Financial Inclusion and the Stability of Monetary Policy: Evidence from Asian Low-middle Income Countries

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Abstract--- The paper uses principal component analysis (PCA) to build financial inclusion index (FII). Then, the study runs the Pooled ordinary least square (POLS), fixed effect model (FEM), random effect model (REM) to examine the effect of financial inclusion (FI) on monetary policy in Asian low-middle income countries over the data for the period of 2008-2018. The robustness of the model is tested by generalized least square (GLS). The empirical results show that FI effects significantly on monetary policy. Accordingly, increasing the level of financial inclusion will reduce inflation, contributing to price stability and macroeconomic development.

Keywords--- Financial inclusion, monetary policy, low-middle income, Asia.

I. INTRODUCTION

Recently, financial inclusion (FI) has been globally considered as an important factor for the goal of sustainable development. For Asian low-middle income countries, it is not only important but also a top priority. Due to the fact that the level of access to and use of formal financial services in these countries is very low, specifically more than 50% of the adult population in the region does not have a bank account, only 29% of workers are received salaries through their accounts at a financial institution (World Bank Group, 2018); and there is no uniformity among countries in the region, while Malaysia, Indonesia have almost achieved financial universalization, Vietnam and the rest of the country face many challenges. In addition, due to the relatively small size of the financial market, these countries are very vulnerable to external shocks (Shimizu, 2014). And monetary policy is seen as a tool to stabilize the economy, whereby the way that central banks implement monetary policy is to rely on the individual's access to the system. Since then, it shows the importance of FI in the economy in general and in efforts to maintain price stability, effectively implement monetary policy in particular.

Although there are many studies on FI such as those focusing on measurement and promotion of FI (Sarma, 2008; Demirguc-Kunt and Klapper, 2012; Allen et al., 2016); or studying the impact of FI on poverty reduction, income inequality and growth (Park and Mercado, 2015; Ghosh & Vinod, 2017), as well as studies of FI's impact on financial stability (Khan, 2011; Garcia, 2016). However, there is a lack of academic literature to study the effect of FI on monetary policy, especially through price stabilization. There are almost no studies on this topic in the Asian region, except the case study in Vietnam (Huong, 2018). Additionally, the FI measurement method has not reached a formal consensus (Park and Mercado, 2015; Mialou et al., 2017). The empirical research results on the relationship between these two factors are sometimes contradictory. Therefore, the development of a set of FI measurement indicators for the Asian low-middle income countries

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and a test to see whether FI has an impact on monetary policy in these countries is extremely necessary and particularly meaningful strategies for these countries in the process of global financial integration.

The paper used PCA method to develop FI index for Asian low-middle income countries. Subsequently, the Pooled OLS, FEM, REM models are used to analyze and the GLS estimation is employed to overcome defects of the model to answer the question of whether FI affects monetary policy in these countries. To this end, the paper is structured as follows. Section 2 reviews both theoretical framework and literatures on the financial inclusion and the stability of monetary policy. Section 3 introduces variables, model and methodology. The empirical results are analyzed in Section 4. And the Section 5 will make conclusion and suggest some policy implications.

II. LITERATURE REVIEW

Although there is no consensus on the comprehensive financial definition (FI) but it is generally understood that the FI is a process that ensures everyone easy access and use of the financial services the system timely and affordable financial formalities, especially for financially disadvantaged groups (Sarma, 2008; De Koker and Jentzsch, 2013; Joshi et al., 2014). There have been many attempts to measure the FI level. Accordingly, there are many measures for this factor (Sarma, 2008; Demirguc-Kunt and Klapper, 2012). However, these assign equal weight to variables and aspects. Therefore, Amidžić et al. (2014) provide a new index using factor analysis (FA), or principal component analysis (PCA) of Camara and Tuesta (2014) to determine appropriate weights to calculate the FI index is an attempt to overcome previous criticisms. Recently, from the perspective of policy makers, the FI level is measured from three main aspects: access, use and service quality (Mialou et al., 2017; World Bank, 2016). However, comparing the measurement of financial service quality for a large number of countries is so difficult. Therefore, both Amidžić et al. (2014), Ahamed and Mallick (2017), Mialou et al. (2017) all ignore this aspect when developing FI level indicators. Thus, this is still a topic that researchers continue to debate.

Monetary policy is a macroeconomic policy implemented by the central bank that influences money supply or interest rates to achieve macroeconomic goals and targets all sectors of the economy (Lapukeni, 2015). The goals of monetary policy are often expressed in many aspects such as economic stability, job creation, financial system stability, etc, but price stability is always the most important goal (Cecchetti and Krause, 2002; Louis and Balli, 2013). Berument et al. (2007) show the relationship between the degree of openness and the effect of monetary policy on output growth and inflation. According to the traditional economic theory, central banks often change the money supply to influence interest rates rather than other economic variables. Therefore, policy interest rates are used as a good proxy for monetary policy (Ehrmann et al., 2001; Gambacorta, 2005). Besides, money supply is also an important representative variable of monetary policy because under the Keynesian IS-LM model (Keynes, 1936), central banks can implement monetary policy by changing the money supply or interest rates to affect output and other economic variables. Meanwhile, empirical studies on the relationship between FI and monetary policy considered inflation as a proxy for monetary policy (Lapukeni, 2015; Lenka and Bairwa, 2016).

The theoretical framework used to explain the response of monetary policy to FI levels is the model of Gali et al. (2004). In this model, the economy consists of those who have access to financial markets and those who do not make savings or borrowings but consume all their income. Accordingly, the resolution of parameter values according to Taylor rule shows that this depends greatly on the proportion of households that have access to financial markets. A major reason that monetary policy rules can become volatile as FI levels decrease is that consumers who are excluded financially are not directly affected by interest rates, making monetary policy less effective. (Mehrotra and Yetman, 2014). This shows the implications of the limitations in financial access to the central bank's policy response function and the effectiveness of monetary policy.

Some empirical studies have also shown that the FI has a significant influence on monetary policy. The researches of Mbutor and Uba (2013), Lapukeni (2015) and Lenka and Bairwa (2016) all showed that increasing the level of FI has a significant impact on monetary policy and contributes to the efficiency of monetary policy in Nigeria, Malawi, and South

Asian Association for Regional Cooperation (SAARC) countries. The common point of these studies is that the inflation is used as a measure of monetary policy. However, the research model of Mbutor and Uba (2013) is quite simple and lacks theoretical support. Meanwhile, a multi-dimensional measure of FI level analyzed by PCA and the use of FEM, REM, and PCSE models for data analysis is considered as an advantage of Lenka and Bairwa (2016). Accordingly, the FI index includes many factors of financial access (number of Automated Teller Machines-ATMs and number of commercial bank branches per 1,000 km^2, number of ATMs and number of commercial bank branches per 100,000 adults), and bank penetration (balance of deposits and loans as a percentage of GDP).

The research on the case study in Vietnam (Huong, 2018) also provided evidence that increasing 1% of FI level will reduce 0.74% of inflation rate. However, according to Evans (2016), FI is not an important driver for the effectiveness of monetary policy in Africa. Dienillah et al. (2018) aimed to measure financial inclusion and financial stability indexes between countries and analyze the impacts of financial inclusion on financial stability in 19 countries based on income group from 2004 to 2014. The results showed higher income countries have higher income inclusion and financial stability index than lower income countries. Financial inclusion only has positive effect significant effect to financial stability in high income countries. McAleer et al. (2019) investigated the linkages between financial inclusion and macroeconomic stability, which has not yet been thoroughly examined in the literature, for 22 emerging and frontier economies from 2008 to 2015, with particular focus on a potential optimal level. Using the panel threshold estimation technique, the empirical findings showed that financial inclusion, as approximated by the growth rate in the number of bank branches over 100,000 account holders, was found to enhance financial stability under a certain threshold. Financial inclusion was also found to be of benefit to maintaining stable inflation and output growth.

Most recently, Saraswati et al. (2020) used the Vector Error Correction Model (VECM) to analyze the effects of financial inclusion and fintech on effectiveness of the Indonesian monetary policy in the period of 2009-2018. The results demonstrate that financial inclusion level affects inflation rate as a proxy of effectiveness of the Indonesian monetary policy, both in the short run and long run. However, the effect of shocks in financial inclusion on inflation is not permanent. Meanwhile, fintech only affects inflation rate in the short run.

III. METHODOLOGY

Data

The paper uses annual data collected from the results of the Financial Access Survey (FAS) and International Monetary Fund (IMF) financial statistics, the World Bank reports on countries development indices for the period 2008-2018 for 08 Asian low-middle income countries as Cambodia, India, Indonesia, Mongolia, Pakistan, Philippines, Uzbekistan and Vietnam. The paper dropped data from 05 countries as Bangladesh, Kyrgyr Republic, Lao PDR, Myanmar and Timor-Leste because there was insufficient data over the years.

Variables

According to Mehrotra and Nadhanael (2016), in developing countries, central banks often choose inflation targets to implement monetary policy. Another saying, inflation is the ultimate goal of any monetary authority (Lapukeni, 2015; Lenka and Bairwa, 2016). Price stability is the state in which the general price level is stable or the inflation rate is low enough and stable (Weber, 2006). Therefore, this paper chooses inflation as a proxy for monetary policy and builds a model to test the impact of FI on monetary policy through the objective of price stability:

$$Y_{i,t}=\beta_0+\beta_1 FII_{i,t}+\beta_3 Z_{i,t}+u_{i,t} \quad (1)$$

In which:

Y is inflation rates (the percentage change of annual consumer price index)

FII is the financial inclusion index

Z is a set of control variables as lending rate (LR), exchange rate (ER) and money supply quantity (MS_2)

Specific variables in the model are as follows:

- FI level measurement variable (FII): Based on the proposal of Sarma (2016), the author developed a set of FI index including three aspects of FI:

+ Access aspect (penetration): number of deposit accounts.

+ Available aspects (availability): number of bank branches and automated teller machine (ATM) per 100,000 adults.

+ Access to use: credit and deposit volume as a proportion of GDP.

Table 1: Estimated FI index in Asian low-middle income

Year	FI index							
	Cambodia	India	Indonesia	Mongolia	Pakistan	Philippines	Uzbekistan	Vietnam
2008	0.00	0.08	0.15	0.35	0.05	0.13	0.32	0.38
2009	0.04	0.11	0.16	0.36	0.10	0.15	0.32	0.47
2010	0.06	0.12	0.17	0.37	0.14	0.16	0.33	0.56
2011	0.09	0.14	0.24	0.44	0.14	0.17	0.35	0.52
2012	0.14	0.17	0.33	0.45	0.15	0.17	0.39	0.52
2013	0.16	0.21	0.38	0.51	0.17	0.21	0.41	0.58
2014	0.23	0.21	0.41	0.53	0.19	0.23	0.41	0.62
2015	0.28	0.24	0.42	0.57	0.22	0.25	0.44	0.69
2016	0.28	0.28	0.44	0.57	0.26	0.27	0.45	0.78
2017	0.29	0.29	0.45	0.59	0.26	0.27	0.45	0.78
2018	0.29	0.29	0.45	0.62	0.27	0.29	0.46	0.79

Source: Author's estimation

Table 2: Statistical description

Variables		Observations	Mean	Std.Deviation	Min	Max
zINF	oberall	88	0.19232	0.18423	0	1
	between	8		0.11012	0.05567	0.38566
	within	11		0.15334	-0.12163	0.95501
zFII	oberall	88	0.52114	0.29661	-1.11028	0.99896
	between	8		0.30012	0.14052	0.94253
	within	11		0.08124	0.32108	0.72243
zLR	oberall	88	0.33016	0.30594	0	1
	between	8		0.29432	0.02949	0.73455
	within	11		0.13222	-0.01586	0.78828
zER	oberall	88	0.22511	0.32888	0	1
	between	8		0.35146	3.91103	0.90566
	within	11		0.04519	0.06151	0.34952
zMS_2	oberall	88	0.44633	0.30055	0	1
	between	8		0.30854	0.07684	0.85784
	within	11		0.08809	0.26681	0.73681

Source: Author's estimation

PCA built FII by combining the three aspects and the above 5 elements.

Inflation variable: the index of annual percentage change in consumer price is considered as a variable to measure for this factor.

Other control variables: According to Lapukeni (2015); Lenka and Bairwa (2016), lending rates and exchange rates, money supply were selected as control variables in the model to avoid the bias.

Methodology

Building the FI level index set (FII) - FI index

In order to solve the first research goal, meaning to develop FI index set for Asian low-middle income countries, the paper uses PCA method to determine the weight for the factors in FI index. Accordingly, the jth index can be expressed as:

$$FII_{i,j} = \sum W_{i,j} X_i \quad (2)$$

In which: FII_{ij} is FI index (including 03 aspects, 05 elements: number of bank deposit accounts, number of bank branches, number of ATMs per 100,000 adults, deposit balance over as a percentage of GDP, credit balance in a percentage of GDP), w_{ij} is the weight, X_i is the corresponding initial value of the components.

Examine the effect of FI on monetary policy in Asian low-middle income countries

To solve the second research goal, the paper conducted data regression through Pooled OLS, FEM, REM for model (1), then selected the appropriate model to test the effect of FI to monetary policy. Simultaneously, the paper uses GLS estimates to overcome the problem of heteroscedasticity and autocorrelation.

IV. EMPIRICAL RESULTS

The results of PCA

Table 3: Correlation matrix

	zINF	zFII	zLR	zER	zMS₂
zINF	1.0000				
zFII	-0.3499*	1.0000			
zLR	0.6152*	-0.6729*	1.0000		
zER	0.4619*	-0.1682	0.5798*	1.0000	
zMS₂	-0.1908	0.8009*	-0.5386*	0.0169	1.0000

Note: the asterisk ** denotes 5 % statistical significance
Source: Author's estimation

Before using PCA, the indices of each aspect were normalized to have values from 0 to 1 to ensure the scale was not significant. Through PCA, the paper calculates the eigenvalues of the five factors that measure FI levels. Individual values greater than 1 are considered for the analysis (as proposed by Kaiser, 1960). According to Lenka and Bairwa (2016), if the value contains more than one component, consider more than one main component (PC); then, take the weight of each element (calculated by PCA) multiply by the corresponding variable and add them up to get the final index.

The eigenvalues of five PCs is 2.579, 2.011, 0.221, 0.1115 and 0.519. This PCA result shows that up to two PCs have their own values greater than 1, so we take the first two components and continue using PCA to find the weights assigned to them. After checking the conformity (KMO), the paper forecasts the FI index for countries in Asian low-middle income as hereafter. It can be seen that the levels of FI in Cambodia, India, Pakistan, and Philippines are relatively low. Particularly in Vietnam, from 2010 up to now, there are much improvements, especially in 2018, Vietnam's FI index achieved relatively good results (0.79) compared to other countries in the bloc.

Regression results

The analytical data as well as the data declarations are presented in Table 2. Accordingly, the correlation between the calculated variables in Table 3.

Table 4: The regression results by Pooled OLS, FE and RE

Dependent variables	Pooled OLS	FE	RE
	Independent variable: zINF		
zFII	-0.06609	0.1981	-0.06704
zLR	0.3987***	0.5789***	0.3988***
zER	0.03551	-0.3772	0.03512
zMS₂	0.1669	-0.5549*	0.1544
Constant	0.01481	0.2488	0.01377

Note: the asterisk *, ** and *** denotes 10, 5 and 1 % statistical significance, respectively
Source: Author's estimation

Table 5: The regression results by GLS

zINF	Coef.	Std.Err.	z	P>z	[95% Conf. Interval]	
zFII	-0.11811	0.07111	-1.61	0.101	-0.25895	0.023
zLR	0.36698	0.10844	3.38	0.001	0.15199	0.590
zER	-0.01499	0.09033	-0.18	0.859	-0.19794	0.171
zMS_2	0.15021	0.05582	2.72	0.007	0.04091	0.259
Cons.	0.07024	0.05109	1.42	0.148	-0.02682	0.169

Source: Author's estimation

Table 4 presents the regression results of the Pooled OLS, FEM and REM models. It explains the impact of FI level, lending rates, exchange rates and money supply on inflation of an economy, thereby showing the degree of influence of FI on monetary policy of the economy of Asian low-middle income countries.

After conducting tests of model defects as multicollinearity problem; heteroscedasticity; autocorrelation as well as selecting the appropriate model basing on Hausman test, the paper finds that the FEM model is suitable for the analysis (Prob> chi2 = 0 <α = 5%). However, there is autocorrelation phenomenon (Prob = 0 <α) and heteroscedasticity (Prob = 0 <α). Therefore, the estimated results may not be effective. So, to handle this problem, the paper uses GLS to fix defects to find more accurate estimates.

The adjusted GLS results show that some variables as FI index (zFII), lending rate (zLR), exchange rate (zER) and money supply (zMS_2) are statistically significant. In other words, FI level, lending rate, exchange rate and money supply influence monetary policy through inflation. The FI and the exchange rate have a negative effect on inflation. Specifically, when the level of FI and the exchange rate increase, inflation will decrease and vice versa. Lending rates and money supply impact positively on inflation. The study indicates that increasing by 1% of FI level will reduce 0.118% of inflation rate. This result is consistent with most of the results of the studies of Mbutor and Uba (2013), Lapukeni (2015), Lenka and Bairwa (2016). Similarly, when the exchange rate goes up by 1%, it also reduces 0.014% of inflation rates of Asian low-middle income economies. In contrast, when the lending rate and money supply increased by 1%, the inflation rate increased to 0.366% and 0.150%, respectively. It can be seen that the reaction of inflation to the variables is consistent with the theoretical framework.

V. CONCLUSION AND POLICY IMPLICATION

Finance inclusion is an issue of global concern because it brings many economic benefits to individuals, small businesses and sustainable growth for an economy in general. However, few studies examine its impact on monetary policy as a tool to stabilize the price of the economy. By using the annual data gathered from the IMF's Financial Access Survey results and the World Bank's data for the period 2008-2018, the paper proposes a set of FI indexes to measure FI levels for economies in low-middle income countries in Asia. Simultaneously, the paper provides empirical evidence showing that the effect of FI on monetary policy is enormous. Accordingly, when the FI level increases, it can reduce the inflation rate, creating a stability of prices. The empirical results help policymakers and the community be more aware of the importance of increasing FI levels in the economy. Then, there are solutions to incorporate FI into the formulation and quantification of its impacts on monetary policy, contributing to economic stability and sustainable growth.

For the bloc of Asian low-middle income countries, member economies also viewed FI as one of the important pillars of financial integration and established a working group to promote this issue. However, the economies of countries in question are mainly based on cash transactions, a large proportion of the adult population has not yet used formal financial services. Therefore, the transition to a cashless system and increasing opportunities to access and use financial services for people through diversification and innovation of service delivery forms, improving financial infrastructure and promoting the application of digital technology in the economy are one of the focal points that these governments should go forwards.

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