

Relationship Between Financial Inclusion And Economic Growth: Relationship Between Evidence From Ardl Modelling

Ibrahim Musa¹, Sule Magaji², Ali Salisu³, Achi Peter O⁴

ibmmusa75@gmail.com¹, sule.magaji@uniabuja.edu.ng², asalisu.eco@buk.edu.ng³, emekapeterz@gmail.com⁴

Department of Economics, Faculty of Social Sciences, University of Abuja^{1,2,4}, Department of Economics, Faculty of Social Sciences, Bayero University, Kano³

ABSTRACT

This study examines the impact of financial inclusion on economic growth in Nigeria from 1986 to 2020. The Zivot-Andrew unit root test was used to examine the statistical characteristics of the data. The Zivot Andrew unit root test shows that while Automated Teller Machines and foreign direct investment are stationary at level, the gross domestic product, commercial bank branches, and phone-based transactions are stationary at first difference. Bound test for long run shows that there is long run relationship among the variables of interest. According to the Auto Regressive Distributive Lag (ARDL) result, commercial bank branches in Nigeria have a short-term, positive, and significant impact on the country's gross domestic product. The Nigerian gross domestic product is negatively impacted by automated teller machines; however, this impact is negligible. The long run coefficient demonstrates positive and statistically significant influence of commercial bank branches on Nigeria's GDP. The Nigerian gross domestic product has positively and statistically significantly impacted by automated teller machines. Mobile phone-based transaction has positive and significant impact on gross domestic product in Nigeria. In Nigeria, foreign direct investment has a positive and statistically significant impact on GDP. Both in terms of sign and size, the error correction term (ECT) satisfies all theoretical and statistical requirements. The ECT coefficient is -0.522626 with a 5% level of significance. This shows that at 52.26 percent, the disequilibrium brought on by the shock in the years before is corrected to the long-term equilibrium in the present year. The Granger causality test demonstrates that while mobile phone-based transactions do not granger cause gross domestic product, commercial bank branches, automated teller machines, domestic depositors' money in banks, and foreign direct investment do. The studies recommend, the Central Bank of Nigeria should push commercial banks to increase the number of automated teller machines in each branch.

Keywords: Financial inclusions, FDI, Economic growth & ARDL

JEL Classification Code: G10,G32, P43.

1.0 Introduction

Government and non-governmental organizations, including the World Bank Group of the G20, the International Monetary Fund (IMF), the Alliance for Financial Inclusion (AFI), and the Consultative Group to Assist the Poor (CGAP), have developed numerous policies and initiatives to reduce financial exclusion globally. These organizations, along with the governments of numerous nations, are dedicated to expanding access

to financial services for those who do not already have it. The World Bank Group provides more than 100 emerging and developing nations with a wide range of tools (financing, policy, advice, data, and technical help) to improve their access to financial services. The objective of financial inclusion is now being worked on by all nations. Financial inclusion has been prioritized highly on the national agendas of many developing nations, especially Asia and Africa, due to the increased awareness of the role that financial sector development plays in reducing poverty and promoting economic progress (Demirgüç-kunt, Hu & Klapper, 2019).

There is general agreement regarding the significance of financial inclusion for development, especially as a tool to enhance the lives of impoverished households and accelerate economic activity. Because of this, financial inclusion has been ranked among the top development priorities by both national and international policymakers (World Bank 2012, Alliance for Financial Inclusion 2011). The majority of the poor are excluded from chances for wage-earning jobs and live and work in the informal sector. Policy makers and experts all across the world now place more emphasis on financial inclusion. This is due to its effective function as an economic engine and the potential it holds as a vehicle for economic growth, especially in the areas of wealth creation, employment creation, poverty reduction, boosting welfare and general standards of living (Charles-Anyagwu, 2020). The seventh most important goal for sustainable development is financial inclusion. Because of its significant effects on growth, entrepreneurship, employment, income inequality, and the reduction of poverty, financial inclusion has gained prominence around the world (Dixit & Ghosh, 2013). Financial inclusion has favorable effects on people's income levels and, consequently, the economy as a whole. Increasing financial inclusion spurs entrepreneurship, innovation, modernization, and growth in agriculture (Kelkar, 2010 and Igwe, Magaji & Darma, 2021).

Full financial inclusion is defined by the Centre for Financial Inclusion's publication (2015) as a situation in which everyone who can use financial services has access to a full range of high-quality services that are offered at reasonable costs, in a convenient manner, and with the clients' dignity. Access to suitable financial products and services is referred to as

financial inclusion or access to finance. However, it serves as a standard for measuring how widely financial services are available to the general public. Financial inclusion and access to finance are two different concepts, according to the World Bank (2016). But not using financial services does not automatically imply lack of access. Despite having affordable access to financial services, many people opt not to utilize them for religious or other reasons. Financial institutions regard prompt actual consumer access to financial services to be cost-effective or economically rational, and they offer customer-friendly services at an accessible price (Demirguc-Kunt, Klapper, Singer, Ansar, & Hess, 2018).

The investigation of the connection between financial inclusion and economic growth in Nigeria is the major goal of the article. The particular goals are to evaluate how commercial bank branches affect economic expansion in Nigeria and how automated teller machines affect that expansion. The remainder of the paper is structured as follows: The second section of the paper is a review of the literature. The third section discusses a methodology that could be used to accomplish the research's goals. The fourth section presents and analyzes the empirical data, and section five captures the conclusion of the paper

2.0 Empirical Literatures

Ngoma (2019) used a binary logit model to analyze the factors influencing financial inclusion in Zimbabwe and used the following variables: account ownership, saving, borrowing, mobile money accounts, income, employment, education, and gender. This study proved that age, income, gender, education, and employment status were all personal traits that affected financial inclusion in Zimbabwe. Additionally, this survey found

that the majority's lack of banking was largely due to a lack of faith in financial institutions.

Elsayed & Elatroush (2019) investigate the main deterrents 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 major problem with the paper is inability to show and present the major findings of the study.

Using cross-sectional data and 315 questionnaires, Dandibi, Wurim, and Umaru (2019) investigate the effects of financial inclusion and financial literacy on the performance of agro-based SMEs in Yobe State, Nigeria. The study applied an ordinary least squares model and financial literacy, availability, accessibility, affordability, and usability (OLS). The results showed that the performance of agro-based SMEs in Yobe State is significantly impacted by the availability, accessibility, pricing, and use of financial services. Additionally, financial literacy somewhat mediates the association between accessibility and affordability of financial services and performance while totally mediating the relationship between the availability of financial services and the performance of agro-based SMEs in Yobe State.

Using the Vector Autoregression Model, Anthony-Orji, Orji, Ogbuabor, and Onoh (2019) examine how monetary policy shocks affect financial inclusion in Nigeria (VAR). The model's variables include money supply, interest rate, financial

inclusion, and bank deposit rates. The findings of the study demonstrate that shocks to Nigeria's financial inclusion, such as those to the minimum rediscount rate, interest rate, large money supply, and deposit bank rates, have occurred. According to the study, the country has to adopt effective monetary policy measures to boost financial inclusion.

In 2019, Ong'eta established the factors that determine financial inclusion. In the study, it was determined that supply- and demand-related factors both affect financial inclusion. Demand-related factors include household or individual income, education, collateral, employment guarantee program membership, income inequality, age, financial literacy, savings, and gender. Financial inclusion is impacted by a number of supply-related factors, including high interest rates (cheap loans), innovation (agent banking and mobile banking), ICT, bank branches, and financial product sensitization. The results of the analysis were used without any methodology and without specifying the variables.

Based on data from 120 countries between 2011 and 2014, Bouzkurt, Karakus, and Yildiz (2018) explore the causes causing changes in the financial inclusion levels (panel data). The following variables were analyzed using OLS and spatial regression techniques in the study. The findings demonstrate that social, banking, and political factors are crucial in determining how financial inclusion will develop. The report also identifies a global convergence in financial inclusion.

Tambunlertchai (2018) looks at the barriers to saving and factors that affect access to official savings products. 5100 questionnaires are being distributed in Myanmar. Age square, gender, married status, own money, mthlyinc, primedu, lowsecedu, hissecedu, higher edu, infconsumer, fent, and infent are among

the variables used in the analysis. The study used a logit model and discovered that formal savings are low in Myanmar and rise with income, education, and budgeting, among other characteristics.

The determinants of financial inclusion in Nigeria are studied by Nwafor and Yomi (2018) using time series data and the two-stage least squares regression method. The model includes the following variables: 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 Financial Deepening Index expressed as Bank Credit to GDP. Findings showed that financial inclusion had a considerable impact on economic growth in Nigeria and that, throughout the review period, financial industry intermediation had little impact on financial inclusion. The development of financial goods by Nigerian banks to reach the economically underserved areas of the nation was advised since doing so would raise the country's GDP per capita and, in turn, spur economic growth.

Consumer price index (CPI), nominal exchange rate, nominal gross domestic product (GDP), and policy interest rate were the variables employed by Brownbridge, Bwire, Rubatsimbira, and Grace in their 2017 study to examine the intensity of the impulse response of inflation to the monetary policy variable. Panel vector auto-regressions and panel vector error correction (PVEC) methods were used in the investigation (PVARs). The results suggest that economies with higher levels of financial inclusion have stronger impulse reactions, but this does not necessarily imply that stronger monetary transmission mechanisms are the result of higher levels of financial inclusion since

the degree of financial inclusion may be correlated with other development-related factors that also affect the monetary transmission mechanism.

Using time series data, Abdullahi and Fakunmoju (2017) looked at how SMEs in Nigeria contributed to sustainable economic growth between 1970 and 2015 and employed the following variables in their model. The study used the Ordinary Least Squares (OLS) model, which showed that financial inclusions have a favorable impact but have little impact on 5% sustainable economic growth. It was suggested that Nigerian SMEs operators have access to financing facilities in order to achieve sustainable growth and development.

In their study, Financial Inclusion as a Strategy for Enhanced Economic Growth and Development, Okoye, Erin, and Modebe (2017) used the Ordinary Least Squares method to examine the effects of financial inclusion on economic growth and development in Nigeria from 1986 to 2015. The study measured financial inclusion using the loan to deposit ratio, financial deepening indices, loans to rural areas, and branch network. Indicators of financial deepening in the study were the ratios of GDP to broad money supply and GDP to private sector credit. The researchers used per capita income as a proxy for economic growth and GDP growth over time to quantify poverty, creating a development index. The study demonstrated that financial inclusion has promoted poverty alleviation in Nigeria through rural credit distribution while credit delivery to the private sector has not significantly boosted economic growth in Nigeria. The report recommended that the monetary authorities step up their efforts to promote financial inclusion through enhanced loan delivery to the private sector in order to

ensure efficient and effective resource allocation and usage.

From a microeconomic viewpoint using cross sectional data, Tuesta, Sorensen, Haring, and Cámara (2015) analyze the three dimensions that determine financial inclusion in the case of Argentina. Level of education, income, credit card, debit card, e-payments, and formal credit were all used as factors in the study, which used a probit model. According to the report, having financial products including accounts, credit and debit cards, formal credit, and electronic payments depends significantly on factors like income, age, and educational attainment.

3.0 Methodology

The study looks at the relationship between economic growth and financial inclusion in Nigeria from 1986 to 2020. The dependent and independent variables must be related linearly in the models.

$$GDP = f(CBBA, ATMAD, MBPT, FDI) \quad 3.1$$

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 is the long-term, steadily increasing value of economic activity inside a nation. The Gross Domestic Product (GDP) is a useful tool for calculating an economy's overall worth. Automated Teller Machines (ATAMAD), Commercial Banks Branch per 100,000 Adults (CBBA), and mobile phone-based transactions (MBPT). The percentage of

GDP used to measure foreign direct investment is.

3.1 Auto Regressive Distributed Lag (ARDL) Model

The Auto Regressive Distributed Lag (ARDL) Model was used in the study in order to achieve the paper's aims. The appropriate test for such a model is ARDL when variables are shown to be stationary at different orders of cointegration (Asteriou & Hall, 2007). However, in order to confirm the long-term relationships between the variables and the model's data production process, one needs test for both cointegration and stability (Asteriou & Hall, 2007). The requirement to test for the error correction model (ECM), which demonstrates how much of the disequilibrium is being rectified over time and is referred to as the "adjustment impact," arises if the variables are cointegrated (Asteriou & Hall, 2007). Due to the elimination of trend in the relevant variables and the fact that the disequilibrium error component is a stationary variable, the error correction model (ECM) has the advantage of eliminating the false regression issue (Asteriou & Hall, 2007). The equation presents the generic autoregressive distributed lag (ARDL) ECM.

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

Where Δ is the difference operator, is a vector of dependent variable, x_{t-1} is the matrix of lag values of explanatory variables and 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:

$$\Delta GDP_t = \mu + \sum_{i=1}^{n-1} a_i \Delta GDP_{t-1} + \sum_{i=0}^{m-1} \beta_i \Delta CBBA_{t-i} +$$

$$\sum_{i=0}^{m-1} \gamma_i \Delta ATMAD_{t-i} + \sum_{i=0}^{m-1} v_i \Delta MBPT_{t-i} + \sum_{i=0}^{m-1} w_i \Delta FDI_{t-i} - \pi \hat{e}_{t-1} + \varepsilon_t \quad 3.3$$

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 π 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: $\alpha_i = \beta_i = \gamma_1 = u_i = v_i = \omega_i = 0$ (No long run relationship).

H1: $\alpha_i \neq \beta_i \neq \gamma_1 \neq u_i \neq v_i \neq \omega_i \neq 0$ (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.

4.0 Empirical Results and Discussion

4.1 Descriptive Statistics

Table 4.1 Descriptive statistics

Statist ics	LGD P	LCBB A	LAT MAD	LMB PT	LFDI
Mean	11.2	0.67	0.99	6.75	0.13
Media	6185	6333	7125	6218	5649
n	11.4	0.66	1.03	7.60	0.19
Std.	4032	0865	9505	6334	0924
Dev.	0.40	0.07	0.30	1.65	0.25
	4913	8972	6628	9323	1365
Skew ness	-	-	-	-	-
	0.41	0.36	2.65	0.69	0.27
Kurto sis	982	5971	3391	2907	1054
	1.57	2.17	9.86	1.74	2.75
Jarqu e-Bera	9152	7051	5000	8700	3195
	3.06	1.36	84.7	3.92	0.39
Proba bility	4304	4607	0143	2010	9144
	0.21	0.50	0.00	0.14	0.81
Observ ations	6070	5451	0000	0717	9081
	34	34	34	34	34

Source: Researcher computation using E-views 10.

The results of the descriptive statistics for the study are shown in Table 4.1, which demonstrates that the standard deviations of the variables used are significantly different from their means. The distribution's skewness indicates negative values for the gross domestic product, Automated Teller Machines per 100,000 adults, and mobile phone-based transactions. This shows that the gross domestic product and Automated Teller Machines per 100,000 adults are normally distributed, with the exception of mobile phone-based transactions, which are greater than zero and are therefore skewed to the left. Foreign direct investment and commercial bank branches per 100,000 adults both have positive values that are less than one, indicating that they are regularly distributed and skewed to the right. ATDs per 100,000 adults are the only variable that is not normally distributed according to the table's kurtosis because it is more than 3. Additionally, estimated is the Jarque-Bera test for normalcy. With the exception of Automated Teller Machines per 100,000 Adults, all of the variables included show that they are normally distributed because their p-values are greater than 5%.

4.2 Zivot and Andrew Unit Root Test

The study used the Zivot and Andrew unit root test to determine the order of integration among the variables used, because neglecting the unit root test with a break may result in the acceptance of a null hypothesis that should be rejected.

Table 4.2 Zivot-Andrew Unit Root Test

Variables	Level	Break point	First difference	Break point
	Statistics		Statistic	
LGDP	- 3.399245	2015	- 6.28219 0**	1994
LCBBA	- 4.458530	1993	- 5.70273 4**	1994
LATMA D	- 5.621703 **	2009		
LMBPT LFDI	- 3.900394	2012	- 6.35364 7**	2005
	- 5.049258 **	2010		

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

According to Table 4.2's Zivot-Andrew unit root test, the gross domestic product, the number of commercial bank branches per 100,000 adults, and mobile phone-based transactions are stationary at the first difference, or I (1) process, with the break dates being 1994, 1994, and 2005, respectively. The break dates for automated teller machines per 100,000 individuals and foreign direct investment are 2009 and 2010, respectively. Zivot-Andrew unit root test results thus demonstrate a variety of order of integration among the applied variables.

4.3 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	2.08
		I(1) Bound	4.15	3.73	3.38	3

Researcher computation using E-views 10.

According to table 4.3, the co-integration bound test result shows that the F-statistics value is higher than any of the critical values of all bounds, which is 14.63319. As a result, the model has substantial evidence of cointegration. This shows that the Autoregressive Distributed Lag (ARDL) model was used in the investigation.

4.4 Results of Autoregressive Distributed Lag (ARDL) Model

Because of the unit root tests and bounds tests carried out during the study, which recommend using the ARDL model. The Akaike Information Criterion (AIC), which is regarded as a more reliable model, is used to automatically choose the suitable model (number of lags). The model's short run and long run parameters are shown below.

4.4.1 Short run Relationship

The short run parameters of the ARDL model are shown in the section below. After assessing up to 486 distinct models, AIC offers a (1, 1, 1, 0, 0) model.

Table 4.4 Short run parameters of the ARDL model

Variabl es	Coeffici ent	Std. Error	t- Statistic	Prob .
D(LCBB A)	0.59356 0	0.145 941	4.067 131	0.00 09
D(LATM AD)	0.08620 6	0.021 677	3.976 884	0.00 11
R- squared	0.99586 5			
Adjuste d R- squared	0.99353 9			
S.E. of regressi on	0.03094 6			
Sum squared resid	0.01532 3			
Log likeliho od	59.7822 4			
F- statistic	428.155 2			
Prob(F- statistic)	0.00000 0			
Durbin- Watson stat	2.15369 1			

Source: Researcher computation using E-views 10

The results from table 4.4 show that commercial bank branches have a positive and statistically significant short-term impact on Nigeria's gross domestic product. This result is consistent with economic a priori expectations, which presupposed a positive relationship between commercial bank branches and GDP. Additionally, automated teller machines have a short-term negative but statistically negligible influence on Nigeria's gross domestic product. This result defies economic a priori expectations, which expected a positive link between automated teller

machines and GDP. The R-squared and its adjusted value are quite high, 0.995865, which suggests that Commercial Bank branches, Automated Teller Machines, mobile phone-based transactions, and foreign direct investment in Nigeria account for 99% of the change in the gross domestic product. The commercial bank branches, automated teller machines, mobile phone-based transactions, and foreign direct investment all have 100% significance influence on Nigeria's gross domestic product, according to the p-value of the f-statistics, which is (0.000000).

4.4.2 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

Vari	Coeffici	S	t Pro
LC	0.59345	0.31100	5.1235 0.00
LAT	0.36941	0.08538	4.3266 0.00
LM	0.11313	0.02431	4.6535 0.00
LF	0.14858	0.10530	1.4110 0.17
Coint	-	0.04403	- 0.00

A unit increase in commercial bank branches in Nigeria will result in a 0.59% rise in gross domestic product, according to the result from table 4.5, which shows that commercial bank branches have a positive and statistically significant impact on Nigeria's GDP over the long term. The encouraging results are consistent with economic a priori expectations, which presupposed a favorable link between commercial bank branches and GDP. In the long run, Automated Teller Machines have a positive and statistically significant impact on Nigeria's gross domestic product; this suggests that adding one more

Automated Teller Machine will result in a 0.36% boost in GDP. Additionally, over time, mobile phone-based transactions have a positive and statistically significant impact on Nigeria's gross domestic product. This positive finding is consistent with the economic a priori assumption that there would be a positive relationship between mobile phone-based transactions and GDP. Accordingly, an increase of just one unit in mobile phone-based transactions will result in a 0.11% increase in Nigeria's GDP. In the long run, foreign direct investment has a positive and statistically significant impact on Nigeria's gross domestic product, which translates to an increase in GDP of 0.14% for every unit more invested abroad.

Both in terms of sign and size, the error correction term (ECT) satisfies all theoretical and statistical requirements. The ECT coefficient is -0.522626 with a 5% level of significance. This shows that at 52.26 percent, the disequilibrium brought on by the shock in the years before is corrected to the long-term equilibrium in the present year.

4.4.3 Post estimation tests

Table 4.6 Post estimation tests

Tests	P-value
Serial correlation	0.4556
Heteroscedastics	0.1647
Normality	0.8710

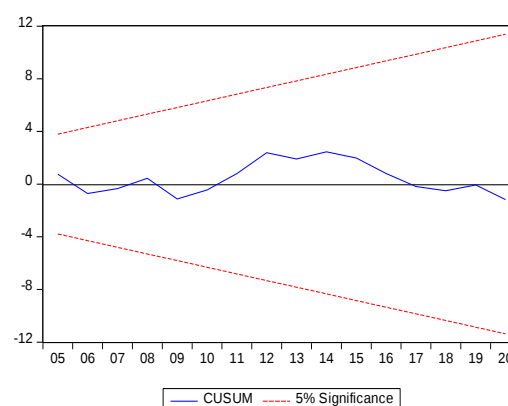
Source: Researcher computation using E-views 10.

The model passed all post-estimation tests with probability values more than 5%, including serial correlation, heteroscedasticity, and normality tests. We may say that the model is reliable.

4.4.4 Stability

To make sure the data generation process is compatible with the estimated coefficient of the model, a stability test of the model is used.

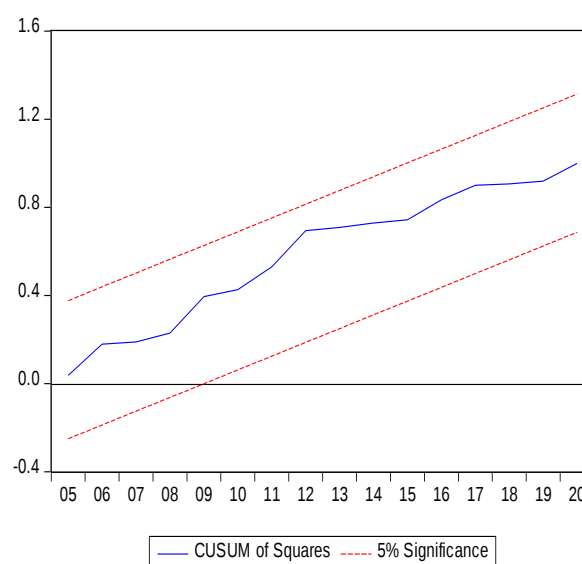
Figure 4.1 CUSUM Plot Recursive Residuals of ARDL model



Source: Researcher computation using E-views 10.

Since the CUSUM plot in Figure 4.1 is within 5% of significant, the model is stable. This demonstrates that there is no possibility of irrational regression.

Figure 4.2 CUSUM SQUARE Plot Recursive Residuals of ARDL model



Source: Researcher computation using E-views 10.

According to Figure 4.2, the model is stable because the cumulative sum square plot is within 5% of significant. This demonstrates that there is no possibility of irrational regression.

5.0 Conclusions and Recommendations

Using quarterly data from 1986 to 2020, the research examines the connection between financial inclusions and economic growth in Nigeria. The investigation has made use of the Auto Regressive Distributive Lag (ARDL) model. The short run outcome demonstrates that a commercial bank branch has a favorable and statistically significant impact on Nigeria's gross domestic product. The Nigerian gross domestic product is negatively impacted by automated teller machines, however this impact is statistically negligible. Additionally, the long-term outcome demonstrates that commercial bank branches have a favorable and statistically significant impact on Nigeria's gross domestic product. The Nigerian gross domestic product is positively and statistically significantly impacted by automated teller machines. Bank deposits made by domestic customers have a positive and statistically significant impact on Nigeria's GDP. The Nigerian gross domestic product is positively and statistically significantly impacted by mobile phone-based transactions. In Nigeria, foreign direct investment has a positive and statistically significant impact on GDP. Both in terms of sign and size, the error correction term (ECT) satisfies all theoretical and statistical requirements. The ECT coefficient is -0.522626 with a 5% level of significance. This shows that at 52.26 percent, the disequilibrium brought on by the shock in the years before is corrected to the long-term equilibrium in the present year. According to the paper, the Central Bank of Nigeria should require commercial banks to increase the number of automated teller machines in each branch and ensure that the machines are always being serviced so that customers may access their money. For rural residents and the economy as a whole, more and better financial services should

be made available in order to increase their participation and contribution to national productivity.

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