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THE BASEL III NET STABLE FUNDING RATIO AND A RISK-RETURN TRADE-OFF: BANK-LEVEL EVIDENCE FROM VIETNAM

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ABSTRACT

The Net Stable Funding Ratio (NSFR) liquidity rule under Basel III guidelines is designed to handle long-term liquidity risk, promoting the sustainable structures of bank funding. This study estimates the NSFR and analyses the impact of this liquidity ratio on banks according to a risk-return trade-off in Vietnam prior to the Basel III implementation. Using yearly data for commercial banks from 2007 to 2018, I find that banks with higher NSFR gain more potential benefits than banks with lower NSFR. Concretely, a rise in NSFR increases bank profitability and decreases bank funding costs, credit risks and liquidity creation, as evidenced by a comprehensive set of alternative measures. The findings of this study offer insightful implications on the bank policy framework advocating the Basel III liquidity regulation in Vietnam as well as other emerging markets.

Keywords: Basel III, liquidity creation, liquidity regulation, Net Stable Funding Ratio, Vietnam

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INTRODUCTION

The Basel III Accord for the first time has introduced the global standards for bank liquidity, namely, the Liquidity Coverage Ratio (LCR) and the Net Stable Funding Ratio (NSFR), expected to be implemented gradually for banks from 2015 to 2019. The objectives of these ratios, according to the Basel Committee on Banking Supervision (BCBS), are to reduce the probability of bank failure and prevent potential systemic stress (BCBS, 2010b). More precisely, the LCR focuses on the short-term liquidity, boosting banks to have enough liquidity to survive one month in a stress scenario. In contrast, the NSFR prioritises the long-term liquidity, encouraging banks to keep more high liquid assets and to increase more stable funding sources.

Integrating the new liquidity standards into the banking regulatory framework is generally expected to yield various benefits for banks themselves and financial markets. However, there also exist some viewpoints that show scepticism about the bright sides of those ratios. King (2013) argues that LCR and NSFR are the most controversial liquidity rules as they require more stable funding sources, which are usually costly as well as encourage higher liquidity positions of assets, thereby negatively affecting bank profitability. Meanwhile, DeYoung et al. (2018) claim that the way a framework of new liquidity constraints affects bank behaviour and financial risks in the markets is unclear. Likewise, Khan et al. (2017) doubt whether the new funding liquidity rule proposed in Basel III will make banks less risky and gain more stability. Given these contexts, investigating the effects of historically varying the new global liquidity indicators on banks before official Basel III implementation is worthy of an in-depth analysis.

Though estimating the cost-benefit trade-off between the new global liquidity regulation and bank performance/financial risks by empirical banking models is an important area of research, there has been limited work done regarding this topic so far. The primary reason is that the newly introduced prudential liquidity rules in Basel III have not yet been applied in many countries, especially emerging markets in Asia. These countries have almost only approached Basel I and Basel II, which exclude the liquidity rules. Additionally, findings based on developed markets in the Europe or the US are difficult to apply to emerging markets in Asia due to the significant differences in the development of the financial system, the regulatory framework and the banking industry's position in the economy. To fill this gap in the literature, I decide to explore the banking market in Vietnam, a typical emerging market in Asia that provides a suitable context for research. In recent years, Vietnam

has remained one of the fastest growing economies in Asia, mainly relying on funding from the banking channel (Vo, 2018). Consequently, Vietnamese banks are more likely to face severe liquidity mismatch due to the low quality of lending after a period of rapid credit expansion (Dang, 2019). In terms of the regulatory frameworks, liquidity management requirements are of great interest to policymakers (will be discussed later in the paper). These facts make the study of new global liquidity ratios greatly necessary in Vietnam, which could answer important policy and managerial questions. Moreover, it is more favourable to examine a single market to obtain more accurate results, thanks to a consistent retrospective calculation of liquidity ratio over the whole sample period under study.

The objective of this study is to analyse the impact of the NSFR proposed by Basel III guidelines on banks in Vietnam before the Basel III implementation, through a comprehensive set of proxies that capture a wide range of bank performances and financial risks. By observing the association between the NSFR and banks' historical benefits and costs, we are likely to learn how this ratio affects banks in the future and thereby consider integrating the new liquidity instruction into the banking regulatory framework. The NSFR rule requires banks to allocate both assets and liability appropriately, so it could pose significant impacts on bank performances and financial risks. In this study, I employ various measures to capture the banks' responses, including profitability, funding costs and credit quality. Also, inspired by the work of Khan et al. (2017) focusing on liquidity creation as a proxy for the typical risk of financial intermediation, I further examine the impact of the Basel III NSFR on liquidity creation measured by the three-step procedure proposed by Berger and Bouwman (2009).

I am interested in the NSFR because it is simply a fixed-weight average of available on- and off-balance sheet items, which could be reliably estimated by banks' historical financial data. In contrast, the analysis of LCR does not seem feasible since the monthly data of cash inflows and outflows required to calculate this ratio is not easily found in standard financial reports. Moreover, Vietnamese regulatory authorities have already constructed a criterion similar to the new LCR rule in the regulatory framework, but they have not yet announced the approach to the new NSFR regulation. Hence, understanding the role of the NSFR has potential policy contributions in the future, which is currently left unaddressed. Different from some other studies, I do not limit my surveys to the large active banks of the system, but instead, I include banks of all sizes in the research sample. Indeed, some documents have suggested that the NSFR standard is likely to be applied for mid-sized and perhaps even small-sized banks

(DeYoung & Jang, 2016). To achieve reliable estimation results on banking behaviour models, I use the dynamic panel with the generalised method of moments (GMM) estimator, which could deal with the endogeneity bias and capture the persistence of bank performance.

Given the recent full introduction of the new global NSFR liquidity standard, there is limited literature that has examined how this ratio potentially affects bank health and wealth so far. Furthermore, most of them focus on the leading banking markets. In this context, my work has some contributions. First, it adds to the extensive strand of the empirical literature on bank liquidity management in general and the emerging stream of knowledge on the potential effects of NSFR on banks in particular, especially from the perspective of an emerging market in Asia. I have adopted a variety of alternative measures to the broad bank-level aspects, including profitability, funding costs and credit risk. Second, the study enriches the empirical literature on bank liquidity creation by investigating the relationship between the NSFR and bank liquidity creation. This literature stand is very limited but rapidly growing after Berger and Bouwman (2009) propose a novel procedure to measure bank liquidity creation. Subsequent empirical studies employ their liquidity creation measures to explore the links between liquidity creation and bank capital (Horváth et al., 2014), monetary policy (Berger & Bouwman, 2017), economic cycle (Davydov et al., 2018), government intervention (Berger et al., 2016), bank competition (Horváth et al., 2016), and banking governance (Díaz & Huang, 2017). However, how the NSFR rule affects bank liquidity creation has remained unexplored in the literature so far. Third, the findings in this study may be a useful reference for other emerging countries, especially those in Asia with similar circumstances as Vietnam. It should be noted that this study predates the implementation of the NFSR regulation in Vietnam. So, it may provide useful implications for policymakers in developing the liquidity policy framework in the future, which might potentially be close in spirit to the Basel III guidelines.

THE LIQUIDITY REGULATIONS OF THE VIETNAMESE BANKING INDUSTRY

Regulations on liquidity management of the Vietnamese banking industry seem to appear relatively late compared to other countries. In 2005, a framework of liquidity standards was issued, requiring banks to organise a specialised unit to manage strategies and develop policies related to bank liquidity. More specifically, requirements on the development of early warning systems and

hypothetical scenarios in the stress liquidity situation were provided. In this regard, the minimum ratio of liquidated assets to due liabilities for 7-day and 30-day terms, and the maximum level of short-term funding used to finance medium- and long-term lending began to be established to ensure liquidity reserves and control the increase in lending.

In the period from 2006 to 2011, the State Bank of Vietnam (SBV) continued to upgrade banking regulations, notably the requirement to raise the regulatory capital buffer and strictly control the transformation of rural banks into urban banks. At the same time, liquidity management requirements tended to be supplemented and modified to match the adaptability of the system as well as to approach international standards. In 2009, the SBV adjusted the maximum ratio of short-term funding used to finance medium- and long-term lending (not exceeding 30%). Then in 2010, the agency further detailed regulations, such as the capital adequacy ratio (not less than 9%), the high liquid assets to due liabilities ratio (not less than 15%), the loan-to-deposit ratio (not more than 85%).

During the banking restructuring period under "Project 254" from 2012, the SBV cooperated with leading banks to provide liquidity to weak banks, thereby reducing liquidity risks. Moreover, the SBV also issued anew framework, gathering all previous liquidity management regulations, and continuing to upgrade them. This new framework had more details on the internal governance of bank liquidity as well as more stringent liquidity management requirements, including the liquidity reserve ratio, the liquidity coverage ratio within 30 days, the ratio of short-term funding used to finance medium- and long-term investments, the ratio of short-term funding used to invest in government bonds, and loans to deposits ratio. In particular, the 30-day liquidity coverage ratio (not less than 50%) had a similar meaning and calculation with the Basel III LCR liquidity recommendation. By mid-2016, the liquidity management regulations continued to have some significant changes. Accordingly, the maximum ratio of short-term funding used to finance medium- and long-term lending was gradually reduced from 60% to 40% in two years; individual deposits and demand deposits from organisations were added to the category of short-term funding.

Looking back at the banking liquidity regulations in Vietnam, one could see that the requirements of liquidity management have been taken care of carefully by the state agencies in each period, considering the industry's specific context. Although such orientations are increasingly upgraded to be closer to international standards, the NSFR standard has almost not been integrated into the framework of liquidity regulations in Vietnam so far. Overall, an analysis

of the upsides and downsides of the NSFR rule is essential to lend some perspectives to policymakers in Vietnam and other emerging countries as well, where the implementation of the NSFR rule is still left open.

RELATED LITERATURE ON THE NSFR LIQUIDITY RULE UNDER BASEL III

Prior to the Basel III guidelines which introduce global liquidity standards, liquidity risk has long been central in models of bank runs (Diamond & Dybvig, 1983; Diamond & Rajan, 2005), profit-lowering cost and bank profitability (Bourke, 1989; Dermine, 1986), capital buffer (Diamond & Rajan, 2001), and bank risk-taking and lending (Acharya & Naqvi, 2012; Ericsson & Renault, 2006; Hassan et al., 2019). Most empirical studies following these streams of literature have employed simple accounting indicators based on assets and liability of banks to analyse the separate impacts of bank assets liquidity (e.g., the ratio of liquid assets over total assets, the inverse rate of loans to total assets) and funding stability (e.g., the ratio of deposit over total assets) on banks rather than the liquidity mismatch between bank assets and liabilities as to the core concept of Basel III liquidity guidelines.

After the introduction of the Basel III guidelines, the emerging but limited strand of literature has employed a detailed breakdown of both on- and off-balance sheets to calculate the NSFR liquidity requirement and analyse its impacts on banks. Yan et al. (2012) investigate the net benefit for banks in the UK if they meet the NSFR long-term liquidity rule at 100%. The authors realise that the NSFR rule positively contributes to macro issues such as preventing banking crises and economic downturns, thus leading to the conclusion that the new liquidity reforms help improve the financial stability of the banking system. The study of Yan et al. (2012) is motivated by an earlier comprehensive analysis of the BCBS (2010a), which examines the general effects of Basel III guidelines for selected economies and indicates the net benefits of the NSFR liquidity requirement.

Apart from macro effects, lending spreads' responses to the adjustment of the NSFR areprobably the first bank-level aspect that academics consider. In theory, both liquid assets and stable funding sources would be costly to banks. This claim is empirically confirmed by King (2013), who finds a potential reduction of the net interest margin by 70–88 basis points on average if banks try to pursue strategies to meet the new NSFR requirement. The finding is based on a sample of 15 synthetic banks representing 15 countries, also including

some emerging market economies. Hypothesising that the new NSFR standard could limit banks' ability to do maturity transformation and thereby induce a significant impact on bank performance, Dietrich et al. (2014) analyse Western European banks to find the answer. As a result, they provide reliable evidence that no significant association exists between the NSFR rule and bank profit. Furthermore, they document that banks with high NSFR tend to reduce the loan losses and the volatility of revenue, thus lending the supports for the new liquidity standard in terms of creating more resilience for the banking system. Dietrich et al. (2014) state that banks can deploy different strategies to meet the strict liquidity ratios, which are likely to have ununiform welfare implications for banks.

Another empirical study to investigate the effects of NSFR on bank stability is performed by Ashraf et al. (2016) for a group of Islamic banks. Following the modified NSFR approach, the scholars find that the NSFR rule is beneficial to the financial stability of the banking industry, but the marginal benefit diminishes according to the increased bank size. The same finding of bank stability improvement when banks have higher NSFR is previously confirmed in a study by Chalermchatvichien et al. (2014) for the Asian banking market. In another vein, only focusing on the available amount of stable funding, Roulet (2018) however could not find out the significant impact on loan growth of European banks, thus underlining the role of funding structure in the explanation of bank lending behaviour.

METHODOLOGY AND DATA

Variables

The calculation of the NSFR under Basel III quantitative guidelines is considered to be relatively specific; in practices, there are however problems arising related to the exact calculation of this ratio and thus cause obstacles for researchers, policymakers and banks themselves. Almost all of the prior works focusing on the effect of Basel III NSFR use the approximation framework based on the haircuts of many components on the balance sheet (along with the off-balance sheet) to feasibly compute the NSFR (Ashraf et al., 2016; Dietrich et al., 2014; King, 2013; Yan et al., 2012). The assumptions from those approximate calculations are conceptually consistent in terms of the liquidity position features for assets and stable funding characteristics for liabilities, fortunately well capturing the spirit from the Basel III liquidity guidelines. Consistent with the availability of my data, I have to accept the shortcomings

when calculating the NSFR and thus adopt an approach following the assumptions of Dietrich et al. (2014) as follows:

$$\text{NSFR} = \frac{\text{Available stable funding (ASF)}}{\text{Required stable funding (RSF)}} \tag{1}$$

where the detailed breakdown is:

(a) ASF factors with the weights: total equity (100%), eliminated non-controlling interest (minorities) (−100%), total deposits from customers (90%), total long-term funding from debt issuance (60%), financial tools and cash collateral (50%), all other liabilities (0%).

(b) RSF factors with the weights: cash and due from institutions (0%), loans to institutions (0%), total securities (40%), residential loans (65%), corporate loans (85%), all other assets (100%), all off-balance sheet items (5%).

In a 1-year stress scenario, the greater ASF-factor is assumed to capture the more stability of liability, and the larger RSF-factor is assumed to indicate the less likelihood that an asset can be liquidated. Given that we are not able to split the loan portfolios into smaller items with different maturity based on my available data, so I treat the retail and corporate loans with the weights of 65% and 85%, respectively.

To investigate how the NSFR from Basel III liquidity guidelines affects banks, I employ a number of measures to capture bank health and wealth. I prioritise indicators based on traditional accounting data due to the lack of market data. To this end, an important set of measures to consider first is bank profitability. Accordingly, I use three profitability proxies, including the net return on average asset ratio (*ROA*), the net return on average equity ratio (*ROE*), and the net interest margin (*NIM*) computed by the net interest income divided by total average interest-earning assets. These ratios are widely applied to assess bank profitability from different angles. The impacts of the NSFR on profitability measures are likely to be negative as an increase in the NFSR requires more costly stable funding sources and narrows more profitable risky assets. Given that bank profitability relates to liabilities and assets sides, which are strongly correlated with the adjustment of the NSFR, I further clarify the estimates of *NIM* via another indicator—funding costs. This indicator is defined as interest expenses as a share of average total interest-bearing liabilities, which is expected to increase with high NSFR based on the assumption of yield curve nature during normal time.

One additional aspect to be taken into account is bank risk. The literature so far has shown that there is no consensus on how to measure bank risk as well as no single definition of bank risk exists. However, in most documents that outline bank risk, credit risk and liquidity risk emerge as the most important types of risk for bank survival, and they could cause severe effects on financial markets, especially in emerging economies (Chen et al., 2015). Moreover, due to a potential correlation between them, which is also investigated in the literature (Ericsson & Renault, 2006; Hassan et al., 2019), an indicator of credit risk assessment or, in other words, loan portfolio quality measure is appropriate in my situation. To this end, I take the ratio of non-performing loans over total gross loans (*NPL*) as a proxy for bank risk. Banks could improve their liquidity positions on the assets side to increase the NSFR, which is conducive to the quality of the asset's portfolio. Hence, a negative correlation between the NSFR and the non-performing loan rate is expected.

Another indicator also to capture bank risk, in a sense, is liquidity creation that describes a core function of credit intermediation. Berger and Bouwman (2009) argue that banks create liquidity to fuel the economy with relatively illiquid assets by using relatively liquid liabilities, and the same mechanism is observed through off-balance sheet operations, such as credit commitments. During this process, banks are involved in the typical risk of financial intermediation. The more liquidity a bank creates, the larger the mismatch between assets and liabilities becomes and the higher the typical risk of financial intermediation is (Khan et al., 2017). In the context that bank funding through customer deposits is not fragile, banks could charge more for their financial intermediation services, and thus mitigating the liquidity that they create (King, 2013). We need to be aware that the NSFR focuses on funding risk. Therefore, a correlation between the NSFR and bank liquidity creation is potential and worthy of a survey, especially when such a relationship is almost not yet disclosed in empirical documents.

Berger and Bouwman (2009) develop a three-step procedure to calculate liquidity creation of banks based on the liquidity characteristics of both on- and off-balance sheet items. Those three specific steps are:

1. Categorising items based on liquidity features,
2. Allocating weights for categorised items, and
3. Combining steps 1 and 2 in a final formula, depending on whether or not the off-balance sheet items are considered.

Following the approach by Berger and Bouwman (2009) to reflect the bank liquidity creation with the inclusion of off-balance sheet items, I calculate my final proxy for bank risk as follows:

$$\text{Liquidity creation} = 0.5 \times (\text{Illiquid assets} + \text{Liquid liabilities} + \text{Illiquid off-balance sheet commitments}) - 0.5 \times (\text{Liquid assets} + \text{Illiquid liabilities and equity} + \text{Liquid off-balance sheet commitments}) \quad (2)$$

Detailed categories and their weights are presented in Table 1. Banks create most liquidity by financing illiquid assets with liquid liabilities; for instance, banks use deposits from customers to lend to the economy. As a result, illiquid assets and liquid liabilities are assigned a weight of 0.5. In contrast, banks destroy most liquidity by raising illiquid liabilities plus equity and then maintaining liquid assets; for example, banks use equity to buy securities. In this case, liquid assets, illiquid liabilities, and equity are assigned a weight of –0.5. I apply a similar approach for off-balance sheet commitments.

Table 1
The categorised items and weights for the calculation of liquidity creation

Illiquid assets (0.5)	Liquid assets (−0.5)
• Corporate loans • Other assets (not including interbank loans and loans to individuals as semiliquid assets with the weight of 0)	• Cash and funds in central bank • Deposits in other institutions • Total securities and trading financial assets
Liquid liabilities (0.5)	**Illiquid liabilities and equity (−0.5)**
• Deposits from customer • Trading liabilities	• Other liabilities (not including deposits from other institutions and other borrowed funds as semiliquid liabilities with the weight of 0) • Equity
Illiquid off-balance sheet commitments (0.5)	**Liquid off-balance sheet commitments (–0.5)**
• Loan guarantee commitments • Letters of credit commitments	• All derivatives

In sum, to draw a clear picture of the risk-return trade-off from the NSFR liquidity rule under Basel III guidelines, I broadly determine bank productivity by various dimensions of traditional financial profitability (ROA, ROE and net interest margin), funding cost (interest expenses), loan management performance

(non-performing loans) and even the measure of liquidity creation as the core function of intermediation strictly relevant to the mismatch management between banks' assets and liabilities.

Consistent with previous research results, I incorporate some control variables to explain in more detail the shifting in bank behaviour. Accordingly, the commonly used variables to capture bank-specific factors include bank size (*Size*), bank equity (*Capital*) and loan growth (*LoanGrowth*); meanwhile, the annual gross domestic product growth (*GDP*) and annual inflation rate (*Inflation*) help account for the macroeconomic environment. The details of these variables are presented in Table 2.

Bank size could induce significant effects on bank productivity, resulting from the differences in business models and operational resources. There has been abundant research analysing the impact of bank size with evidence in favour of scale economies for large banks, while the negative sides of bank size have also been recognised by many scholars [see Avramidis et al. (2018) for a review]. Regarding the role of bank capital, prior documents have indicated that a sufficient capital buffer makes banks capable of absorbing risks, lowering moral hazard problems, and gaining greater monitoring incentives (Holmstrom & Tirole, 1997; Tan & Floros, 2013). However, prudent investment strategies are unlikely to yield attractive returns (Dang, 2019), although banks often desire a greater interest spread to compensate for expensive equity (Berger, 1995). Besides, banks expecting to increase their profits could rely on expanding lending activities. Nevertheless, an alternative view is that this strategy has a higher probability of bringing about major consequences related to the decline in credit quality, as the lending standards are loosened, and the monitoring works are neglected. Numerous studies theoretically and empirically have shown such mechanisms (Foos et al., 2010; Salas & Saurina, 2002). In a recent emerging strand of the empirical literature, bank size and capital play the critical roles in explaining the determinants of the bank liquidity creation (Díaz & Huang, 2017; Toh, 2019), while loan growth is considered to make up the liquidity created by banks directly (Berger & Bouwman, 2009; Davydov et al., 2018).

As for the macroeconomic variables that allow for the environment outside the bank, on the one hand, they are essential factors in determining bank behaviour as mentioned in many previous documents (Athanasoglou et al., 2008; Davydov et al., 2018; Louzis et al., 2012). On the other hand, the presence of macro variables contains important statistical significance. Macroeconomic conditions have an overall impact on the entire banking system of a country.

Such an impact changes over time but remains constant for individual banks in a given year. Therefore, the inclusion of macroeconomic variables is considered to replace other regression techniques that are costly in degrees of freedom, such as the time dummy.

Model Specification and Regression Method

This study aims at examining the impacts of the NSFR inspired by Basel III on various aspects capturing bank performance to seek evidence in favour of the existence of the trade-off between the upsides and downsides for banks. To this end, I employ the dynamic panel models which assume that the lagged dependent variable plays the role of an explanatory variable to exhibit the persistence of bank behaviour over time (Ashraf et al., 2016; Berger et al., 2000; Dietrich et al., 2014; Delis & Kouretas, 2011). This approach leads me to the specification as follows:

$$\begin{aligned} Bank\_Perform_{i,t} = {} & \alpha_0 + \alpha_1 \times Bank\_Perform_{i,t-1} + \alpha_2 \times NSFR_{i,t-1} \\ & + \alpha_3 \times Bank_{i,t-1} + \alpha_4 \times Macro_{t-1} + \varepsilon_{i,t} \end{aligned} \quad (3)$$

Where $Bank\_Perform_{i,t}$ represents separate measures for the broad performance of bank i in year t. *NSFR* denotes the explanatory variable NSFR of main interest. *Bank* is a vector of bank-specific controls (bank size, capital and lending) and *Macro* includes macroeconomic factors (GDP growth and inflation rate). $\varepsilon_{i,t}$ is the error term. To partially reduce the influence of endogeneity problems, all independent variables on the right-hand side are lagged by one period. Furthermore, this procedure could also help reflect the outcome of banks from earlier decisions.

To regress my chosen model, I employ the system GMM estimator, which internally incorporates lagged values of the dependent variable both in levels and first differences as instruments (Arellano & Bover, 1995; Blundell & Bond, 1998). The system GMM estimator is particularly well-suited when using unbalanced dynamic panel regressions. The two-step GMM procedure is also applied to provide a more robust inference for the estimations, while the standard errors are computed following the finite-sample correction suggested by Windmeijer (2005). Hence, my approach could simultaneously capture the dynamic nature of the data and remove the endogeneity bias by using internal instruments. Two tests validate the reliability of the two-step system GMM estimator, namely, the test of over-identifying restrictions for the validity of the instruments employed (Hansen, 1982) and the test for the non-existence of

second-order autocorrelation in the first-differenced errors (Arellano & Bond, 1991).

Data

The construction of variables requires the detailed breakdown of financial data items in both on- and off-balance sheets of banks. To perform this work, I hand collect the data in annual financial statements that are publicly available online at each bank's website. Banks that are acquired or under special control by the government are not included in the sample as their operational regimes are different from those of the others. I also lose some observations because of missing data in some years. Finally, I obtain an unbalanced panel dataset of 28 commercial banks with a total of 272 bank-year observations. I further winsorise all variables computed from the obtained data at 1% and 99% to mitigate the impact of outliers. The macroeconomic data of Vietnam are extracted from the World Development Indicator (WDI) database.

Table 2
Summary statistics

Variables	SD	Mean	10th	25th	Median	75th	90th
NSFR	16.17	121.34	101.92	110.10	122.51	132.25	139.92
ROA	0.58	0.81	0.13	0.39	0.72	1.18	1.58
ROE	6.63	9.45	1.19	4.54	8.20	13.47	18.87
NIM	1.15	2.86	1.68	2.03	2.76	3.39	4.23
NPL	1.45	2.17	0.72	1.26	1.98	2.60	3.39
LCcatfat	13.41	30.64	12.41	21.48	31.82	39.75	47.68
FundingCost	2.16	5.41	3.27	3.86	4.75	6.59	8.79
Size	1.19	32.16	30.51	31.20	32.25	32.93	33.73
Capital	4.49	9.49	5.46	6.37	8.28	10.55	15.88
LoanGrowth	23.75	25.69	3.38	12.32	19.89	33.45	53.21
GDP	0.63	6.20	5.39	5.54	6.21	6.81	7.08
Inflation	5.82	7.16	0.88	3.52	4.71	8.86	18.67

Notes: The unbalanced panel dataset has a total of 272 bank-year observations obtained from 28 commercial banks in Vietnam for the period of 2007–2018. The definitions of variables are as follows. NSFR is the net stable funding ratio introduced in Basel III (%). ROA is the ratio of net return to total average assets (%). ROE is the ratio of net return to total average equity (%). NIM is the ratio of net interest income to total average interest-earning assets (%). NPL is the ratio of non-performing loans to total gross loans (%). LCcatfat is the ratio of "cat fat" liquidity creation following Berger and Bouwman (2009) to total assets (%). FundingCost is the ratio of interest expenses to total average interest-bearing liabilities (%). Size is the natural logarithm of total assets. Capital is the ratio of equity to total assets (%). LoanGrowth is the rate of loan growth. GDP is the rate of annual GDP growth (%). Inflation is the rate of annual inflation (%).

Table 2 presents the summary statistics along with the definitions of variables employed. My primary variable of interest, the NSFR inspired by the Basel III, displays the average value of 121.34%, which is much larger than the globally proposed benchmark. It would be better to compare my NSFR calculation results following the formulaic approach with the published results by the banks themselves or regulators in Vietnam. However, so far, there has been no official announcement of this information. In a sense, my average NSFR calculation is more or less approximately the average value of 121.9% that BCBS (2019) estimates for banks globally at end-June 2018. This suggests that Vietnamese banks were well funded over the past time. However, I could observe that some bank-year observations having the NSFR less than 100%, specifically at the percentile below the 10th (not reported).

Moving on to the mean values of other explanatory variables as outlined in Table 2, the banking system during the sample period has an average ROA of 0.81%, ROE of 9.45%, and the net interest margin of 2.86%. For the funding costs and loan quality, the average ratio of interest expenses to total average interest-bearing liabilities is 5.41% and the average ratio of non-performing loans to total gross loans is 2.17%, respectively. For the liquidity creation ratio, its mean value is 30.64%, along with the enormous gaps among the percentiles, which reflects the banks' differences in terms of the core function. Notably, my sample data are collected during the period in which the banking system has expanded credit aggressively (the average loan growth rate is 25.69% per year), in the context of the fast-growing economy (the average GDP growth is 6.20% per year) and the high-inflation environment (the mean of the annual inflation rate is 7.16% per year).

Table 3 reports the correlation coefficients matrix for the employed variables. Generally, the initial glance at these pairwise correlations support the assumptions of the absence of multicollinearity in the dataset and the ability to capture the same aspect of some measures, such as the profitability ratios. I have to move further to the regression stage to figure out more reliable findings.

RESULTS AND DISCUSSIONS

This section reports the estimation results of the impacts of the NSFR on banks through the broad set of measures for bank profitability, funding costs, assets quality, and liquidity creation ability. I then carry out some robustness checks to verify the reliability of my findings.

Table 3
Correlation coefficient matrix

Variables	*NSFR*	*ROA*	*ROE*	*NIM*	*NPL*	*FundingCost*	*LCcatfat*	*Capital*	*LoanGrowth*	*Size*	*GDP*	*Inflation*
NSFR	1											
ROA	0.19	1										
ROE	0.05	0.78	1									
NIM	0.08	0.57	0.33	1								
NPL	0.01	−0.22	−0.27	0.03	1							
FundingCost	−0.16	0.20	0.02	0.07	0.10	1						
LCcatfat	−0.12	−0.30	−0.14	−0.04	0.13	−0.36	1					
Capital	0.25	0.31	−0.23	0.39	0.07	0.28	−0.31	1				
LoanGrowth	0.02	0.06	0.08	−0.16	−0.07	−0.02	−0.16	−0.06	1			
Size	−0.12	−0.07	0.31	−0.06	0.01	−0.41	0.40	−0.67	−0.14	1		
GDP	−0.06	0.01	0.10	−0.13	−0.32	−0.27	0.01	−0.19	−0.09	0.15	1	
Inflation	0.00	0.39	0.28	0.15	0.10	0.70	−0.27	0.23	−0.02	−0.25	−0.36	1

Main Estimations

Table 4 presents the regression results for bank profitability measured by ROA, ROE, and net interest margin ratio. Before entering the estimation results of interest, I could observe that the lagged dependent variables' coefficients are significant in all regressions, vindicating the application of the dynamic GMM panel model. Besides, my tests show evidence in favour of the validity of the instruments and against the second-order autocorrelation in first-differenced errors. Therefore, I could confidently use the estimation results for decision making.

Looking at the regression coefficients of the NSFR in the functions of *ROA* and *ROE* variables, I could observe that the historical liquidity indicator has a positive impact on bank profitability in the sample period with the statistical significance of 1% level. More surprisingly, the NFSR induces a positive impact on banks' net interest margin also at the significance level 1%, contrary to my initial prediction. As such, Vietnamese banks with higher NSFR tend to be more profitable. Moreover, these observed benefits are also economically significant. For example, a one standard deviation increase in the NSFR (16.17) will lead to an increase in *ROE* by 1.08 given the mean of *ROE* is 9.45; similarly, *ROA* increases by 0.048 or *NIM* increases by 0.097. As to the first benefits from the NSFR liquidity rule, my findings do not support the notion that the increased NSFR is the discount for bank return proxied by the return on assets, the return on equity, and the net interest margin; in sharp contrast, the upsides of NSFR for bank profitability have been exhibited by all employed measures with statistical and economic significance. In practice, banks could rely on many business models that adjust their balanced funding structure flexibly to lead to higher NSFR, thus differently affecting bank performance. As a result, some strategies do not necessarily prevent banks from achieving better profits. However, how each of the strategy drives bank performance, in this case, is not apparent, and I have to leave this question to future research. Among the control variables, loan growth and GDP growth show positive and statistically significant impacts on bank profitability, implying that the expansion of both the bank credit and the economy size enables banks to gain more profits.

In Table 5, I have also achieved important regression results on funding costs, credit quality, and liquidity creation. Once again, the significance of the regression coefficient of the lagged dependent variable and the valid diagnostic tests for the GMM estimator in the dynamic panel model have ensured the reliability of my estimates.

Table 4
Estimation impacts of the NSFR on bank profitability

Variables	*ROA*	*ROE*	*NIM*
$ROA_{i,t-1}$	0.822***		
	(0.046)		
$ROE_{i,t-1}$		0.833***	
		(0.047)	
$NIM_{i,t-1}$			0.673***
			(0.046)
$NSFR_{i,t-1}$	0.003***	0.067***	0.006***
	(0.001)	(0.009)	(0.001)
$Capital_{i,t-1}$	0.000	0.161*	−0.010
	(0.006)	(0.083)	(0.013)
$LoanGrowth_{i,t-1}$	0.002**	0.029***	0.006***
	(0.001)	(0.008)	(0.001)
$Size_{i,t-1}$	0.018	0.900**	0.029
	(0.028)	(0.387)	(0.054)
GDP_{t-1}	0.094***	0.719***	0.360***
	(0.013)	(0.147)	(0.022)
$Inflation_{t-1}$	−0.007**	−0.072***	0.012***
	(0.003)	(0.020)	(0.003)
Observations	244	244	244
AR(1) test (*p*-value)	−3.00	−3.15	−3.22
	(0.003)	(0.002)	(0.001)
AR(2) test (*p*-value)	1.91	0.99	0.86
	(0.057)	(0.321)	(0.388)
Hansen test (*p*-value)	23.90	20.37	23.78
	(1.00)	(1.00)	(1.00)

Notes: All variables are winsorised at the interval of 1% and 99%. The dependent variables are shown at the top of each column. The Hansen test is to test the validity of the instruments employed and the AR (*p*-order) test is to test the *p*-order autocorrelation in first-differenced errors. Robust standard errors are displayed in parentheses.
*, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively. See Table 2 for the detailed descriptions of all variables.

Table 5
Estimation impacts of the NSFR on funding costs, loan quality and liquidity creation

Variables	*FundingCost*	*NPL*	*LCcatfat*
$FundingCost_{i,t-1}$	0.598***		
	(0.030)		
$NPL_{i,t-1}$		0.346***	
		(0.018)	
$LCcatfat_{i,t-1}$			0.609***
			(0.059)
$NSFR_{i,t-1}$	−0.060***	−0.018***	−0.096***
	(0.007)	(0.002)	(0.022)
$Capital_{i,t-1}$	0.046	0.027**	−0.052***
	(0.048)	(0.012)	(0.009)
$LoanGrowth_{i,t-1}$	0.044***	0.003	−0.052***
	(0.002)	(0.002)	(0.009)
$Size_{i,t-1}$	−0.356*	0.030	1.469*
	(0.209)	(0.078)	(0.888)
GDP_{t-1}	1.675***	0.185***	0.326
	(0.086)	(0.047)	(0.414)
$Inflation_{t-1}$	0.035*	0.034***	0.192***
	(0.019)	(0.005)	(0.055)
Observations	244	244	244
AR(1) test (*p*-value)	−3.25	−2.23	−2.88
	(0.001)	(0.026)	(0.004)
AR(2) test (*p*-value)	−2.65	−0.59	−2.42
	(0.088)	(0.555)	(0.095)
Hansen test	26.12	24.96	22.97
	(1.00)	(1.00)	(1.00)

Notes: All variables are winsorised at the interval of 1% and 99%. The dependent variables are shown at the top of each column. The Hansen test is to test the validity of the instruments employed and the AR (*p*-order) test is to test the *p*-order autocorrelation in first-differenced errors. Robust standard errors are displayed in parentheses.
*, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively. See Table 2 for the detailed descriptions of all variables.

In accordance with the finding in case of the net interest margin ratio, I observe the negative impact of NFSR on funding costs at the 1% significance level (column 1). Thus, the hypothesis that the costs of funding increase when banks improve the stability of funding sources, based on the theory of the yield curve in normal times, seems not to hold for the banking industry in Vietnam during my sample period under study. Interestingly, possible benefits in funding costs for banks with high NSFR may turn into better profitability captured by various measures. Based on the favourable market context and the support from the government, Vietnamese banks do not have much difficulty finding funding sources, which makes these banks could attract more stable funding sources even at cheaper costs. Next, the adjustment of NSFR exhibits the negative impact on the measure of non-performing loans rate in the specification of credit risk at the statistical significance level of 1% (column 2). This finding confirms my initial expectation, thereby proving an additional benefit of increasing the NSFR standard. The rise in stable funding resources and the cutting of illiquid assets all illustrate banks' more caution, which is beneficial for the quality of asset portfolios. Additionally, the effects of banks' NSFR on interest expenses and credit risk are economically significant as a one standard deviation increase in NSFR decreases the funding costs ratio by 0.970 and non-performing loans ratio by 0.291.

Moving on to the last measure capturing the typical risk of financial intermediation, the regression coefficient of NSFR in the liquidity creation function is negative and statistically significant at 1% (column 3). The magnitude of the regression coefficient also ensures economic significance. Hence, I find evidence to shed new light on the correlation between the NFSR rule focusing on bank funding risk and the liquidity creation representing the core function and risk exposure of financial intermediation. This finding could be considered as an extended version of Khan et al. (2017). They examine the impact of funding liquidity, measured by the ratio of customer deposits to total bank assets, on liquidity creation as an emerging factor in capturing banks' risk-taking behaviour. These authors confirmed a positive link through the higher funding liquidity accompanied by more liquidity creation. Taken together, my finding also reveals important implications not only for banks themselves as liquidity creation is their core function but also for policymakers in terms of using the bank channel to fuel the economy.

As for the results of control variables in Table 5, bank capital has a positive effect on credit risk (column 2), supporting the notion that an increase in equity capital encourages banks to take more risks (Blum, 1999; Kim & Santomero, 1988). The impact of loan growth on funding costs is statistically

significant positive (column 1), while that on liquidity creation is statistically significant negative (column 3). Also, macroeconomic factors show statistically significant effects on banks expressed by the surveyed indicators. For example, the period of rapid economic growth also contains potential risks for the banking system which could lead to the decline of credit quality (Curry et al., 2008), illustrated by the positive regression coefficient of GDP in the equation of non-performing loans variable (column 2). An economic environment with higher inflation may also enable banks to create more liquidity, as displayed by the positive regression coefficient of the inflation variable in the function of liquidity creation (column 3). This observation is more explicitly pronounced when Vietnamese regulators prefer economic growth by loosening monetary policy.

Robustness Checks

The findings from the dynamic panel models consistently show the numerous benefits that the NSFR liquidity rule brings to banks, different from my initial expectation in terms of a trade-off after a benefit-cost test for the Vietnamese banking market. To further assure the reliability of these findings, I conduct some robustness checks of my main estimation results by performing several alternative regressions. I first select alternative measures to do the work of current dependent variables in capturing the aspects investigated, including bank profitability, funding costs, credit risk and liquidity creation. For the estimation method, I employ another version of the GMM estimator, which is known as the difference GMM estimator, constructing the data sets in first differences and using instruments created internally by further lagged dependent variables. The simultaneous application of the system and difference GMM is to offer comparable information and help comprehensively assess the sensitivity of the dynamic panel analysis with the GMM estimator.

Accordingly, in order to capture bank profitability in place of *ROA*, I make an adjustment to add risk information related to the volatility of bank profit, and thereby create an alternative variable, *ROASD*. More precisely, I calculate the *ROASD* variable by the ratio of *ROA* for a given year and the standard deviation of *ROA* over the whole sample period under study. Such a similar procedure is applied to *ROE* to create a new variable called *ROESD*. As for the net interest margin, I employ another calculation by the rate of net interest income over total average assets, setting up the variable *NIMTA*. The regression results using alternative definitions of the profitability dependent variables with the difference GMM estimator are reported in Table 6. The regression coefficients of NSFR in the functions of *ROASD* and *ROESD* are

significantly positive, confirming the previously obtained patterns. However, with the *NIMTA* variable served as the dependent variable, the regression coefficient of NSFR is not statistically significant. This indicates the sensitivity of estimating the impact of NSFR on the net interest margin ratio.

Table 6
Robustness checks with alternative variables for bank profitability

Variables	*ROASD*	*ROESD*	*NIMTA*
$ROASD_{i,t-1}$	0.565***		
	(0.094)		
$ROESD_{i,t-1}$		0.578***	
		(0.085)	
$NIMTA_{i,t-1}$			0.216***
			(0.051)
$NSFR_{i,t-1}$	0.012***	0.018***	−0.000
	(0.004)	(0.003)	(0.000)
$Capital_{i,t-1}$	−0.020	0.034	−0.000
	(0.024)	(0.023)	(0.001)
$LoanGrowth_{i,t-1}$	0.004***	0.004**	0.001***
	(0.001)	(0.002)	(0.000)
$Size_{i,t-1}$	−0.222	−0.067	−0.013
	(0.158)	(0.190)	(0.010)
GDP_{t-1}	0.136**	0.088**	0.056***
	(0.061)	(0.042)	(0.007)
$Inflation_{t-1}$	−0.009*	−0.017**	0.005***
	(0.005)	(0.008)	(0.001)
Observations	216	216	216
AR(1) test (*p*-value)	−3.06	−2.74	−1.86
	(0.002)	(0.006)	(0.026)
AR(2) test (*p*-value)	0.58	0.82	−0.72
	(0.560)	(0.406)	(0.468)
Sargan test (*p*-value)	26.57	25.24	21.70
	(0.431)	(0.505)	(0.704)

Notes: All variables are winsorised at the interval of 1% and 99%. The dependent variables are shown at the top of each column. The Sargan test is to test the validity of the instruments employed and the AR (*p*-order) test is to test the *p*-order autocorrelation in first-differenced errors. Robust standard errors of variables are displayed in parentheses. Symbols *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively. See Table 2 for the detailed descriptions of all variables.

Next, to build up a new variable replacing the original *FundingCost* variable, I approach the rate of interest expenses over total average deposits (*FundingCostTD*) as a limited definition of funding costs. To reflect the possibility of loan impairments, the rate of loan loss provisions to total gross loans (*LoanLoss*) is widely used in most bank risk literature as an alternative proxy for credit risk. Finally, I use another classification among the liquidity creation measures following the procedure of Berger and Bouwman (2009), which differs from the initial *LCcatfat* variable in removing the off-balance sheet items from the calculation formula. Both liquidity creation measures, including the *LCcatfat* and its alternative variable, *LCcatnonfat*, are based on the "category" type of items instead of the "maturity" type and also the preferable ones according to Berger and Bouwman (2017), Chatterjee (2015), and Toh (2019). In reality, bank liquidity creation is proactively performed through liquidity transformation mechanisms rather than maturity transformation mechanisms. After altogether forming the alternative variables, I rerun all regressions with these new variables and report the robustness check results in Table 7. I find that the NSFR's regression coefficients remain negative and statistically significant in all columns as previously. From the economic view, their significance is also unchanged. All in all, these findings exhibit the robustness of my findings, confirming that improving the NSFR decreases the costs and riskiness of Vietnamese banks during the sample period under study.

CONCLUSION

The NSFR liquidity rule under Basel III guidelines is designed to handle funding risk, or in other words, to promote the stable sources of bank funding. Moreover, in a sense, this new regulatory standard imposes liquidity constraints on banks' assets and require banks to comply with. However, it is uncertain whether the concentration on the new Basel III liquidity guideline will help banks gain more safety and soundness to create a resilient banking system (DeYoung et al., 2018; Khan et al., 2017). There have been a limited number of studies performed to clarify the importance of the NSFR indicator, focusing on the disadvantages of increasing the NSFR level in addition to its positive aspects. Furthermore, this issue is not fully understood so far, especially in emerging markets where the NSFR liquidity requirement under Basel III has not been of interest to bank managers and regulators. In this study, I attempt to gain some further insights by conducting a benefit-cost test of the NSFR liquidity requirement for Vietnamese commercial banks, using the financial data from 2007 and 2018. Some interesting results have emerged through a set of essential measures to cover a broad range of bank performance characteristics.

Table 7
Robustness checks with alternative variables for funding costs, loan quality and liquidity creation

Variables	*FundingCostTD*	*LoanLoss*	*LCcatnonfat*
$FundingCostTD_{i,t-1}$	0.588***		
	(0.042)		
$LoanLoss_{i,t-1}$		0.546***	
		(0.058)	
$LCcatnonfat_{i,t-1}$			0.544***
			(0.044)
$NSFR_{i,t-1}$	−0.134***	−0.004***	−0.140***
	(0.012)	(0.001)	(0.024)
$Capital_{i,t-1}$	−0.025	0.018***	0.355***
	(0.044)	(0.005)	(0.114)
$LoanGrowth_{i,t-1}$	0.044***	−0.002***	−0.070***
	(0.002)	(0.001)	(0.012)
$Size_{i,t-1}$	−2.775***	−0.195***	4.258***
	(0.179)	(0.034)	(0.520)
GDP_{t-1}	1.671***	0.051***	−0.031
	(0.119)	(0.017)	(0.314)
$Inflation_{t-1}$	−0.112***	0.000	0.161***
	(0.022)	(0.003)	(0.062)
Observations	216	216	216
AR(1) test (*p*-value)	−2.74	−3.04	−2.72
	(0.006)	(0.002)	(0.006)
AR(2) test (*p*-value)	−1.38	−0.08	−2.14
	(0.165)	(0.932)	(0.318)
Sargan test	24.51	17.85	21.72
	(0.546)	(0.881)	(0.703)

Notes: All variables are winsorised at the interval of 1% and 99%. Robust standard errors are displayed in parentheses. The dependent variables are shown at the top of each column. The Sargan test is to test the validity of the instruments employed and the AR (*p*-order) test is to test the *p*-order autocorrelation in first-differenced errors.
*, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively. See Table 2 for the detailed descriptions of all variables.

My estimation results display that banks with higher NSFR seem to achieve better profitability, as represented by traditional accounting indicators, including the net return on assets or equity, and even the net interest margin. These findings are further reinforced by a favourable impact of the high NSFR on reduced funding costs. Thus, building up NSFR is not necessarily detrimental to bank profitability, but also helps improve this important financial goal. The research results also indicate that the NSFR liquidity requirement is greatly beneficial for the quality of bank credit, which is illustrated by the negative correlation between NSFR calculation and credit risk measures. This finding enriches the strand of research examining the interrelationship between credit and liquidity risk, the two most typical and important types of risks for the banking system. Finally, as the most striking finding of my study that has almost been explored for the first time, I find the negative impact of the NSFR on bank liquidity creation, which is a core function of a bank and creates the typical risk of financial intermediation. I could strongly believe that the Basel III NSFR reduces the mismatch between the assets and liabilities.

Overall, different from the research of King (2013), which shows a trade-off between the new Basel III liquidity regulation, my works offer reliable evidence in favour of the comprehensive benefits of the NSFR liquidity standard on banks despite sharp critics this rule has been facing. My findings support an updated policy framework that encourages banks to comply with the new Basel III liquidity rules when the NSFR standard has passed the benefit-cost test at the bank level. Such an orientation is not redundant, at least for Vietnam or other emerging markets with similar economic and financial backgrounds.

Despite considerable efforts, I acknowledge that the study has several limitations. First, the calculation of the NSFR standard in my study is approximate. It tends to be illustrative of the potential magnitude of the effect, due to the lack of available disaggregate data. My conclusions are drawn by testing whether pre-Basel III banks in Vietnam perform better or not with the new Basel III NSFR liquidity regulation. Second, other possible benefits and costs arising from the NSFR under Basel III rules have not been taken into account because of the difficulties in quantification. Therefore, a further comprehensive analysis of this indicator with more detailed data, considering the specific market conditions and the internal situations of the bank along with different NFSR adjustment strategies, before entering the officially implementing process, is undoubtedly necessary for the future.

REFERENCES

Acharya, V., & Naqvi, H. (2012). The seeds of a crisis: a theory of bank liquidity and risk taking over the business cycle. *Journal of Financial Economics*, *106*(2), 349–366. https://doi.org/10.1016/j.jfineco.2012.05.014

Arellano, M., & Bond, S. (1991). Some tests of specification for panel data: Monte-Carlo evidence and an application to employment equations. *The Review of Economic Studies*, *58*(2), 277–297. https://doi.org/10.2307/2297968

Arellano, M., & Bover, O. (1995). Another look at the instrumental variable estimation of error-components models. *Journal of Econometrics*, *68*(1), 29–51. https://doi.org/10.1016/0304-4076(94)01642-D

Ashraf, D., Rizwan, M. S., & L'Huillier, B. (2016). A net stable funding ratio for Islamic banks and its impact on financial stability: An international investigation. *Journal of Financial Stability*, *25*, 47–57. https://doi.org/10.1016/j.jfs.2016.06.010

Athanasoglou, P. P., Brissimis, S. N., & Delis, M. D. (2008). Bank-specific, industry-specific and macroeconomic determinants of bank profitability. *Journal of International Financial Markets, Institutions and Money*, *18*(2), 121–136. https://doi.org/10.1016/j.intfin.2006.07.001

Avramidis, P., Cabolis, C., & Serfes, K. (2018). Bank size and market value: The role of direct monitoring and delegation costs. *Journal of Banking & Finance*, *93*, 127–138. https://doi.org/10.1016/j.jbankfin.2018.05.016

Basel Committee on Banking Supervision (BCBS) (2010a). An assessment of the long-term impact of stronger capital and liquidity requirements. BCBS Report No. 173. Bank for International Settlements.

BCBS (2010b). Basel III: International framework for liquidity risk measurement, standards and monitoring. Bank for International Settlements. Retrieved from https://www.bis.org/publ/bcbs188.htm

BCBS (2019). Basel III Monitoring Report, March 2019. Bank for International Settlements. Retrieved from https://www.bis.org/bcbs/publ/d461.pdf

Berger, A. N. (1995). The relationship between capital and earnings in banking. *Journal of Money Credit and Banking*, *27*, 432–456. https://doi.org/10.2307/2077877

Berger, A. N., Bonime, S. D., Covitz, D. M., & Hancock, D. (2000). Why are bank profits so persistent? The roles of product market competition, informational opacity, and regional/macroeconomic shocks. *Journal of Banking & Finance*, *24*(7), 1203–1235. https://doi.org/10.1016/S0378-4266(99)00124-7

Berger, A. N., & Bouwman, C. H. (2017). Bank liquidity creation, monetary policy, and financial crises. *Journal of Financial Stability*, *30*, 139–155. https://doi.org/10.1016/j.jfs.2017.05.001

Berger, A. N., & Bouwman, C. H. S. (2009). Bank liquidity creation. *Review of Financial Studies*, *22*(9), 3779–3837. https://doi.org/10.1093/rfs/hhn104

Berger, A. N., Bouwman, C. H., Kick, T., & Schaeck, K. (2016). Bank liquidity creation following regulatory interventions and capital support. *Journal of Financial Intermediation*, *26*, 115–141. https://doi.org/10.1016/j.jfi.2016.01.001

Blum, J. (1999). Do capital adequacy requirements reduce risks in banking? *Journal of Banking & Finance*, *23*(5), 755–771. https://doi.org/10.1016/S0378-4266(98)00113-7

Blundell, R., & Bond, S. (1998). Initial conditions and moment restrictions in dynamic panel data models. *Journal of Econometrics*, *87*(1), 115–143. https://doi.org/10.1016/S0304-4076(98)00009-8

Bourke, P. (1989). Concentration and other determinants of bank profitability in Europe, North America, and Australia. *Journal of Banking & Finance*, *13*, 65–79. https://doi.org/10.1016/0378-4266(89)90020-4

Chalermchatvichien, P., Jumreornvong, S., & Jiraporn, P. (2014). Basel III, capital stability, risk-taking, ownership: Evidence from Asia. *Journal of Multinational Financial Management*, *28*, 28–46. https://doi.org/10.1016/j.mulfin.2014.09.001

Chatterjee, U. K. (2015). Bank liquidity creation and asset market liquidity. *Journal of Financial Stability*, *18*, 139–153. https://doi.org/10.1016/j.jfs.2015.03.006

Chen, T-H., Chou, H-H., Chang, Y., & Fang, H. (2015). The effect of excess lending on bank liquidity: Evidence from China. *International Review of Economics and Finance*, *36*, 54– 68. https://doi.org/10.1016/j.iref.2014.11.007

Curry, T. J., Fissel, G. S., & Hanweck, G. A. (2008). Is there cyclical bias in bank holdings company risk ratings? *Journal of Banking & Finance*, *32*(7), 1297–1309. https://doi.org/10.1016/j.jbankfin.2007.11.009

Dang, V. D. (2019). Should Vietnamese banks need more equity? Evidence on risk-return trade-off in dynamic models of banking. *Journal of Risk and Financial Management*, *12*(2), 1–13. https://doi.org/10.3390/jrfm12020084

Davydov, D., Fungácová, Z., & Weill, L. (2018). Cyclicality of bank liquidity creation. *Journal of International Financial Markets, Institutions & Money*, *55*, 81–93. https://doi.org/10.1016/j.intfin.2018.02.014

Delis, M. D., & Kouretas, G. P. (2011). Interest rates and bank risk-taking. *Journal of Banking & Finance*, *35*(4), 840–855. https://doi.org/10.1016/j.jbankfin.2010.09.032

Dermine, J. (1986). Deposit rates, credit rates, and bank capital: The Klein-Monti model revisited. *Journal of Banking & Finance*, *10*(1), 99–114. https://doi.org/10.1016/0378-4266(86)90022-1

DeYoung, R., Distinguin, I., & Tarazi, A. (2018). The joint regulation of bank liquidity and bank capital. *Journal of Financial Intermediation*, *34*, 32–46. https://doi.org/10.1016/j.jfi.2018.01.006

DeYoung, R., & Jang, K.Y. (2016). Do banks actively manage their liquidity? *Journal of Banking & Finance*, *66*, 143–161. https://doi.org/10.1016/j.jbankfin.2015.11.013

Diamond, D. W., & Dybvig, P. (1983). Bank runs, deposit insurance, and liquidity. *Journal of Political Economy*, *91*(3), 401–419. https://doi.org/10.1086/261155

Diamond, D. W., & Rajan, R. G. (2001). Liquidity risk, liquidity creation, and financial fragility: A theory of banking. *Journal of Political Economy*, *109*(2), 287–327.

Diamond, D. W., & Rajan, R. G. (2005). Liquidity shortages and banking crises. *Journal of Finance*, *60*(2), 615–647. https://doi.org/10.1086/319552

Díaz, V., & Huang, Y. (2017). The role of governance on bank liquidity creation. *Journal of Banking & Finance*, *77*, 137–156. https://doi.org/10.1016/j.jbankfin.2017.01.003

Dietrich, A., Hess, K., & Wanzenried, G. (2014). The good and bad news about the new liquidity rules of Basel III in Western European countries. *Journal of Banking & Finance*, *44*, 13–25. https://doi.org/10.1016/j.jbankfin.2014.03.041

Ericsson, J., & Renault, O. (2006). Liquidity and credit risk. *Journal of Finance*, *61*(5), 2219– 2250. https://doi.org/10.1111/j.1540-6261.2006.01056.x

Foos, D., Norden, L., & Weber, M. (2010). Loan growth and riskiness of banks. *Journal of Banking & Finance*, *34*(13), 2929–2940. https://doi.org/10.1016/j.jbankfin.2010.06.007

Hansen, L. P. (1982). Large sample properties of generalized method of moments estimators. *Econometrica: Journal of the Econometric Society*, *50*(4), 1029–1054. https://doi.org/10.2307/1912775

Hassan, M. K., Khan, A., & Paltrinieri, A. (2019). Liquidity risk, credit risk and stability in Islamic and conventional banks. *Research in International Business and Finance*, *48*, 17–31. https://doi.org/10.1016/j.ribaf.2018.10.006

Holmstrom, B., & Tirole, J. (1997). Financial intermediation, loanable funds, and the real sector. *The Quarterly Journal of Economics*, *112*, 663–691. https://doi.org/10.1162/003355397555316

Horváth, R., Seidler, J., & Weill, L. (2014). Bank capital and liquidity creation: Granger-causality evidence. *Journal of Financial Services Research*, *45*(3), 341–361. https://doi.org/10.1007/s10693-013-0164-4

Horváth, R., Seidler, J., & Weill, L. (2016). How bank competition influences liquidity creation. *Economic Modelling*, *52*, 155–161. https://doi.org/10.1016/j.econmod.2014.11.032

Khan, M. S., Scheule, H., & Wu, E. (2017). Funding liquidity and bank risk taking. *Journal of Banking & Finance*, *82*, 203–216. https://doi.org/10.1016/j.jbankfin.2016.09.005

Kim, D., & Santomero, A. M. (1988). Risk in banking and capital regulation. *The Journal of Finance*, *43*(5), 1219–1233. https://doi.org/10.1111/j.1540-6261.1988.tb03966.x

King, M. R. (2013). The Basel III net stable funding ratio and bank net interest margins. *Journal of Banking & Finance*, *37*(11), 4144–4156. https://doi.org/10.1016/j.jbankfin.2013.07.017

Louzis, D. P., Vouldis, A. T., & Metaxas, V. L. (2012). Macroeconomic and bank-specific determinants of non-performing loans in Greece: A comparative study of mortgage, business and consumer loan portfolios. *Journal of Banking & Finance*, *36*(4), 1012–1027. https://doi.org/10.1016/j.jbankfin.2011.10.012

Roulet, C. (2018). Basel III: Effects of capital and liquidity regulations on European bank lending. *Journal of Economics and Business*, *95*, 26–46. https://doi.org/10.1016/j.jeconbus.2017.10.001

Salas, V., & Saurina, J. (2002). Credit risk in two institutional regimes: Spanish commercial and savings banks. *Journal of Financial Services Research*, *22*(3), 203–224. https://doi.org/10.1023/A:1019781109676

Tan, Y., & Floros, C. (2013). Risk, capital and efficiency in Chinese banking. *Journal of International Financial Markets, Institutions and Money*, *26*, 378–393. https://doi.org/10.1016/j.intfin.2013.07.009

Toh, M. Y. (2019). Effects of bank capital on liquidity creation and business diversification: Evidence from Malaysia. *Journal of Asian Economics*, *61*, 1–19. https://doi.org/10.1016/j.asieco.2018.12.001

Vo, X. V. (2018). Bank lending behavior in emerging markets. *Finance Research Letters*, *27*, 129–134. https://doi.org/10.1016/j.frl.2018.02.011

Windmeijer, F. (2005). A finite sample correction for the variance of linear efficient two-step GMM estimators. *Journal of Econometrics*, *126*(1), 25–51. https://doi.org/10.1016/j.jeconom.2004.02.005

Yan, M., Hall, M. J., & Turner, P. (2012). A cost–benefit analysis of Basel III: Some evidence from the UK. *International Review of Financial Analysis*, *25*, 73–82. https://doi.org/10.1016/j.irfa.2012.06.009