



Liquidity risk, macroprudential regulation and bank performance: empirical evidence from Vietnamese commercial banks

Nguyen Tri Minh¹

University of Economics Ho Chi Minh City, Ho Chi Minh City, Vietnam

Tran Ngoc Tho

University of Economics Ho Chi Minh City, Ho Chi Minh City, Vietnam

Nguyen Huu Tuan

SSI Securities Corporation, Ho Chi Minh City, Vietnam

Received: 07 October 2021; **Revised:** 10 May 2022; **Accepted:** 18 May 2022

<https://doi.org/10.38203/jiem.022.2.0045>

Abstract

This paper attempts to bridge the gap in the literature on the effects of liquidity risks and macroprudential policies on the performance of domestic banks in Vietnam. The two-way fixed effects and fixed effects generalized least squares methods were employed to analyze panel data from 31 Vietnamese commercial banks from 2006 to 2020. The results show that the liquid assets to total assets ratio has a positive effect on bank performance, which is measured by net interest margin. Stricter macroprudential regulations, which are represented by the short-term funding for mid-to-long-term loans ratio, improve domestic banks' performance when taking the increase of foreign bank presence into account.

Keywords: Bank performance, Liquidity risk, Short-term funding for mid-to-long-term loans, Regulation, Vietnam

1. Introduction

Previous studies have shown that bank performance can be affected not only by banking sector-specific factors but by external ones as well (Demirguc-Kunt and Huizinga, 1999; Athanasoglou *et al.*, 2008; Dietrich and Wanzenried, 2014). Regarding the factors specific to the banking sector, the effect of liquidity risks on bank performance has gained more attention since the 2008 global financial crisis. A report by IMF (2011) points out that poor liquidity management and overdependence on short-term capital have led to rapid failures of many financial institutions.

¹ Corresponding author: minhntri@ueh.edu.vn

External factors such as the regulations issued by relevant authorities, the business environment, and institutions also affect bank performance. For an emerging economy as Vietnam, macroprudential policy tools have a significant effect on the performance of commercial banks. Macroprudential policy tools are employed alongside monetary policies to ensure the stability of the financial system (Borio and Shim, 2007; OECD, 2021). Therefore, macroprudential policy tools affect the performance of commercial banks. The short-term funding to mid-to-long-term loans (SFML) ratio is one tool that is unique to Vietnam. As domestic banks are highly dependent on short-term funding for liquidity, to boost performance they tend to use short-term capital to finance mid-to-long-term lending. SFML regulations limit these banks' ability to borrow by offering low-cost short-term deposit rates, causing their profits to drop. Such regulations strengthen the liquidity and stability of the entire system, which can be regarded as a positive externality that each individual bank can benefit from. Thus, the combined effect of SFML regulations on bank performance is an empirical exercise to be addressed in this study.

Additionally, since Vietnam committed to opening its economy as required when joining the World Trade Organization (WTO), many foreign banks have been attracted to enter the domestic banking market. Compared to domestic banks, these foreign banks have the advantages of scale, product diversity, and managerial expertise. The presence of foreign banks can either increase the domestic banks' performance via the spillover effect or decrease it through the competition effect (Claessens *et al.*, 2001; Manlagnit, 2011). SFML has limited effects on foreign banks as they are less dependent on short-term capital than domestic banks. Therefore, we would like to address the performance of domestic commercial banks as the State Bank of Vietnam (SBV) is restricting the SFML limit, while the foreign banks are taking advantage of Vietnam's economy opening policy to expand their businesses.

Despite the extensiveness, prior research has not focused much on the possible effects of macroprudential policies on bank performance in Vietnam (Vu and Nahm, 2013; Trang and Tuan, 2015; Vinh and Thao, 2016; Tho *et al.*, 2019; Batten and Vo, 2019; Le *et al.*, 2021). Therefore, the findings of this study contribute to the debate on how bank performance is affected by liquidity risks as well as regulations.

The rest of this paper is organized as follows. Section 2 reviews the effects that liquidity risk and regulation may have on bank performance. Section 3 gives the details on the data and methodology. Section 4 shows the empirical results. Section 5 provides the conclusion and policy implications.

2. Liquidity risk, regulation, and bank performance

2.1 Measures of liquidity risk

Liquidity is the ability of a bank to have sufficient cash for lending and fulfilling withdrawal requests of its customers with reasonable costs and processing times. Liquidity risks can be defined as the risks where a bank fails to acquire enough cash when needed. A bank typically raises cash by the means of borrowing or sale of financial assets (Bessis, 2015). The banks

with a high liquidity risk have insufficient funds to make payments that are soon to be due or to meet an unexpected surge in demand for withdrawals (Saleh and Abu Afifa, 2020). The failures of Northern Rock in 2007 and Lehman Brothers in 2008 are prominent examples of liquidity risks in the banking system.

Various liquidity ratios were used in many prior studies to measure liquidity risks. Barth *et al.* (2003) and Demirguc-Kunt *et al.* (2003) use liquid assets to total assets ratio. Shen *et al.* (2001) use liquid assets to deposits ratio while Kosmidou *et al.* (2005) employ liquid assets to customer and short-term funding. These ratios use liquid assets for calculation, and higher ratio values mean more liquidity for banks.

Demirguc-Kunt and Huizinga (1999) and Athanasoglou *et al.* (2006) use the total assets ratio, while Pasiouras and Kosmidou (2007), Kosmidou (2008), Ben Naceur and Kandil (2009) employ net loans to customer and short term funding ratio. In these studies, higher ratio values mean less liquidity.

Aside from ratios, there are alternative methods of liquidity risk measurement, which are not only quantitative but also qualitative (Cornett and Saunders, 2003; Matz and Neu, 2007). One of such is the quantitative method suggested by Basel Committee on Banking Supervision (BCBS, 2000) refers to maturity laddering.

2.2 The possible effects of liquidity risks on bank performance

Liquidity risks can affect a bank's performance. In some cases, high liquidity risks lead to bank failure. The loss of liquidity causes banks to seek more expensive sources of capital, increase costs, and thus decrease profit in the process. A bank's capital structure could be imbalanced due to its borrowings for the purpose of fulfilling the withdrawal requests of its customers. The borrowed capital could eventually affect its profits. High liquidity risks also turn customers away, as they may refuse to make new deposits and even withdraw money from banks, making the banks' liquidity risks worsen and profit plummets further. Other than borrowing more, banks may also have to sell their assets to increase liquidity. Since banks need prompt selling deals, it is possible that a substantial discount may be offered to the buyers. Thus, the bank's income is affected. Nonetheless, when a bank needs to meet the liquidity requirement, which is specified by the central bank, low liquidity reserves, i.e., high liquidity risks, lower the cost of capital, leading to more available capital for the bank to spend and increase income. In this case, liquidity has a positive effect on bank performance.

While some studies find that banks' willingness to take risks can strongly influence their performance, the results concerning liquidity risks are limited (Stiroh, 2004). Ben Naceur and Kandil (2009) find an inverse relationship between profitability and the number of liquid assets, which supports the previous findings that the loans to deposits ratio and net interest margin have a significant direct relationship (Pasiouras and Kosmidou, 2007; Chortareas *et al.*, 2012). Meanwhile, Demirguc-Kunt *et al.* (2003), utilizing the liquid asset to total asset ratio, discover that banks with more liquid assets have less net interest margin than those with less. More liquidity also leads to less interest margin when the deposit market is competitive. Ly (2015)

discovers that liquidity risk ratio has an inverse relationship with bank performance and banks holding more liquid assets are not likely to gain more profits. Chen *et al.* (2018) find that bank profitability can be dampened by liquidity risks because the banks with larger financing gap is dependent on liquid assets or considerable external funding to fulfill the demand of funds. They also find that liquidity risks lead to a rise in net interest margin, implying that the banks having a higher level of liquid assets in loans can earn more interest income.

2.3 Possible effects of regulations on bank performance

Barth *et al.* (2006) propose that supervisory regulations improve bank efficiency and performance since they regulate market failures and direct banks to meet the common goal of the economy. Ly (2015) also discovers that capital regulations increase bank performance. Meanwhile, Ayadi *et al.* (2016) suggest that prudential regulations reduce bank efficiency as they limit banks' ability to allocate their capital in the most efficient way. Macroprudential policies have attracted more attention since the 2008 global financial crisis, especially in emerging economies. Those policies were created for the purpose of decreasing the probability of another financial crisis occurring, or at least reducing the impact of such a crisis if it happens (Boar *et al.*, 2017). Recently, Gaganis *et al.* (2021) have an in-depth evaluation of the effects of macroprudential and consumer protection policies on bank efficiency. The study shows that the effect of macroprudential policies is unclear. Such policies decrease the likelihood of a crisis or its contagion in the banking system, earn public trust, and hence increase stability and sustainability of the banking system. Eventually, macroprudential policies lead to lower costs of capital and increase in bank efficiency. However, macroprudential policies challenge banks' expanding ability and create extra costs for them to comply with the supervisory regulations. Therefore, in reality, the net effect of the macroprudential policies depends on which one of those aforementioned effects is more dominant.

Macroprudential tools are created based on the authorities' viewpoint. In this paper, the SFML limit is one of such tools, which is created by the SBV to control the use of short-term funding for mid-to-long-term lending among commercial banks. The reasons for the domestic banks' dependency on short-term funding are its low cost and the fact that the mid-to-long-term interest rates tend to be higher than short-term ones. The strategy of short-term funding boosts the banks' profit, but also leads them to a crisis if there is a disturbance in the financial system. The profit of a bank will decrease when it has to seek for more expensive capital to boost liquidity, which is accompanied by higher liquidity risks. Therefore, regulations are needed for the Vietnamese banks to be less dependent on short-term capital and prevent maturity mismatch caused by the aforementioned strategy. In the long term, lowering the SFML limit encourages banks to diversify their capital structures, and become more selective in giving loans to stimulate credit growth. This can lead to improvement in bank performance and a robust financial system.

The SFML ratio has been used since 1999 (SBV, 1999). In 2019, banks must lower their proportions of mid-to-long-term loans funded by short-term liabilities from the previous upper limit of 60% to no more than 40%. From 2023, those percentages must not exceed 30%

(SBV, 2019). When the SFML limit is lowered, intense debates between policymakers and domestic banks' executives occur.

While SFML can be seen as a useful macroprudential policy instrument in Vietnam, such instrument is rarely used in other countries. There is little empirical evidence on the effect of SFML on bank performance.

3. Methodology

3.1 Model and estimation method

This paper's model is partially based on the model employed by Ly (2015), and it can be summed up by the following equation:

$$NIM_{i,t} = \alpha + \beta_1 L_{i,t} + \beta_2 B_{i,t} + \beta_3 C_t + \beta_4 M_t + u_i + v_t + \varepsilon_{i,t} \quad (1)$$

where i represents bank and t represents time; L stands for the liquidity risk; B represents bank-specific characteristics; C stands for the degree of the SBV's macroprudential control; M consists of macroeconomic control variables; u is the bank fixed effect; v is the time fixed effect; and ε is the error term.

Net interest margin (NIM) was chosen as the dependent variable, which represents bank performance. In Vietnam, the main activities of domestic commercial banks are lending and borrowing. During the period when our data were collected, interest income contributed 80% to total bank income. Therefore, NIM is suitable for measuring bank performance in Vietnam. NIM has also been used as a bank performance indicator in the work of Claessens (2001) and Ly (2015). According to Chortareas *et al.* (2012), NIM represents the difference between how much a bank earns from borrowers and how much it pays its depositors. Greater NIM means that a bank's cost of funding is cheaper. The reason NIM was chosen instead of other commonly used bank performance variables such as return on assets (ROA) or return on equity (ROE) is that the business activities of commercial banks in Vietnam primarily involve loans and deposits. However, ROA was also used as an alternative dependent variable to test the model's robustness.

L was estimated using two different ratios. The first one is the liquid assets to total assets ratio (LIQUID), which covers cash on hand, gold, silver, and gemstone holdings, deposits with the SBV as well as other credit institutions, trading securities, and available-for-sale investment securities. The other alternative is the interbank ratio, which is the ratio of interbank assets to interbank liabilities (INTER). Higher values of LIQUID and INTER signify lower liquidity risks. According to Beltratti and Stulz (2009), an increase in liquid assets holdings may lead to less liquidity risk but at the cost of decreased return. Therefore, the liquidity measure variable may have a negative coefficient sign.

Vector B includes bank-specific variables. Loan (LOAN) is the primary asset of the banks. This variable is the ratio of loans to total assets. A larger loan balance can lead to more interest income (Lopez-Espinosa *et al.*, 2011). Furthermore, a larger loan balance also means higher

competitiveness and specialization, leading to lower costs and profitability (Manlagnit, 2011). Therefore, a positive coefficient is expected.

Deposit (DEPOSIT) is the ratio of deposit to total assets. Customer deposit is a source of profit opportunities for banks. Typically, as a bank raises more capital, its interest cost increases, which leads to a decrease in profit. However, according to the theory of pricing based on risk premium by Maudos and Solis (2009), a bank asks for a higher interest margin to compensate for increased costs. Furthermore, domestic firms are dependent on banks for capital, giving banks opportunities to demand higher interest rates. When banks have limited access to international capital or interbank markets, more deposits mean more stability and profit (Beltratti and Stulz, 2009; Ly, 2015). Hence, this variable is expected to have a positive coefficient.

Capital strength (EQUITY) is the equity to total asset ratio. Stronger capital enables a bank to borrow less and lend more, as well as increase its ability to absorb risk and hence profitability. Tan (2016) and Goddard *et al.* (2004) find evidence of a positive effect that capital has on bank profitability. Therefore, EQUITY is expected to have a positive sign.

Income diversification (INCDIV) is the ratio of non-interest income to gross revenue. Income diversification improves banks' profitability due to economies of scale (Klein and Saldenberg, 2000). Such relationship is also shown in the work of Baele *et al.* (2007) and Elsas *et al.* (2010). Besides, a bank uses diversification to carry out cross-financing (Maudos and Solis, 2009). In other words, when a bank chooses to diversify, it may tolerate a decrease in lending rate to improve its own competitiveness. Therefore, INCDIV is expected to have a negative relationship with NIM and a positive relationship with ROA.

Average operating costs (COST) is the ratio of operating costs to total assets. Banks with higher operating costs usually need higher profitability to compensate, leading to higher interest margin (Maudos and Fernandez de Guevara, 2004; Maudos and Solis, 2009). However, Athanasoglou *et al.* (2008) suggest that in Greece, well-managed banks decrease their operating costs, and increase their profitability. Therefore, the effect of operating costs on bank performance is either positive or negative.

Bank size (SIZE) is defined by the logarithm of total bank assets. Such measure was commonly used in previous studies on bank performance (Goddard *et al.*, 2004). According to Goddard *et al.* (2004), large banks reap benefits not only from economies of scale or scope, but also from their reputation, i.e., the inherent strength of their brand name. Their major status gives them regulatory protection against failure. Those factors give rise to a positive relationship between size and profitability. Hence, bank size is expected to have a positive coefficient.

Market power (LERNER) is represented by the Lerner index, ranging from zero to one. A number of studies have found the positive relationship between market power and NIM (Maudos and Solis, 2009; Fungacova and Poghosyan, 2011). Banks with considerable market power achieve greater net interest margins (Maudos and Solis, 2009).

It is determined by the difference between price and marginal cost per price unit. In their empirical research, Maudos and Fernandez de Guevara (2004) suggest using the average price of bank products, which is represented by total assets, to determine the Lerner index. The average price is total revenue including both interest and other incomes per total asset. The formula for Lerner index is shown below:

$$LI_i = \frac{(p_i - MC_i)}{p_i} \quad (3)$$

where p_i is the average price of i^{th} bank's products; MC_i is the marginal cost for each product unit, which is usually determined by a logarithmic cost function. According to Fungacova *et al.* (2010) with an assumption of symmetry and linear homogeneity restrictions in input prices, the total cost in banking is calculated as follows:

$$\ln C_{it} = \alpha_0 + \alpha_1 \ln TA_i + \frac{1}{2} \alpha_2 (\ln TA_i)^2 + \sum_{j=1}^2 \beta_j \ln w_{ji} + \frac{1}{2} \sum_{j=1}^2 \sum_{k=1}^2 \beta_{jk} \ln w_{ji} \ln w_{ki} + \frac{1}{2} \sum_{j=1}^2 \gamma_j \ln TA_i \ln w_{ji} + \varepsilon_{it} \quad (4)$$

where C_i is the total cost of i^{th} bank; TA_i is the income-generating assets of i^{th} bank; w_{ji} is the j^{th} input cost of i^{th} bank; w_j is determined by operating costs on total assets, which also includes labor costs, and interest costs on total deposits. Panel data with frontier estimation was also employed in order to find the necessary parameters for Equation (4). From there, the marginal cost (MC) can be found using the following equation:

$$MC = \frac{C}{TA} (\alpha_1 + \alpha_2 \ln TA + \sum_{j=1}^2 \gamma_j \ln w_j). \quad (5)$$

C stands for the SBV's macroeconomic regulations, which are represented by the SFML ratio:

$$SFML = \frac{\text{Mid-to-long-term loan balance} - \text{Mid-to-long-term capital}}{\text{Short-term capital}}. \quad (6)$$

The guidelines for calculating SFML are provided by the SBV and updated from time to time. However, the general regulations specify that the mid-to-long-term loan balance consists of loans that have more than one year to maturity. Mid-to-long-term capital consists of Tier I capital and capital with more than one year to maturity, but not deposits made by the State Treasury. Short-term capital is capital with one year to maturity or less, not including deposits made by the State Treasury as well as other credit institutions.

According to the collected data, most of the Vietnamese commercial banks' capital comes from demand and short-term, which is less than 12 months, deposits. Meanwhile, bank-sponsored projects, such as those in real estate, may have long payback periods. Therefore, slight control of short-term funding used for mid-to-long-term loans protects the financial system from collapsing in case of a real estate bubble bursting or economic downturn. Furthermore, this regulation also forces banks to seek long-term capital to balance their lending, as well as extend mid-to-long-term loans more carefully. Since the SBV requires all domestic banks' short-term funding used for mid-to-long-term loans not to exceed 60% of capital, which was lowered to 45% in 2018, domestic banks have to raise more mid-to-

long-term capital to decrease SFML and fulfill the aforementioned requirement. Despite this restriction, which has caused long-term deposit rates to rise, the domestic banks have to restructure their loan portfolios so that their efficiency can be improved. Therefore, SFML contributes to overcoming the widespread issues of adverse selection, non-performing loans, and moral hazards, increasing domestic banks' profitability in the process. Hence, SFML is expected to have a negative sign.

To reduce any potential bias in the aforementioned variables, macroeconomic variables are incorporated into this model and included in vector M. Vector M includes the following variables: FOREIGN, GGDP, MACGDP, ASSGDP.

Foreign bank presence (FOREIGN) is represented by the ratio of total foreign banks' assets to total domestic banks' assets, which denotes how influential the foreign bank branches are in the Vietnamese banking market. Foreign banks have increased their presence in Vietnam since the country joined the WTO in 2007. According to the SBV's annual report in 2018, Vietnam had nine wholly foreign-owned banks, two joint-venture banks and 49 subsidiaries of foreign banks. The same report also noted that the subsidiaries had the total assets of 1,136,614 billion VND, which is approximately 14.44% of total assets of the domestic banks in our sample. The entry of foreign players into the Vietnamese banking sector means increased competition between banks operating in Vietnam as a whole. This causes the domestic banks to adjust their business strategies and management style to be more efficient. According to Demirguc-Kunt and Huizinga (1999), in developing countries, foreign banks have greater interest margins than those of domestic banks', while in developed countries, the situation is reversed. In Vietnam, Tho *et al.* (2017) show that the increasing foreign bank presence lowers returns on assets of domestic banks, which is due to the competition effect. Therefore, foreign bank presence may have a negative sign.

GDP growth (GGDP) is annual GDP growth. By extension, it also implies how efficient a country's existing legal environment and supervision is (Demirguc-Kunt and Detragiache, 2002).

MACGDP is calculated by stock market capitalization per GDP. ASSGDP is computed by total assets of banks per GDP. The way that the stock market capitalization value is calculated is similar to the method employed by the World Bank. MACGDP represents the equity market size and the role of that market in financing the economy (Naceur and Omran, 2011). ASSGDP symbolizes the banking industry's state of development and the vital role of bank financing in the economy (Pasiouras and Kosmidou, 2007). Therefore, the coefficients of the two aforementioned financial development variables can be positive or negative.

The relationships between dependent and explanatory variables are shown in Table 1.

Table 1. Details of variables and their expected impacts on the bank's interest margin

Variables	Notation	Description	Expected impact
Bank performance	NIM	Net interest income to total assets	Dependent variable
Bank performance	ROA	Profit before tax to total assets	Dependent variable
Liquidity risk	LIQUID	Ratio of liquid assets to total assets	-
Liquidity risk	INTER	Ratio of interbank assets to interbank liabilities	-
Loan	LOAN	Ratio of loans to total assets	+
Deposit	DEPOSIT	Ratio of deposit to total assets	+
Capital strength	EQUITY	Ratio of equity to total assets	+
Income diversification	INCDIV	Ratio of non-interest income to gross revenue.	- [+] ^a
Average operating costs	COST	Ratio of operating costs to total assets	+/-
Market power	LERNER	Lerner index	+
Bank size	SIZE	The logarithm of total bank assets	+
Foreign bank presence	FOREIGN	Ratio of total foreign banks' assets to total domestic banks' assets	-
Regulation	SFML	Ratio of short-term funding for mid-to-long-term loans	-
GDP growth	GGDP	Annual GDP growth	+/-
State of financial development	MACGDP	Stock market capitalization per GDP	+/-
State of financial development	ASSGDP	Total assets of banks by GDP	+/-

Notes: ^aINCDIV is expected to have a negative effect on NIM and a positive effect on ROA.

Source: The authors' summary

The unbalanced panel data, which consists of 417 observations, came from 31 domestic commercial banks from 2006 to 2020. Two-way fixed-effect (FE) and fixed-effect generalized least squares (FE-GLS) estimation methods were employed in accordance with Wooldridge (2002) to address the limitations of panel data. Robust estimation of variance was also carried out, which is based on Huber (1967) and White (1980, 1982).

3.2 Data

The bank-specific data were collected from the banks' publicized information, as well as the website of SSI Securities Corporation. The other variables were gathered from the SBV's website, the General Statistics Office of Vietnam (GSO), and the Ho Chi Minh City Stock Exchange (HOSE). The time period covered by this research is from 2006 to 2020. This time period is chosen because only a few Vietnamese commercial banks have disclosed their own business

and financial data before 2006. According to the SBV (2018), by the end of 2018, Vietnam had two joint-venture, nine foreign and 35 domestic commercial banks. As joint-venture and foreign banks do not fully disclose their financial data, the sample covers the domestic ones only.

While the global financial crisis occurred and severely affected major banks in the United States and Europe during the study period, most Vietnamese commercial banks not only came out unscathed but also reaped considerable profits. The prime examples are Vietcombank, Joint Stock Commercial Bank for Investment and Development of Vietnam (BIDV), and Asia Commercial Bank (ACB). A number of state-owned banks even decided to equitize during the crisis such as Vietcombank in late 2007 or VietinBank in late 2008. Therefore, the global financial crisis did not have any significant effect on Vietnamese commercial banks.

Table 2. Descriptive statistics

Variables	Obs.	Mean	Std. Dev.	Min	Max
NIM	417	0.026	0.011	0.006	0.081
ROA	417	0.012	0.009	0.000	0.066
LIQUID	417	0.312	0.122	0.097	0.635
INTER	417	1.218	1.369	0.002	10.225
LOAN	417	0.548	0.130	0.225	0.797
DEPOSIT	417	0.669	0.123	0.278	0.905
EQUITY	417	0.103	0.060	0.029	0.385
INCDIV	417	0.016	0.053	(0.005)	0.378
COST	417	0.016	0.005	0.006	0.033
LERNER	417	0.695	0.101	0.290	0.928
SIZE	417	11.200	1.393	7.187	14.232
FOREIGN	417	0.139	0.018	0.081	0.163
SFML	417	0.415	0.112	0.300	0.600
DSFML	417	-0.001	0.091	(0.300)	0.100
FOREIGN/SFML	417	0.362	0.112	0.202	0.544
GGDP	417	0.061	0.010	0.029	0.078
MACGDP	417	0.313	0.163	0.096	0.640
ASSGDP	417	1.684	0.537	0.706	2.417

Source: The authors' calculation

To eliminate irregularities in the sample, the variables were trimmed at the 1th and 99th percentiles before carrying out estimations. Table 2 shows the descriptive statistics of collected data after winsorizing.

The average NIM of Vietnamese commercial banks is about 2.6% and most banks have NIM values close to the mean value. Meanwhile, LIQUID has a mean value of 31.2% with

the maximum value of 63.5% and minimum value of 9.7%. Despite this wide variability, most banks' LIQUID values are close to the mean value.

Regarding INTER, its mean value is 1.292. However, unlike LIQUID, the values of INTER are not close to the mean value. Furthermore, 60.1% of INTER observations have values smaller than 1, implying that in the interbank market, it's more common for domestic banks to borrow than lend. The INTER values also show that domestic commercial banks are exposed to considerably high liquidity risks. In addition, the data show that large state-owned banks such as Vietcombank, BIDV and VietinBank have been maintaining their lender position in the interbank market. Table A.1 in the Appendix shows ten observations with the highest INTER values. Eighty percent of this group has NIM close to the mean value, which supports the hypothesis that NIM is low when INTER is high.

In the years from 2006 to 2020, the SBV changed policies five times and SFML was kept at 40% at the end of 2020. Until the end of that year, this requirement had only been applied to the domestic banks. The SBV reduced SFML to 30% in 2009, which remained constant until 2013, to ensure the banking sector's safety, especially with regards to bank liquidity.

As most of the correlation coefficients of the employed variables are smaller than 80%, except the one between SFML and SFML/FOREIGN, multicollinearity is unlikely to occur (Gujarati, 2003), and the outlying correlation was addressed by replacing SFML with its first difference (DSFML) whenever SFML/FOREIGN was included in the estimations.

4. Results

4.1 *Effect of liquidity risk and regulation on bank performance*

Tables 3 and 4 show the results of Model (1) using FE and FE-GLS methods, respectively. In these tables, Columns (1) and (2) present the results when LIQUID is applied as the liquidity measure. Contrary to the prior expectation, LIQUID has a significant positive effect on bank performance at 1% level, implying that the domestic banks which are less exposed to liquidity risks have better performance. Bourke (1989) also finds significant evidence on such relationship. A possible reason is that as banks hold liquid assets as a way to fulfill capital safety requirements, the opportunity costs are high, making banks require higher NIM to improve their performance. Furthermore, in the Vietnamese market, the banks with high liquidity have higher chance of credit growth, as they satisfy the regulations and earn the trust of their customers. This also helps those banks earn more from loan interests. According to Columns (3) and (4) of Table 3 and Table 4, INTER has a negative effect on bank performance. However, the coefficient values of INTER are rather small and not statistically significant in both tables.

Columns (1) and (3) of Tables 3 and 4 show that SFML and bank performance have a negative relationship at 1% significance, implying that stricter regulations, for example decreased SFML, lead to better bank performance. This also means that SFML is a useful tool for the SBV in monetary policies.

Table 3. Results from FE method with NIM as dependent variable

VARIABLES	Expected impact	(1)	(2)	(3)	(4)
		NIM	NIM	NIM	NIM
LIQUID	-	0.020*** (0.005)	0.021*** (0.005)		
INTER	-			-9.88e-05 (0.000)	-0.000 (0.000)
LOAN	+	0.033*** (0.005)	0.034*** (0.006)	0.020*** (0.004)	0.020*** (0.004)
DEPOSIT	+	-0.022*** (0.005)	-0.021*** (0.005)	-0.023*** (0.006)	-0.023*** (0.006)
EQUITY	+	0.051*** (0.014)	0.053*** (0.015)	0.049*** (0.015)	0.052*** (0.015)
INCDIV	-	0.023** (0.009)	0.022** (0.009)	0.027*** (0.009)	0.026*** (0.008)
COST	+/-	1.284*** (0.189)	1.307*** (0.188)	1.249*** (0.194)	1.272*** (0.193)
LERNER	+	0.029*** (0.007)	0.026*** (0.007)	0.029*** (0.007)	0.025*** (0.007)
SIZE	+	0.007*** (0.001)	0.007*** (0.001)	0.007*** (0.001)	0.007*** (0.001)
FOREIGN	-	-0.040*** (0.014)	-0.120*** (0.028)	-0.045*** (0.015)	-0.122*** (0.031)
SFML	-	-0.021*** (0.003)		-0.021*** (0.004)	
DSFML	-		-0.003 (0.003)		-0.003 (0.003)
FOREIGN/SFML	+/-		0.026*** (0.006)		0.026*** (0.006)
GGDP	+/-	0.138*** (0.047)	0.134*** (0.047)	0.142*** (0.046)	0.137*** (0.046)
MACGDP	+/-	-0.025*** (0.004)	-0.018*** (0.003)	-0.021*** (0.004)	-0.014*** (0.003)
ASSGDP	+/-	-0.003 (0.002)	-0.005** (0.002)	-0.004* (0.002)	-0.006** (0.002)

Table 3. Results from FE method with NIM as dependent variable (*continued*)

VARIABLES	Expected impact	(1)	(2)	(3)	(4)
		NIM	NIM	NIM	NIM
Constant		-0.096*** (0.020)	-0.104*** (0.020)	-0.075*** (0.019)	-0.082*** (0.019)
Observations		417	417	417	417
R-squared		0.638	0.634	0.620	0.615
Number of banks		31	31	31	31
Fixed year		Yes	Yes	Yes	Yes
Fixed bank		Yes	Yes	Yes	Yes
AR1		No	No	No	No

Notes: Standard errors in parentheses; *, **, *** indicates statistical significance at 10%, 5%, and 1%, respectively.

Source: The authors' calculation

Table 4. Results from FE-GLS method with NIM as dependent variable

VARIABLES	Expected impact	(1)	(2)	(3)	(4)
		NIM	NIM	NIM	NIM
LIQUID	-	0.018*** (0.003)	0.019*** (0.003)		
INTER	-			-0.000 (0.000)	-0.000 (0.000)
LOAN	+	0.027*** (0.004)	0.028*** (0.004)	0.013*** (0.003)	0.013*** (0.003)
DEPOSIT	+	-0.018*** (0.002)	-0.018*** (0.002)	-0.018*** (0.003)	-0.017*** (0.003)
EQUITY	+	0.036*** (0.007)	0.037*** (0.007)	0.039*** (0.007)	0.040*** (0.007)
INCDIV	-	0.023*** (0.006)	0.022*** (0.006)	0.028*** (0.006)	0.027*** (0.007)
COST	+/-	1.247*** (0.083)	1.270*** (0.083)	1.171*** (0.084)	1.192*** (0.085)
LERNER	+	0.024*** (0.003)	0.021*** (0.003)	0.022*** (0.003)	0.019*** (0.003)
SIZE	+	0.005*** (0.000)	0.005*** (0.000)	0.005*** (0.000)	0.005*** (0.000)

Table 4. Results from FE-GLS method with NIM as dependent variable (*continued*)

VARIABLES	Expected impact	(1)	(2)	(3)	(4)
		NIM	NIM	NIM	NIM
FOREIGN	-	-0.028** (0.013)	-0.082*** (0.020)	-0.031** (0.013)	-0.082*** (0.021)
SFML	-	-0.015*** (0.002)		-0.015*** (0.002)	
DSFML	-		-0.001 (0.002)		-0.001 (0.002)
FOREIGN/SFML	+/-		0.018*** (0.003)		0.017*** (0.003)
GGDP	+/-	0.110*** (0.034)	0.108*** (0.034)	0.127*** (0.035)	0.120*** (0.036)
MACGDP	+/-	-0.022*** (0.003)	-0.018*** (0.003)	-0.019*** (0.003)	-0.015*** (0.003)
ASSGDP	+/-	-0.002** (0.001)	-0.003*** (0.001)	-0.002** (0.001)	-0.003*** (0.001)
Constant		-0.069*** (0.009)	-0.075*** (0.010)	-0.050*** (0.009)	-0.054*** (0.009)
Observations		417	417	417	417
Number of banks		31	31	31	31
Fixed year		Yes	Yes	Yes	Yes
Fixed bank		Yes	Yes	Yes	Yes
AR1		Yes	Yes	Yes	Yes

Notes: Standard errors in parentheses; *, **, *** indicate statistical significance at 10%, 5%, and 1%, respectively.

Source: The authors' calculation

4.2 Effect of bank characteristic variables

The bank characteristic variables are LOAN, EQUITY, DEPOSIT, INCDIV, COST, LERNER and SIZE. According to Tables 3 and 4, only DEPOSIT and INCDIV have relationships that are contrary to prior expectations, while the remaining five variables have relationships as expected. All coefficients are statistically significant.

The initial expectation is that an increase in DEPOSIT would lead to a rise in NIM as a bank has access to more interbank capital. However, the results show the opposite. This may stem from the decrease in intermediary costs resulting from larger scales of operation. Such cost reductions tend to happen in banks specializing in traditional products, leading to fall in NIM. Dietrich and Wanzenried (2014), Phan *et al.* (2020), Hong and Tuan (2021) also find similar results.

Another initial expectation is that more diversified income, i.e., higher INCDIV, would lead to worse bank performance, in other words, lower NIM. The results show the contrary. More income diversification means that banks can achieve more stability as well as customer reach, due to more products and services available, leading to an increase in the banks' reputation and NIM. The positive effect of income diversification on bank profitability has been found in the works of Baele *et al.* (2007) and Elsas *et al.* (2010).

4.3 Effect of macroeconomic variables

Among the macroeconomic variables, FOREIGN is found to have a significant negative effect on NIM, as shown in all Columns in Tables 3 and 4. Those results matched the prior expectation. More foreign bank presence induces competition pressure on the domestic banks, forcing the latter to decrease NIM. Tho *et al.* (2017) also find similar results. Regarding the GDP variables, the results show that GGDP has a significant positive relationship with NIM in all Columns of Tables 3 and 4, which corroborate the findings of Vinh and Thao (2016). MACGDP and ASSGDP have negative relationships with NIM, with most of the coefficients being significant at 1% level. These results support the findings of Ly (2015).

4.4 Combined effect of regulation and foreign bank presence

Five years after Vietnam's accession to WTO in 2007, foreign banks in Vietnam have been able to compete with domestic ones on equal grounds. Gopalan and Rajan (2017) show that intense competition, which is coupled strong foreign bank presence, improves banking efficiency and boosts development of the financial sector, which can facilitate the pass-through indirectly. According to the WB (2008), "foreign banks have supported the development of local financial markets in several developing countries, particularly in local securities and derivatives markets by investing considerable capital and expertise. Foreign banks participate as primary dealers in some government bond markets and as pension fund managers and swap dealers in other markets". This happens mainly through the bond markets' development and integration, which play a role in creating a robust yield curve, hence expediting the pass-through. According to the SBV's proposal, the SFML limit will be lowered to 30% in 2023. Meanwhile, the presence of foreign banks increases further as the financial market will become more globally integrated due to EU-Vietnam Free Trade Agreement coming into effect in August 2020. Therefore, an extra scenario was created to analyze how the change in the SBV's regulations affects bank performance. This scenario has increased foreign bank presence and the SBV tightens their regulations, which is represented by FOREIGN divided by SFML (FOREIGN/SFML). Hence, FOREIGN/SFML was added to Model (1). If FOREIGN increases and SFML decreases, the value of FOREIGN/SFML will increase. If FOREIGN decreases and SFML increases, FOREIGN/SFML will decrease.

The results from the modified model are shown in Columns (2) and (4) of Tables 3 and 4. In Model (1), SFML has a negative relationship with NIM. In the modified model, FOREIGN/SFML is found to have a significant positive effect on NIM. Increase in foreign bank presence and tightening of the SBV's regulations leads to a rise in NIM. It implies an increase in domestic banks' performance if there is an increase in foreign bank presence and the SBV carries out prudent liquidity risk management.

4.5 Results of robustness check models

To reassess the effects of liquidity risk and regulation on bank performance, a robustness check was conducted by replacing NIM with ROA. The robustness check's results are shown in Tables 5 and 6. In particular, the focus variables LIQUID, INTER, SFML, and FOREIGN/SFML yield similar results to the NIM-based model. A notable difference is that DSFML, while having a negative coefficient like the NIM-based model, is significant this time, at either a 5% or 10% level. The coefficient of COST is more limited in significance, with only three cases being significant at a 10% level or below. In addition, the sign of INCDIV's coefficient is the same as initially expected in this case.

Table 5. Results from FE method with ROA as a dependent variable

VARIABLES	Expected impact	(1)	(2)	(3)	(4)
		NIM	NIM	NIM	NIM
LIQUID	-	0.019*** (0.004)	0.020*** (0.004)		
INTER	-			-0.000 (0.000)	-0.000 (0.000)
LOAN	+	0.025*** (0.005)	0.026*** (0.005)	0.012*** (0.004)	0.012** (0.004)
DEPOSIT	+	-0.018*** (0.003)	-0.017*** (0.004)	-0.018*** (0.003)	-0.017*** (0.004)
EQUITY	+	0.067*** (0.010)	0.070*** (0.010)	0.067*** (0.010)	0.070*** (0.011)
INCDIV	+	0.064*** (0.009)	0.062*** (0.009)	0.069*** (0.009)	0.067*** (0.009)
COST	+/-	0.181* (0.101)	0.212** (0.102)	0.148 (0.111)	0.178 (0.112)
LERNER	+	0.036*** (0.004)	0.031*** (0.004)	0.036*** (0.004)	0.031*** (0.004)
SIZE	+	0.008*** (0.001)	0.009*** (0.001)	0.008*** (0.001)	0.008*** (0.001)
FOREIGN	-	-0.032 (0.019)	-0.138*** (0.032)	-0.038* (0.020)	-0.144*** (0.033)
SFML	-	-0.028*** (0.003)		-0.028*** (0.003)	
DSFML	-		-0.005** (0.002)		-0.006** (0.002)

Table 5. Results from FE method with ROA as a dependent variable (*continued*)

VARIABLES	Expected impact	(1)	(2)	(3)	(4)
		NIM	NIM	NIM	NIM
FOREIGN/SFML	-		0.035*** (0.004)		0.035*** (0.004)
GGDP	+/-	0.157*** (0.053)	0.153*** (0.053)	0.163*** (0.052)	0.158*** (0.053)
MACGDP	+/-	-0.012*** (0.004)	-0.002 (0.003)	-0.008** (0.004)	0.001 (0.003)
ASSGDP	+/-	-0.011*** (0.002)	-0.013*** (0.002)	-0.012*** (0.002)	-0.014*** (0.002)
Constant	+/-	-0.099*** (0.013)	-0.110*** (0.014)	-0.079*** (0.013)	-0.089*** (0.013)
Observations		417	417	417	417
R-squared		0.637	0.630	0.621	0.611
Number of banks		31	31	31	31
Fixed year		Yes	Yes	Yes	Yes
Fixed bank		Yes	Yes	Yes	Yes
AR1		No	No	No	No

Notes: Standard errors in parentheses; *, **, *** indicate statistical significance at 10%, 5%, and 1%, respectively.

Source: The authors' calculation

Table 6. Results from FE-GLS method with ROA as dependent variable

VARIABLES	Expected impact	(1)	(2)	(3)	(4)
		NIM	NIM	NIM	NIM
LIQUID	-	0.018*** (0.003)	0.019*** (0.003)		
INTER	-			-0.000*** (0.000)	-0.000*** (0.000)
LOAN	+	0.021*** (0.003)	0.023*** (0.003)	0.008*** (0.003)	0.009*** (0.003)
DEPOSIT	+	-0.016*** (0.002)	-0.015*** (0.002)	-0.016*** (0.002)	-0.015*** (0.003)
EQUITY	+	0.057*** (0.006)	0.059*** (0.006)	0.060*** (0.007)	0.064*** (0.007)

Table 6. Results from FE-GLS method with ROA as dependent variable (*continued*)

VARIABLES	Expected impact	(1)	(2)	(3)	(4)
		NIM	NIM	NIM	NIM
INCDIV	+	0.059*** (0.006)	0.057*** (0.006)	0.066*** (0.006)	0.065*** (0.006)
COST	+/-	0.105 (0.070)	0.131* (0.070)	0.066 (0.072)	0.093 (0.073)
LERNER	+	0.029*** (0.003)	0.025*** (0.003)	0.029*** (0.003)	0.025*** (0.003)
SIZE	+	0.006*** (0.000)	0.007*** (0.000)	0.006*** (0.000)	0.006*** (0.000)
FOREIGN	-	-0.032** (0.012)	-0.132*** (0.018)	-0.044*** (0.013)	-0.144*** (0.019)
SFML	-	-0.023*** (0.002)		-0.023*** (0.002)	
DSFML	-		-0.007*** (0.002)		-0.007*** (0.002)
FOREIGN/SFML	+/-		0.031*** (0.003)		0.031*** (0.003)
GGDP	+/-	0.136*** (0.032)	0.137*** (0.032)	0.148*** (0.033)	0.148*** (0.033)
MACGDP	+/-	-0.008*** (0.002)	-0.000 (0.002)	-0.006** (0.002)	0.001 (0.002)
ASSGDP	+/-	-0.009*** (0.001)	-0.011*** (0.001)	-0.010*** (0.001)	-0.012*** (0.001)
Constant		-0.071*** (0.001)	-0.081*** (0.009)	-0.056*** (0.008)	-0.064*** (0.009)
Observations		417	417	417	417
Number of banks		31	31	31	31
chi ²		1197	1157	1089	1028
Fixed year		Yes	Yes	Yes	Yes
Fixed bank		Yes	Yes	Yes	Yes
AR1		Yes	Yes	Yes	Yes

Notes: Standard errors in parentheses; *, **, *** indicate statistical significance at 10%, 5%, and 1%, respectively.

Source: The authors' calculation

5. Conclusion and policy implication

The research provides empirical evidence of liquidity risk's effect on bank performance in an emerging economy. We drew the following conclusions from the results. Firstly, liquidity risks have a positive effect on bank performance. This can be explained by the higher opportunity costs associated with more liquid assets, which can lead banks to price their products higher to compensate. Furthermore, in the Vietnamese market, banks are the main loan providers. They are the key influencers in determining lending interest rates. Therefore, higher opportunity costs lead to a higher net interest margin. Besides, banks with higher liquidity have more opportunities for credit growth, leading to more profit. Secondly, when the SBV lowers the SFML limit, bank performance increases. This result implies that banks will become more restricted in using short-term capital for funding mid-to-long-term projects. A bank's liquidity improves as it has to seek more mid-to-long-term capital and become more selective in financing mid-to-long-term projects, leading to better bank performance. Thirdly, in the scenario of the SBV's lowering the SFML limit and increase in foreign bank presence, domestic banks' performance will increase. As the domestic banks lessen their dependence on short-term capital for funding mid-to-long-term loans, they curb the undesirable side of the competition effect caused by foreign bank presence. Besides, the results also show that LOAN, EQUITY, INCDIV, COST, LERNER, SIZE and GDP have positive effects on bank performance, while DEPOSIT, FOREIGN MACGDP and ASSGDP have negative effects.

The results show that domestic commercial banks in Vietnam with lower liquidity risk have better performance. This can lead to more profits but may also affect the investment decisions from households and businesses. The SBV needs to have a comprehensive evaluation on liquidity policies. If the regulations unintentionally force the domestic banks to maintain high levels of liquid assets for extended periods of time, it will be difficult for the banks to decrease lending rates due to limited credit supply. This can hinder investments, which are vital to economic growth. The results also show that despite the increasing presence of foreign banks, SFML still has a negative relationship with domestic banks' performance. Restricting SFML leads to improvement in bank performance. This finding supports the decrease in SFML to 30% as stated in Circular No. 22/2019/TT-NHNN on limits and prudential ratios of banks and foreign bank branches. Although the policy has had positive effects on liquidity control and bank performance, it has also led to a spike in NIM. Such increase in NIM has a negative impact on investment in the private sector and households, affecting economic growth. Therefore, in order for SFML to be a truly efficient regulatory tool, the SBV should have additional policies so that the banks can decrease NIM, such as encouraging diversification of products or changing management models to decrease costs.

Foreign bank presence creates competition effect in the domestic market. However, when the SBV lowers the SFML, forcing the domestic banks to be less dependent on short-term capital in the process, the domestic banks can curb the competition effect. To make the banking sector more open and lessen the undesirable effect on performance of the domestic

banks, more incentives should be given to the domestic banks to increase mid-to-long-term capital, such as encouraging banks to pay stock dividends, or making it easier for the banks to issue long-term bonds. The domestic banks can also look for new sources of financing in the international financial market to make themselves less dependent on short-term capital, reducing the competition effect in the process.

This research only focuses on domestic commercial banks, as we have not gained access to financial data on wholly-owned subsidiaries of foreign banks. However, this is part of an ongoing research, and a future paper focus on comparing the effects of liquidity risk and macroprudential tools on performance of both domestic and foreign banks operating in Vietnam. This can give policymakers a clearer picture of such effects in the Vietnamese banking market to formulate relevant policies.

References

- Athanasoglou, P., Delis, M. and Staikouras, C. (2006), “Determinants of bank profitability in the South Eastern European region”, *Munich Personal RePEc Archive 10274*, University Library of Munich, Germany.
- Athanasoglou, P.P., Brissimis, S.N. and Delis, M.D. (2008), “Bank-specific, industry-specific and macroeconomic determinants of bank profitability”, *Journal of International Financial Markets, Institutions and Money*, Vol. 18, pp. 121 - 136.
- Ayadi, R., Naceur, S. B., Casu, B. and Quinn, B. (2016), “Does Basel compliance matter for bank performance?”, *Journal of Financial Stability*, Vol. 23, pp. 15 - 32.
- Baele, L., De Jonghe, O. and Vander Vennet, R. (2007), “Does the stock market value bank diversification?”, *Economic Systems*, Vol. 31, pp. 1999 - 2023.
- Barth, J.R., Nolle, D.E., Phumiwasana, T. and Yago, G. (2003), “A cross-country analysis of the bank supervisory framework and bank performance”, *Financial Markets, Institutions & Instruments*, Vol. 12, pp. 67 - 120.
- Barth, J.R., Caprio, G.Jr. and Levine, R. (2006), *Rethinking bank regulation: till angels govern*, Cambridge: Cambridge University Press.
- Batten, J. and Vo, X.V. (2019), “Determinants of bank profitability - Evidence from Vietnam”, *Emerging Markets Finance and Trade*, Vol. 55, pp. 1417 - 1428.
- BCBS. (2000), *Sound practices for managing liquidity in banking organizations*, Bank for International Settlements.
- Beltratti, A. and Stulz, R.M. (2009), “Why did some banks perform better during the credit crisis? A cross-country study of the impact of governance and regulation”, NBER Working Papers 15180, National Bureau of Economic Research.
- Ben Naceur, S. and Kandil, M. (2009), “The impact of capital requirements on banks’ cost of intermediation and performance: the case of Egypt”, *Journal of Economics and Business*, Vol. 61, pp. 70 - 89.
- Bessis, J. (2015), *Risk management in banking*, John Wiley & Sons.

- Boar, C., Gambacorta, L., Lombardo, G. and Pereira Da Silva, L.A. (2017), “What are the effects of macroprudential policies on macroeconomic performance?”, *BIS Quarterly Review September*.
- Borio, C. and Shim, I. (2007), “What can (macro-)prudential policy do to support monetary policy?”, BIS Working Paper No. 242, Bank for International Settlements.
- Bourke, P. (1989), “Concentration and other determinants of bank profitability in Europe, North America and Australia”, *Journal of Banking & Finance*, Vol. 13, pp. 65 - 79.
- Chen, Y.-K., Shen, C.-H., Kao, L. & Yeh, C.-Y. (2018), “Bank liquidity risk and performance”, *Review of Pacific Basin Financial Markets and Policies*, Vol. 21, 1850007.
- Chortareas, G.E., Girardone, C. and Ventouri, A. (2012), “Bank supervision, regulation, and efficiency: evidence from the European Union”, *Journal of Financial Stability*, Vol. 8, pp. 292 - 302.
- Claessens, S., Demirguc-Kunt, A. and Huizinga, H. (2001), “How does foreign entry affect domestic banking markets?”, *Journal of Banking & Finance*, Vol. 25, pp. 891 - 911.
- Cornett, M.M. and Saunders, A. (2003), *Financial institutions management: a risk management approach*, McGraw-Hill/Irwin.
- Demirguc-Kunt, A. and Detragiache, E. (2002), “Does deposit insurance increase banking system stability? An empirical investigation”, *Journal of Monetary Economics*, Vol. 49, pp. 1373 - 1406.
- Demirguc-Kunt, A. and Huizinga, H. (1999), “Determinants of commercial bank interest margins and profitability: some international evidence”, *The World Bank Economic Review*, Vol. 13, pp. 379 - 408.
- Demirguc-Kunt, A., Laeven, L. and Levine, R. (2003), “The impact of bank regulations, concentration, and institutions on bank margins”, Policy Research Working Paper Series 3030, The World Bank.
- Dietrich, A. and Wanzenried, G. (2014), “The determinants of commercial banking profitability in low-, middle-, and high-income countries”, *The Quarterly Review of Economics and Finance*, Vol. 54, pp. 337 - 354.
- Elsas, R., Hackethal, A. and Holzhauser, M. (2010), “The anatomy of bank diversification”, *Journal of Banking & Finance*, Vol. 34, pp. 1274 - 1287.
- Fungacova, Z. and Poghosyan, T. (2011), “Determinants of bank interest margins in Russia: does bank ownership matter?”, *Economic Systems*, Vol. 35, pp. 481 - 495.
- Fungacova, Z., Solanko, L. and Weill, L. (2010), “Market power in the Russian banking industry”, *International Economics*, Vol. 124, pp. 127 - 145.
- Gaganis, C., Galariotis, E., Pasiouras, F. and Staikouras, C. (2021), “Macroprudential regulations and bank profit efficiency: international evidence”, *Journal of Regulatory Economics*, Vol. 59, pp. 136 - 160.
- Goddard, J., Molyneux, P. and Wilson, J.O.S. (2004), “The profitability of European banks: a cross-sectional and dynamic panel analysis”, *The Manchester School*, Vol. 72, pp. 363 - 381.
- Gopalan, S. and Rajan, R.S. (2017), “Does foreign bank presence affect interest rate pass-through in emerging and developing economies?”, *Journal of Macroeconomics*, Vol. 54, pp. 373 - 392.
- Gujarati, D. (2003), *Basic econometrics*, Fourth Edition, Singapura: McGraw-Hill.

- Hong, D.T.T. and Tuan, N.H. (2021), “Tac dong cua Fintech toi hieu qua hoat dong cua ngan hang thuong mai”, *Tap chi Thi truong Tai chinh Tien te*, So 1+1, tr. 51 - 58.
- Huber, P.J. (1967), “The behavior of maximum likelihood estimates under nonstandard conditions”, *Proceedings of the Fifth Berkeley Symposium on Mathematical Statistics and Probability*, Vol. 1, pp. 221 - 233.
- IMF. (2011), “Durable financial stability: getting there from here”, IMF Global Financial Stability Report April /11.
- Klein, P.G. and Saldenber, M.R. (2000), “Diversification, organization, and efficiency: evidence from bank holding companies”, *Performance of Financial Institutions*, Cambridge University Press, Cambridge, pp. 153-173
- Kosmidou, K. (2008), “The determinants of banks’ profits in Greece during the period of EU financial integration”, *Managerial Finance*, Vol. 34, pp. 146 - 159.
- Kosmidou, K., Tanna, S. and Pasiouras, F. (2005), “Determinants of profitability of domestic UK commercial banks: panel evidence from the period 1995-2002”, in *Money Macro and Finance (MMF) Research Group Conference*, pp. 1 - 27.
- Le, H.N.Q., Nguyen, T.V.H. and Schinckus, C. (2021), “Bank efficiency, market structure and strategic interaction: evidence from Vietnam”, *Research in International Business and Finance*, Vol. 56, 101371.
- Lopez-Espinosa, G., Moreno, A. and De Gracia, F.P. (2011), “Banks’ net interest margin in the 2000s: a macro-accounting international perspective”, *Journal of International Money and Finance*, Vol. 30, pp. 1214 - 1233.
- Ly, K.C. (2015), “Liquidity risk, regulation and bank performance: evidence from European banks”, *Global Economy Finance Journal*, Vol. 8, pp. 11 - 33.
- Manlagnit, M.C.V. (2011), “The economic effects of foreign bank presence: evidence from the Philippines”, *Journal of International Money and Finance*, Vol. 30, pp. 1180 - 1194.
- Matz, L. and Neu, P. (2007), *Liquidity risk measurement and management: a practitioner’s guide to global best practices*, John Wiley & Sons (Asia) Pte Ltd, Singapore.
- Maudos, J. and Solis, L. (2009), “The determinants of net interest income in the Mexican banking system: an integrated model”, *Journal of Banking & Finance*, Vol. 33, pp. 1920 - 1931.
- Maudos, J.N. and Fernandez De Guevara, J. (2004), “Factors explaining the interest margin in the banking sectors of the European Union”, *Journal of Banking & Finance*, Vol. 28, pp. 2259 - 2281.
- Naceur, S.B. and Omran, M. (2011), “The effects of bank regulations, competition, and financial reforms on banks’ performance”, *Emerging Markets Review*, Vol. 12, pp. 1 - 20.
- OECD. (2021), *Strengthening macroprudential policies in emerging Asia*, The Development Dimension, OECD Publishing, Paris.
- Pasiouras, F. and Kosmidou, K. (2007), “Factors influencing the profitability of domestic and foreign commercial banks in the European Union”, *Research in International Business and Finance*, Vol. 21, pp. 222 - 237.

- Phan, D.H.B., Narayan, P.K., Rahman, R.E. and Hutabarat, A.R. (2020), “Do financial technology firms influence bank performance?”, *Pacific-Basin Finance Journal*, Vol. 62, 101210.
- Saleh, I. and Abu Afifa, M. (2020), “The effect of credit risk, liquidity risk and bank capital on bank profitability: evidence from an emerging market”, *Cogent Economics Finance*, Vol. 8, 1814509.
- SBV. (1999), *Decision no. 297/1999/QD-NHNN5 of august 25th, 1999, on the promulgation of the regulation on prudential ratios in the activities of credit institutions.*
- SBV. (2018), *Annual report 2018.*
- SBV. (2019), *Circular No. 22/2019/TT-NHNN on November 15, 2019, limits and prudential ratios of banks and foreign bank branches.*
- Shen, C.H., Kuo, C.J. and Chen, H.J. (2001), “Determinants of net interest margins in Taiwan banking industry”, *Journal of Financial Studies*, Vol. 9 No. 1, pp. 47 - 83.
- Stiroh, K.J. (2004), “Diversification in banking: is noninterest income the answer?”, *Journal of Money, Credit and Banking*, Vol. 36, pp. 853 - 882.
- Tan, Y. (2016), *Efficiency and competition in Chinese banking*, Chandos Publishing.
- Tho, T.N., Tuan, N.H. and Minh, N.T. (2017), “Foreign bank’s presence and domestic bank’s performance: empirical evidence from Vietnam”, *Journal of Finance and Marketing*, Vol. 42, pp. 2 - 15.
- Tho, T.N., Tuan, N.H. and Minh, N.T. (2019), “The impacts of competition and risk taking on performance of Vietnamese commercial banks”, *The Asian Journal of Economics and Banking*, Vol. 165, pp. 19 - 36.
- Trang, N.T.N. and Tuan, N.H. (2015), “The nonlinear linkage between interest margin and non-interest income of Vietnam’s commercial banks”, *Journal of Economic Development*, Vol. 26 No. 12, pp. 30 - 52.
- Vinh, N.T.H. and Thao, L.P.T.D. (2016), “Effects of bank capital on profitability and credit risk: the case of Vietnam’s commercial banks”, *Journal of Economic Development*, Vol. 23, pp. 117 - 137.
- Vu, H. and Nahm, D. (2013), “The determinants of profit efficiency of banks in Vietnam”, *Journal of the Asia Pacific Economy*, Vol. 18, pp. 615 - 631.
- WB. (2008), “Global development finance 2008: the role of international banking”, *Review, Analysis, and Outlook*, Vol. 1.
- White, H. (1980), “A heteroskedasticity-consistent covariance matrix estimator and a direct test for heteroskedasticity”, *Econometrica*, Vol. 48, pp. 817 - 838.
- White, H. (1982), “Maximum likelihood estimation of misspecified models”, *Econometrica*, Vol. 50, pp. 1 - 25.
- Wooldridge, J.M. (2002), *Econometric analysis of cross section and panel data*, MIT Press.

Appendix

Table A.1. Banks with the highest INTER

Bank name	Year	NIM	INTER
An Binh Commercial Joint Stock Bank	2006	2.44%	5.15
Asia Commercial Bank	2006	1.84%	5.05
Vietnam Bank for Agriculture and Rural Development	2015	2.82%	10.23
Bank for Investment and Development of Vietnam	2006	2.08%	8.51
Vietnam Joint Stock Commercial Bank For Industry And Trade	2006	2.62%	5.33
Vietnam Export Import Bank	2008	2.74%	6.06
Kien Long Commercial Joint - Stock Bank	2006	5.08%	10.23
Military Commercial Joint Stock Bank	2006	2.91%	4.89
Military Commercial Joint Stock Bank	2014	3.51%	4.65
National Citizen Commercial Joint Stock Bank	2006	2.57%	10.23
Saigon Bank for Industry and Trade	2013	4.67%	10.23
Saigon Thuong Tin Commercial Joint Stock Bank	2009	2.21%	5.55
Vietnam Export Import Bank	2020	2.07%	5.12

Source: The authors' compilation