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Article

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BANKING & FINANCE | RESEARCH ARTICLE

The interrelationships between bank profitability, bank stability and loan growth in Southeast Asia

Dat T Nguyen^{1,2*} and Tu DQ Le^{1,2*}

Abstract: The purpose of this study is to examine the relationship between bank profitability, bank stability, and loan growth may exist in Southeast Asia, including a sample of 79 listed banks in five countries in Southeast Asia (ASEAN-5) from 2006 to 2019. Using a simultaneous equations model (SEM) with the generalized method of moments is used to examine the links bank profitability, bank stability and loan growth. The findings show a two-way relationship between these variables. More specifically, bank profitability and stability are positively related. Bank stability and loan growth are inversely connected. Furthermore, the findings demonstrate that bank profitability and loan growth are positively related. These findings, however, suggest a trade-off in banks' pursuit of large loan growth. Our findings, however, have implications for bank supervisors, policymakers, and bank managers.

Subjects: Banking; Business, Management and Accounting; Risk Management

Keywords: Bank stability; profitability; loan growth; Southeast Asia; SEM

1. Introduction

Banks play an important role in economic development through the financial services they provide. It can be said that the intermediary role of banks is a catalyst for economic growth. The performance of the banking sector over time is an indicator of financial stability in any country. The

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PUBLIC INTEREST STATEMENT

Loan growth is critical for enhancing bank profitability by increasing interest income. Furthermore, increased competition resulted in a reduction in interest margins, reducing the banking system's profitability and exposing it to larger risks. Increased loan growth would raise systematic bank risk. However, the relationship between loan growth, bank profitability, and stability is more complicated. For example, bank profitability has a significant impact on credit expansion since profitable banks can absorb more capital. Furthermore, a healthy banking system absorbs financial shocks by increasing capital, resulting in improved bank stability. Banks that lack effective risk management and have a high-risk loan portfolio, on the other hand, may experience a high level of non-performing loans, reducing bank profitability. This study adds empirical evidence, exploring the link between loan growth, bank profitability and bank stability in ASEAN 5 countries.

extent to which banks extend credit to customers for business activities will promote a country's economic growth and its long-term sustainability (Kolapo et al., 2012). Banks help develop the economy, agriculture, industry, infrastructure, services, and improve people's living standards through healthy lending activities. Credit is the main activity of banks and remains one of the top priorities of countries in the current period. The main activity of a bank is to mobilize deposits and then lend them to customers, generating interest income. Rapid credit growth can be risky for banks, as banks with high loan growth lead to an increase in loan provisions in subsequent years after controlling for the impact of the business cycle and other economic conditions. This means that banks pursuing a policy of high loan growth will face higher risks (Foos et al., 2010)

Theoretically, changes in the aggregate bank credit level over time should affect its performance and stability. As a result, credit availability promotes economic growth by allowing people to convert their savings into investments during a boom (Al-Khouri & Arouri, 2016). Loan growth is also important for boosting bank profitability by increasing interest income. On the other hand, empirical studies on loan growth show that bank profitability has a significant impact on credit expansion. These findings point to a bidirectional relationship between loan growth and profitability. Furthermore, despite being the primary source of revenue, credit expansion exposes banks to greater risk. According to Al-Khouri and Arouri (2016), a decrease in loan quality would have an impact on bank stability and soundness. Prior research shows that loan growth harms bank stability and exacerbates the banking crisis (Demirgüç-Kunt & Detragiache, 2002). A bidirectional relationship between loan growth and bank stability, on the other hand, may exist. Due to their large capital and liquidity, healthy banks have a high ability to control risks. Fragile banks are also willing to offer more loans without regard to their quality to compete in the banking market (Igan & Pinheiro, 2011). Furthermore, Al-Khouri and Arouri (2016) discovered that bank stability and profitability are linked in two ways.

This study contributes to the extant literature in several ways. Most prior studies focus on the one-way relationship between loan growth and bank stability, e.g., the impact of one on another and vice versa, such as the study of Kashif et al. (2016), Kwan and Eisenbeis (1997), and Salas and Saurina (2002). Further Most prior studies focus on the one-way relationship between loan growth and bank profitability such as the study of Miller and Noulas (1997); Molyneux and Thornton (1992). Finally previous studies exam relationship between bank profitability and bank stability such as the study of Le and Ngo (2020); Molyneux and Thornton (1992). In addition, previous studies were conducted in developed and developing countries. One could argue that the effect of loan growth on bank risk-taking in other markets would be different because the regulatory and economic environments faced by banks are likely to differ significantly across nations, and because the level and quality of service associated with deposits and loans in different countries may differ. Further, there are currently no studies in Southeast Asia. So this study examines the relationship between bank profitability, bank stability, and loan growth may exist in Southeast Asia.

The author chooses Southeast Asian banks for several reasons. Firstly, the Southeast Asian countries (ASEAN) are known as a relatively successful regional cooperation mechanism. They are outstandingly developed economies, and are emerging Asian dragons, including Vietnam, Thailand, the Philippines, Malaysia, and Indonesia, except Singapore, are developed countries. It has a certain amount of clout in the Asia-Pacific. According to the report of the Asian Development Bank, the average growth rate of Southeast Asia in 2017 reached 5.11%, in 2018 it reached 4.62%.¹ Therefore, Southeast Asia is recognized for its achievements in maintaining regional stability, promoting economic development, and especially in the institutionalization of regional cooperation among member states. Besides, the strong growth rate in Southeast Asian countries accompanied by increased lending leads to increased risks. In 2018, the average bad debt ratio in Southeast Asia was 3.42%.²

The following is how the rest of the study is structured: The literature review of the relationship between loan growth, profitability, and bank stability is presented in Section 2. The methodology

and data are described in Section 3. The empirical results are discussed in Section 4, and the conclusion is in Section 5.

2. Literature review

Credit expansion, in theory, stimulates economic growth by converting savings into investments. Loan growth rates are much higher than GDP growth in the banking systems of developed Southeast Asian countries. Meanwhile, increased competition reduces profit margins, which reduces the banking system's profitability while also increasing risks (Le, 2017). Higher loan growth, taken together, would raise systematic bank risk (Le, 2018). Dell'Ariccia and Marquez (2006) and Ong and Maechler (2009), for example, show that loan growth affects bank stability. The sign of the relationship between bank stability and loan growth, on the other hand, is unknown. As a result of lower costs and better risk management, safer banks may have a competitive advantage, allowing them to expand their credit. However, as credit demand rises, banks' ability to manage risk decreases, increasing nonperforming loans. As a result, the bank's profits are reduced, and loan growth is slowed. The moral hazard hypothesis, on the other hand, states that less-sound banks may extend more credit in order to increase profitability and attract more investors. This credit expansion may result in increased risk and instability (Kwan & Eisenbeis, 1997). Empirical research on the association between loan growth and individual bank riskiness begin early in developed countries and provide mixed results. For example, several studies in the United States find a significant and a negative impact of loan growth on non-performing loans in the first year after credit expansion, but a positive relationship is partially found in subsequent years (Clair, 1992). Outside of the United States, Laeven and Majnoni (2003) observe a highly negative contemporaneous relationship between loan growth and loan losses, implying that banks make insufficient provisioning in good times but overreact in bad. When a positive relationship between loan growth and loan loss provisioning is explored in OECD nations between 1991 and 2000, the opposite findings are observed (Bikker & Metzmakers, 2005). Kashif et al. (2016) investigates the loan growth and bank solvency in Pakistan over 2006–2014. The result show that loan growth in the previous year raises non-performing loans and decreases the solvency of banks with a time lag of many years. Baradwaj et al. (2014) examined the impact of lending growth on the riskiness of Chinese banks from 1992 to 2007. The findings suggest that lending growth raises bank risk. Sinkey and Greenawalt (1991) investigated the loan loss and risk-taking behaviour of large commercial banks in the United States from 1984 to 1987. According to the findings, loan loss rates show a positive relationship with loan volume, loan rate, and volatile funds from previous years. Similarly, Salas and Saurina (2002) analysed the drivers of lending decisions by Spanish commercial banks and savings banks from 1985 to 1997. They discovered that credit expansion, market exploration, and managerial leniency towards borrower creditworthiness affect future loan losses. In contrast to these findings, Brei et al. (2020) used a dataset of 32 economies (15 advanced and 17 emerging) from 2007 to 2015 and discovered that higher growth in SME lending is associated with greater banking system stability, as measured by a longer distance to default, but only in emerging market economies. When taken as a whole, the first hypothesis is as follows:

H₁: Between loan growth and bank stability, there is no bidirectional causality.

Loan growth is expected to result in higher profitability because loans are the primary source of bank revenue. However, several studies in the US and EU have found a negative relationship between loan growth and profitability (Miller & Noulas, 1997; Molyneux & Thornton, 1992) or no significant relationship at all (Al-Khouri & Arouri, 2016). This suggests that rapid loan growth could lead to increased risk, which would result in a drop in bank profitability. Profitable banks, on the other hand, are more likely to increase credit because they can attract more funds. Several studies have found the opposite (Al-Khouri & Arouri, 2016). The following is the third hypothesis, which is based on these findings:

H₂: Between loan growth and bank profitability, there is no bidirectional causality.

Furthermore, Molyneux and Thornton (1992) study at EU banks points out that bank risk and profitability have a negative relationship. Banks that lack proper risk management and have a high-risk loan portfolio may experience a high level of nonperforming loans, which reduces profitability. Al-Khouri and Arouri (2016) study the relationship between bank stability, performance and credit growth for 59 GCC banks over the period 2004–2012, the result show that Stable banks tend to expand credit faster, and are more profitable. On the other hand, other studies in Vietnam and China show that bank risk does not affect bank profitability (Le, 2017; Tan, 2016) or A cross-country analysis that the two have a positive relationship (Le & Ngo, 2020). A profitable banking system, on the other hand, tends to absorb financial shocks by increasing capital, thereby improving financial system stability (Athanasoglou et al., 2008; Le, 2018). Hellmann et al. (2000), on the other hand, argue that an insufficient bank regulatory environment and asymmetric information may increase profit-ability, which reflects high-risk premia that can lead to financial instability. The second hypothesis is constructed as follows, based on the above arguments:

H₃: Profitability and bank stability do not have a bidirectional causal relationship.

In summary, previous research suggests that the relationships between bank stability, profitability, and loan growth can differ depending on banking characteristics and national regulation (John et al., 2008; Kim et al., 2014). Given the size and impact of several emerging markets on the global economy, a gap in the banking literature is to be expected: few empirical studies have examined the relationship between bank stability, profitability, and loan growth in Southeast Asian banks. As a result, this investigation is required.

3. Methodology and data

3.1. Methodology

According to Le (2019), the ratio of returns profits before tax on equity ROE is a proxy for bank profitability. ZSCORE measures bank stability as a standard deviation of ROA over the sample period mixed with current period ROA and EQUITY values. The natural logarithm of Z-scores is employed to mitigate this issue because the distribution of Z-scores is extremely skewed. In the remainder of this study, we will continue to use the name “ZSCORE” to denote the natural logarithm of the Z-score for brevity. Loan growth LG is defined as the annual percentage change in a bank’s total outstanding loans. As previously stated, the three endogenous variables in the simultaneous equation system are represented by ROE, ZSCORE, and LOGR, with two right-hand-side endogenous variables in each of the three equations. The model is completed by including exogenous variables with explanatory power for each of the above variables. Previous research, such as Le (2017), Nguyen (2012), and others, has shown that bank profitability is related to bank stability, loan growth, and efficiency. Bank, bank size, and liquidity The following equation is formed:

$$ROE_{i,t} = \alpha_0 + \alpha_1 ZSCORE_{i,t} - 1 + \alpha_2 LG_{i,t} + \alpha_3 SIZE_{i,t} + \alpha_4 LIQUID_{i,t} + \alpha_5 NIE_{i,t} + \nu_{i,t} \quad (1)$$

Where the non-interest expenditure to total assets ratio (NIE) is used as a proxy for bank efficiency. The natural logarithm of total assets is used to calculate bank size. The loan-to-total-asset ratio as a measure of liquidity (LIQUID).

According to Le (2019), Al-Khouri and Arouri (2016), and others, bank stability is related to profitability, financial market development, the openness of the banking system, and bank size. The model is estimated using the following proxies:

$$ZSCORE_{i,t} = \alpha_0 + \alpha_1 LG_{i,t} + \alpha_2 ROE_{i,t} + \alpha_3 SIZE_{i,t} + \alpha_5 FINANDEVE_{i,t} + \alpha_6 FRE_{i,t} + \nu_{i,t} \quad (2)$$

ZSCORE, the mean returns on assets and the mean standard deviation of ROA over the sample period, combined with the current period value of EQUITY. The natural logarithm of total assets is used to

bank size. FINANDEVE, a ratio between the value of the total number of shares traded to the average real market capital, is used to control developments in financial markets. FRE measures the openness of the banking system. This score is built on key facts such as whether banks are free to operate accepting deposits and lending, conducting activities in foreign currencies, if foreign banks are allowed to enter local markets, and the extent of government intervention in credit allocation.

According to Amador et al. (2013); Imbierowicz and Rauch (2014), loan growth is related to bank size, funding source, bank reform, inflation, and economic growth. The loan growth equation looks like this:

$$LG_{i,t} = \alpha_0 + \alpha_1 ZSCORE_{i,t} + \alpha_2 ROE_{i,t} + \alpha_3 SIZE_{i,t} + \alpha_4 DEPOSIT_{i,t} + \alpha_5 GDP_{i,t} + \alpha_6 INF_{i,t} + \nu_{i,t} \quad (3)$$

The natural logarithm of total assets is used to calculate the size of a bank SIZE. The annual change in total deposits DEPOSIT is utilized as a proxy for the financing source. The annual inflation rate, INF, is used to account for the consequences of inflation. The annual GDP growth rate GDP is used to calculate economic growth.

Panel Unit Root tests Fisher-Type with deducted cross-sectional averages as recommended by Choi (2001) are utilized due to our unbalanced panel data, as discussed later. The significant results at the 1% significance level generally indicate that the examined series does not contain a unit root. As a result, the series is estimated at levels. When one or more regressors are endogenous, we test for heteroscedasticity before choosing our model. To assess the null hypothesis of homo-scedasticity, the Breusch and Pagan/Cook-Weisberg test is used. In two steps, we perform the Breusch-Pagan/Cook-Weisberg heteroskedasticity tests χ . The first step is to run each of the three equations with pooled OLS and robust standard errors. The Breusch-Pagan/Cook-Weisberg tests are then run. Table 2 shows the regression Chi-square χ^2 results and p-values here only the results of χ^2 and p-values are presented.³ Table 1 demonstrates that the low p-values

Table 1. The results of the Breusch-Pagan test

	ZSCORE	LG	ROE
Chi-square (χ^2)	105.27	306.28	4719.11
P-value	0.000	0.000	0.000

Table 2. Descriptive statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
ZSCORE	1,106	0.119	0.013	0.084	0.147
LG	1,106	0.185	0.433	-0.411	11.317
ROE	1,106	0.094	0.264	-6.502	1.842
SIZE	1,106	28.944	3.103	21.449	34.938
DEPOSIT	1,106	0.168	0.557	-0.422	15.410
NIE	1,106	0.520	0.611	-0.608	14.359
LIQUID	1,106	0.127	0.077	0.001	0.439
FINANDEVE	1,106	54.012	35.033	10.764	126.365
FRE	1,106	49.358	11.177	30.000	70.000
GDP	1,106	0.052	0.016	-0.015	0.075
INF	1,106	0.053	0.049	-0.060	0.227

ZSCORE, the mean returns on assets and the mean standard deviation of ROA over the sample period, combined with the current period value of EQUITY; LG, the annual percentage change in total outstanding loans; ROE, the ratio of the returns on equity; SIZE, the natural logarithm of total assets; The annual percentage change in total deposits is known as DEPOSIT; LIQUID the loan to total asset ratio; FINANDEVE, a ratio of the value of total shares traded to average real market capital; FRE, the banking freedom index; GDP, the growth rate of gross domestic products; INF, the inflation rate.

indicate strong heteroscedasticity, implying that the GMM technique is preferred for dealing with this issue.⁴

For the following reason, Equations (1-3) are estimated jointly. On the surface, these equations appear to be unrelated to one another. However, because they use the same data, the error terms in these three equations could be connected. The apparent simultaneous equation bias from Equations (1-3), if unaccounted for, can lead to biased and inconsistent estimators due to the association between random errors and endogenous variables. These errors, $\varepsilon_{i,t}$, $\mu_{i,t}$, and $\nu_{i,t}$ are contemporaneously connected because they include the influence of elements that were left out of the equations. Because the firms' operations are comparable in many ways, the effect of the omitted factors on the correlation between loan growth, bank profitability, and stability for one firm is more likely to be similar to that of another firm. If this is the case, the effects captured by $\varepsilon_{i,t}$, $\mu_{i,t}$ and $\nu_{i,t}$ are similar and will be linked. One such option is to estimate the three equations together using the panel Generalised Method of Moments (Baltagi, 2021). In panel data, the GMM estimator is thought to be more efficient than the fixed or random effects estimators if the regressors' stringent exogeneity assumption fails or if a serial correlation exists (Wooldridge, 2002). Because endogeneity is successfully managed by the framework of the simultaneous equations approach (Greene, 2008), all estimations in the results section are performed using the system GMM technique, which makes use of the interactions between the innovations in Equations (1-3). In the presence of endogenous explanatory regressors, the GMM estimator also produces efficiency advantages. We further correct for heteroskedasticity and arbitrary autocorrelations by estimating the above equations using the Newey-West methodology (Newey & West, 1987).

3.2. Data

Our data was gathered from a variety of sources. Financial statements of banks and Refinitiv Eikon were used to acquire bank-level data in five ASEAN countries. In which, Indonesia has the largest number of banks, which amounts to 43%, followed by the Philippines (18.98%), Malaysia (13.92%), Thailand (12.65%), and Vietnam (11.39%). Singapore as a developed country is excluded from our sample. After excluding those with missing data, this arrives at an unbalanced panel of 79 listed banks in the period 2006–2019.⁵ The World Bank database is used to collect macroeconomic statistics such as inflation and GDP growth rates, the Financial Development and Structure dataset is used to collect other indicators (Beck et al., 2000). While banking Freedom data was achieved from the Heritage Foundation. Table 2 shows descriptive statistics for the variables in the simultaneous equations model.

Table 1 allows for an average loan maturity of 18%. While the minimum is low compared to the average, it is 41.1%. The maximum similarity reached a peak of 1131.7%. Besides, ZSCORE has an average value of 11.92%. The lowest value is 8.44% and the highest is 14.76%. ROE has an average value of 9.4%. The lowest return is -650% and the highest return that the budget achieves is 184%. According to Köhler (2012), large rates of credit growth do not imply excessive risk-taking when all other banks have similarly high growth rates.

Finally, Table 3 displays the correlation matrix among independent variables, demonstrating that there is no multicollinearity among them.

4. Results

The Granger causality tests for the key variables in this investigation are shown in Table 4. The tests are carried out using two, three, and four lags, as recommended by econometric literature (Thornton & Batten, 1985; Wooldridge, 2002). The findings in Tables 5–7 then confirm the whole Granger-causality test results. Most of the time, bidirectional causal correlations exist between ROE, ZSCORE, and LG, indicating that these variables are significantly connected. Because simultaneous equation bias can result in inconsistent estimators, it is critical to control these feedback issues using a system estimating approach.

Table 3. The correlation matrix of variables

	ZSCORE	LG	ROE	SIZE	DEPOSIT	NIE	LIQUID	FINANDEVE	FRE	GDP	INF
ZSCORE	1.000										
LG	0.075	1.000									
ROE	0.109	0.033	1.000								
SIZE	0.495	0.082	0.054	1.000							
DEPOSIT	0.093	0.074	-0.080	0.099	1.000						
NIE	-0.148	0.051	0.096	-0.187	-0.113	1.000					
LIQUID	-0.025	0.021	0.065	-0.022	0.186	-0.122	1.000				
FINANDEVE	-0.652	-0.152	0.041	-0.697	-0.156	0.282	-0.270	1.000			
FRE	-0.341	-0.177	-0.065	-0.365	-0.224	0.050	-0.130	0.538	1.000		
GDP	0.181	0.134	0.025	0.188	0.138	-0.024	0.278	-0.370	-0.274	1.000	
INF	0.333	0.119	0.040	0.365	0.105	-0.139	0.076	-0.486	-0.538	0.319	1.000

ZSCORE, the mean returns on assets and the mean standard deviation of ROA over the sample period, combined with the current period value of EQUITY; LG, the annual percentage change in total outstanding loans; ROE, the ratio of the returns on equity; SIZE, the natural logarithm of total assets; DEPOSIT, the annual percentage change in total deposits is known as DEPOSIT; The ratio of operating expenses to total assets is known as NIE; LIQUID the loan to total asset ratio; FINANDEVE, a ratio of the value of total shares traded to average real market capital; FRE, the banking freedom index; GDP, the growth rate of gross domestic products; INF, the inflation rate.

Table 4. Pairwise Granger-causality tests

Null Hypothesis:	F-Statistic	Prob.	F-Statistic	Prob.	F-Statistic	Prob.
Number of lag	2		3		4	
ROE does not Granger Cause ZSCORE	12.416	0.000	1.790	0.148	2.155	0.073
ZSCORE does not Granger Cause ROE	2.585	0.076	2.160	0.091	4.061	0.003
LG does not Granger Cause ZSCORE	5.551	0.004	5.112	0.002	1.430	0.222
ZSCORE does not Granger Cause LG	14.179	0.000	9.071	0.000	8.635	0.000
LG does not Granger Cause ROE	1.965	0.141	16.348	0.000	13.668	0.000
ROE does not Granger Cause LG	171.731	0.000	234.714	0.000	205.251	0.000

4.1. The interrelationships among bank profitability, bank stability, and loan growth

The panel GMM approach is used to estimate all versions. To account for heteroskedasticity and autocorrelation, the Newey-West approach is also used. To avoid potential endogeneity with bank-level control variables, we follow Fu et al. (2016) and replace all bank-level explanatory variables in all regressions with their one-year lagged value. As a result, the one-year lag values of the allegedly endogenous variables were used as instruments. Because these variables are rather weak instruments, we do not use further lags in our regressions.

The Hansen test (J-statistic) result is provided to test the over-identifying constraints in a system of simultaneous equations (Baltagi, 2021). According to the data in Tables 5–7, the p-value of the Hansen test is not statistically significant in any of the models, and hence the null hypothesis can not be rejected. As a result, there is no evidence of over-identification constraints. In other words, all of the prerequisites for the moment have been met, and the aforesaid instruments have been accepted.

Table 5 shows that ZSCORE is positively and strongly related to ROE, implying that bank stability can lead to increased profits. This is consistent with findings of Al-Khouri and Arouri (2016) in GCC.

Table 5. The result of the bank profitability

Variables	ROE
constant	19.750 (11.711)
ZSCORE	29.110*(36.925)
LG	9.716**(9.106)
SIZE	-12.388(16.008)
LIQUID	-34.429*** (19.497)
NIE	-45.082(24.414)
No.obs	537
J-statistics	0.122

ZSCORE, the mean returns on assets and the mean standard deviation of ROA over the sample period, combined with the current period value of EQUITY; LG, the annual percentage change in total outstanding loans; ROE, the ratio of the returns on equity; SIZE, the natural logarithm of total assets; LIQUID the loan to total asset ratio; The ratio of operating expenses to total assets is known as NIE. The results were calculated using a simultaneous equations model (SEM) with the GMM estimator and the Newey-West method, as shown in the table. In SEM, the three endogenous variables are ROE, ZSCORE, and LG. ***Significant at 1% levels, respectively. t-statistics are shown in parentheses.

Table 6. The result of the bank stability

Variables	ZSCORE
constant	-0.323 (0.308)
LG	-0.039**(0.090)
ROE	0.018*** (0.007)
SIZE	-0.425** (0.010)
FINANDEVE	-0.005 (0.001)
FRE	-0.001 (0.004)
No.obs	537
J-statistics	0.122

ZSCORE, the mean returns on assets and the mean standard deviation of ROA over the sample period, combined with the current period value of EQUITY; LG, the annual percentage change in total outstanding loans; ROE, the ratio of the returns on equity; SIZE, the natural logarithm of total assets; FINANDEVE, a ratio of the value of total shares traded to average real market capital; FRE, the banking freedom index. The results were calculated using a simultaneous equations model (SEM) with the GMM estimator and the Newey-West method, as shown in the table. In SEM, the three endogenous variables are ROE, ZSCORE, and LG. ***Significant at 1% levels, respectively. t-statistics are shown in parentheses.

This could be explained by the fact that “too-safe” banks may be hesitant to participate in riskier assets because they closely adhere to regulatory requirements. As a result, they may miss out on a lucrative profit opportunity as the banking industry becomes more competitive. LG is found to have a positive impact on ROE, meaning that loan growth can increase bank profitability. This is in contrast to the results of Miller and Noulas (1997); Molyneux and Thornton (1992) in EU and US. LIQUID displays a negative association that might be: an overabundance of liquid assets, as if the bank is less invested due to its conservative tendency, or a lack of investment opportunities, resulting in a lower profit than normal.

Table 6 indicates that the ROE coefficient is positive and significant, implying that banks may be hesitant to take excessive risks in a highly profitable market. This is consistent with the earlier suggestions of Al-Khouri and Arouri (2016) in GCC. Furthermore, the LG coefficient is negative and significant, implying that banks that are less invested in loan growth tend to lower bank credit defaults. This is consistent with findings of Kashif et al. (2016) in Pakistan. SIZE is negatively and

Table 7. The result of the loan growth

Variables	LG
constant	0.202 (0.099)
ZSCORE	-0.002**(0.006)
ROE	0.013** (0.003)
SIZE	-0.156* (0.307)
DEPOSIT	0.022 (0.045)
GDP	0.023** (0.005)
INF	-0.010*** (0.004)
No.obs	537
J-statistics	0.122

ZSCORE, the mean returns on assets and the mean standard deviation of ROA over the sample period, combined with the current period value of EQUITY; LG, the annual percentage change in total outstanding loans; ROE, the ratio of the returns on equity; SIZE, the natural logarithm of total assets; The annual percentage change in total deposits is known as DEPOSIT; GDP, the growth rate of gross domestic products; INF, the inflation rate. The results were calculated using a simultaneous equations model (SEM) with the GMM estimator and the Newey-West method, as shown in the table. In SEM, the three endogenous variables are ROE, ZSCORE, and LG. ***Significant at 1% levels, respectively. t-statistics are shown in parentheses.

strongly related to ZSCORE, lending credence to the too-big-to-fail concept. This implies that large banks have greater incentives to invest in hazardous assets. This finding is consistent with (Beck et al., 2006) and (Le, 2019). Also, not found the relationship between FINANDEVE and FRE with bank stability.

Table 7 shows that ZSCORE is inversely related to LG, indicating that unstable banks are connected with excessive loan growth, validating the moral hazard argument. ROE is observed to have a positive effect on LG, implying that more profitable banks are connected with increased loan growth. SIZE has a negative and substantial coefficient, indicating that larger banks are shifting away from traditional activities and toward off-balance-sheet activities and retail banking. GDP has a positive and significant relationship with LG, suggesting that high growth rates increase bank loans for investment. INF has a negative and significant relationship with LOGR, implying that a high inflation rate decreases bank loans.

Table 8. Regression occurred as a result of the global financial crisis

Variables	ROE	ZSCORE	LG
LG	2.030**(6.120)	-0.031**(0.120)	
ROE		4.075***(5.270)	2.701**(0.043)
ZSCORE	25.023**(27.982)		-1.327*(0.211)
CRISIS	-0.154(0.082)	0.001(0.004)	0.115*(0.213)
constant	2.763(3.102)	6.214(8.264)	8.426(5.248)
No.obs	537	537	537
J-statistics	0.122	0.122	0.122

The table shows the estimated results from a simultaneous equations model with the GMM estimator. The same set of control variables are employed as in Equations (1-3), as well as CRISIS, a dummy variable that takes a value of 1 during the 2007-09 period and 0 otherwise. However, owing to space restrictions, the coefficients for the other control variables are not shown in the table. Parentheses denote t-statistics. *, **, and *** Significant at the 10% and 1% levels, respectively.

Table 9. Regression results for small banks and large bank

Variables	SMALL BANK			LARGE BANK		
	ROE	ZSCORE	LG	ROE	ZSCORE	LG
LG	0.014 (0.221)	0.230*** (3.135)		0.557* (2.173)	-1.039 (0.879)	
ROE		-2.316*** (2.840)	7.402*** (3.008)		14.503*** (5.866)	2.832** (2.219)
ZSCORE	0.411*** (2.060)		-3.217** (4.066)	-4.241*** (2.136)		1.625** (2.118)
constant	0.491** (2.674)	3.165 (16.871)	6.247 (1.676)	5.307*** (3.533)	1.191** (2.533)	3.291 (3.373)
No.obs	324	324	324	332	332	332
J-statistics	0.165	0.165	0.165	0.141	0.141	0.141

Small banks are those with total assets that are less than the average. Large banks are those with higher than average total assets. The results of simultaneous equation modeling with the GMM estimator are shown in the table. The same set of control variables are employed as in Equations (1-3). However, owing to space restrictions, the coefficients for the other control variables are not shown in the table. Parentheses denote t-statistics. *, **, and *** Significant at the 10% and 1% levels, respectively.

4.2. Robustness checks

The first, when CRISIS, a dummy variable that takes a value of 1 during the period 2007–2009 and 0 otherwise, is used, the same basic findings as shown in Table 8 are obtained. CRISIS, in particular, is positively and strongly related to LG but statistically insignificant in the ROE and ZSCORE equations. This shows that the global financial crisis did not have an impact on banks' decisions to make loans during this time. Nonetheless, this validates the early findings of Al-Khouri and Aroui (2016) and Dietrich and Wanzenried (2014) in low-and middle-income nations.

The second, as demonstrated in Table 9, we analyze whether the link between bank stability, profitability, and loan growth differs between small and large banks. According to Le (2019), Fu et al. (2016), and others, large and small banks are characterized as having total assets that are greater than or less than the median. Bank stability is positively related to loan growth and adversely related to profitability for small banks. This shows that tiny banks are more likely to rely on traditional lending activities, which may result in lower profits over time. Large banks with a lower profit margin are more stable and less diversified. Our major findings, however, are solid.

5. Conclusions

This study examines the multidimensional relationship between bank stability, profitability, and loan growth in Southeast Asian national banks between 2006 and 2017 using the GMM estimator. The findings suggest a two-way relationship between bank stability, profitability and loan growth.

Banks that perform well, on the other hand, have higher profitability and lower loan growth. Lending growth increases bank profitability while decreasing bank stability, whereas bank profitability has a positive impact on both bank stability and loan growth. Furthermore, the findings show a negative relationship between bank size and stability, bolstering the “too big to fail” theory. However, if the rate of loan growth is rapid, the risk of loan default rises as well.

Due to the short time frame and straightforward research objectives, the study's scope is limited. Research is a never-ending process in which the flaws of previous studies inspire new ideas and innovations in subsequent studies. We expect that the existing literature and evidence will direct potential researchers' attention to the banking business line, specifically the problem and possibilities of loan growth, as well as its experiences with loan defaults.

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Notes

1. <https://data.adb.org/dataset/gdp-growth-asia-and-pacific-asian-development-outlook>
2. <https://www2.deloitte.com/content/dam/Deloitte/uk/Documents/corporate-finance/deloitte-uk-deleveraging-asia-2019.pdf>
3. On request, the complete results of each equation are available.
4. See Baum et al. (2003).
5. In the case of Vietnam, Vietnamese banks were required to provide their audited financial reports to the public and investors (T. D. T. Le, 2019).

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