

An Empirical Study of Financial Inclusion and Financial System Stability in ASEAN-4

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Abstract

The financial system is a relatively important sector in the economy of a country. Its role in providing access to financial services to people is able to support a better economy. The main problem in this financial system is caused by the barriers that prevent individuals or companies from accessing these financial services. This study aims to empirically analyze the relationship financial inclusion and financial system stability in ASEAN 4 (Indonesia, Malaysia, Thailand, and The Philippines). Financial inclusion proxied by the financial inclusion through credit variable and other banking variables such as the number of financial services access, banking asset, and financial system stabilization is seen from banking performance through non-performing loan and Z score instruments. Empirically, the study uses panel data in the form of annual data for 2005–2016. The method used Panel VAR. The result shows that financial inclusion affects the stability of the financial system in ASEAN 4. This indicates that financial development through financial inclusion can encourage stability of the financial system in ASEAN 4. In this globalization era, the integrated financial system is increasing, this research shows the importance of developing financial inclusion by eliminating barriers to financial exclusion.

Keywords: Financial Development, Financial Inclusion, Financial System Stability

JEL Classification Code: E44, G21, G18

1. Introduction

Banking is one of the ideal instruments in integrating development and increasing economic growth. In this case, banks make considerable contributions to the movement of other economic sectors, especially the real sector, in the

capital and productive financing. One way to increase the productive sector and develop the financial sector is through financial inclusion, which is an important program in several countries in ASEAN. The concept of inclusive growth integrates financial inclusion as an instrument in developing people's welfare and reduces poverty and. In addition, seeing through the global financial crisis in 2008, which gave a systemic impact on global economic condition, stabilization and risk mitigation towards the financial sector becomes very important. These conditions are going along with the activities of developing countries in order to improve access to finance through increased access and financial services, especially for low-income populations, who mostly experience constraints in the financing sector as a form of strategy for improving financial development (Morgan & Pontines, 2014). ASEAN countries that are, in the majority, developing countries certainly had been widely impacted by the phenomenon of the global economic crisis in 2008. The economic instability of ASEAN countries is substantially seen in the performance of the macroeconomic and banking sectors as reflected in the decline in economic growth, uncontrolled increase of inflation, a decline in the performance of banking sector, and instability in the labor market.

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A number of empirical studies that highlight financial inclusion and financial system stability have also been carried out by economists, especially the impact of financial inclusion in influencing the performance of financial system stability. Morgan and Pontines (2014) show that financial inclusion has an impact on financial system stability. The results of the analysis show that an increase in the financing of the small company sector can reduce credit congestion and the failure of credit payments. This shows that the policies related to financial inclusion through financing services contribute to financial system stability. Meanwhile, Hannig and Jansen (2011) examines financial inclusion and financial system stability from the standpoint of risk regulation in banks. The results of their analysis show that financial inclusion from the side of financial access leads to risks at the institutional level even though it is not systemic as indicated by the pattern of low-income community savings that tend to be static. The financial stability is shown by the potential costs in financial participation, which is compensated with changing benefits so that it will affect the increase in financial stabilization.

This study attempts to highlight the impact of financial inclusion proxied by the financial inclusion through credit variable and other banking variables such as the number of accesses and financial services and banking assets. Meanwhile, financial system stabilization is seen from banking performance through non-performing loan and Z score instruments in ASEAN 4 (Indonesia, Malaysia, The Philippines and Thailand), which have almost the same economic patterns, either macro-economic or banking as well as the same economic openness to the global economy.

The movement of the variables of credit, NPL and Z score in ASEAN 4 show the highest bank credit during the years 2004–2015 is found in the Thai graph quadrant, which reaches 102% higher than that of other countries. Meanwhile, Thailand's Z score is the lowest compared to that of other countries. However, of these four countries, Indonesia has a better stability seen in the period 2004–2015, which tends to experience a fairly stable increase in credit even though the non-performing loan variable increased in 2008 due to the global financial crisis. Furthermore, Malaysia and The Philippines have almost the same pattern of credit movements, which tend to decline in the 2006–2009 period for The Philippines and 2007–2013 for Malaysia, but the movement of the non-performing loan in these two countries tends to be stable and even in the position of significant decline. Meanwhile, the Indonesian Z score variable looks stable until the period of 2015, but the highest Z score variable is in Thailand and Malaysia. This condition shows that financial stabilization in ASEAN 4 countries indicates increasing progress with the contribution of financial inclusion through credit, which has an impact on decreasing NPL and increasing Z score.

Financial inclusion program in Asia has been intensified for the purpose of increasing development from the financial sector and maintaining financial stability and increasing access to financial services for the public, especially in the formal financial sector (Bansal, 2014; Wardhono et al., 2018). Sarma and Pais (2008) confirmed that financial inclusion is a process that ensures easy access, availability and use of formal financial system for all segments and for efforts to allocate effective and productive resources, so it reduces costs that can increase financing in obtaining financial services (Berger et al., 2009; Pant Joshi, 2011). The all-inclusive financial system enhances the efficiency and well-being of society through the provision of safe financial practices.

Based on banking phenomena by seeing the performance of financial inclusion and banking stability in ASEAN 4 as well as several empirical studies, which are currently limited to highlighting the phenomenon of inclusion and financial stability, this study aims to determine the effect and contribution of financial inclusion in attempts to improve financial stability proxied through credit variable for financial inclusion and non-performing loan as well as Z score as a proxy for financial system stability in ASEAN 4.

2. Literature Review

Financial inclusion is one of the instruments in an effort to realize inclusive growth in line with a concept that has recently emerged related to inclusive sustainable development. Inclusive growth in economic development is a framework of financial sector development that is focused on financial inclusion to increase the percentage of people who have access to formal financial services. Beck et al. (2004) also show that financial development can be an important part because it can facilitate access and financial transactions so that they can help improve financial access and financial stabilization. In addition to helping service and access to finance, the existence of bank branches in various regions will help improve financial inclusion and financial systems that are expected to run stably (Donou-Adonsou & Sylwester, 2016; Ward, 2016; Wardhono et al., 2018).

Broadly defined financial inclusion refers to universal access to various types of financial services at a reasonable cost so that it covers not only formal banking products, but also other financial services such as insurance products and equity (Chauvet & Jacolin, 2017; Pant Joshi, 2011). In the un-bankable community group, financial inclusion is needed to facilitate the process of access to banking services such as credit as a form of business capital at affordable costs (Fungáčová & Weill, 2014; Ghosh & Vinod, 2017).

This financial inclusion is found to be very helpful for low-income groups who needed venture capital funding and to prevent community groups from high-interest loans by

some moneylenders (Gathergood & Weber, 2017; Mehrotra & Yetman, 2003). This condition has indicated that the existence of financial inclusion can provide a clear picture and can realize the ease of access to financial services through formal credit, especially in low-income communities (Ghosh & Vinod, 2017; Satya R. Chakravarty & Pal, 2010). An increasingly inclusive financial system has led to a better system of financial stability. In addition, inclusive finance can also provide access to broader financial services for every citizen, especially for un-bankable and marginal groups with limited access to financial services. Bhalla (2011) points out that inclusive growth can be shared equally and felt massively by all residents, not only economically, but also socially so that people's welfare can increase. An inclusive financial system is able to empower individuals to be able to access financial services as well as attempt to get out of poverty (Margono et al., 2020; Rakhmindyarto et al., 2012). In addition, these efforts can also directly increase the intensity of financial services and help increase and maintain financial stability.

Several empirical studies have also confirmed the role of financial inclusion in economic development and in pushing financial stabilization. The study by Adu et al (2013) in the study shows that the financial development sector has a positive effect on economic growth. Meanwhile, the research conducted by Morgan and Pontines (2014) emphasizes the impact of financial inclusion performance on financial system stability in developing countries. The results of his analysis found some evidence that an increase in the portion of loans for small and medium enterprises (SMEs) helps financial stability, especially by reducing non-performing loans (NPLs) and the possibility of default by financial institutions (Ratnawati, 2020; Takasu & Nakano, 2019).

Hannig and Jansen (2011) argues that greater financial inclusion provides an opportunity to improve financial stability for several fundamental reasons, among others, financial inclusion brings about risks at the institutional level, but this is not systemic. This is evidenced that low-income savers and borrowers tend to maintain solid financial behavior during the financial crisis, saving deposits in a safe place and repay their loans. The risk profile of banking institutions at the lower end of the financial market is characterized by a large number of vulnerable clients who have limited balances and trade in small volumes. This profile can raise worries about reputation risk for central banks and consumer protection. Besides, the potential costs of financial inclusion compensated by important dynamic benefits can improve financial stability over time through a deeper and more diversified financial system.

The efforts of financial development in an economy can directly have an impact on the scope of reducing poverty and inequality and improving the performance of banks that can contribute to the stability of a country's financial system

(Margono et al., 2020; Purnamasari et al., 2020). Apart from the role of financial inclusion that can help improve financial stability, other banking instruments such as bank assets, bank income, and others can also contribute greatly to promoting increased inclusion and financial stability.

3. Method and Analysis

The efforts of financial development in an economy can directly have an impact on the scope of reducing poverty and inequality and improving the performance of banks that can contribute to the stability of a country's financial system. Apart from the role of financial inclusion that can help improve financial stability, other banking instruments such as bank assets, bank income, and others can also contribute greatly to promoting increased inclusion and financial stability.

This study aims to determine the relationship between financial inclusion and financial system stability in ASEAN 4, which is based on the literature of previous studies by Dienillah et al. (2018); Morgan and Pontines (2014). This study tries to do a different analysis by using bank credit variables in general to see financial inclusion in overall financial participation in ASEAN 4. In addition, this study also attempts to look at financial system stability in ASEAN 4 by looking at the performance portion of the NPL and Z score, which later will carries out correlation analysis between financial inclusion and financial system stability. The data used is secondary data sourced from the Global Financial Development Database (GFDD) in the form of annual panel data consisting of Indonesia, Malaysia, The Philippines, and Thailand.

This study simulated three models based on referred empirical studies by Dienillah et al. (2018); Morgan and Pontines (2014), which focus on financial inclusion proxied with bank credibility in general and financial system stability proxied through NPL and Z score. Independent variables used for supporting financial inclusion consisted of ATMs, bank branches and banking assets. While the variables used for financial system analysis consisted of bank loans, regulations on the risk of banking assets, and bank returns, which are banking instruments in regulating financial stability. In this study, in addition to knowing the correlation of financial inclusion and financial system stability, this study tried to determine the effect, a pattern of shocks and the level of the shock contribution to the variables of inclusion and financial stabilization in each model as well as the model decline as follows:

Financial Inclusion Model proxied from the variable of credit participation in commercial banks.

$$\text{Bank Credit} = f(\text{ATM, Branches Banking, Bank Asset}) \quad (1)$$

Then, the model is transformed into the econometric model as follows:

$$\text{Bank Credit}_{it} = \beta_1 + \beta_2 \text{ATM}_{it} + \beta_3 \text{Branches Banking}_{it} + \beta_4 \text{Bank Asset}_{it} + e_{it} \quad (2)$$

Stability Model of Financial System with NPL

$$\text{NPL} = f(\text{Bank Credit, Bank Regulatory Risk Asset, Bank Return}) \quad (3)$$

Then, the model is transformed into the econometric model as follows:

$$\text{NPL}_{it} = \beta_1 + \beta_2 \text{Bank Credit}_{it} + \beta_3 \text{Bank Regulatory Risk Asset}_{it} + \beta_4 \text{Bank Return}_{it} + e_{it} \quad (4)$$

Stability Model of Financial Score with Z score

$$\text{Z score} = f(\text{Bank Credit, Bank Regulatory Risk Asset, Bank Return}) \quad (5)$$

The model then is transformed into the econometric model as follows:

$$\text{Z score}_{it} = \beta_1 + \beta_2 \text{Bank Credit} + \beta_3 \text{Bank Regulatory Risk Asset} + \beta_4 \text{Bank Return} \quad (6)$$

Based on the three models and objectives of this study, this study uses Vector Autoregression (VAR) with panel data of 4 ASEAN countries (Indonesia, Malaysia, The Philippines, and Thailand). The VAR estimation requires several pre-estimation tests consisting of unit root test to see

the data stationarity in each variable, cointegration test to see the long- or short-term relationship in the research model, optimum lag test to see in what lag the estimation results show the best results of all, the Impulse Response Function (IRF) test to see the shocks of independent variables in response to the dependent variable shocks as well as the Variance Decomposition (VD) test to see the magnitude of the shock contribution given by the independent variable on the dependent variable. This method also does not classify endogenous and exogenous variables so that all variables become endogenous variables (Gujarati & Porter, 2009).

4. Results

This study has two models with the integration of banking variables to see financial inclusion performance and financial stability system in ASEAN 4. Financial inclusion performance is reflected in bank credit while financial stability is reflected in NPL (Net Performing Loan) that represents banking performance in terms of performance credit and Z score to see banking risks. To see these results, the VAR method is used to determine the response of variables in each model and to see the effect of banking variables on the inclusion and financial stability performance in ASEAN 4. The results of the pre-VAR estimation test are shown in Table 1.

Table 1 shows the results of data stationarity that can be known through several tests consisting of LLC root, IPS, ADF, and PP tests. The results of the analysis show that each variable has a different level of data stationarity. This condition is seen in the stationary ATM variable at the level of LLC and the second difference for other root tests. Meanwhile, the bank branch variable has the best data stationarity in LLC and PP tests with the level of data stationarity at the level of IPS and the ADF is at the second difference level. Bank asset has the level of data stationarity level at the first difference for LLC and PP and at the second

Table 1: Data Stationarity Test

Variables	LLC	IPS	ADF	PP
ATM	0.0731*	0.0809***	0.061***	0.0000***
Bank Branch	0.0047*	0.4239***	0.3591***	0.0000*
Bank Asset	0.0124**	0.0079***	0.0053***	0.0010**
NPL	0.0000*	0.0000*	0.0002*	0.0000*
Bank Credit	0.0020**	0.0395**	0.0071**	0.0228**
Z score	0.0046*	0.0116***	0.0071***	0.0000*
Bank Regulatory Risk Asset	0.0144*	0.0015**	0.0012***	0.0000*
Bank Return Asset	0.0122**	0.0005**	0.0005**	0.0001*

Significance: *10%; **5%; ***1%.

difference for IPS and ADF. The best results are indicated by the NPL variable, which shows the level of data stationarity at the level for all unit root tests. Furthermore, the credit variable has stationary data at the level of the first difference for all unit root tests. Variable Z score as a proxy for stationary financial stabilization is at the level of LLC and PP tests and the stationarity is on the second difference level for the IPS and ADF tests. The variable of risk regulation on banking assets has a level of data stationarity at the level of LLC and PP tests while the IPS test is at the level of the first difference and the second difference level in the ADF test. Different results are indicated by the bank return variable that has stationary data at PP level and first difference for LLC, IPS, and ADF. This condition concludes that each variable has a different level of stationarity, but the variable that has the best data stationarity is NPL so that it can be said that the NPL variable has stable data fluctuations.

The next analysis is by looking at the cointegration test, which aims to determine the long-term relationship between financial inclusion and financial system stabilization. In this study, financial inclusion is proxied through a credit variable while financial system stability is proxied using NPL and Z score variables.

The analysis results in Table 2 show that there is a long-term relationship in model 1 and model 3. Meanwhile, in model 2 there is no cointegration, which means that there is no long-term relationship in the model. This condition is confirmed by a probability value of $0.0326 < 0.05$ in the inclusion model and 0.0000 in the stability model of the financial system using Z score whereas the NPL does not show cointegration as indicated by the value of $0.1214 > 0.05$. This condition shows that there is a long-term relationship

in the financial inclusion model and financial system stability through the Z score. It can be concluded that in the long run the number of ATMs, bank branches and bank assets has a significant effect on credit growth, which in this case is part of financial inclusion. Meanwhile, financial stability, which is proxied by Z score also has a long-term relationship with the number of loans, bank assets and risk regulation of bank assets.

Another test that can be done is the optimum lag test, which aims to determine the best results in the VAR estimation for a particular lag. The results of the analysis show that the best lag test is in the 3rd lag for all models indicated by the smallest AIC value in the lag. In this case, the inclusiveness and financial system stability model have the best lag in the 3rd lag, so it can be concluded that the best result in the estimation model is in the 3rd lag.

To determine the correlation between financial inclusion and financial system stability, the correlation test is used. The results of the analysis in Table 3 show that the correlation between financial inclusion proxied by credit and financial stability proxied using two variables, namely, NPL and Z score. The results show that system stability through Z score has a correlation with NPL (financial system stability) with positive correlation and financial inclusion with a negative correlation. This condition is confirmed with a value of $0.019 < 0.8$ and $-0.454 < 0.8$. This means that an increase in the value of the Z score will be followed by an increase in the NPL. Meanwhile, when there is an increase in the value of the Z score, the bank credit will decrease. The same results are shown by the NPL variable, which has a positive correlation with Z score with a value of $-0.019 < 0.8$, which means that an increase in NPL will be followed by an increase in the Z score. Meanwhile, the correlation between NPL and bank credit shows a negative value of -0.019 , which means that when there is an increase in NPL value or bad credit, bank credit will reduce. Different results are indicated by the variable of bank credit as a proxy of financial inclusion on financial system stability. This condition shows that there is a negative correlation between bank credit and the Z score and NPL are confirmed with a value of -0.454 and $-0.019 < 0.8$, which means that when there is an increase in credit, there will be a decrease in financial system stability proxied

Table 2: Financial Inclusion Cointegration Test and Optimum Lag of ASEAN 4

	Probability	Notes
Cointegration Model of Financial Inclusion	0.0326	Cointegrated
Cointegration Model of NPL Financial Stability	0.1214	Not Cointegrated
Cointegration Model of Z Score Financial Stability	0.0000	Cointegrated
	Lag	AIC
Model of Financial Inclusion	3	16.32644
Model of NPL Financial Stability	3	10.53237*
Model of Z Score Financial Stability	3	12.14227

*Value of AIC is Small.

Table 3: Table of Financial Inclusion and Financial System Stability Correlations

	Z_SCORE	NPL	BANK CREDIT
Z_SCORE	1	0.019279	-0.454160
NPL	0.0192796	1	-0.019804
BANKCREDIT	-0.4541601	-0.0198041	1

from bad credit and Z value score. The results conclude that financial inclusion has a negative correlation with financial system stability in ASEAN 4.

Table 4 shows the contribution level of the independent variable shock to financial inclusion. The results of the analysis show that bank branches and bank assets contribute stably up to the 10th period in encouraging financial inclusion as indicated by an increase in the value of the shock contribution to the variance decomposition, which increases throughout periods 1 to 10 in the branches banking and asset bank variables. Meanwhile, the ATM variable shows shocks that tend to decline until the 10th period. This condition indicates that the bank branches and bank assets have a large

contribution to shocks to financial inclusion in ASEAN 4, which is proxied through bank credit variables.

Different results are shown in Table 5 about the contribution of independent variable shocks to financial system stability. This condition is shown by the NPL value, which tends to decline until the 10th period so that the volatility in the NPL variable decreases up to period 10. This condition gains a response to the shock of the risk regulation of bank assets, which tend to increase until the 10th period. However, bank loans tend to fluctuate throughout the 10th period, but still in short and small fluctuations. This condition indicates that bank returns and credit banks have a relatively small volatility response compared to the risk regulation of

Table 4: Variance Decomposition of Inclusion Model

Variance Decomposition of Bank Credit				
Period	Bank Credit	ATM	Bank Branch	Bank Asset
1	100.0000	0.000000	0.000000	0.000000
2	97.85488	0.408087	0.862136	0.874901
3	75.73062	3.908506	18.78989	1.570983
4	66.57264	9.289274	20.80324	3.334846
5	64.68016	5.451579	24.82494	5.043319
6	63.57711	3.564332	26.18374	6.674825
7	51.73281	2.084683	39.85768	6.324832
8	46.62665	1.599982	44.83211	6.941263
9	42.14470	0.963576	49.68424	7.207483
10	39.52071	0.534345	52.25951	7.685438

Table 5: Variance Decomposition of Financial Stability Model

Period	Variance Decomposition of NPL				Variance Decomposition of Z-score			
	NPL	Bank Return	Bank Regulatory Risk	Bank Credit	Z-score	Bank Return	Bank Regulatory	Credit Bank
1	100.0000	0.000000	0.000000	0.000000	100.0000	0.000000	0.000000	0.000000
2	94.96163	0.000682	3.857768	1.179924	92.71968	0.059443	5.144137	2.076743
3	89.26396	0.018421	3.652281	7.065341	75.81297	5.041316	14.03777	5.107945
4	80.16806	2.946132	7.611000	9.274812	68.46290	4.399406	17.03164	10.10605
5	76.13545	4.662401	10.66864	8.533509	68.47805	4.532303	17.15460	9.835047
6	73.30769	5.700770	12.90756	8.083980	70.13586	4.273039	16.17748	9.413616
7	72.90303	5.628994	13.26283	8.205146	70.98334	4.539666	15.37322	9.103774
8	72.71628	5.623471	13.37522	8.285030	70.33647	5.803671	14.71131	9.148550
9	72.75134	5.613166	13.37007	8.265428	69.93601	7.119977	14.14769	8.796318
10	72.69696	5.619587	13.43400	8.249455	69.49809	8.546724	13.55961	8.395575

bank assets in influencing financial system stability seen from bad credit (NPL). Different results are indicated by the response of the independent variable to financial system stability, which is proxied through the Z score.

Based on the results in Table 5, which shows the contribution level of the shock on the Z score, it can be seen that Z score variable has a shock down to the 10th period while the credit bank has a fluctuating response throughout the periods 1 to 10 as indicated by a decrease in bank credit. The same thing is shown by the bank return and asset risk regulation of the bank, which also contributes to fluctuating shocks throughout the period to the 10th period. This condition shows that financial system stability proxied through Z score has shocks that tend to decline throughout the period and is then responded by independent variables, which consist of bank credit, risk regulation of bank assets and bank returns that experience fluctuations in the shock response.

Figure 1 shows the volatile response of the independent variable to financial inclusion and financial system stability. The results of the analysis show that the variables of the number of ATMs, bank branches and bank assets have a fluctuating response and tend to be unresponsive to bank credit. Other results related to financial system stability indicate that bank returns, risk regulation of bank assets and credit provide a stable response to the movement of NPLs, which are massively indicated in periods 5 to 10, which begin to show stability in volatility in all variables followed

by NPL. Almost the same thing is also indicated by variable credit shocks, bank returns and risk regulation of bank assets against the Z score movement. The risk regulation movement of asset credit and bank return shows a stable movement in responding to the Z score for the 10th period, which tends to decrease and calm down, but a little different from credit shocks that are a little more distant in the center line. These conditions indicate that credit turmoil is still far following Z score volatility. Based on these results, it can be concluded that the stability of the financial system is responded stable by banking instruments as independent variables and financial inclusion represented by credit in ASEAN 4. Whereas, the VAR results for ASEAN 4 can be shown in equation 7, 8 and 9 consisting of analysis on inclusion model, financial system stability seen from two perspectives, namely, bad credit (NPL) and Z score.

$$\begin{aligned} \text{Credit} = & -3.10 + 1.30 \text{Credit}_{t-1} - 0.60 \text{Credit}_{t-2} + 0.32 \text{Credit}_{t-3} \\ & (0.0000) \quad (0.0228) \quad (0.0543) \\ & -0.06 \text{ATM}_{t-1} + 0.09 \text{ATM}_{t-2} + 0.14 \text{ATM}_{t-3} \\ & (0.483) \quad (0.52) \quad (0.8782) \\ & -0.47 \text{Bank Branches}_{t-1} + 3.26 \text{Bank Branches}_{t-2} \\ & (0.26) \quad (0.159) \\ & -2.94 \text{Bank Branches}_{t-3} + 0.44 \text{Bank Asset}_{t-1} \\ & (0.0748) \quad (0.44) \\ & -0.03 \text{Bank Asset}_{t-2} - 0.01 \text{Bank Asset}_{t-3} + \varepsilon \\ & (0.96) \quad (0.97) \end{aligned} \quad (7)$$

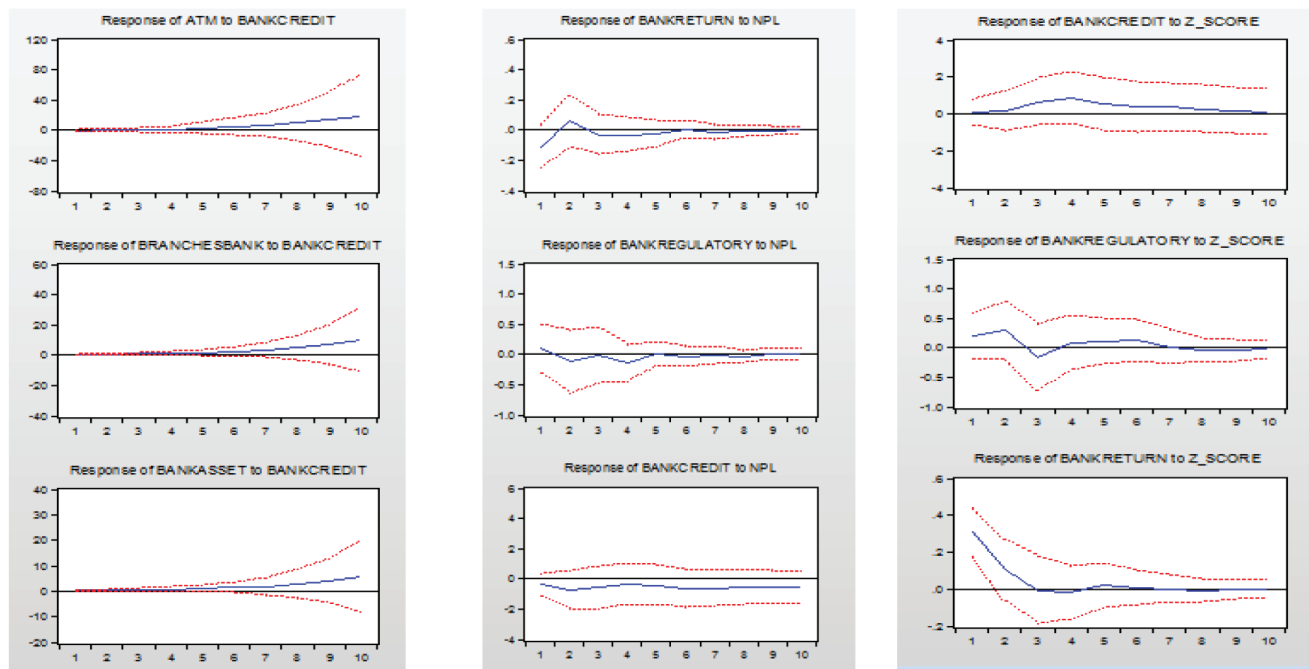


Figure 1: Impulse Response Function

The results of the VAR analysis for credit model show that past credit to the third lag has a significant impact on credit as a proxy of financial inclusion. In addition, the number of bank branches in the third period also gives a significant, negative effect on financial inclusion. This condition is confirmed by the probability value in the credit variable of lag 1 with a value of 0.000 with a negative, positive and significant coefficient on credit lag 2 with a probability of 0.0228. Meanwhile, the 3rd lag shows a positive coefficient with a probability of 0.0543 when compared to alpha 10%. The figure concludes that the credit variable in the first and third lags shows a positive relationship between past credit and current credit. Whereas, in the second lag there is a negative relationship between past credit and current credit. Another variable of the bank branch in the third period gave a significant, negative effect on credit as indicated by the probability value in the bank branch variable with a value of $0.0748 < \alpha$ value of 10%. The second model of financial system stability with the NPL proxy shows different results.

$$\begin{aligned} \text{NPL} = & 1.71 + 0.626 \text{NPL}_{t-1} + 0.18 \text{NPL}_{t-1} \\ & (0.3804) \quad (0.0175) \\ & + 0.018 \text{Bank Return}_{t-1} - 0.006 \text{Bank Return}_{t-2} \\ & (0.92) \quad (0.9731) \\ & + 0.083 \text{Bank Return}_{t-3} - 0.078 \text{Bank Regulatory}_{t-1} \\ & (0.6381) \quad (0.2797) \\ & + 0.092 \text{Bank Regulatory}_{t-2} \\ & (0.251) \\ & - 0.1129 \text{Bank Regulatory}_{t-3} + 0.024 \text{Bank Credit}_{t-1} \\ & (0.0857) \quad (0.4650) \\ & + 0.026 \text{Bank Credit}_{t-2} - 0.048 \text{Bank Credit}_{t-3} + \varepsilon \\ & (0.6271) \quad (0.1549) \end{aligned} \quad (8)$$

The estimation model of financial stabilization with NPL as the proxy in equation 8 indicates that dominant financial stability is significantly influenced by bank regulations related to asset risks. This condition is indicated by a probability value of $0.0857 < \alpha$ 10% with a negative coefficient. Whereas, other variables do not show a significant effect on financial system stability. Based on these results, it can be concluded briefly that when there is an increase in regulation related to the risk of bank assets, bad credit will reduce, so that it can have a positive impact on financial system stability by highlighting the credit distribution and credit performance so that it can collaborate with financial inclusion performance in ASEAN 4. Different results are shown in the estimation of the financial system stability model with the Z score variable as follows:

$$\begin{aligned} Z_{\text{score}} = & 0.157 + 0.60 Z_{\text{score}}_{t-1} - 0.36 Z_{\text{score}}_{t-2} \\ & (0.016) \quad (0.271) \\ & + 0.795 Z_{\text{score}}_{t-3} + 0.124 BC_{t-1} - 0.058 BC_{t-2} \\ & (0.0047) \quad (0.188) \quad (0.678) \\ & - 0.062 BC_{t-3} + 0.283 \text{Bank Regulatory}_{t-1} \\ & (0.525) \quad (0.168) \\ & + 0.157 \text{Bank Regulatory}_{t-2} - 0.246 \text{Bank Regulatory}_{t-3} \\ & (0.475) \quad (0.1905) \\ & - 0.109 \text{Bank Return}_{t-1} + 0.804 \text{Bank Return}_{t-2} \\ & (0.879) \quad (0.3148) \\ & - 0.2147 \text{Bank Return}_{t-3} + \varepsilon \\ & (0.0013) \end{aligned} \quad (9)$$

Equation 9 shows that the financial system stabilization in ASEAN 4 is influenced by returns from banks. This condition is indicated by a probability value in the variable of bank return lag 3 with a value of $0.0013 < 0.05$ with a negative parameter value. Thus, an increase in bank returns will reduce the predictive rate of the probability of bankruptcy of a banking company. Meanwhile, the other variables do not show a significant effect on financial system stability in ASEAN 4 through the Z score variable.

5. Discussion

The results of the analysis in general on the three models show that financial inclusion proxied through credit is influenced by the number of bank branches that provide services more specifically to the un-bankable communities. This condition is supported by an increase in knowledge and literacy towards banks in Indonesia, so that it will improve public access and services to the banking sector, especially in low-income communities and small and medium enterprises that have financing problems. Meanwhile, there is also a massive increase in financial literacy in ASEAN developing countries which leads to increased financial access. The overall credit performance of ASEAN has increased after the global economic crisis so that this condition has massively affected the performance of financial system stability. The decline in financial performance prompted by the phenomenon of the global crisis has resulted in the emergence of new policies for financial stabilization and encouraging economic resilience (Hannig & Jansen, 2011).

Credit contribution as a form of financing participation in encouraging financial stability is also influenced by the performance of the credit itself, so guarantees are needed in minimizing non-performing loans. Based on the estimation results, the financial stability model proxied by the credit congestion (NPL) variable is influenced by banking regulation on asset risk as indicated by a significance value

of 0.085 smaller than the alpha value of 10% with a negative coefficient value. This condition indicates that the application of banking regulations to asset risk can minimize bad credit, so it can improve financial system stability. The form of banking regulation in minimizing risks both in terms of assets and credit has a strong essence, especially after the 2008 crisis that caused trauma for large and developing countries that have strong relations to global economic performance (Report to the Ministry for Finance, 2010). In addition, there is also a mix of banking and monetary policies that have strength from a macroeconomic standpoint and banking sectors. Open market operations also give an impact on the stability of the financial system through the performance of increased financing or other banking instruments that are able to encourage financial stability (Goodhart, 2008).

Meanwhile, the financial system stability model through the Z score variable also concludes that financial system stability is influenced by bank return, which has a large role instability. This indicates the increasingly intense performance of the banking industry and competition in the banking industry, which will reduce the value of bank returns so that it will have an impact on the increase in the loan market due to the extremely high-interest rates on loans and will be barriers to loan repayment (Allen et al., 2016; Berger et al., 2009). The increase in financial inclusion programs carried out in developing countries of ASEAN 4 leads to banking competition so that it will provide various forms of banking risk from both positive and negative contributions. Based on the results of the analysis and discussion, this study tries to imply and simulate policies that can simultaneously be applied to ASEAN 4 countries with banking characteristics that are not widely different. The synergy between monetary and banking policies in efforts to stabilize finance can be controlled through macroeconomic variables such as interest rates, price stability and market capital (Hyun & Shin, 2009; Wardhono et al., 2018).

The results of the analysis also show that financial inclusion and financial system stability in ASEAN 4 have a very close relationship based on negative correlation analysis. These results indicate that increasing financial inclusion, in the long run, will directly increase financial risks, which will threaten financial system stability. This condition is caused by the lack of readiness of the community to comprehensively accept financial integration. This condition requires the emergence of policies that can minimize and synergize through financial service authority that is in charge of controlling and managing banking performance, which generally comes into contact with macroeconomic concepts. Macroprudential policy as a form of carefulness of banks in conducting financial expansion needs to be a concern by making a mix of monetary policy (Borio & White, 2011).

In the past decade, in 2009, after the global economic crisis, the impact on the Indonesian economy had a major influence on the decline in banking assets. This condition

directly impacts on credit performance and Indonesia's financial stability. In 2009, Indonesia's financial assets tended to be smaller compared to other ASEAN countries to reach below 60% of GDP. Then, going along time and the recovery of the economy after the crisis, banking performance has shown its best performance in recent years. This condition is reflected in the decline in non-performing loans that occurred as well as increased investment, especially in the financial sector (Wardhono et al., 2019). In addition, financial inclusion reflected in financial services provided by the financial system has a positive impact on long-term economic growth.

Malaysia's financial condition also experienced fluctuations similar to other ASEAN countries as a result of the external turmoil of the global crisis. During the post-crisis period, various efforts were made as a form of economic recovery, including in the financial sector. The Malaysian financial system remained in an efficient position in supporting financial intermediation activities and meeting real needs in 2016 despite US policy that increased geopolitical risk and volatility in commodity markets and will continue to influence investor sentiment. The economic outlook for 2018, especially in Malaysia's domestic financial stability, can still be maintained in a positive condition. The risks to financial stability from an increase in the level of household debt continued to decline. This indicates that banking assets and other banking instruments have a large share in maintaining Malaysia's domestic financial stability.

In addition, among middle-income countries, Malaysia had reached one of the highest levels of financial inclusion up to 92% at the end of 2015. It is recorded that 92% of the Malaysian adult population have active deposits in financial institutions through savings, withdrawal, and access to automated cash registers with ATMs and making payments by national electronic facilities. In the global economic period experiencing a systemic banking crisis after liberalization, deregulation, and privatization of the financial system, Malaysia did not experience a systemic banking crisis. Malaysia was able to survive and grew in its financial system for a long period of time and could achieve reconciliation of two policy objectives, namely, financial stability and financial inclusion.

Meanwhile, Thailand also had various steps to maintain economic and financial stability towards recovery after the global economic crisis. In 2016, Bank of Thailand collaborated with relevant institutions in the issuance of regulations for various types of financial institutions as well as regulatory revisions to the financial system and payment system, so this could maintain financial stability that can be implemented in a more comprehensive and appropriate manner amid the global conditions and financial system that is always dynamic. This combination is carried out for the main purpose of achieving healthy financial development and a stable and efficient financial system in the face of future risks. A policy includes regulations such as conservation capital buffer, liquidity

coverage ratio (LCR), specialized financial institutions (SFI) and revision of the legal payment system.

Other conditions, to maintain and enhance financial inclusive growth, the government and central bank of Thailand carried out various collaborations. Some forms of programs carried out to achieve good financial inclusion are focused on various aspects, including improving financial literacy, supporting commercial and non-commercial banks to further explore their roles, improving management in banking institutions (Suwaruchiporn, 2016). These efforts significantly affect the financial inclusion level in Thailand that continues to increase, but cannot yet reach the communities massively and inclusive. A number of poor people who still get problems in financial service and access to finance informal finance (Tambunlertchai, 2015). In addition, a breakthrough form of financial innovation in the context of education for the poor is outlined in the form of personal smart cards for payment, which have now been available even though they are not popular.

Other conditions are indicated by the Philippines that confirm that the Banks dominate the financial system in the Philippines as shown by the number of banking assets of two-thirds of the total amount held by the banking sector. During the recovery that occurred after the crisis in 1990, banking performance through restructuring, consolidation, and nonperforming assets helped improve bank performance, so that the impact of the subsequent crisis in 2008 was felt to be much lighter. The banking system that has good capitalization and liquidity and high-quality general assets strengthen banking resilience and minimize credit risks and liquidity markets. However, these conditions actually turned around with the quality of assets of banks, cooperatives and rural banks that experienced weaker conditions.

The condition of banking stabilization on several sides cannot be generalized because financial development has not been created as a whole. Financial inclusion that still faces several obstacles, especially related to financial access and services in rural areas, has resulted in financial stability not being achieved optimally. The Philippine government has identified financial inclusion as an important strategy for inclusive growth. One of the concentrations to achieve inclusive growth includes financial development as contained in financial inclusion. The integration of financial inclusion is directed at improving financial literacy and finance-related education to encourage the creation of inclusive growth from the financial sector, especially as an effort to overcome poverty (Llanto, 2015). Overall, the level of financial inclusion is still far from developing countries or other ASEAN neighbors. Current financial participation in the Philippines has not had an impact on financial stability in The Philippines (Operana, 2016). Operana (2016) also found that there was no relationship between NPL and a number of physical institutions, loans to MSMEs, liquidity, and GDP. Thus, in initiating financial inclusion the government must reach a clear market segment on target to make the program run effectively and efficiently.

6. Conclusion

The results of the analysis and discussion in this study conclude that financial inclusion through the proxy variable credit shows the fluctuating responses of the shocks occurred in the independent variables of ATMs, bank branches and bank assets by credit distribution. Branch banking has a significant influence on increasing credit in ASEAN 4. This condition indicates that the majority of credit distribution occurs in un-bankable communities that have limited reach and access to the banking sector, so that bank branches contribute to the credit distribution.

Meanwhile, the results of the analysis of the financial stabilization model proxied through the NPL are dominated by the contribution of banking regulations to asset risk. Accordingly, it can be indicated that the performance of non-performing loans (NPLs) is influenced by the application of risk regulation to banking assets. Whereas, the stability of the financial system, which is proxied through the Z score gets a big response from the return of banking results. This condition indicates that the policy in controlling the return of banking results can affect financial system stability in ASEAN 4. The results of the analysis to see the correlation also indicate that financial inclusion has a negative correlation with financial system stability. These results indicate that financial expansion through financial inclusion, especially in ASEAN 4 with the low quality of financial literacy, results in increased risk in the banking sector and threatens to decrease financial stability in ASEAN 4.

Policy recommendations that can be implemented are in the form of monetary and banking policy mixes that carry prudence in the control and control of the banking sector through macroprudential policies, control of macroeconomic instruments such as interest rates and inflation as a form of price stability control. In addition, to improve financial inclusion it is necessary to increase access and service to the banking sector in various circles. In order to maintain stability and minimize bad credit, it is also necessary to have outstanding through credit distribution, so that the flow of credit, especially for people who still have low literacy, can be well-controlled. Furthermore, the market segment in financial inclusion must also be carried out appropriately on target to maintain financial stabilization and maintain banking performance. In addition to promoting financial stability, financial inclusion also plays a role in creating inclusive growth, so that the poor communities can reach out and access financial services easily.

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