



DOES FINANCIAL INCLUSION ALLEVIATE POVERTY IN NIGERIA? A TIME SERIES ANALYSIS

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Abstract

The quest to reduce poverty by the government and its agencies through the provision of financial services for the poor and rural dwellers in Nigeria makes it imperative to investigate how the access, availability and cost of financial services provided by Deposit money banks (DMBs) have reduced poverty in Nigeria. In order to achieve this purpose of the study, data on poverty rate as dependent variable, deposit penetration, credit penetration, bank branch penetration, ratio of domestic investment to GDP and interest rate as independent variables were sourced from secondary source and analysed using the Autoregressive and Distributed lag (ARDL) methodology. The result shows that: deposit penetration and bank branch penetration had negative and significant impact on poverty level both in the short and long run hence retarded poverty while credit penetration has mix effect on poverty in the short run but positive and significant impact on poverty in the long run. Ratio of domestic investment to GDP also exerted negative impact on poverty in the long run while interest rate has insignificant and negative impact on poverty in the short run but positive and insignificant effect on poverty in the long run. The result also shows that the variables in the poverty equation adjust speedily to short run dynamics in poverty level. Given these results, the study concludes that, financial inclusion (access, availability and cost of financial services) significant implications on poverty level both in short and long run in Nigeria over the period of this study. Based on this conclusion, the study recommends: increase in deposit mobilisation through savings, domestic investment and banks' branches to create jobs and reduce poverty in Nigeria.

Key words: Poverty rate, Deposit penetration, Credit penetration, Branch penetration, Domestic investment, Interest rate.

INTRODUCTION

Poverty refers to inability of people or person to meet their fundamental and necessity needs like food, clothes and shelter. According to UNDP poverty means "denial of choices and opportunities, a violation of human dignity" and it means the poor inability to be involved in society effectively apart from not having "food, clothes and shelter". The multi-dimensional nature of poverty factor was presented by UNDP which assessed 105 nations that cover nearly three quarter of global population in 2020. The work moved beyond revenue and identified how people are ignored within

three main dimensions like health-care, education and living-standard. The work revealed that multi-dimension poverty nature is noticed in every less developed nation globally but it is mostly severe serious in sub-Sahara Africa and south Asian nations where 83% of multi dimension poor people live. The nations with most persons living in multi-dimension poverty are “India, Nigeria, Ethiopia, Pakistan and Bangladesh”. In sub-Sahara Africa, over 550 million persons are living in multi-dimension poverty while in Nigeria over 40% of people are living in severe poverty. The 2020 UNDP records confirmed Nigeria as poverty headquarters globally with over 40% of people living in extreme poverty and it is supposed that nearly 150 million persons would drop into severe poverty by end of 2021.

Due to crucial role financial services and inclusion play in gathering and allocating funds between lacking and excess monetary units, Policy-makers, regulators and banking sector have not reneged in instituting programs that would improve realisation of financial inclusion agenda and poverty alleviation in Nigeria. The key player behind this strategy is that nations that are seeking or pursuing rigorous monetary inclusion intend to accomplish high macro-economic performance especially poverty alleviation than ones with lower financial inclusion rate (Uruakpa et al., 2019).

Consequent upon these actions, Nigeria government, CBN and DMB have over these years, initiated and implemented countless of programs geared toward improving monetary inclusion in the nation thus stimulate investment, economic growth and reduce poverty of the nation. Some of programs initiated by government and monetary sectors in Nigeria over these years include: local banking aimed at facilitating bank habits among large agro-based rural people; community formation and micro-finance banks, “e-banking products, electronic payment system and cashless policy – ATMs, POS and mobile banking; Non-interest banking involving Islamic banking; the National Economic Reconstruction Fund (NERFUND) and Family Economic Advancement Programme (FEAP)” among others (NFS, 2018).

In spite of existence of these schemes, CBN report of 2016 shows that only 58% of Nigeria which represent 96.4million adults are restricted from access to monetary services. In 2018, CBN initiated strategy targeted at reducing number of adult in Nigeria that are monetarily not included to 20% in 2020 from base figure of over 45% in 2010. The extent to which these strategies and policies have affected local investment and poverty are key concerns of this paper. We shall continue our investigation by reviewing works carried out by past scholars on the topic, followed by outlining the methodology employed to address the questions raised, results, findings and concluding remarks.



LITERATURE REVIEW

Some scholars championed by Romer in 1990 examined connections between financial advancement and long-term growth and poverty reduction. The concern of these scholars was if financial conditions could show maintainable increment in per-capita GDP and their main contention was that “finance generates an external effect on aggregate investment efficiency, which offsets the decrease in the marginal product of capital. Some studies consider the role of stock markets exclusively”. In several studies this model structure is AK typed (Romer, 1986) which means that “there are constant returns to a sufficiently broad concept of capital”. Bencavenga and Smith (1991) presented model in which savings were directed to productive operations through ensuring that investors adjust or control their assets composition to physical growth improving investments. People are confronted with uncertainty concerning their future money needs and thus they keep two forms of assets, namely liquid assets these are unproductive but safe, or non-liquid assets these are highly productivity and unsafe. The presence of financial intermediaries moves assets composition to riskier one and thereby increases growth and reduce poverty. Monetary firms allow people to reduce danger connected to their liquidity needs. Not minding the uncertainty people face concerning future money needs, banks are confronted with predictable need for money from depositors due to law of massive numbers. Thus, banks are helped to allocate invested funds efficiently. Also, social unnecessary funds are reduced because people are never compelled to liquidate their assets in presence of financial intermediaries. In same manner Bencevenga et al., (1995) revealed that monetary firms reduce liquidity danger which savers confront by making monetary assets buyable or by help depositors withdraw money before maturity which minimizes disincentive to invest in long-term assets. The lower transaction expenses in monetary markets are critical to analysis. King and Levine (1993) presented Schumpeterian model for technology-based progress likened to Romer (1990) and Grossman and Helpman (1991) and stated that “Financial intermediaries provided by banks and security markets help investors to take up innovative activities which affects economic growth through productive investment”. Monetary systems impact of business activities in different manner: They assess businesses, pool resources; diversify value and risk, supposed gain from inventive operations. Better financial systems increase probability for successful invention.

Distortions such as rate of deposit ceilings or massive reserve needs reduce invention rate. Another set of work is focused on issues such as state interventions in money market or market-failure. These scholars put these “old” concerns into “new framework of endogenous growth”. Roubin and Sala-Martin (1992) for example re-investigated financial repression context for AK model especially for endogenous

increment with fixed capital return. In this model state might design policies for financial repression to create simple inflationary income. Financial repression triggered people to move massive nominal money and that is base for inflation. Due to massive income levy based on levy evasion, states opt to repress monetary sector and increase inflation. Growth will be hindered due to negative impact of financial repression on capital effectiveness and savings.

Mattesini (1996) presented different technique for financial advancement. He designed simple overlapped model in which money market is known for asymmetric or non-unified information. Similar to Roubini Martin production based on Romer (1986) fixed scale technology return and one factor of growth is cost monitoring level for monetary firms, one parameter represents efficiency of intermediation system which is approximated through spread between lend and borrow funding rates to conduct analysis. High cost for monitoring is assumes to minimize monetary growth rate which means that growth and spreading are supposed to be connected negatively. The critical plank in this these argument is that increase in access to financial services through intermediation by the banking sector help to stimulate investment, create jobs and reduce poverty among the people. However, the low access to financial services in most developing economies especially, Nigeria has worsened poverty among the populace resulting to about 50% of its populace living below the poverty as at the year 2020.

Supporting the crucial role of financial inclusion in development process, Demirguc-Kunt et al., (2017) in their work provided proof on how ease to cheap financial services motivate people to make daily monetary transactions efficiently and safely and increase their investment and monetary risk handling options by using formal financial system. They argued that “development is very common for people living in the poorest 40% of households”. They also maintained that not all financial products are operative in accomplishing economic development goals like poverty and inequality annihilation.

Uddin et al., (2012) used ARDL approach to examine connections between bank financial services and poverty eradication in Bangladesh from year 1976 to 2010 and their findings show that long run improve bank sector activities was linked with poverty alleviation. However, two-way cause-based (bi-directional) connection exist between improve bank sector activities and poverty reduction was found in short run. Based on their findings, they suggested that government and monetary sector operators must improve financial sector in order to eradicate poverty and improve performance of Bangladesh economy. These findings were also reinforced by another study in 2014 by same authors using same method of ARDL for Bangladesh. This time, they used growth variables in addition to data sourced between 1970 and 2011. Their findings this time indicated that policy and politics in Bangladesh have powers to



reduce or eradicate poverty by availing funds to SMEs thereby, stimulating jobs and eradicating poverty.

Boukhatem (2016) studied how financial inclusion reduced poverty using panel analysis for data obtained 67 low and mid revenue nations over time period 1988-2012. This author did not use growth variable like other works and findings revealed improvement in access to monetary services impact positively on poverty reduction. This result ignites call on policy-makers to consider program for increasing fund supply or bank-credit which contribute to enhancing people welfare and increase monetary transactions that triggers increased opportunities for fund gathering, revenue allotment and triggers family demand.

Park and Mercado (2018) examined “the effect of financial inclusion on poverty and income inequality across different countries’ income groups for 151 countries”. They employed PCA and cross-section technique. The outcomes from their work show that increased monetary-inclusion appreciably co-varies with high economic development and low poverty rates for high and mid-high-income nations. The outcome also reveals that financial inclusion does not co-vary with high monetary growth and low poverty rate for mid-low and low-revenue. The work also reports that financial inclusion insignificantly impacts on revenue inequality in all income group.

In related work on “the effect of the proportion of adult population with access to formal financial services and poverty and inequality for 162 countries” Honohan (2011) built composite monetary access detector using cross-section series that combined family survey data-sets and secondary data. The study uncovered that access to financial service significantly and negatively connected to poverty alone without inclusion of control factor like Per Capita income, private credit to GDP ratio, price-level, institution effectiveness, population and sub-Sahara Africa dummy. Also this study availed prove that access to monetary services significantly reduced revenue inequality as one variable and when private-credit to GDP ratio and price-level were involved. However, accessing monetary service was not found to reduce poverty and inequality when Per Capita Income and sub-Sahara Africa imitation were included.

Jabir et al., (2017) examined “the impact of access to financial services on poverty alleviation among the low-income household level for 35 countries in sub-Saharan Africa”. With cross section data for 2011 to 2006 and outcome of their investigated revealed that accessing monetary services seriously negatively affect poverty hence reduce sub-Sahara Africa. To the authors, this was achieved by availing large welfare gains to poor in these nations.

García-Herrer and Turégano (2015) worked on “the effect of spread of the financial sector and access to financial services on income inequality reduction using regression analysis”, the authors uncovered that access to monetary services significantly and negatively connected to revenue inequality. This implies that accessing monetary services reduced revenue inequality. This outcome was realised when regression was tested for critical economic development and financial program variables. The study also reported that size and spread for financial sector and services did not promote income equality like accessing financial services.

In related study on how requirements and conditions for monetary services affect poverty and inequality in Latin-America and Caribbean nations, Dable-Norris et al., (2015) uncovered that minimising monetary involvement and controlling expenses and liberalising collateral demand and promote investment, economic development and reduce inequality in Latin-America and Caribbean nations via trade-offs were possible.

Omar and Inabar (2020) examined “the effect of monetary-inclusion on poverty and inequality in less developed countries” by using unbalanced yearly panel data from 116 LDCs spanned from 2004 to 2016. The authors measure financial-inclusion with broad set of monetary sector outreach factors like Per capita income, internet users’ ratio, age-dependency ratio, price-increase and revenue inequality. Their reason for this choice of variables is that they have serious implications on financial inclusion level in developing nations. The outcome of their study revealed that financial inclusion seriously negates poverty rates and income inequality in less developed countries. Hence concluded that financial inclusion reduced poverty and inequality for developing nations and suggests reaching-out to unbanked people especially in local areas as viable means for eradicating poverty and inequality.

Churchill et.al (2020), also examine the effect of financial inclusion – measured in terms of “access to banks, access to credit, and access to insurance” on poverty among family members using data from the 2016 Financial Inclusion Insights (FII) scheme for Nigeria. They found that financial inclusion reduces poverty. Empirical analyses from the study shows that a standard deviation rise in financial inclusion is associated with a 0.277-0.672 standard deviation drop in poverty, depending on how poverty is measured. Based on the finding, the study concluded that closeness to bank, access to savings and fixed deposit account are very important in alleviating poverty than credit and insurance services.

In a similar study in Nigeria, Eze and Alugbuo (2021) studied how access to financial services provided by the banks and insurance companies alleviate poverty using a logit model using the World Bank Global Findex survey data collected in Nigeria in 2017. In order to achieve the objectives of the study, the “poor” was used as the regressand while the regressors were; “age of respondents, educational level of respondents, gender, employment status, wage payment, government transfers,



pension, savings, self-employment income and wage earnings of respondents". The study found that access to financial services by family members reduced poverty in Nigeria. The study also found that self-development and entrepreneurial skills were important in reducing poverty in Nigeria. Based on the results, the study recommended siting of bank branches in rural areas, development of financial products that will address the needs of the diverse religious groups in the country and enlightenment of the public especially the unbanked group as possible ways of making financial services unfriendly with poverty in Nigeria.

Ogbeide and Igbini(2019) also studied how financial services provided by financial institutions alleviated poverty in Nigeria over the period 2002-2015 using time series data and the ordinary least squares multivariate regression technique. Their findings show that financial services provided by the monetary institutions had serious effect on personal income level (per capita income) hence alleviates poverty and raises the living standard of the people. The result further revealed that banks branch penetration has positive implication on personal income level hence also reduces poverty and raised living standard. Savers with Deposit money banks (DMBs) per 1000 adults had a negative impact on poverty reduction from the result of the study while borrowers from DMBs per 1,000 adults were found to raise personal income level hence reduced poverty but the variable was not significant statistically. The study also discovered that availability of ATM machines facilitated access to financial services, raises income level and reduces poverty insignificantly. Based on these results and findings, the study recommended strengthening of policies that encourages access to financial services in order to reduce poverty in Nigeria.

The review of relevant literature indicates that much had been done on the contribution of financial inclusion on poverty in the world and Nigeria in particular. However, most of the studies consulted in Nigeria do not really consider and capture issues of financial penetration, access and cost which are germane in financial inclusion. This paper seeks to fill this gaps by employing the autoregressive and distributed lag (ARDL) approach.

METHODOLOGY

The Endogenous growth model led by Romer (1986) also recognised the critical role of financial services in the growth process and poverty alleviation via human capital development. Grossman and Helpman (1991) specially argued that financial services provided by deposit money banks and security markets help investors to take up innovative activities which affects economic growth through productive investment. The NeoStructuralists however argued that financial sector plays a vital role in

determining whether financial services provided by the sector could spur economic growth or not.

Empirically, Boukhatem (2016) studied how financial inclusion helped in reducing poverty using panel analysis for 67 low and middle income countries. Makina and Walle (2019) used dynamic Panel and panel VAR to examine financial inclusion and economic growth in African countries. Kinn et al., (2018) used dynamic panel and panel VAR to examine how financial services provided by banks affect economic growth in Organisation of Islamic Countries (OICs). On the country specific study, Uddin et al., (2012) used the Autoregressive and Distributed Lag (ARDL) approach to investigate how financial inclusion alleviate poverty in Bangladesh between 1976-2010 and 1970-2011. Ogbeide and Igbinigie (2019) also studied how financial services provided by financial institutions alleviated poverty in Nigeria over the period 2002 and 2015 using time series data and the ordinary least squares multivariate regression technique. While appreciating the various works done by other scholars, this shall follow the paths adopted by Uddin et al., (2012) and Ogbeide and Igbinigie (2019) in its investigation and analysis. However, the choice of the independent variables is a major points of departure from other studies.

Based on these theoretical and analytical underpinnings, the seeks to achieve its objectives by specifying the following functional relationship between financial inclusion, domestic investment and poverty level as follow:

$$POVR_t = f(NAPA_t, DCE_t, DDE_t, GCF_t, INTR_t) \quad (1)$$

For ease of estimation, the above functional relationships between poverty rate and financial inclusion could be expressed in mathematical form thus;

$$POVR_t = \beta_0 + \beta_1 NAPA_t + \beta_2 DCE_t + \beta_3 DDE_t + \beta_4 GCF_t + \beta_5 INTR_t + e_t \quad (2)$$

Where:

β_0 = intercept or autonomous component of poverty rate; β_1 - β_5 = parameter estimates
 $POVR_t$ = Poverty rate; $NAPA_t$ = Number of bank account per 1000 adults/bank branch penetration; DCE_t = ratio of Domestic credit to GDP/ credit penetration; DDE_t = ratio of Domestic deposit to GDP/deposit penetration; GCF_t = ratio of Gross capital formation to GDP/investment penetration and $INTR_t$ = interest rate.

The nature of information to be investigated in this study is predominantly quantitative; hence mostly secondary data were used in our analysis. These are information already published in text books, economics journals, Central Bank statistical bulletin etc. In nutshell, the study sourced it data from: Central Bank of Nigeria statistical bulletin, National Bureau of Statistics, and The World Bank data base.



For us to ascertain the long run capacity and short run dynamic interactions among the time series variables under study – Unemployment rate, poverty rate and inflation rate and deposit penetration, credit penetration, bank branch penetration, ratio of domestic investment to GDP and interest rate on loanable funds, we adopted also the Autoregressive distributed lag (ARDL) bound test approach to co-integration as formulated by Pesaran and Shin (1999) and Perasan et al., (2001) due to its superiority over the Engle and Granger (1987) and Johansen’s (1995) models. The ARDL cointegration technique as a general 12 vector autoregressive (VAR) model of order p , in Z_t ,

Where: Z_{it} = column vector composed of the six variables: Y_{it} = selected macroeconomic variables (unemployment rate, poverty rate and inflation rate).

$Z_{it} = (POVR_t DDE_t DCE_t NBPA_t GCF_t INTR_t)'$ was also used. The null hypothesis of no cointegration is tested against the alternative hypothesis of cointegration. ARDL is therefore represented as follows:

$$D(POVR_t) = \beta_{01} + \lambda_{1i}(POVR_{t-1}) + \lambda_{2i}(DDE_{t-1}) + \lambda_{3i}(DCE_{t-1}) + \lambda_{4i}(NBPA_{t-1}) + \lambda_{5i}(GCF_{t-1}) + \lambda_{6i}(INTR_{t-1}) + \sum_{t=1}^p \beta_{1i}D(Y_{t-1}) + \sum_{t=1}^q \beta_{2i}D(DDE_{t-1}) + \sum_{t=1}^q \beta_{3i}D(DCE_{t-1}) + \sum_{t=1}^q \beta_{4i}D(NBPA_{t-1}) + \sum_{t=1}^q \beta_{5i}D(GCF_{t-1}) + \sum_{t=1}^q \beta_{6i}D(INTR_{t-1}) + \varepsilon_{1i} \tag{3}$$

$$D(DDE_{it}) = \beta_{02} + \lambda_{2i}(POVR_{t-1}) + \lambda_{3i}(DDE_{t-1}) + \lambda_{4i}(DCE_{t-1}) + \lambda_{5i}(NBPA_{t-1}) + \lambda_{6i}(GCF_{t-1}) + \lambda_{7i}(INTR_{t-1}) + \sum_{t=1}^p \beta_{2i}D(DDE_{t-1}) + \sum_{t=1}^q \beta_{3i}D(POVR_{t-1}) + \sum_{t=1}^q \beta_{4i}D(DCE_{t-1}) + \sum_{t=1}^q \beta_{5i}D(NBPA_{t-1}) + \sum_{t=1}^q \beta_{6i}D(GCF_{t-1}) + \sum_{t=1}^q \beta_{7i}D(INTR_{t-1}) + \varepsilon_{2i} \tag{4}$$

$$D(DCE_t) = \beta_{03} + \lambda_{3i}(POVR_{t-1}) + \lambda_{4i}(DDE_{t-1}) + \lambda_{5i}(DCE_{t-1}) + \lambda_{6i}(NBPA_{t-1}) + \lambda_{7i}(GCF_{t-1}) + \lambda_{8i}(INTR_{t-1}) + \sum_{t=1}^p \beta_{3i}D(DCE_{t-1}) + \sum_{t=1}^q \beta_{4i}D(DDE_{t-1}) + \sum_{t=1}^q \beta_{5i}D(POVR_{t-1}) + \sum_{t=1}^q \beta_{6i}D(NBPA_{t-1}) + \sum_{t=1}^q \beta_{7i}D(GCF_{t-1}) + \sum_{t=1}^q \beta_{8i}D(INTR_{t-1}) + \varepsilon_{3i} \tag{5}$$

$$D(NBPA_t) = \beta_{04} + \lambda_{4i}(POVR_{t-1}) + \lambda_{5i}(DDE_{t-1}) + \lambda_{6i}(DCE_{t-1}) + \lambda_{7i}(NBPA_{t-1}) + \lambda_{8i}(GCF_{t-1}) + \lambda_{9i}(INTR_{t-1}) + \sum_{t=1}^p \beta_{4i}D(NBPA_{t-1}) + \sum_{t=1}^q \beta_{5i}D(DDE_{t-1}) + \sum_{t=1}^q \beta_{6i}D(DCE_{t-1}) + \sum_{t=1}^q \beta_{7i}D(POVR_{t-1}) + \sum_{t=1}^q \beta_{8i}D(GCF_{t-1}) + \sum_{t=1}^q \beta_{9i}D(INTR_{t-1}) + \varepsilon_{4i} \tag{6}$$

$$\begin{aligned}
 D(GCF_t) &= \beta_{05} + \lambda_{5i}(POVR_{t-1}) + \lambda_{6i}(DDE_{t-1}) + \lambda_{7i}(DCE_{t-1}) + \lambda_{8i}(NBPA_{t-1}) + \lambda_{9i}(GCF_{t-1}) + \lambda_{10i}(INTR_{t-1}) \\
 &+ \sum_{t=1}^p \beta_{5i} D(GCF_{t-1}) + \sum_{t=1}^q \beta_{6i} D(DDE_{t-1}) + \sum_{t=1}^q \beta_{7i} D(DCE_{t-1}) + \sum_{t=1}^q \beta_{8i} D(NBPA_{t-1}) + \sum_{t=1}^q \beta_{9i} D(POVR_{t-1}) \\
 &+ \sum_{t=1}^q \beta_{10i} D(INTR_{t-1}) + \varepsilon_{5i}
 \end{aligned} \tag{7}$$

$$\begin{aligned}
 D(INTR_t) &= \beta_{06} + \lambda_{6i}(POVR_{t-1}) + \lambda_{7i}(DDE_{t-1}) + \lambda_{8i}(DCE_{t-1}) + \lambda_{9i}(NBPA_{t-1}) + \lambda_{10i}(GCF_{t-1}) + \lambda_{11i}(Y_{t-1}) \\
 &+ \sum_{t=1}^p \beta_{6i} D(INTR_{t-1}) + \sum_{t=1}^q \beta_{7i} D(DDE_{t-1}) + \sum_{t=1}^q \beta_{8i} D(DCE_{t-1}) + \sum_{t=1}^q \beta_{9i} D(NBPA_{t-1}) + \sum_{t=1}^q \beta_{10i} D(GCF_{t-1}) \\
 &+ \sum_{t=1}^q \beta_{11i} D(POVR_{t-1}) + \varepsilon_{5i}
 \end{aligned} \tag{8}$$

The ARDL bounds test is based principally on the combined F-statistic which its asymptotic distribution is non-standard under the null hypothesis of no cointegration. The basic step in the ARDL bounds approach is to estimate the six equations (1, 2, 3, 4, 5 & 6) by ordinary least squares (OLS).

Consequent upon earlier works by Pesaran and Shin (1999) and Perasan et al., (2001), the short run dynamic parameters is arrived at by the estimation of an error correction model linked with the long-run estimates. The model where the null hypothesis of no cointegration is rejected is derived with an error-correction term. Hence the vector error correction model is therefore stated thus:

$$\begin{aligned}
 D(POVR_t) &= \beta_0 + \sum_{i=1}^p \lambda_{1i} D(POVR_{t-1}) + \sum_{i=1}^q \lambda_{2i} D(DDE_{t-1}) + \sum_{i=1}^q \lambda_{3i} D(DCE_{t-1}) + \sum_{i=1}^q \lambda_{4i} D(NBPA_{t-1}) + \\
 &+ \sum_{i=1}^q \lambda_{5i} D(GCF_{t-1}) + \sum_{i=1}^q \lambda_i D(INTR_{t-1}) + \lambda ECT_{t-1} + \varepsilon_i
 \end{aligned} \tag{9}$$

$$\begin{aligned}
 D(DDE_t) &= \beta_0 + \sum_{i=1}^p \lambda_{1i} D(DDE_{t-1}) + \sum_{i=1}^q \lambda_{2i} D(POVR_{t-1}) + \sum_{i=1}^q \lambda_{3i} D(DCE_{t-1}) + \sum_{i=1}^q \lambda_{4i} D(NBPA_{t-1}) + \\
 &+ \sum_{i=1}^q \lambda_{5i} D(GCF_{t-1}) + \sum_{i=1}^q \lambda_i D(INTR_{t-1}) + \lambda ECT_{t-1} + \varepsilon_t
 \end{aligned} \tag{10}$$

$$\begin{aligned}
 D(DCE_t) &= \beta_0 + \sum_{i=1}^p \lambda_{1i} D(DCE_{t-1}) + \sum_{i=1}^q \lambda_{2i} D(POVR_{t-1}) + \sum_{i=1}^q \lambda_{3i} D(DDE_{t-1}) + \sum_{i=1}^q \lambda_{4i} D(NBPA_{t-1}) + \\
 &+ \sum_{i=1}^q \lambda_{5i} D(GCF_{t-1}) + \sum_{i=1}^q \lambda_i D(INTR_{t-1}) + \lambda ECT_{t-1} + \varepsilon_t
 \end{aligned} \tag{11}$$

$$\begin{aligned}
 D(NBPA_t) &= \beta_0 + \sum_{i=1}^p \lambda_{1i} D(NBPA_{t-1}) + \sum_{i=1}^q \lambda_{2i} D(POVR_{t-1}) + \sum_{i=1}^q \lambda_{3i} D(DDE_{t-1}) + \sum_{i=1}^q \lambda_{4i} D(DCE_{t-1}) + \\
 &+ \sum_{i=1}^q \lambda_{5i} D(GCF_{t-1}) + \sum_{i=1}^q \lambda_i D(INTR_{t-1}) + \lambda ECT_{t-1} + \varepsilon_t
 \end{aligned} \tag{12}$$



$$D(GCF_t) = \beta_0 + \sum_{i=1}^p \lambda_{1i} D(GCF_{t-1}) + \sum_{i=1}^q \lambda_{2i} D(POVR_{t-1}) + \sum_{i=1}^q \lambda_{3i} D(DDE_{t-1}) + \sum_{i=1}^q \lambda_{4i} D(DCE_{t-1}) + \sum_{i=1}^q \lambda_{5i} D(NBPA_{t-1}) + \sum_{i=1}^q \lambda_{6i} D(INTR_{t-1}) + \lambda ECT_{t-1} + \varepsilon_t \tag{13}$$

$$D(INTR_t) = \beta_0 + \sum_{i=1}^p \lambda_{1i} D(INTR_{t-1}) + \sum_{i=1}^q \lambda_{2i} D(POVR_{t-1}) + \sum_{i=1}^q \lambda_{3i} D(DDE_{t-1}) + \sum_{i=1}^q \lambda_{4i} D(DCE_{t-1}) + \sum_{i=1}^q \lambda_{5i} D(NBPA_{t-1}) + \sum_{i=1}^q \lambda_{6i} D(GCF_{t-1}) + \lambda ECT_{t-1} + \varepsilon_t \tag{14}$$

Where: $\lambda_{1i}, \lambda_{2i}, \lambda_{3i}, \lambda_{4i}, \lambda_{5i},$ & λ_{6i} are the short-run dynamic coefficients of the model's convergence to equilibrium and β is the speed of adjustment

RESULTS

TABLE 1. DESCRIPTIVE STATISTICS

Statistic	POVR (%)	INTR(%)	DDE/GDP	DCE/GDP	NBPA/100000	GCF/GDP
Mean	57.18205	22.10718	3331.829	9.210077	3.146410	36.36513
Median	58.11000	21.55000	385.1900	8.169000	1.890000	34.11000
Maximum	88.00000	36.09000	17040.72	19.62600	6.560000	89.38000
Minimum	32.00000	10.00000	6.560000	4.958000	1.230000	14.90000
Std. Dev.	14.58604	6.183622	5030.569	3.556115	1.875377	19.06441
Skewness	0.181041	-0.064411	1.370275	1.194680	0.576982	1.057202
Kurtosis	1.908294	2.694020	3.515372	3.999963	1.741735	3.822555
Jarque-Bera	2.149753	0.179105	12.63636	10.90208	4.736654	8.364368
Probability	0.341340	0.914340	0.001803	0.004292	0.093637	0.015265
Sum	2230.100	862.1800	129941.3	359.1930	122.7100	1418.240
SumSq. Dev.	8084.600	1453.013	9.62E+08	480.5462	133.6475	13811.16
Observations	39	39	39	39	39	39

Source: (computedresultEViews12).

The descriptive result reported in Table 1 indicates that there is a serious disparities and instabilities in both poverty and financial inclusion variables in Nigeria over the period under consideration. These are evidenced in the standard deviation, minimum and maximum values of poverty rate, interest rate on credit, ratio of domestic deposit to economic growth, ratio of domestic credit by deposit money banks to GDP, number of deposit money banks branches per 100,000 adults and gross capital formation percentage of GDP. The implication of this result is that the Nigerian economy had witnessed very high level of instability both in poverty level and access to financial services.

TABLE 2. UNIT ROOT TEST RESULT USING PHILIP PERRON (PP) METHOD

Variable	PP Statistic	1%	5%	10%	Decision
POVR	-5.924	-3.621	-2.943	-2.610	Stationary@ 1 st difference
INTR	-8.507	-3.621	-2.943	-2.610	Stationary@1 st difference
DDE	5.220	-3.616	-2.941	-2.609	Stationary@ level
DCE	-7.319	-3.621	-2.943	-2.610	Stationary@ 1 st difference
NBPA	-5.590	-3.621	-2.943	-2.610	Stationary@ 1 st difference
GCF	-3.568	-3.616	-2.941	-2.609	Stationary@ level

Source: (computed result EViews 12).

The unit roots test results reported in Table 2 indicate mix order of stationarity among the variables under investigation. For instance, deposit penetration, and ratio of domestic investment to GDP were stationary at level $\{i(0)\}$ while poverty rate, interest rate, credit penetration and bank branch penetration were stationary at first difference $\{i(1)\}$. This mix order of stationarity informed the choice of ARDL technique for our analysis. To check for long run relationship among the variable, the ARDL bound test was carried out. The result is presented in Table 3.

TABLE 3. BOUND TEST RESULT FOR POVERTY RATE MODEL

F-Bounds Test		Null Hypothesis: No levels relationship		
Test Statistic	Value	Signif.	I(0)	I(1)
			Asymptotic: n=1000	
F-statistic	4.229415	10%	2.08	3
K	5	5%	2.39	3.38
		2.5%	2.7	3.73
		1%	3.06	4.15
Actual Sample Size	35		Finite Sample: n=35	
		10%	2.331	3.417
		5%	2.804	4.013
		1%	3.9	5.419

Source: (computed result EViews 12).

The autoregressive and distributed lag (ARDL) bound test for long run dynamics reported in Table 3 shows that long run equilibrium exists between the dependent (poverty rate) and independent variables (financial inclusion) given the F-statistic of 4.229415 and the critical values at 1%, 5% and 10% respectively. Given this result, we reject the null hypothesis that; no levels relationship exists among the variables in the poverty model. The confirmation of long run relationship is a pre-condition for estimating the long run coefficients and error correction model (ECM) for the poverty equation.



TABLE 4(a). ARDL LONG RUN RESULT FOR POVERTY MODEL - SELECTED MODEL: ARDL (1, 4, 3, 1, 0, 3)

Variable	Coefficient	t-Statistic	Prob.
C	19.21064	0.803718	0.4327
POVR(-1)*	-0.485958	-3.540876	0.0025
DDE(-1)	-0.001961	-2.969408	0.0086
DCE(-1)	5.147149	4.117055	0.0007
NBPA(-1)	-5.081147	-2.357818	0.0306
GCF**	-0.430253	-1.460923	0.1623
INTR(-1)	0.068800	0.251596	0.8044
D(DDE)	-0.005370	-2.820786	0.0118
D(DDE(-1))	0.003752	1.705589	0.1063
D(DDE(-2))	-4.31E-05	-0.018782	0.9852
D(DDE(-3))	-0.005709	-2.711797	0.0148
D(DCE)	3.170758	4.597742	0.0003
D(DCE(-1))	-2.224065	-3.039746	0.0074
D(DCE(-2))	-2.369790	-2.879776	0.0104
D(NBPA)	-9.833566	-5.412355	0.0000
D(INTR)	-0.165112	-0.716741	0.4833
D(INTR(-1))	-0.220295	-0.852710	0.4057
D(INTR(-2))	-0.442707	-1.872702	0.0784

Source: (computed result EViews 12).

TABLE 4(b). LONG RUN COEFFICIENT WITH RESTRICTED CONSTANT AND NO TREND FOR POVERTY RATE MODEL

Variable	Coefficient	t-Statistic	Prob.
DDE	-0.004036	-4.112563	0.0007
DCE	10.59175	3.624264	0.0021
NBPA	-10.45593	-3.069529	0.0069
GCF	-0.885370	-1.975081	0.0647
INTR	0.141576	0.245180	0.8093
C	39.53147	0.945023	0.3579

Source: (computed result EViews 12).

The long run result of the poverty rate model reported in Table 4a and Table 4b, show that ratio of domestic deposit to GDP (deposit penetration) is negatively and significantly related to poverty level. This implies that increase in the deposit penetration retarded poverty and vice versa. This result conforms to theoretical apriori expectation and economic theory. This result is also in agreement with earlier studies by Honohan, (2007 & 2008), Garcial-Herrer & Turegano (2015), Jabir et al., (2017), and Omar & Inaba (2020). These studies reported a negative relationship between access to financial services and poverty rate which implies that access to financial services reduce incidence of poverty.

Ratio of domestic credit to the private sector by DMBs to GDP (credit penetration) has positive relationship with poverty rate. However, it is also significant at 5% level. This implies that domestic credit by DMBs (credit penetration) significantly stimulated poverty in Nigeria thus deviated from the apriori theoretical expectation and economic theory. The result deviated from earlier studies by Honohan, (2007 & 2008), Garcial-Herrer & Turegano (2015), Jabir et al., (2017), and Omar & Inaba (2020).

Ratio of domestic investment to GDP is in consonance with theoretical expectation and theory with a negative coefficient. It is also significant at 5% level. This implies that increase in domestic investment significantly retarded poverty in Nigeria over the period of this study.

Deposit money banks' branches penetration bears a negative coefficient and is significant at 5% level. This indicates that increase in the spreads of banks' branches reduce poverty thus significantly improve the living condition of the people in Nigeria over the period under investigation. This result is in tandem with the theoretical expectation. This result agrees with study by Park and Mercado (2018) who found that financial inclusion defined in term of spread of size on financial services did not reduced poverty in less developed countries.

Interest rate conforms to theoretical expectation with a positive coefficient though it is not significant at 5% level. This implies that increase in cost of funds spurred poverty and vice versa. An increase in cost of credit will reduce access and affordability of basic necessity of living hence fuel poverty. In nutshell, all the indicators of financial inclusion except domestic credit comply with theoretical apriori expectation and are significant at 5% level. This implies that financial inclusion significantly reduced poverty in Nigeria over the period of this study.

TABLE 5. ARDL ERROR CORRECTION (ECM) RESULT FOR POVERTY RATE MODEL WITH
SELECTED MODEL: ARDL (1, 4, 3, 1, 0, 3)

Variable	Coefficient	t-Statistic	Prob.
D(DDE)	-0.005370	-5.412779	0.0000
D(DDE(-1))	0.003752	3.785572	0.0015
D(DDE(-2))	-4.31E-05	-0.036822	0.9711
D(DDE(-3))	-0.005709	-4.744903	0.0002
D(DCE)	3.170758	6.758271	0.0000
D(DCE(-1))	-2.224065	-4.114806	0.0007
D(DCE(-2))	-2.369790	-3.860632	0.0013
D(NBPA)	-9.833566	-7.335728	0.0000
D(INTR)	-0.165112	-0.977775	0.3419
D(INTR(-1))	-0.220295	-1.352902	0.1938
D(INTR(-2))	-0.442707	-2.808672	0.0121
CointEq(-1)*	-0.485958	-6.328906	0.0000
R ² = 0.84; R ² - adjusted = 0.76; Durbin -Watson Stat = 2.28; AIC = 5.76; SC = 6.30			

Source: (computed result EViews 12).



The ARDL error correction model (ECM) result reported in Table 5 indicates that ratio of domestic deposit to GDP (deposit penetration) has negative coefficient with poverty rate at level, lags 2 & 3 but has positive coefficient at lag 2. It is also significant at 5% at these lags. This implies that deposit penetration has significantly implication on poverty level in Nigeria over the period of the study. The conformity of domestic deposit penetration to theoretical expectation and its significance shows that domestic deposit penetration retarded poverty over the period of this study. Increase in domestic deposit increase money supply and level of liquidity hence reduce interest rate on loanable funds for investment which help to stimulate production, create job and reduce poverty. This result agrees with earlier studies carried out by Honohan, (2007 & 2008), Garcial-Herrer & Turegano (2015), Jabir et al., (2017), and Omar & Inaba (2020). These studies reported a negative relationship between access to financial service and poverty rate which implies that access to financial services reduce incidence of poverty.

Ratio of domestic private sector credit to GDP has positive relationship with poverty at level but has negative relationship with poverty at lags 1 & 2. It is also significant at these lags levels. This implies that domestic private credit to GDP has significant effect on poverty rate in Nigeria over the period. Increase in domestic private sector credit promotes investments hence help stimulate economic activities, create additional jobs and reduce poverty. This result deviated from the works of Honohan, (2007 & 2008), Garcial-Herrer & Turegano (2015), Jabir et al., (2017), & Omar and Inaba (2020), at level but complies with these earlier studies at lags 1 & 2. The studies reported a negative relationship between access to financial service and poverty rate which implies that access to financial services reduce incidence of poverty.

Number of DMBs branches per 100,000 adults (branch penetration) has negative and significant relationship with poverty rate. This result is in consonance with theoretical apriori expectation. This implies that number of DMBs branches per 100,000 adults has significant negative implication on poverty hence reduced poverty during the period of this study. The rise in deposit money bank branches after the banking sector in 2004 and the availability of DMBs branches/services in most rural communities may have accounted for this result. The formal banking institution and services in the rural communities have made access to financial services easy and cheaper. This encourages entrepreneurship, investment, job creation and help reduce poverty. It complies with earlier studies by Honohan, (2007 & 2008), Garcial-Herrer & Turegano (2015), Jabir et al., (2017), and Omar & Inaba (2020). These studies reported a negative relationship between access to financial service and poverty rate which implies that access to financial services reduce incidence of poverty. It however, deviated from the

study by Park and Mercado (2018) which found that spread and size of financial services do not reduce poverty in less developed countries.

Interest rate with negative relationship with poverty at level and all the lags levels. This is in tandem with theoretical expectation and economic theory. Though insignificant at 5% level, the result suggests that interest rate on loanable fund has less implication on poverty rate in Nigeria. Interest rate on loanable fund over the period of this stood at an average of 22.1%. This high and unhealthy for investment, production, job creation and poverty reduction in Nigeria.

The negative coefficient of the speed of adjustment of the error correction model indicates that the variables in the poverty equation adjust speedily to changes in short run dynamics/equilibrium.

The coefficient of determination indicates that 84% of the systematic variation in poverty rate is influenced by financial inclusion and domestic investment in Nigeria over the period under study.

TABLE 6. MODEL DIAGNOSTIC TEST FOR POVERTY RATE

Diagnostic test	F-statistic	Probability
Jarque-Bera test for normality	8.845	0.012
Breusch-Godfrey serial correlation LM test	1.000	0.390
Breusch -Pagan Godfrey Heteroskedasticity test	0.966	0.528
Ramsey RESET test for specification error	0.275	0.607

Source: (computed result EViews 12).

The results of the diagnostics test on the residual as reported in Table 6 reveal that the error term is not normally distributed around the mean as the null hypothesis is rejected (Engle, 1982; Jarque & Bera, 1980). The result however shows no evidence of autocorrelation given the serial correlation LM test value of 1.00 and a probability value of 0.39 hence the acceptance of null hypothesis (Ljung & Box, 1978). Furthermore, the test for heteroscedasticity revealed that it is absent in the model as we accept the null hypothesis of the presence of homoscedasticity. The Ramsey RESET test indicated that no variable is missing in the model as the null hypothesis is also accepted given the probability value of 0.607. The adherence of the model to the basic assumptions of ordinary least squares estimation affirms that the model is good for prediction and forecast hence the best linear estimator (the BLUE)



Stability Test Result for Poverty rate model

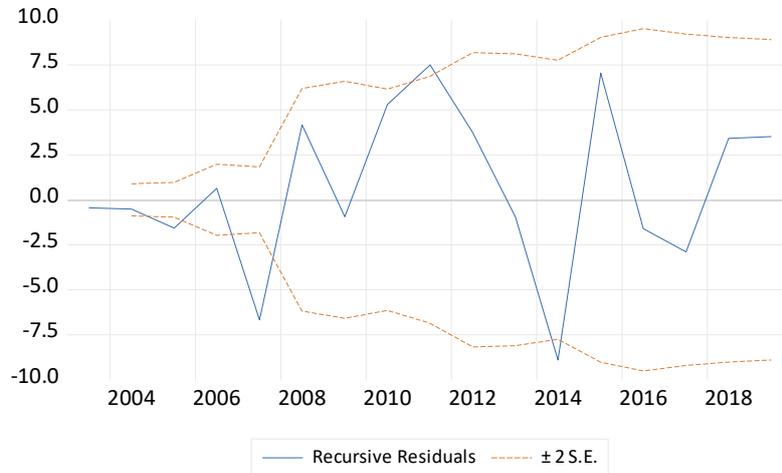


FIG 1(a). RECURSIVE RESIDUAL TEST

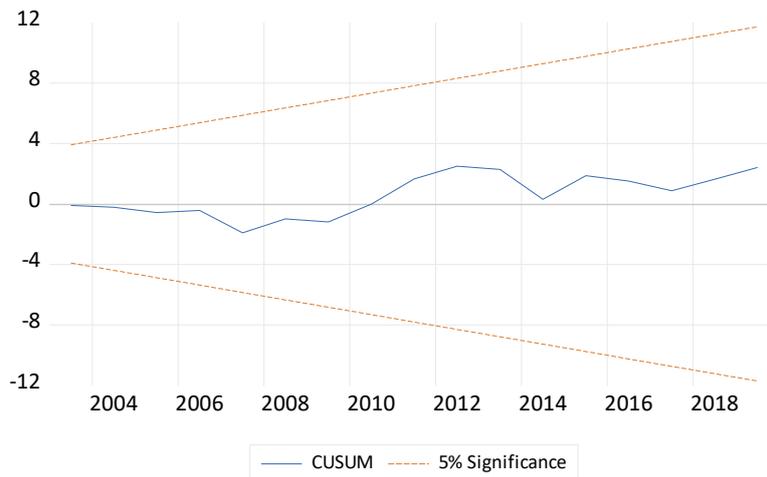


FIG 1(b). CUSUM TEST

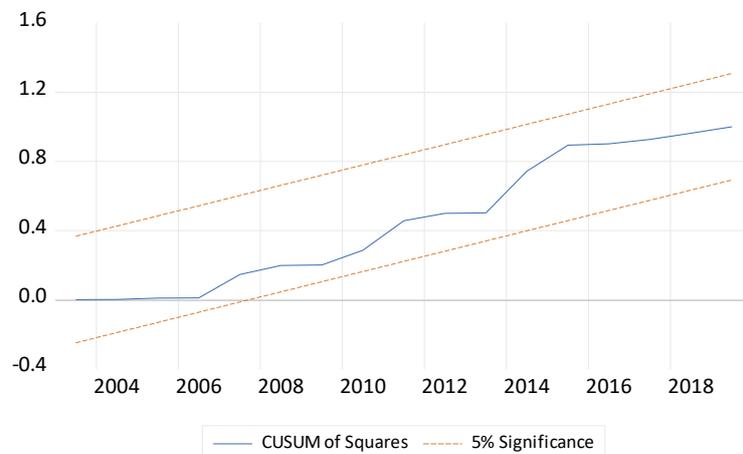


FIG 1(c). CUSUM OF SQUARES TEST

Source: (computed result EViews 12).

Given the instability that sometimes characterized secondary data, testing for the stability of the variables the important, in carrying the stability test, it is crucial to combine short time dynamics to test stability of long time parameters of poverty rate model. This study adopted Bahmani-Oskoe and Shin (2002) technique and apply CUSUM to residuals of ARDL error correction mechanism. For stability in short time dynamics and long-time parameters of poverty rate equation, it is a crucial condition that recursive residuals, CUSUM and CUSUM of squares are within 5% CV representing two straight-lines whose equation are align with Brown et al., (1975). As shown in Figure 1(a, b & c) neither recursive nor CUSUM, and CUSUM square graph crossed 5% CV lines, therefore, we could maintain that estimated features for short time dynamics and long-time of poverty rate equation were stable. That is, stable poverty rate equation exists over this study

CONCLUDING REMARKS

This study examined the impact of financial inclusion on poverty level in Nigeria using the ARDL method. Given the results and findings as outlined above, the study concludes that, financial inclusion (access, availability and cost of financial services) has negative and significant implications on poverty level both in short and long run in Nigeria over the period of this study. Based on this conclusion, the study recommends: increase in deposit mobilisation through savings, domestic investment and banks' branches to create jobs and reduce poverty in Nigeria.

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