Impact of Financial Inclusion on Poverty Reduction in Nigeria

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ABSTRACT

The poverty situation in Nigeria has continued to attract the attention of the general public and various successive governments in the country over the years. It is worrisome that the poverty rate in the country has continued to rise despite the rising GDP. Therefore, this study examines the impact of financial inclusion on poverty reduction in Nigeria.Quarterly time series date on poverty rate, financial inclusion index and per capita GDP were the variable used for the analysis. A dummy variable for banking sector reform was also constructed to test for the impact of financial sector reform on poverty reduction in Nigeria.Using a quarterly data ranging from 2009Q1-2020Q4, Bound Test, Zivot-Andrew unit root for structural break and ARDL methods were used to estimate the impact of financial inclusion indexon poverty reduction.The ARDL results showed thatATM and depositor from banks are negatively and statistically significant in relation with poverty reduction in the short and long run.Banking sector reform has a negative significant relationship with poverty reduction. Hence, we conclude that financial inclusion index has significant impact on poverty reduction in Nigeria. Based on the findings,the study therefore recommends that there is an urgent need for government to provide an enabling and favorable legal environment for lending which will enable banks to operate more profitably through lending and grow eventually leading to expansion of banking services.

Keywords:Financial inclusion, Banking sector reform, Poverty, Zivot-Andrew unit root Test,ARDL.
Keywords: Financial, inclusion, poverty and reduction

INTRODUCTION

The principle of financial inclusion has assumed greater level of importance in recent times due to its perceived importance as a driver of economic growth [1,2]. Easy and affordable access to financial products and services through financial inclusion is an imperative policy instrument to improve livelihood, reduce poverty and inequality [3,4,5], especially for low and middle-income countries. As financial exclusion is termed as 'social exclusion', hence the main objective of financial inclusion policy is to include the poor unbanked people with the mainstream financial system so that they can able to obtain economic benefits [6,7,8]. Understanding the significance of financial inclusion on poor people's lives, many developing and developed countries have extended the outreach of formal banking to the lower sections of society. Financial inclusion has been increasingly drawing interests from policy makers, academicians and practitioners in recent decades across the globe due largely to its positive contributions to economic growth, job creation and poverty alleviation [9,10,11]. Despite such growing interest, there is no commonly accepted precise and comprehensive definition of financial inclusion in the existing strands of theoretical and empirical literatures [12,13,14,15]. In a broader term, financial inclusion is defined as a process that confirms the ease of access, availability and use of formal financial systems [16,18,19,20,21]

Statement of Hypothesis

Following identified departure from existing literature, this study will test the following hypothesis:

i. H_0: Financial inclusion indicators has no significant impact on poverty rate in Nigeria.

ii. H_0: There is no structural break between financial inclusion and poverty rate in Nigeria.

iii.H_0: There is no causality relationship between financial inclusion and poverty rate in Nigeria.

METHODOLOGY

The study adopted *Ex-Post Facto* method of research design. This study employed quarterly time series data from 2009 Q1 to 2020 Q4, Poverty rate,Per capita Gross Domestic Product (GDP), Number of ATMs per 100,000 adults (representing the access indicators), Depositors with Banks per 100,000 adults, Private Sector Credit ratio to GDP and M_3/GDP(representing Usage and Quality indicators).Quarterly data for the periods of 2009Q1 – 2020Q4 were extracted from CBN statistical bulletin 2020 and World Bank Global Findex survey 2020. For poverty measurement, this study uses povertyrateas a dependent variable, while on the independent variable side, financial inclusion index and Per capita GDP, as a control variable. Poverty (*pov*) is accessed through the percentage of people living below the poverty line from Index-mundi statistical data. For control variable, we use per capita GDP. The control variable like Per capita GDP has a significant role to play in reducing poverty. Generally, the rise in per capita income of the individual raises the economic status of the person and equally persuades the individual to spend more money on their consumption.

Model Specification

To capture the objectives of this study, which is to evaluate the impact of financial inclusion onpoverty reduction, the model specified as below:

POV=f(DB,ATM,PSC/GDP,M_3/GDP,GDPc,)1

To accommodate structural break on the modeling, a dummy variable (Dum) is added in equation 3.1 above, the new model is specified as follows:

POV =f(DB,ATM, PSC/GDP,M_3/GDP,GDPc, Dum) 2

Taking logarithm of both sides, the stochastic model is expressed as follows:

$$LPOV_t = \beta_1 + \beta_2 LATM_t + \beta_3 LDB_t + \beta_4 PSC/GDP_t + \beta_5 M_3/GDP_t + \beta_6 GDPC_t + \beta_7 Dum + \mu_t \quad 3$$

Where:

POV_t= Poverty rate at $1.90 a day as a percent of the population of country (dependent variable),

LATM=Number of ATMs per 100,000 adults (in log form),

LDB = Depositors with Banks per 100,000 adults (in log form),

PSC/GDP = Private Sector Credit ratio to GDP,

M_3/GDP = Money supply ratio to GDP,

GDP_C= Per capita Gross Domestic Product (GDP) as a control variable,

Dummy: Dum = O Period before financial inclusion policy (2009-2011) and *Dum*=1 period after financial inclusion policy, (2012-2020).We use 2012 as a year to incorporate dummy because it was the year the federal government and CBN lunched the financial inclusion strategy in Nigeria.

β_1= Constant., β_2, β_3, β_4: β_5, β_6, β_7 are the relative slope coefficients and partial elasticity of the parameters, μ_t= stochastic error term, t = Time period.

In order to consider the structural break effect, the ARDL model in Equation 3 is specified as follows:

$$\Delta POV_t = \alpha_0 + \alpha_1 \Sigma^n_q \Delta_1 POV_{t-1} + \alpha_2 \Sigma^n_q \Delta_2 ATM_{t-1} + \alpha_3 \Sigma^n_q \Delta_3 DB_{t-1} + \alpha_4 \Sigma^n_q \Delta_4 GDPc_{t-1} + \alpha_5 \Sigma^n_q \Delta_5 PSC/GDP_{t-1} + \alpha_6 \Sigma^n_q \Delta_6 M_3/GDP_{t-1} + \alpha_7 \Sigma^n_q \Delta_7 Dum_t + \lambda ECM_{t-1} \quad 4$$

Where;

Δ denotes changes in the variables in the short-run, n is the optimal lag length. The parameters q = 1, 2, 3, 4, 5 are the corresponding long-run multiplier, and the parameters Δ=1, 2, 3, 4, 5 are the shortrun dynamic of the ARDL model.λ = the speed of adjustment and ECM_{t-1} is the error correction term which is derived from the residuals obtained from equation 3.7. $Dum_t$is a dummy variable for the break defined as Dum_t=1 for period after break, otherwise, Dum_t=0, for the period before break.t represents the time period; and β_6 is the coefficient of the break dummy.

A priori expectations:

$f_1\alpha_0 < 0$, $f_1\beta_2 < 0$, $f_1\beta_3 < 0$, $f_1\beta_4 < 0$, $f_1\beta_5 < 0$, $f_1\beta_6 < 0$, $f_7 < 0$.

Unit Root test for Stationarity

In considering the properties of time series, it is imperative that a unit root test be conducted in order to prevent spurious regression results. This test is to establish whether the variables are integrated of order I(0) or I(1) or both. It is conventional that a unit root test is first performed in an econometric analysis (Phillips and Perron, 1988). For this purpose, the study employed the Augmented Dicker full & Phillip-Perron Unit Root tests. The outcome of this test, will inform the appropriate cointegration test to use.

The ADF equation is stated below:

$$\Delta y_t = \delta y_{t-1} + \alpha i P_{i=1} \Delta y_{t-i} + \mu_t \quad 5$$

The testing procedure follows an examination of the student-t ratio for δ. The critical values of the test are all negative and larger in absolute terms than standard critical t-values, so they are called ADF statistics. If the null hypothesis cannot be rejected then the series Y_t cannot be stationary. The decision rule is to reject Ho, if the absolute ADF t-statistic > 5% critical values. If otherwise, accept Ho.

The Phillip-Perron (PP) Unit root test was proposed by [8]. They propose an alternative (nonparametric) method of controlling for serial correlation when testing for a unit root. The PP method estimates the non-augmented DF test equation:

$$\Delta y_t = \alpha y_{t-1} + xt\delta + \varepsilon_t \quad 6$$

Where;

α = p – 1, *xt* = optional exogenous regressors which may consist of constant or a constant and trend, δ = parameter to be estimated and *εt* = white noise. It modifies the t-ratio of the α coefficient in equation 3.6, so that serial correlation does not affect the asymptotic distribution of the test statistic.

The Autoregressive Distributive Lag (ARDL)/ Bound Test

The ARDL model approach to cointegration is used to establish the existence of cointegration or long-run relationship among variables. It's been preferred the most because of its ability to specify both the short run and the long-run parameters simultaneously. According to [9], the approach is most appropriate for variables with mixed order of integration; I(0) and I(1). However, with the assumption of cointegration of the variables in Eqn. 3, the study adopted this approach to estimate the short run and long run parameters of equation 3.3 and thus the model was specified as follows:

$$POV_t = \alpha_0 + \alpha\Sigma\beta_1 POV_{t-1} + \alpha\Sigma\beta_2 ATM_{t-1} + \alpha\Sigma\beta_3 DB_{t-1} + \alpha\Sigma\beta_4 PSC/GDP_{t-1} + \alpha\Sigma\beta_5 M_3/GDP_{t-1} + \alpha\Sigma\beta_6 Dum_t + \lambda ECM_{t-1} \quad 7$$

λ = error correction coefficient (speed of adjustment from the short run to the long run equilibrium after a shock).

The ARDL bounds test for cointegration is based on the Wald-test (F-statistic). Two critical values are given by ARDL Bound cointegration test. The null hypothesis of no cointegration and the alternative hypothesis of cointegration amongst variables are denoted as follows;

H0: $\beta_1 = \beta_2 = \beta_3 = \beta_4 = \beta_5 = \beta_6 = \beta_7 = 0$ (there is no cointegration) 8

H1: $\beta_1 \neq \beta_2 \neq \beta_3 \neq \beta_4 \neq \beta_5 \neq \beta_6 \neq \beta_7 \neq 0$ (there is cointegration) 9

The test criteria will be to accept H_0: if F-statistic < I(0) and reject H0 if F-statistic > I(1). However, if the F-statistic falls between I(0) and I(1), then the test is deemed inconclusive.

For diagnostics, the study will check for structural stability, serial correlation and problems of heteroscedasticity. To check for directional causality amongst the variables, the Pairwise granger causality test will be employed. The model for the causality test is as follows;

$$POV_t = \sum_{t-1}^{n} \alpha_i POV_{t-i} + \sum_{j-1}^{n} \beta_j LATM_{t-1} + \sum_{j-1}^{n} \beta_j LDB_{t-1} + \sum_{j-1}^{n} \beta_j M3/GDP_{t-1} + \sum_{t-1}^{n} \alpha_i PSC/GDP_{t-1} + \sum_{t-1}^{n} \alpha_i Dum_{t-1} + \mu \quad 3.10$$

$$LATM_t = \sum_{t-1}^{n} \alpha_i LATM_{t-1} + \sum_{j-1}^{n} \beta_j LDB_{t-1} + \sum_{j-1}^{n} \beta_j POV_{t-1} + \sum_{j-1}^{n} \beta_j M3/GDP_{t-1} + \sum_{j-1}^{n} \beta_j PSC/GDP_{t-1} + \sum_{t-1}^{n} \alpha_i Dum_{t-1} + \mu \quad 3.11$$

$$LDB_t = \sum_{t-1}^{n} \alpha_i DB_{t-i} + \sum_{j-1}^{n} \beta_j LATM_{t-1} + \sum_{j-1}^{n} \beta_j POV_{t-1} + \sum_{j-1}^{n} \beta_j M3/GDP_{t-1} + \sum_{j-1}^{n} \beta_j PSC/GDP_{t-1} + \mu \quad 3.12$$

$$M3/GDP_t = \sum_{t-1}^{n} \alpha_i M3/GDP_{t-i} + \sum_{j-1}^{n} \beta_j LATM_{t-1} + \sum_{j-1}^{n} \beta_j POV_{t-1} + \sum_{j-1}^{n} \beta_j PSC/GDP_{t-1} + \sum_{j-1}^{n} \beta_j Dum_{t-j} + \sum_{t-1}^{n} \alpha_i DB_{t-i} + \mu \quad 3.13$$

$$PSC/GDP_t = \sum_{t-1}^{n} \alpha_i PSC/GDP_{t-1} + \sum_{j-1}^{n} \beta_j LATM_{t-1} + \sum_{j-1}^{n} \beta_j POV_{t-1} + \sum_{j-1}^{n} \beta_j M3/GDP_{t-1} + \sum_{j-1}^{n} \beta_j Dum_{t-1} + \sum_{t-1}^{n} \alpha_i DB_{t-1} + \mu \quad 3.14$$

$$Dumt = \sum_{t-1}^{n} \alpha_i Dum_{t-1} + \sum_{j-1}^{n} \beta_j LATM_{t-1} + \sum_{j-1}^{n} \beta_j POV_{t-1} + \sum_{j-1}^{n} \beta_j LDB_{t-1} + \sum_{j-1}^{n} \beta_j M3/GDP_{t-1} + \sum_{t-1}^{n} \alpha_i PSC/GDP_{t-1} + \mu \quad 3.15$$

The granger causality test is based on the F-distribution. It involves computing the F-statistics for all the models.*Decision Rule*:Reject H_o: If the probability of the computed F^* is less than 0.05. Accept, if otherwise, we dot reject. The researcher employed the use of E-views 9.0 Econometric software for the data estimation. This choice is because of the availability of ARDL tool in the software [9].

RESULTS AND DISCUSSION

Descriptive Statistic: This was carried out to find out the nature and characteristics of the data.

Table 1: Presentation of Descriptive Statistic Result

	POV	ATM	DB	M3_GDP	PSC_GDP	GDPC	DUM
Mean	27.14583	3179.521	96.56242	22.50236	11.31838	1.147083	0.750000
Median	28.30000	1128.819	15.36105	13.77845	8.362574	1.995000	1.000000
Maximum	35.40000	29690.50	489.3853	79.95000	22.75484	22.18000	1.000000
Minimum	18.20000	11.03000	0.019723	8.464230	5.806165	-17.55000	0.000000
Std. Dev.	5.225346	6490.241	146.2806	18.14598	5.231559	7.569963	0.437595
Skewness	-0.254607	3.222076	1.276477	1.910682	0.741865	0.189050	-1.154701
Kurtosis	1.746645	12.37395	3.023189	5.601164	1.912242	4.473756	2.333333
Jarque-Bera	3.660397	258.7959	13.03623	42.73774	6.769338	4.629831	11.55556
Probability	0.160382	0.000000	0.001476	0.000000	0.033889	0.098775	0.003096
Sum	1303.000	152617.0	4634.996	1080.113	543.2823	55.06000	36.00000
Sum Sq. Dev.	1283.299	1.98E+09	1005706.	15476.00	1286.353	2693.304	9.000000
Observations	48	48	48	48	48	48	48

Source:Authors'computation 2021

The estimated result above showsthe behavioural pattern of the variables over the years under study. From the result as presented in table 1, the variables behave within their maximum and minimum values, which implies that the reaction of the variables to policy review within the period under study is not outrageous, nor deviate too much from the expected outcome or equilibrium. The Jaque-Bera Statistics also show that the variables are normally distributed.The value of Kurtosis of the variables are not far from 3 except that of ATM, DB, M3/GDP, PSC/GDP and Bankingsector reform (Dum). This is also attests to the symmetrical nature of the time series data employed for the analysis.

Unit Root Tests

The Augmented Dickey-Fuller (ADF) and the Phillips-Perron (PP) tests were used to test for the time series properties of the study variables. The results are presented in Table 2 below:

Table 2: Result of ADF and PP Unit Root Test of the variables

Level Form					*First Difference*				*Order of integration*
Variables	*ADF test statistic*	*5% critical values*	*PP test statistic*	*5% critical values*	*ADF test statistics*	*5% critical values*	*PP test statistic*	*5% critical values*	
POV	-1.858495	-2.925169	-1.998934	-2.925169	-6.675633	-2.926622	-6.675531	-2.926622	I(1)
LATM	-2.180670	-2.925169	-2.180670	-2.925169	-7.901759	-2.926622	-7.988138	-2.926622	I(1)
LDB	-2.371847	-2.926622	-2.046727	-2.925169	-5.150949	-2.926622	-5.174776	-2.926622	I(1)
M3/GDP	2.414202	-2.936942	-0.232831	-2.925169	-3.022336	-2.935001	-6.184977	-2.926622	I(1)
PSC/GDP	-1.521746	-2.928142	-1.673666	-2.925169	-4.995177	-2.928142	-8.701476	-2.928142	I(1)
GDP_C	-4.282889	-2.925169	---------	----------	-4.253095	-2.925169	--------	---------	I(0)

Source:Authors'computation 2021

Table 2 above presents the result of the PP and ADF unit root tests of stationarity of the time series data. The results shows that at first difference I(1), *POV,LATM,LDB,M3/GDP* and *PSC/GDP* are stationary,where the absolute values of the ADF & PP test statistic exceed the 5% Mackinnon critical values except the value of per capita GDP which is stationarity at level. Therefore, it is then appropriate to apply the ARDL approach in testing for cointegration since there is a mixture of stationary and non-stationary variables.

ARDL Bound Test

Equation (7) was applied for the ARDL Bound cointegration test. The ARDL model of 3,4,4,4,4,3 was automatically selected using the Akaike Information Criterion. The calculated F-statistic = 13.62461 and is greater than the lower and upper bound critical values of all the significance levels (1%, 2.5%, 5% and 10%) as is evidenced in the table 3 below;

Table 3 ARDL Bound Test Result

ARDL Bounds Test				
Date: 11/20/21 Time: 20:09				
Sample: 2010Q1 2020Q4				
Included observations: 44				
Null Hypothesis: No long-run relationships exist				
Test Statistic	Value	K		
F-statistic	13.62461	6		
Critical Value Bounds				
Significance	I0 Bound	I1 Bound		
10%	1.99	2.94		
5%	2.27	3.28		
2.5%	2.55	3.61		
1%	2.88	3.99		

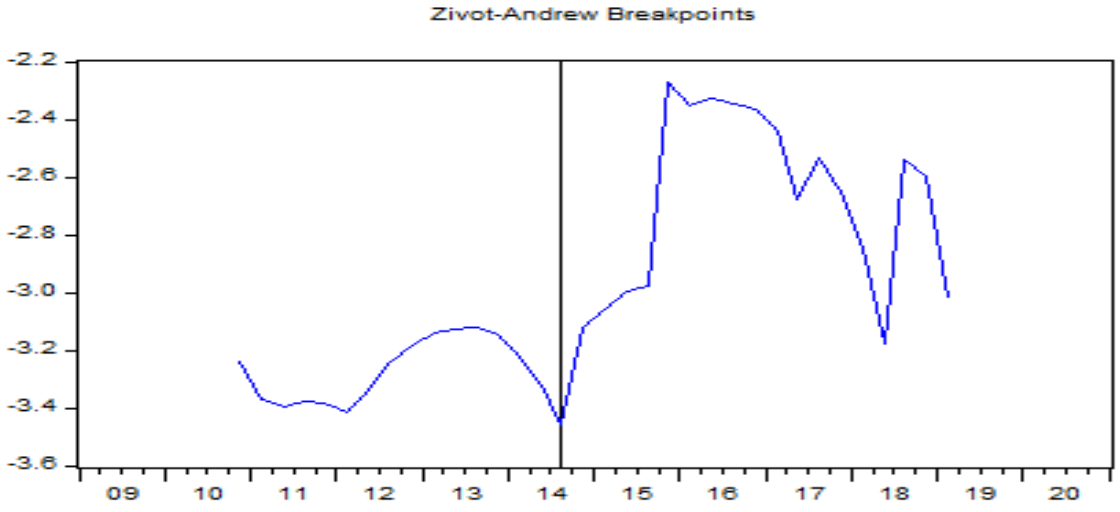
Source:Authors'computation using E-view 9.0

As the table 3 above reveals, the null hypothesis of no cointegration is rejected implying that a long run cointegration relationship exists among the variables. In other words, there is long run association among the variables in the model.

Structural breaks test

The structural break test shownyear 2014Q3 as the break period.Hence, Zivot-Andrew unit root test for structural break was used to account for the structural break and it found that there is a unit root with structural break both intercept and trend in the financial inclusion index (ATM) in year 2014.

Fig. 1 Trend analysis of financial inclusion index and poverty reduction



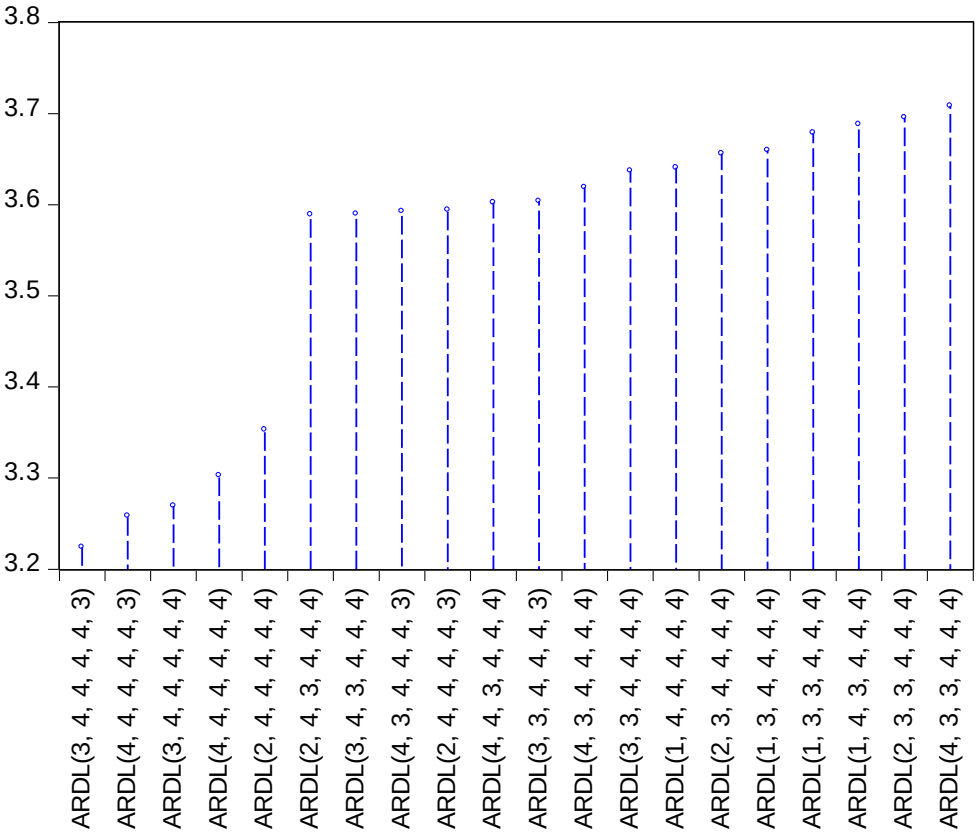
From the figure 1 above, it could be seen that there is sharp increase in financial inclusion index in year 2014 in relation to usage of Automatic Teller Machine (ATM),POS.

Country	Break period	Break Range
Nigeria	2014Q3	2014-2020

Table 4.Zivot-Andrew Structural break Test
Source:Authors' computation. 2021

ARDL with Breakpoint Estimation.

The result is interpreted and discussed based on the lag selected automatically by Akaike Information Criterion (AIC) [3, 4, 4, 4, 4,3] (See fig.2 below).



The estimation is done accounting for the break. The break period (2014Q3, identified through the Zivot-Andrew Unit root test) included in the estimation as a dummy variable.

Table 5ARDL Cointegrating and long run Test Result

ARDL Cointegrating And Long Run Form				
Original dep. variable: POV				
Selected Model: ARDL (3, 4, 4, 4, 4, 4, 3)				
Date: 11/23/21 Time: 20:10				
Sample: 2014Q1 2020Q4				
Included observations: 44				
Cointegrating Form				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(POV(-1))	-0.587170	0.085012	-6.906876	0.0000
D(POV(-2))	-0.273209	0.054416	-5.020704	0.0004
D(LATM)	-	0.005679	-	0.0417

	0.013088		2.304766	
D(LATM(-1))	0.050736	0.007403	6.853288	0.0000
D(LATM(-2))	0.028382	0.004863	5.836216	0.0001
D(LATM(-3))	0.024032	0.006423	3.741555	0.0033
D(LDB)	-0.036982	0.006228	-5.937921	0.0001
D(LDB(-1))	-0.016862	0.007056	-2.389638	0.0359
D(LDB(-2))	0.065048	0.006033	10.781784	0.0000
D(LDB(-3))	0.055029	0.008121	6.775735	0.0000
D(GDPC)	0.000350	0.000658	0.532650	0.6049
D(GDPC(-1))	-0.005650	0.000773	-7.311505	0.0000
D(GDPC(-2))	-0.004424	0.000737	-6.001724	0.0001
D(GDPC(-3))	-0.002386	0.000778	-3.065540	0.0107
D(M3_GDP)	0.005692	0.001203	4.731681	0.0006
D(M3_GDP(-1))	-0.004725	0.000957	-4.935336	0.0004
D(M3_GDP(-2))	-0.007601	0.001093	-6.952276	0.0000
D(M3_GDP(-3))	-0.011761	0.001664	-7.068822	0.0000
D(PSC_GDP)	0.004126	0.003241	1.273356	0.2291
D(PSC_GDP(-1))	0.014334	0.003489	4.108706	0.0017
D(PSC_GDP(-2))	-0.003620	0.003855	-0.939181	0.3678
D(PSC_GDP(-3))	0.059707	0.006390	9.343535	0.0000
D(DUM)	0.037944	0.039520	0.960137	0.3576
D(DUM(-1))	0.056920	0.053697	1.060024	0.3119

D(DUM(-2))	0.476799	0.065961	7.228442	0.0000
CointEq(-1)	-0.856901	0.064163	-13.355096	0.0000
Cointeq = POV - (-0.0428*LATM + 0.0405*LDB + 0.0049*GDPC + 0.0055				
*M3_GDP -0.0174*PSC_GDP + 0.5681*DUM + 3.0717)				
Long Run Coefficients				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
LATM	-0.042753	0.012630	-3.385069	0.0061
LDB	-0.040489	0.006650	-6.088297	0.0001
GDPC	0.004947	0.003735	1.324445	0.2122
M3_GDP	0.005504	0.002391	2.302181	0.0419
PSC_GDP	-0.017431	0.004048	-4.306417	0.0012
DUM	-0.568145	0.059184	-9.599612	0.0000
C	3.071672	0.077374	39.699193	0.0000

Source:Authors' computation 2021

Table 5 above presents the result of the short and long run estimates of the ARDL model. The value of poverty rate (POV) is negatively and statistically significant (P(t) = 0.0000, 0.0004) both in the lag one and lag two. The log value of the number of ATMs per 100,000 adults (*LATM*) isnegativeandsignificant in determining poverty rate both in short and long run.The sign of the coefficient of number of ATMs per 100,000 adults does meet a priori expectation in the short and long run respectively.This outcome is statistically significant since the probability of the t-statistic (*P(t) = 0.0004&0.00061*) is less than 0.05 in the short and long run. This implies that 1% increase in the number of ATMs per 100,000 adults brings about a 0.01% and 0.04%decline in poverty rate in Nigeria, ceteris paribus at the 5% significance level. However, prior to break period, in Lag1,2&3 periods, the number of ATMs per 100,00 Adults has a positive and significant impact on poverty rate. This finding is in line withHarley, Adegoke & Adegbola (2017),whose studies reveals that one percent increase on ratio of active ATM will leads to about 0.0082 percent increase in the gross domestic product and a reduction of poverty in developing economy. Depositor with banks per 100,000 adults (LDB) suggests a negative significant relationship with poverty ratio in the short and long run. The sign of the coefficient of depositor with banks per 100,000 adults does meet a priori expectation in the short and long run respectively.Therefore, 1% increase in the number of depositorswith banks per 100,000 adults brings about a 0.03% and 0.04% decrease in poverty rate on average in the short and long run, ceteris paribus at the 5% significance level. Prior to break period, depositor with banks per 100,000 Adult has negative and significant impact

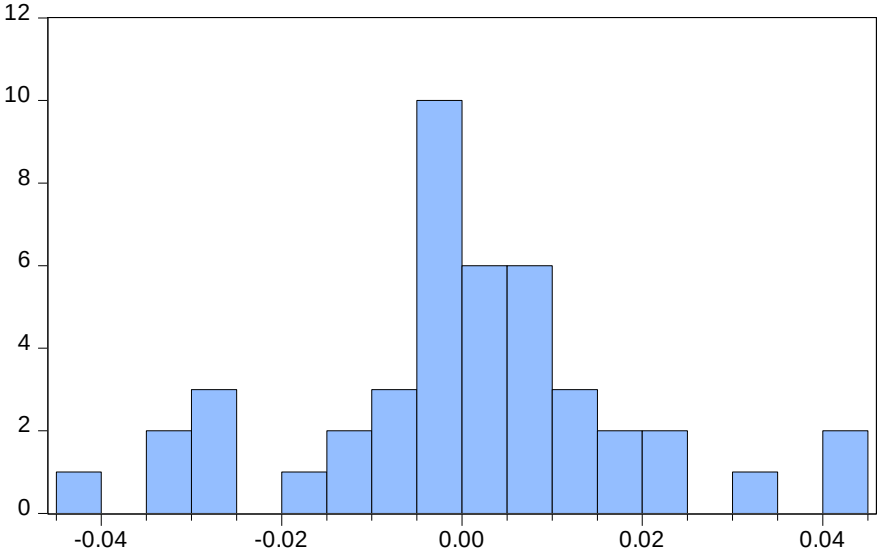
on poverty rate in lag1, whereas in lag2 and lag3, it has positive and significant impact on poverty ratio. This finding isin linewith a prior expectation or economic theoretical expectations that the more depositors to bank, less the poverty rate of those depositors in the long run, all things being equal. The relationship between Per capita GDP (*GDPc*) and Poverty rate is positive and statistically insignificant in the short and long run (P(t) = 0.6049& 0.2122) at 5 per cent.The sign of the coefficient of Per capita GDP does not meet a priori expectation in the short and long run.This finding goes against the economic theoretical expectations thatrise in per capita income of the individual in relation national income and GDP reduces poverty ratio.Therefore, there isno correlation between Per capita GDP and poverty rate reduction within the period under study.However, in Lag1,2&3 periods, per capital GDP has a negative significant relationship with poverty ratio. The coefficient of M_3/GDP is positive and statistically significant in determiningpoverty ratio reduction in the short and long run. The sign of the coefficient of M_3/GDP did not confirm with a priori expectation in the short and the long run respectively.This outcome is statistically significant since the probability of the t-statistic (*P(t) =0.0006 &0.0419*) is less than 0.05 both in the short andlong run.Prior to the break period, Lag1,2, & 3, M_3/GDP has a negative significant relationship with poverty rate reduction. Therefore, 1% increase in the M_3/GDPleads to 0.005% and 0.005%increase in poverty ratein the short and long run at the 5% significance level, ceteris paribus. The relationship between private sector credit to GDP (PSC/GDP) and poverty rate is positive and statistically insignificant at 5 per cent in current periodin the short run(P(t) = 0.2291). However, in the long run, PSC/GDP has a negative significant impact on poverty rate.The sign of the coefficient of PSC/GDP did not confirm with a priori expectation in the short.This outcome is statistically significant since the probability of the t-statistic (*P(t) = 0.0012*) is less than 0.05 in the long run. This implies that 1% increase in PSC/GDPleads to0.01%decline in poverty rate in Nigeria at the 5% significance level, all things being equal. Hence, Lag1, &3, has a positive significant relationship with poverty ratio, whereas Lag2 has a negative insignificant relationship with poverty rate reduction. The dummy variable for banking sector reform (*Dum*) is positive and statistically insignificant in current period in the short run (P(t) = 0.3576). However, in the long run, banking sector reform has a negative significant relationship with poverty rate reduction. Therefore, 1% improvement in the banking sector reform leads to 0.57% decline in poverty rate in Nigeria, in the long run at the 5% significance level, all things being equal.This could be attributed to on-going banking sector reforms which aimed at improving bank stability and easy access of financial services to the masses.Prior to the break period, banking sector reform could be seen to has a positive insignificant relationship with poverty rate in lag1, whereas in lag 2, banking sectorreform has a positive significant relationship with poverty rate. The error correction mechanism (ECM) measures the speed at which prior deviations from the equilibrium are corrected in the current period.The result of the short run model, in table4.5 shows that the error correction term (cointegration term) is negatively signed and statistically significant as is expected by economic theory. The coefficient of ECM as computed is -0.856901. This implies that the speed at which the poverty rate is restored back to equilibrium after a shock is 85 per cent. This outcome is statistically significant with the *p.value* of 0.0000.

Post Estimation Test

Normality Test

Normality test is essential to ascertain the distribution of the data set in the model. It could be seen in figure 3 below that the null hypothesis that the variables are not normally distributed is to be rejected since the probability value of Jarque-Bera

is greater than 0.05, at 0.873161 This means that the variables follow normal distribution.



Series: Residuals
Sample 2010Q1 2020Q4
Observations 44

Mean	-1.07e-15
Median	-0.000150
Maximum	0.043276
Minimum	-0.041590
Std. Dev.	0.017991
Skewness	0.000836
Kurtosis	3.384660
Jarque-Bera	0.271271
Probability	0.873161

Serial Correlation LM test of the selected ARDL Model

Table 6 Breusch-Godfrey Serial Correlation LM Test:			
F-statistic	3.487336	Prob. F(2,9)	0.0756
Obs*R-squared	19.21076	Prob. Chi-Square(2)	0.1860

Source:Authors' computation 2021

Serial correlation test was conducted using the Breusch-Pagan Serial correlation LM test. From table 4.6 above, it can be seen that the probability Chi-Square (0.1860) is greater than 0.05 at 5% significant level. Therefore, the null hypothesis that there is serial correlation in the residual of the short-run model is rejected. We conclude that the residual in our short-run ADRL model is not serially correlated. Heteroscedasticity Test: This test was conducted using the Breusch-Pagan LM test. The result of table 7 below shows that the probability of the Obs*R-square (0.3803) is greater than 0.05. In that, we do not reject the null hypothesis of homoscedasticity or constant variance of the residual.

Table 7 Heteroskedasticity Test: Breusch-Pagan-Godfrey			
F-statistic	1.139818	Prob. F(32,11)	0.4296
Obs*R-squared	33.80498	Prob. Chi-Square(32)	0.3803
Scaled explained SS	2.519168	Prob. Chi-Square(32)	1.0000

Source:Authors' computation 2021

Stability Diagnostic Test

Stability of the short run model was tested using CUSUM test and CUSUM of Squares test. The idea behind this test is to reject the hypothesis of model stability if the blue line lies outside the dotted red lines otherwise, the model is said to be stable. The result of this test is presented in figures 4 and 5. The result of the CUSUM and CUSUM square test shows that the blue lines lies inside the dotted red line which indicates that the model is dynamically stable.

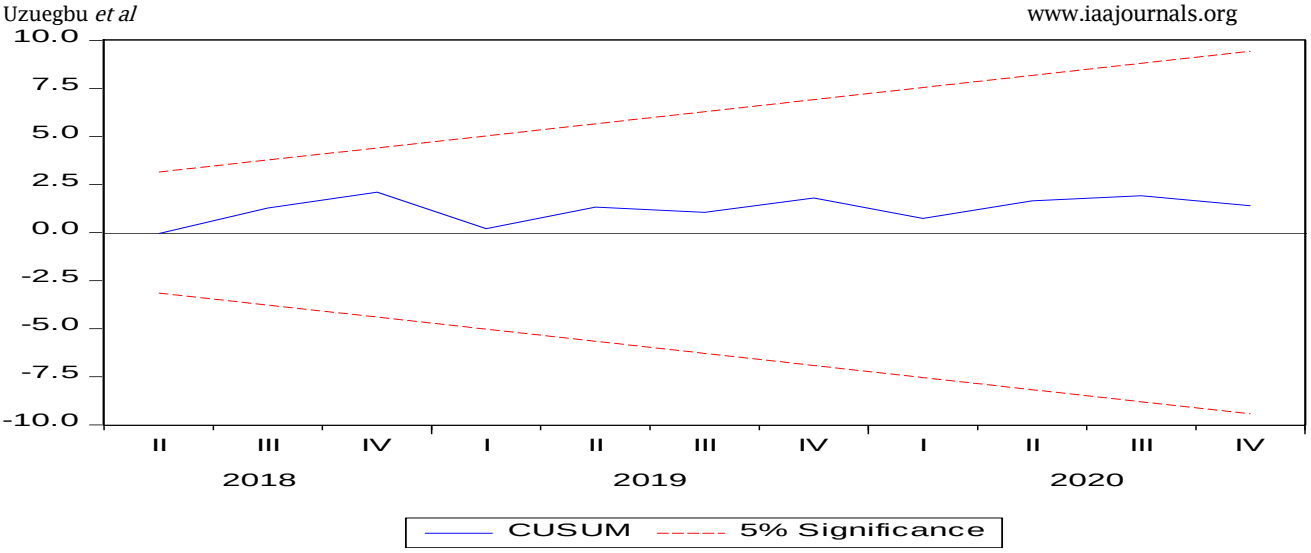


Figure 4

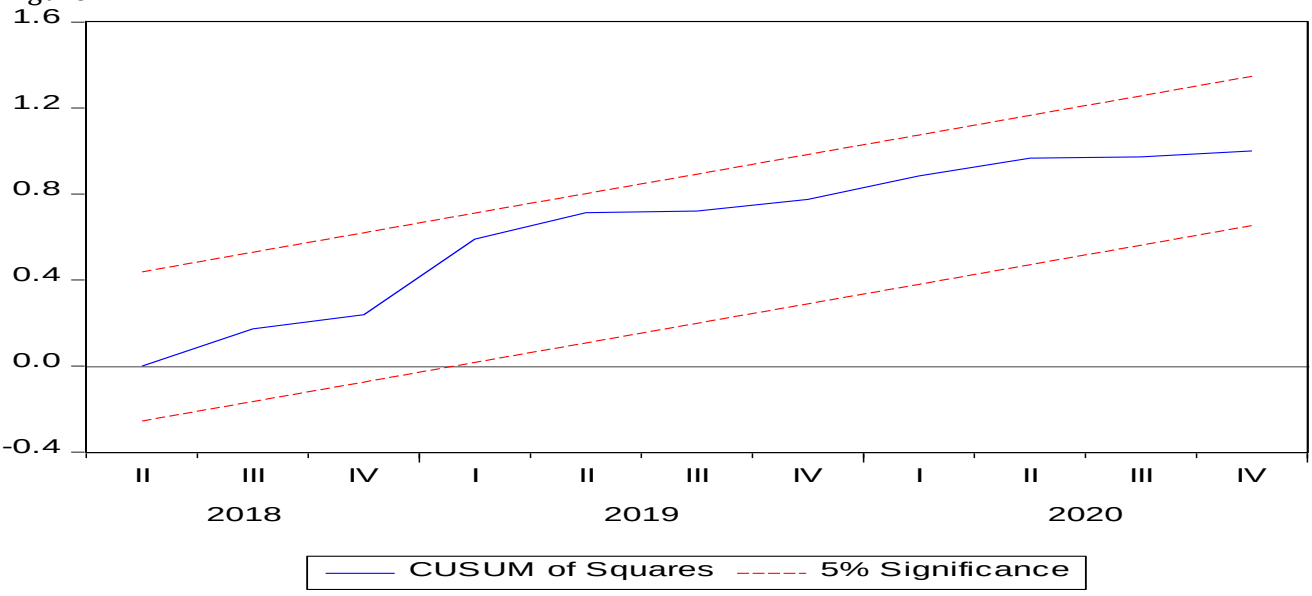


Figure 5

Test for Model Specification

This test is a specification test that helps to check if the model estimated was correctly specified. It makes use of F-statistic and the null hypothesis is that the model was correctly specified. This is to be rejected if the probability value of F-statistic is less than 0.05. Otherwise, the null hypothesis is not to be rejected. Table 4.6 shows that the probability value ofF-statistic (0.2929) is greater than 0.05 indicating that the null hypothesis is not to be rejected at 0.05 levels. This implies that the model estimated was correctly specified.

Table 8 Ramsey RESET Test			
Equation: UNTITLED			
Omitted Variables: Squares of fitted values			
	Value	df	Probability
t-statistic	1.112689	10	0.2919
F-statistic	1.238076	(1, 10)	0.2919

Source:Authors' computation 2021

Granger Causality Test Result

Table 9: Result of Pairwise Granger Causality Test

Pairwise Granger Causality Tests			
Date: 11/20/21 Time: 20:15			
Sample: 2009Q1 2020Q4			
Lags: 2			
Null Hypothesis:	Obs	F-Statistic	Prob.
LATM does not Granger Cause POV	46	3.21669	0.0504
POV does not Granger Cause LATM		0.27207	0.7632
LDB does not Granger Cause POV	46	4.92991	0.0121
POV does not Granger Cause LDB		0.41311	0.6643
GDPC does not Granger Cause POV	46	0.20136	0.8184
POV does not Granger Cause GDPC		0.53037	0.5924
M3_GDP does not Granger Cause POV	46	1.14839	0.3271
POV does not Granger Cause M3_GDP		0.32022	0.7278
PSC_GDP does not Granger Cause POV	46	0.71170	0.4968
POV does not Granger Cause PSC_GDP		0.23914	0.7884
DUM does not Granger Cause POV	46	19.9626	9.E-07
POV does not Granger Cause DUM		0.58741	0.5604

Source:Authors' computation 2021

The Pairwise granger causality test result is presented in table 9 above. The estimated causality results shows that a unidirectional causality running from depositor with banks, banking sector reformto poverty rate in Nigeria. Also, the results show no directional causality between number of *LATM* per 100,000 adults and poverty ratio; per capital GDP and poverty ratio; Private sector credit to GDP and poverty ratio; M_3/GDP and poverty ratio in Nigeria. From the estimated results, the following hypothesis testing were found;

i. H_0: Financial inclusion indicators has no significant impact on poverty rate in Nigeria.

Decision Rule: Reject the null hypothesis if the probability value of financial inclusion indicators is less than 0.05. Otherwise, the null hypothesis is not to be rejected at 5 percent level of significant. From the estimated result in table 5, ATM and depositor from banks are found to be negatively and statistically significant in relation with poverty reduction in the short and long run. This implies that 1% increase in number of ATM per 100,000 adults bring about a 0.01% and 0.04%decline in poverty ratio in Nigeria. Also, 1% increase in the number of depositors from banks per 100,000 adults brings about a 0.03% and 0.04% decrease in poverty ratio in Nigeria. However, M_3/GDP has positive significant impact on poverty ratio in the long run, but statistically insignificant in the short run. Also, PSC/GDP has a positive but statistically insignificant impact on poverty ratio in the short run,

whereas, in the long run PSC/GDP has a negative significant impact on poverty ratio. Therefore, it can be said that overall, financial inclusion index hassignificant impact on poverty reduction in Nigeria in the long run.

ii. H_0: There is no structural break between financial inclusion and poverty rate in Nigeria.

From the result of Zivot-Andrew structural break test 4.4, shows that 2014 year is the break period in the financial inclusion policy in relation with poverty reduction in Nigeria.

iii. H_0: There is no causality relationship between financial inclusion and poverty reduction in Nigeria.

Decision Rule: Reject the null hypothesis if the probability value of F-statistic of pairs is less than 0.05. Otherwise, the null hypothesis is not to be rejected at 5 percent level of significant. From pairwise granger causality test result, the estimated causality result shows that a unidirectional causality running from depositors with banks, banking sector reform to poverty rate in Nigeria. Also, the results show no directional causality between number of *LATM* per 100,000 adults and poverty ratio; per capital GDP and poverty rate; Private sector credit to GDP and poverty rate; M_3/GDP and poverty rate in Nigeria.

Discussion of the Results

To determine the appropriate estimation technique, this study conducted theunit root test and found that the variables are stationary at first difference I(1) and level I(0). Also, the study conducted Zivot-Andrew structural break test and found that there is structural break in financial inclusion indicators (ATM&POS) in 2014 year. However, results from ARDL estimates show that ATM per 100,000 adults and depositors with banks have a negative significant impact on poverty reduction in Nigeria.This finding is in line with [9] whose studies reveals that one percent increase on ratio of active ATM will leads to about 0.0082 percent increase in the gross domestic product and a reduction of poverty in developing economy. Following [13], this study also found a unidirectional causality running from depositor with banks, banking sector reform to poverty ratio in Nigeria.

CONCLUSION AND RECOMMENDATIONS

The importance of financial inclusion is globally acknowledged due to itsstrategic role of bringing integrity and stability into financial systems as well as its role in fighting poverty in a sustainable manner. It is more pertinent in the case of Nigeria as a developing nation to use financial inclusion as a platform not just for growing the financial sector but more as an engine for driving an inclusive economic growth. The study examined the impactof financial inclusion onpoverty reduction in Nigeria between 2009Q1 to 2020Q4.Secondary Time series data were collected from CBN statistical bulletin 2020 and World Bank dataset. The time series data used are quarterly data such as number of ATM per 100,000 adults, Depositor with banks, per capita GDP, M3/GDP and PSC/GDP. The study adopted Augmented Dickey-Fuller and Phillip Perron test to check for maximum order of integration of the variables used in the study and the variables are all integrated at level I(1), except value of per capita GDP which integrated at level I(0).Bound Test cointegration analyses showed evidence of long run relationship among the variables.Also, Zivot-Andrew unit root test for structural break was used to account for the structural break and it found that there is a unit root with structural break both intercept and trend inall financial inclusion index in year 2014.The result of the ARDL reveals that ATM and depositor from banks are negatively and statistically significant in relation with poverty reduction in the short and long run. This implies that 1% increase in number of ATM per 100,000 adults bring about a 0.01% and 0.04%decline in poverty rate, in the short and long run in Nigeria respectively. Also, 1% increase in the number of depositors from banks per 100,000 adults brings about a 0.03% and 0.04% decrease in poverty rate, in the short and long run in Nigeria. However, M_3/GDP has positive

significant impact on poverty rate in the short and long run. Also, PSC/GDP has a positive but statistically insignificant impact on poverty rate in the short run, whereas, in the long run PSC/GDP has a negative significant impact on poverty rate. Banking sector reform has a negative significant relationship with poverty ratio reduction. This implies that a 1% improvement in the banking sector reform leads to 0.57% decline in poverty rate in Nigeria, in the long run at the 5% significance level.Lastly, there is a unidirectional causality running from depositors with banks, banking sector reform to poverty rate in Nigeria. Also, the results show no directional causality between number of *LATM* per 100,000 adults and poverty ratio; per capital GDP and poverty rate; Private sector credit to GDP and poverty ratio; M_3/GDP and poverty rate in Nigeria [14]. The overall conclusion in this study is that financial inclusion index has significant impact on poverty rate reduction in Nigeria, the study recommends thatthere is an urgent need for government to provide an enabling and favorable legal environment for lending which will enable banks to operate more profitably through lending and grow eventually leading to expansion of banking services. This is because government role is more of creating the enabling environment for the operators and the consumers to relate and interact in a mutually beneficial way. There is also need that the poverty reduction initiatives by the government should be geared towards providing jobs opportunities for the poor in order to boost their income. Transaction costs, financial obligations and other requirements/expectations which pose as bottlenecks to using financial services or products should be reviewed downwards to accommodate the proportion of the population that are poor.Banks in Nigeria are therefore expected to build capacity in order to adequately support and propel the growth of financial inclusion in the country. Building capacity will include training and equipping of staff with the necessary skills, particularly in the area of rural development financing.In additional, Central Bank should also provide the microfinance banks with the necessary regulatory support and direct them to focus their services towards the poor masses in rural villages in order to serve them better.

REFERENCES

1. Abel, S., Mutandwa, L.;& Roux, P.L. (2018). A Review of Determinants of Financial Inclusion. *International Journal of Economics and Financial Issues, vol. 8, no. 3, pp. 1.*
2. Achugamonu, R., Anwar, A., Uppun, P., Tri, I., & Reviani, A (2020). Financial exclusion of bankable adults: Implication on financial inclusive growth among twenty-seven SSA countries. Cogent Social Sciences, 6(1), 1730046.
3. Akpunonu, U, Egungwu, I., Dim, E. O.,& Emeka-Nwokeji, N, (2019) Effect of Financial Sector Reforms on Economic Growth in Nigeria. Available at SSRN:https://ssrn.com/abstract=3402435 or http://dx.doi.org/10.2139/ssrn.340243.
4. Afolabi, J.& Mamman, H. (1994). The Dynamics of Savings in the Deregulated Economy: The case of Nigeria. *NDIC Quarterly* 4(4):16-27.
5. Amadou, D. (2018). "*Financial Inclusion and Poverty Reduction: Selected Approaches and Implications for Mali's Choice*," Academic Journal of Economic Studies, Faculty of Finance, Banking and Accountancy Bucharest,"Dimitrie Cantemir" Christian University Bucharest, vol. 4(4), pages 50-56, December.
6. Andabai, A.H.,&Igbodika, S. (2015). The Impact of Financial Inclusion on Economic Growth in Nigeria: An Econometric Analysis. *International Journal of Innovation and Research in Educational Sciences Volume 5, Issue 2*, ISSN (Online) : 2349– 5219.

7. Aro-Gordon, S. (2016) Effectiveness of Financial Inclusion Strategy in Nigeria. *2nd International Conference on Inclusive Economic Growth and Sustainable Development. November 18-19*,Mysuru, India. Retrieved from sdmimd.ac.in/pdfs/IEC2016_Paper 110.pdf.
8. Ayensu A.E. Mensah L., Gyeke-Dako A.& Chibuzo I. (2017). The Impact of Financial Inclusion on Poverty Reduction in Some Selected Sub-Saharan Africa Countries.
9. Bakari., I. H., Donga, M., Adamu, I., Hedima, J. H., Kasima, W., Hajara, B., & Yusrah, I. (2019). An examination of the impact of financial inclusion on poverty reduction: A empirical evidence from sub-saharan Africa. *International Journal of Scientific and Research Publications,* 9(1), 239–252. http://dx.doi. org/10.29322/IJSRP.9.01.2019.p85 32.
10. Baidoo, S. T., & Akoto, L. (2019). Does trust in financial institutions drive formal saving? Empirical evidence from Ghana. *International Social Science Journal, 69 (231), 63–78.* https://doi.org/10.1111/issj.1220 0
11. Baidoo, S. T., Yusif, H., & Ayesu, E. K. (2020). Improving loan repayment in Ghana: Does financial literacy matter? Cogent Economics & Finance, 8(1), 1787693. https://doi.org/10.1080/23322039 .2020.1787693.
12. Banerjee, A.,&Newman, A. (1993). "Poverty, Incentives and Development." *American Economic Review Papers and Proceedings, Vol. 84, No. 2, 211–5.*
13. Barik, R., & Pradhan, A. K. (2021). Does financial inclusion affect financial stability: Evidence from BRICS nations?. *The Journal of Developing Areas, 55(1).*
14. Bateman, M., Duvendack, M., & Loubere, N. (2019). Is fintech the new panacea for poverty alleviation and local development? Contesting Suri and Jack's M-Pesa findings published in Science. *Review of African Political Economy, 46(161), 480–495.* https:// doi.org/10.1080/03056244.2019.1 614552.
15. Beegle, K., Himelein, K., & Ravallion, M. (2003). Frame-of-reference bias in subjective welfare. *Journal of Economic Behavior & Organization, 81(2), 556–570.* https://doi.org/10.1016/j.jebo.201 1.07.020
16. Brune, L., Giné, X., Goldberg, J., & Yang, D. (2011). Commitments to Save: A Field Experiment in Rural Malawi. *World Bank Policy Research Working Paper Series No. 5748. Washington, DC: World Bank.* https://doi.org/10.1596/1813-9450-5748
17. Central Bank of Nigeria (2019) National Financial Inclusion Strategy. Summary report, January. *Central Bank of Nigeria Publications.*CBN (2019). Statistical bulletin.
18. CBN (2019a) Financial Inclusion in Nigeria: Issues and Challenges. Retrieved from https://www.cbn.gov.ng/out/2020 /rsd/occasional%20paper%20no. %2045%20issues%20and%20challen ges.pdf
19. Choudhury, S. R., & Bagchi, D. (2016). Financial Exclusion-A Paradox in Developing Countries. *Journal of Economics and Finance, 3(1), 40–45.* https://smartlib.umri.ac.id/assets/ uploads/files/6744bg0703014045. pdf.
20. Clarke, S.R., Xu, L.,&Zou, R. (2006). Financial Inclusion in India: An axiomatic approach. *Journal of Policy Modelling*, 35, pp. 813-837.
21. Dandume, A. R. (2014). Effects of Financial Inclusion on the Economic Growth of Nigeria (1970-2011). *International Journal of*

Business and Management Review, 11-28.