



The Impact of Financial Inclusion on Financial System Stability in ASEAN+3

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Abstract. The goal of this research is to investigate and assess the effect of financial inclusion on financial system stability in ASEAN+3. This research uses the variables financial system stability, financial inclusion index, GDP per capita and the ratio of domestic credit to the private sector. The data is based on panel data from nine ASEAN+3 countries: Indonesia, Thailand, Cambodia, Malaysia, the Philippines, Myanmar, China, Japan, and Korea, collected between 2004 and 2021. This research uses a quantitative method. The technique used is Fully Modified Ordinary Least Squares (FMOLS). The data was analyzed using the unit root, cointegration, and FMOLS tests. The study found that variable of financial inclusion index has a favourable and significant impact on financial system stability. Financial system stability responds positively to the financial inclusion index. The financial inclusion index has a major contribution to financial system stability since it has a positive coefficient.

Keywords: Financial Inclusion, Financial System Stability, FMOLS.

1 Background

Economic growth is often used as a measure of progress in a country. According to Wahyuningsih [1], several factors can affect economic growth, including financial system stability. Financial system stability is a condition in which banks can operate safely and efficiently so that they can channel credit to the public and encourage investment. Maintained bank stability will trigger economic growth. Comprehensive development of financial inclusion and economic growth is an effective strategy to achieve financial system stability and improve public welfare [2], [3]. Instability and inefficiency of the financial system can help the process of optimal fund allocation, thus helping economic growth, the global financial crisis in 2008 is empirical evidence that shocks to the financial system can trigger a decline in global economic performance [4].

Widespread public concern about economic stability in 1998 and 2008 led to massive withdrawals of funds from banks and financial institutions (panic withdrawals). This shows that the decline in public confidence in financial institutions (lack of confi-

dence) is one of the main factors that triggered the financial crisis. This incident provides lessons related to the importance of efforts to reduce systemic risk to ensure the continuity and stability of the banking system [5], [6]. Since the Global Financial Crisis (GFC), both supervisory authorities and commercial banks have increased their vigilance against banking risks. The COVID-19 pandemic that occurred in 2020 also created uncertainty regarding bank risk and performance in the future [7].

Various factors, including inflation, central bank benchmark interest rates, non-performing loan ratios, and capital flows, influence financial system stability. Bank Z-Score calculations are commonly used to assess financial system soundness. Bank Z-score is a metric used to analyze a bank's financial stability. The main principle is to compare the amount of capital held by the bank with the level of volatility or risk in its business [8]. The greater the Z score number, the better the bank's capital capacity to absorb losses and the lower the chance of bankruptcy [9]. The Z-score model offers advantages in terms of simplicity of calculation, allowing bankruptcy risk analysis to be carried out in an easy way.

Consistent with the literature on financial system stability, the Bank's Z-score evaluates the bankruptcy risk that represents bank stability [10]. The bank z-score predicts bank solvency risk by relating bank capitalization to return volatility. In theory, a greater Bank z-score number indicates more financial system stability. Bank z-score measures financial system stability and represents the likelihood of bank insolvency. A greater bank z-score number indicates a lesser likelihood of insolvency; the greater the bank z-score, the better its financial stability [11]. Many empirical studies have used z-score for financial system stability analysis

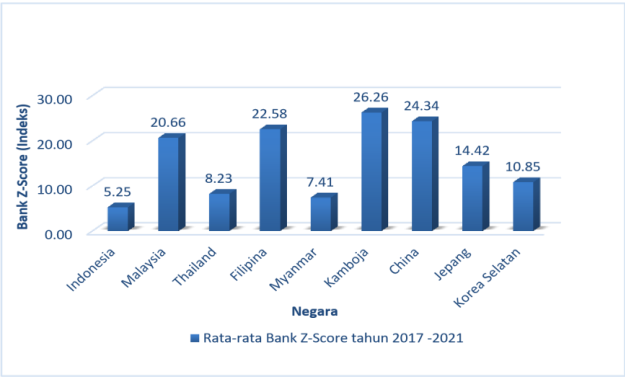


Fig. 1. Average Bank z-score in ASEAN+3 2017-2021

Figure 1 shows Bank z-score data from all countries in ASEAN+3. The greater the Bank z-score, the more stable the financial system, as well as a decrease in the Bank z-score value, which means creating instability in the banking system. Cambodia and China recorded the highest Z-score values among the countries studied, which were 26.26. This value indicates that the banking systems of the two countries are very stable and have a low risk of bankruptcy. This condition can be associated with the implementation of strict banking regulations, strong support from the government, and large

and solid economic size. The Philippines and Malaysia also showed stable banking sectors with values of 22.58 and 20.66, respectively.

In contrast, Japan and South Korea showed lower bank z-score values, 14.42 and 10.85, respectively. Indonesia showed the lowest bank z-score value (5.25), indicating a greater risk of bankruptcy in its banking system. Factors such as economic volatility, high NPL levels, and still-developing regulations may contribute to these low scores. Thailand and Myanmar have moderate bank z-scores of 8.23 and 7.41, respectively. Thailand's financial system stability may be affected by its reliance on tourism and domestic political challenges, while in Myanmar, political instability due to the military coup in 2021 has significantly affected financial system stability.

Financial system stability is the main foundation for sustainable economic growth and social welfare. In an increasingly complex and integrated global context, ensuring financial system stability requires a holistic and inclusive approach. One of the key components in achieving this stability is financial inclusion. Financial inclusion has become a central issue in inclusive economic development. Efforts to increase public access to financial services are expected to drive economic growth, reduce poverty, and improve welfare. Financial inclusion is not only about providing access to banking services for all levels of society but also about creating a strong financial ecosystem that is resilient to various shocks [12].

Financial inclusion has been identified as a global priority by international forums such as the Group of Twenty (G20), Asia-Pacific Economic Cooperation (APEC), Organisation for Economic Cooperation and Development (OECD), Association of Southeast Asian Nations (ASEAN), and Alliance for Financial Inclusion (AFI). It has been implemented in a variety of nations, encompassing low-income countries, high-income, upper-middle, and lower-middle. Several international organizations have acknowledged financial inclusion as an essential global priority. Although the level of development and approach varies in each country, both developed and developing countries, efforts to increase financial access for the community have become a major focus in development policies.

Access to financial services can increase a person's chances of getting a job and increasing income, especially for low-income people [13]. In addition, by combining socio-economic programs with banking system reforms, the government can create a strong synergy to empower the poor and trigger economic growth [14], [15]. So, access to formal financial services not only provides financial benefits but also encourages the development of individuals and society as a whole.

In Sarma [16] it is stated that the development of financial inclusion initiatives requires a performance assessment known as the Index of Financial Inclusion (also known as IFI). The Index of Financial Inclusion combines the dimensions of penetration, access, and utilization of financial inclusion to measure the level of financial inclusion in various countries to measure economic progress related to the development of IFI over time. The main aspect taken into account is banking penetration, which is represented by the number of people using banking services. Banking penetration is a key indicator in the financial inclusion index. The number of savings accounts in commercial banks per 1,000 populations is an indicator that shows this dimension. The second dimension is the availability of access to banking services, reflecting the extent to

which the community can reach banking for the community. This availability metric counts the number of commercial bank offices and ATMs per 100,000 people. The utilization of financial services is the third dimension. This dimension discusses the advantages that the community can derive from financial services. For example, consider the quantity of credit granted by commercial banks (percentage of GDP) [17].

The following are IFI values calculated using numerous variables, particularly those connected to the banking industry, such as availability, use, and banking penetration. Within a year, these data are combined to create a country index.

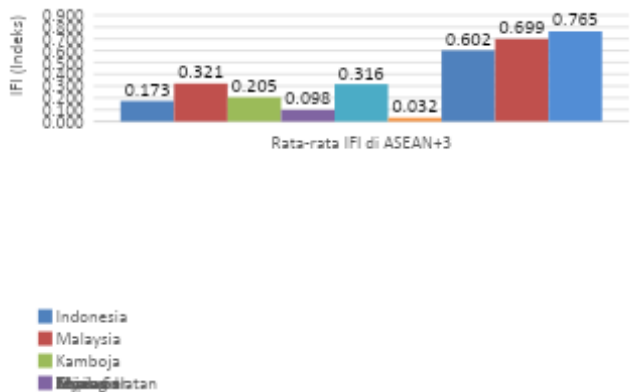


Fig. 2. IFI in ASEAN+3 2017-2021

Figure 2 shows the average IFI in several ASEAN+3 countries for 2017-2021. South Korea and China rank highest with values of 0.765 and 0.602, respectively, reflecting strong financial inclusion thanks to significant investment in financial technology and government policies promoting financial literacy. Malaysia, the Philippines, and Cambodia have relatively moderate IFIs with values of 0.321, 0.296, and 0.205, respectively, indicating that despite progress, many populations still do not have adequate access to basic financial services. Indonesia and Myanmar rank lowest, with IFI values of 0.173 and 0.032, respectively. According to this statement, access to financial services in Indonesia and Myanmar remains highly limited. The key difficulties in improving financial inclusion in these nations are poor financial infrastructure, insufficient financial literacy, and ineffective financial inclusion policies.

Furthermore, what needs to be considered in the development of financial inclusion is that there are still negative consequences for financial stability that also need to be considered. In the development of financial inclusion, a dynamic economic environment and a good policy framework are needed to strengthen the resilience of the banking system to shocks. Conversely, expansive monetary conditions and excessive government intervention can encourage banks to provide credit carelessly, thereby increasing credit risk and triggering systemic instability [18], [19]. In addition, careless implementation of financial inclusion can trigger a decline in credit standards, increase credit risk, and weaken supervision of the microfinance sector. This condition has the poten-

tial to disrupt the stability of the financial system as a whole [20]. Moreover, the development of financial inclusion, not accompanied by an understanding of financial products, will make the positive impact of financial inclusion less felt by society, which is the intended target of financial inclusion [21].

Based on previous research studies conducted by [22], [23], [24], [25], [26], financial inclusion has a significant positive effect on the stability of the financial system, while according to research conducted by [2], [5], [27], [28] financial inclusion does not have a significant effect on the stability of the financial system.

Judging from the importance of Financial Inclusion in improving financial stability in previous studies, therefore this study aims to identify the effect of financial inclusion on the stability of the financial system in ASEAN+3. Due to the limited data taken by researchers, ASEAN+3 countries in the study only cover Indonesia, Malaysia, Thailand, the Philippines, Cambodia, Myanmar, Japan, China, and Korea. Novelty in this study can be seen from the differences in objects in the study and the differences in periods taken from previous studies. This study has a research gap that is included in the theoretical gap category, namely gaps in previous studies that relevant theories have not explained. In addition, the purpose of this study is to see the effect of financial inclusion variables in maintaining economic stability in the ASEAN+3 region.

Thus, the author will look at the association between the Bank z-score as a proxy for financial system stability and indicator variables from the Index of Financial Inclusion (IFI) assessment. As a proxy for financial inclusion, the Index of Financial Inclusion (IFI) is calculated using the number of ATMs per 100,000 populations, the number of commercial bank deposit accounts per 1,000 populations, and the proportion of commercial bank credit to GDP. Furthermore, this study will take into account other factors that may have an impact on the financial system's stability.

2 Research Methods

The population for this study is the whole time series data of bank deposit accounts, ATMs, commercial bank credit to GDP, GDP per capita, and private banking credit to GDP. The World Bank and International Monetary Fund (IMF) database disclosed the purposive sampling approach, which was applied in this study. The data utilized in this investigation is secondary. Secondary data is compiled from a variety of textual sources, including books, scientific journals, and pertinent research papers. This analysis uses annual panel data from the International Monetary Fund (IMF) database and the World Bank's. The observation period is from 2017 to 2021 as a time series unit, including the analysis.

$$BZS_{it} = \alpha + \beta_1 LnIFI_{it} + \beta_2 LnGDPPC_{it} + \beta_3 DCPS_{it} + e_{it} \dots \dots \dots (1)$$

Table 1. Descriptive Variable

Research Variables	Indicator	Sym-bols	Units of Meas-urement	Data Sources
Financial Sys-tem Stability	Bank z-score	BZS	Index	World Bank
Index of Fi-nancial Inclu-sion	Number of commercial bank accounts per 1,000 popula-tion	IFI	Per 1.000 popu-lation	FAS-IMF
	Number of ATMs per 100,000 population IFI Per 100,000 people	IFI	Per 100.000 population	FAS-IMF
	Outstanding Loans from Commercial Bank to GDP	IFI	Percent (%)	FAS-IMF
Other variable	Gross Domestic Product Per Capital	GDPPC	USD/people	World Bank
	Domestic Credit to Private Sector	DCPS	Percent (%)	World Bank

3 Result

Descriptive statistics give information on the research variables utilized to define the sample characteristics in the study. Table 1 displays the findings of the descriptive statistical analysis. The study employed 162 data points for each variable. The dependent variable, Financial System Stability (Bank Z-Score), has a mean of 2.31179 and a standard deviation of 0.9876957. The independent variable, Financial Inclusion, measured by the Index of Financial Inclusion indicator, has a mean value of 0.3019136 and a standard deviation of 0.2484599.

Furthermore, the mean values of the control variables GDP per capita (LnGDPPC) and domestic credit provided by private banking to GDP (DCPS) are 8.473889 and 86.29537, respectively. At the same time, the standard deviation is 1.321803 and 57.12359.

Table 2. Descriptive Statistics Results

Variable		Obs.	Mean	Min	Max	Standard Deviation
Dependent	Bank Z-Score	162	2.31179	-1.51	3.4	0.9876957
	IFI	162	0.3019136	0.01	0.84	0.2484599
Independent	PDB per capita	162	8.473889	5.41	10.8	1.321803
	Domestic Credit to Pri-vate Sector	162	86.29537	0	193.74	57.12359

The following are the results of statistical data processing analysis and there are several discussions so that they can produce concluded research results. The steps in the

Fully Modified Ordinary Least Square (FMOLS) analysis method can be carried out in the following stages [29].

Unit Root Test. Unit root performs a variety of tests on unit roots (stationarity) in panel data. This study used the Harris & Tzavalis [30] unit root test technique, with a null hypothesis that all panels contain unit roots. Stationary data may be noticed in the estimation results by taking the probability values of each variable. As indicated in Table 3, the Harris-Tzavalis unit root test indicates that all variables are stable at the first difference level (1).

Table 3. Result Unit Root Test

Variable	Harris-Tzavalis	
	Level	1st diff
Bank Z-Score	0.0003	0.0000***
IFI	0.9999	0.0000***
LnGDPPC	0.7197	0.0000***
DCPS	0.9282	0.0000***

Note: ***, **, * shows the stationary level at 1%, 5%, 10%

Based on the results of testing all variables, the results of the probability values of all variables have not shown stationary at level 0 or (0.001), except for the dependent variable Bank Z-Score which shows stationary at level (0.0001). Furthermore, it is carried out at level 1 (first difference), showing that all variables have been stationary, as evidenced by the probability value of 0.0000 so that all variables can be tested further.

Cointegration test. Following the unit root test, examine the cointegration test. The cointegration test is designed to assess whether or not there is a long-term link between the dependent and independent variables. This study uses the Kao cointegration test 1999 on a panel data set. The Kao cointegration test presents five test statistics: the modified DF t, DF t, ADF t, unadjusted modified DF t, and unadjusted DF.

Table 4. Cointegration Test Result

	Statistic	p-value
Modified Dickey-Fuller t	-1.1418	0.1268
Dickey-Fuller t	-1.7918	0.0366
Augmented Dickey-Fuller t	-1.0855	0.1389
Unadjusted modified Dickey-Fuller t	-2.8597	0.0021
Unadjusted Dickey-Fuller t	-2.6409	0.0041

Based on the table above, the results of the cointegration test report the output values of all test statistics with p values. All test statistics reject H0 which states that there is no cointegration and do not reject Ha which states that there is a long-term cointegration relationship between all variables.

Fully Modified Ordinary Least Square

After going through the stages of the unit root test and cointegration test to determine the existence of stationarity and cointegration of the panel, the next step is to estimate the data using the FMOLS panel method. The data is processed with the help of Stata 17 software. FMOLS, which Phillips and Perron originally proposed for time-series modelling, is a regression approach designed for parameter estimation in cointegrated systems [31].

To determine if the independent variable has a substantial influence on the dependent variable, compare the t-stat and t-table values. If $t\text{-stat} > t\text{-table}$ or $-t \text{ count} < -t \text{ table}$, H_0 is rejected, although H_a is not. Here is the formula for determining the t-table:

$$t\text{-table} = (a/2; df)$$

df is The degree of freedom is computed with the $n-k$ formula, where n is the number of samples and k is the number of variables. This study has 162 samples and 3 variables, so the df value is $162-3 = 159$. When viewed from the t-table value, df 159 shows a value of 1.974996.

Table 5. FMOLS Estimation Result

Variable	FMOLS		
	Coeff.	Std. Error	t-stat
IFI	8.85	0.368136	24.04
LnGDPPC	0.22	0.001064	206.76
DCPS	-0.02	0.001229	-16.27

Table 5 displays the results of the FMOLS technique estimation. The comparison of t-stat and t-table results shows that the independent variable IFI has a t-stat value $< t\text{-table}$ ($24.04 < 1.97$), indicating that at a 5% error rate, H_0 is rejected and, H_a is not rejected, indicating that the IFI variable has partial significance on the Bank Z-Score. Meanwhile, the coefficient value for the IFI variable is 8.85, indicating that a 1% rise in IFI can boost Financial System Stability by 8.85 percent. While for the LnGDPPS and DCPS variables are not statistically significant because they have t stat values $> t$ table of $206.76 > 1.97$ and $-16.27 > 1.97$ respectively.

The positive impact of financial inclusion on financial stability further supports the findings of previous literature such as [22], [23], [24], [25], [26]. Financial inclusion is not only beneficial for individuals and society but also has a significant positive impact on the stability of the financial system as a whole. By providing wider access to financial services, we can build a stronger, more inclusive, and more shock-resistant financial system. Although financial inclusion has many benefits, it should be remembered that its implementation must be carried out carefully and accompanied by effective supervision. Risks such as overindebtedness and increased systemic risk need to be managed properly so that the benefits of financial inclusion can be enjoyed optimally.

The GDPCC variable (GDP/capita) does not affect the stability of the financial system in ASEAN+3 countries. The high economic heterogeneity among ASEAN+3 countries is a challenge in generalizing the effect of GDP per capita on the stability of the financial system such as consumption patterns [32], differences in the level of financial market development in each country also moderate the relationship between GDP per capita and financial system stability, as do patterns of financial institution behavior,

monetary policy [33]. Fundamental factors such as the quality of corporate governance, the level of government debt, and the global economic cycle have a more dominant role in determining the stability of the financial system in this region. Meanwhile, the variable of the proportion of domestic credit provided to the private sector to GDP (DCPS) is also not significant to the stability of the financial system in ASEAN+3. The proportion of domestic credit provided to the private sector to GDP (DCPS) does not always have a linear and significant relationship to the stability of the financial system. Other factors such as asset quality, bank liability structure, and overall macroeconomic conditions have a more dominant role in determining the stability of the financial system.

4 Conclusion

Financial inclusion (IFI) has a favourable and significant influence on the financial system's stability, as indicated by the Bank Z-score. According to the study's findings, boosting public access to financial services will not only increase public welfare but also strengthen the overall stability of the financial system. GDP per capita (GDPPC) and the proportion of domestic credit to GDP (DCPS) have no substantial influence on financial system stability in ASEAN+3 nations.

This indicates that other factors, such as the quality of corporate governance, bank liability structure, and overall macroeconomic conditions, have a more dominant role in determining the stability of the financial system. To obtain a positive impact from financial inclusion, it is certainly necessary to be supported by regulations and financial authorities that focus more on supervising the quality of assets and the structure of bank liabilities to maintain the stability of the financial system. Likewise, appropriate macroprudential policies can help reduce systemic risk and the financial system is resilient to shocks. For further research, it can be analyzed more deeply regarding the transmission mechanism of the influence of financial inclusion on the stability of the financial system and it is necessary to consider including additional variables to obtain more comprehensive results.

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