

The influence of market power on liquidity creation of commercial banks in Vietnam

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Abstract

Purpose – This research examines the relationship between market power and liquidity creation in the specific context of bank profitability in the Vietnamese banking sector.

Design/methodology/approach – The study applies the methodology proposed by Berger and Bouwman (2009) to demonstrate the creation of bank liquidity through a three-step procedure for investigating the relationship between market power and liquidity creation. The three steps include non-fat liquidity (NFLC), fat liquidity (FLC) and system generalized method of moments estimation for panel data.

JEL Classification — G10, G20, E40

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Findings – This study finds that liquidity creation increases when a bank has high market power. Further, highly profitable banks positively impact the market power of banks with regard to liquidity creation, relative to less profitable banks. Moreover, bank size, capital, economic growth and interest rate negatively influence bank liquidity creation, while credit risk positively relates to bank liquidity creation.

Research limitations/implications – Measurements used in this study are based on the works of Berger and Bouwman (2009). There are specific variations, relative to Basel III. In addition, other variables significantly impact bank liquidity creation that have not been considered in the models, and a quadratic model should have been considered to measure market power and bank liquidity creation.

Practical implications – This study suggests that managers should control the liquidity of their banks by supervising vulnerable characteristics that have been mentioned herein and emphasizing improvements in profitability. Further, the government may consider encouraging banks to generate more liquidity by modifying regulations concerned with market power or reinforcing policies about improving the transparent business environment.

Originality/value – This study characterizes an attempt to examine the influence of market power on the liquidity creation of banks in Vietnam, which represents one of the most dynamic systems in Asia, with several varied participating banks. The current study also examines the same within the specific context of the modifying impact of the profitability of banks.

Keywords Liquidity creation, Market power, Price channel, Fragility channel, GMM, Vietnam

Paper type Research paper

1. Introduction

The banking sector performs essential functions, such as liquidity creation and risk transformation (Diamond and Dybvig, 1983). Banks supply liquidity via liquid liabilities like deposits to finance relatively illiquid assets, such as investments and loans. Thus, banks maintain a balance between the liquidity needs of savers and the demand for long-term financing commitments of corporates (Diamond and Rajan, 2001). By efficiently transforming resources, banks contribute to ensuring the liquidity ability of economic activities. However, the available fund is what ensures the liquidity and access liability to financial resources. As there exists a divergence between assets and liabilities, the capital structure of banks may become more fragile. Consequently, banks fail to generate high liquidity on their balance sheets within a specific period, thereby resulting in adverse outcomes for the economy and increased fragility of the banking sector (Al-Khouri and Aroui, 2019).

Due to the given context, the subject of bank liquidity has greatly appealed to both managers and researchers. Existing literature confirms that the liquidity ability of banks is linked to their market power, from two different perspectives. On the one hand, bank liquidity creation is likely to rise through the "price channel" (Love and Martínez Pería, 2015), which suggests that a high degree of competition may promote credit availability, an idea supported by prior studies such as that of Carbó-Valverde *et al.* (2009) and Love and Martínez Pería (2012). On the other hand, increased competition can decrease bank profitability, thereby raising bank solvency risk (Jiménez *et al.*, 2013). Thus, under the standards of banking supervision, liquidity is threatened and fragility becomes flagrant. Petersen and Rajan (1995) argued that increased competition reduced liquidity creation, reinforcing the "fragility channel" view. The fragility of the bank is underpinned by its functions in offering protection and transforming maturity to liquidity in order to meet the needs of the creditors (Diamond and Dybvig, 1983). In both these mechanisms, the effects of market power in the competitive market are strongly associated with the liquidity creation ability of banks (Davidson *et al.*, 1995).

The Vietnamese banking system is deemed the financial backbone of the economy and is strictly regulated by the State Bank of Vietnam (SBV). Before 1990, it was a one-tier system that did not distinguish between management and commercial functions. The SBV plays both the role of the central bank and the commercial bank. The reform of the banking system in 1990 eliminated the state monopoly and facilitated the diversification of banking activities in terms of ownership and the number of banks. By forming a two-tier banking system, business activities could be separated from functions of state management, operations could

be distributed correspondingly across policy and commercial banks and subsidies could be eliminated via interest rates. Following the 2007–09 financial crisis, the SBV implemented a variety of monetary policies to facilitate macroeconomic stability and economic growth. Notably, commercial banks in Vietnam generated the least liquidity in 2011. The ratio of non-fat liquidity creation and fat liquidity creation to total assets was 8.38 and 11.53%, respectively (Figure 1). Since 2012, when SBV loosened the monetary policy, banks began to expand lending and deposit activities. Thus, bank liquidity creation was higher compared to the previous period. Yet, the bank system in Vietnam faces great challenges when its weaknesses have been revealed for a very long time. As the competition among commercial banks continues to worsen, mergers and acquisitions are deemed an indispensable trend. Notably, from 2011 to 2015, there were 8 M&A deals (Appendix). This restructuring of credit institutions' system leads to a change in bank structure and bank market power, thereby raising the question of whether or not the market power affects the liquidity creation decisions of the commercial banks.

This study contributes to the banking literature and practice in certain aspects, with a limited understanding of the bank liquidity creation channel. Firstly, we provide empirical evidence that illustrates the current banking theories on the relationship between market power and liquidity creation of banks. This is carried out with the application of Berger and Bouwman's (2009) calculations to define the degree of liquidity creation across Vietnamese banks and compare it to other countries to confirm the replication of this aforementioned approach to our current study. Secondly, our study examines the influence of market power on liquidity creation among Vietnamese banks in order to make sense of the context of an emerging country. Indeed, Vietnam's financial system has undergone a long reform period, characterized by a disorganized and inefficient banking system and the concentration of power. Jarvis (2002) commented that the main problem before the reform was the poor and unsafe credit provision of the financial institutions in Vietnam. Following the reform in the mid-1980s, the Vietnamese banking system became one of the most dynamic systems in Asia, with varying types of bank participation. This reform significantly changed the price and volume of the offered credit and promotes transparency in the competition among banks. Recently, Dang and Huynh (2022) suggested that the bank lending channel was significantly influenced by the market power and specific factors associated with the banks in Vietnam. Vo and Nguyen (2018) argued that commercial banks, such as Vietcombank and Vietinbank, have the most prominent charter capital in Vietnam and continue contributing capital to the financial market. Therefore, it is imperative to consider the role of market power, as it determines marginal cost shocks translated into the price and volume

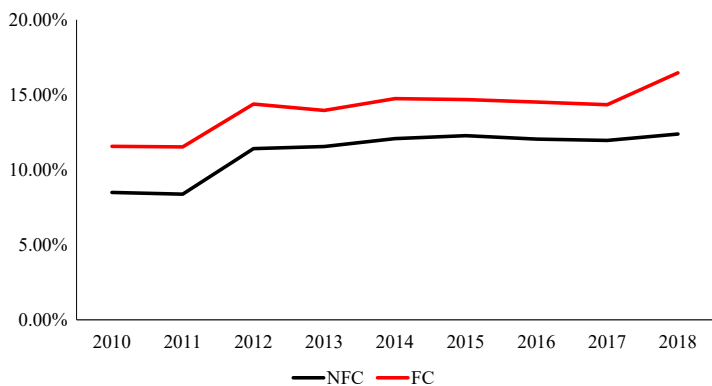


Figure 1.
Bank liquidity creation
ratio in Vietnam

Source(s): Vietnamese State Bank

of borrowed capital (Vanhoose, 1985). To this end, the study offers significant implications for policy-makers and managers of the banking system with regard to providing market liquidity, retaining competitive power and boosting transparency in the market.

This research is organized as follows: Part 2 encompasses the literature review, while Part 3 is concerned with the development of hypotheses. Next, the data and methodology are presented in Part 4. In Part 5, the data set is analyzed and the results are discussed. Finally, Part 6 concludes and offers implications for the commercial bank managers and policy-makers of Vietnam.

2. Literature review

2.1 Ground theories

The liquidity of the bank is defined as its ability to fund the increase in assets and meet its obligations in the short term with few acceptable losses (King, 2013). Banks generate liquidity by converting their liquid assets into illiquid liabilities or by financing their illiquid assets (i.e. investments and loans) with liquid liabilities (i.e. demand deposit) (Berger and Bouwman, 2009). Banks also operate Off-Balance Sheet (OBS) activities, such as loan commitments, to create liquidity (Kashyap *et al.*, 2002). The depositors are provided with available withdrawals for their accounts, while borrowers are committed to long-term cash through loans. Thus, banks maintain a balance between the liquidity needs of savers and the demand for long-term financing commitments, while also contributing capital to the economy (Diamond and Rajan, 2001). Berger and Bouwman (2009) classified all bank assets, liabilities, equity and off-balance sheet activities as liquid, semi-liquid or illiquid; the authors developed a set of indicators to measure liquidity creation by combining the previous classifications in varying ways. In recent years, the measurement of Berger and Bouwman (2009) has been widely used in banking liquidity research (Duan and Niu, 2020; Sahyouni and Wang, 2019).

In this research stream, according to “Relative Market Power” and “Structure – Conduct – Performance” theories, market power significantly affects the behavior of banks via the bank lending and bank risk-taking channel (Lensink and Sterken, 2002; Kahn *et al.*, 2002; Carbó-Valverde *et al.*, 2009; Wang *et al.*, 2022; Nguyen and Phan, 2018b). Competition among commercial banks and high competition (i.e. low market power) were found to influence the pricing policies of banks, thereby diminishing lending rates and increasing deposit rates (Boot and Thakor, 2000). For example, Besanko and Thakor (1992) used an equilibrium analysis to investigate the long-run behavior of banks in the presence of banking deregulation. They demonstrated that enhanced competition among banks led to a drop in equilibrium loan interest rates and increased equilibrium deposit interest rates. Berlin and Mester (1999) found that the US banks operating in a competitive market offered more loan rate smoothing for borrowers. Guzman (2000) analyzed the differences between the economies across competitive and concentrated markets to show that banks in the former environment tended to offer higher deposit rates and lower loan rates than in the latter. Recently, Yang and Shao (2016) used the reverse of the Lerner index to reflect the degree of bank competition, indicating that further competition leads banks to boost more loans by setting lower loan rates to attract new borrowers. They also argued that higher bank competition reduced charter value, which encouraged aggressive lending behavior.

Altunbas *et al.* (2010) found that an unusually low interest remained over a prolonged period, which increased bank risk-taking. Similarly, Bikker and Vervliet (2018) confirmed that a low-interest-rate environment impaired bank performance and compressed net interest margins. In this context, the bank appeared not to maintain a sufficient number of buffers for risk loans (Kashyap and Stein, 1995). Thus, liquidity creation may rise through the pricing channel (Love and Martínez Pería, 2015). Indeed, banks with sufficient buffer are willing to produce higher liquidity than those with insufficient buffer (Naveed *et al.*, 2017; Jiang *et al.*, 2018).

Moreover, banks with higher liquidity can acquire or merge with weaker ones, collectively aiming to consolidate market power (Al-Khouri and Aroui, 2019). Herein, higher market power will result in more liquidity flowing into the financial market and deficient banks in demand for liquidity. Black and Strahan (2002) outlined empirical evidence to illustrate that deregulation reduced the negative effect of concentration on new incorporations. In other words, the rate of new incorporations improved through a higher bank credit availability, following an increased competition among banks. Kahn *et al.* (2005) demonstrated that banks with lower competition failed to generate more liquidity, as exemplified by the case study of the US banks. Berger and Hannan (1989) stated that banks with a monopoly power were incentivized to pursue price imposition, creating less liquidity in a poor-competitive market. Likewise, Corvoisier and Gropp (2002) found that European banks operating in a relatively more concentrated market resulted in less liquidity due to lower interest rates being set for the demand deposits.

Previous studies found that bank liquidity creation was positively related to market power. For instance, Joh and Kim (2012) showed that lower bank competition in 25 OCED countries negatively impacted liquidity creation. The authors suggested that banks with lower market power were more conservative in terms of issuing credit and mobilization deposits, leading banks to generate less liquidity. Lei and Song (2013) used annual bank data of China from 1988 to 2009 to report that with the increase in bank market power, Chinese commercial banks create more liquidity. Recently, Toh *et al.* (2019) claimed that the negative effect of bank competition on liquidity creation disappears for highly diversified banks in Malaysia. However, Lei and Song (2013) confirmed that the market power of banks exerted a negative effect on liquidity creation by utilizing US banks, similar to the study of Horvath *et al.* (2016) regarding Czech banks. These studies had different conclusions with varying data sets associated with periods, environments and countries. Due to its significant impact on the economy, the influence of market power on the banking sector and bank liquidity requires continuous assessment.

Further, the relationship between liquidity creation, market power and bank profitability remains inconsistent. For example, Berger and Bouwman (2009) analyzed the correlation between liquidity creation and bank profitability of US banks from 1984 to 2014, indicating that for large banks, the relationship remained positive, while for medium and small banks, the association was found to be negative. Moreover, Tran *et al.* (2016) demonstrated that banks generate low profitability when they create high bank liquidity in the United States from 1996 to 2013. Their work provided the dynamic interrelationships between liquidity creation, regulatory capital and bank performance, based on the vector-autoregression (VAR) and the generalized-method-of-moments (GMM) estimations. This relationship was positive for a lower capitalized bank but negative for a higher capitalized bank, similar to the findings of Le and Pham (2021) for banks in emerging economies between 2012 and 2016. In this context, bank capital and profitability play an interactive role in modifying the relationship between market power and liquidity creation.

2.2 Hypothesis development

Previous literature has confirmed that fierce competition can motivate a down-trend in loans and an up-trend in deposit interests; both boost the increased demand for deposits and loans (Boot and Thakor, 2000). Thus, bank liquidity creation through the “price channel” is expected to increase (Love and Martínez Pería, 2015). In turn, credit availability shall also increase with the competition, as supported by studies authored by Carbó-Valverde *et al.* (2009) and Love and Martínez Pería (2015). However, increased competition can reduce bank profitability and raise the risk of bank solvency (Jiménez *et al.*, 2013; Horvath *et al.*, 2016). Under the banking supervision’s standards, the liquidity is threatened while its fragility

remains flagrant. The “fragility channel” view is reinforced by [Petersen and Rajan \(1995\)](#), who argue that increased competition (i.e. low market power) reduces liquidity creation, which justifies the positive relationship between the market power and liquidity creation of banks. The fragility of the bank is underpinned by its function in terms of offering protection and transforming maturity to liquidity in order to meet the needs of the creditors ([Diamond and Dybvig, 1983](#)). In this context, banks attempt to limit the volume of deposits accepted and reduce the number of loans granted to avoid the threat of bankruptcy and prevent potential risks ([Horvath et al., 2016](#); [Moslehpour et al., 2022](#)). As a result, credit allocation and risk management pressures encourage limited liquidity creation ([Boyd and De Nicrolo, 2005](#); [Peydro et al., 2021](#)).

Simply put, this view argues that a decline in market competition reduces the motivation of banks to seek and establish long-term relationships with new borrowers ([Horvath et al., 2016](#); [Abraheem et al., 2020](#)). Consequently, banks with excellent market power (i.e. low competition) stuff more liquidity to the financial market or deficient banks in demand for liquidity, as per the works of [Berger et al. \(2010\)](#), [Lei and Song \(2013\)](#), [Horvath et al. \(2016\)](#) and [Jiang et al. \(2018\)](#). Thus, we investigate whether bank market power improves bank liquidity creation in this context. Our hypothesis is as follows:

H1. Banks with higher market power generate higher liquidity.

Although some studies focus on bank liquidity, a limited number of them emphasize the role of bank performance or profitability. For example, [Berger and Bouwman \(2009\)](#) find that banks may increase the amount of net surplus distributed to stakeholders by creating more liquidity, thereby enhancing the value of the bank ([Sahyouni and Wang, 2019](#)). Meanwhile, [Bordeleau and Graham \(2010\)](#) and [Sahyouni and Wang \(2019\)](#) showed that banks could reduce the risk of illiquidity and default by holding more liquid assets. [Al-Khouri and Arouri \(2019\)](#) emphasized that bank profitability could transfer funds by generating more loans and investments; high market power increased bank profitability and the capacity of banks to offer liquidity. Thus, their findings linked profitability, market power and liquidity of banks.

Furthermore, [Toh et al. \(2019\)](#) found that the liquidity generation capacity of banks declined along with market power; yet, a “buffer” through which banks could guarantee operations would enhance their resilience and create liquidity in the event of such a decline. As there is a sufficient buffer in place, more profitable banks are willing to take on higher risks and create more liquidity than less profitable banks ([Hellmann et al., 2000](#)). Thus, the profitable ability is crucial in associating the market power and liquidity creation of banks. Previous studies also demonstrated a variation in the liquidity-profitability between large and small banks, as well as high-capitalized and low-capitalized banks ([Berger and Bouwman, 2009](#); [Tran et al., 2016](#); [Le and Pham, 2021](#)). For this study, we outline the second hypothesis, to test the role of profitability in the relationship between market power and liquidity creation, as follows:

H2. The market power of highly profitable banks impacts their liquidity creation.

3. Data and research model

3.1 Sample selection

The structure of the Vietnamese banking sector encompasses four groups: state-owned banks, private joint-stock commercial banks, branches of foreign banks and foreign joint-venture banks. As this study solely focuses on domestic banks, it does not incorporate branches of foreign banks. Therefore, we have selected 32 commercial banks operating in Vietnam from 2010 to 2018. Our criteria required banks to provide sufficient data regarding the annual financial statements during the research period. Secondly, the banks in this study

were either acquired or controlled under special terms by the State Bank of Vietnam, following the recommendations of prior studies (e.g. [Nguyen and Phan, 2018a](#); [Nguyen and Phan, 2018b](#)). This study also eliminates the merged and consolidated banks operating during this period. Based on these criteria, our sample consists of 24 commercial banks, including 3 state-owned commercial banks and 21 private commercial banks. Private banks are those wherein more than 50% of the total shares are owned by a private party, who may be a foreign partner as well. The final sample includes 238 observations of OBS activities for 24 banks. Finally, macro-economic data, such as GDP growth and interest rates, were collected from the World Development Indicators (WDI) and the International Monetary Fund (IMF).

3.2 Variable measurement

3.2.1 Bank liquidity creation. [Berger and Bouwman \(2009\)](#) propose two measures to create bank liquidity through a three-step procedure, including non-fat liquidity (NFLC), which contains only on-balance sheet activities, and fat liquidity (FLC), which considers both on-balance sheet and OBS activities, which create liquidity similar to on-balance sheet liquidity.

Firstly, the categories of liquid, semi-liquid and illiquid are determined based on assets, liabilities, equity and OBS activities. Following the method of [Berger and Bouwman \(2009\)](#), this research classifies the same into varying categories, as shown in [Table 1](#). Due to the ease,

Assets Illiquid assets (weight = 0.5)	Semi-liquid assets (weight = 0)	Liquid assets (weight = -0.5)
Commercial and corporate loans	Consumer/Retail loans	Deposits and loans to other credit institutions
Other loans	Loans and advances to banks	Trading securities
Fixed assets		Investment securities
Other assets	Long-term investment	Derivatives
Liabilities plus equity Liquid liabilities (weight = 0.5)	Semi-liquid liabilities (weight = 0)	Illiquid liabilities plus equity (weight = -0.5)
Customer deposits-current	Customer deposits – term	Senior debt maturing after one year
Customer deposits-saving	Term deposits from banks	Subordinated borrowing
Demand deposits from banks and other credit institutions	Other deposits	Other funding
	Short-term borrowing from banks	Other liabilities
	Certificates of deposit	Total equity
OBS activities Illiquid O.B.S. (weight = 0.5)	Semi-liquid O.B.S. (weight = 0)	Liquid O.B.S. (weight = -0.5)
Acceptances and documentary credits reported OBS	Guarantees	
Committed credit lines		
Other contingent liabilities		

Table 1.
Liquidity classification
of bank activities

Source(s): [Berger and Bouwman \(2009\)](#) and [Fu et al. \(2015\)](#)

cost and timeliness with which banks employ their liquid fund to support their commitments, it is believed that category-based classifications would be more appropriate than maturity-based; further, it would be more relevant than the time to self-liquidation. Secondly, the activities of a bank are associated with varying weights according to liquidity creation intuition, the magnitudes of which are determined based on the following assessments: a unit of liquidity is created by converting a unit of liquid liabilities into that of illiquid OBS activities or illiquid assets. However, a unit of liquidity is destroyed by converting a unit of illiquid liabilities or equity into that of liquid OBS activities or liquid assets. Following the works of [Berger and Bouwman \(2009\)](#), a weight of 0.5 is allocated for illiquid OBS activities, illiquid assets and liquid liabilities, whereas a weight of 0.0 is proposed for semi-liquid OBS, semi-liquid assets and semi-liquid liabilities. Thus, a weight of -0.5 is assigned for liquid OBS activities, liquid assets and illiquid liabilities. Thirdly, FC and NFC are calculated by combining the activities as determined and weighted in [equation \(1\)](#) and [equation \(2\)](#), respectively.

$$\text{FLC} = 0.5 * (\text{illiquid assets} + \text{liquidity liabilities} + \text{illiquid O.B.S.}) - 0.5 * (\text{liquid assets} + \text{illiquidity liabilities} + \text{equity} + \text{liquid O.B.S.}) \quad (1)$$

$$\text{NFLC} = 0.5 * (\text{illiquid assets} + \text{liquidity liabilities}) - 0.5 * (\text{liquid assets} + \text{illiquidity liabilities} + \text{equity}) \quad (2)$$

3.2.2 Market power. The Lerner index, a standard of market power used in banking studies, has been used. The difference between the output price, P and the marginal cost relative to the price of MC ([Demirgüç-Kunt and Huizinga, 2010](#)) is divided by P to obtain the Lerner index, which is demonstrated in the following equation:

$$\text{Lerner} = \frac{P - MC}{P}, \quad (3)$$

where P is calculated by the ratio of total revenue to total assets, and MC is a translog cost function ([Berger and Bouwman, 2009](#); [Turk Ariss, 2010](#)):

$$MC = \frac{\text{Cost}}{Q} \left(\beta_1 + \beta_2 * \ln Q + \sum_{k=1}^2 \theta_k * W_k + \delta_3 * \text{Trend} \right). \quad (4)$$

[Equation \(4\)](#) indicates that MC is a function of *Cost* and output products Q , wherein the bank cost *Cost* is a function of output:

$$\begin{aligned} \text{Cost}_{it} = & \beta_0 + \beta_1 * \ln Q + \frac{\beta_2}{2} * \ln Q^2 + \sum_{k=1}^2 \gamma_k * W_k + \sum_{k=1}^2 \theta_k * \ln Q * W_k + \sum_{k=1}^2 \sum_{j=1}^2 W_k * W_j \\ & + \delta_1 * \text{Trend} + \delta_2 * \text{Trend}^2 + \delta_3 * \text{Trend} * \ln Q + \sum_{k=1}^2 \varphi_k * \text{Trend} * W_k + e \end{aligned} \quad (5)$$

where the total assets of the bank measure the output products $\ln Q$; the financial capital $w1$ is captured by the interest cost and the total deposits; the physical capital $w2$ is measured by operating cost on the total assets; and staff salaries on the total assets provide the human

capital $w3$. The changes in the cost function over time (technical changes) are presented by *Trend*. Equation (5) reflects that *Cost* combines output products and three input prices, presented by the physical capital $w1$, the human capital $w2$ and the financial capital $w3$. Scales of the cost of the input $w1$ and $w2$ by $w3$ are used to control heteroskedasticity. After approximating equation (5) using the OLS regression, the marginal cost MC is obtained by computing Equation (4).

3.2.3 Control variables. Based on the recommendations from the previous studies, the current work of research selected other variables to control for firm-specific characteristics and macroeconomic conditions that may be associated with the creation of bank liquidity. These are bank size (*SIZE*) at year-end, which is using the natural logarithm of the book value of total assets (Distinguin *et al.*, 2013; Berger *et al.*, 2016; Casu *et al.*, 2018); bank capital (*CAP*), which is the ratio between equity and total assets at year-end (Diamond and Rajan, 2001), and credit risk (*NPL*), calculated by the proportion of non-performing loans to total loans at the year-end (Berger and Bouwman, 2009; Horvath *et al.*, 2016). Moreover, the macro-variables adopted in this study are economic growth (*GDPGR*), which is measured as the annual changes in the gross domestic product (Athanasoglou *et al.*, 2008; Rauch *et al.*, 2010), and interest rate (*RATE*), which is the monetary policy-related interest rate of the economy, collected from the reports of Vietnam State Bank, as suggested by Casu *et al.* (2018) and Nguyen and Phan (2018b). Furthermore, we use the re-finance rate, as suggested by IMF, to measure the monetary policy-related interest rate of the economy. As previously mentioned, Yeddou and Pourroy (2020) suggested that ownership structure may contribute to the relationship with bank liquidity. However, this study believes that Vietnam also depends on a banking system that acts as the financial backbone of the economy, which passed the history of the centrally planned economy with the dominance of state-owned banks. Although state ownership has significantly declined since equitization from the 1986 reform, both state-owned and non-state banks believe that they represent the “tactful tool” of the government in the implementation of monetary policies to achieve stability in the macro-economy, curb inflation and ensure the social security of the country. Therefore, we temporarily disregard state ownership in this research; it may be considered separately in subsequent studies.

3.3 Research model

We develop the models used by Rauch *et al.* (2010) and Casu *et al.* (2018) to investigate the influence of market power on bank liquidity creation in Vietnam:

$$LC_{it} = \alpha_0 + \alpha_1 * LC_{it-1} + \alpha_2 * LERNER_{it} + \alpha_3 * SIZE_{it} + \alpha_4 * CAP_{it} + \alpha_5 * NPL_{it} + \alpha_6 * GDPGR_t + \alpha_7 * RATE_t + \varepsilon_{it} \quad (6)$$

where LC_{it} represents the dependent variables presented to bank liquidity creation and measured by (1) *FLC*, bank fat liquidity creation on total assets, and (2) *NFLC*, bank non-fat liquidity creation on total assets, respectively (Berger and Bouwman, 2009). LC_{it-1} represents the lagged dependent variables, and $LERNER_{it}$ reflects the market power [1] captured by the Lerner index (Nguyen and Phan, 2018b).

Although the Herfindahl-Hirschman Index (HHI) is also a measure of market concentration, calculated by squaring the market share of each competing entity in a market and then summing the resulting numbers (Ali *et al.*, 2021), with a range between 0 and 10,000, each entity can have up to the bulk of its business for a particular market segment. For example, this problem can occur when an industry entity has roughly equal market shares, but each operates only in specific areas; they will have a monopoly in that particular market.

Thus, for HHI to be adequately used, other factors must be considered, and the market must be clearly defined.

Meanwhile, the Lerner index measures the market power of a bank, which is set between the price of a commodity and its marginal cost (Demirgüç-Kunt and Huizinga, 2010). The higher the value of the Lerner index, the more likely the entity will charge higher marginal costs. Hence, the more significant its monopoly power would be. The Lerner index better reflects monopoly power. For example, Repkova (2012) estimated the market power in the Czech banking industry between 2000 and 2010. He found that HHI showed a trend of modest decrease, indicating that market concentration changed appreciably over the sample period. However, the Lerner index showed that the Czech banking sector operated between two extremes: monopoly and perfect competition, and the estimated level of competition in the Czech deposit market was based on period. Thus, this study used the Lerner index to measure the market power of a bank. Other variables of equation (6) have been defined in Section 4.2.

Further, the study intends to determine if the profitability level of a bank alters the relationship between bank liquidity creation and market power by employing an interactive term of market power and profitability level – $LERNER_{it} * D_High_{it}$ to the baseline equation (6). The second equation is followed by:

$$LC_{it} = \alpha_0 + \alpha_1 * LC_{it-1} + \alpha_2 * LERNER_{it} + \beta * LERNER_{it} * D_High_{it} + \alpha_3 * SIZE_{it} + \alpha_4 * CAP_{it} + \alpha_5 * NPL_{it} + \alpha_6 * GDPGR_t + \alpha_7 * RATE_t + \varepsilon_{it}, \quad (7)$$

where D_High_{it} is a dummy variable that proxies the profitability level, which equals 1 if the bank possesses an above-median value of return on assets in year t , and 0 if the bank possesses a below-median value of return on assets in year t (Agustini and Viverita, 2012; Klein and Weill, 2018). As argued in section 2.2, profitability serves as a buffer for liquidity creation and market power. The value of D_High_{it} is intended to examine the difference of $LERNER_{it}$ to liquidity among banks with higher and lower profitability, as shown in Equation (7).

Notably, equations (6) and (7) represent dynamic models with a lagged factor of the dependent variable, which may cause endogenous problems. In this case, endogeneity can be inconsistent and biased (Ullah *et al.*, 2018). The GMM method, according to Arellano and Bover (1995), is suitable for dealing with endogeneity as it eliminates unobserved effects and allows the creation of orthogonal conditions between $\varepsilon_{i,t}$ and explanatory variables. This study proposes that using lagged control variables does not correctly reflect the effects on liquidity creation; hence, it adopts the current control variables and uses GMM to handle potential endogeneity. The Arellano-Bond test for AR(2), and the Hansen test, must be satisfied to confirm consistent and unbiased results (Roodman, 2009).

4. Result and discussions

Table 2 illustrates the variables encompassed by the descriptive statistics of the study, such as liquidity creation, Lerner index, bank size, bank capital, credit risk, economic growth and interest rate. The abbreviations of these variables are shown in Section 4. The mean values of FLC and NFLC received 10.3216 and 7.9603%, respectively. FLC and NFLC range from a minimum of –17.9559% and –18.3960% to the maximum values of 41.2741 and 30.6165%, respectively. Correspondingly, Petrolimex Group Commercial Joint Stock Bank and Tien Phong Commercial Joint Stock Bank create the most and least liquidity. Moreover, this average liquidity creation appears to be much lower than in other countries, including developed and developing countries. For example, this ratio is smaller than the 17% in Malaysia (Toh *et al.*, 2019), the 20% in the Czech Republic (Horvath *et al.*, 2016) and the

Table 2.
Descriptive statistics
for all variables

Variable	Mean	Sd	Min	Max
NFLC (%)	7.9603	9.3967	−18.3960	30.6165
FLC (%)	10.3216	10.7801	−17.9559	41.2741
NFLC_EX (%)	12.6041	9.1207	−8.8753	37.2515
FLC_EX (%)	14.9654	10.5542	−7.7528	47.9091
LERNER	0.220054	0.100453	0.0000	0.493945
CAP (%)	9.2875	4.1620	4.0618	25.6425
SIZE (LOG)	32.3269	1.1773	30.1630	34.8111
NPL (%)	1.2942	0.9051	0.0046	6.0427
GDPGR (%)	6.2327	0.5761	5.2474	7.0758
RATE (%)	6.4333	2.9889	3.6639	13.1457

Source(s): Authors

22–30% in the United States (Jiang *et al.*, 2018). An explanation for the lower level of liquidity creation in Vietnamese banks is that bank size is smallest compared to other countries, leading to a decrease in the generation of liquidity.

LERNER has a mean value of 0.220,054 in our sample, with a standard deviation of 0.100,453. Thus, it is lower in comparison with China (about 0.3914) or Singapore (about 0.3316) (Fu *et al.*, 2015), indicating that rivalry among commercial banks was rather aggressive from 2010 through 2018. Specifically, the lowest LERNER is 0.0000 (Tien Phong Commercial Joint Stock Bank), while the highest is 0.493945 (The Vietnam Technological and Commercial Joint Stock Bank).

We present the correlation matrix in Table 3. Based on these results, market power, bank size, credit risk and economic growth were found to positively correlate with liquidity creation. In contrast, equity and interest rates negatively correlate with liquidity creation. The correlation coefficients of the independent variables are all less than 0.8.

Table 3 shows the estimation results of the impact of market power on bank liquidity creation in Vietnam. According to Kiviet (2020), the *p*-value of the AR(1) test is often less than 10% in default, while the *p*-values of the AR(2) test have to be greater than 10%, indicating the lack of autocorrelation problems. Similarly, the Hansen test shows that the instruments, as a group, are exogenous, which confirms that GMM estimations are appropriately conducted, and the estimated findings are reliable and unbiased.

We confirm that the liquidity creation of banks is attached to lagged liquidity creation. This implies that liquidity creation is a series of continuous activities that relate to banks over time. Our model eliminates the continuous influence of liquidity creation over time to ensure that the impact of the remaining factors can be more clearly depicted. We find that *LERNER* positively correlates with bank liquidity creation at a 1% significance level across the regressions. The empirical results indicate that banks with higher market power create more liquidity than those with lower market power, including *FLC* and *NFLC* measurements in Table 4. A greater market power increases liquidity creation by 1.4364 and 0.8670 points for *FLC* and *NFLC* with a 1% significant statistic, respectively. This result supports our hypothesis that banks with higher market power will generate higher liquidity, consistent with the “fragility channel” view and prior empirical studies such as Berger *et al.* (2010), Joh and Kim (2012), Lei and Song (2013), Horvath *et al.* (2016) and Jiang *et al.* (2018). The above explanations emphasize that increased competition reinforces financing impediments and lending rates, thereby increasing bank fragility. Thus, banks with low competition have to reduce their profits and increase their liquidity buffer to prevent risks and losses. These results support the prediction that the ability of a bank to create liquidity depends on the ability of bank competition. Our view is that a low degree of market power encourages the customer to switch banks and challenges banks in their ability to offset the costs of building

	NFLC	FLC	NFLC_EX	FLC_EX	LERNER	CAP	SIZE	NPL	GDPGR	RATE
NFLC	1									
FLC	0.9328***	1								
NFLC_EX	0.9752***	0.9145***	1							
FLC_EX	0.9052***	0.9812***	0.93***	1						
LERNER	0.146**	0.2911***	0.1038	0.257***	1					
CAP	-0.2415***	-0.2039***	-0.0206	-0.0111	-0.2047***	1				
SIZE	0.2751***	0.3095***	0.1207*	0.1755***	0.6608***	-0.713***	1			
NPL	0.2344***	0.2093***	0.2637***	0.233***	-0.0548	0.0973	0.0518	1		
GDPGR	0.1448**	0.1395**	0.1008	0.1007	0.2664***	-0.212***	0.1808***	-0.2681***	1	
RATE	-0.1884***	-0.1587**	-0.1419**	-0.117*	-0.1163*	0.2289***	-0.2053***	0.1502**	-0.6207***	1
Note(s): significance level (***, ** < 1%)										
Source(s): Authors										

Table 3.
Correlation matrix

Table 4.
The effect of market
power on bank
liquidity creation:
baseline model

Dependent variable	Fat liquidity creation (FLC)	Non-fat liquidity creation (NFLC)
Lag of FLC	0.3706*** (5.16)	
Lag of NFLC		0.1685*** (3.90)
LERNER	1.4364*** (3.29)	0.8670*** (6.08)
CAP	-1.6866** (-2.11)	-1.4528*** (-4.36)
SIZE	-7.0879 (-1.12)	-4.2347* (-1.79)
NPL	2.6527*** (3.49)	3.0471*** (4.87)
GDPGR	-4.9699*** (-4.14)	-2.6263*** (-3.51)
RATE	-0.4003*** (-2.62)	-0.2681* (-1.89)
Constant	250.8444 (1.22)	152.6170** (2.00)
Observations	192	192
Number of groups	24	24
Number of IVs	20	20
AR(1) (<i>p</i> -value)	0.0142	0.0611
AR(2) (<i>p</i> -value)	0.1685	0.1535
Hansen (<i>p</i> -value)	0.1950	0.1129
Note(s): significance level (***) <i>p</i> < 1%), (**) <i>p</i> < 5%), (*) <i>p</i> < 10%) and () is <i>t</i> -statistic		
Source(s): Authors		

long-run relationships with customers (Petersen and Rajan, 1995; Degryse and Ongena, 2005; Leroy and Lucotte, 2017). Thus, we note that commercial banks in Vietnam that transformed from state-owned banks should significantly enhance the competitive power to increase credit supply.

The regression results show a negative and significant relationship among *SIZE*, *FLC* and *NFLC*. The finding suggests that larger banks will create less liquidity than smaller ones, which is consistent with the findings of Berger and Bouwman (2009), Fu *et al.* (2015) and Le (2019), who claimed the existence of a negative link between liquidity creation and bank capital. However, these studies only consider bank capital as a significant factor of bank power, while our study uses the *LERNER* index to cover all factors of the market power of the bank, including output price and the marginal cost. Fu *et al.* (2015) also suggested that this relationship varied by bank size and region, implying that the relationship between market power and liquidity creation may differ in each country. In addition, bank capital significantly and negatively influences bank liquidity creation at a 10% level. Diamond and Rajan (2001) and Le (2019) argue that banks with a higher capital decrease customer deposits (crowd-out), and, as a result, banks produce less liquidity. Finally, credit risk positively impacts bank liquidity creation at a 1% significance level across the regressions, characterizing a positive relationship between liquidity risk and credit risk in prior studies (He and Xiong, 2012; Imbierowicz and Rauch, 2014). Notably, our results contrast that of Le and Pham (2021), who argued that credit risk negatively impacted liquidity creation. We note that there are differences in these studies in terms of the period time. However, it raises the question of whether or not there exists a threshold of credit risk in liquidity creation, which may be addressed in subsequent studies.

Economic growth shows a significant negative relationship with bank liquidity creation in terms of macroeconomics variables. Economic growth improves borrowers' income and payment capacity, which compels borrowers to prepay loans, thereby reducing bank lending. As a result, bank liquidity creation decreases. The interest rate also shows a significant adverse effect on bank liquidity creation. The tight monetary policy will decrease the liquidity created by commercial banks. [Casu et al. \(2018\)](#) suggest that commercial banks raise the price of loans and the deposit rate when the interest rate of the economy increases. This phenomenon impedes the demand of households and firms for credit and deposits, thus reducing bank liquidity creation.

[Table 5](#) illustrates the estimated results of the impact of market power on bank liquidity creation by bank profitability. Firstly, we observe that the Lerner index positively correlates with bank liquidity creation at a 1% significance level in all regression models. It indicates that banks with higher market power create more liquidity than ones with lower market power. Secondly, the coefficient β on $LERNER_{it} * D_High_{it}$ is positive and significant at 5 and 10% in the two regression models, applying for *FLC* and *NFLC*. Because D_High_{it} is a dummy variable representing banks with above-mean profitability at time t of bank i , it also reflects disparities in market power in terms of different profitability. The study results indicate that the effect of this interactive variable is positive, suggesting that highly profitable banks can suffer more from the positive impact of bank market power on liquidity creation than banks with lower profitability. Because there is enough "buffer" in place, more profitable banks are willing to increase the amount of net surplus distributed to stakeholders by creating more liquidity, thereby enhancing the value of the bank ([Sahyouni and Wang, 2019](#)). Hence, banks acquire more market power by granting more credit once they maintain the "buffer" for future risk (see [Table 6](#)).

Dependent variable	Fat liquidity creation (FLC)	Non-fat liquidity creation (NFLC)
Lag of FLC	0.2820*** (6.36)	
Lag of NFLC		0.2053*** (2.69)
LERNER	0.4371** (1.96)	0.7560*** (2.62)
LERNER*D_HIGH	0.1559* (2.19)	0.1558* (1.73)
CAP	-1.3197*** (-4.00)	-1.6122*** (-3.81)
SIZE	-6.9548*** (-2.74)	-6.6564** (-2.23)
NPL	1.9913*** (4.48)	1.8154*** (3.92)
GDPGR	0.5060 (0.65)	-1.9382* (-1.91)
RATE	-0.1250 (-1.00)	-0.1797 (-1.45)
Constant	228.9966*** (2.85)	229.7151** (2.33)
Observations	192	192
Number of groups	24	24
Number of IVs	24	23
AR(1) (p -value)	0.0153	0.0321
AR(2) (p -value)	0.2924	0.4185
Hansen (p -value)	0.1586	0.1627

Note(s): significance level (***) $p < 1\%$, (**) $p < 5\%$, (*) $p < 10\%$ and () is t -statistic

Source(s): Authors

Table 5.
The effect of market
power on bank
liquidity creation by
bank profitability level

Table 6.
The effect of market
power on bank
liquidity creation:
robustness check

Dependent variable	FLC_EX	NFLC_EX	FLC_EX	NFLC_EX
Lag of FLC_EX	0.3007*** (7.40)		0.2160*** (2.86)	
Lag of NFLC_EX		0.1483*** (3.66)		0.1823** (2.52)
LERNER	1.1742*** (3.96)	0.8667*** (6.90)	0.7773* (1.72)	0.6822*** (2.61)
LERNER*D_HIGH			0.2541* (1.76)	0.1626* (1.86)
CAP	−0.9400** (−2.34)	−0.9430*** (−2.82)	−1.1455** (−2.10)	−1.0957*** (−2.58)
SIZE	−6.4829* (−1.82)	−4.2435** (−1.98)	−6.1679* (−1.71)	−6.1008** (−2.17)
NPL	1.7862*** (2.80)	3.1499*** (5.03)	3.5232*** (5.56)	1.8676*** (3.94)
GDPGR	−3.5547*** (−4.34)	−2.3613*** (−3.21)	−0.5782 (−0.75)	−1.4258 (−1.63)
RATE	−0.2630* (−1.86)	−0.2774** (−2.41)	−0.0087 (−0.05)	−0.1292 (−1.23)
Constant	225.5925** (1.97)	150.9183** (2.16)	201.2365* (1.75)	208.9827** (2.26)
Observations	192	192	192	192
Groups	24	24	24	24
Instruments	24	21	24	23
AR(1) (<i>p</i> -value)	0.0250	0.0621	0.0295	0.0353
AR(2) (<i>p</i> -value)	0.1287	0.1487	0.2179	0.4038
Hansen (<i>p</i> -value)	0.2352	0.1499	0.2261	0.1473

Note(s): significance level (****p* < 1%), (***p* < 5%), (**p* < 10%) and () is *t*-statistic
Source: Authors

Since banks must satisfy the regulatory capital framework, they attempt to seek profitability to build capital (Blum, 1999; Perotti *et al.*, 2011). When more profit is generated, banks improve their income-generating capacity and operating synergy (Demirgüç-Kunt and Huizinga, 2010). As a result, the impact of market power on liquidity creation is more substantial in the higher profitability banks, compared to lower profitability banks.

To verify the robustness of the findings, we further investigate the impact of market power on bank liquidity creation using alternative liquidity creation measures, NFLC_EX and FLC_EX. According to liquidity creation theories, banks produce more liquidity by transforming illiquid assets into liquid liabilities than illiquid claims such as equity (Fu *et al.*, 2015). To address this potential concern, Berger and Bouwman (2009) suggested that equity should be detached from basic measures. Hence, two alternative measures, FLC_EX (fat liquidity creation but excluding equity) and NFLC_EX (non-fat liquidity creation but excluding equity), are employed in this study. Table 4 demonstrates the impacts of market power on bank liquidity creation in two alternative measures. The empirical results suggest that our hypotheses also consist of both NFLC with FLC and NFLC_EX with FLC_EX measures. Consequently, a high bank market power level leads to increased liquidity creation. Furthermore, highly profitable banks positively impact their market power on liquidity creation, relative to less profitable banks (see Table 6).

5. Conclusion

Our study assesses the effect of market power on the liquidity creation of Vietnamese commercial banks from 2010 to 2018. Applying the GMM estimation, our study finds that market power, measured using the Lerner index, significantly impacts bank liquidity

creation. The empirical findings show that bank liquidity increases when a bank has high market power, and the converse is correct as well. These results support the “fragility channel” view, in which lending rates and financing impediments are pushed by the increased competition, leading to increased bank fragility. In other words, a bank with lower market power has a higher level of risk-aversion and supplies a lower liquidity creation. The financial market is believed to react differently to the competition between emerging and developed countries. However, our main results remain robust as per several robustness tests, confirming that bank market power matters for liquidity creation in the financial market. In the further step, this study determines whether the profitability of the bank played a role in the relationship between market power and liquidation. This study also finds that highly profitable banks positively market power in terms of liquidity creation than less profitable banks. As previous studies did not fully claim the role of bank profitability in liquidity creation, our study indicates that profitability is determined as a “buffer” in creating high liquidity, especially in the context of declined market power.

As side effects, our study finds that bank capital decreases liquidity creation, demonstrating the support for the “financial fragility.” The study also finds that interest and economic growth negatively impact the bank’s ability to provide liquidity. The increased borrowing needs in the growing economy have placed banks in advance overloading, resulting in decreased liquidity creation. Our results also show a significantly negative influence of interest, demonstrating that tight monetary policy causes adverse effects on creating liquidity. By contrast, credit risk positively impacts bank liquidity creation, denoting a positive relationship between liquidity creation and liquidity risk, due to a high risk-taking appetite.

Our findings have some implications for managers of banks and policy-makers of government. Firstly, managers should control their bank’s liquidity by supervising vulnerable characteristics mentioned in this study, which include risk-taking appetite and the capital ability of a bank to achieve liquidity creation quickly. Managers must balance the advantages and disadvantages of liquidity creation and consider the competitiveness of the bank before making decisions. Secondly, our study supports the expansionary monetary policy that maintains interest rates low enough to boost the liquidity creation of banks. Finally, the government should encourage banks to create more liquidity by changing regulations concerning controlled market power to promote investment, especially in the growing economy. Regulations may be reinforced regarding liquidity and a transparent business environment may be created to prevent the risk-taking appetite and avoid liquidity risk. Finally, the increased competitiveness through the application of technology to provide deposit and lending services is an urgent implication for enhancing the bank’s ability to create liquidity.

However, our research also has some limitations. Firstly, the liquidity measurement in this study is based on the work of [Berger and Bouwman \(2009\)](#), and there are specific differences compared to Basel III. However, future studies are necessary due to the uncertainty in the definition and measurement of liquidity. Furthermore, this study does not address the causality between market power and liquidity creation of banks, although some suggestions raised this question in their studies ([Davidson et al., 1995](#)). Besides, the limitation of data is also an issue to consider. Although the current study was conducted using data from banks listed in Vietnam and other particular banks excluded from the statistical sample due to their specific nature, this result may not be generalized to all commercial banks. Finally, other variables can significantly impact bank liquidity creation and are not integrated into our models, such as state ownership ([Nguyen and Wong, 2021](#)) and business environment ([Nguyen et al., 2020](#)). Therefore, a quadratic model should have been considered to measure market power and bank liquidity creation in follow-up studies.

Note

1. Market power can be measured from the perspective of NEIO and IO. However, among these measures, Lerner can reflect the change in market power among banks over time, while other indexes fail to do so.

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(The Appendix follows overleaf)

Appendix
Mergers and acquisitions in the period 2010–2018

Year	Target banks or financial institutions	Acquirer banks
2011	Saigon Commercial Bank Tin Nghia Bank First Commercial Bank	Saigon Commercial Bank
2012	HabuBank	Saigon Hanoi Bank
2013	Dai A Bank	HoChiMinh City Development Bank
2013	Western Bank PetroVietnam Finance Corporation	Public Commercial Bank
2015	Vietnam Construction Bank Ocean Bank GP Bank	SBV
2015	Mekong Housing Bank	BIDV
2015	Mekong Development Bank	Maritime Bank
2015	Southern Bank	Sacombank

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