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# Relationship between Financial Inclusion and Monetary Policy on Economic Growth: Evidence from Panel Data Draw from a Sample of Developing Countries

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## Abstract

Financial inclusion augments the ability to acquire economic resources and ensure the livelihood of individuals in different economic systems. Rising the accessibility of financial infrastructure stimulates the economic power of human beings. The study analyses the relationship between financial inclusion, and monetary policy on the economic growth of Developing Countries using panel data from 2010 to 2020. The panel unit root tests indicated that real gross domestic product, exchange rate, and interest rate are stationary at the level. In contrast, Automated Teller Machines, Bank branches, inflation rate, and money supply are stationary at the first difference. The Generalized Method of Moment (GMM) results shows that bank branches have a positive but statistically significant effect on real gross domestic product in the selected developing countries. The automated Teller Machine has a positive but statistically insignificant effect on real gross domestic product in the selected developing countries. The interest rate has a negative but statistically significant effect on real gross domestic product in the selected developing countries. The inflation rate negatively but statistically significant effect on real gross domestic product in the selected developing countries. Money supply has a negative but statistically significant effect on real gross domestic product in the selected developing countries. The exchange rate negatively and statistically insignificant effect on real gross domestic product

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in the selected developing countries. The study concluded that both financial inclusion and monetary policy have a positive and significant effect on economic growth in developing countries for the period under study. The study recommends that Government should ensure that commercial banks perform a perfect banking system and ensure that customer satisfaction is met in terms of providing varieties of ATMs, opening new branches, etc by so doing economic growth could be achieved in developing countries. In taking austerity measures on the economy the central authority should not employ only monetary policy but rather a combination of fiscal policy in order to stabilize the economy and achieve higher economic growth in developing economies.

**Keywords:** Financial inclusion, Monetary policy, Economic growth, developing countries, Generalized Method of Moment (GMM)

## 1. Introduction

Financial inclusion has become a global challenge for developing economies, but also a mere topic for developed economies. Financial inclusion augments the ability to acquire economic resources and ensure the livelihood of individuals in different economic systems. Rising the accessibility of financial infrastructure stimulates the economic power of human beings. There are millions of people who are not included in the formal financial (FF) sector as a result of insufficient earnings and facilities in developing regions. Financial exclusion results in minimized funds available for investment, which results in low capital accumulation. Thus, financial inclusion helps to solve this issue through greater economic expansion (Thathsarani, Wei, & Samaraweera, 2021).

In developing economies of Africa and Asia, most people are not using the goods and services supplied by financial institutions or they do not have any bank accounts even. There are certain factors that result in financial exclusion which include low income, financial illiteracy, lack of proper documentation, distant financial institution, and complex financial goods and services (Oji, 2015). According to Global Findex Database (2014), about 2 billion young people do not have a bank account in any bank; they are not using banking services especially in developing economies. There are many other reasons for not having an account which includes lack of money, geographical reasons, strict conditions of banks, etc. Due to financial exclusion poverty goes up and economic growth decline in developing countries.

A financial system has the ability to serve all members of a community, especially women and the poor, can provide educational and investment opportunities for every household; it can assist people to receive bank loans,

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have insurance coverage for various types of risks, and facilitate and secure payments (Avais, 2014; Mader, 2018). Well-functioning financial systems promote the establishment of new enterprises and the growth of existing companies (Demirguc-Kunt & Levine, 2008), good sound economic empowerment, and active participation in the financial system of youth, women, and other vulnerable groups previously marginalized (Siddik, 2017). Furthermore, about 515 million adults acquired a financial account over three years whereas 1.2 billion people opened an account with a formal financial institution or provider of mobile financial services between 2010 and 2017. By any metric, this is a remarkable improvement, but so much remains to be done. By 2017, 1.7 billion people aged 16 and above had zero access to an account, which is about 31per cent of the world's adult population (Demirguc-Kunt et al, 2018). Moreover, the report showed that every one out of two people in the world did not have access to a formal savings account, insurance, loan, and other financial services. The report also showed that less than a quarter of adults possessed an account, in a formal financial institution and most of them used informal methods to save, and their borrowings were mainly for family, friends, and other traditional techniques (Demirguc-Kunt et al., 2018). According to Deep Knowledge Analytics & Future Fintech (2019), the figure of adults excluded from financial services in many economies is greater than the adult population living below the poverty line of $2 per day. A study on financial inclusion in terms of ownership and use of accounts showed that financial exclusion among individuals resulted from a high minimum balance to maintain a bank account, non-close proximity to financial institutions, lack of legal rights, and not environmentally sustainable (Allen, Demirguc-Kunt, Klapper, & Martinez Peria, 2016).

Based on the literature reviewed the current study identified that most of the studies on financial inclusion, monetary policy, and economic growth were conducted in Sub-Saharan Africa (Ajide, 2017), High, middle and low-income countries (Chu, 2019), middle-income countries (Elsayed et, al, 2019), Asian countries (Lei et, al 2019), Central and West Africa countries (Soumaré et, al 2016) and West Africa countries (Akudugu, 2013). Therefore, the current study specifically examined the relationship between financial inclusion and monetary policy on economic growth in developing countries. Based on the availability of data, 23 developing countries are taken over the period 2010 to 2020 in the study. Difference GMM was used to estimate the impact of financial inclusion and monetary policy on economic growth. The main objective of the paper is to investigate the relationship between financial inclusion and monetary policy on the economic growth of Developing Countries. The other segment of the paper is designed as follows: literature review which is the second part of the study, methodology which discussed the technique of analysis employed in the study and is the third part of the

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paper, part four of the paper is the presentation and analysis of the empirical findings and the final section concludes the paper.

## 1.2. Components of Financial Inclusions

To measure the index, we take the importance of the largest demand-side harmonized dataset at the individual level, the World Bank's Global Findex (2011 and 2014). It offers a homogeneous measure of indicators for individuals' use of financial products across economies. This survey gather information about 150,000 nationally representative and randomly selected adults from 140 countries in 2011 and 137 in 2014, across the world. Data available at the individual, rather than household, the level is also an advantage that increases the accuracy and comparability of the analyses. This database fills an important gap in the financial inclusion data landscape. We also use supply-side aggregate data on access from the International Monetary Fund's Financial Access Survey (2015). This is a source of supply-side data that offers information on an unbalanced panel of 189 countries, covering the period 2004-2015.

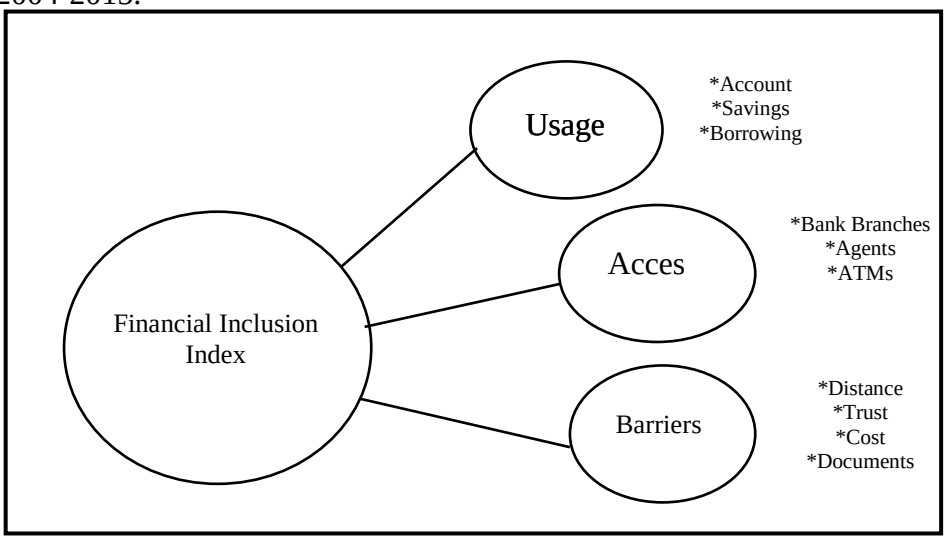


**Figure 2.1** Components of Financial Inclusions

i. Usage: -To assess the extent of usage of the formal financial services by individuals, we try to proxy the utility derived of using such services by considering the use of different products: holding at least one active financial product that allows making and receiving payments and storage money, having a savings account and having a loan in a formal financial institution. Taking advantage of the information in the Global Findex data set, we can calculate the usage direction of formal financial services. We built the indicator to account for people using at least one formal financial service that allows making and receiving

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payments and storage of money by adding information from several questions in the Global Findex. We consider formal financial service users for this indicator as the percentage of respondents who report having an account (by themselves or together with someone else) at a bank or another type of financial institution. Account at a financial institution such as respondents who report having an account at a bank or at another type of financial institution, like a credit union, microfinance institution, cooperative, or the post office (if applicable), or having a debit card in their own name. It includes an additional 2.77 percent and 2.04, for 2014 and 2011 respectively, of respondents who report not having any of the previous products but receiving wages, government transfers, or payments for agricultural products into an account at a financial institution in the past 12 months; pay utility bills or school fees from an account at a financial institution in the past 12 months, or receive wages or government transfers into a card in the past 12 months. Often, these individuals are not aware that they have a bank account.

ii. Barriers: -The barriers to financial inclusion, perceived by unbanked individuals, provide information about the bottlenecks that prevent them from using formal financial services. This information gives an additional angle to examine the extent of financial inclusion since it provides the number of financially excluded individuals and the reasons perceived by these individuals for being excluded from the formal financial system. There are two types of financial exclusion: voluntary or self-exclusion and involuntary. If we treat financial inclusion as a behavioral issue, individuals need to decide whether to participate in the formal financial system given their budget constraints and utility function. One possibility is that some individuals do not have a demand for formal financial services, leading them to self-exclusion because of cultural reasons, lack of money or just because they are not aware of the benefits of these types of services. This choice can be shaped by imperfect information about the utility of financial services for managing risk, savings for the future, and affordability of different investments such as education or buying a house. However, exclusion can also be due to other market imperfections such as the lack of access to financial services or an inappropriate product range that does not satisfy people's needs. The latter bottlenecks that hinder financial inclusion may be associated with the category of involuntary exclusion so that people cannot satisfy their demands.

In order to calculate the magnitude of inclusiveness of financial systems, from the unbanked perspective, we take into account only the information about barriers that represent involuntary exclusion such as

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distance, lack of the necessary documentation, affordability, and lack of trust in the formal financial system. The question about perceived barriers is formulated in the Global Findex questionnaire in such a way that individuals can choose multiple reasons for not having a bank account.

According to the Global Findex data set, about 20 percent and 16, for 2011 and 2014 respectively, of the unbanked population cites distance as one of the reasons that hinder them from having an account. This reason occurs more frequently in developing countries where access points are remote. Documentation requirements are also cited as a perceived barrier to financial inclusion by almost 20 percent of the unbanked in 2011 and 19 percent in 2014. Affordability is the second most, in addition, we consider as banked those individuals who reported not having a bank account because someone else in the family already has one. They are contemplated as indirect users of formal financial services.

iii. Accessibility: - Access to formal financial services represents the possibility for individuals to use them. However, greater access does not necessarily imply a higher level of financial inclusion. There is a threshold for access since, when it reaches a certain level, a marginal increase does not necessarily generate a financial inclusion increase. It may enhance frequency in the use of financial services, by increasing the intensive margin of usage but does not necessarily improve extensive margin, in terms of higher percentages of accounts held or any other financial service. However, greater access is expected to foster financial inclusion when access levels are below the threshold, through greater availability, if financial services meet the needs of the population. Also, when increasing access is generated from different financial companies, more intense competition may increase the consumption of financial services through prices too, even above the threshold.

Banking agents, also known as banking correspondents, are non-financial commercial establishments that offer basic financial services under the name of a financial services provider, facilitating access points to the formal financial system. The establishments are shared across diverse sectors (grocery shops, gas stations, postal services, pharmacies, etc.), as long as they are brick-and-mortar stores whose core business involves managing cash. In its most basic form, banking correspondents carry out only transactional operations (cash in, cash out) and payments but, in many cases, they have evolved as a distribution channel for the banks ‘credit, saving, and insurance products.

These three indicators account for the physical points of services offered by the institutions belonging to the formal financial system such as

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commercial banks, credit unions, saving and credit cooperatives, deposit-taking microfinance, and other deposit takers (savings and loan associations, building societies, rural banks, and agricultural banks, post office agro-allied institutions, post office savings banks, savings banks, and money market funds). Information on ATMs and bank branches is collected by financial services providers through the International Monetary Fund's Financial Access Survey (FAS).

Access itself is not enough. Even if FinTech is able to provide access to about 2 billion people that are excluded from formal financial services, it wouldn't make big difference if those people are not using the services. According to the Asia foundation's publication last year, in developing countries, around 10 percent of adults with formal accounts are neither making deposits nor withdrawals in a typical month compared to 2 percent in developed economies.

Thus, access is important but more importantly, is the usage that can be enhanced through financial education. It could indeed be challenging for people to use the services when they are complex. The main target in boosting financial service usage is financial education and more importantly educating the young population who in the future will be able to make sustainable financial choices, which will have a positive impact on the people and the society at large.

### 1.3. Financial Inclusion and Monetary Policy theory

There is no existing economic theory, according to the author's knowledge, that links financial inclusion or financial deepening to monetary policy or, specifically, to inflation. On the theoretical side, however, most of the work on monetary policy is focused on a context that assumes that a representative household exists. Although some households are able to hold assets and smooth consumption over time, others are unable to hold assets and thus are unable to respond to changes in interest rates. It is common knowledge that informal labor and credit market information is essential for understanding the transmission mechanism of monetary policy and the conduct of an efficient monetary policy. These sentiments are accepted by numerous authors: because financial inclusion enhances the resilience of aggregate demand to the interest rate, it has been argued that it is useful for monetary policy performance (Mbutor and Uba, 2013). Immature financial markets tend to weaken monetary policy's effectiveness, and financial inclusion makes monetary policy more effective by removing the need for the informal sector, which tends to interfere with monetary policy's effects, at least as long as the monetary policy only uses regulated financial institutions.

For monetary policy, the presence of high levels of financial exclusion suggests the following, Firstly, most agents (households) and even informal

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firms do not look at interest rates as a guide, nor do they respond to them but interest rates are an important monetary policy instrument. Second, the broad informal sector uses informal finance and non-banking currencies. Thirdly, the rates and how they are set are informal markets for which the central bank is unaware and cannot account for them. Fourthly, the signaling of the monetary policy of developing countries' apex banks can enter only a small segment of the economy which is not capable of organizing the entire market. Increased financial inclusion would also mean less cash outside the banking system that could be improved; the transmission mechanism, the speed and money multipliers that are subject to fluctuations that complicate monetary policy analysis, the volatile and unpredictable demand for money, and the volatile relationship between the intermediate target (broad money) and the operational target (reserve money) under the monetary target (reserve money) under a money targeting framework, which is what most developing countries are using.

## 2. Empirical Literatures

Elsherif (2019) examined the relationship between financial inclusion and monetary policy transmission in Egypt for the period 2000 to 2017 using time series data. The study employed a vector error correction model (VECM) and include commercial bank branches, ATMs, domestic credit, account ownership, and depositors with the commercial bank as variables in the analysis. The result shows that financial inclusion and monetary policy of a long-run relationship. The reaction of policy effectiveness to the positive financial inclusion shock is statistically significant.

Ebenezer, Joshua, Kofi, and Agyapomaa (2019) investigated the dynamic and bi-causal link between monetary policy and financial inclusion in sub-Saharan Africa using panel data. Variables used in the study include MPR, ATM, CBB, CBA, Browers from commercial banks, depositors from commercial banks, inflation exchange rate, and GDP and employed Panel VAR. The findings suggest that a bi-causal relationship exists between monetary policy and financial inclusion. Specifically, it is evident that monetary policy affects financial inclusion, and financial inclusion is also influenced by monetary policy. The policy implication of this study is that the effectiveness of monetary policy depends on financial inclusion. Hence, the efforts of governments in sub-Saharan African countries should aim at policies that enhance financial inclusion for the effective implementation of monetary policy.

Usman and Adigun (2019) assessed the relationship between financial inclusion and money supply in Nigeria from 1981 to 2016. Total loans of rural banks, a total deposit of rural banks, the number of Automated Teller Machines (ATM) per 100,000 adults, and the total number of commercial

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bank branches are the variables included in the model. The study employed the Multiple Regression and Error Correction Model and the result revealed important positive relationships between currency supply and total loan of rural banks (t=4.651, p=0.001), total credit to individuals(t=4.427, p=0.0001), number of bank branches (t=1.734, p=0.094) and the number of ATMs per 100,000 adults(t=3.605, p=0.0012). Suggested that the Central Bank of Nigeria (CBN) should implement financial policies that will generate a positive investment climate through market-based interest rates that will inspire investments and absolutely impact the money supply and hence lead to rising in the financial inclusion level.

Anthony-Orji, Orji, Ogbuabor, and Onoh, (2019) investigated the impact of monetary policy shocks on financial inclusion in Nigeria using the Vector Autoregression Model (VAR). Financial inclusion, interest rate, money supply, and deposit rates of bank deposits are the variables in the model. Findings of the study reveal that shocks to minimum rediscount rate, interest rate, broad money supply, and deposit rates of deposit banks all have a significant impact on financial inclusion in Nigeria. The study recommends that there is a need to adopt effective monetary policy measures that will increase financial inclusion in the country.

Ebenezer (2018) examined the relationship between financial inclusion, monetary policy, financial sector development, and financial regulation in Sub-Saharan Africa using Panel data. The study employed Panel VAR and includes MPR, financial inclusion, real exchange rate, GDP, and inflation as variables in the model. The findings indicate that there is a reverse causality between financial sector development and financial inclusion in both the Sub-Sahara Africa countries sample and the full sample. Financial inclusion is a driver of financial sector development and vice versa.

Brownbridge, Bwire, Rubatsimbira, and Grace (2017) investigated the strength of the impulse response of inflation to the monetary policy variable using the consumer price index (CPI), nominal exchange rate, and nominal gross domestic product (GDP) and the policy interest rate as variables in the analysis. The study employed panel vector error correction (PVEC) methodology and panel vector auto-regressions (PVARs). The results show that countries with higher levels of financial inclusion depict stronger impulse responses, although this does not necessarily mean that higher levels of financial inclusion are the cause of stronger monetary transmission mechanisms as the degree of financial inclusion may be associated with other aspects of development which also affect the monetary transmission mechanism.

Harley, Adegoke, and Adegbola (2017) examined the empirical study on the role of financial inclusion in economic growth and poverty reduction in a developing economy using panel data analysis ranges from 2006 to 2015 using

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a log-linear model specification framework. The results show that the records of active ATMs, bank branches and government expenditures selected from three African countries were the most robust predictors of financial inclusion on poverty reduction in a developing economy. The result shows that a one percent increase in the ratio of active ATMs will lead to about a 0.0082 per cent increase in the gross domestic product and a reduction of poverty in developing economies. According to them, an indicator shows that most of the ATMs in developing economies are outdated and thus required a technological upgrade to have a significant impact in rural areas. The coefficient of determination was very high as it showed that about 92 per cent of the total variations in the real growth rate of the gross domestic product are explained by all the independent variables in the model. Consequently, the researchers recommended that Government should focus on poverty reduction through a focus on infrastructural development that will enhance banking services.

Okoye, Erin and Modebe (2017), in their study, investigated the outcome of financial inclusion on economic growth and development in Nigeria over the period 1986 to 2015 using the Ordinary Least Squares technique. They measured financial inclusion in the study using a loan to deposit ratio, financial deepening indicators, loans to rural areas, and branch networks. Measures of financial deepening adopted in the study are ratios of private sector credit to GDP and broad money supply to GDP. Economic growth was proxied as growth in GDP over successive periods while per capita income was adopted as a measure of poverty, hence an index of development. The study showed that credit delivery to the private sector has not significantly supported economic growth in Nigeria and that financial inclusion has promoted poverty alleviation in Nigeria through rural credit delivery. The paper recommended that the monetary authorities should deepen financial inclusion efforts through enhanced credit delivery to the private sector as well as strengthen the regulatory framework to ensure efficient and effective resource allocation and utilization.

Evans (2016) investigated financial inclusion and monetary policy effectiveness in Africa, Monetary policy effectiveness, financial inclusion, money supply, and interest rate are the variables included in the model. The Panel VECM approach was adopted in the analysis and the result shows that financial inclusion and monetary policy effectiveness in a long-run relationship. On the other hand, the positive interest rate has a positive and statistically significant permanent effect on the level of monetary policy effectiveness.

Nandru, Byram, and Rentala (2016) examined the impact of ownership of a bank account and use of banking services as determinants of financial inclusion using cross-sectional data and used Ownership of account, income level, age, gender, employment status, and educational level as variables in the

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model. The study employed the logit model and found that income level and education have a significant impact on financial inclusion as measured by the ownership of a bank account.

Lenka and Bairwa, (2016) investigated the impact of financial inclusion on the monetary policy of South Asian Association for Regional Cooperation (SAARC) countries from 2004 –2013. The study employed inflation rate, commercial bank branch, ATMs, Outstanding loans from commercial banks (% of GDP), outstanding deposits with commercial banks (% of GDP), commercial bank lending IR, and Foreign Exchange rate as variables and adopted FEM, REM, and Panel-corrected standard errors. The result of the study indicates that financial inclusion, exchange rate, and interest rate are negatively associated with inflation in SAARC countries.

Hung (2015) analyzed the relationship between financial inclusion and monetary policy in Vietnam from 2004 to 2015 using time series data, variables included in the model are; Inflation rate, financial inclusion index, commercial bank branch, ATMs, interest rate, and exchange rate. The study employed a vector error correction model (VECM) and found an increase in the financial inclusion index would lower inflation, which is used as a proxy for the effectiveness of the monetary policy. In addition, the lending interest rate of banks is in negative relation to the inflation in Vietnam.

Mbutor and Uba (2013) examined the impact of financial inclusion on monetary policy in Nigeria using time series data and including banks' lending rates, loans and advances of commercial banks, rural branch deposits and loans, exchange rates, and several bank branches. The study adopted the Ordinary least square model (OLS). The result of the study supports the notion that growing financial inclusion would improve the effectiveness of the monetary policy.

## 3. Methodology

### 3.1. Model Specification

The dynamic model was an important model for the research on financial inclusion because countries are heterogeneous in their targeted monetary policies. Additionally, besides, the dynamic model is advantageous because most financial inclusion and monetary policy research had issues with endogeneity, and several explanatory variables may be correlated with the unobservable country-specific effects. Therefore, the present study employed a specified dynamic panel model and applied the two-step system generalized method of moment (GMM) estimation technique. GMM improved efficiency, specifically when the dependent variable was persistent (Arrelano and Bover, 1995).

$$GDP = ATM + CBB + MS + EXRATE + INF + INT + U_{it} \ldots\ldots\ldots\ldots (3.1)$$

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Where:
GDP = Gross Domestic Product
ATM = Automated Teller Machine per 100,000 adults
CBB = Bank Branch per 100,000 adults
EXRATE = Exchange rate
INF = Inflation Rate
INT = Interest rate
MS = Money supply
This Model is adopted from the work of Gretta (2017), Elsharif (2019), Evans (2016) and Mbutor &Uba (2013) with little Modifications

### 3.2. Generalize method of moment (GMM)

The difference GMM started by estimating the model in differences and included lagged values of the explained and the explanatory variables as internal instruments. First, the model specification started with a specification on level equation such as

$$Y_{it} = \lambda Y_{it-1} + \gamma X_{it} + \eta_{it} + \mu_{it}, \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3.2)$$

Where Y (explained variable) is a function of its past values. The models added explanatory variables X which are assumed to be weakly exogenous and firm-fixed effects. Second, after transforming model 7 into the first difference, it becomes:

$$\Delta Y_{it} = \lambda \Delta Y_{it-1} + \gamma \Delta X_{it} + \Delta \mu_{it}, \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3.3)$$

The transformation in model 7 into the first difference eliminated the firm-specific effects ($\eta_i$). However, there was a new endogeneity problem as a result of the correlation between the lagged explained variable ($Y_{it-1}$) and the different error term $\mu_{it}$, as well as the possibility that some independent variables were endogenous. As such, these problems were solved via higher-order lags of the explained variable such as $Y_{it-2}$ as instruments for $Y_{it-1}$ and higher-order lags for the explanatory variables such as $X_{it-2}$ as instruments (Arellano and Bond, 1991). Additionally, the difference GMM estimators provided consistent and unbiased estimators when this moment conditions were sustained and were valid.

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# 4. Empirical Results and Discussion

## 4.1. Descriptive statistics

**Table 4.1** Descriptive statistics

| Statistics | RGDP | ATM | BB | EXRATE | INF | INT | MS |
|---|---|---|---|---|---|---|---|
| Mean | 11.48542 | 42.78506 | 11.63781 | 100.0076 | 5.751479 | 8.106063 | 70.80946 |
| Median | 11.49771 | 28.61229 | 10.41000 | 55.06000 | 4.900000 | 4.902500 | 66.20537 |
| Std. Dev. | 0.551690 | 35.45064 | 5.106473 | 115.5296 | 4.273271 | 7.930438 | 33.64109 |
| Skewness | 0.527789 | 0.863422 | 0.483056 | 0.725886 | 0.609119 | 0.982633 | 0.559499 |
| Kurtosis | 3.222985 | 2.554154 | 2.343337 | 5.473502 | 7.998533 | 6.475035 | 2.370498 |
| Jarque-Bera | 8.196273 | 22.39791 | 9.608923 | 126.9819 | 248.8693 | 195.7527 | 11.60770 |
| Probability | 0.356127 | 0.291314 | 0.938193 | 0.421786 | 0.423217 | 0.858632 | 0.643016 |
| Observations | 170 | 170 | 170 | 170 | 170 | 170 | 170 |

*Source: researcher computation using E-views 10.*

Table 4.1 indicates the result of descriptive statistics of the study, it indicates that the standard deviations of the variables employed are far away from their means except for money supply (33.64109). The Skewness of the distribution in the table shows positive values for all the variables under study such as gross domestic product, Automated Teller Machines, bank branches, exchange rate, inflation rate, interest rate, and money supply. This indicates that these variables are skewed to the right and are normally distributed. The Kurtosis in the table shows that real gross domestic product Automated Teller Machines, bank branches, and money supply are normally distributed while exchange rate, inflation rate, and interest rate are not normally distributed because their Kurtosis values are greater than 3.

The Jarque-Bera test for normality is also estimated. It indicates that all the variables employed are normally distributed because their p-values are greater than 5 %.

## 4.2. Panel unit root test

### 4.2.1. Levin Lin and Chu, Breitung, and Im Pesaran and Shin unit root test

**Table 4.2** Levin Lin and Chu, Breitung, and Im Pesaran and Shin unit root test

| | Test at Level | | | Test at first difference | | |
|---|---|---|---|---|---|---|
| Variables | LLC PV | Breitung PV | IPS PV | LLC PV | Breitung PV | IPS PV |
| RGDP | 0.0000** | 0.1532 | 0.0256** | - | 0.0210* | - |
| ATM | 1.0000 | 0.3829 | 0.6794 | 0.0000** | 0.0032** | 0.0313** |
| BB | 1.0000 | 0.6860 | 0.5767 | 0.0000 | 0.0335 | 0.0404 |
| EXRATE | 0.0000** | 0.0000** | 0.0005** | - | - | - |
| INF | 0.0846 | 0.9669 | 0.9381 | 0.0031** | 0.0091* | 0.0221* |
| INT | 0.0000 | 0.0035 | 0.0003 | - | - | - |
| MS | 0.0006 | 1.0000 | 0.5918 | 0.0000** | 0.0000** | 0.0166** |

*Source: Researcher computation using E-views 10.*

*The asterisks *, ** indicate rejection of the null hypothesis at 10% and 5% levels respectively.*

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Table 4.2 indicates the panel unit root test of Levin Lin and the Chu (LLC), Breitung, and I'm Pesaran and Shin (IPS) unit root test, the tests show that real gross domestic product is stationary at a level under LLC and IPS tests while in Breitung test is stationary at first difference. Furthermore, from table 4.2 the result shows that Automated Teller Machines, Bank branches, inflation rate, and money supply are stationary at first difference i.e. they are I(1) process. In contrast, exchange rate and interest rate are stationary at level i.e. they are I(0) processes. Therefore, based on the Levin Lin and Chu, Breitung, and I'm Pesaran and Shin unit root test there is a mixture of the order of integration of the variables under study.

## 4.3. Panel Cointegration

**Table 4.3** Kao panel Cointegration Test

| **ADF t-statistic** | **Probability** |
|---|---|
| -0.426438 | 0.3349* |

Source: *Researcher computation using E-views 10.*

Table 4.3 presents the result of the Kao residual panel cointegration test. The result confirmed the absence of cointegration amongst the variables in the model as the ADF t-statistics probability value is significant at 1%. Therefore, we cannot reject the null hypothesis and concludes that no long-run relationship exists, because the p-value is greater than 5.

## 4.4. Generalized Method of Moment (GMM)

**Table 4.4** Generalized Method of Moment (GMM)

| **Variables** | **Coefficient** | **Standard Error** | **T-statistics** | **P-Value** |
|---|---|---|---|---|
| LGDP(-1) | 0.367426 | 0.087044 | 4.221148 | 0.0000 |
| BB | 0.006845 | 0.006635 | 1.031606 | 0.0001 |
| ATM | 0.000834 | 0.000549 | 1.520773 | 0.0753 |
| INT | -0.000577 | 0.002069 | -0.278780 | 0.0000 |
| INFL | -0.006214 | 0.001608 | -3.863470 | 0.0000 |
| LMS | -0.063585 | 0.016922 | -3.757524 | 0.0000 |
| EXRATE | 0.000192 | 0.000363 | 0.528215 | 0.0737 |
| | | | | |
| | | | | |
| Arellano-Bond Serial correlation test | | | | |
| AR(1) | | | | 0.4580 |
| AR(2) | | | | 0.6250 |
| J-statistic | | | | 1.326017 |
| Prob(J-statistic) | | | | 0.506148 |

Source: *Researcher computation using E-views 10.*

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Table 4.4 indicates the Generalized Method of Moment (GMM) result of the estimated model in the study, the result shows that the dependent variable (real gross domestic product) at lag 1 has a positive and statistically significant, which means that the dependent variable depends largely on itself. Bank branches indicate positive but statistically significant effects on the real gross domestic product in the selected developing countries, this implies that an increase in bank branches by a single digit will result in an increase in the real gross domestic product in the selected developing countries. This is concurring with the finding of Harley et al (2017). Automated Teller Machine indicates positive but statistically insignificant effects on the real gross domestic product in the selected developing countries, meaning that an increase in Automated Teller Machine will bring about an increase in the real gross domestic product in the selected developing countries. This conforms to the economic apriori expectation which establishes the positive relationship between Automated Teller Machine and real gross domestic product in developing countries. The positive finding is similar to the finding of Harley et al (2017). Interest rate indicates negative but statistically significant effects on the real gross domestic product in the selected developing countries, this means that an increase in interest rate will result in a decrease in the real gross domestic product in developing countries. The inflation rate indicates negative but statistically significant effects on the real gross domestic product in the selected developing countries, by implication an increase in the inflation rate in developing countries will result in a decrease in their real gross domestic product. Money supply indicates negative but statistically significant effects on the real gross domestic product in the selected developing countries, this means that an increase in money supply in developing countries will result in a decrease in their real gross domestic product. The exchange rate shows positive but statistically insignificant effects on the real gross domestic product in the selected developing countries, this implies that an N1 increase in the exchange rate will bring about an increase in the real gross domestic product in the selected developing countries. This concurred with the economic apriori expectation which assumed the positive relationship between exchange rate and real gross domestic product.

The Arrelano and Bond serial correlation test shows that both AR (1) and AR (2) p-values are greater than 5%, this means that we cannot reject the null hypothesis and conclude that model has no serial correlation problem. In another word, the model is free from serial correlation problems. Furthermore, the J-statistic in the table which tests the over-identification restriction in the model is close to zero and its corresponding p-value is far from zero, this indicates the good fitness of the model.

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## Conclusion and Recommendations

The study examines the relationship between Financial Inclusion and monetary policy on Economic growth: Evidence from Panel Data Draw from a Sample of Developing Countries from 2010 to 2020 and employed the following variables; real gross domestic product, bank branches, Automated Teller Machines, exchange rate, inflation rate, interest rate, and money supply. The panel unit root tests show that real gross domestic product, exchange rate and interest rate are stationary at level i.e they are I(0) process. Automated Teller Machines, Bank branches, inflation rate, and money supply are stationary at first difference i.e they are I(1) process. The Generalized Method of Moment (GMM) results show that bank branches have a positive but statistically significant effect on real gross domestic product in the selected developing countries. The automated Teller Machine has a positive but statistically insignificant effect on real gross domestic product in the selected developing countries. The interest rate has a negative but statistically significant effect on real gross domestic product in the selected developing countries. The inflation rate has a negatively but statistically significant effect on real gross domestic product in the selected developing countries. Money supply has a negative but statistically significant effect on real gross domestic product in the selected developing countries. The exchange rate has a negatively and statistically insignificant effect on real gross domestic product in the selected developing countries. Based on this the study concluded that financial inclusion has a positive and significant effect on economic growth in developing countries for the period under study while monetary policy has a negative effect on economic growth in developing countries for the period under study. The study recommends that Government should ensure that commercial banks perform a perfect banking system and ensure that customer satisfaction is met in terms of providing varieties of ATMs, opening new branches, etc by so doing economic growth could be achieved in developing countries. In taking austerity measures on the economy the central authority should not employ only monetary policy but rather a combination of fiscal policy in order to stabilize the economy and achieve higher economic growth in developing economies.

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## Appendix

### Descriptive statistics

| | LGDP | ATM | BA | BB | EXRATE | INF | INT | MS |
|---|---|---|---|---|---|---|---|---|
| Mean | 11.48542 | 42.78506 | 361.5987 | 11.63781 | 100.0076 | 5.751479 | 8.106063 | 70.80946 |
| Median | 11.49771 | 28.61229 | 130.2200 | 10.41000 | 55.06000 | 4.900000 | 4.902500 | 66.20537 |
| Maximum | 12.45796 | 124.2953 | 2133.160 | 25.73000 | 590.2300 | 29.50000 | 39.65424 | 163.7435 |
| Minimum | 10.00016 | 2.053480 | 3.197033 | 4.300000 | 2.620000 | -1.100000 | 0.500000 | 16.33246 |
| Std. Dev. | 0.551690 | 35.45064 | 445.0615 | 5.106473 | 115.5296 | 4.273271 | 7.930438 | 33.64109 |
| Skewness | -0.527789 | 0.863422 | 1.639316 | 0.483056 | 1.725886 | 1.609119 | 1.982633 | 0.559499 |
| Kurtosis | 3.222985 | 2.554154 | 6.002713 | 2.343337 | 5.473502 | 7.998533 | 6.475035 | 2.370498 |
| Jarque-Bera | 8.196273 | 22.39791 | 139.1836 | 9.608923 | 126.9819 | 248.8693 | 195.7527 | 11.60770 |
| Probability | 0.356127 | 0.291314 | 0.174891 | 0.938193 | 0.421786 | 0.423217 | 0.858632 | 0.003016 |
| Sum | 1941.036 | 7230.674 | 61110.18 | 1966.791 | 16901.29 | 972.0000 | 1369.925 | 11966.80 |
| Sum Sq. Dev. | 51.13284 | 211133.7 | 33277397 | 4380.779 | 2242311. | 3067.822 | 10565.83 | 190129.5 |
| Observations | 170 | 170 | 170 | 170 | 170 | 170 | 170 | 169 |

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## Panel unit root test

Panel unit root test: Summary
Series: GDP
Date: 01/11/22 Time: 10:46
Sample: 2010 2020
Exogenous variables: Individual effects, individual linear trends
User-specified lags: 2
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

| Method | Statistic | Prob.** | Cross-sections | Obs |
|---|---|---|---|---|
| Null: Unit root (assumes common unit root process) | | | | |
| Levin, Lin & Chu t* | -11.9004 | 0.0000 | 22 | 176 |
| Breitung t-stat | -1.02292 | 0.1532 | 22 | 154 |
| Null: Unit root (assumes individual unit root process) | | | | |
| Im, Pesaran and Shin W-stat | -1.95033 | 0.0256 | 22 | 176 |
| ADF - Fisher Chi-square | 83.8056 | 0.0003 | 22 | 176 |
| PP - Fisher Chi-square | 41.9822 | 0.5585 | 22 | 220 |

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Panel unit root test: Summary
Series: D(GDP)
Date: 01/11/22 Time: 10:48
Sample: 2010 2020
Exogenous variables: Individual effects, individual linear trends
User-specified lags: 2
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

| Method | Statistic | Prob.** | Cross-sections | Obs |
|---|---|---|---|---|
| Null: Unit root (assumes common unit root process) | | | | |
| Levin, Lin & Chu t* | -7.19357 | 0.0000 | 22 | 154 |
| Breitung t-stat | -2.03400 | 0.0210 | 22 | 132 |
| Null: Unit root (assumes individual unit root process) | | | | |
| Im, Pesaran and Shin W-stat | 0.04066 | 0.5162 | 22 | 154 |
| ADF - Fisher Chi-square | 47.9386 | 0.3161 | 22 | 154 |
| PP - Fisher Chi-square | 51.2856 | 0.0096 | 22 | 198 |

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

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Panel unit root test: Summary
Series: ATM
Date: 01/11/22 Time: 10:49
Sample: 2010 2020
Exogenous variables: Individual effects, individual linear trends
User-specified lags: 2
Newey-West automatic bandwidth selection and Bartlett kernel

| Method | Statistic | Prob.** | Cross-sections | Obs |
|---|---|---|---|---|
| Null: Unit root (assumes common unit root process) | | | | |
| Levin, Lin & Chu t* | 33.0553 | 1.0000 | 21 | 161 |
| Breitung t-stat | -0.29778 | 0.3829 | 21 | 140 |
| Null: Unit root (assumes individual unit root process) | | | | |
| Im, Pesaran and Shin W-stat | 0.46608 | 0.6794 | 21 | 161 |
| ADF - Fisher Chi-square | 32.9587 | 0.8398 | 21 | 161 |
| PP - Fisher Chi-square | 217.466 | 0.0000 | 21 | 203 |

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Panel unit root test: Summary
Series: D(ATM)
Date: 01/11/22 Time: 10:49
Sample: 2010 2020
Exogenous variables: Individual effects, individual linear trends
User-specified lags: 2
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

| Method | Statistic | Prob.** | Cross-sections | Obs |
|---|---|---|---|---|
| Null: Unit root (assumes common unit root process) | | | | |
| Levin, Lin & Chu t* | 58.9147 | 0.0000 | 14 | 98 |
| Breitung t-stat | -3.26356 | 0.0032 | 14 | 84 |
| Null: Unit root (assumes individual unit root process) | | | | |
| Im, Pesaran and Shin W-stat | -4.27590 | 0.0313 | 14 | 98 |
| ADF - Fisher Chi-square | 34.6299 | 0.0009 | 14 | 98 |
| PP - Fisher Chi-square | 226.003 | 0.0000 | 14 | 126 |

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

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Panel unit root test: Summary
Series: BB
Date: 01/11/22 Time: 10:51
Sample: 2010 2020
Exogenous variables: Individual effects, individual linear trends
User-specified lags: 2
Newey-West automatic bandwidth selection and Bartlett kernel

| Method | Statistic | Prob.** | Cross-sections | Obs |
|---|---|---|---|---|
| Null: Unit root (assumes common unit root process) | | | | |
| Levin, Lin & Chu t* | 16.7576 | 1.0000 | 21 | 161 |
| Breitung t-stat | 0.48447 | 0.6860 | 21 | 140 |
| Null: Unit root (assumes individual unit root process) | | | | |
| Im, Pesaran and Shin W-stat | 0.19353 | 0.5767 | 21 | 161 |
| ADF - Fisher Chi-square | 53.0215 | 0.1185 | 21 | 161 |
| PP - Fisher Chi-square | 229.767 | 0.1324 | 21 | 203 |

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Panel unit root test: Summary
Series: D(BB)
Date: 01/11/22 Time: 10:52
Sample: 2010 2020
Exogenous variables: Individual effects, individual linear trends
User-specified lags: 2
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

| Method | Statistic | Prob.** | Cross-sections | Obs |
|---|---|---|---|---|
| Null: Unit root (assumes common unit root process) | | | | |
| Levin, Lin & Chu t* | 38.4822 | 0.0000 | 14 | 98 |
| Breitung t-stat | -0.86508 | 0.0335 | 14 | 84 |
| Null: Unit root (assumes individual unit root process) | | | | |
| Im, Pesaran and Shin W-stat | -0.95243 | 0.0404 | 14 | 98 |
| ADF - Fisher Chi-square | 45.2434 | 0.0208 | 14 | 98 |
| PP - Fisher Chi-square | 224.189 | 0.0000 | 14 | 126 |

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

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Panel unit root test: Summary
Series: EXRATE
Date: 01/11/22 Time: 10:52
Sample: 2010 2020
Exogenous variables: Individual effects, individual linear trends
User-specified lags: 2
Newey-West automatic bandwidth selection and Bartlett kernel

| Method | Statistic | Prob.** | Cross-sections | Obs |
|---|---|---|---|---|
| Null: Unit root (assumes common unit root process) | | | | |
| Levin, Lin & Chu t* | -12.5364 | 0.0000 | 22 | 175 |
| Breitung t-stat | 4.11906 | 0.0000 | 22 | 153 |
| Null: Unit root (assumes individual unit root process) | | | | |
| Im, Pesaran and Shin W-stat | -0.97222 | 0.0005 | 22 | 175 |
| ADF - Fisher Chi-square | 47.7053 | 0.0245 | 22 | 175 |
| PP - Fisher Chi-square | 67.3963 | 0.0132 | 22 | 219 |

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Panel unit root test: Summary
Series: D(EXRATE)
Date: 01/11/22 Time: 10:53
Sample: 2010 2020
Exogenous variables: Individual effects, individual linear trends
User-specified lags: 2
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

| Method | Statistic | Prob.** | Cross-sections | Obs |
|---|---|---|---|---|
| Null: Unit root (assumes common unit root process) | | | | |
| Levin, Lin & Chu t* | 2.00775 | 0.9777 | 21 | 147 |
| Breitung t-stat | 3.42059 | 0.9997 | 21 | 126 |
| Null: Unit root (assumes individual unit root process) | | | | |
| Im, Pesaran and Shin W-stat | 0.37162 | 0.6449 | 21 | 147 |
| ADF - Fisher Chi-square | 41.5588 | 0.4902 | 21 | 147 |
| PP - Fisher Chi-square | 112.832 | 0.0000 | 21 | 189 |

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

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Panel unit root test: Summary
Series: INF
Date: 01/11/22 Time: 10:54
Sample: 2010 2020
Exogenous variables: Individual effects, individual linear trends
User-specified lags: 2
Newey-West automatic bandwidth selection and Bartlett kernel

| Method | Statistic | Prob.** | Cross-sections | Obs |
|---|---|---|---|---|
| Null: Unit root (assumes common unit root process) | | | | |
| Levin, Lin & Chu t* | -1.37448 | 0.0846 | 23 | 183 |
| Breitung t-stat | 1.83748 | 0.9669 | 23 | 160 |
| Null: Unit root (assumes individual unit root process) | | | | |
| Im, Pesaran and Shin W-stat | 1.53902 | 0.9381 | 23 | 183 |
| ADF - Fisher Chi-square | 24.2608 | 0.9965 | 23 | 183 |
| PP - Fisher Chi-square | 69.4410 | 0.3144 | 23 | 229 |

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Panel unit root test: Summary
Series: D(INF)
Date: 01/11/22 Time: 10:55
Sample: 2010 2020
Exogenous variables: Individual effects, individual linear trends
User-specified lags: 2
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

| Method | Statistic | Prob.** | Cross-sections | Obs |
|---|---|---|---|---|
| Null: Unit root (assumes common unit root process) | | | | |
| Levin, Lin & Chu t* | -0.66477 | 0.0031 | 22 | 154 |
| Breitung t-stat | 0.73579 | 0.0091 | 22 | 132 |
| Null: Unit root (assumes individual unit root process) | | | | |
| Im, Pesaran and Shin W-stat | -0.19647 | 0.0221 | 22 | 154 |
| ADF - Fisher Chi-square | 48.8721 | 0.0037 | 22 | 154 |
| PP - Fisher Chi-square | 195.616 | 0.0000 | 22 | 198 |

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

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Panel unit root test: Summary
Series: INT
Date: 01/11/22 Time: 10:56
Sample: 2010 2020
Exogenous variables: Individual effects, individual linear trends
User-specified lags: 2
Newey-West automatic bandwidth selection and Bartlett kernel

| Method | Statistic | Prob.** | Cross-sections | Obs |
|---|---|---|---|---|
| Null: Unit root (assumes common unit root process) | | | | |
| Levin, Lin & Chu t* | -4.05797 | 0.0000 | 19 | 150 |
| Breitung t-stat | 1.93452 | 0.0035 | 19 | 131 |
| Null: Unit root (assumes individual unit root process) | | | | |
| Im, Pesaran and Shin W-stat | 0.41056 | 0.0003 | 19 | 150 |
| ADF - Fisher Chi-square | 31.7713 | 0.0018 | 19 | 150 |
| PP - Fisher Chi-square | 40.4600 | 0.0022 | 19 | 188 |

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Panel unit root test: Summary
Series: D(INT)
Date: 01/11/22 Time: 10:56
Sample: 2010 2020
Exogenous variables: Individual effects, individual linear trends
User-specified lags: 2
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

| Method | Statistic | Prob.** | Cross-sections | Obs |
|---|---|---|---|---|
| Null: Unit root (assumes common unit root process) | | | | |
| Levin, Lin & Chu t* | -3.48760 | 0.0002 | 17 | 119 |
| Breitung t-stat | 1.42006 | 0.9222 | 17 | 102 |
| Null: Unit root (assumes individual unit root process) | | | | |
| Im, Pesaran and Shin W-stat | 0.54172 | 0.7060 | 17 | 119 |
| ADF - Fisher Chi-square | 25.9935 | 0.8357 | 17 | 119 |
| PP - Fisher Chi-square | 103.185 | 0.0000 | 17 | 153 |

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

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Panel unit root test: Summary
Series: MS
Date: 01/11/22 Time: 10:57
Sample: 2010 2020
Exogenous variables: Individual effects, individual linear trends
User-specified lags: 2
Newey-West automatic bandwidth selection and Bartlett kernel

| Method | Statistic | Prob.** | Cross-sections | Obs |
|---|---|---|---|---|
| Null: Unit root (assumes common unit root process) | | | | |
| Levin, Lin & Chu t* | -3.22602 | 0.0006 | 23 | 181 |
| Breitung t-stat | 5.26311 | 1.0000 | 23 | 158 |
| Null: Unit root (assumes individual unit root process) | | | | |
| Im, Pesaran and Shin W-stat | 0.23225 | 0.5918 | 23 | 181 |
| ADF - Fisher Chi-square | 46.0907 | 0.4685 | 23 | 181 |
| PP - Fisher Chi-square | 62.3881 | 0.0640 | 23 | 227 |

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Panel unit root test: Summary
Series: D(MS)
Date: 01/11/22 Time: 10:58
Sample: 2010 2020
Exogenous variables: Individual effects, individual linear trends
User-specified lags: 2
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

| Method | Statistic | Prob.** | Cross-sections | Obs |
|---|---|---|---|---|
| Null: Unit root (assumes common unit root process) | | | | |
| Levin, Lin & Chu t* | 5.08212 | 0.0000 | 20 | 140 |
| Breitung t-stat | 7.48499 | 0.0000 | 20 | 120 |
| Null: Unit root (assumes individual unit root process) | | | | |
| Im, Pesaran and Shin W-stat | 0.57272 | 0.0166 | 20 | 140 |
| ADF - Fisher Chi-square | 36.1942 | 0.0423 | 20 | 140 |
| PP - Fisher Chi-square | 68.8020 | 0.0031 | 20 | 180 |

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

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Kao Residual Cointegration Test
Series: GDP ATM BA BB EXRATE INF INT MS
Date: 01/11/22 Time: 11:13
Sample: 2010 2020
Included observations: 253
Null Hypothesis: No Cointegration
Trend assumption: No deterministic trend
User-specified lag length: 1
Newey-West automatic bandwidth selection and Bartlett kernel

| | t-Statistic | Prob. |
|---|---|---|
| ADF | -0.426438 | 0.3349 |
| Residual variance | 7.14E+21 | |
| HAC variance | 6.82E+21 | |

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(RESID)
Method: Least Squares
Date: 01/11/22 Time: 11:13
Sample (adjusted): 2012 2020
Included observations: 124 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| RESID(-1) | -0.530172 | 0.094468 | -5.612180 | 0.0000 |
| D(RESID(-1)) | 0.163166 | 0.114762 | 1.421777 | 0.1576 |

| | | | |
|---|---|---|---|
| R-squared | 0.205759 | Mean dependent var | -7.13E+09 |
| Adjusted R-squared | 0.199249 | S.D. dependent var | 1.00E+11 |
| S.E. of regression | 8.97E+10 | Akaike info criterion | 53.29239 |
| Sum squared resid | 9.81E+23 | Schwarz criterion | 53.33788 |
| Log likelihood | -3302.128 | Hannan-Quinn criter. | 53.31087 |
| Durbin-Watson stat | 1.660413 | | |

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Fixed and Random
effets models
Dependent Variable: LGDP
Method: Panel Generalized Method of Moments
Transformation: First Differences
Date: 03/12/22 Time: 21:43
Sample (adjusted): 2012 2020
Periods included: 9
Cross-sections included: 21
Total panel (unbalanced) observations: 133
White period instrument weighting matrix
White period standard errors & covariance (d.f. corrected)
Instrument specification: @DYN(LGDP,-2)
Constant added to instrument list

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| LGDP(-1) | 0.367426 | 0.087044 | 4.221148 | 0.0000 |
| BB | 0.006845 | 0.006635 | 1.031606 | 0.0001 |
| ATM | 0.000834 | 0.000549 | 1.520773 | 0.0753 |
| INT | -0.000577 | 0.002069 | -0.278780 | 0.0000 |
| INFL | -0.006214 | 0.001608 | -3.863470 | 0.0000 |
| LMS | -0.063585 | 0.016922 | -3.757524 | 0.0000 |
| EXRATE | 0.000192 | 0.000363 | 0.528215 | 0.0737 |

Effects Specification

Cross-section fixed (first differences)

| | | | |
|---|---|---|---|
| Mean dependent var | 0.010965 | S.D. dependent var | 0.037678 |
| S.E. of regression | 0.038762 | Sum squared resid | 0.189315 |
| J-statistic | 1.326017 | Instrument rank | 21 |
| Prob(J-statistic) | 0.506148 | | |

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Arellano-Bond Serial Correlation Test
Equation: Untitled
Date: 03/12/22 Time: 21:46
Sample: 2010 2020
Included observations: 137

| Test order | m-Statistic | rho | SE(rho) | Prob. |
|---|---|---|---|---|
| AR(1) | -0.742160 | -48582700 | 65461260 | 0.4580 |
| AR(2) | -0.488786 | -2701900 | 55279600 | 0.6250 |