation between the independent variables and random elements (REM),

H₁: There is a correlation between the independent variables and random elements (FEM).

Table 4 presents the Hausman test statistics for choosing between FEM and REM. The probability of the Chi-Squared statistic is 0.0092, which is lower than $\alpha = 0.05$. Hence, H₀ is rejected in prefer of H₁, and thus, FEM is appropriate. So, FEM is more appropriate than REM, and we use FEM to analyze the results for NPL.

Besides, Table 4 shows that there are no significant differences between FEM and REM. Consequently, the choice of FEM is suitable.

Table 4 shows the results of testing the error variance using White's heteroskedasticity test. The value of the Likelihood ratio = 133.197 and the probability of the Chi-Squared statistic (6) is $0.0000 < 0.05$ (at the 5% significance level). Thus, the null hypothesis is rejected, with shows that the model has volatility in the error variance. So, the results must be re-conducted after correcting for autocorrelation and volatilities in the error variance.

To overcome volatility in the error variance, we use generalized least squares (GLS) to estimate equation (1). The final results are shown in Table 5.

Table 5. Estimated Regression (GLS) for dependent variable LR

Variables	Coefficient	Std	t-Statistic	Prob
FOWN	-0.056*	0.031	-1.781	0.075
FBANK	0.071***	0.018	3.793	0.000
CR	0.038***	0.012	3.167	0.002
EA	0.310	0.268	1.155	0.249
SIZE	0.009	0.016	0.585	0.559
GDP	1.334	0.814	1.638	0.102
C	-0.653	0.392	-1.664	0.097
Obs	308			
Adjusted R-squared	22.65%			

Note: The variables FOWN, FBANK, CR, EA, SIZE, and GDP are identified in Table 1. ***, ** and * denote significance at the 1% 5%, and 10% levels, respectively. P-values in parentheses.

Foreign ownership (FOWN): FOWN has a negative impact on the liquidity risk of Vietnam commercial banks at -0.0563 which is statistical significance at 10%. This confirmed a higher foreign ownership ratio which reduces the liquidity risk of the banks. In addition, when commercial banks with higher foreign ownership ratios have more opportunities to access large capital sources, and those banks have access to modern technologies, and experience in organization, administration, and management skills from foreign banks. Foreign investors have brought many positive changes not only in improving financial resources but also in improving human resources, technologies, increasing competitiveness, and risk management in banks to reduce liquidity risk. This experimental result is completely consistent with the theory and also coincides with previous experimental studies of Micco *et al.* (2007), Demirguc-Kunt *et al.* (1998), Freixas & Holthausen (2005); Vinh & Duc (2017).

The presence of foreign banks (FBANK): The presence of foreign banks has a positive impact on liquidity risk at 0.071 with a statistical significance level of 1%. This result is consistent with the research hypothesis and in line with reality in emerging economies. When the economy is in the deep integration stage, competition for resources, as well as management experience from outside, is inevitable. The results suggest that the competitive pressure from foreign banks leads to higher weaknesses of domestic banks. In addition, this result is similar to some results of previous studies such as Dietrich & Vollmer (2010), Buch & Goldberg (2015), Caccavaio *et al.* (2015), Cetorelli & Goldberg (2012)

Credit risk (CR): has a positive impact on the liquidity risk of commercial banks with a regression coefficient of 0.038 at a 1% significance level. This result is consistent with the hypothesis and in line with the reality at Vietnam commercial banks in recent years. When credit growth is too fast, the credit risk of commercial banks also has an upward trend leading to higher credit risk because the bank is holding more risky assets. Besides, when the banks with higher credit risk, the bank's income sources have significantly reduced, causing higher bank liquidity risk. Additionally, boosting business performance requires the banks to trade off between credit risk and liquidity risk. This result is consistent with previous studies such as (Acharya & Viswanathan, 2011; Diamond & Rajan, 2005; Gorton & Metrick, 2012; He & Xiong, 2012).

Bank Size (SIZE), Equity Ratio (EA), and Economic growth (GDP) are consistent with the research hypothesis but it is not statistically significant. Furthermore, economic growth leads to increase loans, banks tend to shift liquid assets to profitable assets to meet the credit needs of the economy which increase liquidity risk. Moreover, Vietnam's economic growth has depended on a number of industries (Nguyen *et al.*, 2021, Wong, 2021) including the very risky real estate industry. This industry requires a large amount of capital when the real estate market is hot in the period 2011-2013 and the recent period from 2017 until now. Due to the big demand, taking advantage of opportunities as well as competition among large banks, banks often pay little attention to liquidity, leading to increased liquidity risk in these periods.

5. Concluding Remarks and Policy Implications

5.1 Conclusion

With an integration of the economy, the Vietnam banking system has been under pressure to compete with other banks in the region as well as over the world. To improve their competitiveness, banks have to upgrade their size, apply modern technologies, and adopt advanced management skills. To achieve these goals, Vietnam commercial banks have been looking for foreign investors to be their strategic shareholders. In fact, many Vietnam commercial banks have attracted a large amount of capital from foreign investors to invest in the period from 2009 to 2019. The role of foreign shareholders has become an important and practical issue for the Vietnam banking system. However, there are very few, if there are any, empirical studies to examine the relationship between foreign ownership and the presence of foreign banks on commercial banks' performance, liquidity risk, credit risk, etc. To bridge the gap in the literature and contribute to the literature, this paper studies the relationship between foreign ownership, the presence of foreign banks, and the liquidity risk of Vietnam commercial banks.

Our study is conducted at 28 Vietnam commercial banks in the period from 2009 to 2019 with 308 observations. Analytical methods with OLS, FEM, and REM are used to analyze the panel data. Additionally, to overcome the limitations of the model, the GLS method is applied. Our study finds that an increase in the foreign ownership ratio reduces the liquidity risk of Vietnam commercial banks, which means that it can help reduce the liquidity risk. Conversely, an increase in foreign bank presence has a positive effect on the liquidity risk of Vietnam commercial banks, leading to higher liquidity risk. The study also highlights the positive impact of credit risk on the liquidity risk of commercial banks. The results confirm that all of our proposed research hypotheses hold and our research results are consistent with the findings in the literature.

5.2 Policy Implications

The findings in our paper provide empirical evidence on the role of foreign shareholders in the liquidity risk management in Vietnam commercial banks and whether the presence of foreign banks has an impact on the liquidity management of Vietnam commercial banks. In addition, our study provides some policy suggestions that contribute to improving liquidity management in Vietnam commercial banks.

With the research results, we confirm that banks have to minimize liquidity risk to maintain stability in the bank operations. To achieve it, Vietnam commercial banks have to pay attention to factors that positively affect liquidity risk such as the capital of foreign investors. By doing this, commercial banks could raise capital from foreign shareholders and could reach the maximum percentage of 30% limit. Moreover, Vietnam commercial banks should analyze the operational strategies of foreign banks in Vietnam to obtain more appropriate plans. Furthermore, the banks should not focus only on profitability but also consider risk management including credit and liquidity risk. The banks manage credit risk as well as liquidity by applying the trade-off theory is appropriate to avoid losing control over risk types.

The inference from our findings to investors is that they should consider the risk management activities of commercial banks to make reasonable decisions, especially considering factors that positively affect risk. Particularly, the investors should find out information about foreign ownership, foreign bank presence, and credit risk to make a better decision. Finally, our findings infer that the State bank of Vietnam should monitor the activities of commercial banks in

order to have support policies that can prevent major risks to the banking system. Attracting financial resources from foreign commercial banks is necessary for the financial market, but it is also to have appropriate policies to control the massive inflow of foreign capital, which negatively affects the domestic investment environment. Effective control will help commercial banks to compete fairly and thereby reduce liquidity risk for commercial banks.

5.3 Limitations and Directions for Future Research

Research data is limited because some Vietnam commercial banks did not fully disclose information over a period from 2009 to 2019. Therefore, a few factors have not yet been considered in the research model. Based on the above-mentioned limitation, future research could expand the scope of the study by increasing the sample size to get better reliability of the research results. Furthermore, future research should include other commercial banks in the countries in regional Asia to have a comparison.

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