Correlation Between Foreign Ownership and Liquidity Risk

Nguyen Ngoc Thach[1], Bui Dan Thanh[2], and Le Thi Lan[3](✉)

[1] Institute for Research Science and Banking Technology, Banking University HCMC, 36 Ton That Dam, District 1, Ho Chi Minh City, Vietnam
thachnn@buh.edu.vn

[2] Banking Technology, Banking University HCMC, 36 Ton That Dam, District 1, Ho Chi Minh City, Vietnam
thanhbd@buh.edu.vn

[3] Joint Stock Commercial Bank for Investment and Development of Vietnam, 137C Nguyen Chi Thanh St., Ward 9, District 5, Ho Chi Minh City, Vietnam
lanbt6988@gmail.com

Abstract. The article studies the influence of foreign ownership ratio on liquidity risk of Vietnamese commercial banks in the period 2009–2020. The article uses regression methods based on Bayesian approach with sample data of 30 Vietnamese commercial banks. The research results show that the higher the foreign ownership ratio, the lower the liquidity risk of commercial banks, as expected for the study. Besides, the variables of credit risk, equity ratio, loan-to-deposit ratio and economic growth have significant impact on liquidity risk.

Keywords: Foreign ownership · liquidity risk · commercial banks · Bayesian regression · Vietnam

1 Introduction

In the integrated and developed economy nowadays, commercial banks are focusing on finding strategic partners to develop their business and minimize risks specific to the banking industry. In addition, signed free trade agreements make access to foreign capital increasingly easier.

The amount of foreign ownership in Vietnamese banks accounts for a large market share (more than 60% of Vietnamese commercial banks have capital from foreign investors). However, in many banks, the foreign ownership ratio is quite modest. In addition, according to Decree 01/2014/ND-CP limiting the foreign ownership ratio not to exceed 30% of the capital of commercial banks in Viet Nam, the opening of the door to welcome foreign investors is very limited.

However, in terms of academics, there are not many practical studies on this issue, or only revolve around making profits without strongly focusing on risk management. Therefore, the question is whether foreign ownership actually performs well in liquidity risk management at commercial banks of Vietnam. To answer the above question,

N. Ngoc Thach et al. (Eds.): *Optimal Transport Statistics for Economics and Related Topics*, SSDC 483, pp. 574–587, 2024.
https://doi.org/10.1007/978-3-031-35763-3_41

we chose the topic: "The impact of foreign ownership on liquidity risk of Vietnamese commercial banks".

2 Literature Review

2.1 Theory of Foreign Ownership

Foreign ownership, also known in specialized terms, is the percentage (%) of shares held by all foreign investors. According to Decree 01/2014/ND-CP: "The total share ownership of foreign investors must not exceed 30% of the charter capital of a Vietnamese commercial bank".

According to previous studies, the foreign ownership ratio is determined by the following formula:

$$\text{FOREIGN} = \frac{\text{Shares of foreign shareholders}}{\text{Total number of shares issued}}$$

2.2 Liquidity Theory of Commercial Banks

According to Duttweiler (6), liquidity is the ease with which a particular asset is converted into cash and the market accepts that transaction. Bank liquidity includes two types: natural liquidity and artificial liquidity. Liquidity risk occurs when the bank is short of short-term assets with high liquidity such as cash, gold, silver, precious stones, deposits at the State bank or other credit institutions, etc.… to meet the needs of depositors and borrowers.

2.3 Theory of Liquidity Risk

According to Circular 08/2017/TT-NHNN, liquidity risk is defined as follows: "Liquidity risk is the risk that credit institutions, foreign bank branches are unable to fulfill their obligations to repay the debt when it is due; or a credit institution or foreign bank branch that is capable of performing a debt repayment obligation when it is due, but has to pay high costs to fulfill that obligation."

According to Duttweiler (6), liquidity risk is defined as the risk arising when a commercial bank is no longer able to pay at a certain time, or has to raise capital from a third party at high cost to meet the demand of instant payment.

According to Athanasoglou et al. (2); Demirgüç-Kunt and Huizinga (4); Tran Hoang Ngan and Pham Quoc Viet (2016) liquidity risk is measured using the formula:

$$L_3 = \frac{\text{Loans}}{\text{Total Assets}}$$

The higher the ratio, the higher the bank's liquidity risk, which means that the higher the bank's lending ratio, the higher its liquidity risk.

2.4 Comprehensive Researches

Nguyen et al. (11) investigates how foreign ownership and management affect listed companies' financial performance in the Vietnamese stock market. 427 listed companies from all industries were included in the data throughout a five-year period, from 2014 to 2018. ROA, and ROE are used to gauge a company's financial success. The study tested each model using the Pool OLS least squares approach while also considering fixed effects (FEM), random effects (REM). The FEM model is the most practical one. The findings indicate that the size of the company and the percentage of foreign ownership have a favorable effect on financial success. Financial performance is negatively impacted by foreign management, age of the companies, liquidity, and financial leverage.

Kusi et al. (12*)* uses information on 26 banks that was gathered between 2006 and 2016 from the Bank of Ghana. To arrive at the results, three panel estimation strategies: two-step GMM, Hausman-Taylor and Fixed effect models were used. Regression models are used in the study, which reveals that foreign and privately owned banks are less likely to produce more liquidity than their domestic and state-owned bank counterparts, suggesting that domestic and state-owned banks produce more liquidity. These findings suggest that although there is a lot of room for more liquidity to be created, policymakers may speed up the process by using state- and locally-owned banks while also designing policies that encourage foreign and privately owned banks to increase their liquidity creation, which is beneficial for economic growth.

Le (13) investigates the impact of foreign ownership on bank risk in Vietnam between 2006 and 2015. The findings suggest that the State Bank of Vietnam should further relax its limitations on foreign investments in the banking system since foreign ownership can reduce bank risk. The results also show a relationship between bank risk and technological efficiency, suggesting the existence of the skimping-cost hypothesis. The same finding holds true for big banks, institutions with more liquid assets, and institutions with faster loan growth. According to the author's findings, state-owned banks with higher levels of foreign ownership are probably more stable. The same holds true for listed banks that have a bigger percentage of foreign ownership.

Al-Harbi (14) investigate the determinants of Islam banks (IBs) liquidity. On an imbalanced panel data set of all IBs operating in the nations of the Organization of Islamic Cooperation from 1989 to 2008, the author applies a generalized least square fixed effect model. All of the factors have statistically significant correlations with IBs' liquidity, according to the estimation results, but these relationships have distinct signs. On the one hand, IBs' liquidity was adversely impacted by foreign ownership, credit risk, profitability, inflation rate, monetary policy, and deposit insurance. On the other hand, there is a strong correlation between the liquidity of IBs and the capital ratio, size gross domestic product growth and concentration.

Nacerayeddou et al. (2020) examine the connection between bank ownership structure and bank liquidity creation for the years 2004–2018 using a new, hand-collected database on ownership structure for a sample of commercial banks from 17 western European nations. The concentration of bank ownership and the identity of the principal owner are the authors' main concerns. The effects are twofold: first, ownership concentration significantly and favorably affects the generation of liquidity. Analyze the

effect of the owner's nature on the creation of liquidity next. When another bank or the government owns more than 50% of a bank, 65% of a non-financial company, 75% of a family, or 85% of a financial organization, banks tend to create more liquidity, according to the authors.

3 Model and Method

From the review of previous studies, the research team proposes the following research hypotheses:

$FOREIGN_{i,t}$ – Foreign Ownership Ratio: According to Terrell (8), foreign owned banks can indirectly increase efficiency by stimulating competition in the domestic financial market. In addition, foreign-owned banks have improved their supervisory and regulatory frameworks, lending quality and risk management. Therefore, this study expects that the higher the foreign ownership ratio, the lower the bank's liquidity risk. ***Hypothesis 1: There is a negative relationship between foreign ownership ratio and liquidity risk (H_1).***

$CR_{i,t}$ – Credit Risk: Banks in Vietnam are focusing mainly on lending activities and have a high bad debt ratio, the higher the level of bad debt, the more provisions the bank makes, that is, as the provisioning increases, the bank's profit accordingly decreases. In order to ensure profitability, banks tend to lend more and cut down on highly liquid assets. This means that when credit risk increases, the bank's liquidity risk increases. ***Hypothesis 2: There is a positive relationship between liquidity risk and credit risk (H_2).***

$SIZE_{i,t}$ – Bank Size: According to most authors, bank size always affects liquidity risk in two directions, either positive or negative. If SIZE has a positive correlation with liquidity risk, it shows that if the scale is expanded, the operating and management costs will increase, human resources are not enough to control the risk. If SIZE has a negative correlation with liquidity risk, it means that the more the bank expands, the more likely the bank will be able to attract capital sources, as well as lend more and bring in more profits for the bank. Due to expansion, it is easier to attract external funds to meet short-term liquidity needs in a timely manner, meaning liquidity risk is reduced. ***Hypothesis 3: There is a negative relationship between liquidity risk and bank size (H_3).***

$EQUITY_{i,t}$ – Equity Ratio: According to the basic hypothesis of return and risk is "High risk high return", that is, taking risks will receive a larger return, which means if this ratio is low, the bank's profits increase by taking on a moderate level of risk. According to Circular 41/2016/TT-NHNN and Circular 22/2019/TT-NHNN regulating capital adequacy ratio. Accordingly, in order to meet the CAR ratio, banks are racing to increase their own capital. When a bank has a large capitalization, the capital adequacy ratio and liquidity ratio will also increase, which means the bank's liquidity risk will decrease. ***Hypothesis 4: There is a negative relationship between liquidity risk and equity ratio (H_4).***

$LDR_{i,t}$ – Lending/Depositing Ratio: According to Golin (7), a higher ratio means more loans than mobilized capital. Therefore, when facing liquidity risk, it will be

difficult for banks to mobilize cheap capital if they lend too much, reducing the bank's liquidity, which means increased liquidity risk. Also according to the author, when this ratio is low, banks can easily mobilize from various sources such as interbank market, issue of valuable papers, etc. with cheap capital, making the liquidity of banks increase. ***Hypothesis 5: There is a positive relationship between liquidity risk and loan/deposit ratio (H_5).***

$ROA_{i,t}$ – Profit/Total Assets: Profit after tax after one year of a bank is used for two main purposes: retained earnings for reinvestment and/or distribution of profits to shareholders. When profits are retained, they are also reinvested in a bank account. When the profit/total assets ratio is high, it means that the bank's liquidity is high, which means that the liquidity risk is low (Aspachs, 1). ***Hypothesis 6: There is a negative relationship between liquidity risk and return/total assets (H_6).***

DR_t – Average Real Deposit Rate: When the bank's deposit rate decreases, the deposit flow will move to a place with higher interest rates. At that time, the domino effect will take place, causing customers to suddenly withdraw their deposits but other loans and receivables have not been due to be settled, causing the bank to temporarily lose liquidity. When deposit interest rates are high, banks will limit their holding of highly liquid and low-profit assets because those assets are not profitable enough for the bank to ignore. This increases the bank's liquidity risk. ***Hypothesis 7: There is a negative relationship between liquidity risk and average real deposit rate (H_7).***

IR_t – Real Interbank Interest Rate: According to Dinger (5), real interbank interest rate is an index to measure liquidity costs in the banking system. The real interbank rate is determined as the net value between the 1-month interbank rate and annual inflation. When banks need liquidity to pay their due debts, banks can mobilize capital from external sources with high interest rates but can also borrow through the interbank market with cheap capital. Therefore, the interbank interest rate reflects the liquidity status of the banking system and is continuously updated by the central bank. ***Hypothesis 8: There is a positive relationship between liquidity risk and real interbank interest rate (H_8).***

SMR_t – market Interest Rate Volatility Index: According to Dinger (5), the market interest rate volatility index is measured by the standard deviation of the 1-month term interbank market interest rate, this index is given on the liquidity shortage of the whole banking system. Thereby, investors and policy makers can observe the situation of the currency market. According to Von Hagen and Ho (10); Dinger (5) research shows that the market interest rate and the liquidity situation of the banking system have an inverse relationship, that is, when the market interest rate decreases, the liquidity of the banking system is good and risky liquidity is minimized. ***Hypothesis 9: There is a positive relationship between liquidity risk and market interest rate volatility index (H_9).***

GDP_t – Economic Growth: In good and stable economic conditions, people will have excess capital and save more, the liquidity of banks will be stable. But on the contrary, when the economy is exhausted, loans with bad debts are difficult to recover, affecting debt recovery. When the payables are due, the bank's liquidity is not enough to meet the customer's withdrawal demand, and the liquidity risk increases. ***Hypothesis 10: There is a negative relationship between liquidity risk and economic growth (H_{10}).***

NIM_t – the Difference Between Lending and Deposit Rates in the Industry: According to Aspachs et al. (1); Vodova (9); Bonfim and Kim (3) introduced the difference between lending interest rates and deposit rates of the whole industry as a new point for the research topic. When this difference is high, the amount of money mobilized is less and the loan disbursement is also less (because the deposit interest rate is quite low while the lending interest rate is quite high). But if this difference is low, it will affect the bank's profit. According to Vodova (9), NIM does not affect the liquidity of banks. But Bonfim and Kim (3) found that NIM and liquidity risk were inverse, while Aspachs et al (1) showed the same results. When NIM increases, it means that banks earn more money, which means that the bank's ROA also increases (Table 1).
Hypothesis 11: The difference between lending interest rates and deposit interest rates in the whole industry exists in the opposite direction. Liquidity risk (H_{11}).

Thus, the research model has the form:

$$LR = \beta_1 \mathbf{FOREIGN} + \beta_2 CR + \beta_3 SIZE + \beta_4 EQITY + \beta_5 LDR + \beta_6 ROA + \beta_7 DR + \beta_8 IR + \beta_9 SMR + \beta_{10} GDP + \beta_{11} NIM + \varepsilon$$

The study is based on unbalanced panel data. The data is compiled from Financial Statements, Annual Reports of 30 commercial banks for the period from 2009 to 2020.

To conduct a Bayesian analysis, a priori information is required for the research model, but since most of the prior research was performed using a frequency approach, a priori information is not available. However, with the research data of 30 banks in the period 2009–2020, the number of observations is very large, so the priori information does not have a great influence on the posterior distribution. In this case, Block et al. (2011) proposed a standard Gaussian distribution with different a priori information (simulation of a priori information) and carried out Bayesian factor analysis to choose a simulation with the best previous information.

The simulations in Table 2 show decreasing levels of a priori information with Simulation 1 having the strongest a priori information and Simulation 5 having the weakest a priori information.

In the next step, the author carried out Bayesian regression for the above simulations, then performed Bayesian factor analysis and Bayestest model. These are the techniques proposed by StataCorp LLC (2019) to select the simulation with the best a priori information. Basically, the Bayesian factor will provide a tool to compare the probability of a particular hypothesis (a priori information) to the probability of another hypothesis. It can be understood as a measure of the strength of evidence in favor of a theory among competing (information a priori) theories. Accordingly, Bayesian analysis will provide average Log BF (Bayes Factor - Bayes factor), Log ML (Marginal Likelihood - marginal likelihood) and average DIC (Deviance Information Criterion - information bias); The posterior Bayesian test will help compare the posterior probability of the simulations with different a priori information, accordingly, based on the research data combined with the proposed a priori information, we will choose The simulation has the greatest posterior probability P(M|y).

In summary, in this study, the research team will build 5 simulations with 5 different a priori information, and Bayesian factor analysis and posterior Bayes test will help to choose a simulation with suitable a priori information. The simulation selected will be

Table 1. The data used in the research model

Description	Variable	Formula	Expectation
Dependent variable			
Liquidity risk	LR	$\frac{\text{Loans}}{\text{Total Assets}}$	
Independent variable			
Foreign ownership ratio	FOREIGN	$\text{FOREIGN} = \frac{\text{Shares of foreign shareholders}}{\text{Total number of shares issued}}$	−
Credit risk	CR	$\frac{\text{Provision for credit risks}}{\text{Total Assets}}$	+
Bank size	SIZE	Log (Total Assets)	−
Equity ratio	EQUITY	$\frac{\text{Equity}}{\text{Total Assets}}$	−
Lending/depositing ratio	LDR	$\frac{\text{Lending}}{\text{Depositing}}$	+
Profit to total assets	ROA	$\frac{\text{EAT}}{\text{Total Assets}}$	−
Average real deposit rate	DR	12-month term deposit interest rate – Annual inflation	−
Real Interbank Interest Rate	IR	1-month term interbank interest rate – Annual inflation	+
Market interest rate volatility index	SMR	$\sqrt{\frac{1}{n}\sum_{i=1}^{n}\left(IR_i - \overline{IR}\right)^2}$	+
Economic growth	GDP	Log (GDP)	−
The difference between lending and deposit rates in the industry	NIM	Loan interest rate – Deposit interest rate	−

Note: + is the positive effect, - is the opposite effect
Source: Compiled by the author

the one with the largest Log BF, Log ML average, minimum DIC mean and the largest P(M|y).

4 Research Results and Discussion

Table 3 shows that simulation 1 meets the criteria to be the most suitable priori information simulation. Moreover, the results of post-test also show that simulation 1 has superiority over other simulations, so simulation 1 with a priori information N (0, 1) will be selected.

Bayes analysis is simulated through the Markov chain Monte Carlo (MCMC), therefore, to ensure the stability of the Bayesian regression, the MCMC series must converge, which means that the MCMC series must ensure stationarity. StataCorp LLC (2019) proposes that the MCMC series convergence test can be conducted through the convergence diagnostic graph.

Table 2. Simulation of a priori information

Rational function	$LR \sim N(\mu, \sigma)$
A priori distribution	
Simulation 1	$\alpha \sim N(0, 1)$ $\sigma^2 \sim Invgamma(0.01, 0.01)$
Simulation 2	$\alpha \sim N(0, 10)$ $\sigma^2 \sim Invgamma(0.01, 0.01)$
Simulation 3	$\alpha \sim N(0, 100)$ $\sigma^2 \sim Invgamma(0.01, 0.01)$
Simulation 4	$\alpha \sim N(0, 1000)$ $\sigma^2 \sim Invgamma(0.01, 0.01)$
Simulation 5	$\alpha \sim N(0, 10000)$ $\sigma^2 \sim Invgamma(0.01, 0.01)$

Source: Compiled by the author

Table 3. Bayes Factor analysis results

	Chains	Avg DIC	Avg log (ML)	Log (BF)	P (Mly)
SALEG1	3	−884.4302	409.2040		0.9299
SALEG2	3	−891.2087	406.6183	−2.5857	0.0701
SALEG3	3	−890.8738	394.7687	−14.4353	0
SALEG4	3	−890.7863	381.2600	−27.9440	0
SALEG5	3	−890.7615	367.4591	−41.7450	0

Source: Calculations of the author

According to StataCorp LLC (2019), the MCMC series convergence diagnostic graph includes trace plot, histogram, autocorrelation, and density plot. The trace plot helps to track the historical display of a parameter value over the iterations of the series, Fig. 1 shows the trace plot fluctuates around the mean value, so the MCMC series is stationary, that is, reaching convergence conditions. Besides, the autocorrelation chart in the graphs only fluctuates around the level below 0.02, according to StataCorp LLC (2019) the autocorrelation chart fluctuates around the level below 0.02, showing the agreement with the density the distribution and reflect all delays that are within the effective limit. According to StataCorp LLC (2019), the posterior distribution plot and density estimate show that the simulation of the shape of the normal distribution of the parameters, the histogram shape is uniform, it can be concluded that Bayes regression ensure stability. Thus, the results from Fig. 1 show that the MCMC series meets the convergence condition.

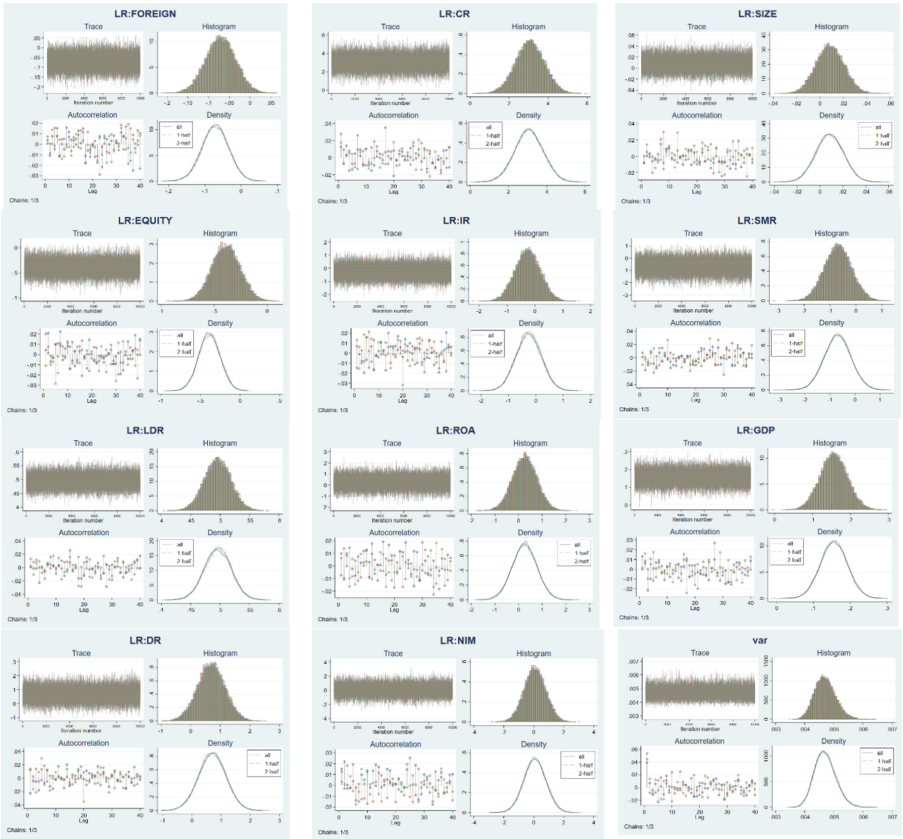

Fig. 1. Convergence diagnostic graph. Source: Calculations of the author

In addition to graphical convergence diagnostics, StataCorp LLC (2019) also recommends testing through Mean Acceptance Rate; Average minimum efficiency; and Gelman-Rubin Rc max. Table 4 shows that the model's acceptance rate reaches 1, the model's minimum efficiency is 0.91, far exceeding the allowable level of 0.01; In addition, the maximum Rc value of the coefficients is 1, Gelman and Rubin (1992) argue that the diagnostic value Rc of any coefficient of the model greater than 1.2 will be considered non-convergent. Thus, the values in Table 4 show that the MCMC series of the model satisfy the convergence requirements.

Regression results in the Table 4 have identified the variables FOREIGN and EQUITY have negative impact on liquidity risk (LR) while the variable CR, LDR, GDP increase liquidity risk. Besides determining the sign of the regression coefficients, unlike the frequency method, the Bayes approach also allows us to calculate the probability of the occurrence of these effects (Table 5).

The results show the probability that when the foreign ownership ratio (FOREIGN) is higher, the liquidity risk (LR) of Vietnamese joint stock commercial banks tends to decrease, that is, the foreign ownership ratio tends to increase with a probability of

Table 4. Regression results

	Mean	Std. Dev	MCSE	Median	Equal-tailed	
					[95% Cred. Interval]	
FOREIGN	−0.0712	0.0364	0.0002	−0.0712	−0.1426	−0.0004
CR	3.0656	0.7403	0.0044	3.0649	1.6029	4.5038
SIZE	0.0085	0.0119	0.0001	0.0084	−0.0147	0.0318
EQUITY	−0.3879	0.1340	0.0008	−0.3885	−0.6485	−0.1260
IR	−0.2617	0.4573	0.0027	−0.2617	−1.1499	0.6380
SMR	−0.6947	0.5305	0.0031	−0.6949	−1.7283	0.3508
LDR	0.4958	0.0224	0.0001	0.4959	0.4517	0.5395
ROA	0.2569	0.5193	0.0030	0.2585	−0.7609	1.2750
GDP	0.1556	0.0364	0.0002	0.1555	0.0846	0.2270
DR	0.6908	0.4647	0.0027	0.6922	−0.2340	1.6003
NIM	0.0702	0.7317	0.0043	0.0649	−1.3604	1.5042
_cons	−1.6052	0.3997	0.0023	−1.6043	−2.3940	−0.8202
var	0.0047	0.0004	0.0000	0.0047	0.0040	0.0055
Avg acceptance rate	1					
Avg efficiency min	0.9085					
Max Gelman-Rubin Rc	1					

Source: Calculations of the author

more than 97%. This result is consistent with the study of Hammami and Boubaker (2015); Laeven (1999); Demirgüç-Kunt and Huizinga (4). According to Terrell (8), by promoting competition in the domestic financial sector, foreign-invested commercial banks can indirectly promote efficiency. The supervisory and regulatory framework, lending standards and risk management of commercial banks have all been strengthened by commercial banks with foreign capital. Therefore, the smaller the liquidity risk of commercial banks, the greater their foreign ownership ratio. Research results show that foreign partners have a very good impact on liquidity management to reduce risks.

In addition, equity ratio (EQUITY) also has a negative effect on liquidity risk (LR), equity ratio tends to increase with a probability of more than 99%. This result is consistent with research expectations and in agreement with the studies of Bunda and Desquilbet (2008); Lucchetta (2007); Vodova (9); Vu Thi Hong (2015). Commercial banks tend to reduce risk when equity ratio is higher because the source of money for business operations is equity, which will affect investment and lending regulations. Commercial banks must ensure capital adequacy ratio as prescribed in Circular 41/2016/TT-NHNN and Circular 22/2019/TT-NHNN regulating capital adequacy ratio. Commercial banks are preparing to increase their own capital to meet the CAR requirement. The liquidity risk of a commercial bank will be reduced if it is highly capitalized as it will have a higher capital adequacy ratio and liquidity ratio.

Table 5. Probabilistic test

	Mean	Std. Dev	MCSE
{LR:FOREIGN} < 0	0.9758	0.1538	0.0009
{LR:CR} > 0	1.0000	0.0000	0.0000
{LR:SIZE} > 0	0.7594	0.4275	0.0025
{LR:EQUITY} < 0	0.9979	0.0454	0.0003
{LR:IR} < 0	0.7167	0.4506	0.0026
{LR:SMR} < 0	0.9042	0.2943	0.0017
{LR:LDR} > 0	1.0000	0.0000	0.0000
{LR:ROA} > 0	0.6901	0.4625	0.0027
{LR:GDP} > 0	0.9999	0.0082	0.0000
{LR:DR} > 0	0.9305	0.2544	0.0015
{LR:NIM} > 0	0.5356	0.4987	0.0029

Source: Calculations of the author

Another result is that credit risk (CR) has a positive effect on liquidity risk (LR) with 100% probability. This result is consistent with the author's expectation and the results of studies by Delécha et al. (2012); Phan Thi My Hanh and Tong Lam Vy (2019). This explains why commercial banks in Vietnam focus mainly on lending and have a high NPL ratio; The higher the level of bad debt, the better the commercial bank's performance. In other words, if provisioning increases, profits of commercial banks will also increase. Commercial banks often increase lending while reducing the proportion of holding high-liquid assets to achieve profit goals. Therefore, when credit risk increases, there is a risk that commercial banks will run out of liquidity. The research results also show how closely the risks in commercial banks are related, showing that the State Bank must act quickly to protect commercial banks when they are in danger. If a commercial bank is in jeopardy, depositors will suffer significant losses, which will reduce public confidence in the commercial banking sector and increase the likelihood of a collapse of the financial system.

Besides, the loan/deposit ratio (LDR) is positively related to liquidity risk (LR) with the probability of 100%. This result is in line with the author's expectation and is consistent with the research results of Vu Thi Hong (2015); Bonfim and Kim (3). According to Golin (7), a larger ratio indicates that commercial banks are lending more than available capital. Therefore, if commercial banks lend too much while dealing with liquidity risk, it will be difficult to mobilize cheap capital, increasing liquidity risk. The author believes that when this ratio is low, commercial banks can easily mobilize capital from many different sources, including the commercial interbank market, issuing valuable papers, etc. increase their liquidity. Commercial banks allocate deposits to a certain extent between loans, investments and liquid assets in the market. Therefore, commercial banks will limit lending to liquid assets when this ratio is high, which indicates a high loan ratio, reducing the liquidity of commercial banks.

Bayesian regression results show that economic growth (GDP) positively affects liquidity risk (LR), the level of impact is very obvious when the probability is more than 99%. This result is contrary to the author's expectation but is consistent with the Bunda and Desquilbet (2003); Vodova (9); Cucinelli (2013). Vietnam's economy still has many risks, loans are not well secured, bad debt ratio is still high, it is difficult for commercial banks to recover debts. Therefore, the liquidity of commercial banks is also significantly affected. In addition, because commercial banks are the main source of capital for businesses during times of rapid economic expansion, they often cut their current assets while increasing lending, which increases the risk liquidity risk.

5 Conclusion and Policy Implications

From the research results and the reality of Vietnam's economy, the article argues that increasing the foreign ownership ratio to reduce liquidity risk in Vietnamese commercial banks is completely grounded in the integration period and developed as it is today. In credit institutions, the "rich" and "poor" banks have a clear division, so the state banks as well as the Government need to have a specific roadmap for each different group of banks in the banking system.

For groups of banks that operate inefficiently and have a high level of risk, the maximum ceiling to consider on the foreign ownership ratio can be as high as 100%. The reason is due to:

Firstly, the bank is a tool to help the state bank manage the currency in the economy, so if it operates inefficiently, it needs to be restructured comprehensively. When banks are weak, risks to the whole industry may occur due to the domino effect and crowd psychology that will cause people to go to bank branches to withdraw money to choose a safer investment channel. When the liquidity in the whole system is not enough, the crisis will happen like 2008.

Secondly, the self-restructuring resources of this group are almost non-existent because it is difficult to find a strategic partner with a maximum ownership level of only 30%, not enough 36% to have enough power to veto ineffective policies as well as to control ineffective policies like 51% to have the right to dominate the bank. Therefore, the 30% level is not really effective.

Thirdly, foreign investors when investing in a risky market like Vietnam are quite afraid as well as when banks operate inefficiently, investors have to choose other partners with a high level of stability and lower risk. Therefore, the foreign ownership rate at 30% will not attract strategic partners for this group of banks.

Fourthly, according to Clause 2, Article 149 of the Law on Credit Institutions 2010, it is stipulated: "The State Bank has the right to request the owner to increase capital, formulate and implement a restructuring plan or force a merger …, consolidation or acquisition for a specially controlled credit institution, if the owner is unable or unable to carry out the capital increase". Therefore, the 100% ceiling is suitable for this group of banks.

For a group of banks with normal operations, the foreign ownership ceiling should be carefully considered between political and economic goals. The maximum political goal should be only 49% to avoid being taken over and dominate the entire financial market,

as well as creating autonomy for the economy to avoid being too dependent on foreign countries. The economic objective is to use foreign capital to improve equipment, modern technology, information security regime and improve human resources. In addition, the capital increase also helps banks complete the race to meet Basel II standards according to the set schedule.

For state-owned commercial banks, as the leading role in leading the entire banking system, the foreign ownership level of 0% is quite reasonable and does not need to be adjusted.

Besides, the research results show that liquidity risk and credit risk have a positive impact with a very large intercept. That is, liquidity is greatly affected by the debt collection ability of banks. Banks need to have policies to manage and handle bad debts as well as improve credit quality. To prevent problem debt, banks must improve the quality of inspection and supervision before, during and after lending.

The research results also show that the equity ratio has a negative impact on the bank's liquidity risk, that is, the higher the equity, the lower the liquidity risk. When the equity ratio increases, the bank will be less dependent on mobilized funds, reducing liquidity pressure. When equity increases, in addition to msueeting Basel II standards, it also ensures the liquidity of banks for due deposits.

In addition, the loan/deposit ratio has a positive impact on liquidity risk. Most commercial banks in Vietnam only focus on lending mainly when the loan ratio accounts for more than 70% compared to other products and services at the bank, so the risk is quite large when bad debts increase. This means that the liquidity of the bank is vulnerable to serious damage. On the other hand, banks make profits based on NIM mainly without diversifying their own income, making their dependence on lending rates even higher. Therefore, in order to reduce liquidity risk, the bank must reduce the lending ratio, which means that the bank must implement policies to diversify income as well as use mobilized capital effectively.

Finally, the research results show that economic growth has a positive impact on liquidity risk. To minimize risks as well as attract foreign investors, first of all, information on the market needs to be transparent. In addition, the State Bank should have policies to help commercial banks manage bad debts and deal with problem debts. The bigger the economic growth, the more developed the economy and then the liquidity risk will be reduced.

References

Aspachs, O., Nier, E.W., Tiesset, M.: Liquidity, banking regulation and the macroeconomy (2005). Available at SSRN 673883

Athanasoglou, P., Delis, M., Staikouras, C.: Determinants of bank profitability in the South Eastern European region (2006). MPRA Paper No. 10274

Bonfim, D., Kim, M.: Liquidity risk in banking: is there herding. In: European Banking Center Discussion Paper, vol. 24, pp. 1–31 (2012)

Demirgüç-Kunt, A., Huizinga, H.: Determinants of commercial bank interest margins and profitability: some international evidence. World Bank Econ. Rev. **13**(2), 379–408 (1999)

Dinger, V.: Do foreign-owned banks affect banking system liquidity risk? J. Comp. Econ. **37**(4), 647–657 (2009)

Duttweiler, R.: The meaning of liquidity risk. Chapter 1, 10–11 (2009)
Golin, J.: The Bank Credit Analysis Handbook: A Guide for Analysts. In: Bankers and Investors. Wiley, Hoboken (2001)
Terrell, H.S.: The role of foreign banks in domestic banking markets. In: Federal Reserve Bank of San Francisco Proceedings, pp. 297–304 (1984)
Vodova, P.: Liquidity of Czech commercial banks and its determinants. Int. J. Math. Model. Meth. Appl. Sci. **5**(6), 1060–1067 (2011)
Von Hagen, J., Ho, T.K.: Money market pressure and the determinants of banking crises. J. Money Credit Bank **39**(5), 1037–1066 (2007)
Nguyen, T.X.H., Pham, T.H., Dao, T.N., Nguyen, T.N., Tran, T.K.N.: The impact of foreign ownership and management on firm performance in Vietnam. J. Asian Finance Econ. Bus. **7**(9), 409–418 (2020)
Kusi, B.A., Kriese, M., Nabieu, G.A.A., Agbloyor, E.K.: Bank ownership types and liquidity creation: evidence from Ghana. J. Afr. Bus. **23**, 568–586 (2021)
Le, T.: Can foreign ownership reduce bank risk? Evid. Vietnam. SSRN Electr. J. (13) (2021)
Al-Harbi, A.: Determinates of Islamic banks liquidity. J. Islamic Account. Bus. Res. **11**(8), 1619–1632 (2020)