

HOW MARKET CONCENTRATION AND LIQUIDITY AFFECT NON-PERFORMING LOANS: EVIDENCE FROM VIETNAM

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Abstract: The present study is the first to estimate the impacts of market concentration and liquidity on the non-performing loans in Vietnam, a transitional economy in Asia. This research is unique because government-owned banks secure unprecedented market power against private banks in Vietnam. The data is collected from 33 Vietnamese banks from 2009 to 2020. The study employs the Random Effect Models and the two-step system Generalized Method of Moments to analyze the results. The empirical findings document an inversed relationship between market concentration and non-performing loans. Specifically, when the Herfindahl–Hirschman Index increases by one point, the non-performing loans ratio reduces by 0.1%. However, the non-performing loans of commercial banks in Vietnam are positively empowered by liquidity. The findings of the study imply that a percentage increase in bank funding diversity and liquidity creation cause non-performing loans to rise by 0.52% and 0.3%, respectively. The results are supported by the bank concentration and stability theory, the "too-big-to-fail" hypothesis, and prior literature. The study outcomes are relevant for policymakers to develop banking system stability. The present study also provides recommendations for bank managers and policymakers to control the non-performing loans of commercial banks. The authors suggest future studies explore this topic across the country to generalize in-depth insights.

Keywords: bank liquidity, non-performing loans, bank funding diversity.

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Introduction

Stability in the banking sector is one of the crucial components for the sustainable development of the economy (Khoa et al., 2022). During the last decades, the banking system has been developed significantly. The rapid growth of non-performing loans (NPLs) is discussed in various studies (Louzis et al., 2012; Kingu et al., 2018; Hoang et al., 2020; Dao and Phan, 2020). However, prior studies generate controversial findings on determinants of NPLs across emerging and

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developed economies. The NPLs are affected by different factors depending on their economy due to different market microstructures.

The impacts between market concentration and the risk-taking behavior of commercial banks are closely analyzed in prior literature. The bank concentration and stability theory conjecture that banks with higher market power have higher capitals that empower their profitability. Moreover, the NPLs are reduced when commercial banks have the resources to monitor loan quality and credit activity. On the other hand, smaller banks are motivated to relax their credit procedure, making credits more accessible to subprime customers and degrading the loan quality (Aldomy et al., 2020).

This study is conducted in Vietnam for the following reasons. From 2009 until 2020, the empirical data shows that Vietnamese banks have an average NPLs value of 1.91%, which, compared to the rest of the world, is still high despite the government's efforts to address these issues. Besides, the average liquidity creation in Vietnamese banks increased from 27% in 2009 to 35% in 2020, with the average value being 31.83%. Although it is widely acknowledged that credit risk and liquidity risk are fundamental challenges for commercial banks in both emerging and mature markets, the effects of bank liquidity creation on NPLs are received limited attention. The present research aims to determine various factors that affect banks' risk in Vietnam from 2009 to 2020. Specifically, it estimates the impacts of market concentration, bank liquidity creation and funding diversity on the NPLs of commercial banks in Vietnam.

In addition, The State Bank of Vietnam issued a policy to enhance banking stability in 2012. Accordingly, the ratio of NPLs resolved by customers' repayment over the total resolved on-balance NPLs from the validation of Resolution 42 to May 31, 2020, is 40.1%, compared to 22.8% between 2012 and 2017. Commercial banks have adopted several policies from February 2020 to the present to help lower the risk of bad debt due to the COVID-19 outbreak. According to Circular No. 01/2020/TT-NHNN and Circular No. 03/2021/TT-NHNN issued by the State Bank of Vietnam, banks shall provide the utmost help to customers whose income has been affected by the COVID-19 pandemic.

In this research, the authors calculate the ratio of NPLs to total loans to measure the NPLs of each Vietnamese bank (Hoang et al., 2020; Louzis et al., 2012). The researchers also complement Berger and Bouwman (2009) and Dang (2020) in calculating bank liquidity creation and adjusting by including current, saving, and time deposits as the liquid liabilities. To measure bank funding diversity, this study follows the studies of Vo (2020) and Duong et al. (2022) to estimate bank funding diversity. Finally, the authors follow Saif-Alyousfi et al. (2018) to compute the market concentration proxied by the Herfindahl-Hirschman Index (HHI).

The current study extends existing literature in the following ways. Firstly, a comprehensive data set of Vietnamese commercial banks from 2009 to 2020 is consolidated to reflect credit growth after the financial crisis. In addition, this is the

first study to examine the market concentration and bank liquidity on NPLs of commercial banks in Vietnam, a transition country in Asia. Policymakers are supported by the findings of this study to modify the banking policy structure to improve discipline and limit bank managers' perverse incentives to take on too much risk during banking activities.

This research generates striking results. Firstly, an inverse relationship between market power and NPLs is indicated in this study. Banks with higher market power have competitive advantages and resources to develop risk management skills to control the loan quality efficiently, which is supported by bank concentration and stability theory. In addition, the findings figure out that the NPLs are positively pronounced by liquidity creation and funding diversity. Banks create liquidity to support credit operations and enhance profitability, which might lead to higher NPLs. Moreover, bank managers are motivated by excess funding diversity to participate in riskier lending activities to increase their salaries and remunerations. The findings of the study are aligned with the studies of Casu et al. (2018), Toh (2019), Dang (2020), Vo (2020), Aldomy et al. (2020), and Duong et al. (2022), and are also supported by the bank concentration and stability theory and the "too-big-to-fail" hypothesis.

Literature Review

The mixed impact of market concentration, proxied by HHI, on NPLs is widely discussed in prior literature. The market concentration's positive effect on NPLs is reported in the research conducted by Căpraru and Andrieș (2015) and Tongurai and Vithessonthi (2022). Increased competition might encourage banks to ex-ante take on higher risks. It is unwise for a few banks to bear the lower risk when their competitors take higher risks to enhance bank performance. Hence, commercial banks are motivated to take higher risks due to increasing competition.

However, higher market power reduces the bank's risk-taking behavior. This argument is supported by competition stability theory, Jiménez et al. (2013), Aldomy et al. (2020), and Tabak et al. (2011). Lower market power reduces the bank's profitability due to shrinking market share. Therefore, weaker market power erodes bank performance and increases the perceived bankruptcy risk of commercial banks. The following hypothesis is proposed as mixed findings between market competition and bank risk-taking behavior are identified in the prior literature.

Hypothesis 1: There is a negative relationship between market power and NPLs.

Other authors have mainly been interested in questions concerning bank diversification. Research on the subject has been mostly restricted to limited bank comparisons as a measure of diversification (Salas and Saurina, 2002). However, research on bank funding diversification and risk-taking behavior has received limited attention. The effects of bank funding diversity on the banks' risk profile in Vietnam are closely examined in the study by Vo (2020). The study revealed a positive association between bank funding diversity and NPLs. Therefore, banks are

motivated to operate riskier if they have more diversified funding sources. Conversely, having a solid capital structure helped the U.S and European banks survive during the financial crisis, as reported in Vazquez and Federico (2015).

As mixed findings between funding diversity and credit risk are reported in the prior literature, the authors have framed the following hypothesis.

Hypothesis 2: There is a positive relationship between bank funding diversification and NPLs.

The relationship between liquidity creation and NPLs is analyzed in the existing literature. Allen and Gale (2004) suggested that the more banks create liquidity, the more they may face losses when they sell their illiquid assets to meet customers' liquidity demands. A positive relationship between NPLs and European liquidity creation is reported in the study by Casu et al. (2018). Similarly, Toh (2019) reports that banks create more liquidity when they are exposed to higher credit risk in the Malaysian banking sector. Toh (2019) explains that asset risks are mitigated by additional liquidity creation. Dang (2020) also shows that Vietnamese banks with higher credit risks had a higher level of liquidity from 2007 to 2018.

Nevertheless, Horváth et al. (2014) suggest that larger banks increase their owned capital to minimize liquidity risk as a capital buffer. Therefore, the large proportion of illiquid assets in the balance sheets motivates banks to mitigate liquidity creation for safety purposes and raise their capital to reduce bankruptcy costs. Umar and Sun (2016) argued that bank liquidity creation is unrelated to NPLs in Chinese banks.

As mixed findings between liquidity creation and credit risk are discussed in the prior literature, the following hypothesis has been constructed.

Hypothesis 3: There is a positive relationship between liquidity creation and NPLs.

Other Determinants of NPLs

Ekinci and Poyraz (2019) report that bank size (SIZE) is measured by the logarithm of a bank's total assets. Kusi et al. (2017) also show that bank size is positively and significantly associated with bank risk. When the bank's operating scale becomes large, it leads to ineffective monitoring and evaluation of customers due to high operating costs, increasing NPLs. Dao and Phan (2020) showed that larger banks take more credit risks because they are supported by the government in case of bankruptcy. Conversely, Hu et al. (2004) and Salas and Saurina (2002) indicated that credit risk is reduced in larger banks because they have more experience evaluating credit applications.

Management Competence (MC): Custódio and Metzger (2014) state that bank credit risks are decreased by highly financially educated managers because they have analytical decision-making skills and management experience. In addition, Gong et al. (2020) also indicate risk management is efficiently empowered by experienced CEOs. Therefore, the credit risk is lowered by improving management competence. Nguyen (2014) and Salas and Saurina (2002) report a positive impact of bank lending (BLOAN) on NPLs due to an increased volume of loans to meet required

profitability. However, Hoang et al. (2020) report an insignificant effect of bank lending on NPLs.

Research Data and Methodology

This study is mainly based on data obtained from the audited financial statements of 33 domestic banks from 2009 to 2020. All variable is winsorized at the 5% and 95% levels to mitigate extreme value issues (Duong et al. 2021). Observations that do not have enough data to calculate relevant variables are also removed from the sample (Duong et al., 2022). The final sample is a balanced panel with 387 annual observations of 33 commercial banks from 2009 to 2020.

The variables discussed in our study include non-performing loans, bank liquidity creation, bank funding diversity, market concentration factors and control variables. All these variables are discussed in Table 1.

Table 1. Variables definitions

Variables	Symbol	Equation	References
<i>Dependent variable</i>			
Non-performing loans (%)	NPLs	$NPLs = (\text{Group 3 loans} + \text{Group 4 loans} + \text{Group 5 loans}) / \text{Total loans}$	Louzis et al. (2020), Hoang et al. (2020)
<i>Independent variables</i>			
Bank funding diversity (%)	BFD	We follow Vo (2020) to estimate the bank funding diversity, which ranges from 0 to 1.	Vo (2020)
Bank liquidity creation (%)	NONFAT	“Non-fat cat” measurement	Berger and Bouwman (2009)
Herfindahl–Hirschman Index	HHI	$HHI_t = \sum_{i=1}^n S_{i,t}^2$ S _{i,t} represents the market shares by total assets of bank i at time t.	Tabak et al. (2011)
<i>Control variables (bank-specific variables)</i>			
Bank size	SIZE	The logarithm of total assets	Ekinci and Poyraz (2019)
Bank lending	BLOAN	$BLOAN = \text{Total loan} / \text{Total assets}$	Vo (2020)
Management competence	MC	The logarithm normalizes the total revenue ratio to the number of board members.	Gong et al. (2020)

Non-performing loans (NPLs) are bad debts created by a loan's failure to perform its intended function. According to Decision No.493/2005-QD-NHNN issued by the State Bank of Vietnam, the authors measure NPLs by calculating the ratio of NPLs to total loans, where Group 3 loans are 91 to 180 days past due; Group 4 loans are those that are 181 to 360 days past due; Group 5 loans are those that are 361 days or more past due.

Because of the data limitations on maturity, the researchers classify these items into different categories. Besides, off-balance-sheet activities are included in the measure of bank liquidity creation, the "non-cat fat" liquidity creation measurement (Berger and Bouwman, 2009).

Bank funding diversity (BFD): In this research, bank funding diversity is calculated based on the study of Vo (2020). BFD is bank funding diversity, which is ranged from zero to one. The higher value ratings indicate that the bank obtains funds from various sources.

HHI is the widely used indicator to compute the market concentration of many specific sectors, especially in the manufacturing sector. Commercial banks are quietly different from manufacturing enterprises, but they still pay their equity costs and earn revenue from the assets. Prior studies point out that HHI Index can be used in the banking sector to generate reliable results. Following Tabak et al. (2011), the HHI index represents the market shares by total assets of bank i at time t .

$$NPLS_{i,t} = \alpha + \beta_1 HHI_{i,t} + \beta_2 LIQ_{i,t} + \gamma CV_{i,t} + \varepsilon_{i,t}$$

In which $NPLs$ represent credit risk, the explanatory variables are HHI Index (HHI) and bank liquidity (BFD and NONFAT). The control variables (CV) are bank loans (BLOAN), bank size (SIZE) and management competence (MC). The ε is the error term. All the variable definitions are explicitly described in Table 1.

Firstly, Standard Least Square estimations such as the Pooled Ordinary Least Squares (OLS), Fixed Effects Model (FEM), and Random Effects Model (REM) estimations are employed to examine the impact of market concentration and liquidity on the NPLs. The Redundant and Hausman tests are conducted to select the most suitable estimation method among the three estimation methods. The REM is preferable. The Wooldridge test, Breusch and Pagan multiplier test, and Durbin Wu-Hausman test show problems in the result. Therefore, two-step system Generalized Method of Moments (SGMM) estimations are implemented to mitigate potential estimation bias. Finally, the study implemented the Arellano Bond and Hansen tests and confirmed that the model is free from autocorrelation problems, and valid instruments were added.

Empirical Findings and Discussion

Table 2. Descriptive statistics

Variable	Mean	Maximum	Minimum	Standard Deviation	Obs
NPLs	0.0191	0.1246	0.0000	0.0149	387
BFD	0.5500	0.7545	0.1876	0.1012	387
NONFAT	31.8300	34.7040	27.6109	1.2904	387
SIZE	31.7300	34.9500	26.0900	1.5400	387
BLOAN	0.5500	0.8186	0.1473	0.1353	387
HHI	0.0020	0.0401	0.0000	0.0055	387
MC	10.3000	13.6900	4.3900	1.3800	387

The descriptive statistics of 7 variables from 33 listed banks in Vietnam from 2009 to 2020 are reported in Table 2. The NPLs have an average value of 1.91%, which is relatively high compared to other countries in the region. For instance, the average NPLs in Indonesia is 1.73% (Lestari, 2018), and in China is 1.78% (Umar and Sun, 2016). The average HHI ratio is 0.2%, implying that the Vietnamese banking industry is highly competitive. The BFD variable has a mean value of 0.550 with a standard deviation of 0.1, which aligns with Vo (2020) and Duong et al. (2022). Finally, Vietnamese banks' average liquidity creation (NONFAT) is 31.83%. Finally, descriptive statistics for the control variables are also reported in Table 2. The correlation between the independent variables is indicated in Table 3. The absolute highest correlation value is 0.66, which is below 0.8. So, the selection of our variables is appropriate. Furthermore, the Variance Inflation Factor (VIF) Test reported that the VIF range from 1.19 to 2.24, and the mean VIF is 1.75. Therefore, the present study does not have multicollinearity problems among the independent variables (Duong et al., 2022).

Table 3. Pearson correlation matrix

	BFD	NONFAT	SIZE	BLOAN	HHI	MC	VIF
BFD	1						2.07
NONFAT	-0.3861	1					1.88
SIZE	0.0090	-0.0285	1				1.22
BLOAN	-0.6626	0.3331	0.1469	1			2.24
HHI	-0.2281	0.6322	0.0038	0.3934	1		1.88
MC	0.0170	-0.0257	0.3329	-0.1173	-0.0353	1	1.19

An inverse relationship between market power proxied by HHI and NPLs is indicated in Table 4. The findings conjecture that banks with lower market power have higher NPLs and vice versa. The result implies that when the HHI index increase by one point, the NPLs ratio is reduced by 0.1%. Therefore, smaller banks with less competitive advantages and market share are motivated to relax the credit procedure to attract customers, causing higher NPLs. Aldomy et al. (2020) and Tabak et al. (2011) suggest that loan quality is efficiently managed in banks with more considerable market power because they have the resources for developing risk management activities. While the findings are aligned with Tabak et al. (2011), they are inconsistent with Căpraru and Andrieș (2015), and the findings are also supported by the bank concentration and stability theory and Hypothesis 1, implying that banks with higher market power have lower NPLs and vice versa.

Table 4. Regression results from REM and the two-step system GMM

Independent variables	REM	SGMM
NPLs(-1)		0.2088* (1.71)
HHI	-0.1773 (-1.12)	-0.0010* (-1.67)
BFD	-0.0133 (-0.56)	0.5264* (1.83)
NONFAT	-0.0008 (-1.32)	0.0301* (1.87)
SIZE	0.0830 (0.82)	-0.0039* (-1.73)
MC	-3.39E-05 (-1.42)	-3.3697* (-1.65)
BLOAN	0.0037 (1.24)	0.1573* (1.68)
Constant	0.0542*** (3.29)	0.0010 (0.57)
Firm fixed (dummy variables)	No	

Cross-section fixed (first differences)		Yes
The period fixed (dummy variables)	No	Yes
Observations	387	308
R-squared	0.0186	
F-Statistic	1.2017	
Prob (F-Statistic)	0.3045	
Prob (Hausman test)	<0.0001	
AR (1) test ^a		0.0117
AR (2) test ^b		0.9147
J-statistic ^s		32.6935
Prob(J-statistic)		0.2902

The positive relationship between bank funding diversity (BFD) and NPLs is indicated in Table 4. The finding implies that a percentage increase in BFD cause NPLs to rise by 0.52%. Banks with more diversification of funding sources have more diversification opportunities. Therefore, these banks will not be dependent on a single source of capital, which will lower their funding liquidity risk. Bank managers are encouraged to increase the volume of loans to maximize profits, including lower bank lending standards. However, the finding is contradicted by the common assumption that bank profitability is pronounced by additional diversification opportunities without increasing risky activities (Vo, 2020). Thus, the results are aligned with Vo (2020) and Duong et al. (2022) and support Hypothesis 2, implying a positive relationship between bank funding diversity and NPLs.

Table 4 also reports that NPLs are positively affected by bank liquidity creation. In other words, banks with more extraordinary liquidity creation are more likely to have additional NPLs. The study finding implies that a percentage increase in NONFAT causes NPLs to rise by 0.03%. A large proportion of the bank's liquidity creation is utilized by credit activities, contributing the most to bank profitability. Therefore, bank managers are motivated to increase the use of their capital to create more liquidity through both on-balance-sheet and off-balance-sheet activities to improve bank performance. Thus, higher NPLs are increased by excessive liquidity creation, which degrades the loan quality. The findings of the current research are supported by Dang (2020), Toh (2019), and Casu et al. (2018), and the results support Hypothesis 3, implying that liquidity creation positively affects NPLs.

An inverse relationship between bank size and NPLs can be identified in Table 4. Large banks have more diversified lending portfolios than small banks. Besides, larger banks have more experience in loan assessment and efficient credit risk management. Therefore, the credit risk is significantly reduced in larger banks due to diversifying credit activities. These findings are aligned with Dao and Phan (2020) and the "too-big-to-fail" hypothesis.

A negative relationship between management competence (MC) and NPLs is also documented in Table 4. Custódio and Metzger (2014) and Gong et al. (2020) suggest that NPLs are efficiently managed by highly competent managers because they have analytical and risk management experiences. Finally, the current research indicates that NPLs are positively affected by increasing bank lending. The findings show that a percentage increase in bank lending ratio causes NPLs to rise by 0.15%. Bank managers are pressured to increase loan volume to archive KPIs, causing lower loan quality and higher NPLs. The results are consistent with Nguyen (2014) and Salas and Saurina (2002).

Conclusion

The impacts of market power and bank liquidity on the NPLs of commercial banks are closely examined in this study. The sample of this study is included data from 33 Vietnamese banks from 2009 to 2020. The two-step System GMM estimations are employed to analyze the data because they efficiently control endogeneity, autocorrelation and heteroscedasticity issues.

The findings show that NPLs are adversely affected by the market power of commercial banks in Vietnam. The higher market concentration causes smaller banks to relax their credit procedure to strengthen their performance, causing higher NPLs. Moreover, the NPLs in larger banks are significantly reduced because they have the resources to monitor loan quality and credit activity. In addition, the findings document a positive relationship between bank liquidity, which is proxied by funding diversity and liquidity creations, and NPLs. Bank managers are motivated by excess liquidity to extend credit activities to empower their salary and remunerations. The findings are aligned with the studies of Aldomy et al. (2020), Tabak et al. (2011), Vo (2020), Duong et al. (2022), Dang (2020), Toh (2019), Casu et al. (2018) and prior literature and findings are also supported by the bank concentration and stability theory and the "too-big-to-fail" hypothesis.

Practical implications for bank managers and policymakers in emerging markets are generated by this study. While commercial banks focus on generating more revenue through lending, banks are motivated to diversify funding liquidity sources to reduce NPLs. In addition, with a more diversified funding source, banks in Vietnam will be more active in carrying out various banking activities. Therefore, commercial banks can improve their profitability and minimize their risk. However, to maintain a reasonable level of loan volume, banks are recommended to manage their capital requirements and operating costs. Finally, since banks have more capital as a buffer against risky activities, they are encouraged to increase their lending capacity. However, they should improve their loan quality instead of focusing only on the volume of loans and improving their risk management. Unstable economic influences in the banking industry are efficiently managed by good management and a strong capital structure.

Although the current study has a marginal contribution, it has the following limitations. It has data limitations because data is collected from only listed banks in Vietnam, resulting in limited observations. The second limitation of our study is that the data is not for an extended period because of the lack of data sources. Therefore, future studies are suggested to employ cross-country analyses to provide in-depth insights into this topic.

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JAK KONCENTRACJA RYNKU I PŁYNNOŚĆ WPLYWAJĄ NA KREDYTY ZAGROŻONE : DOWÓD Z WIETNAMU

Streszczenie: Niniejsze badanie jest pierwszym, w którym oszacowano wpływ koncentracji rynku i płynności na kredyty zagrożone w Wietnamie, gospodarce w Azji w okresie przejściowym. Badanie jest unikalne , ponieważ banki będące własnością rządu

zabezpieczają bezprecedensową siłę rynkową wobec banków prywatnych w Wietnamie. Dane zebrano z 33 wietnamskich banków w latach 2009-2020. W badaniu wykorzystano modele efektów losowych i dwustopniowy system uogólnionej metody momentów do analizy wyników. Wyniki badań empirycznych dokumentują odwrotną zależność między koncentracją na rynku a kredytami zagrożonymi. W szczególności, gdy indeks Herfindahla-Hirschmana wzrastał jeden punkt, wskaźnik kredytów zagrożonych zmniejsza się o 0,1%. Jednakże, zagrożone kredyty banków komercyjnych w Wietnamie są pozytywnie wzmacniane przez płynność. Wyniki badania sugerują, że procentowy wzrost zróżnicowania finansowania banków i tworzenia płynności powoduje wzrost kredytów zagrożonych odpowiednio o 0,52% i 0,3%. Wyniki są poparte teorią koncentracji i stabilności banków, hipotezą „zbyt duży, by upaść” oraz wcześniejszą literaturą. Wyniki badań są istotne dla decydentów politycznych w zakresie rozwoju stabilności systemu bankowego. Niniejsze badanie zawiera również zalecenia dla menedżerów banków i decydentów dotyczące kontroli kredytów zagrożonych w bankach komercyjnych. Autorzy sugerują, że przyszłe badania ten temat prowadzone były w całym kraju, aby uogólnić dogłębne spostrzeżenia.

Słowa kluczowe: płynność banków, HHI, kredyty zagrożone, zróżnicowanie finansowania banków.

市场集中度和流动性如何影响不良贷款：来自越南的证据

摘要：本研究首次评估了市场集中度和流动性对亚洲转型经济体越南不良贷款的影响。这项研究是独一无二的，因为在越南，国有银行针对私人银行获得了前所未有的市场力量。数据收集自 2009 年至 2020 年的 33 家越南银行。该研究采用随机效应模型和两步系统广义矩量法来分析结果。实证结果证明了市场集中度与不良贷款之间的反比关系。具体而言，当赫芬达尔-赫希曼指数上升 1 个百分点时，不良贷款率下降 0.1%。然而，越南商业银行的不良贷款受到流动性的积极赋能。该研究的结果表明，银行融资多样性和流动性创造的百分比增加导致不良贷款分别增加 0.52% 和 0.3%。结果得到银行集中度和稳定性理论、“太大而不能倒”假说和先前文献的支持。研究结果与政策制定者发展银行系统稳定性有关。本研究还为银行管理者和政策制定者提供了控制商业银行不良贷款的建议。作者建议未来的研究在全国范围内探索这一主题，以概括深入的见解

关键词：银行流动性，HHI，不良贷款，银行融资多样性