

# Relationship Between Financial Inclusion and Economic Growth: Evidence From ARDL Modelling

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## ABSTRACT

This study examines the impact of financial inclusion on economic growth in Nigeria. The statistical properties of data were tested using Zivot-Andrew unit root test. The Zivot Andrew unit root test indicates that gross domestic product, commercial bank branches (CBB) and mobile phone-based transactions are stationary at first difference while Automated Teller Machines (ATM) and foreign direct investment (FDI) are stationary at level. ATM has negative impact on GDP product in Nigeria. The long run coefficient shows that CBB has positive impact on GDP. ATM has positive impact on GDP. Mobile phone-based transaction has positive impact on GDP. FDI has positive impact on GDP. The error correction term (ECT) meets all the theoretical and statistical requirements both in the sign and size. This indicates that at 52.26% of the disequilibrium due to the shock in the previous years is adjusted back to the long run equilibrium in the current year. The Granger causality test shows that CBB, ATM, domestic depositors' money in banks and FDI granger causes GDP while mobile phone-based transactions do not granger cause GDP. The study recommends that Central Bank of Nigeria should compel commercial banks to add the number of ATM in each branch.

**Keywords:** Financial inclusions, FDI, Economic growth & ARDL

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## INTRODUCTION

Financial inclusion became so important at both global and national level by both government and non-governmental institutions such as World Bank group of G20, International Monetary Fund (IMF), Alliance for financial Inclusion (AFI) and Consultative Group to Assist the Poor (CGAP) came up with many policies and initiative to reduce financial exclusion throughout the world. These organizations together with governments of many countries are committed to advancing financial services to the people who do not have access to financial services. The World Bank Group offers a comprehensive set of instruments (financing, policy, advice, data and technical assistance) to more than 100 emerging and developing countries to increase their access to financial services. Today, all the countries work on financial inclusion and setting it as a priority goal. Given the increased awareness of the contribution of financial sector development to poverty reduction and economic growth, financial inclusion has been placed high on the national agendas of many developing countries, including Asia and Africa (Demirgüç-kunt, Hu & Klapper, 2019).

There is a consensus about the importance of financial inclusion on development, particularly as a tool to improve poor household lives and speed economic activity. That is why global and national level policy makers have included financial inclusion in their development priorities (World Bank 2012,

Alliance for Financial Inclusion 2011). Generally, poor lives and works in informal economy and is excluded from wage-earning employment opportunities. Financial inclusion has assumed a greater level of importance among policy makers and researchers across the globe. This is as a result of its efficient role as a driver of economy, and also, the promise it holds as a tool for economic development, particularly in the area of wealth creation, employment generation, poverty reduction, improving welfare and general standard of living (Charles-Anyagwu, 2020). Financial inclusion ranked the seventh in the sustainable development goals. Financial inclusion got importance throughout the world due to its substantial impacts on growth, entrepreneurship, employment, income inequality and poverty alleviation (Dixit & Ghosh, 2013). Financial inclusion has positive impacts on individuals level of income and thereby, economy as whole. Enhancing financial inclusion modernizes the agriculture, promotes innovation, surges entrepreneurship and increases growth (Kelkar, 2010 and Igwe, Magaji & Darma, 2021).

The centre for financial inclusion publication (2015) describes full financial inclusion as a state in which all people who can use financial services have access to a full suite of quality services, provided at affordable prices, in a convenient manner, and with dignity for the clients. Financial inclusion or access to finance is the ability to access appropriate financial products and services. However, it is the benchmark used to access how financial services reach to common people in the economy. The World Bank (2016) stated that financial inclusion and access to finance are different principles. However, failure to use financial services does not necessarily mean a lack of access. Many people may have access to financial services at a reasonable price, but choose not to use them for religious and other purposes. Financial institution provides customer-friendly services at an affordable price, is cost-effective or economically rational, and considers real consumer access to financial services to be timely (Demirguc-Kunt, Klapper, Singer, Ansar, & Hess, 2018).

The main objective of the paper is to investigate the relationship between financial inclusion and economic growth in Nigeria. The specific objectives are to assess the impact of commercial bank branches on economic growth in Nigeria and to examine the response of automated teller machine on economic growth in Nigeria. The rest of the paper is organised as follows: literature review which is the second part of the paper, methodology in which the objectives of the paper could be achieved and is the third part of the paper, part four of the paper is presentation and analysis of the empirical findings and the final section concludes the paper.

### **Empirical Literatures**

Ngoma (2019) examines the determinants of financial inclusion in Zimbabwe using a binary logit model and employed the followings variables which includes account ownership, saving, borrowings, mobile money account, income, workforce, education, and gender. This study established that individual characteristics: age, income, gender, education and employment status were the determinants of financial inclusion in Zimbabwe. In addition, this study established that trust in financial institutions was the major reason why the majority remained unbanked.

Elsayed & Elatroush (2019) investigate the main determents that may affect financial inclusion in sample of 21 middle-income countries using cross sectional data, variables used in the study includes Financial institution account, ATMs, commercial bank branches, borrowings from financial institutions, borrowings to start or operate a business, percentage of savings within financial institutions, savings for education, savings to start, and finally operate or expand a business. The study employed Two stages least squares and principal component techniques. The mojour problem with the paper is inability to show and present the major findings of the study.

Dandibi, Wurim, & Umaru (2019) examine the impact of financial inclusion and financial literacy on the performance of agro-based SMEs in Yobe State, Nigeria using cross sectional data and administering 315 questionnaire. The study used financial literacy, availability, accessibility, affordability and usability and employed Ordinary least square model (OLS). The result revealed that availability, accessibility, affordability and usability of financial services all have significant effect on the performance of agro-based SMEs in Yobe State. Also, financial literacy fully mediated the relationship between the availability of financial services and the performance of agro-based SMEs in

Yobe State while partially mediating the relationship between accessibility and affordability of financial services and performance.

Anthony-Orji, Orji, Ogbuabor, & Onoh (2019) investigate 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 deposit 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 significant impact on financial inclusion in Nigeria. The study recommends that there is need to adopt effective monetary policy measures that will increase financial inclusion in the country.

Ong'eta (2019) establishes the determinants of financial inclusion. The paper established that factors that determine financial inclusion are both demand related factors and supply related factors. The demand related factors include; income of individuals or households, education, collateral, being in employment guarantee scheme, income inequality, age, financial literacy, savings and gender. The supply related factors that determine financial inclusion includes; high interest rates (affordable credit), innovation (agent banking and mobile banking), ICT, bank branches, sensitization of financial products. No methodology, variables are not shown, and the data used in the analysis.

Bouzkurt, Karakus & Yildiz (2018) investigate the factors generating changes in the financial inclusion levels based on data from 120 countries from 2011 to 2014 (panel data). The study adopted OLS and spatial regression analysis and used the followings variables in the analysis. The results show that social, banking and political factors play an important role in the determination of change in financial inclusion. The study also finds that financial inclusion convergence among the countries.

Tambunlertchai (2018) examines the factors that determine access to formal savings products and to looks at what the barriers to saving are. Administering 5100 questionnaires in Myanmar. Variables employed in the analysis includes age square, gender, marital status, own money, mthlyinc, primedu, lowsecedu, hissecedu, higher edu, infconsumer, fent and infent. The study employed logit model and found that a low level of saving in Myanmar, and that formal savings increase with income, education, and keeping a budget, among other factors.

Nwafor & Yomi (2018) investigate the determinants of financial inclusion in Nigeria using time series data and adopted Two-staged Least Squares Regression Method and includes the following variables in the model GDP, Financial Deepening Index expressed as Broad Money Supply to GDP, Financial Deepening Index expressed as Bank Credit to GDP, Commercial Banks Deposit From Rural Areas, Commercial Bank Loans to Rural Areas, Commercial Bank Loan to Deposit Ratio and Commercial Bank Loan to Small and Medium Scale Enterprises. Findings revealed that financial inclusion have significant impact on economic growth in Nigeria and that financial industry intermediation have not influenced financial inclusion within the period under review. It was recommended that Nigerian banks should develop financial products to reach the financially excluded regions of the country as this will increase GDP per capital of Nigeria and consequently economic growth.

Brownbridge, Bwire, Rubatsimbira & Grace (2017) assess the strength of the impulse response of inflation to the monetary policy variable using consumer price index (CPI), nominal exchange rate, 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 suggest that economies with higher levels of financial inclusion exhibit stronger impulse responses, although this does not necessarily imply that higher levels of financial inclusion are the cause of stronger monetary transmission mechanisms as the degree of financial inclusion may be correlated with other aspects of development which also affect the monetary transmission mechanism.

Abdullahi & Fakunmoju (2017) examines the effect of financial inclusion on SMEs contribution to sustainable economic growth between 1970 and 2015 in Nigeria using time series data and used the following variables in the model. The study employed Ordinary least square model (OLS) and revealed that financial inclusions have positive effect but do not significantly affect sustainable economic growth at 5%. It was recommended that sustainable growth and development can be achieved in Nigeria if SMEs operators have access to loans facilities.

Okoye, Erin & Modebe (2017), in their study; financial inclusion as a strategy for enhanced economic growth and development 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 loan to deposit ratio, financial deepening indicators, loan to rural areas, and branch network. 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 by the researchers 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 study 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 in order to ensure efficient and effective resource allocation and utilization.

Tuesta, Sorensen, Haring & Cámara (2015) analyses the three dimensions determinant of financial inclusion in the case of Argentina, from a micro-economic perspective that is cross sectional data. The study employed level of education, income, credit card, debit card, e-payments, and formal credit as variables and adopted probit model. The study found that level of education, income and age are all significant variables which determine whether they have financial products such as accounts, credit and debit cards, formal credit and electronic payments.

### **Methodology**

The paper examines the relationship between financial inclusions and economic growth in Nigeria from 1986 to 2020. The models shall assume a linear relationship between the dependent and independent variables.

$$GDP = F(CBBA, ATMAD, MBPT, FDI) \dots \dots \dots (3.1)$$

Where;

*GDP* = Gross domestic product

*CBBA* = Branches of commercial banks per 100,000 adults

*ATMAD* = Automated Teller Machine per 100,000 adults

*MBPT* = mobile phone-based transactions

*FDI* = Foreign direct investment

Where

Economic growth refers to sustained rise in the value of economic activities within a country over a period of time. The Gross Domestic Product (GDP) often comes in handy in measuring the aggregate worth of an economy. Commercial banks branch per 100,000 adults, (CBBA), Automated Teller Machines per 100,000 adults (ATAMAD), mobile phone-based transactions (MBPT). Foreign direct investment is measured as percentage to GDP.

### **Auto Regressive Distributed Lag (ARDL) Model**

For the purpose of achieving the objectives of the paper, the study employed Auto Regressive Distributed Lag (ARDL) Model. When variables are found to be stationary at different order of cointegration then the suitable test for such model is ARDL (Asteriou & Hall, 2007). However, one must test for both cointegration and stability to ensure long-run relationship among the variables and that the data-generation process conforms with the model, respectively (Asteriou & Hall, 2007). If the variables are cointegrated then there is the need to test for Error correction model (ECM) which shows how much of the disequilibrium is being corrected over a period; what is called 'adjustment effect' (Asteriou & Hall, 2007). Error correction model (ECM) possesses advantages of resolving the problem of spurious regression because it eliminates trend in the variables involved; and that the disequilibrium error term

is stationary variable, which is prevented from exploding over time (Asteriou & Hall, 2007). The general autoregressive distributed lag (ARDL) ECM is presented in equation

$$\Delta y_t = \mu + \sum_{i=1}^{n-1} a_i \Delta y_{t-i} + \sum_{i=0}^{m-1} \gamma_i \Delta x_{t-i} - \pi \hat{e}_{t-1} + \varepsilon_t \dots \dots \dots (3.2)$$

Where  $\Delta$  is the difference operator,  $y_t$  is a vector of dependent variable,  $x_{t,i}$  is the matrix of lag values of explanatory variables and  $\pi$  is the adjustment effect or error correction coefficient which is expected to be negative for the error to be corrected. Specifically, the ECM model to be tested is specified in equation.

$$\Delta GDP_t = \mu + \sum_{i=1}^{n-1} a_i \Delta GDP_{t-i} + \sum_{i=0}^{m-1} \beta_i \Delta CBBA_{t-i} + \sum_{i=0}^{m-1} \gamma_i \Delta ATMAD_{t-i} + \sum_{i=0}^{m-1} v_i \Delta MBPT_{t-i} + \sum_{i=0}^{m-1} w_i \Delta FDI_{t-i} - \pi \hat{e}_{t-1} + \varepsilon_t \dots \dots \dots (3.3)$$

If  $\pi = 1$  then 100% of the adjustment takes place within single period (instantaneous/full adjustment). If  $\pi = 0$  then there is no adjustment. Thus, any other value is interpreted accordingly; a value of  $\pi$  closer to 1 implies quick adjustment, and value closer to 0 implies slow adjustment.

The null and alternative hypotheses for bound test concerning the test for cointegration are:

Ho:  $a_i = \beta_i = \gamma_i = v_i = \omega_i = 0$  (No long run relationship).

H1:  $a_i \neq \beta_i \neq \gamma_i \neq v_i \neq \omega_i \neq 0$  (there is long run relationship).

Decision rule: If F-statistics is greater than any of the critical values of all bounds, reject the null hypothesis otherwise to accept the alternative hypothesis.

## Empirical Results and Discussion

### Descriptive statistics

Table 4.1 Descriptive statistics

Statistics	LGDP	LCBBA	LATMAD	LMBPT	LFDI
Mean	11.26185	0.676333	0.997125	6.756218	0.135649
Median	11.44032	0.660865	1.039505	7.606334	0.190924
Std. Dev.	0.404913	0.078972	0.306628	1.659323	0.251365
Skewness	-0.419827	0.365971	-2.653391	-0.692907	0.271054
Kurtosis	1.579152	2.177051	9.865000	1.748700	2.753195
Jarque-Bera	3.064304	1.364607	84.70143	3.922010	0.399144
Probability	0.216070	0.505451	0.000000	0.140717	0.819081
Observations	34	34	34	34	34

Source: Researcher computation using E-views 10.

Table 4.1 shows the result of descriptive statistics of the study, it indicates that the standard deviations of the variables employed are far away from their means. The Skewness of the distribution shows negative values of gross domestic product, Automated Teller Machines per 100,000 adults and mobile phone-based transactions, this indicates that gross domestic product and Automated Teller Machines per 100,000 adults are skewed to the left and are normally distributed except for mobile phone-based transactions because it is greater than zero. Commercial bank branches per 100,000 adults and foreign direct investment shows positive values but less than one, it implies that, these variables are skewed to the right and are normally distributed. The Kurtosis in the table shows that all the variables employed are normally distributed except for Automated Teller Machines per 100,000 adults because is greater than 3. The Jarque-Bera test for normality is also estimated. It indicates that all the variables

employed are normally distributed as their p-values are greater than 5% except for Automated Teller Machines per 100,000 adults.

### Zivot and Andrew Unit Root Test

The study employed Zivot and Andrew unit root test in order to identify the order of integration among the variables employed, because ignoring unit root test with break may lead the acceptance of null hypothesis where is supposed to be rejected.

**Table 4.2 Zivot-Andrew Unit Root Test**

Level			First difference	
Variables	Statistics	Break point	Statistics	Break point
LGDP	-3.399245	2015	-6.282190**	1994
LCBBA	-4.458530	1993	-5.702734**	1994
LATMAD	-5.621703**	2009		
LMBPT	-3.900394	2012	-6.353647**	2005
LFDI	-5.049258**	2010		

Source: Researcher computation using E-views 10. Asterics\*\* indicates stationary at 5% level of significance.

Table 4.2 shows Zivot-Andrew unit root test, the test indicates that gross domestic product, Commercial bank branches per 100,000 adults, and mobile phone-based transactions are stationary at first difference that is I (1) process, the break dates are 1994, 1994 and 2005 respectively. Automated Teller Machines per 100,000 adults and foreign direct investment are stationary at level that is I (0) process, the break dates are 2009 and 2010 respectively. Therefore, evidence from Zivot-Andrew unit root test shows mixture of order of integration among the variables employed.

### Bound Test for Long run

The test is conducted in order to ensure the existence of long run association among the variables employed.

**Table 4.3 Result of Cointegration Bounds test**

Statistics	Value	Critical bounds			
F-statistics	14.63319**	1%	2.5%	5%	10%
		I(0) Bound	3.06	2.7	2.39
		I (1) Bound	4.15	3.73	3.38

Source: Researcher computation using E-views 10.

From table 4.3, the result of co-integration bound test indicates a higher value of F-statistics than any of the critical values of all bounds 14.63319. Therefore, there is a strong evidence of cointegration in the model. This provides evidence of adopting Autoregressive Distributed Lag (ARDL) model in the study.

### Results of Autoregressive Distributed Lag (ARDL) model

As a result of unit root tests and bounds test conducted in the study which suggests the use of ARDL model. The appropriate model (number of lags) is selected automatically using Akaike Information Criterion (AIC) which is seen as more robust model. Below, both short run and long run parameters of the model are presented.

### Short run Relationship

Below the result of short run parameters of the ARDL model is presented. AIC suggests a (1, 1, 1, 0, 0) model after testing for up to 486 different models.

**Table 4.4 Short run parameters of the ARDL model**

Variables	Coefficient	Std. Error	t-Statistic	Prob.
D(LCBBA)	0.593560	0.145941	4.067131	0.0009
D(LATMAD)	-0.086206	0.021677	-3.976884	0.0011
R-squared	0.995865			
Adjusted R-squared	0.993539			
S.E. of regression	0.030946			
Sum squared resid	0.015323			
Log likelihood	59.78224			
F-statistic	428.1552			
Prob(F-statistic)	0.000000			
Durbin-Watson stat	2.153691			

*Source: Researcher computation using E-views 10*

The result from table 4.4 indicates positive and statistically significant impact of Commercial bank branches on gross domestic product in Nigeria in the short run, the positive finding is in line with economic appriori expectation which assumed a positive relationship between Commercial bank branches and gross domestic product. Furthermore, Automated Teller Machines shows negative but statistically insignificant impact on gross domestic product in Nigeria in the short run, the negative finding is contrary to economic appriori expectation which assumed a positive relationship between Automated Teller Machines and gross domestic product. The R-squared and its adjusted value are very high 0.995865, this implies that 99% change in gross domestic product is explained by Commercial bank branches, Automated Teller Machines, mobile phone-based transactions and foreign direct investment in Nigeria. The p-value of f-statistics indicates (0.000000), this means that Commercial bank branches, Automated Teller Machines, mobile phone-based transactions and foreign direct investment have 100% significance influence on the gross domestic product in Nigeria.

#### **Long run and Error Correction Result**

As a result of bound test, which confirm the existence of long run relationship among the variables of employed.

**Table 4.5 ARDL Long run form Results and ECM**

Variables	Coefficient	Std. Error	t-Statistic	Prob.
LCBBA	0.593453	0.311005	5.123558	0.0001
LATMAD	0.369419	0.085381	4.326694	0.0005
LMBPT	0.113133	0.024311	4.653564	0.0003
LFDI	0.148589	0.105302	1.411073	0.1774
CointEq(-1)*	-0.522626	0.044037	-11.86779	0.0000

*Source: Researcher computation using E-views 10*

The result from table 4.5 indicates that commercial bank branches has positive and statistically significant impact on gross domestic product in Nigeria in the long run, this means that one unit increase in commercial bank branches in Nigeria will cause 0.59% increase in gross domestic product. The positive finding is in line with economic appriori expectation which assumed a positive relationship between commercial bank branches and gross domestic product. Automated Teller Machines shows positive and statistically significant impact on gross domestic product in Nigeria in the long run, this implies that one unit increase in Automated Teller Machines in Nigeria will bring about 0.36% increase in gross domestic product. Furthermore, mobile phone-based transactions shows positive and statistically significant impact on gross domestic product in Nigeria in the long run, the positive finding



is similar with economic appriori expectation which assumed a positive relationship between mobile phone-based transactions and gross domestic product. This means that one unit increase in mobile phone-based transactions will cause 0.11% increase in gross domestic product in Nigeria. Foreign direct investment indicates positive and statistically significant impact on gross domestic product in Nigeria in the long run, this means that one unit increase in foreign direct investment will cause 0.14% increase in gross domestic product in Nigeria.

The error correction term (ECT) meets all the theoretical and statistical requirements both in the sign and size. The ECT coefficient is -0.522626 and significance at 5%. This indicates that at 52.26% of the disequilibrium due to the shock in the previous years is adjusted back to the long run equilibrium in the current year.

### Post estimation tests

**Table 4.6 Post estimation tests**

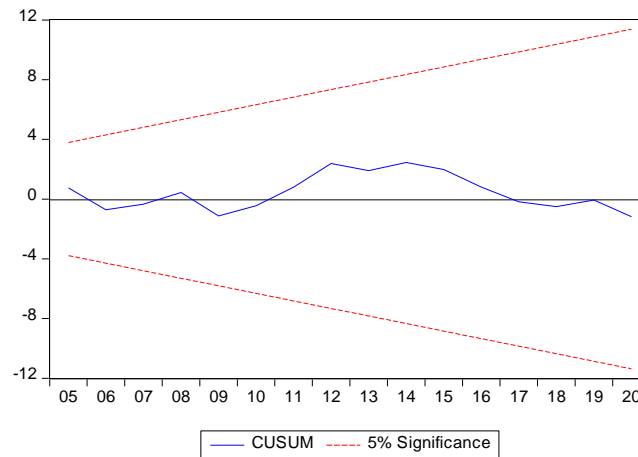
Tests	P-value
Serial correlation	0.4556
Heteroscedastics	0.1647
Normality	0.8710
Ramsey test	0.0315

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

The model passed all post estimation test such as serial correlation, Heteroscedasticity, and normality test except for Ramsey reset test, as their probability values are greater than 5%. We can conclude that the model is robust.

### Stability

Stability test of the model is employed in order to ensure the data generating process is compatible with the estimated coefficient of the model.

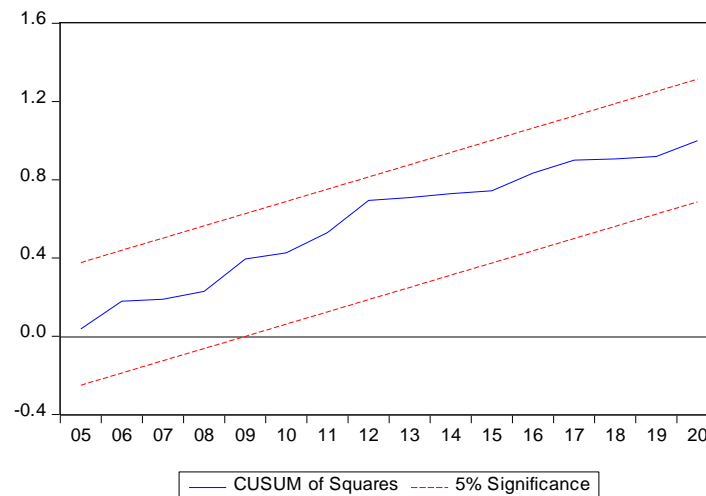


**Figure 4.1 CUSUM Plot Recursive Residuals of ARDL model.**

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

From Figure 4.1, the CUSUM plot is within 5% level of significant, this means that the model is stable. This shows that there is no chance of having spurious regression.





**Figure 4.2 CUSUM SQUARE Plot Recursive Residuals of ARDL model.**

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

From Figure 4.2, the Cumulative sum square plot is within 5% level of significant, this means that the model is stable. This shows that there is no chance of having spurious regression.

### Conclusions and Recommendations

The paper investigates the relationship between financial inclusions and economic growth in Nigeria using quarterly data from 1986 to 2020. The Auto Regressive Distributive lag (ARDL) model has been used in the analysis. The short run result shows that, the short run result indicates that a commercial bank branch has positive and statistically significant impact on gross domestic product in Nigeria. Automated Teller Machine has negative but statistically insignificant impact on gross domestic product in Nigeria. Moreover, the long run result shows that commercial bank branch has positive and statistically significant impact on gross domestic product in Nigeria. Automated Teller Machine has positive and statistically significant impact on gross domestic product in Nigeria. Domestic depositors' money in banks has positive and statistically significant impact on gross domestic product in Nigeria. Mobile phone-based transaction has positive and statistically significant impact on gross domestic product in Nigeria. Foreign direct investment has positive and statistically significant impact on gross domestic product in Nigeria. The error correction term (ECT) meets all the theoretical and statistical requirements both in the sign and size. The ECT coefficient is -0.522626 and significance at 5%. This indicates that at 52.26% of the disequilibrium due to the shock in the previous years is adjusted back to the long run equilibrium in the current year. The article recommends that Central Bank of Nigeria should compel commercial banks to add the number of Automated Teller Machine in each branch and ensure constant service delivery service of the machines for customer to have access to their funds. More and improved financial services should be made available to rural dwellers and the economy in general to help them participate and contribute more to national productivity.

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