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The Impacts of Liquidity Creation on Banking Stability: An Empirical Research in ASEAN-5

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Abstract: Using both GMM estimation and the Bayesian approaches during the period of 2007 to 2021 to examine the impacts of liquidity creation (LC) on banking stability (Bank Stability-BS) on the sample of 53 banks in 5 Southeast Asian countries (ASEAN-5), the author has become a pioneer that carries out the first empirical study applying two approaches, which provides a broader perspective on the effects of liquidity creation on bank stability. Positive impacts of Liquidity Creation (LC) on the financial stability revealed from both approaches have contributed important management implications to the banking industry in ASEAN-5 in particular, and emerging and developing economies in general. The research also enriches the literature overview on the relationship between Liquidity Creation (LC) and bank stability.

Key words: Southeast Asia, Banking stability, Liquidity Creation, GMM, the Bayes method.

JEL Code: G21, G22, G4.

1. Introduction

A few encouragements for the author to study the role of liquidity creation on banking stability in ASEAN-5 are listed as follows:

First, financial stability of the banking system is considered one of the most important factors affecting economic growth, especially in developing and emerging economies (Ali, Haroon, Rizvi, & Azmi, 2021). Financial stability refers to the

smooth functioning of the key elements structuring the financial system (Qureshi & Aftab, 2023). Above all, the impacts of global crises in the past decades and the recent financial downturn in particular have pointed out that the ability to take excessive risks of a bank is the reason for financial chaos (Duan & Niu, 2020). As a result, the need for a stable and thriving banking system has become the top priority of the national economy (Hasanul Banna, 2021).

Second, liquidity creation and risk transformation are basically functions of banks (Berger & Bouwman, 2009). Furthermore, banks have an incentive to maximize liquidity creation to increase profits (Duan & Niu, 2020) and bank values (Berger & Bouwman, 2009) because illiquid assets generate higher income than highly liquid ones. On the other hand, Fidrmuc, Fungáčová, & Weill (2015) argue that liquidity creation has a negative impact on bank stability in which equity capital acts as a buffer to help banks absorb shocks causing asset values decline (Distinguin, Roulet, & Tarazi, 2013). Several banks have experienced this liquidity shortage due to the contagion effects, resulting in a drop of real economy growth (Fidrmuc et al., 2015). Thus, the role of liquidity creation has become essentially important for the national financial system and economy (Berger & Bouwman, 2017).

Third, the financial system in ASEAN mostly relies on banking institutions where banks play an important role in promoting economic development (Lestari, Ma, & Jun, 2023). Therefore, banking stability in the region has become one of the top concerns among researchers (Gupta & Kashiramka, 2024). Noting that heterogeneous development characteristics of the banking system found in ASEAN-5 (Williams & Rajaguru, 2022) is another important factor affecting banking stability, the authors have provided empirical evidence and profound implications for policymakers to address the above in ASEAN-5.

Fourth, banking risk is also an issue struggled by many banks in Asia because private sector companies mostly depend on banks via funding sources (Hasanul Banna, 2021). In the context that Asian economies are becoming more and more significant during financial globalization (Ha, 2021, Thanh Nga, 2025), greater need to study the correlation between banking stability and liquidity creation has been recognized. Bank liquidity creation is necessary for financial markets to function smoothly, but excessive liquidity creation can reduce bank liquidity and increase the fragility of the banking sector (Berger & Bouwman, 2017; Gupta & Kashiramka, 2024). Therefore, in developing countries, the role of banks in creating liquidity and stability is critically significant.

To fill in the academic gap of the literature review on the impacts of liquidity creation on banking stability in ASEAN-5, the authors have successfully conducted the study.

First, with the new approach of Berger & Bouwman (2009), a variety of Liquidity Creation aspects have been employed such as LC with bank capital (Toh, 2019), market power (Fu, Lin, & Molyneux, 2016), profitability (Duan & Niu, 2020; Sahyouni & Wang, 2018; Tran, Lin, & Nguyen, 2016, Doğan & Yildiz, 2023), competition (Jiang, Levine, & Lin, 2019), ownership structure (Yeddou & Pourroy, 2020); however, liquidity creation in the relation with financial stability is rarely examined except for Berger, Boubakri, Guedhami, & Li (2019) and Gupta & Kashiramka (2020).

Second, liquidity creation and financial stability correlation have been tested using both frequency and the Bayesian statistical methods to ensure the reliability of the research results. Acknowledging the differences of the above approaches, the researchers have pointed out a few shortcomings of the frequency statistics method (Kruschke and Liddell, 2018). While scientific conclusions in frequency statistics are drawn without prior information or constant parameters in the Bayesian statistics, parameters are modeled as random variables to accurately describe different aspects of the sample over time and platforms (Thach, 2020). Using this approach, the author has been recognized as the first researcher to test the impacts of liquidity creation on financial stability in ASEAN-5.

Third, with the latest updated research data from 2007 to 2021 of several banks in Indonesia, Malaysia, Philippines, Vietnam and Thailand (ASEAN-5), the study has provided in-depth insights of the effects of LC on banking stability after the Global Financial Crisis - GFC. The study results of above correlation can be further generalized for policy-making debates with direct implications beneficial for several countries in the region.

This article is structured into five parts in which research introduction of theoretical basis literature overview are presented in Part 1 and 2, respectively. Part 3 establishes the research models and describes measurement methods of variables. In part 4, the authors provide statistical evidence and analyze the research results based on the empirical models. Research conclusions and policy implications are finally presented in Part 5.

2. Research Theoretical Basis and Literature Overview

2.1. Liquidity Creation - LC

Creating liquidity is providing relatively liquid assets financed by relatively liquid liabilities on the balance sheet (Bryant, 1980; Diamond, 1996) or making commitments, loan bonds and other similar off-balance sheet requirements. Banks create liquidity by converting highly liquid assets into illiquid counterparts. (Berger & Bouwman, 2009) proposed a method of measuring liquidity based on the liquidity characteristics of each item classified on and off the balance sheet. Banks create LC through risk-transfer activities to serve the purpose of providing credit to borrowers who cannot access finance from the capital market. At the same time, providing access to payment services for depositors (Bryant, 1980; Diamond, 1996) Banks are encouraged to maximize LC for higher profits and greater values as illiquid assets can generate better returns than liquid assets (Duan & Niu, 2020). When borrowers and depositors request liquidity at the same time, balancing costs and benefits from LC (Berger et al., 2019) soon becomes very challenging. When it comes to financial stability of the banks, two-side effects can occur due to LC disbalancing, which has been one of the top concerns for many bank managers in the region.

2.2. The impacts of liquidity creation on banking stability

In search of the impacts of liquidity creation on banking stability, different outcomes have been found through various situations. High liquidity creation hypothesis (HLCH) assumes that the probability of bankruptcy increases when LC of the bank rises higher than the optimal level (Fidrmuc et al., 2015; Gupta & Kashiramka, 2020). Accordingly, banks will lack liquid assets to be able to meet customers' needs of either deposit or withdrawal requests. As a result, illiquid assets will have to be sold at low prices, increasing the risks of loss for many banks (Allen & Gale, 2004). Banks that receive short-term deposits and keep long-term assets in incompatible duration might further suffer financial weaknesses. Liquidity transformation, therefore, causes greater financial fragility (Diamond & Rajan, 2005). According to HLCH, creating liquidity leads to solvency shortage risks. Experiencing a large and sudden deposit outflow, banks that face illiquidity have to sell illiquid assets at cheap prices, resulting in liquidity risks, following possibility of bankruptcy. This corresponds to the 'bankruptcy cost hypothesis' that increased LC reflects more liquidity risks, leading to greater risks of bankruptcy (Tran et al., 2016). In other words, higher liquidity results in lower stability of the bank.

Additionally, LC features the ability of the banks to facilitate local banking transactions among studied economies, thereby supporting macroeconomic development of these nations. From that, lower LC reflects funding management instability, which can be seen via the balance sheet and other signs of trouble. Banks with lower LC are less dependent on core funding resources as short-term deposits, and instable long-term capital as loans or bonds. The majority of researchers support the act to increase LC as they believe that the tendency to raise bank capitals relevant to LC level can help to minimize bank risks, eventually reducing bankruptcy possibility (Distinguin et al., 2013). In the case that LC decreases, funding for credit cards is limited, thereby higher risks of bankruptcy and economic recession can be revealed.

Using data from 690 banks of 24 countries during 2000–2014, Islamic banks (IBs) reveal that Liquidity Creation (LC) increases bank stability and creates more liquidity per unit of assets in general (Berger et al., 2019). Studying a sample of 91 banks commercial banks in India in the period of 2007 - 2019, Gupta & Kashiramka (2020) also show a positive impact on financial stability; level of the positive LC effects varies depending on the size of the bank. Similar outcomes have been revealed in the research of Duan & Niu (2020) on 9,074 commercial banks in the period of 2001-2016 using the FEM method. On the other hand, a negative association between LC and financial stability is found in different banks of developing countries (Sahyouni, Zaid, and Adib, 2021; Yeddou & Pourroy, 2020). Furthermore, Fungacova, Turk, & Weill (2021) Zhang, Fu, Lu, Wang, & Zhang (2021), and Mohammad & Khan, (2024) found that LC has a U-shaped impact on banking system-wide risks, which contributes to inconsistent study results on the correlation between LC and banking stability.

Based on various empirical research results, two opposing hypotheses have been proposed as follows:

Hypothesis 1A. Liquidity creation has a positive impact on banking stability or increases the stability of a bank, contrary to the “High Liquidity Creation Hypothesis” (HLCH).

Hypothesis 1B. Liquidity creation has a negative effect on banking stability or increases the instability of a bank, consistent with the “High Liquidity Creation Hypothesis” (HLCH).

3. Research data and research methodology

3.1. Research data

Research data from ASEAN-5 including Vietnam, Thailand, Indonesia, and Malaysia have been collected and categorized into different groups: bank-specific data (Bankscope) and related macroeconomic factors (World Bank and IMF). The final research sample includes 53 commercial banks, 795 observations with unbalanced panel data over the period of 2007–2021 (a few banks were excluded from the research database due to heterogeneity or inadequate values during the research period). As shown in Table 1, Indonesia has the highest data proportion (36%), followed by Vietnam and Thailand (21%), Philippines (11%), and Malaysia (11%). The total assets of these 53 chosen banks have accounted for approximately 75% of the total banking assets in ASEAN, ensuring representativeness and liability for the research paper.

Table 1: Number of banks used in the study

No.	Country	Number of banks (N)	Number of observations	Percentage (%)
1	Vietnam	11	165	21%
2	Thailand	11	165	21%
3	Indonesia	19	285	36 %
4	Malaysia	6	90	11%
5	Philippines	6	90	11%
Total		53	796	100%

Source: Statistics collected by the authors

3.2. Research models

Inherited from Berger et al. (2019), the authors have established a research model to examine the impact of liquidity creation on banking stability in Southeast Asian countries:

$$Z - \text{score}_{i,j,t} = \beta_0 + \beta_1 * Z\text{score}_{i,j,t-1} + \beta_2 * LC_{i,j,t} + \beta_x X_{i,j,t} + \mu_i + \varepsilon_{i,j,t} \quad (1)$$

Where i and t represent country and time, respectively.

$Z - \text{score}_{i,j,t} = \ln(Z\text{-score})$ are the dependent variables indicating the stability of bank i country j in year t ; $LC_{i,j,t}$ = liquidity creation index of bank i , country j in

year t ; X_{ijt} is a set of control variables, which are specific to bank i in country j in year t such as SIZE, NPL, CAR, CIR, NIM, LIQ and macroeconomic factors of country j in year t (such as GDP, INF); μ_i is a fixed effect, constant over time but unobservable. However, $\varepsilon_{i,j,t}$ is an error quantity, which can be observable.

The Z-score is widely used in the banking and finance literature to measure bank stability (Samarasinghe, 2023). Z-score is an objective measure that any bank can use (Shabir, Jiang, Bakhsh, & Zhao, 2021). It uses the mean and standard deviation estimates of returns over the entire sample period (Berglund & Mäkinen, 2019; Lepetit & Strobel, 2013). A higher Z-score corresponds to a lower probability of insolvency; therefore, a higher Z-score implies higher bank stability (lower risk) and vice versa. The study took the natural logarithm of the calculated Z-score to reduce the impact of extreme values of the Z-distribution (Fiordelisi & Mare, 2014; Lepetit & Strobel, 2013).

To measure bank stability, Z-score is widely used in banking and finance literature (Samarasinghe, 2023). It is an objective measure that any banks can use (Shabir et al., 2021) based on the mean values and the standard deviation of returns estimates over the entire sample period (Berglund & Mäkinen, 2019; Lepetit & Strobel, 2013). A higher Z-score corresponds to a lower probability of insolvency risk; therefore, a higher Z-score implies higher bank stability (or lower risk) and vice versa. After natural logarithm of the calculated Z score had been taken, the impact of extreme values of the Z distribution declined (Fiordelisi & Mare, 2014; Lepetit & Strobel, 2013).

Following the three-step process of (Berger & Bouwman, 2009) the study applies “Catfat” and “CatNonfat” to calculate bank liquidity creation ability. Categorization has been done in Step 1. All of a bank's on-balance sheet and off-balance sheet activities as liquid, semi-liquid or illiquid are all classified based on the level of convenience, cost and time needed to convert its obligations into liquidity funds (for customers) or to obtain liquidity funds (for banks). Classified activities were then weighted in Step 1. After that, Liquidity Creation was calculated by combining the activities classified in both Step 1 and Step 2. The third step calculates the bank's liquidity creation capability as follows:

$$\text{CatFat} = 0.5 \times (\text{illiquid assets} + \text{liquid debt} + \text{illiquid off-balance sheet commitments}) + 0 \times (\text{semi-liquid assets} + \text{semi-liquid liabilities} + \text{semi-liquid off-balance sheet commitments}) - 0.5 \times (\text{liquid assets} + \text{illiquid debt and equity} + \text{liquid off-balance sheet commitments})$$

$$\text{CatNonFat} = 0.5 \times (\text{illiquid assets} + \text{liquid debt}) + 0 \times (\text{semi-liquid assets} + \text{semi-liquid debt}) - 0.5 \times (\text{liquid assets} + \text{illiquid debt and equity})$$

Bank-specific (variables) and macro-economic variables

In addition, the study considers adding a series of control variables according to the early warning model CAMELS according to (Berger et al., 2019; Dang, 2022) including the total assets variable (Bank size - SIZE) to control the risks from the loan portfolio of each individual bank, NPL margin acts as a proxy for credit risk; capital adequacy ratio (CAR); cost/income ratio (CIR); net return on the banks' earning assets (Quality of management - NIM); ratio of current assets to total assets (LIQ). Besides, there are some macroeconomic variables such as annual GDP growth rate (GDP), inflation (INF) to control economic growth, business cycle and institutional effects.

Table 2: Liquidity classification of bank activities

Illiquid assets (weight 0.5)	Semiliquid assets (weight = 0)	Liquid assets (weight = -0.5)
Corporate loans	Interbank loans	Cash and due from institutions
Other assets	Loans to individuals	Total securities
Liquid liabilities (weight = 0.5)	Semiliquid liabilities (weight = 0)	Illiquid liabilities and equity (weight = -0.5)
Customer deposits	Deposits from institutions	Other liabilities
Trading liabilities	Other borrowed money	Equity
Illiquid off-balance sheet guarantees (weight = 0.5)	Semiliquid off-balance sheet guarantees (weight = 0)	Liquid off-balance sheet guarantees (weight = -0.5)
Loan guarantee commitments	Other off-balance sheet guarantees	All derivatives
Letters of credit commitments		

Source(s): (A. N. Berger & C. H. S. Bouwman, 2009; Fu et al., 2016)

Table 3: Description of variables in the model

Symbol	Measure	Expectation	Author
Dependent variable			
	$\frac{\mu(ROAA_{c,t}) + CAR_{i,t}}{\sigma(ROAA_{c,t})}$		
Financial Stability	$Z-score_{it}$ In there: $\mu(ROAA_{c,t})$ is the average value of $ROAA$ in country c in year t $CAR_{i,t}$ is the capital of bank i in year t $\sigma ROAA_{c,t}$ is the standard deviation of $ROAA$ of country c in year t		(Berger et al., 2019; Fiordelisi & Mare, 2014; Gupta & Kashiramka, 2020; Lepetit & Strobel, 2013)
Independent variables			
Liquidity Creation	LC $\frac{Liquidity\ Creation}{Total\ assets} \times 100$ Liquidity creation is determined by two metrics CatFat (LC1) and CatNonFat (LC2).	-	(Berger et al., 2019; Berger & Bouwman, 2017; Berger & Bouwman, 2009; Dang, 2022; Duan & Niu, 2020)
Control variables			
Bank size	SIZE Ln(Total assets)	+	(Gupta & Kashiramka, 2020; Hasanul Banna, 2021; Tran et al., 2016; Zheng & Cronje, 2019)
Capital adequacy ratio	CAR $= \frac{Equity\ Capital}{Total\ risk - weighted\ assets} \times 100$		(Gupta & Kashiramka, 2020; Zheng & Cronje, 2019; Mdaghri & Oubdi, 2022)
Credit risks	NPL $CIR = \frac{Total\ cost}{Total\ income} \times 100$	-	(Gupta & Kashiramka, 2020; Hasanul Banna, 2021; Zheng & Cronje, 2019)
Cost/ income ratio	CIR $CIR = \frac{Total\ cost}{Total\ income} \times 100$	-	(Gupta & Kashiramka, 2020; Hasanul Banna, 2021; Zheng & Cronje, 2019)
Net Interest Margin Ratio	NIM $\frac{Interest\ income - Interest\ cost}{Total\ assets} \times 100$	+	(Gupta & Kashiramka, 2020; Hasanul Banna, 2021; Zheng & Cronje, 2019)
Liquidity ratio	LIQ $\frac{Cash + deposits\ of\ other\ institutions}{Total\ assets} \times 100$	+	(Gupta & Kashiramka, 2020; Hasanul Banna, 2021; Zheng & Cronje, 2019)
Economic growth	GDP $\frac{GDP_t - GDP_{t-1}}{GDP_{t-1}}$	+	(Gupta & Kashiramka, 2020; Hasanul Banna, 2021; Zheng & Cronje, 2019)
Inflation Ratio	INF $\frac{CPI_t - CPI_{t-1}}{CPI_{t-1}}$	-	(Gupta & Kashiramka, 2020; Hasanul Banna, 2021; Zheng & Cronje, 2019)

Source: Summarized by the authors

3.3. Research methodology

Regarding the estimation model, the authors have faced four problems in the process of estimating equation (1). First, some variables may have a two-way relationship with banking stability variables, leading to endogeneity. Secondly, some fixed effects in μ_i may be correlated with the independent variables in the model, also leading to endogeneity. Thirdly, the presence of the lagged variable $Z_{corseit-1}$ can lead to high serial autocorrelation. The final data set from five studied countries, compared with the original 15 during the observation period, may not be suitable for some estimation methods. These are the four issues that might cause inconsistent and biased OLS estimates results. Traditional panel data estimation methods such as FEM and REM cannot handle endogeneity and serial correlation. The IV-2SLS method requires the identification of appropriate instrumental variables, which are not parts of the model. Tran et al. (2016) argue that the correlation between liquidity creation, capital and bank profits always has endogeneity and serial correlation problems in dynamic panel models. All in all, the authors decide to apply the two-step SGMM estimation in which Arellano-Bond, Hansen and Sargan statistics are used to validate instrumental variables.

To examine the relationship among variables, the study also uses the Bayesian regression method via Gibbs sampling algorithm to understand the impacts of liquidity creation on banking stability in Southeast Asian countries during the period of 2007–2021 (Ha, 2021; Oanh, Van Nguyen, Le, & Duong, 2023; Rashid and Naeem, 2017). It is noted that conclusions are based on the data set regardless of prior information (Miočević, MacKinnon, & Levy, 2017) and parameters are considered constants in frequency statistics. On the contrary, parameters in the Bayes statistics are assumed to be random variables, following a distribution law (Block, Miller, & Wagner, 2014). Different from the frequency statistics, conclusions in the Bayes statistics are based on a priori information that was combined with the collected data set, revealing higher accuracy (Rashid and Naeem, 2017). Convergence diagnostics of MCMC series has also been applied to ensure that the Bayesian inference, based on MCMC sample simulation, is reasonable. The advantage of the Bayes compared to frequency is the generality of the Bayes, which means not many tests are performed, similar to frequency statistical methods such as testing endogeneity, autocorrelation, etc. Testing the convergence of the MCMC series is done through trace plots (Trace Plot), posterior distribution plots (Histogram), autocorrelation plots (Autocorrelation), kernel density estimation (Density Plot). A trace plot helps trace the historical display of a parameter value across iterations of the series (Smid, McNeish, Miočević, & van de Schoot, 2020). In addition to graphical convergence diagnosis, testing is also proposed through the average acceptance rate and minimum efficiency. Not only providing the standard error (Standard Deviation) for the regression coefficient, the Bayesian regression results

also distributes parameters of Monte-Carlo Standard Error – MCSE, indicating the robustness of the regression coefficient. Regarding MCMC chains, the closer MCSE approaches 0, the stronger the MCMC chain is found. According to (Flegel et al., 2008), if MCSE is less than 6.5%, the standard deviation is an acceptable level. Less than 5%, this indicator is considered optimal. When the MCMC chains converge, the Bayesian inference is strong, then all the disadvantages of the frequency statistics are solved (Miočević et al., 2017; Nguyen, Trung, & Thach, 2019). If the test results show that the trace histograms run quickly through the distribution; the autocorrelation histogram drops quickly or low autocorrelation; the shapes of the histograms simulating the shape of the probability distributions are identical, then the Bayesian inference can be concluded stable.

Furthermore, convergence diagnostics of MCMC series have been applied to ensure the appropriateness of the Bayesian inference on MCMC sample simulation. In Bayes, MCMC series autocorrelation test of variables is carried out by Autocorrelation model and Effective Sample Size (ESS) plots. Unlike the frequency statistical method, many tests of endogeneity or autocorrelation do not have to be executed thanks to the Bayes' featured advantage of generality. When the MCMC series converge, the Bayesian inference becomes robust, all the disadvantages of the frequency method are solved accordingly (Miočević et al., 2017; Nguyen et al., 2019). In addition to graphical convergence diagnosis, testing is also proposed through the average acceptance rate and the smallest efficiency (Grzegorzcyk, 2023).

4. Research results and discussions

4.1. Descriptive Statistics

Table 4 provides a statistics summary on the research variables. The average of CatNonFat/Total Assets and CatFat/Total Assets in ASEAN-5 are 4% and 0.3%, respectively in the period of 2007–2021. Z-score indicator in 53 banks in ASEAN countries is 20.23 and the standard deviation is 12.70, which is quite high, showing that the Z-score index has strong and uneven fluctuations during the research period. Furthermore, the mean values of ASEAN bank size and SD are 32.23 and 1.42, respectively, revealing large annual differences across banks. The average GDP rate of countries has achieved 4.88% during 2007-2021, 0.3% lower than the GDP growth rate in the period of 2011-2019 (Banna & Alam, 2021), probably due to impact of the Covid-19 pandemic. In the first quarter of 2020, Indonesia achieved a 3% growth while Malaysia and the Philippines reached 0.7% and 0.2%, respectively (Brief, 2020). This indicates the serious impacts of Covid-19 on ASEAN economic growth, thereby affecting the entire banking sector in ASEAN.

Table 4: Descriptive statistics of variables in the research model

Variable	Number of observation	Average	Standard Deviation	Min value	Max value
Z-score	795	20.226	12.706	0.130	90.491
LC1	795	0.317	0.140	-0.265	0.768
LC2	795	4.051	0.702	0.293	5.382
SIZE	795	32.232	1.420	27.194	35.105
CAR	795	4.069	3.773	-1.139	23.115
NPL	795	2.130	5.351	-0.000	31.040
CIR	795	0.333	3.064	0.000	86.302
NIM	795	0.481	1.687	0.000	23.905
LIQ	795	0.207	0.107	0.045	0.610
GDP	795	4.888	2.773	-9.573	8.464
INF	795	4.443	3.013	1.573	9.868

Source: Results processed using Stata 17.0 software

4.2. Correlation results between variables and multicollinearity

Table 5 presents the results of the matrix in which the correlation coefficients are all less than 0.8 (Kennedy, 2008) and the VIF of all variables is less than 5 (Neter, Kutner, Nachtsheim, & Wasserman, 1996), thus most collinearity is not a concern in this study. The table also presents interesting preliminary results. Bank stability is positively correlated with LC, capital adequacy, profitability, growth rate, liquidity and negatively correlated with scale, NPL, cost-to-income ratio, inflationary.

Table 5: Autocorrelation results of variables in the research model

	Z-score	LC1	LC2	SIZE	CAR	NPL	CIR	NIM	LIQ	GDP	INF	VIF Mean
Z-score	1.00											
LC1	0.03	1.00										
LC2	0.03	0.05	1.00									
SIZE	-0.06	0.03	0.02	1.00								
CAR	0.02	-0.01	-0.01	-0.24	1.00							
NPL	-0.08	-0.05	-0.09	-0.01	0.01	1.00						
CIR	-0.06	0.00	-0.04	-0.04	0.01	0.00	1.00					
NIM	0.00	0.06	-0.04	-0.01	0.08	0.05	0.00	1.00				
LIQ	0.15	-0.07	-0.03	-0.02	0.29	-0.08	-0.03	-0.01	1.00			
GDP	0.02	0.00	-0.12	0.04	0.23	0.01	0.02	0.07	0.03	1.00		
INF	-0.07	-0.05	-0.02	-0.01	0.36	0.08	0.02	0.06	0.01	0.01	1.00	
VIF		1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.28

Source: Results processed using Stata 17.0 software

4.3. Regression results

The research analysis employs two variables representing LC1 liquidity creation (catfat); LC2 (catnonfat) and banking stability (Z-score) according to table 6A (The SGMM regression) and table 6B (The Bayesian regression).

Table 6A: Liquidity Creation and Bank Stability in ASEAN-5 (The SGMM regression results)

Independent Variables	SGMM regression			
	Z-score (1- Catfat)		Z-score (2- Catnonfat)	
	Regression coefficient [Standard Deviation]	Probability statistics	Regression coefficient [Standard Deviation]	Probability statistics
LC1	5.542 [1.456]	0.000***		
LC2			7.814 [0.327]	0.000***
L.Z-score	12.340 [0.008]	0.000***	12.147 [0.005]	0.000***
SIZE	0.558 [0.203]	0.006***	0.659 [0.098]	0.000***
CAR	-0.732 [0.063]	0.000***	-0.433 [0.045]	0.000***
NPL	0.242 [0.007]	0.000***	0.244 [0.015]	0.000***
CIR	-31.194 [0.143]	0.000***	-0.949 [0.192]	0.000***
NIM	-0.335 [0.043]	0.000***	-0.477 [0.034]	0.000***
LIQ	202.333 [1.609]	0.000***	177.496 [1.074]	0.000***
GDP	-0.263 [0.036]	0.000***	-0.092 [0.037]	0.014***
INF	0.048 [0.015]	0.002***	0.286 [0.019]	0.000***
_cons	-2.34 [2.603]	0.000***	-5.946 [2.603]	0.000***
Number of observations	795		795	
Number of banks	53		53	

Number of groups	125	125
Number of instruments	87	87
Wald Test (Fstatistics)	22.29***	20.87***
AR(1)	0.023	0.020
AR(2)	0.296	0.278
Sargan Test	1.000	0.999

***, **, and * indicate significance at 1%, 5%, and 10% respectively.

Results processed using Stata 17.0 software Source: Orbis Bank-focus, WB, IMF.

Note: Table 6A uses Z-score (Stability Bank); LC1 = "catfat" measure scaled by total assets (LC1) as the measure of liquidity creation, LC2="catnonfat" measure scaled by total assets (LC2) as the measure of liquidity creation; SIZE= Bank size; CAR = Capital adequacy ratio; NPL = Non provision ratio ; CIR = Cost to income ratio; NIM = Net Income Marginal; LIQ = Liquid asset to total asset ratio; GDP= GDP growth; INF= inflation rate. There are 2 models, model 1 uses catfat variable; Model 2 uses catnonfat variable as explanatory variable. The estimation method is the two-step GMM dynamic panel estimator with corrected standard errors Windmeijer (2005). Data sample includes 53 commercial banks, 795 observations with unbalanced panel data over the period of 2007–2021 The study examines the appropriateness of the instrumental variables used in the Sargan test, Arellano-Bond AR(1) and AR(2) models to see whether first-order autocorrelation and second-order autocorrelation exist. in the model or not (Ahamed & Mallick, 2019). The AR(1) statistics are significant (<0.05) and AR(2) are not significant (>0.1) indicating that there is first-order autocorrelation and no second-order autocorrelation in the model. Sargan/Hansen test (with $p\text{-value}>0.1$) means accepting hypothesis H_0 , in which hypothesis H_0 states that the instrumental variable is exogenous, meaning not correlated with the error of the model. The AR(2) test has $p\text{-value}>0.1$, which means accepting the hypothesis H_0 . Hypothesis H_0 of the AR(2) test is that there is no second-order autocorrelation in the model. Thus, the results of the models show that the tools of the two models are appropriate and there is no autocorrelation phenomenon in the model.

Table 6A illustrating the two-step SGMM regression results shows a positive association between LC and BS in both models. The regression coefficients with variables LC1 and LC2 are positive and statistically significant at the 1% significance level. For the LC1 variable, it has a positive impact on Z-score with a regression coefficient of 5.542 (standard deviation 1.456); LC2 variable also has a positive impact on Z-score but the level is higher with a coefficient of 7.814 (0.327).

Our findings contrast with those of Berger et al. (2019) and Fidrmuc et al. (2015) that liquidity created by conventional banks increases their risk of bankruptcy. The lagged value of the Z-score is significant in both models. Accordingly, higher Z-score in the previous year results in a rise in Z-score this year up to 12.13% (model 1) and 12.3% (model 2). The finding shows that LC has a positive impact on BS over the years (Gupta & Kashiramka, 2024). Table 6A also shows that control variables such as SIZE, NPL, LIQ, INF have a positive impact on Z-score, the remaining variables such as CAR, CIR, NIM have a negative impact on Z-score

and all variables are statistically significant at 1% level. The SGMM regression results show that the Wald-F test is significant at the 1% level, the Sargan test and the AR(2) test give results greater than 5%, showing that the GMM model is not defective, and the variables in the SGMM regression model are all statistically significant at the 1% level.

Table 6B: Liquidity Creation and Bank Stability in ASEAN-5
(The Bayesian regression results)

Independent Variables	Dependent Variables			
	Z-score (1- Catfat)		Z-score (2- Catnonfat)	
	Average of parameter series [Standard Deviation]	Standard error (MCSE)	Average of parameter series [Standard Deviation]	Standard error (MCSE)
LC1_Var	2.627 [3.216]	0.032		
LC2_Var			0.214 [0.662]	0.006
SIZE	0.122 [0.238]	0.002	0.047 [0.233]	0.002
CAR	0.033 [0.136]	0.001	0.049 [0.135]	0.001
NPL	-0.283 [0.103]	0.001	-0.275 [0.103]	0.001
CIR	-0.227 [0.145]	0.001	-0.227 [0.146]	0.001
NIM	0.676 [0.331]	0.003	0.643 [0.329]	0.003
LIQ	16.138 [4.012]	0.040	16.330 [4.105]	0.042
GDP	0.155 [0.166]	0.001	0.157 [0.167]	0.001
INF	-0.366 [0.157]	0.0016	-0.363 [0.158]	0.001
_cons	14.830 [7.567]	0.0757	15.426 [7.576]	0.075
Average acceptance rate	0.918		0.911	
Minimal effect	0.050		0.050	
Number of observations	795		795	
Number of banks	53		53	

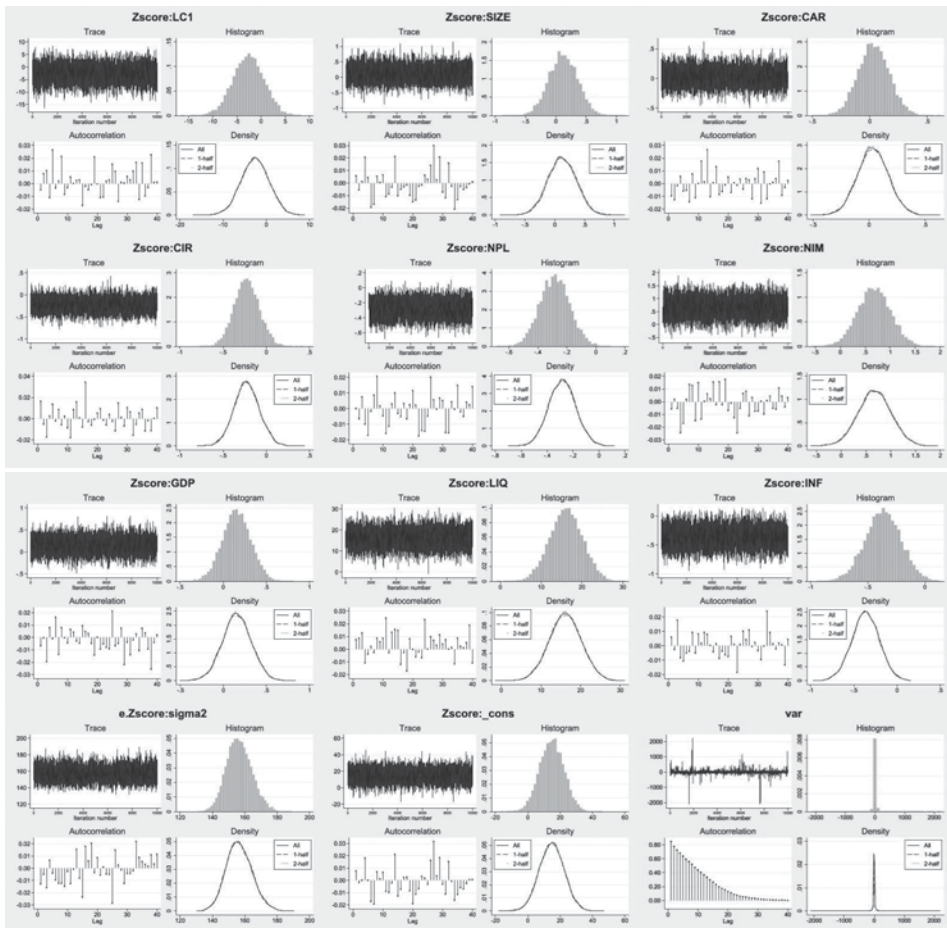
Results processed using Stata 17.0 software Source: Orbis Bank-focus, WB, IMF.

Note: The table shows the estimation results obtained from Bayesian regression.

Panel 6B uses Z-score (Stability Bank); the dependent variable is Catfat (columns 2-3) measured as “cat fat” liquidity creation on total assets and Catnonfat (columns 4-5) measured as “cat-nonfat” liquidity creation on total assets. Symbols: Z-score (Stability Bank); LC1 = “catfat” measure scaled by total assets (LC1) as the measure of liquidity creation, LC2=“catnonfat” measure scaled by total assets (LC2) as the measure of liquidity creation; SIZE= Bank size; CAR = Capital adequacy ratio; NPL = Non-performing loans; CIR = Cost to income ratio; NIM = Net Income Marginal; LIQ = Liquid asset to total asset ratio; GDP= GDP growth; INF= inflation rate. There are 2 models, model 1 uses catfat variable; Model 2 uses catnonfat variable as explanatory variable. Table 6B shows that the MCSE standard errors of the MCMC series of parameters are very small decimal numbers (less than 0.1). The results of Table 5 indicates that the MCSE of the parameters are decimal numbers, less than 0.1. The estimation results also show that the acceptance rates of the models are 0.918 and 0.911 (above 0.15), respectively, and the smallest effectiveness of the three models is greater than or equal to 0.01, therefore, all regression models meet the requirements (Gelfand, Hills, Racine-Poon, & Smith, 1990; Grzegorzczuk, 2023).

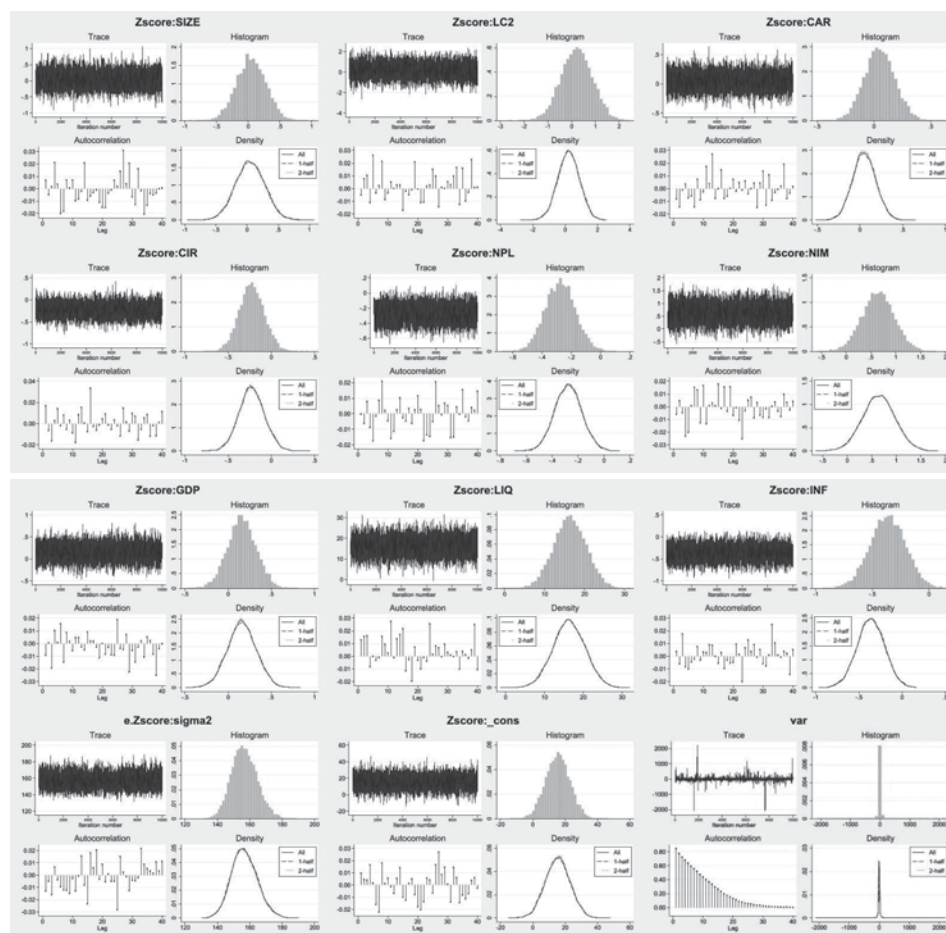
Model (1) for variable (LC1) and model (2) for variable (LC2) in table 6B also show that liquidity creation has a positive impact on financial stability (Z-score), which is similar to research results of (Gupta & Kashiramka, 2020; Javid, Chandia, Zaman, & Akhter, 2023; Zheng & Cronje, 2019). Different from other countries with developed economies in the region, the results perhaps stem from the uneven level of development of banking systems in ASEAN countries. From a policy perspective, limiting LCs in emerging and developing economies seems to be a prudent policy to prevent increased “fragility” across the system (Berger et al., 2019). Besides, the MCMC series standard errors of the parameters are very small decimal numbers, demonstrating the high accuracy of the estimated parameters. Additionally, the model acceptance rates of 0.9182 and 0.9113 are higher than the required level at 0.15 (Gelfand et al., 1990). Along with histograms, autocorrelation charts, and kernel density estimates (density plot), the convergence of MCMC series through trace plots has been conducted and diagnosed according to (Thach, 2020). The trace plots show no signs of non-convergence of the MCMC series. Figures 1 and 2 indicate trace plots that run quickly through the distribution, low autocorrelation is drawn from autocorrelation plots that drop quickly, and the shape of the probability distributions. From that, the Bayesian inference is robust.

Figure 1: Convergence test of MCMC series for Z-score variable (1- Catfat)



Note: Check the MCMC convergence of parameter estimates through visual diagnostics using graph 1 with the convergence diagnostic results for the Z-score variable (1- Catfat) shown in all graphs. of parameters in the model is quite reasonable, the trace plots and correlograms show low autocorrelation; The shape of the histogram is uniform, and has a normal distribution shape. Source: Results processed using Stata 17.0 software

Figure 2: Convergence test results of MCMC series for Z-score variable (2- Catnonfat)



Note: Check the MCMC convergence of parameter estimates through visual diagnostics using graph 2 with the convergence diagnostic results for the Z-score variable (2- Catnonfat) shown in all graphs. of parameters in the model is quite reasonable, the trace plots and correlograms show low autocorrelation; The shape of the histogram is uniform, and has a normal distribution shape. Source: Results processed using Stata 17.0 software

As shown in Tables 6A and 6B, consistent direction of liquidity creation (LC1, LC2) impacts on the financial stability index (Z-score) in both GMM and Bayesian methods, in line with (Gupta & Kashiramka, 2020; Zheng & Cronje, 2019), but not similar to (Berger et al., 2019). Different levels of banking development among Southeast Asian economies are the main reasons for the above.

5. Conclusions and policy implications

This study aims to fill the theoretical gap of the literature review by examining the relationship between liquidity creation and bank stability. Using CatFat and CatNonFat indexes, the author follows the method of Berger & Bouwman (2009) to represent the ability to create liquidity by a sample of 794 observations from 53 banks in ASEAN-5 during the period of 2007–2021. Applying both GMM and BAYES methods, the researcher has found that liquidity creation has a positive impact on bank stability via both liquidity measures and approaches.

The study findings and relevant policy implications are listed as below:

First, with the main focus on the latest database of selected banks in ASEAN-5, this empirical research can be generalized to provide in-depth insights related to Liquidity Creation and banking stability in other countries of the region.

Second, applying the Bayesian approach as a pioneer to examine the impacts of liquidity creation on banking stability in ASEAN-5, the authors have revealed similar research results, which is rather in line with studies using the SGMM. Bank liquidity creation has also increased steadily since 2010 after a brief decline in the post-GFC years (Nguyen, Ahmed, Chevapatrakul, & Onali, 2020). This paper, therefore, has provided important findings to enrich not only the academic literature on the general impacts of liquidity creation on banking stability, but also contribute to the regulatory frameworks for the governance of banking systems.

Third, the research indicates positive impacts of LC on BS in ASEAN-5, enriching the literature review. Not only new empirical insights but the complex nature of the correlation between bank stability (a critical feature of the banking system) and liquidity creation (a fundamental function) has also been revealed. Additionally, the authors have found factors affecting BS in the research sample, which is critically important for supervision and management of banking industry in ASEAN, especially in emerging and developing countries.

Due to uneven development across studied countries, the gaps between LC and BS in emerging and developed economies have been recognized as a limit of the research. To address the above, further studies on different scales, types of banks, and banking cultures in various regions are highly recommended in the future for better clarification of liquidity creation effects on banking stability.

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References

1. Ahamed, M. M., & Mallick, S. K. (2019). Is financial inclusion good for bank stability? International evidence. *Journal of Economic Behavior & Organization*, 157, 403-427. doi:<https://doi.org/10.1016/j.jebo.2017.07.027>
2. Ali, M., Haroon, O., Rizvi, S. A. R., & Azmi, W. (2021). Stability versus fragility: new evidence from 84 banks. *Studies in Economics and Finance*, 38(2), 441-453. doi:<https://doi.org/10.1108/SEF-04-2020-0109>
3. Allen, F., & Gale, D. (2004). Financial fragility, liquidity, and asset prices. *Journal of the European Economic Association*, 2(6), 1015-1048. doi:<https://doi.org/10.1162/JEEA.2004.2.6.1015>
4. Banna, H., & Alam, M. R. (2021). Impact of digital financial inclusion on ASEAN banking stability: implications for the post-Covid-19 era. *Studies in Economics and Finance*, 38(2), 504-523. doi:<https://doi.org/10.1108/SEF-09-2020-0388>
5. Berger, A. N., Boubakri, N., Guedhami, O., & Li, X. (2019). Liquidity creation performance and financial stability consequences of Islamic banking: Evidence from a multinational study. *Journal of Financial Stability*, 44, 100692. doi:<https://doi.org/10.1016/j.jfs.2019.100692>
6. Berger, A. N., & Bouwman, C. H. (2009). Bank liquidity creation. *The review of financial studies*, 22(9), 3779-3837. doi:<https://doi.org/10.1093/rfs/hhn104>
7. Berger, A. N., & Bouwman, C. H. (2017). Bank liquidity creation, monetary policy, and financial crises. *Journal of Financial Stability*, 30, 139-155. doi:<https://doi.org/10.1016/j.jfs.2017.05.001>
8. Berger, A. N., & Bouwman, C. H. S. (2009). Bank Liquidity Creation. *Review of Financial Studies*, 22(9), 3779-3837. doi:[10.1093/rfs/hhn104](https://doi.org/10.1093/rfs/hhn104)
9. Berglund, T., & Mäkinen, M. (2019). Do banks learn from financial crisis? The experience of Nordic banks. *Research in International Business and Finance*, 47, 428-440. doi:<https://doi.org/10.1016/j.ribaf.2018.09.004>
10. Block, J. H., Miller, D., & Wagner, D. (2014). Bayesian methods in family business research. *Journal of Family Business Strategy*, 5(1), 97-104. doi:<https://doi.org/10.1016/j.jfbfs.2013.12.003>
11. Brief, A. P. (2020). Economic impact of COVID-19 outbreak on ASEAN. *ASEAN Integration Monitoring Directorate (AIMD) and Community Relations Division (CRD)*, 1-17.
12. Bryant, J. (1980). A model of reserves, bank runs, and deposit insurance. *Journal of banking & finance*, 4(4), 335-344. doi:[https://doi.org/10.1016/0378-4266\(80\)90012-6](https://doi.org/10.1016/0378-4266(80)90012-6)
13. Dang, V. D. (2022). Bank funding, market power, and the bank liquidity creation channel of monetary policy. *Research in International Business and Finance*, 59, 101531. doi:<https://doi.org/10.1016/j.ribaf.2021.101531>

14. Doğan, M., & Yildiz, F. (2023). Testing the factors that determine the profitability of banks with a dynamic approach: evidence from Turkey. *Journal of Central Banking Theory and Practice*, 12(1), 225-248. DOI: [10.2478/jcbtp-2023-0010](https://doi.org/10.2478/jcbtp-2023-0010)
15. Diamond, D. W. (1996). *Liquidity, banks, and markets: effects of financial development on banks and the maturity of financial claims* (Vol. 1566): World Bank Publications.
16. Diamond, D. W., & Rajan, R. G. (2005). Liquidity shortages and banking crises. *The Journal of finance*, 60(2), 615-647. doi:<https://doi.org/10.1111/j.1540-6261.2005.00741.x>
17. Distinguin, I., Roulet, C., & Tarazi, A. (2013). Bank regulatory capital and liquidity: Evidence from US and European publicly traded banks. *Journal of banking & finance*, 37(9), 3295-3317. doi:<https://doi.org/10.1016/j.jbankfin.2013.04.027>
18. Duan, Y., & Niu, J. (2020). Liquidity creation and bank profitability. *The North American Journal of Economics and Finance*, 54, 101250. doi:<https://doi.org/10.1016/j.najef.2020.101250>
19. Fidrmuc, J., Fungáčová, Z., & Weill, L. (2015). Does bank liquidity creation contribute to economic growth? Evidence from Russia. *Open Economies Review*, 26, 479-496. doi:<https://doi.org/10.1007/s11079-015-9352-1>
20. Fiordelisi, F., & Mare, D. S. (2014). Competition and financial stability in European cooperative banks. *Journal of International Money and Finance*, 45, 1-16. doi:<https://doi.org/10.1016/j.jimonfin.2014.02.008>
21. Fu, X., Lin, Y., & Molyneux, P. (2016). Bank capital and liquidity creation in Asia Pacific. *Economic Inquiry*, 54(2), 966-993. doi: <https://doi.org/10.1111/ecin.12308>
22. Fungacova, Z., Turk, R., & Weill, L. (2021). High liquidity creation and bank failures. *Journal of Financial Stability*, 57, 100937. doi:[10.1016/j.jfs.2021.100937](https://doi.org/10.1016/j.jfs.2021.100937).
23. Gelfand, A. E., Hills, S. E., Racine-Poon, A., & Smith, A. F. (1990). Illustration of Bayesian inference in normal data models using Gibbs sampling. *Journal of the American Statistical Association*, 85(412), 972-985. doi:<https://doi.org/10.1080/01621459.1990.10474968>
24. Grzegorzczuk, M. (2023). Being Bayesian about learning Gaussian Bayesian networks from incomplete data. *International Journal of Approximate Reasoning*, 108954. doi:<https://doi.org/10.1016/j.ijar.2023.108954>
25. Gupta, J., & Kashiramka, S. (2020). Financial stability of banks in India: does liquidity creation matter? *Pacific-Basin Finance Journal*, 64, 101439. doi:<https://doi.org/10.1016/j.pacfin.2020.101439>

26. Gupta, J., & Kashiramka, S. (2024). Examining the impact of liquidity creation on bank stability in the Asia Pacific region: Do ESG disclosures play a moderating role? *Journal of International Financial Markets, Institutions and Money*, 91, 101955. doi:<https://doi.org/10.1016/j.intfin.2024.101955>
27. Ha, V. D., Nguyen, T. X. L., Ta, T. H. N., & Nguyen, M. H. (2021). Does Capital Affect Bank Risk in Vietnam: A Bayesian Approach. *Data Science for Financial Econometrics*, 898, 623-633. doi:https://doi.org/10.1007/978-3-030-48853-6_42
28. Hasanul Banna, M. R. A. (2021). Impact of digital financial inclusion on ASEAN banking stability: implications for the post-Covid-19 era. *Studies in Economics and Finance*, 38(2), 504-523. doi:<https://doi.org/10.1108/SEF-09-2020-0388>
29. Javid, M., Chandia, K. E., Zaman, Q. U., & Akhter, W. (2023). Examining the effect of liquidity creation on banking profitability and stability: moderating role of political instability. *Kybernetes*, 52(10), 4061-4080. doi: <https://doi.org/10.1108/K-01-2022-0021>
30. Jiang, L., Levine, R., & Lin, C. (2019). Competition and bank liquidity creation. *Journal of Financial and Quantitative Analysis*, 54(2), 513-538. doi:<https://doi.org/10.1017/S0022109018000820>
31. Kennedy, P. (2008). *A guide to econometrics*: John Wiley & Sons.
32. Kruschke, J. K., Liddell, T.M. . (2018). Bayesian data analysis for newcomers. *Psychonomic bulletin & review*, 25(1), 155-177. doi:<https://doi.org/10.3758/s13423-017-1272-1>
33. Lepetit, L., & Strobel, F. (2013). Bank insolvency risk and time-varying Z-score measures. *Journal of International Financial Markets, Institutions & Money*, 25, 73-87. doi:<https://doi.org/10.1016/j.intfin.2013.01.004>
34. Lestari, D., Ma, S., & Jun, A. (2023). Enhancing bank stability from diversification and digitalization perspective in ASEAN. *Studies in Economics and Finance*. doi:<https://doi.org/10.1108/SEF-12-2022-0554>
35. Miočević, M., MacKinnon, D. P., & Levy, R. (2017). Power in Bayesian mediation analysis for small sample research. *Structural equation modeling: a multidisciplinary journal*, 24(5), 666-683. doi:<https://doi.org/10.1080/10705511.2017.1312407>
36. Neter, J., Kutner, M. H., Nachtsheim, C. J., & Wasserman, W. (1996). *Applied linear statistical models*.
37. Nguyen, H. T., Trung, N. D., & Thach, N. N. (2019). *Beyond traditional probabilistic methods in econometrics*. Paper presented at the Beyond Traditional Probabilistic Methods in Economics 2.

38. Nguyen, T. V. H., Ahmed, S., Chevapatrakul, T., & Onali, E. (2020). Do stress tests affect bank liquidity creation? *Journal of Corporate Finance*, 64, 101622. doi:<https://doi.org/10.1016/j.jcorpfin.2020.101622>
39. Mohammad, K. U., & Khan, M. R. (2024). Liquid asset holdings and banking profitability: Evidence from South Asia. *Journal of Central Banking Theory and Practice*, 13(2), 129-152. DOI: [10.2478/jcbtp-2024-0016](https://doi.org/10.2478/jcbtp-2024-0016)
40. Mdaghri, A. A., & Oubdi, L. (2022). Bank-specific and macroeconomic determinants of bank liquidity creation: Evidence from MENA countries. *Journal of Central Banking Theory and Practice*, 11(2), 55-76. DOI: [10.2478/jcbtp-2022-0013](https://doi.org/10.2478/jcbtp-2022-0013)
41. Oanh, T. T. K., Van Nguyen, D., Le, H. V., & Duong, K. D. (2023). How capital structure and bank liquidity affect bank performance: Evidence from the Bayesian approach. *Cogent Economics & Finance*, 11(2), 2260243. doi:<https://doi.org/10.1080/23322039.2023.2260243>
42. Qureshi, S., & Aftab, M. (2023). Exchange rate interdependence in ASEAN markets: A wavelet analysis. *Global Business Review*, 24(6), 1180-1204. doi:<https://doi.org/10.1177/0972150920919371>
43. Rashid, A., & Naeem, N. (2017). Effects of mergers on corporate performance: An empirical evaluation using OLS and the empirical Bayesian methods. *Borsa Istanbul Review*, 17(1), 10-24. doi:<https://doi.org/10.1016/j.bir.2016.09.004>
44. Sahyouni, A., & Wang, M. (2018). The determinants of bank profitability: does liquidity creation matter? *Journal of Economics and Financial Analysis*, 2(2), 61-85. doi:[10.1991/jefa.v2i2.a18](https://doi.org/10.1991/jefa.v2i2.a18)
45. Sahyouni, A., Zaid, M.A.A. and Adib, M. (2021). Bank soundness and liquidity creation. *EuroMed Journal of Business*, 16(1), 86-107 doi:<https://doi.org/10.1108/EMJB-04-2019-0061>
46. Samarasinghe, A. (2023). Stock market liquidity and bank stability. *Pacific-Basin Finance Journal*, 79, 102028. doi:<https://doi.org/10.1016/j.pacfin.2023.102028>
47. Shabir, M., Jiang, P., Bakhsh, S., & Zhao, Z. (2021). Economic policy uncertainty and bank stability: Threshold effect of institutional quality and competition. *Pacific-Basin Finance Journal*, 68(101610). doi:<https://doi.org/10.1016/j.pacfin.2021.101610>
48. Smid, S. C., McNeish, D., Miočević, M., & van de Schoot, R. (2020). Bayesian versus frequentist estimation for structural equation models in small sample contexts: A systematic review. *Structural equation modeling: a multidisciplinary journal*, 27(1), 131-161. doi:<https://doi.org/10.1080/10705511.2019.1577140>

49. Thach, N. N. (2020). How to explain when the ES is lower than one? A Bayesian nonlinear mixed-effects approach. *Journal of Risk and Financial Management*, 13(2), 21. doi:<https://doi.org/10.3390/jrfm13020021>
50. Toh, M. Y. (2019). Effects of bank capital on liquidity creation and business diversification: Evidence from Malaysia. *Journal of Asian Economics*, 61, 1-19. doi:<https://doi.org/10.1016/j.asieco.2018.12.001>
51. Tran, V. T., Lin, C.-T., & Nguyen, H. (2016). Liquidity creation, regulatory capital, and bank profitability. *International Review of Financial Analysis*, 48, 98-109. doi:<https://doi.org/10.1016/j.irfa.2016.09.010>
52. Thanh Nga, T. T. (2025). Fintech innovation and banking stability: evidence from a developing country approach by quantile regression. *Ianna Journal of Interdisciplinary Studies*. Vol 7 (2) 789-803, DOI:<https://doi.org/10.5281/zenodo.15599960>
53. Windmeijer, F. (2005). A finite sample correction for the variance of linear efficient two-step GMM estimators. *Journal of econometrics*, 126(1), 25-51.
54. Williams, B., & Rajaguru, G. (2022). The evolution of bank revenue and risk in the Asia-Pacific Region. *Pacific-Basin Finance Journal*, 71, 101693. doi:<https://doi.org/10.1016/j.pacfin.2021.101693>.
55. Yeddou, N., & Pourroy, M. (2020). Bank liquidity creation: does ownership structure matter? *The Quarterly Review of Economics and Finance*, 78, 116-131. doi:<https://doi.org/10.1016/j.qref.2020.01.003>
56. Zhang, X., Fu, Q., Lu, L., Wang, Q., & Zhang, S. (2021). Bank liquidity creation, network contagion and systemic risk: Evidence from Chinese listed banks. *Journal of Financial Stability*, 53, 100844. doi:<https://doi.org/10.1108/EMJB-04-2019-0061>
57. Zheng, C., & Cronje, T. (2019). The moderating role of capital on the relationship between bank liquidity creation and failure risk. *Journal of banking & finance*, 108, 105651. doi:<https://doi.org/10.1016/j.jbankfin.2019.105651>