



## Effects of Financial Inclusion, Exchange Rates, Interest Rates on Inflation in 17 Emerging Market Countries

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**Abstract:** *Financial inclusion as seen from the ease and extent of public access to financial services has become an important issue in economic development. The purpose of the study is to examine how interest rates, exchange rates, and financial inclusion affect inflation in 17 emerging markets between 2008 and 2021. The System Generalized Method of Moment (Sys-GMM) and the Index of Financial Inclusion (IFI) are used in this study. According to research, exchange rates and interest rates have a favorable effect on inflation in 17 emerging countries, while financial inclusion has a considerable negative influence on inflation. Inflation will decline as financial inclusion increases. The efficiency of monetary policy, which in turn influences inflation, can be improved via financial inclusion.*

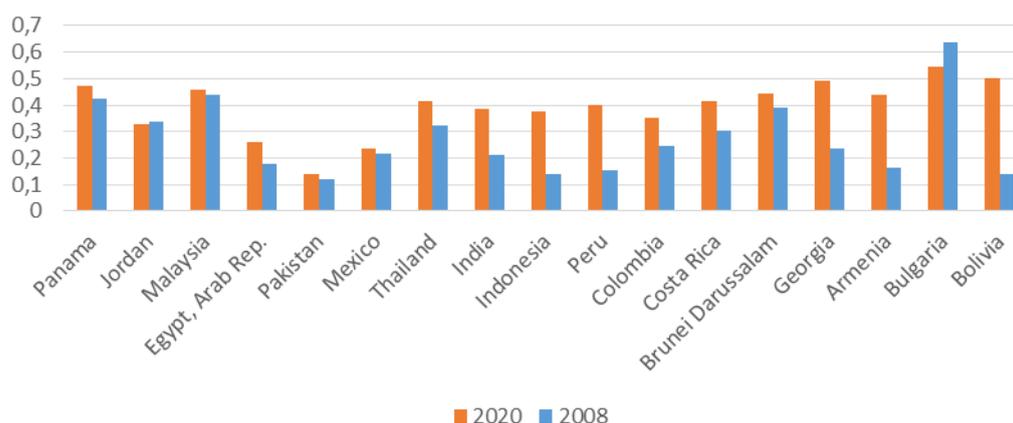
**Keywords:** *Exchange rate; Index financial inclusion; Inflation; Financial inclusion; Lending rate*

### 1. Introduction

In recent years, advances in financial inclusion have captured the world's attention. Financial inclusion is that businesses and individuals can access financial services and products that are suitable and affordable so that they can make payments, insurance, savings, credit and other transactions sustainably and responsibly (Yin et al., 2019). Financial inclusion is a variety of financial services that make it easier for people to use financial services with various efforts aimed at eliminating all forms of barriers that hinder public access to formal financial services (Bank Indonesia, 2014). Figure 1 shows a comparison of the financial inclusion Index in 17 emerging market countries (World Bank, 2021). It can be seen that the majority of the 17 countries experienced an increase in the financial inclusion index. Countries that experienced a decline in the financial inclusion index were Jordan and Bulgaria.

Reports show that users of financial products without financial knowledge find it difficult to make the most of them and avoid risks. People who do not have financial education who apply for a car loan are at greater risk of losing money because they are not aware of the cost of the loan and the penalties for default. These products are also at risk of causing the habit of accumulating debt. But, financially savvy people can use these loans to get a car that will help them increase their productivity at work. That is, financial literacy is important for society, and having financial products or financial inclusion must always be accompanied by good financial literacy (World Bank, 2021). In the current fintech era, digitalization of financial institutions is experiencing rapid development. Digitalization of financial institutions can increase financial inclusion and empower people who have not

been touched by financial institution products. Increasing access to financial institutions to the public is a focus of financial inclusion programs in Asia. Many people have barriers to accessing financial institutions. These barriers include the lack of understanding that the public knows about the role of financial institutions and the products that exist in financial institutions do not provide what the community needs (Aziz et al., 2020; Dienillah & Anggraeni, 2016).

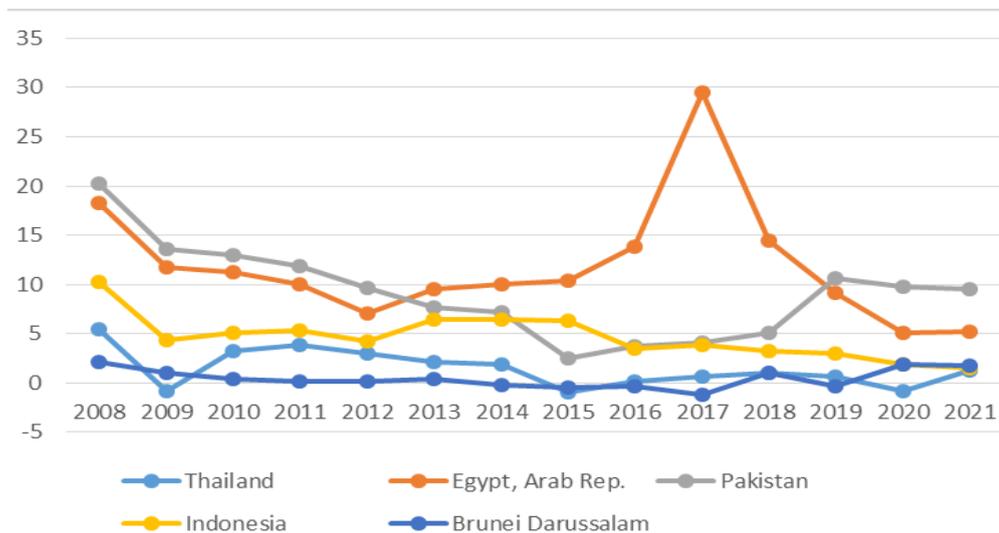


**Figure 1. Comparison Financial Inclusion Index in 17 Emerging Markets Countries in 2008 & 2020**

People's financial transactions have changed as a result of the COVID-19 pandemic. Digital payment systems and mobile banking services are becoming more popular among the public, and this will reduce the possibility of spreading the COVID-19 virus (Allam, 2020). Changes in people's transaction patterns in general are an inseparable part of technological advances such as the availability of smartphones. The latest technology and strong internet support make it easy for users to explore the world online. According to Inclusion, digital finance allows people to access formal financial services from the financial sector using digital technology. According to (Lauer & Lyman, 2015) the term financial inclusion includes access, availability, and function of all financial transactions in the financial system. There are several reasons for the importance of financial inclusion, first, it encourages the better distribution of resources. Second, households and small businesses may see better financial opportunities if they have better access to financing. Third, improved monetary policy encourages an increase in formal borrowing, encouraging the remuneration of informal financial institutions (Sarma, 2012).

Financial inclusion increases the effectiveness of monetary policy, and on the other hand, monetary policy, aimed at reducing inflation, facilitates financial inclusion. Effective monetary policy increases financial inclusion in a country, and high levels of financial inclusion will lower the inflation rate and make monetary policy effective (Arshad et al., 2021; Jungo et al., 2022). Monetary policy effectiveness will be achieved if monetary policy transmission runs smoothly on various monetary policy transmission channels (Putranto et al., 2023). In this case, the role of financial inclusion is through lending rate channels and exchange rate channels which have an impact on the final target, namely inflation control. Financial inclusion can help monetary policy to expand its reach financially so as to facilitate better predictions of inflation movements (Nguyen, 2018). This research is in line with the

findings which state that financial inclusion can affect inflation so that monetary policy runs more effectively through various financial institutions and financial infrastructure which ultimately affects real sector performance and controls inflation to increase the sustainability of economic growth (Dasril & Achسانی, 2015). The following is the development of inflation in 5 emerging markets countries from 2008-2021 presented in Figure 2 (World Bank, 2021).



**Figure 2. Development of Investment in 5 Emerging Markets Countries in 2008-2021**

Figure 2 shows inflation in 5 emerging market countries (Thailand, Indonesia, Egypt, Brunei, Pakistan) experiencing fluctuating developments, except Egypt experienced a high inflation rate increase in 2017 due to local currency devaluation. Most of the emerging market countries have inflation rates of less than 5% and tend to decline fluctuating since 2008, that year financial inclusion has been implemented in several countries and has become a trend that has attracted world attention.

The ultimate goal of a country's monetary policy is to achieve stability in the value of that country's currency. Currency stability is seen from two sides, namely the stability of the domestic currency which is reflected in the price of domestic goods and services and the stability of the value of the currency when compared to foreign currencies (exchange rates). The exchange rate movements (increases-decreases) in the short-term cause general price changes to the same degree (Tugral & Bari, 2021). Other research then states that the exchange rate is the main determinant of inflation so that changes in the exchange rate will have a strong impact on inflation (Koku et al., 2016). The results also revealed that the exchange rate is still the main source of inflationary pressure and also concluded that exchange rate shocks did cause significant changes in inflation (Pham et al., 2023).

Fluctuations in inflation can affect the real sector or the production sector through changes in lending rates. The increase in lending rates has a direct impact on decreasing production (Gross Domestic Product) further causing an increase in inflation (Dinh, 2020). Lending rates affect GDP growth through appropriate borrowing thresholds. If it exceeds

this threshold, it will cause inflation. Other research shows a positive relationship between loan interest rates and inflation (Nguyen, 2018). Other researcher found the effect of exchange rates and lending rates on inflation, his empirical findings stated that exchange rates and lending rates have a positive and significant effect on inflation as measured by the consumer price index (Özen et al., 2020). Research on the role of financial inclusion has been conducted by other researcher, with the topic on the effect of financial inclusion on inflation in Indonesia. There is a positive and significant influence of interbank money market interest rates, deposit rates, fintech and investment on inflation. Meanwhile, the Financial Inclusion Index and Output Gap variables have a negative effect on inflation (Saraswati et al., 2020).

Furthermore, financial inclusion has also been examined on the analysis of the relationship between financial inclusion and monetary policy in two regions, namely Sub-Saharan Africa and Latin America and the Caribbean. The results showed that financial inclusion has a significant relationship with monetary policy in both regions (Jungo et al., 2022). Other finding focuses on analyzing the relationship between financial inclusion and monetary policy in several ASEAN countries. The findings found that financial inclusion has a significant relationship with monetary policy, as well as influencing the effectiveness of monetary policy in controlling inflation and financial stability (Komala & Widodo, 2022).

The importance of financial inclusion, exchange rates, and loan interest rates on inflation is evident from the research phenomenon that has been described, which is why the author is interested in examining how these factors affect inflation in emerging market nations. This research uses the GMM dynamic panel data analysis tool (Dynamic panel method with a generalized method of moments (GMM) approach pioneered by Arellano & Bond (1991), because this model is more suitable to be used because the research data analyzed is dynamic panel data. The advantage of GMM is that it analyzes panel data to solve parameter estimation problems associated with dynamic models. Then the advantages of other GMM methods are unlike the assumption of normality, GMM does not require distribution conditions. GMM can also handle heteroscedasticity issues and easily find suitable instrument variables to deal with endogeneity. Therefore, the GMM model is best suited to this study because the GMM estimator provides consistent and efficient estimates, addresses endogeneity issues, and is better suited for panel studies that have fewer time points and a larger number of individuals.

## **2. Literature Review**

### **2.1. Financial Inclusion**

According to World Bank (2016), it means the availability of access to financial services and products that provide benefits to the community and are affordable to meet the needs of transactions, savings, payments, insurance and credit in a sustainable and responsible manner. Financial inclusion is an effort to enable people who cannot pay to join the formal financial system so that people can facilitate financial services. Financial inclusion is providing availability and easy access in terms of inclusion, wants, and benefits of the formal financial system for economic actors (Hannig & Jansen, 2011; Sarma, 2012).

Jungo et al., (2022) conducted a comparative study on the relationship between financial inclusion and monetary policy in Sub-Saharan Africa and Latin America and the Caribbean. This study analyses the relationship between financial inclusion and monetary policy in these two countries, using a comparative approach to analyse data from different countries. The results show a significant relationship between financial inclusion and monetary policy. Komala & Widodo (2022) investigated the relationship between financial inclusion and financial policies in several ASEAN member countries. The study found that financial inclusion has a significant relationship with financial policy and impacts the ability of financial policy to determine inflation and financial stability. So, financial inclusion is a way to enable cashless people to access formal financial services. Furthermore, financial inclusion theory states that existing subsystems-financial, social, and economic—affect financial inclusion. Increased financial inclusion has a positive effect on the financial system and can ultimately affect inflation.

## **2.2. Inflation**

There are many different definitions of inflation, but all definitions have similarities in their problems. Defining inflation is the general increase in prices of goods, services and commodities. Another definition, inflation occurs when there is an imbalance in demand with aggregate supply. This means that aggregate demand exceeds aggregate supply. Thus, aggregate price movements reflect the relationship between the prices of goods or services. In general, economists state that inflation can cause a decrease in the value of money and purchasing power, large and small due to the elasticity of supply and demand. Some factors that can determine price fluctuations in general include price controls, consumer subsidies, government policies and so on (Samuelson & Solow, 1956).

From several understandings that explain the meaning of inflation, it can be concluded into 3 main points that exist in inflation according to namely there is a possibility of prices rising, meaning that prices are at or below the previous price, but there are still signs of increasing. Second, prices will not only increase at one time but will continue to increase. Third, price increases occur in general. That is, the price does not increase against one or some commodities, but increases against all commodities. argues that an economy can be considered inflationary if: 1) Prices are rising, 2) Prices are rising in general, 3) are persistent (Bauer & Rudebusch, 2020; Cao et al., 2021). Inflation can be influenced by many factors such as the money supply, national production or income, prices of goods, exchange rates, or other macroeconomic varies. The asymmetric effect of exchange rates on inflation in Turkey, analyzing national variables such as output gaps, debt, interest rates, and foreign exchange rates, revealing positive and significant effects on its inflation (Tuğral & Bari, 2021). In general, the calculation of the inflation formula through the consumer price index (CPI) is as follows (Gunawan, 1991):

$$\text{Inflation} = \frac{CPI_{t+1} - CPI_t}{CPI_t}$$

### **2.3. Exchange rate**

Exchange rate is the price or value of currency used by residents within a country to trade with other countries or between countries. The exchange rate, according is the value obtained by comparing one currency with another. The exchange rate refers to the exchange of currencies between one currency and another, and is obtained from the demand and supply of two currencies to find a balance point between them. and used in international trade. Currency exchange rates depend on the demand and supply of binary currency (Abimanyu, 2004; Mankiw, 2020).

The relationship between inflation and exchange rates can be shown in purchasing power parity theory. According to this theory, the value of a country's currency is equal to the value of another country's currency. Exchange rates can change following relative price movements in the country. The theory of purchasing power parity can be explained in absolute terms, namely the relationship of prices at the domestic level and prices at the foreign level. This theory can be intended as a comparison of domestic and foreign price indices in a certain period. The purchasing power parity theory essentially uses the principle of price. This law stipulates that the same amount of goods can be purchased in each country when units of value of a country's currency are converted into that country's currency (Halwani, 2005; Mankiw, 2012)

Indirectly, the effect of exchange rates on some industries is a result of the country's import and export needs. If the price of imported coal increases relative to domestic prices, it results in a decrease in import demand and an increase in domestic demand. However, if the country does not import or produce imported goods then there will be a depreciation or devaluation of the currency causing a serious economic crisis if the country does not import or produce imported goods. Many domestic industries that require imported raw materials in their production processes have decreased productivity. This decline led to an increase in the company's foreign loans used to finance trade in raw materials in the domestic market. Due to the low selling price of goods in foreign currencies, the company has difficulty paying off its debts. This can bankrupt the company and lay off employees. This adds to the number of unemployed in the country. Other study explored the relationship between inflation and interest rates in Turkey (Özen et al., 2020). It examines various factors such as consumer inflation, producer inflation, interest rates, overnight interest rates, and commercial bank credit. The research reveals that interest rates and overnight interest rates positively and significantly affect inflation, while Overnight interest rates negatively affect inflation. The study shows that interest rates in emerging markets also affect inflation.

### **2.4. Loan Interest Rate**

Interest is a mandatory fee for the borrower on loans that have been received which is a reward for the borrower for making a loan (Hubbard, 1997). Interest rates are prices like any other price, so interest rates are closely related to demand and supply. states the interest rate is an annual payment on the loan in the form of a percentage of the loan amount obtained through interest that has been earned each year and divided by the loan amount. The interest rate is the price that the borrower pays to the lender. Interest rates are influenced by the

demand and supply of loanable funds. Interest rates represent the potential value of not using money. Losses will increase if interest rates increase (opportunity value) not using money and the demand for money will rise. Rising interest rates affect demand for services and goods. Rising interest rates make it more expensive to borrow money and provide a return on people's savings, as well as reduce the number of companies that borrow and invest (Bauer & Rudebusch, 2020; Dimand, 2019; Shiller & Huston McCulloch, 1990; Zhu et al., 2018).

Liquidity preference theory is a theory of the relationship between interest rates and inflation. This theory is a Keynesian theory that explains that the movement of interest rates has a function as a balancer between the demand for money and the money supply. When the value of interest rates is above the equilibrium level, the amount of money that wants to be in the hands of the public will be less than the money issued by the central bank, this causes this extra money to raise interest rates, and vice versa. According to the theory of liquidity preference, when a person has money, they can choose to use it now or invest it for future profits. This fits with the Keynesian perspective on how to save money for speculation. How much money can be used for speculation depends on the interest rate. If the value of interest rates falls, then the amount of money owned by the public will rise or the amount of money in circulation will rise

Research on lending rates against inflation which estimated impact of borrowing and inflation on economic growth in Vietnam and China found that borrowing positively affects inflation (Dinh, 2020). The effect of financial and technological inclusion on Indonesia's monetary policy finding that financial and technological inclusion positively influence the effectiveness of monetary politics, with positive and significant effects on bank, insurance, fintech, investment, and output gap variables. However, variable income inclusion and output inequality have a negative impact on inflation (Saraswati et al., 2020).

### **3. Research Methods**

The object of this study is inflation in 17 emerging markets countries as a dependent variable, then the independent variables are financial inclusion index, exchange rate and loan interest rate. the 17 emerging markets countries studied include Brunei Darussalam, Indonesia, Georgia, Panama, Jordan, Egypt, Pakistan, Mexico, Peru, Colombia, Costa Rica, Indonesia, Malaysia, Thailand, and Armenia. The type of data used is secondary data based on panel data for the period 2008 to 2021. The variables in this study consist of inflation, financial inclusion, exchange rates and lending rates (Table 1). Financial inclusion is seen from the financial inclusion index with indicators such as the number of deposit accounts, the number of branch offices, the number of ATMs, and the ratio of savings and loans to total Gross Domestic Product. This research also uses inflation, financial inclusion, exchange rate and lending rate variables which obtain form World Bank and IMF.

#### **3.1. Index Financial Inclusion**

The index of financial inclusion (IFI) measures the level of financial inclusion. The financial inclusion index developed by consists of three components: penetration, availability of banking services and usage (Sarma, 2012).

The study used 3 dimensions of financial inclusion, including the dimensions of bank penetration, availability of services and usability with one indicator each. These indicators include:

- a. Number of deposit accounts per 1000 adults, the following indicators are indicators of the dimensions of bank penetration.
- b. Number of branch offices per 100,000 adults, the following indicators are indicators of the dimension of service availability.
- c. Number of ATMs per 100,000 adults, the following indicators are indicators of the dimension of service availability.
- d. The ratio of Savings and Loans to total GDP of the following indicators is an indicator of the usability dimension.

In theory, the minimum and maximum limits for each dimension when calculating the amount of the financial inclusion index do not have specific rules, but the state of a region determines how the minimum and maximum limits are determined. In this study, the minimum and maximum values of each dimension following the provisions of are as follows (Sarma, 2012).

- a. The minimum value for all dimensions is 0 (zero).
- b. The maximum value for the number of deposit accounts per 1000 adults is \$2500. This explains that the average adult has 2 deposit accounts.
- c. The maximum value for the number of bank branches per 100,000 adult residents is 60. This explains that each bank serves 1667 clients/customers.
- d. The maximum value for the number of ATMs per 100,000 adults is 120. This explains that 1 ATM is used by 833 adults for transactions.
- e. The maximum value of the ratio of total savings and loans to total GDP is 300. This explains that the ratio of savings and loans to total GDP is 3
- f. It is assumed that all dimensions have the same importance weight, which is weighted 1

If you have obtained value from each dimension of financial inclusion. Then, calculate the financial inclusion index with the formula below:

$$IFI = \frac{1}{2} \left[ \frac{\sqrt{d_1^2 + d_2^2 \dots d_n^2}}{\sqrt{n}} + \left( 1 - \sqrt{\frac{(1-d_1) + (1-d_2) + (1-d_3)}{n}} \right) \right]$$

### **3.2. Dynamic Panel Method**

Dynamic panel data analysis was used as an analysis method in this study. The existence of dynamism in data today that has a relationship to previous data is the reason why this dynamic panel model is used. Dynamic panel models are commonly used for dynamic variables such as economic variables. Dynamic can be said when a variable is still influenced by the value of another variable or a variable that is still related to the past. Dynamic relationships are characterized by the addition of lag of dependent variables to explanatory variables in the model causing estimates to produce biased and unreliable estimators when using static panel data analysis. Therefore, this study uses a dynamic panel model because

of its superiority in overcoming the problem of endogeneity through the use again of the dependent variable (Nabilah & Setiawan, 2016; Urusiyah, 2013).

To overcome the problem, there is a method that can be the solution. The dynamic panel method with a generalized method of moments (GMM) approach was pioneered by is the right choice. If using the Arellano-Bond GMM method, the resulting estimates will be unbiased, and consistent. And of course, the requirement to qualify this method is to escape the unusualness, and be consistent (Arellano & Bond, 1991). The following are some criteria for choosing the best GMM model, including (Firdaus, 2011);

- a. The instrument is valid, if the Sargan test rejects the null hypothesis. If the results of FD-GMM explain that the instruments used in the model are not suitable, it is necessary to test using SYS-GMM. The Sargan test serves as a tester of the effectiveness of this method, which shows a significant bias. Instrument and component errors do not correlate if the instruments in the study are valid.
- b. Consistent, consistency requirements are met if the Arellano-Bond test shows that the test statistics result in significance where the p-value of AR(2) must be insignificant. The Arellano-Bond test is an autocorrelation test of the GMM method to test the consistency of estimates.
- c. Unbiased, The forecast is unbiased if the forecast result is between FE and PLS. In the FE model, the lag coefficient (1) of the dependent variable will be biased downward while in the PLS model, the lag coefficient (1) of the dependent variable will be biased upward.

In general, the regression model of dynamic panel data is as follows:

$$Y_{i,t} = \beta_0 + \delta Y_{i,t-1} + x_{i,t}\beta + u_{i,t}; i = 1,2, \dots, N_i = 1,2, \dots, T$$

$Y_{i,t}$  is the dependent variable of the  $i$ -th cross section unit against the  $t$ -th period.  $\beta_0$  is constanta.  $Y_{i,t-1}$  for the Lag  $Y_{i,t}$ .  $x_{i,t}$  are the independent variable vector of observations of the  $i$ -th cross-section unit for a  $t$ -time period of size  $1 \times k$ ,  $u_{i,t}$  for error regression unit cross section  $i$  and unit time series  $t$ .  $\delta$  for the scalar. The dynamic panel analysis method with GMM has two approaches, namely the first-difference GMM model (FD-GMM) and the GMM system model (SYS-GMM). The model is selected based on the test results of the dynamic panel model specification. A smaller standard error value indicates that the two models meet the dynamic panel model specification test. To test the model specification, namely by conducting the Arellano-Bond test to test consistency and conducting Sargan testing to test the validity of the instrument. This test is carried out to meet the requirements of GMM model testing, which is unbiased, consistent, and valid.

### **3.2.1. Sargan Test (Instrument Validity Test)**

The Sargan test is used to determine validity by using more instrumental variables than the estimated parameters (overidentifying restriction conditions). Instrument validity testing aims to detect the possible presence of bias in the estimated parameters due to improper use of instrument variables contained in the equation. The validity of the instrument will undergo a test called Sargan Specification Test (Arellano & Bond, 1991). The hypothesis is as

follows: It can be said that the research instrument is said to be valid by using the J-statistical value if the value of Prob >  $\alpha$  (0.05) then it does not reject H0. In conclusion, there are conditions of moment (instrument variables used) or in other words valid. Whereas if the value of Prob <  $\alpha$  (0.05) then reject H0. In conclusion, there are no conditions of moment (instrument variables used) or in other words invalid (Utami et al., 2019).

### **3.2.2. Arellano-Bond Test (Consistency Test)**

Furthermore, the next requirement that must be done to see whether the estimated results are correct is to meet the consistency requirements. In FD-GMM and SYS-GMM models, the Arellano-Bond test is used to determine the correlation between residual components with each other. This test can be used by using residual checking tests using AR.

If  $|m1| > Z_{table}$  or in other words  $pvalue < \alpha$  then the conclusion is reject H0, meaning that the Arellano-Bond test on AR(1) is significant. Next  $|m2| < Z_{table}$  or in other words  $pvalue > \alpha$  then the conclusion does not reject H0, the Arellano-Bond test on AR(2) is not significant. The consistency requirement is met if the Arellano-Bond test shows that the test statistics result in significance where the p-value AR(2) must be insignificant.

### **3.2.3. Selecting a Dynamic Panel Data Regression Model**

#### **a) First-Difference Generalized Method of Moment (FD-GMM)**

To solve the correlation problem between lag bound variables with error components is to perform the distinction first. It aims to eliminate the individual effects of  $i$  on the model. However, even though the individual effect  $i$  has been lost, the error component ( $v_{it}-v_i, t-1$ ) is still correlated with the bound variable ( $y_{it}-y_i, t-1$ ), so the OLS estimator will produce inconsistent and biased estimates. Therefore, it is advisable to use the instrumental variable method first before estimating the model (Lubis, 2013). So that the First-Difference Generalized Method of Moment model in this study is:

$$INF_{i,t} = \beta_0 + \delta INF_{i,t-1} + IFI_{i,t}\beta + LEXR_{i,t}\beta + LR_{i,t}\beta + u_{i,t}$$

Where:  $INF_{i,t}$  is inflation in the country at the time  $it$ .  $\beta_0$  is the constant..  $\delta INF_{i,t-1}$  for the innflation lag in the country in the previous time  $it$ .  $IFI_{i,t}\beta$  is the *Financial Inclusion Indeks* on country at time  $it$ .  $LEXR_{i,t}\beta$  is the natural logarithm of the Exchange Rate in the country at time  $ti$ .  $LR_{i,t}\beta$  is the lending Rate in the country at time  $ti$ .  $u_{i,t}$  is Error regression cross-section unit  $i$  and time series unit  $t$

#### **b) System Generalized Method of Moment (Sys-GMM)**

FD-GMM estimators may experience bias and inaccuracy in small samples. In addition, the instrument denoted in the first difference equation is the weak instrument in FD-GMM. Therefore, the application of initial conditions is critical to producing effective estimators from dynamic panel data models with short time series. The generalized method of the moments system is considered more efficient than previous estimation methods. This is due to the use of additional level information, namely the condition moment and the level instrument variable matrix in addition to the first difference by combining the condition moment and the level instrument variable matrix (Blundell & Bond, 1998).

FD-GMM estimators can experience bias and inaccuracy in small samples. In addition, the instrument denoted in the first difference equation is the weak instrument in FD-GMM. Therefore, the application of initial conditions is critical to producing effective estimators from dynamic panel data models with short time series. The generalized method of moments system also known as the GMM System Estimator, Bond and Lundel—it is considered more efficient than previous estimation methods (Arellano & Bond, 1991; Blundell & Bond, 1998). This is due to the use of additional level information, namely the condition moment and the level instrument variable matrix in addition to the first difference by combining the condition moment and the level instrument variable matrix. So that the system generalized method of moment model in this study is:

$$INF_{i,t} = \beta_0 + \delta INF_{i,t-1} + IFI_{i,t}\beta + LEXR_{i,t}\beta + LR_{i,t}\beta + u_{i,t}$$

Where  $INF_{i,t}$  for the inflation in the country at the time  $it$ .  $\beta_0$  is the constanta.  $\delta INF_{i,t-1}$  for the nflation lag in the country in the previous time  $it$ .  $IFI_{i,t}\beta$  is financial inclusion index on country at time  $it$ .  $LEXR_{i,t}\beta$  is the natural logarithm of the Exchange Rate in the country at time  $ti$ .  $LR_{i,t}\beta$  for the lending Rate in the country at time  $ti$ .  $u_{i,t}$  is the error regression unit cross section unit  $i$  and time series unit  $t$ .

#### 4. Results and Discussion

The following are some criteria for choosing *the best Generalized Method of Moment* model, including the unbiased (Firdaus, 2011). The estimate is unbiased if the forecast result is between the *Fixed Effect Model* and *Pooled Least Square*. In the *Fixed Effect Model* model, the lag coefficient (1) of the dependent variable will be biased downward while in the *Pooled Least Square model*, the lag coefficient (1) of the dependent variable will be biased upward. The following is the result of the lag coefficient (1) of the dependent variable (inflation) presented in Table 1. as follows:

**Table 1. Lag Coefficient Results (1) Dependent Variable (Inflation)**

$\zeta$	Coefficient	Std. error.	z	P>z	95% conf.	Interval
INF L1.	0.127	0.038	3.31	0.001	0.051	0.202
IFI	-17.559	16.782	-1.05	0.295	-50.453	15.334
Lexr	3.086	2.293	1.35	0.178	-1.408	7.581
LR	0.404	0.139	2.91	0.004	0.132	0.676
_cons	-5.129	2.980	-1.72	0.085	-10.970	0.710

Source: Secondary data (2023)

In Table 1. it can be seen that the value of the lag of (1) First-Difference Generalized Method of Moment (FD-GMM) inflation is below the value of the lag (1) of fixed effect model inflation. While the lag value (1) of system generalized method of moment (Sys-GMM) inflation is above the lag value of (1) fixed effect model inflation and below the lag of (1) pooled least square inflation. Thus, in this study using the system generalized method of moment (Sys-GMM) because the system generalized method of moment (Sys-GMM) has met the first criterion, which is unbiased.

The second is a valid instrument, if the Sargan test rejects the null hypothesis. The Sargan test serves as a tester of the effectiveness of this method, which shows a significant bias. Instrument and component errors do not correlate if the instruments in the study are

valid. It can be said that the research instrument is said to be valid by using the J-statistical value if the value of Prob >  $\alpha$  (0.05) then it does not reject H0. The following are the Sargan test results presented in Table 2 as follows:

**Table 2. Sargan Test Results**

<b>chi2(89)</b>	=	<b>13.596</b>
Prob >	chi2	= 1.000

Source: Secondary data (2023)

In Table 2 it can be seen that the estimation using the system generalized method of moment (Sys-GMM) passes the Sargan test because the value of Prob > chi2 is 1 and greater than 0.05 thus rejecting the null hypothesis. The consistency requirement is met if the Arellano-Bond test shows that the statistical significance test results where the p-value of AR (2) must be insignificant. The Arellano-Bond test is an autocorrelation test of the GMM method to test the consistency of estimates. The following are the results of the Abond test presented in Table 3. as follows:

**Table 3. Abond Test Results**

<b>Order</b>	<b>z</b>	<b>Prob &gt; z</b>
1	-1.989	0.046
2	-1.787	0.074

Source: Secondary data (2023)

In Table 3 it can be seen that estimation using the system generalized method of moment (Sys-GMM) passes the Arellano-Bond test because the p-value of AR(2) is 0.074 and greater than 0.05 so it is not significant. The results of estimation with the system generalized method of moment (Sys-GMM) can be seen in Table 4:

**Table 4. System Generalized Method of Moment (Sys-GMM)**

<b>INF</b>	<b>Coefficient</b>	<b>Std. Error.</b>	<b>z</b>	<b>P&gt;z</b>	<b>95% conf.</b>	<b>Interval</b>
INF L1.	0.222	0.040	5.48	0.000**	0.143	0.302
IFI	-12.896	5.399	-2.39	0.017*	-23.478	-2.314
lexr	0.462	0.231	2.00	0.046*	0.008	0.915
LR	0.294	0.099	2.94	0.003*	0.098	0.490
_cons	2.778	2.103	1.32	0.186	-1.343	6.901

\*\*Sig < 1%; \* Sig < 5%

A negative coefficient value indicates that when the level of the financial inclusion index rises, it will directly affect inflation. Increasing financial inclusion can increase the effectiveness of monetary policy along with reducing inflation. This is in line with the hypothesis put forward at the beginning of the study which states that when the Financial Inclusion Index increases, it will reduce inflation. The results of the study are in line with previous examination that found the household decisions about consumption, behavior, and investment decisions of companies are strongly influenced by the level of financial inclusion (Bourainy et al., 2021; Jungo et al., 2022; Komala & Widodo, 2022; Nguyen, 2018; Saraswati et al., 2020). Then financial inclusion increases the effectiveness of monetary policy, and on the other hand, monetary policy, aimed at reducing inflation, facilitates financial inclusion (Jungo et al., 2022). Financial inclusion

will allow monetary policy to extend its reach to the financially excluded and help policymakers to make better predictions of inflation movements (Nguyen, 2018).

A positive coefficient value indicates that when the exchange rate rises, the exchange rate rises meaning that there is a decrease in the value of the country's currency (depreciation). Currency depreciation can increase inflation as the price of imported goods becomes more expensive. This increase in the price of imported goods has the potential to spread to other sectors in the economy, thus triggering inflation. The results are in line with purchasing power parity theory, which argues that exchange rates between two countries should be equal to their price level ratios. When rising price levels or inflation will lead to a decrease in the country's currency or depreciation. Conversely, when the price level decreases, there will be an appreciation of the currency. The results of the study are in line with previous examination which states that exchange rate movements (increases-decreases) in the short term cause general price changes to the same degree (Koku et al., 2016; Tugral & Bari, 2021). Changes in the exchange rate will have a strong impact on inflation. The results also revealed that the exchange rate is still the main source of inflationary pressure.

A positive coefficient value indicates that when the Loan Interest Rate rises, it directly affects Inflation. The price of factors of production is influenced by the interest rate on loans. When loan interest rates increase, it will increase the price of these factors of production. As the price of factors of production increases, producers will increase the price of goods. If the increase in the price of these goods occurs in general, it will increase inflation. This is in line with the theory of liquidity preferences where the theory of liquidity preferences explains that when interest rates increase, it will increase the velocity of money. This rapid velocity of money indicates economic conditions that show an increase in demand for goods and services. An increase in demand will cause the price of goods to rise, which in turn will cause inflation to increase. Inflation has a direct impact on GDP growth, so the increase in lending rates causes an increase in inflation (Dinh, 2020; Long et al., 2021; Nguyen, 2018). Lending rates affect GDP growth through appropriate borrowing thresholds, if it exceeds this threshold, it will cause inflation. Research conducted by the country also shows a positive relationship between loan interest rates and inflation (Nguyen, 2018). Interest rates on bank loans are positively related to the inflation rate. This has implications when bank lending rates increase, the inflation rate will also increase (Dinh, 2020).

## **5. Conclusion**

Based on the results of the analysis and discussion of the effect of financial inclusion, exchange rates and lending rates on inflation in 17 emerging markets countries for the period 2008 to 2021 which has been described in the previous chapter, this study uses the GMM System method where conclusions are obtained, among others, first, Financial inclusion in 17 Emerging Markets countries continues to increase. This is in accordance with what is expected by international organizations such as the United Nations, IMF, APEC and others. Second, Financial inclusion has a significant negative effect on inflation in 17 emerging market countries. The research found that financial inclusion is important to ensure that

everyone feels the direct impact of monetary policy changes, namely inflation. The findings demonstrate that lowering inflation is a function of expanding financial inclusion.

Third, exchange rates have a significant positive effect on inflation in 17 emerging market countries. An exchange rate increase means that there is a decrease in the value of the country's currency (depreciation). Currency depreciation can increase inflation as the price of imported goods becomes more expensive. This increase in the price of imported goods has the potential to spread to other sectors in the economy, thus triggering inflation. Fourth, lending rates have a significant positive effect on inflation in 17 emerging market countries. The price of factors of production is influenced by the interest rate on loans. When loan interest rates increase, it will increase the price of these factors of production. As the price of factors of production increases, producers will increase the price of goods. If the increase in the price of these goods occurs in general, it will increase inflation

Based on the results and conclusions of the analysis, several recommendations can be made for policies that can be implemented and improvements to this research, including: First, the results of the study show that Financial Inclusion plays a role in controlling inflation. Therefore, the central bank as the monetary authority is expected to strengthen the implementation of pre-existing inclusive financial policies. Second, the government is also expected to participate in financial inclusion policies by providing facilities that can make it easier for unbanked people to be interested in creating accounts, creating special institutions that handle financial inclusion, providing education about financial inclusion, and improving consumer protection. When financial inclusion increases, it will increase the effectiveness of monetary policy which then affects inflation. Third, people are expected to support, save and borrow so that financial inclusion can increase.

## **6. Limitations and suggestions for future research**

It is important to remember that this study has some limitations that can be corrected for future research. To this end, the sample size can be increased by adding developed countries or other groups of countries, such as countries that have policies that target inflation and non-inflation. Then for the financial inclusion index dimension, the dimensions of affordability and punctuality can be added. Affordability refers to an individual's ability to have access to financial services that suit their needs, while punctuality refers to an individual's ability to have access to financial services in a timely and effective manner. Affordability can be measured using indicators such as: the number of customers who have access to formal and informal financial services, the level of use of financial services by the community, the availability of financial services that are in accordance with the needs of the community. Punctuality can be measured using indicators such as: the time needed to gain access to financial services, the speed of sending funds to customer accounts, the speed of sending information to customers about financial transactions (Abdurehman, 2016).

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