

**EFFECTS OF FINANCIAL INCLUSION ON POVERTY REDUCTION,
SAVINGS AND NIGERIA ECONOMIC GROWTH: 1980 -2022**

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Abstract

This study examined the financial inclusion and Nigerian economic growth for the period 1980-2022. The study considered the following three objectives; to examine the significant impact of financial inclusion on the Nigerian economic growth, evaluate the impact of financial inclusion on poverty reduction in Nigeria and to ascertain the impact of financial inclusion no savings growth in Nigerian economy. Secondary time series data were used to carry out the empirical analysis. The study employed the aid of vector error correction model (VECM) approach, Augmented Dickey-Fuller (ADF) and Phillips-Perron tests, Co-integration Test and ECM. Based on the above econometric and statistic techniques conducted, it was observed that financial inclusion has significant positive impact on the Nigerian economic growth. Our results indicated that financial inclusion has significant positive impacts on poverty reduction in Nigeria. Furthermore, the result reported that financial inclusion has significant positive impact on the Nigerian savings growth within the study period (1980-2022). These empirical results do support that; One percent decrease in the interest rate (ITR), inflation rate (IFR) and exchange rate (EXR) at lag (-2) will lead to [31% (ITR)-2), 53%(IFR)-2), and 8%(EXR)-2)] increases on the aggregate saving (ASE) Nigeria economy. One percent increase in the financial inclusion proxy by; deposit from the rural areas (DRA), loan to rural areas (LRA), account owners of any type (AA) and electronic money

banking/payment system (EMB) at lag (-2) will lead to [38%(DRA)-2), 29%(LRA)-2), 59%(AA)-2) and 03%(EMB)-2)] increases on Per capita income (PCI) respectively in Nigeria. Based on these findings, the researcher recommends that; Nigeria governments should fund financial inclusion programs preferring financial literacy as a national strategy for financial inclusion because it is relatively cheaper to educate the population about financial management and the benefits of using formal financial services. Stable electricity supply to drive the infrastructural facilities provided by banks, telecommunication companies and other related service providers such availability and affordability of financial services in Nigerian monetary authority (CBN) should increase the number of formal account ownership by building up trust securities in financial institutions operation in Nigeria, remove all obstacles for account ownership such as income and age bracket bias, distance in location and education discrimination in the delivery and use of financial services.

Keywords: financial inclusion, poverty reduction, savings and Nigeria economic growth.

Introduction

The establishment of a financial system has become important in order to enhance the efficient allocation of financial resources, promote capital accumulation, improve investor engagement in the financial market, and ultimately contribute to economic growth (Central Bank of Nigeria, The Nigerian Financial System, 2017). It is widely recognised that the financial system encompasses all financial intermediaries operating within the financial sector of an economy. This is based on the premise that the real economy has three key economic entities: enterprises, households, and other entities involved in the production of goods and services. These commodities and services can be either consumed immediately or utilised to generate additional output in the future. The conceptualization of economic activity as real sectors stems from the use of tangible resources in the production of goods and services

that are afterwards consumed by individuals. Conversely, the financial system primarily focuses on facilitating the transfer of funds between entities engaged in surplus and deficit spending, enabling individuals to engage in purchasing activities, and facilitating the exchange of ownership of productive resources. The existing body of economic literature has demonstrated that the financial system plays a crucial role in facilitating economic growth and development, productive activities, financial intermediation, capital formation, and the effective management of the payments system (Sanusi, 2011). Therefore, this prompts us to consider the nature and operations of a comprehensive financial system. Financial inclusion refers to the provision of accessible and cost-effective financial products and services that cater to the need of individuals and enterprises.

Financial inclusion in Nigeria has reached an alarming rate with Nigeria being reputed for being one of the worlds leading financial exclusion examples. A great number of the output of the Nigerian economy is outside the financial system and the economic agents are still struggling to make payments from the financial system. The past forty years has seen several cases of financial exclusion which has attracted a significant concern from the world, most especially the International Monetary Fund and the World Bank (Kama & Adigun, 2013).

The existing body of literature examining the relationship between finance inclusion and poverty has demonstrated that finance plays a crucial role in fostering economic growth. However, it is important to note, as highlighted by Beck, Demirgüç-Kunt and Levine (2007), that the observed positive impact of finance growth does not automatically imply that finance directly alleviates poverty. Instead, it is essential to investigate whether financial inclusion has a significant effect on reducing poverty and positively influencing economic conditions. Economic growth is often accompanied with unequal income distributions, which in turn can lead to poverty. However, it is worth noting that economic growth can also be linked to declining inequality and reduced poverty rates. In the event that financial mechanisms, facilitated by economic growth, result in an augmentation of wealth for affluent individuals while exacerbating income

inequality, it can be concluded that the impoverished demographic will not benefit from such financial activities. On the other hand, the field of finance has the potential to assist individuals in poverty by fostering inclusivity and aiding them in navigating the obstacles related to investment (Awaworyi & Vijaya, 2020).

Recently, the Central Bank of Nigeria has stepped up its efforts to get banks to invest significantly in more cost-effective ways through the granting of operating license to branchless channels, including; Automated Teller Machine (ATM) and Point-of-Service (POS) devices. There were 22,500 installed Automated Teller Machine (ATM) by the end of 2022, or 28 Automated Teller Machine (ATMs) for every 100,000 adults. In contrast, Indonesia had 13 Automated Teller Machine (ATMs) for every 100,000 adults, Argentina had 42 Automated Teller Machine (ATMs) for every 100,000 adults, Brazil had 120 Automated Teller Machine (ATMs) machines for every 100,000 adults, and Malaysia had 56 Automated Teller Machine (ATMs) per 100,000 adults. South Africa had an average of 59 Automated Teller Machine (ATMs) for every 100,000 adults. Nigeria has 4 Automated Teller Machine (ATMs) for every 100,000 adults making it top only to countries like Bangladesh and Pakistan. By the end of 2022, there were 1,115,272 Automated Teller Machine (ATMs) s operational in Nigeria. The CBN Financial Stability Report (2022) noted that the implication of the latest

development is that there are 10 POSs for every 98 individuals in Nigeria, as opposed to an average of 13 for every 100,000 people in Nigeria in 2010. The number of deployed and functional Point of Sale (POS) devices climbed from 5,300 in June 2010 to 54,594 as of September 2020, according to an assessment of the project's progress in Lagos and Abuja. Between the end of 2021 and the end of 2022, this number increased to over 400,000; the number of deployed POS that are regularly used did not increase at the same rate because of its ability to drive economic growth and sustainability (Central Bank of Nigeria (CBN), 2022).

Financial inclusion in Nigeria is characterized by both low levels and significant disparities. Specifically, surveys indicate that approximately 80 percent of the Nigerian population remains unbanked thereby excluded from the realm of financial inclusion. The primary factors contributing to this exclusion are the lack of resources and a stable income, as reported by reputable sources such as the World Bank Group (2021). Another challenge that arises is the absence of sufficient financial literacy. According to a recent survey conducted, a development institution based in the United Kingdom, it was discovered that a significant proportion of adults in Nigeria possess limited financial literacy and capability. This is particularly evident in the area of financial planning, where approximately two-thirds of respondents demonstrate a low-to-medium ability to effectively manage

their spending and mitigate risks.

The Central Bank of Nigeria (CBN) has implemented various measures to promote financial literacy and inclusion in the country. One such measure is the "national peer group programme for financial inclusion of youths," which aims to educate young individuals about financial matters. Additionally, the CBN has focused on enhancing the financial capabilities of consumers and civil servants. In order to reach rural communities and underserved segments of the population, the CBN has embraced digital technology. This approach takes advantage of the widespread availability of mobile phones in Nigeria, with approximately 80 percent of adults owning one. By leveraging this technology, the CBN is able to provide financial services to these communities at a lower cost compared to traditional methods such as physical money transfers. Furthermore, the adoption of digital technology has facilitated economic growth in Nigeria. It has enabled the development of new business models, investment in digital infrastructure, and the expansion of e-commerce. These initiatives are outlined in the (CBN's Monetary Policy Operation for 2022). Additionally, a McKinsey Global Institute report (2022) revealed that Digital Financial Inclusion could potentially boost Nigeria's GDP by 12.4% by 2025, mobilize new deposits worth about USD 36 billion, generate about 3 million new jobs, lower government leakages by USD 2 billion annually, and include an additional 46

million people. In light of this, the researcher sets out to look at how financial inclusion has affected Nigerian aggregate savings, poverty reduction and economic growth from 1980 to 2022 with the following objective; to examine the significant impact of financial inclusion on the Nigerian aggregate savings, to evaluate the impact of financial inclusion on poverty reduction in Nigeria and to ascertain the significant impact of financial inclusion on Nigerian economic growth.

Theoretical literature review

The formal financial system is accessible to all adult individuals throughout the economy. The provision of a financial service to one individual does not have any negative impact on the quality of financial services offered to another person, as the availability of financial services to one person does not affect their availability to others. This perspective argues that the concept of financial inclusion is beneficial for the entire population, ensuring that no individuals are excluded or left behind. All people and small organisations that establish a formal bank account are eligible to receive complimentary debit cards and enjoy the privilege of using ATMs without incurring any fees, aligning with the principle of public benefit. Moreover, it is important to note that financial service providers, such as financial institutions, bear the responsibility of funding the expenses associated with offering financial services, which can be considered as a sunk cost in the

context of sustaining a banking enterprise (Ozili, 2018).

Furthermore, it is possible for the government to offer financial institutions subsidies as a means to assist them in managing any expenses related to the provision of complimentary financial services. Moreover, it is possible for a government to offer a singular monetary deposit into the bank accounts of all its citizens, contingent upon the requirement of possessing a formal account. There are two advantages to this. According to the public good hypothesis, financial inclusion is posited to yield benefits for individuals across all positions and income levels. Hence, financial inclusion confers advantages upon individuals of varying socioeconomic backgrounds, encompassing the privileged and the underprivileged, as well as those who are included inside the system and those who are excluded from it. Furthermore, the pursuit of financial inclusion, which is of utmost importance for the welfare of the general populace, necessitates the use of public money rather than private funding. This preference arises due to the fact that private investors would expect a higher return on their investment, hence rendering the usage of private funds for financial inclusion initiatives prohibitively expensive. Moreover, the concept of public benefit offers an opportunity for governmental entities to take charge of advancing financial inclusion. Finally, as stated by Ozili (2018), the public good theory of financial inclusion fails

to recognise private sector actors as proponents of this endeavour.

There are four notable limitations associated with the public good theory. Firstly, by refraining from examining the fundamental causes of financial exclusion, one can approach financial inclusion as a public good. Furthermore, the allocation of public financing towards financial inclusion as a public good may result in insufficient resources being allocated to other significant public programmes, so impeding their ability to acquire the necessary support. Furthermore, financial inclusion can be considered a "public good" that is provided at no cost to anyone who utilise financial services, aligning with the principles of the public good concept. The long-term sustainability of financial inclusion may be compromised when it is perceived as a public benefit, despite being sponsored by public funds and provided to end users free of charge. Achieving financial inclusion as a public good in developing and emerging economies poses challenges due to the predominant reliance on private investments to finance financial institutions and banks in these regions (Ozili, 2018). Consequently, the applicability of the public benefit idea of financial inclusion may be diminished in these particular places.

Neoclassical theory places the government in a supporting position and concentrates on economic agents. According to this theory, businesses and consumers are the two main

economic actors, and they act in a competitive, self-interested, and well-informed manner. With these presumptions, theory assumes that consumer decisions and/or bad government policies are to blame for financial exclusion. According to this view, the market is the only solution to all economic ills. According to the argument made by Boyce (2000), a deregulated economy has the property of heading toward the Pareto optimal whereas government intervention will produce imbalances and obstruct the path of progress. Economic expenses that result in access restrictions may be the reason why consumers choose to use informal financial services instead of mainstream financial services. At this time, there is a contradiction because although deregulation looks to improve financial inclusion, financial exclusion appears to have emerged as an issue that is becoming worse. The claim that financial inclusion rather than financial exclusion should have been the outcome of deregulation is based on the idea that market-driven policies invariably result in the creation of financial goods (Chavan, 2008).

The information asymmetries that are at the foundation of market distortions in the microeconomy are highlighted by new-keynesian analysis. Credit restrictions are discussed in connection to financial inclusion and exclusion. The absence of accurate information on the potential borrower and lender is one factor contributing to financial exclusion. Stiglitz & Weiss (1981) claim that the knowledge asymmetry

in the system allows creditors to act in a way that lowers interest rates and restricts lending in order to steer clear of riskier borrowers. This worrisome issue furthers the disparity in wealth and income. Financial exclusion rises when economic disparities widen because there is no longer a unified loan market; instead, it is fragmented (Dymski, 2005).

The relationship between Financial Inclusion (FI) and poverty is conveyed through both direct and indirect pathways when examined within the context of financial development. Financial Inclusion (FI) plays a pivotal role in poverty reduction by facilitating enhanced accessibility to credit, insurance, and various other financial services. These resources cater to the fulfillment of everyday transactional requirements, including consumption, investment, and overall economic advancement. Scholars have proposed that the augmentation of Financial Inclusion (FI) possesses the potential to raise the entrepreneurial prospects of beneficiaries, hence leading to improvements in their income, consumption patterns, level of autonomy, and involvement in familial and communal decision-making processes. Financial Inclusion (FI) enhances the productive assets of individuals living in poverty by facilitating their ability to allocate resources towards the acquisition of novel technologies, education, and healthcare. Investments made by individuals with limited financial resources have the potential to enhance their ability to attain sustainable

livelihoods. The indirect channel functions by employing finance-growth stimulating theories that have their origins in the works of Schumpeter (1934) and McKinnon (1973) (Isaac Koomson, Renato A Villano, & David Hadley, 2020).

Umозurike, Ganiyat and Chiadikobi (2023) examined the effects of financial inclusion on economic growth in Nigeria. Banking services were introduced in rural areas in 1977, with subsequent efforts in the 1990s and early 2000s to support the establishment of community and micro-finance banks. The monetary authorities and government have also implemented policies during this period to enhance financial inclusion. The present study draws conclusions regarding the impact of financial inclusion on economic growth in Nigeria. It has been determined that in the short-term, there exists a positive and statistically significant effect of commercial bank loans on rural areas. Put simply, if there is a rise in commercial bank loans to rural areas, it would result in a 1.4 percent increase in economic growth, assuming all other factors remain constant. The observed outcome exhibits a comparatively higher value at lag one, followed by a decrease in value at lag two. However, over a prolonged period of time, the estimated coefficient exhibits a negative trend, although it does not reach statistical significance. This observation suggests that the impact of commercial bank loans on economic growth in rural areas may have a negative connotation.

Regarding the automated teller machines (ATMs) in rural areas, the estimated coefficient exhibits a positive effect at the current level and a negative effect at the previous time period (lag one). These effects are found to be statistically significant. While the former exhibits a significance level of 10%, the latter demonstrates a significance level of 5%. Over an extended period of time, the coefficient of automated teller machines (ATM) in rural areas exhibits a positive value of 0.591483. However, this positive relationship lacks statistical significance. This implies that the influence of the ATM in the rural is a short-run phenomenon but not robust. The evaluation of the impact of bank branches in rural areas on economic growth in Nigeria reveals a negative relationship at the current level, but a positive relationship at the lagged levels of one and two.

The obtained results exhibit statistical significance at the one percent level for the level variable. Additionally, for the lag one variable, the statistical significance is observed at the five percent level, while for the lag two variable, the statistical significance is observed at the ten percent level. Over an extended period of time, the outcome exhibits a negative trend; however, it does not reach a level of statistical significance. This implies that the impact of rural bank branches on economic growth in Nigeria is characterised by a combination of positive and negative effects. In a study conducted by Onoh and Longtei (2023), an investigation was

undertaken to analyse the effects of financial inclusion on the economic growth of Nigeria during the period spanning from 1990 to 2020. The primary aims of this study are to investigate the influence of financial inclusion on the economic growth of Nigeria and to explore the causal relationship between financial inclusion and economic growth in the country. The study utilised the Ordinary Least Square Method (OLS) regression analysis. The variables included in this study encompass the Gross Domestic Product Growth Rate, the ratio of Broad Money to GDP, the ratio of credit to the private sector to GDP, the Deposits of rural branches of deposit money banks, and the Loans of rural branches of deposit money banks. The data utilised in this study was obtained from the statistical bulletin of the Central Bank of Nigeria. The study's findings indicate that there is a notable correlation between financial inclusion and economic growth in Nigeria.

Appah, Tebepah, and Newstyle (2023) conducted a study on the relationship between digital financial services and the economic growth of Nigeria during the period spanning from 2006 to 2021. The study's specific objectives encompass examining the correlation between automated teller machine services and real gross domestic product, assessing the association between point of sales services and real gross domestic product, ascertaining the connection between mobile banking services and real gross domestic product, and investigating

the relationship between web banking services and real gross domestic product in Nigeria from 2006 to 2021. The research was based on the technology acceptance model (TAM) proposed by Davis (1989). The collection of quarterly secondary data from the Central Bank of Nigeria was conducted using purposive sampling technique. The acquired quarterly data underwent analysis through univariate, bivariate, and multivariate methods. The results obtained from the Vector Error Correction Model (VECM) analysis revealed that the impact of automated teller machine (ATM) services on the real gross domestic product (GDP) in Nigeria is positive but statistically insignificant. On the other hand, point of sales (POS) services was found to have a positive and statistically significant influence on the real GDP in Nigeria. Similarly, mobile banking services were found to have a positive but statistically insignificant impact on the real GDP in Nigeria. Lastly, web banking services were found to have a positive and statistically significant influence on the real GDP in Nigeria. Based on the empirical evidence presented, the study reached the conclusion that digital financial services exert a significant impact on the economic growth of Nigeria.

In their study, Chude and Chude (2022) conducted an investigation into the relationship between financial inclusion and economic growth in Nigeria over the period of 1981 to 2021. The primary objectives of the study were to analyse the influence of

total bank loans on economic growth, determine the impact of bank branches on economic growth, evaluate the effect of commercial banks' deposits on economic growth, and assess the impact of automated teller machine services on economic growth in Nigeria. The Ordinary Least Squares (OLS) approach of data analysis was chosen due to its desirable qualities of Best Linear Unbiased Estimators (BLUE). The variables utilised in this study were obtained from the Central Bank of Nigeria Statistical Bulletin. The variables employed in the study encompassed total bank loans, bank branches, commercial banks deposit, and gross fixed capital formation. The study employed the unit root test, co-integration technique, and Error Correction Mechanism. The analysis was conducted using E-View software. The research findings indicate that there is a statistically significant negative relationship between the total bank loan and economic growth in Nigeria. This finding suggests that the provision of bank loans by Total has not been conducive to fostering economic growth in Nigeria. Bank branches in Nigeria have a notable and substantial impact on the country's economic progress. This suggests that the presence of Bank branches has made a substantial contribution to the overall economic growth observed in Nigeria. The presence of deposits in commercial banks has been found to have a favourable and statistically significant impact on the overall economic growth of Nigeria. The findings of this study suggest that there is a favourable relationship between

commercial bank deposits and the overall economic performance of the country.

In a recent study, Olalekan and Oladayo (2022) investigated the correlation between financial inclusion and economic growth in Nigeria. The data utilised in this study was sourced from the bulletins published by the Central Bank of Nigeria, encompassing the time span from 1981 to 2020. Statistical analysis encompasses the application of descriptive statistics, The Johansen Co-Integration Test, Phillips-Perron Unit Root Test, Pairwise Granger Causality, and Error Correction Model are all statistical methods commonly employed in academic research. The Error Correction Model was utilised to estimate the hypotheses that were formulated in accordance with the established objectives. The dependent variable in this study was economic growth, which was measured using Gross Domestic Product. The independent variable, financial inclusion, was approximated by the total bank deposit and total credit disbursement. The results of the Error Correction Model indicate a statistically significant positive association between the total bank deposit and gross domestic product. The link between total credit disbursement and gross domestic product is both negative and statistically negligible. The findings of the study provide empirical support for the finance-led growth hypothesis, so confirming that money plays a significant role as a determinant of

economic growth in Nigeria.

Obi (2022) conducted a study to determine the impact of economic growth in Nigeria. The research employed a time series dataset spanning the years 2004 to 2021. The research encompassed the period prior to the inclusion, extending to the duration of its execution. The Ordinary Least Squares (OLS) technique was employed for the purpose of data estimation. Preliminary and post-estimation tests were additionally performed. Despite the relatively brief duration of the implementation of the financial inclusion plan, the ordinary least squares (OLS) analysis yielded results that confirm its favourable impact on economic growth. The study reached the conclusion that financial inclusion serves as a catalyst for economic growth. The study conducted by Olusegun, Evbuomwan, and Belonwu (2021) investigated the relationship between financial inclusion and financial stability in Nigeria. Panel data for the period from 2014Q1 to 2018Q4 was utilised for the analysis. A composite measure, known as the financial inclusion index, was developed to capture the extent of penetration, availability, and utilisation within the financial sector. The research provides empirical data supporting the notion that financial inclusion has a beneficial effect on financial stability. This suggests that an increase in the degree of financial inclusion would result in a corresponding enhancement in financial stability. Regarding

dimension, it was shown that both penetration and availability exhibited a positive correlation with financial stability, whereas consumption demonstrated a negative correlation.

This suggests that policymakers are confronted with the dilemma of prioritising between implementing changes that would enhance financial inclusion, innovation, and financial access, or directing their efforts towards advancing financial stability. Enueshike and Okpebru (2020) conducted a study to investigate the impact of financial inclusion on the economic growth of Nigeria during the period spanning from 2000 to 2018. The estimation of the variables was conducted using archival data obtained from the Central Bank of Nigeria Statistical Bulletin. The regression analysis aimed to examine the relationship between the dependent variable of financial inclusion, which was measured by the contribution of financial institutions to the gross domestic product, and the explanatory variables of loans to small and medium companies and rural bank deposits. Additionally, the control variable of inflation was included in the analysis. The study employed an ex-post facto research approach and conducted diagnostic tests for unit roots and co-integration. The results indicate a mixed co-integration of the variables and a long-term relationship between them. The statistical estimation of the explained and explanatory variables was conducted using auto-regressive distribution lag. The results obtained from Wald tests indicate that the loan

to small and medium enterprises, rural bank deposits, and inflation have a substantial impact on economic growth in Nigeria.

Soyemi, Olowofela, and Yunusa (2020) conducted an assessment to determine the influence of financial inclusion on sustainable development. The study employed both the Error Correction Model (ECM) and the Fully Modified Ordinary Least Square (FMOLS) to analyze the short-run and long-run relationships between the variables. The data for the Human Development Index (HDI) in Nigeria was limited to the period from 2001 to 2016. The analytical findings suggest that there is a short-term causal relationship between several factors, namely the presence of commercial bank branches, demand deposits from rural areas, loans provided to rural areas, and the Human Development Index (HDI). The findings from the long-term analysis indicate that the independent variables, namely loans to rural regions, the number of commercial bank branches, and demand deposits from rural areas, all exhibit a statistically significant positive influence on the Human Development Index (HDI) in Nigeria. The findings of the study indicate that there is a significant relationship between financial inclusion and sustainable development in Nigeria.

The research conducted by Gbalam and Dumani (2020) examines the determinants of financial inclusion in Nigeria. Estimates were generated for the time period spanning from 2000 to

2018 by employing the ordinary least square and error correction methodologies on time series data. Based on the findings of the study, it has been shown that the presence of commercial bank branches and the level of deposit interest rates exert a modest nevertheless detrimental impact on the state of financial inclusion. Further empirical evidence indicates that variables such as lending interest rate, the ratio of rural deposits to loans, and domestic credit to private sector as a percentage of GDP exhibit a significant and substantial impact on the level of financial inclusion. The findings also suggest that there is a positive but insignificant relationship between gross domestic product per capita and financial inclusion. Ozili (2020), an analysis was undertaken to investigate the factors contributing to financial inclusion in Nigeria, as well as the challenges and achievements associated with this endeavour. Utilising data obtained through the Ordinary Least Squares (OLS) estimation technique and the Global Findex database provided by the World Bank, this study examines the period spanning from 2011 to 2017. Based on his research findings, individuals who have completed at least a secondary education and those who are unemployed exhibit higher levels of ownership in debit cards, various types of accounts, and accounts held in financial institutions.

Furthermore, those who have obtained a minimum of a secondary education tend to acquire higher levels of debt from banks or other financial

institutions, while simultaneously exhibiting lower levels of savings inside these same institutions. Conversely, there was a decline in the proportion of women, individuals from low-income backgrounds, and those with only a primary school education or lower who engaged in savings activities through savings clubs or external sources beyond their immediate family. Moreover, there was a decline in credit card ownership among persons who were unemployed, while there was an increase in ownership among those who were employed, the wealthiest individuals, and those who had attained at least a secondary level of education. In both 2011 and 2017, a decrease in borrowing from family and friends was observed across the majority of categories. The econometric analysis ultimately reveals that the influence of borrowing and saving via financial institutions on economic growth is considerably lower compared to borrowing and saving facilitated by familial networks, friends, or savings clubs.

Methodology

Theoretical Framework

One of the earliest attempts to model economic growth is popularly referred to as the 'Harrod-Domar' Model associated with the English economist, Sir Roy Harrod and American Economist, Evsey Domar. The model is an early attempt to show that growth is directly related to savings and indirectly related to the capital/output ratio. According to the model, growth (G) can be written symbolically as: G

= s/k

Where, k is incremental capital-output ratio and s - the average propensity to save. The model indicated that saving affect growth directly, while the incremental capital/output ratio affects growth indirectly or inversely.

However, Solow's (1956) model of economic growth is based on the premise that output in an economy is produced by a combination of labour (L) and capital (K), under constant returns, so that doubling input results in doubling output. Contemporary versions distinguish between physical and human capital. Thus, the quantity of output (Y) is also determined by the efficiency (A) with which capital and labour is used. Or mathematically: $Y = A f(L, K)$.

Solow assumed that this production function exhibits constant returns to scale, that is, if all inputs are increased by a certain multiple, output will increase by exactly the same multiple.

To Schumpeter (1912), the presence of a well-developed and operational finance sector is a necessary condition for entrepreneurs to effectively participate in technical innovation. This phenomenon arises due to the presence of expenses that may exceed the financial capacity of the entrepreneurs themselves. The author argues that a proficient financial system possesses the capability to identify and provide assistance to entrepreneurs who have the highest potential for successfully transforming

original concepts into marketable goods using new production methods. The aforementioned arguments demonstrate that finance exerts a positive influence on the real economy, indicating that increased accessibility to capital enhances wellbeing, stimulates production, and alleviates poverty. The involvement of a greater number of persons in the formal financial system leads to an increase in their economic agency, enabling them to actively partake in productive endeavours that facilitate their upliftment from poverty and contribute to the overall expansion of the economy. Thus, the economic growth indicators in this study are real gross domestic product, per capital and aggregate savings in the economy.

Nevertheless, in accordance with the principles of equilibrium and fundamental economic theory, it is imperative that investment be equivalent to savings. In the context of economic analysis, it is important to consider the relationship between savings (S), investment (I), the marginal efficiency of capital (MEC), and the interest rate (IR). Hence, we proceed to represent this theoretical association using mathematical notation; $I = S$ and $I = (MEC, IR)$. The assertion presented above illustrates the positive impact of savings on investment, indicating a correlation between increased investment and the accumulation of both human and material capital.

Model Specification

This study adopts the extended Solow growth model for its empirical framework. The model examines long run economic growth by looking at capital, labour/ growth and technical progress (Agenor, (2004). The extended Solow growth model is represented symbolically below;

$$Q = f(K, L) \dots 3.1$$

Equation 3.1 above was modified to capture Financial Inclusion and Nigeria Economic growth.

Financial Inclusion and Economic Growth

RGDP = [ITR, OFA, APD, IFR and NCA] ... (1)

Where: RGDP is the aggregate worth of an economy,

Financial Inclusion indicators; ITR is the interest rate, OFA is Number of on boarded (New) Financial service Agent, IFR is the inflation rate and NCA is Number of Credit Accounts.

Labor is of two types, human and machine or artificial intelligent (AI). In this study, our labor is Active POS Deployed, (APD).

Financial Inclusion and Poverty Reduction

objective two in equation 2 is expressed as;

PCI = (DRA, LRA, AA, EMB, NCB) ... (2)

Per capita income (PCI) as function of [demand deposit from the rural areas (DRA) and loan to rural areas (LRA), AA = account owners of any type (age from 15 year above), EMB = Electronic money banking/payment system (which include; Cheque, ATM,

POS and internet transfer) ownership age from 15 year above), and NCB is number of commercial bank branches in the country.

The reduction of poverty in society is one of the main objectives of financial inclusion. In this approach, the amount of per capita income at any particular moment serves as a proxy for poverty. A reliable predictor of a population's economic well-being in any nation is per capita income (PCI). A high PCI value denotes a higher quality of life, whereas a low or falling PCI value denotes a descent into poverty.

Financial Inclusion and Saving Growth in Nigeria, objective three of this study as;

ASE = (ITR, CPS, AA and EXR) ... (3)

Where ASE is aggregate saving in the economy, ITR is interest rate, IFR is the inflation rate, CPS is credit to private sector to GDP (CPS/GDP), AA is account owners of any type (age from 15 year above) and exchange rate (EXR).

Specification of Models by Objectives

Objective One

$$\ln RGDP_t = \alpha + \beta_1 \ln ITR_t + \beta_2 \ln OFA_t + \beta_3 \ln APD_t + \beta_4 \ln IFR_t + \beta_5 \ln NCA_t + \mu_t$$

VECM for Equation (1)

$$\begin{aligned} \Delta RGDP_t &= \sum_k^p \lambda_k v_{k,t-1} \sum_{s=1}^p \Delta \mu_t, s \Delta RGDP_{t-s} + \sum_{s=1}^p \alpha_2 s \Delta ITR_{t-s} + \sum_{s=1}^p \alpha_3 s \Delta OFA_{t-s} + \sum_{s=1}^p \alpha_4 s \Delta APD_{t-s} + \\ &\quad \sum_{s=1}^p \alpha_5 s \Delta IFR_t + \sum_{s=1}^p \alpha_6 s \Delta NCA_t + \zeta_{1,t} \\ \Delta NCA_t &= \sum_k^p \lambda_k v_{k,t-1} \sum_{s=1}^p \beta_1 s \Delta RGDP_{t-s} + \sum_{s=1}^p \beta_2 s \Delta ITR_{t-s} + \sum_{s=1}^p \beta_3 s \Delta OFA_{t-s} + \sum_{s=1}^p \beta_4 s \Delta APD_{t-s} + \sum_{s=1}^p \beta_5 s \\ &\quad \Delta IFR_t + \sum_{s=1}^p \beta_6 s \Delta NCA_t + \zeta_{2,t} \\ \Delta ITR_t &= \sum_k^p \lambda_k v_{k,t-1} \sum_{s=1}^p \gamma_1 s \Delta RGDP_{t-s} + \sum_{s=1}^p \gamma_2 s \Delta ITR_{t-s} + \sum_{s=1}^p \gamma_3 s \Delta OFA_{t-s} + \sum_{s=1}^p \gamma_4 s \Delta APD_{t-s} + \sum_{s=1}^p \gamma_5 s \\ &\quad \Delta IFR_t + \sum_{s=1}^p \gamma_6 s \Delta NCA_t + \zeta_{3,t} \\ \Delta OFA_t &= \sum_k^p \lambda_k v_{k,t-1} \sum_{s=1}^p \delta_1 s \Delta RGDP_{t-s} + \sum_{s=1}^p \delta_2 s \Delta ITR_{t-s} + \sum_{s=1}^p \delta_3 s \Delta OFA_{t-s} + \sum_{s=1}^p \delta_4 s \Delta APD_{t-s} + \sum_{s=1}^p \delta_5 s \\ &\quad \Delta IFR_t + \sum_{s=1}^p \delta_6 s \Delta NCA_t + \zeta_{4,t} \\ \Delta APD_t &= \sum_k^p \lambda_k v_{k,t-1} \sum_{s=1}^p \theta_1 s \Delta RGDP_{t-s} + \sum_{s=1}^p \theta_2 s \Delta ITR_{t-s} + \sum_{s=1}^p \theta_3 s \Delta OFA_{t-s} + \sum_{s=1}^p \theta_4 s \Delta APD_{t-s} + \\ &\quad \sum_{s=1}^p \theta_5 s \Delta IFR_t + \sum_{s=1}^p \theta_6 s \Delta NCA_t + \zeta_{5,t} \\ \Delta NCA_t &= \sum_k^p \lambda_k v_{k,t-1} \sum_{s=1}^p \phi_1 s \Delta RGDP_{t-s} + \sum_{s=1}^p \phi_2 s \Delta ITR_{t-s} + \sum_{s=1}^p \phi_3 s \Delta OFA_{t-s} + \sum_{s=1}^p \phi_4 s \Delta APD_{t-s} + \\ &\quad \sum_{s=1}^p \phi_5 s \Delta IFR_t + \sum_{s=1}^p \phi_6 s \Delta NCA_t + \zeta_{6,t} \end{aligned}$$

Objective Two

$$\ln PCI_t = \beta + \beta_1 LR_{A,t} + \beta_2 DR_{A,t} + \beta_3 AA_t + \beta_4 EMB_t + \beta_5 NCB_t + e_{t} \dots (2)$$

VECM for Equation (2)

$$\begin{aligned} \Delta PCI_{it} &= \sum_k^p \lambda_k v_{k,t-1} \sum_{s=1}^p \alpha_1 s \Delta PCI_{i,t-s} + \sum_{s=1}^p \alpha_2 s \Delta DR_{A,t-s} + \sum_{s=1}^p \alpha_3 s \Delta AA_{i,t-s} + \sum_{s=1}^p \alpha_4 s \Delta LR_{A,t-s} + \sum_{s=1}^p \alpha_5 s \\ &\quad + \sum_{s=1}^p \alpha_6 s \Delta EMB_{it} + \sum_{s=1}^p \alpha_7 s \Delta NCB_{it} + \zeta_{1,t} \\ \Delta DR_{A, it} &= \sum_k^p \lambda_k v_{k,t-1} \sum_{s=1}^p \beta_1 s \Delta PCI_{i,t-s} + \sum_{s=1}^p \beta_2 s \Delta DR_{A,t-s} + \sum_{s=1}^p \beta_3 s \Delta AA_{i,t-s} + \sum_{s=1}^p \beta_4 s \Delta LR_{A,t-s} + \sum_{s=1}^p \beta_5 s \\ &\quad + \sum_{s=1}^p \beta_6 s \Delta EMB_{it} + \sum_{s=1}^p \beta_7 s \Delta NCB_{it} + \zeta_{2,t} \\ \Delta AA_{it} &= \sum_k^p \lambda_k v_{k,t-1} \sum_{s=1}^p \gamma_1 s \Delta PCI_{i,t-s} + \sum_{s=1}^p \gamma_2 s \Delta DR_{A,t-s} + \sum_{s=1}^p \gamma_3 s \Delta AA_{i,t-s} + \sum_{s=1}^p \gamma_4 s \Delta LR_{A,t-s} + \sum_{s=1}^p \gamma_5 s \\ &\quad + \sum_{s=1}^p \gamma_6 s \Delta EMB_{it} + \sum_{s=1}^p \gamma_7 s \Delta NCB_{it} + \zeta_{3,t} \\ \Delta LR_{A, it} &= \sum_k^p \lambda_k v_{k,t-1} \sum_{s=1}^p \delta_1 s \Delta PCI_{i,t-s} + \sum_{s=1}^p \delta_2 s \Delta DR_{A,t-s} + \sum_{s=1}^p \delta_3 s \Delta AA_{i,t-s} + \sum_{s=1}^p \delta_4 s \Delta LR_{A,t-s} + \sum_{s=1}^p \delta_5 s \\ &\quad + \sum_{s=1}^p \delta_6 s \Delta EMB_{it} + \sum_{s=1}^p \delta_7 s \Delta NCB_{it} + \zeta_{4,t} \\ \Delta EMB_{it} &= \sum_k^p \lambda_k v_{k,t-1} \sum_{s=1}^p \theta_1 s \Delta PCI_{i,t-s} + \sum_{s=1}^p \theta_2 s \Delta DR_{A,t-s} + \sum_{s=1}^p \theta_3 s \Delta AA_{i,t-s} + \sum_{s=1}^p \theta_4 s \Delta LR_{A,t-s} + \sum_{s=1}^p \theta_5 s \\ &\quad + \sum_{s=1}^p \theta_6 s \Delta EMB_{it} + \sum_{s=1}^p \theta_7 s \Delta NCB_{it} + \zeta_{5,t} \\ \Delta NCB_{it} &= \sum_k^p \lambda_k v_{k,t-1} \sum_{s=1}^p \phi_1 s \Delta PCI_{i,t-s} + \sum_{s=1}^p \phi_2 s \Delta DR_{A,t-s} + \sum_{s=1}^p \phi_3 s \Delta AA_{i,t-s} + \sum_{s=1}^p \phi_4 s \Delta LR_{A,t-s} + \sum_{s=1}^p \phi_5 s \\ &\quad + \sum_{s=1}^p \phi_6 s \Delta EMB_{it} + \sum_{s=1}^p \phi_7 s \Delta NCB_{it} + \zeta_{6,t} \end{aligned}$$

Objective Three

$$\Delta SE_{it} = \alpha + \alpha_1 ITR_t + \alpha_2 CPS_t + \alpha_3 AA_t + \alpha_4 EXR_t + e_{t} \dots (3)$$

VECM for Equation (3)

$$\begin{aligned} \Delta SE_{it} &= \sum_k^p \lambda_k v_{k,t-1} \sum_{s=1}^p \beta_1 s \Delta SE_{i,t-s} + \sum_{s=1}^p \beta_2 s \Delta ITR_{t-s} + \sum_{s=1}^p \beta_3 s \Delta CPS_{t-s} + \sum_{s=1}^p \beta_4 s \Delta AA_{t-s} + \sum_{s=1}^p \beta_5 s \\ &\quad \Delta EXR_{t-s} + \zeta_{1,t} \\ \Delta ITR_{it} &= \sum_k^p \lambda_k v_{k,t-1} \sum_{s=1}^p \gamma_1 s \Delta SE_{i,t-s} + \sum_{s=1}^p \gamma_2 s \Delta ITR_{t-s} + \sum_{s=1}^p \gamma_3 s \Delta CPS_{t-s} + \sum_{s=1}^p \gamma_4 s \Delta AA_{t-s} + \sum_{s=1}^p \gamma_5 s \\ &\quad \Delta EXR_{t-s} + \zeta_{2,t} \\ \Delta CPS_{it} &= \sum_k^p \lambda_k v_{k,t-1} \sum_{s=1}^p \delta_1 s \Delta SE_{i,t-s} + \sum_{s=1}^p \delta_2 s \Delta ITR_{t-s} + \sum_{s=1}^p \delta_3 s \Delta CPS_{t-s} + \sum_{s=1}^p \delta_4 s \Delta AA_{t-s} + \sum_{s=1}^p \delta_5 s \\ &\quad \Delta EXR_{t-s} + \zeta_{3,t} \\ \Delta AA_{it} &= \sum_k^p \lambda_k v_{k,t-1} \sum_{s=1}^p \theta_1 s \Delta SE_{i,t-s} + \sum_{s=1}^p \theta_2 s \Delta ITR_{t-s} + \sum_{s=1}^p \theta_3 s \Delta CPS_{t-s} + \sum_{s=1}^p \theta_4 s \Delta AA_{t-s} + \sum_{s=1}^p \theta_5 s \\ &\quad \Delta EXR_{t-s} + \zeta_{4,t} \\ \Delta EXR_{it} &= \sum_k^p \lambda_k v_{k,t-1} \sum_{s=1}^p \phi_1 s \Delta SE_{i,t-s} + \sum_{s=1}^p \phi_2 s \Delta ITR_{t-s} + \sum_{s=1}^p \phi_3 s \Delta CPS_{t-s} + \sum_{s=1}^p \phi_4 s \Delta AA_{t-s} + \sum_{s=1}^p \phi_5 s \\ &\quad \Delta EXR_{t-s} + \zeta_{5,t} \end{aligned}$$

Where p is the lag length, $\zeta_{j,t}$ are the uncorrelated white noise error terms

often called impulses, or innovations or shocks α_{ji} , β_{ij} , δ_{ij} are dynamic parameters of the model.

A Priori Expectation

Based on economic theory, financial inclusion in relationship with gross domestic product Savings and poverty reduction would have positive relationship. However, the three dependent variables relation expectation is as follows: RGDP as a function of (ITR, OFA, APD, IFR and NCA) is assumed to be positive respectively. While per capital income (PCI) proxy to poverty reduction is a function of (DRA, AA, EMB and NCB) is expected to be positive relationship with the dependent variable, whereas (LRA) is assume to have negative relationship with per capital income (PCI) the dependent variable. The a priori expectation behavior of the relationship between aggregate savings (ASE) and these independent variables (ITR, CPS, AA and EXR) is assumed to be positive.

Estimation Procedures

To investigate how financial inclusion affects economic growth in Nigeria, econometric techniques will be applied. These techniques include the unit root test using the Augmented Dickey-Fuller (ADF) and Phillips-Perron stationarity test, error correction model (ECM), vector error correction model (VECM) models, Co-integration Test, and Granger Causality Test. Meanwhile, annual time series data is used in this inquiry.

Specifically, Central Bank of Nigeria (CBN) statistics bulletin and World Bank global Data Base were the sources of this study data.

Battery Tests

In this section, we discuss the necessary tests that were carried out on the data before and after estimating the models for the study. These tests are; descriptive analysis, unit root test, Serial Correlation LM Test co-integration test and others.

Regression Results, Interpretation and Analyses

Table 1: Descriptive Statistics

	RGDP	ITR	OFA	APD	IFR	NCA	PCI	LRA	AA	EMB	NCE	ASE	CPS	EXR
Mean	39918.85	17.0247	8614.70	25461.62	18186.66	10974.0	15984.64	10974.0	4.02914	14725.0	4019.29	2524.70	4794.81	49594.62
Median	38751.19	17.50000	13854.6	48000.0	117000.0	10250.0	16232.50	12321.50	40625.0	40325.0	1973.00	2407.00	5240.00	49700.0
Maximum	85417.6	20.0000	32521.79	42964.0	70.0000	100000.0	23045.93	100000.0	100000.0	42325.0	22444.2	5000.00	2407.02	160000.0
Minimum	3044.23	4.50000	16177.7	0.00000	0.00000	35.0000	27042.75	35.0000	1042.20	10975.0	304.700	476.000	4.70000	6.00005
Std. Dev.	22277.18	4.69279	17714.7	41042.7	164689.9	24044.2	47517.70	24044.2	17046.5	27000.0	4700.0	1700.0	705.015	41007.2
Skewness	4.93526	0.84020	1.24945	1.84700	2.47002	0.20620	2.47002	2.75072	2.10702	2.00000	4.32000	2.20017	0.10025	0.84004
Kurtosis	1.83004	1.00000	2.09446	3.77721	4.02000	0.01776	1.74000	1.00000	4.32005	1.00000	4.00000	3.00000	2.20017	2.00000
Jarque-Bera	4.02597	1.45003	10.2554	18.2554	18.1000	0.01227	1.07403	1.07403	18.1000	1.07403	22.0000	4.00000	0.00078	1.07403
Probability	0.00000	0.48112	0.00002	0.00000	0.00000	0.10000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Sum	4773065	744048	1041247	1041247	401384	401384	1041384	401384	401384	5701320	170132	104044	104044	4701384
Sum Sq	2404740	1017729	1704740	7102149	1000000	2200142	2000000	2200142	1402142	1402142	1100142	2400142	1700142	1000000
Observations	41	41	41	41	41	41	41	41	41	41	41	41	41	41

Source: Computed by the Researcher using E-views Statistical package.

The descriptive statistics values conducted are; mean median, maximum, minimum, standard deviation, skewness, kurtosis, Jarque-Bera and their Probability with number of observations. Thus, the mean, median, maximum and standard deviation of all the variables have positive average values as we can observe in the table, even and kurtosis

all has positive and significant, we can conclude that our data has a good fit to be used for estimation.

Unit Root Test Results

The results of the Augmented Dickey Fuller (ADF) test are presented in table 2 below. A variable is said to be stationary if the computed ADF is greater than the critical ADF at 5 % chosen level of significance.

Table 2: Unit root test for variables in levels

Series	ADF Statistic at Level	PP Statistic at level	5% Critical Level	ADF Statistic at 1 st Difference	PP Statistic at 1 st difference	5% Critical Level	Order of Integration
RGDP	-1.794021	-1.798376	-3.520787	-5.881287	-6.877324	0.0000	I(1)
ITR	-2.844649	-3.351923	-3.533083	-6.284261	-10.782206	-0.0000	I(1)
OFA	-0.125626	-0.526957	-3.533083	-5.784985	-6.335506	0.0000	I(1)
APD	-2.549837	-2.549837	-3.520787	-4.598629	-7.338882	0.0000	I(1)
IFR	-2.465323	-3.200473	-3.536601	-5.388022	-9.099602	0.0005	I(1)
NCA	3.164809	-3.423387	-3.529793	-6.631887	-11.37865	0.0000	I(1)
PCI	3.789289	1.754586	-3.529623	-7.382795	-7.016760	0.0000	I(1)
LRA	3.164809	-3.323387	-3.529793	-5.811853	-11.37865	0.0001	I(1)
DRA	-2.573389	-3.518279	-3.526609	-9.178197	-7.065599	0.0000	I(1)
AA	3.786280	-0.398861	-3.529793	-4.711086	-4.711006	0.0026	I(1)
EMB	4.838081	6.020136	-3.536601	-9.382017	-8.148192	0.0000	I(1)
NCB	-1.398367	-1.784732	-3.520787	-5.043856	-5.043856	0.0010	I(1)
ASE	-1.002492	-0.623319	-3.540328	-7.715382	-6.118333	0.0000	I(1)
CPS	-1.688866	-1.498253	-3.523623	-4.773128	-4.173128	0.0107	I(1)
EXR	-0.381786	-0.484744	-3.520787	-5.789488	-6.709800	0.0002	I(1)

Source: Researcher's Estimate from Eview 9.0 (2023).

From table 2 above, the Augmented Dickey-Fuller and Phillips-Perron (PP) test (ADF) unit root test statistic results, shows that the working variables [RGDP, ITR, OFA, APD, FR, NCA, PCI, LRA, DRA, AA, EMB, NCB, ASE, CPS and EXR] were not stationary at the normal level of differentiation since their ADF and PP t-statistic value were less than the 5

percent critical value [3.552973] respectively. Meanwhile, ADF and PP result of these variables [PCI, AA and EMB] at level shows greater than the 5 percent critical value [3.552973]. However, viewing it statistically they are not significant, because they appear positive and not negative while other appears negative. Based on the unit root assumption, for a variable to be significant, it must be negative. Therefore, to meet the one of the conditions of vector error correction model, these variables were, subjected to unit root test in first order difference which after the differentiation these variables became stationary at first difference (that is these variables become free from the unit root problem) in the scenes that their ADF and PP t-statistic values were all greater than the 5 percent chosen critical value respectively. The unit root test result of these variables used in this study further revealed that there exists first order of integration I(1) among these variables. Again, it shows that there is already co-integration among these variables but the degree of the co-integrating equation is yet unknown. Meanwhile, the existence of first order of integration I(1) among these variables used in the study satisfied and justified the assumption and condition of the Vector Error Correction model estimation.

Co-integration Test for Objective One: impact of financial inclusion on the Nigerian economic growth.

Table 3: Co-integration Test: RGDP, ITR,OFA, APD,FR, NCA,

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.886170	271.4863	95.75366	0.0000
At most 1 *	0.776515	186.7372	69.81889	0.0000
At most 2 *	0.686273	128.2992	47.85613	0.0000
At most 3 *	0.586993	83.08910	29.79707	0.0000
At most 4 *	0.545688	48.60175	15.49471	0.0000
At most 5 *	0.366964	17.83191	3.841466	0.0000

Source: Researcher's Estimate from Eviews 9.0 (2023).

Judging by the trace - statistics and its corresponding probability value, there are at least six co-integrating equations in table 3 above. This means that the variables are co-integrated and it can be concluded that a long-run equilibrium relationship exists among the variables since their individual trace statistic were greater than that of 5 percent critical value and probability value indicated statistically significant which addressed model one of the studies.

Table 3.1: Results of Error Correction Model (Model One)

Dependent Variable: RGDP				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	21930.80	2616.086	8.383058	0.0000
ITR	292.2466	148.0004	1.974634	0.0562
OFA	1.965340	0.118131	16.63701	0.0000
APD	-0.067033	0.030147	-2.223569	0.0327
IFR	-90.33544	40.86839	-2.210399	0.0337
NCA	-0.003041	0.003603	-0.843918	0.4044
ECM(-1)	-0.886522	0.091769	-9.660318	0.0000
R-squared	0.973066	Mean dependent var		40415.61
Adjusted R-squared	0.968449	S.D. dependent var		22316.02
S.E. of regression	3963.893	Akaike info criterion		19.55885
Sum squared resid	5.50E+08	Schwarz criterion		19.84846
Log likelihood	-403.7359	Hannan-Quinn criter.		19.66501
F-statistic	210.7487	Durbin-Watson stat		2.006440
Prob(F-statistic)	0.000000			

Source: Researcher's Estimate from Eviews 9.0 (2023).

The first model examined the impact of financial inclusion on economic

growth in Nigeria and the result presented in the table 3.1 depicts positive and significant relationship between the financial inclusion variables and economic growth variables. At 2.006440, the Durbin Watson statistics shows the absence of auto-correlation given its value that is between 1.8 and 2.2. We therefore reject the null hypothesis of the presence of autocorrelation among the disturbance terms in the model and accept the alternative hypothesis that there is no autocorrelation between the error terms. The fitness of the model is confirmed by the Prob F-statistic which is significant at 5 percent given the value of 0.000000, this led to rejection of the null hypothesis that all the explanatory variables introduced in the model are not jointly significant in explaining the variations in gross domestic product which measures economic growth and conclude that they are simultaneously significant.

The error correction term, ECMt-1, was significant at 5% with very high feedback of 88%. It is also negatively signed, showing that the adjustment is in the right direction to restore the long run relationship. This confirms also that any disequilibrium in the short run can be fixed back with a speed of 88% in the long run; in subsequent years. Apparently, it will take about 8 years to correct. The coefficient of determination (R²) explains 97% of the variations in the dependent variable which is above 50% and even after taking into consideration the degree of freedom, the adjusted coefficient of determination (adjusted R²) still

explains 96% variation in the dependent variable. The results of the tests suggest that the model is well specified, and hence the results are credible.

interest rate (ITR), Number of on boarded (New) Financial service Agent (OFA), Active POS Deployed (APD) and inflation rate (IFR) respectively, have negative relationship with the explanatory variable (i.e., real gross domestic product (RGDP) proxy for economic growth). It implies that decreases in these explanatory variables [ITR, OFA, APD and IFR] will lead to a decline in the Nigerian real gross domestic product (RGDP) proxy for economic growth by [59.5ITR, 0.28OFA, 0.66APD and 104.16IFR] at the short run. Meanwhile, the Number of Credit Accounts (NCA) in Nigeria reported positive relationship with the dependent variable (real gross domestic product (RGDP) proxy for economic growth). In other words, a unit increase in Number of Credit Accounts (NCA) in Nigeria will increase the real gross domestic product (RGDP) proxy for economic growth in Nigeria by [7%]. Thus, the t – statistic APD and NCA given as [2.66848, and 5.38821] of these variables were significant in the short run.

Table 4: Vector Error Correction Results for objective one

Dependent variable:					
RGDP					
CoIntEq1	D(lag(-1))	D(lag(-2))			
RGDP(1)	1.00000 (0.00000)	0.821938 (0.18828)	18.54793 (2.92153)		
c	-24877.63 (3.15930)*	[3.60227]*			
ITR(-1)	-59.56809 (290.088) [-0.20535]*	-0.421838 (0.10343) [-2.24049]*	-1.728734 (0.75405) [-2.29790]*		
OFA(-1)	-0.283189 (0.15269) [-1.47074]*	-0.013277 (0.28352) [-0.85418]*	0.852108 (0.14828) [5.74677]*		
APD(-1)	-0.669329 (0.25105) [-2.66848]*	0.423908 (0.23079) [1.88019]*	-0.912769 (0.34956) [-2.61809]*		
IFR(-1)	-104.1659 (102.657) [-1.02066]	0.115663 (0.16756) [0.69056]	-0.510436 (0.18772) [-2.71915]*		
*					
NCA(-1)	0.076640 (0.01282) [5.38821]*	-0.004254 (0.00150) [-2.90119]*	-0.484018 (0.30832) [-1.56987]*		
c					
-337.6510 (691.758) [-0.48809]	0.375929 (1.16671) [0.32221]	646.3087 (268.665) [2.40965]	-3948.535 (6230.70) [-0.63372]	-0.796852 (3.89265) [-0.19847]	-45409.14 (53189.0) [-0.82279]
R-squared					
Adj. R-squared	0.665281	0.870593	0.375803	0.512253	0.326499
Sum sq resid	0.523669	0.815844	0.111435	0.268380	-0.002025
S.E. equation	15705.80	1850687	1.792109	18660.65	15.52127
F-statistic	4.607621	15.90153	1.421836	2.108487	0.989556
Log likelihood	-165.7614	-258.9958	-389.1177	-441.5088	-157.1307
Huako AIC	0.665281	0.870593	0.375803	22.7744	8.556137
Schwarz BC	0.523669	0.815844	0.111435	21.9665	9.147645
Mean dependent	15705.80	1850687	1.792109	971.8750	-0.189435
S.D. dependent	22.95866	246.7963	8299.102	2188.44	15.17458

CoIntEq1, co-integrating equation one which denotes for the short run result of the VECM, while D(lag(-1)) and D(lag(-2)) are the error correction equation at lag one and two for all the variables. In the table, * denotes t-statistic in parentheses.

Source: Researchers' Extract from E-view 9.0 Estimation output (2023).

The co-integrating equation short run result of the VECM equation showed that the constant is negative valued at [-24877.63]. The implication is that holding all the independent factors [interest rate (ITR), Number of on boarded (New) Financial service Agent (OFA), Active POS Deployed (APD), inflation rate (IFR) and Number of Credit Accounts (NCA)], constant, real gross domestic product (RGDP) will steady at 284 percent at the short run. Meanwhile, the explained variables coefficients under VECM short run result showed that

However, the error correction equation at lag one and two Colum's showed that coefficients of ITR and NCA have a negative relationship with the dependent variable (real gross domestic product (RGDP)). While the coefficients of OFA at lag one alone and APD at lag two, were reported negative whereas at lag one and two respectively had positive with the dependent variable. The implications of these negative responses of these

financial inclusion variables are as follow; first, shilling increase in the [Number of on boarded (New) Financial service Agent (OFA), Active POS Deployed (APD), in Nigeria will lead to [(0.01 lag ⁽⁻¹⁾, 48.3 lag ⁽⁻²⁾ NCA), (42.5 lag ⁽⁻¹⁾, 71.2 lag ⁽⁻²⁾ ITR), 0.01lag ⁽⁻¹⁾ AFD and 91.2OFA lag ⁽⁻²⁾ cents decrease on real gross domestic product (RGDP). Whereas the coefficients of APD at lag two and OFA at lag two coefficients have positive relationship with the constant variable (RGDP). In other words, a unit APD and OFA respectively will lead to [(43 lag ⁽⁻¹⁾, OFA and 85 lag ⁽⁻²⁾ APD)] percent's increase on Nigerian gross domestic product (RGDP).

The t- statistic of error correction equation for these variables ITR, NCA, APD, OFA at their lag one and two is given as [-2.24048lag ⁽⁻¹⁾, 2.29790lag ⁽⁻²⁾ ITR],[2.90119lag⁽⁻¹⁾, 1.56987lag⁽⁻²⁾NCA], [1.88010lag⁽⁻¹⁾, 2.34308lag ⁽⁻²⁾APD], [2.71915lag ⁽⁻¹⁾IFR], [5.74677lag⁽⁻²⁾OFA]were statistically significant to the study within the observation time. Meanwhile, not all the explanatory variable has their signs both at lag one and two in line with the theoretical assumption. The coefficient of determination adjusted square R² (0.6652) have a good fit to the study since 52 percent variation on the dependent variable (RGDP) is as a results of influence/impact from these explanatory variables. In the same view, the F-statistic reported [22.95966], which is 22.95 percent total joint influence of the variables implying significant in the model.

Objective Two: impact of financial inclusion on poverty reduction in Nigeria].

Co-integration Test for objective/model Two

*Table 5: Co-integration Test for objective/model Two
Series: D(PC1,2) D(DRA,2) D(LRA,2) D(AA,2) D(EMB,2) D(NCB,2)*

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.876203	219.9123	95.75366	0.0000
At most 1 *	0.776933	148.8825	69.81889	0.0000
At most 2 *	0.694168	97.87293	47.85613	0.0000
At most 3 *	0.518482	57.59244	29.79707	0.0000
At most 4 *	0.441081	32.74487	15.49471	0.0001
At most 5 *	0.317050	12.96535	3.841466	0.0003

Source: Researchers' Extract from E-view 9.0 Estimation output (2023).

Judging by the trace - statistics and its corresponding probability value, there are at least six co-integrating equations in table 5 above. This means that the variables are co-integrated and it can be concluded that a long-run equilibrium relationship exists among the variables since their individual trace statistic were greater than that of 5 percent critical value. The probability value indicated statistically significant which addressed model two of the study.

Table 5.1: Results of Error Correction Model (Two)

Dependent Variable: PCI				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-734.8440	117.6759	-6.244642	0.0000
DRA	0.000399	0.000189	2.111381	0.0432
LRA	0.000364	0.000211	1.720145	0.0957
AA	-6.74E-05	3.09E-05	-2.180286	0.0372
EMB	0.023530	0.008605	2.735142	0.0104
NCB	0.555809	0.031103	17.86993	0.0000
ECM(-1)	-0.545922	0.162669	-3.356031	0.0022
R-squared	0.951992	Mean dependent var	1365.050	
Adjusted R-squared	0.942390	S.D. dependent var	919.1633	
S.E. of regression	220.6176	Akaike info criterion	13.79940	
Sum squared resid	1460164.	Schwarz criterion	14.10416	
Log likelihood	-248.2888	Hannan-Quinn criter.	13.90684	
F-statistic	99.14930	Durbin-Watson stat	2.026445	
Prob(F-statistic)	0.000000			

Source: Researchers' Extract from E-view 9.0 Estimation output (2023).

The second model examines the determinants of Financial Inclusion in Nigeria and the result presented in table 5.1 depicts positive and significant relationship between the Financial Inclusion variables and poverty reduction in Nigeria. At 2.026445, the Durbin Watson statistics shows the absence of auto-correlation given its value that is between 1.8 and 2.2. We can therefore we reject the null hypothesis of the presence of autocorrelation among the disturbance terms in the model and accept the alternative hypothesis that there is no autocorrelation between the error terms. The fitness of the model is confirmed by the prob F-statistic which is significant at 5 percent given the value of 0.000000 which led to rejection of null hypothesis that all the explanatory variables introduced in the model are not jointly significant in explaining the variations in financial inclusion. The error correction term, ECMt-1, was significant at 5% with a

little high feedback of 54%. It is also negatively signed and significant, showing that the adjustment is in the right direction to restore the long run relationship. This confirms also that any disequilibrium in the short run can be fixed back with a speed of 54% in the long run-in subsequent years. Apparently, it will take about 5 years to correct. The coefficient of determination (R^2) explains 95% of the variations in the dependent variable which is above 50% and even after taking into consideration the degree of freedom, the adjusted coefficient of determination (adjusted R^2) still explains 94% variation in the dependent variable. Also, a unit increase in coefficients of demand deposit from the rural areas (DRA) and loan to rural areas (LRA), Electronic money banking/payment system (which include; Cheque, ATM, POS and internet transfer) ownership age from 15 year above) (EMB), and number of commercial bank branches in the country (NCB) will lead to on the average 0.000399, 0.000364, 0.023530 and 0.555809 increase in financial inclusion respectively.

Table 6: Vector Error Correction Results for objective Two [Impact of financial inclusion on poverty reduction in Nigeria].

Date: 09/24/23 Time: 03:34		
Sample (adjusted): 1988 2022		
Included observations: 35 after adjustments		
Standard errors in () & t-statistics in []		
Co-integrating Eq.	Correct	
PCI(-1)	1.000000	C -640.1583
DRA(-1)	1.19E-05 (0.00050) [0.02395]	
LRA(-1)	-0.004137 (0.00050) [-8.19344]	
AA(-1)	0.000308 (5.0E-09) [6.20104]	
EMB(-1)	-0.008130 (0.00873) [-11.2435]	
NCB(-1)	-0.455048 (0.03165) [-14.3768]	
<hr/>		
<i>D(lag(-1))</i>	<i>D(lag(-2))</i>	
DPCI(-1))	-12.17992 (4.20546) [-2.89622]	-7.429071 (3.52274) [-2.10889]
DDRA(-1))	0.744279 (0.11969) [6.21898]	2.241385 (0.38289) [5.85394]
DLRA(-1))	-2.467317 (0.71722) [-3.43773]	-0.472001 (0.18133) [-2.60293]
DAA(-1))	0.781990 (0.17017) [4.59536]	0.048714 (0.05864) [0.79666]
DEMB(-1))	25.93833 (17.2383) [1.50458]	0.259203 (0.13698) [1.85787]
DNCB(-1))	50.12307 (119.435) [0.41967]	2.046865 (1.71339) [1.19463]
C	-70.18770 (46.8502) [-1.50178]	-3263.521 (46582.9) [-0.07008]

R-squared	0.600218	0.653451
Adj. R-squared	0.352734	0.438920
Sum sq. residuals	899044.4	6.91E+11
S.E. equation	191.2460	181372.2
F-statistic	2.425283	3.045959
Log likelihood	-222.7181	-464.5141
Akaike AIC	13.52075	27.34866
Schwarz SC	14.14889	27.96580
Mean dependent	45.31801	2399.337
S.D. dependent	225.2811	242135.5

Source: Researchers' Extract from E-view 9.0 Estimation output (2023).

Table 6 is of two sides. First is the vector error correlation (VECM) co-integrating short run equation denotes CointEq1, the second is the long run VECM result which denote D(lag (-1)) and D(lag (-2)). Examining the co-integrating short run aspect of the table, we observed that coefficients of demand deposit from the rural areas (DRA) and account owners of any type (age from 15 year above) (AA) post a positive relationship with the

dependent variable Per capita income (PCI). Meaning that, a unit increase in these variables (DRA and AA) will lead to [0.1, 14] percent's increases on the Per capita income (PCI) levels in Nigerian poverty level in the economy at the short run. Whereas, coefficients of loan to rural areas (LRA), Electronic money banking/payment system (which include; Cheque, ATM, POS and internet transfer) ownership age from 15 year above) (EMB), and number of commercial bank branches in the country (NCB) post a negative relationship with Per capita income (PCI) the dependent variable. It implies that a unit declined inflows of loan to rural areas (LRA), Electronic money banking/payment system (which include; Cheque, ATM, POS and internet transfer) ownership age from 15 year above) (EMB), and number of commercial bank branches in the country (NCB) will lead to [0_{LRA}, 0_{EMB} and 48_{NCB}] percent's decrease on Per capita income (PCI). Again, VECM equation showed that the constant variable that is (PCI) reported negative valued at [-640.1583]. The implication is that holding all the independent factors of financial inclusion constant, Per capita income (PCI) in the Nigerian poverty level will steady at 64 percent at the short run. Meanwhile, the t – statistic of LRA, AAA, EMB and NCB given as [8.19344LRA, 6.20104AA, 11.2435EMB and 14.3768NCB] of this variable were all significant in the short run.

Error correction equation Colum's showed that coefficients of the rural

areas (DRA), account owners of any type (age from 15 year above) (AA), Electronic money banking/payment system (which include; Cheque, ATM, POS and internet transfer) ownership age from 15 year above) (EMB), and number of commercial bank branches in the country (NCB) at lag one and two, have a positive relationship with the dependent variable (Per capita income (PCI) in the Nigerian economy. This implies that at the long run, a unit increase in these financial inclusion variable (DRA, AA, EMB and NCB), will lead to [(0.744279 lag (-1), 2.241385 lag (-2) DRA), (0.781990 lag (-1), 0.046714 lag (-2) AA), (25.93633 lag (-1) 0.258203 lag (-2) EMB), (50.12307 lag (-1), 2.046865 lag (-2) NCB)] percent respective increases on Per capita income (PCI) in the Nigerian economy. In other words, the three of the financial inclusion variables used in this model and objective two of this study impact positively on poverty reduction while improving the economy as a whole. Whereas coefficient of loan to rural areas (LRA) at both lags one and two post a negative relationship with the dependent variable (i.e., Per capita income (PCI) of Nigerian's. The implications of this negative responses of loan to rural areas (LRA) which is one of the financial inclusion variables are as follow; first, a unit decrease in the (inflows of loan to rural areas (LRA) in the Nigeria economy will lead to [(-2.467317 lag (-1), -0.472001lag (-2) LRA] percent's increase on Nigerian poverty level, thereby decreasing Per capita income

(PCI) of Nigerian.

The t- statistic of error correction equation for these variables is [(4.59536_{AA (-1)}, (6.21858_{DRA (-1)}, 5.85394_{DRA (-2)}) (3.43773_{LRA9-1}), 2.60293_{LRA (-2)}) 1.50458_{EMB (-1)}, 1.85787_{EMB (-2)} and [1.19463_{NCB (-1)}] were statistically significant to the study within the observation time. Meanwhile, the explanatory variable all have the signs in line with the theoretical assumption. Whereas the coefficient of determination R² (0.600218) have a good fit to the study since 60 percent variation on the dependent variable (PCI) is as results of influence/impact from these financial inclusion explanatory variables. In the same view, the F-statistic reported [2.425283], which is 2.4 percent total joint influence of the variables implying significant in the model.

Objective Three: [To ascertain impact of financial inclusion on savings in Nigeria

Table 7 Co-integration Test for objective/model Three
Series: ASE ITR CPS AA EXR

Hypothesized		Trace	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None*	0.867582	237.8881	69.81889	0.0000
At most 1*	0.819262	159.0382	47.85613	0.0000
At most 2*	0.688151	92.32061	29.79707	0.0000
At most 3*	0.500211	46.87636	15.49471	0.0000
At most 4*	0.398536	19.82716	3.841466	0.0000

Source: Researchers' Extract from E-view 9.0 Estimation output (2023).

Also, the Maximum Eigenvalue of the variables are all proved the same significantly significant since their max-eigen statistic of the variables are (i.e., ASE [237.8881 > 69.81889], ITR [159.0382 > 47.85613] CPS

[92.32061 > 29.79707] AA [46.87636 > 15.49471] and EXR [19.82716 > 3.841466] higher when view along with 5 percent critical-value, this could be confirmed with their probability values as it valued [0.0000] respectively. Simply put, there is four indicated co-integrating eqn(s) among the variables in the model estimated.

Table 7.1: Results of Error Correction Model Three

<i>Dependent Variable: ASE</i>				
<i>Variable</i>	<i>Coefficient</i>	<i>Std. Error</i>	<i>t-Statistic</i>	<i>Prob.</i>
<i>C</i>	-301.6965	454.5287	-0.663757	0.5111
<i>ITR</i>	-13.85186	25.25622	-0.548454	0.5868
<i>CPS</i>	0.000803	4.48E-05	17.91405	0.0000
<i>AA</i>	0.001546	0.000139	11.09857	0.0000
<i>EXR</i>	-2.008847	3.044305	-0.659870	0.5135
<i>ECM(-1)</i>	-0.206297	0.165757	-1.244574	0.2213
<i>R-squared</i>	0.991756	<i>Mean dependent var</i>		5097.331
<i>Adjusted R-squared</i>	0.990611	<i>S.D. dependent var</i>		7095.987
<i>S.E. of regression</i>	687.5897	<i>Akaike info criterion</i>		16.03583
<i>Sum squared resid</i>	17020067	<i>Schwarz criterion</i>		16.28406
<i>Log likelihood</i>	-330.7523	<i>Hannan-Quinn criter.</i>		16.12681
<i>F-statistic</i>	866.1346	<i>Durbin-Watson stat</i>		2.006095
<i>Prob(F-statistic)</i>	0.000000			

Source: Researchers' Extract from E-view 9.0 Estimation output (2023).

The error correction model estimated result presented in Table 7.1 revealed a positive and significant relationship between the dependent variable Aggregate saving in the economy (ASE) and independent variables ITR, CPS, AA, EXR. At 2.006095, the Durbin Watson statistics does not propose evidence of auto-correlation. This value is between 1.8 and 2.2 which suggests the absence of autocorrelation. Therefore, we reject the null hypothesis of the presence of autocorrelation among the disturbance terms in the model and accept the alternative hypothesis that there is no

autocorrelation between the error terms. The fitness of the model is confirmed by the prob F-statistic which is significant at 5 percent given the value of 0.009064 which led to rejection of null hypothesis that all the explanatory variables introduced in the model are not jointly significant in explaining the variations in Aggregate saving in the economy (ASE) level and concluded that they are simultaneously significant. The error correction term, ECMt-1, was significant at 5% with low feedback of 0.20%. It is also negatively signed, showing that the adjustment is in the right direction to restore the long run relationship. This confirmed also that there is a strong relationship between financial inclusion variables and aggregate saving in the economy (ASE) which implies that a deviation from equilibrium level in the current year will be corrected by 0.20% in subsequent years. Apparently, it will take about 2 years to correct.

Table 8: Vector Error Correction Results for objective Three (To ascertain impact of financial inclusion on savings in Nigeria).

Vector Error Correction Estimates	
Cointegrating Eq:	CointEq1
ASE(-1)	1.000000
ITR(-1)	9.104585 (18.0616) [0.56686]
CPS(-1)	-0.000912 (3.3E-05) [-27.9460]
AA(-1)	-0.001078 (0.00016) [-6.59344]
EXR(-1)	-2.936213 (2.31758) [-1.26693]
C	-823.0323
D(lag(-1)) D(lag(-2))	
D(ASE(-1))	0.532249 0.505708 (0.19654) (0.19421) [2.70813] [2.60392]
D(ITR(-1))	-4.228637 -0.567944 (32.5684) (0.19113) [-0.12984] [-2.97146]
D(CPS(-1))	0.373885 0.264366 (0.16651) (0.09257) [2.24537] [2.85396]
D(AA(-1))	-0.776332 -0.919081 (0.36327) (0.29059) [-2.13707] [-3.16281]
D(EXR(-1))	17712.35 9933.825 (6655.86) (3069.99)
[2.66117] [3.23578]	
C	-313.6117 0.131695 -80233.87 -155036.7 4.869267 (173.368) (1.01744) (150584) (77174.9) (5.19349) [1.80894] [0.12944] [-0.53282] [-2.00890] [0.93757]
R-squared	0.612993 0.299121 0.644837 0.691085 0.232667
Adj. R-squared	0.460955 0.023776 0.505308 0.569726 -0.068786
Sum sq. resid	12507492 430.7742 9.44E+12 2.48E+12 11224.13
S.E. equation	668.3533 3.922345 590518.1 297518.2 20.02153
F-statistic	4.021821 1.086348 4.621342 5.694542 0.771818
Log likelihood	-309.8167 -104.2916 -580.4911 -553.7533 -169.4964
Akaike AIC	16.09084 5.814582 29.62455 28.28766 9.074818
Schwarz SC	16.59750 6.321246 30.13122 28.79433 9.581482
Mean dependent	516.1968 0.187218 389964.8 149318.2 10.01280
S.D. dependent	910.3187 3.969822 825369.5 455566.6 19.36653
Determinant resid covariance (dof adj)	
	2.31E+31
Determinant resid covariance	
	3.89E+30
Log likelihood	
	-1692.509
Akaike information criterion	
	87.87546
Schwarz criterion	
	90.61989

Source: Researchers' Extract from E-view 9.0 Estimation output (2023).

Table 8 is of two sides. First is the vector error correlation (VECM) co-integrating short run equation denotes Coint-equation1, the second is the long run VECM result which denote D(lag (-1) and D(lag (-2)). Examining the co-integrating short run aspect of the table, we observed that coefficients of credit to private sector (CPS), account owners of any type (age from 15 year above) (AA) and exchange rate (EXR) post a negative relationship with the

dependent variable Aggregate saving in the economy (ASE). Meaning that, a unit increase in these variables (CPS, AA and EXR) will lead to [0.09CPS, 0.01AA, and 2.93EXR] percent decreases respectively on the aggregate saving in the economy (ASE). Whereas, coefficients of interest rate (ITR), post a positive relationship with aggregate saving in the economy (ASE). It implies that a unit increase inflows of this variable in Nigerian will lead to [9.104585 ITR] percent decrease on aggregate saving in the economy (ASE). Again, VECM Coin-equation showed that the constant reported negative valued at [-313.6117]. The implication is that holding all the independent factors constant, aggregate saving in the economy (ASE) in the Nigeria will decline by 313 percent at the short run.

Error correction equation Colum's showed that coefficients of credit to private sector (CPS) and exchange rate (EXR) both at lag one and two have a positive relationship with the dependent variable (ASE). This implies that at the long run, a unit increase in these variables (CPS and EXR), will lead to [0.373885(-1), 0.264366(-2) CPS], [17712.35(-1), 9933.825(-2) EXR] percent increase on aggregate saving in Nigerian economy (ASE) within the study period. Whereas the coefficients of interest rate (ITR) and account owners of any type (age from 15 year above) (AA) both at lag one and two, post a negative relationship with the dependent variable (i.e., aggregate savings in Nigerian economy (ASE).

The implications of these negative responses of these variables are as follow; first, shilling increase in the (inflows interest rate (ITR) and account owners of any type (age from 15 year above) (AA)) will lead to [-4.228637(-1), -0.567944(-2) ITR], [-0.776332(-1), -0.919081(-2) AA] percent decrease on aggregate savings in Nigerian economy (ASE). The t-statistic of error correction equation for these variables is [[2.70813(-1), 2.60392(-2) ASE], (2.97146(-2) ITR), (2.24537(-1), 2.85596(-2) CPS), [-2.13707(-1), -3.16281(-2) AA and (2.66117(-1), 3.23578(-2) EXR]] were statistically significant to the study within the observation time.

Consequently, the coefficient of determination adjusted square R^2 (0.612993) have a good fit to the study since 61 percent variation on the dependent variable (aggregate savings in Nigerian economy (ASE)) is as a result of influence/impact from these explanatory variables. In the same view, the F-statistic reported [4.031831], which shows total joint influence of the variables in the model.

Table 9: Autocorrelation VECM test Result

Lags	LM Stat	Probability Value
1	42.03374	0.0178
2	36.67254	0.0620
3	51.37399	0.0014
4	59.99453	0.0001
5	29.68818	0.2362
6	33.09174	0.1288
7	48.16701	0.0036
8	32.28121	0.1500
9	34.91747	0.0897
10	53.34109	0.0008
11	41.76502	0.0191
12	39.91965	0.0297

Source: Researchers' Extract from E-view 9.0 Estimation output (2023).

This test is condition to test if they exist auto or serial correlation problem

to this VECM equation two employed. However, viewing table 4.1 above, we observed that the LM-statistic values were examined using ten lags, and almost the lags of LM-statistic value were statistically significant as is proven by the pro-value in the table. We therefore conclude that there is no presence of serial correlation in the model.

Heteroskedasticity Test

Table 10 VECM Residual Heteroskedasticity

<i>Joint test: No Cross Terms (Only Levels and Squares)</i>		
Chi-sq	df	Prob.
427.8655	330	0.0002

Source: Researchers' Extract from E-view 9.0 Estimation output (2023).

Viewing the VECM Residual Heteroskedasticity results in table 10, we concluded that there is no occurrence of Heteroskedasticity of constant variance in the model since the p-value [0.0002] of the Chi-square statistic value [427.8655] showed statistically significant within 330 degrees of freedom at 5 percent level of significance.

Granger Causality Test Results

Table 11: Pairwise Granger Causality Tests for Objective One

<i>Null Hypothesis:</i>	Obs	F-Statistic	Prob.
<i>RGDP does not Granger Cause ITR</i>	41	0.16787	0.8461
<i>ITR does not Granger Cause RGDP</i>		0.30919	0.7360
<i>RGDP does not Granger Cause OFA</i>	41	0.25964	0.7728
<i>OFA does not Granger Cause RGDP</i>		12.7698	0.0075
<i>RGDP does not Granger Cause APD</i>	41	6.63897	0.0035
<i>APD does not Granger Cause RGDP</i>		9.10788	0.0006
<i>RGDP does not Granger Cause IFR</i>	41	0.38791	0.6813
<i>IFR does not Granger Cause RGDP</i>		1.49761	0.2373
<i>RGDP does not Granger Cause NCA</i>	41	0.21826	0.8050
<i>NCA does not Granger Cause RGDP</i>		8.07537	0.0013

Source: Researchers' Extract from E-view 9.0 Estimation output (2023).

The result in the table 11 revealed as follows; that we should reject the null hypotheses that said; RGDP does not Granger Cause OFA, APD does not Granger Cause RGDP, RGDP does not Granger Cause APD and RGDP does not Granger Cause NCA are rejected. Reason is that their computed F^x – values [12.7698RGDP, (6.63897APD, 9.10788RGDP), and 3.91918NCA] and p-values; [0.0075RGDP, 0.0035APD, 0.0006RGDP, 0.0013NCA] were respectively significant at 5% level. In other words, the past value of these financial inclusion indicators namely, Number of on boarded (New) Financial service Agent (OFA), Active POS Deployed (APD), and Number of Credit Accounts (NCA) in the Nigeria does granger causes the present value of gross domestic product (RGDP). Whereas, the past value of gross domestic product (RGDP) does not granger causes the present value of Number of on boarded (New) Financial service Agent (OFA), and Number of Credit Accounts (NCA) since their f- and p-value [(0.25964OFA), 0.7728p and (0.21826NCA) 0.8050p] computed shows statistically insignificant which implies per directional or partial causal relationship between these variables [RGDP, OFA, NCA] in the model. On the same view, the results revealed that there exists a bidirectional causal relationship between Active POS Deployed (APD) and gross domestic product (RGDP) Nigeria within the period of the study. Thus, these variable's f- values computed [6.63897RGDP, 9.10788APD) and P-

value (0.0035RGDP, 0.0006APD) were statistically significant respectively at 5% level of significance. The implication is that the past value of Active POS Deployed (APD) and gross domestic product (RGDP) in Nigeria does in granger causes the present values of each other in the model.

Table 11.1: Pairwise Granger Causality Tests for Objective Two

Null Hypothesis:	Obs	F-Statistic	Prob.
PCI does not Granger Cause LRA	41	2.84828	0.0711
LRA does not Granger Cause PCI		4.39029	0.0197
PCI does not Granger Cause DRA	41	2.62549	0.0862
DRA does not Granger Cause PCI		1.74672	0.0888
PCI does not Granger Cause AA	41	1.06057	0.3568
AA does not Granger Cause PCI		0.47971	0.6229
PCI does not Granger Cause EMB	36	0.23152	0.7947
EMB does not Granger Cause PCI		0.37710	0.6889
PCI does not Granger Cause NCB	41	11.8874	0.0001
NCB does not Granger Cause PCI		0.82208	0.4476

Source: Researchers' Extract from E-view 9.0 Estimation output (2023).

Table 11.1 revealed that null hypotheses that said; PCI does not Granger Cause LRA, LRA does not Granger Cause PCI, PCI does not Granger Cause DRA, DRA does not Granger Cause PCI and PCI does not Granger Cause NCB should be rejected as their f- value [2.84828PCI, (4.39029LRA, 2.62549PCI, 1.74672DRA and 11.8874NCB)] and p- value [0.0711PCI, 0.0197LRA, 0.0862PCI, 0.0888DRA and 0.0001NCB] computed respectively, were significant at 5% level. This implies that the past value of these financial inclusion indicators namely, demand deposit from the rural areas (DRA), loan to rural areas (LRA), and number of commercial bank branches in the country (NCB) in the Nigeria does granger causes the present value of Per capita income (PCI) within the period

of this study. Whereas, per capita income (PCI) past value does not granger causes the present value of these financial inclusion indicators impact the demand deposit from the rural areas (DRA). We conclude that there exists partial causal relationship between these variables [PCI, LRA, DRA and NCB] in the model.

The results also revealed that there exists no positive causal relationship between account owners of any type (age from 15 year above) (AA), Electronic money banking/payment system (which include; Cheque, ATM, POS and internet transfer) EMB and Per capita income (PCI), since their f-value [1.06057AA, 0.47971PCI, 0.37710EMB and 0.23152PCI] and p-value [0.3568AA, 0.6229PCI, 0.6889EMB, and 0.7947PCI] computed respectively, were insignificant at 5% level. In other words, the past value of account owners of any type (age from 15 year above) (AA), Electronic money banking/payment system (which include; Cheque, ATM, POS and internet transfer) EMB and Per capita income (PCI) computed does not statistically granger causes the present value of each other [i.e. (AA and PCI), (EMB and PCI) in the model.

These results suggested that; AA does not Granger Cause ASE, ASE does not Granger Cause AA, EXR does not Granger Cause ASE and ASE does not Granger Cause EXR null hypotheses should be rejected, since their f- value [(5.54321ASE, 9.31795AA), (2.93030ASE, 2.80335EXR)] and p-value [(0.0080ASE, 0.0005AA), (0.0662ASE, 0.0739EXR)] computed respectively, were significant at 5% level. This implies that the past value of these financial inclusion indicators namely, credit to private sector (CPS), account owners of any type (age from 15 year above) (AA) and exchange rate (EXR) in Nigeria does granger causes the present value of Aggregate saving (ASE) in Nigerian economy and at the same time, the past value of Aggregate saving (ASE) does granger causes the present value of [ASE, AA and EXR] within period of this study. We then conclude that there exists a bidirectional causal relationship among the variables. The table further revealed that ASE does not Granger Cause ITR and at the same time, ITR does not Granger Cause ASE. However, the result shows that ASE does Granger Cause CPS, whereas CPS does not Granger Cause ASE. This is confirmed with their f-values [(0.11848ASE, 0.11037ITR), (11.1069ASE, 0.41719CPS)] and p-value [(0.8886ASE, 0.8958ITR), (0.0002ASE 0.6620CPS) at 5% significance level. We then conclude that there exists a partial causal relationship among the [ITR, CPS and ASE] variables in the model tested.

Table 11.2: Pairwise Granger Causality Tests for Objective Three

<i>Null Hypothesis:</i>	<i>Obs</i>	<i>F-Statistic</i>	<i>Prob.</i>
<i>ASE does not Granger Cause ITR</i>	41	0.11848	0.8886
<i>ITR does not Granger Cause ASE</i>		0.11037	0.8958
<i>ASE does not Granger Cause CPS</i>	41	11.1069	0.0002
<i>CPS does not Granger Cause ASE</i>		0.41719	0.6620
<i>ASE does not Granger Cause AA</i>	41	5.54321	0.0080
<i>AA does not Granger Cause ASE</i>		9.31795	0.0005
<i>ASE does not Granger Cause EXR</i>	41	2.93030	0.0662
<i>EXE does not Granger Cause ASE</i>		2.80335	0.0739

Source: Researchers' Extract from E-view 9.0 Estimation output (2023).

Evaluation of working hypotheses

Null Hypothesis 1: There is no significant impact of financial inclusion on Nigeria's economic growth.

From the VEC table 4 we examine the hypothesis one of the studies by considering the size and signs of the coefficients used in the model and as well their significance as we compare the t-statistic both calculated and tabulated critical value at 5% level of significance. First, we reject the null hypothesis one of this study and accept the alternative hypothesis with the following observations: **T-test:** In short run equation, all the coefficients variable employed in the model were all statistically significant at 5% level of significance using the calculated t-value of the model. In other words, from the long run regression estimate of the variables $2.24048\text{lag}(-1)$, $2.29790\text{lag}(-2)$ [ITR], $[2.90119\text{lag}(-1)$, $1.56987\text{lag}(-2)$ NCA], $[1.88010\text{lag}(-1)$, $2.34308\text{lag}(-2)$ APD], $[2.71915\text{lag}(-1)$ IFR], $[5.74677\text{lag}(-2)$ OFA]. were respectively greater than the tabulated t-value is 1.569. We observed that: One percent decrease in financial inclusion proxy by these variables; [ITR, NCA, APD, and OFA] will leads to 2% to 5% increase on economic growth (i.e., Real Gross Domestic Product (RGDP) respectively at the long run in Nigeria during the periods of the study. Again, looking at the Granger causality test carried out, we observed that there exists per directional or partial causal relationship between these variables [RGDP, OFA, NCA] in

the model, whereas there exists a bidirectional causal relationship between Active POS Deployed (APD) and gross domestic product (RGDP) only Nigeria within the period of the study. Based on this, we therefore reject the null hypothesis one of this study and accept the alternative hypothesis one that said, "Financial inclusion has significant impact on the Nigerian economic growth" during the period of the study 1980-2022.

Null Hypothesis II: Financial inclusions have no significant impact on poverty reduction in Nigeria.

We employed results of VECM table 6 to examine the hypothesis two of the study by considering the size and signs of the coefficients used in the model and as well their significance as we compare the t-statistic at 5% level of significance. First, we reject the null hypothesis two of this study and accept the alternative hypothesis with the following observations:

- **T-test:** In short run equation from table 6, four of the variables employed in the model were all statistically significant at 5% level of significance using the calculated t-value of the model. In other words, from the short run regression estimate the t-statistic of these variables $[8.19344(-1)$ LRA, 6.20104_{AA} , 11.2435_{EMB} and 14.3768_{NCB}] were respectively greater than the tabulated t-critical value 1.569. While at the long run, the t-statistic of the variables were, $[(4.59536_{AA}(-1)$, $(6.21858_{DRA}(-1)$, $5.85394_{DRA}(-2)$ $(3.43773_{LRA}(-1)$, $2.60293_{LRA}(-2)$

1.50458_{EMB (-1)}, 1.85787_{EMB (-2)} and [1.19463_{NCB (-1)}] respectively, greater than the tabulated t- value is 1.569.

- One percent increases in the financial inclusion variables; deposit from the rural areas (DRA), loan to rural areas (LRA), at lag one (-1) and lag two, will leads to [6%(DRA)-1), 5%(DRA)-2), 8%(LRA)-1)), increases on Per capita income (PCI) respectively, in the long run in Nigeria during the periods of the study.
- One percent increases in the financial inclusion variables; account owners of any type (AA) and electronic money banking/payment system (EMB) at lag one (-1) and two (-2) will leads to [1.5%_(AA)-1), 1.8%_(AA)-2), 26%_(EMB)-1) 03%_(EMB)-2)] increase on the Per capita income (PCI) respectively, in the long run in Nigeria during the periods of the study.
- Whereas one percent increase in the financial inclusion variable; number of commercial bank branches in the country (NCB) at lag one (-1) will leads to by 1.9% increase on the Per capita income (PCI) respectively, in the long run in Nigeria during the periods of the study.

Meanwhile, viewing at the Granger causality test carried out, we observed that there exists partial causal relationship between these variables [PCI, LRA, DRA and NCB] which implies that [LRA, DRA and NCB]

does granger causes the present value of per capital income whereas per capital income does granger causes these financial inclusion indicators [LRA, DRA and NCB] in the model. Based on this, we concluded, “financial inclusion has significant impact on poverty reduction in Nigeria” during the period of the study 1980-2022.

Null Hypothesis III: Financial inclusion has no impact on the Nigerian savings growth.

Results of VECM table 8 was employed in examining the hypothesis three of the study by considering the size and signs of the coefficients used in the model and as well their significance as we compare the t-statistic both calculated and tabulated critical value at 5% level of significance with the following observations:

The variables t- statistic of error correction equation for these variables is [[2.70813(-1), 2.60392(-2) _{ASE)}, (2.97146(-2) _{ITR)}, (2.24537(-1), 2.85596(-2) _{CPS)}, [-2.13707(-1), -3.16281(-2) _{AA} and (2.66117(-1), 3.23578(-2) _{EXR)}] were statistically greater than the 5% critical value 1.569.

We also observe that one percent increase in the financial inclusion variables such as account owners of any type (AA) and credit to private sector (CPS) at lag (-1) and (-2), leads to [35%_(CPS)-1), 42.8%_(CPS)-2) and 3.1%_(AA)-2) increases on aggregate saving (ASE) which is quall to investment in the economy

respectively during the periods of the study. On the other hand, One percent decrease in the interest rate (IR) at lag one (-1) will leads to 56% (IR)(-1), increase on the aggregate saving (ASE) in the Nigerian economy respectively, in the long run during the periods of the study. Whereas one unit decrease in at lag (-1) and (-2) will leads to 17% (EXCR)-1), 99% (EXCR)-2) increase on the aggregate saving (ASE) in the Nigerian economy respectively, in the long run during the periods of the study.

Meanwhile, viewing at the Granger causality test carried out, we observed that there exists a bidirectional causal relationship between these variables [ASE, AA and EXR] and in the same model reported partial causal relationship between the dependent variable [ASE] and [CPS and ITR] financial inclusion indicators in the model tested. Based on this, we conclude that, “financial inclusion has significant positive impact on the Nigerian savings and investment growth” during the period of the study 1980-2022.

Conclusion.

This study sought to examine the impact of Financial Inclusion on the Nigerian Economic growth 1980 to 2022. There is the expectation that financial inclusion in Nigeria will contribute to economic growth by possible positive in greater savings, broad money, credit to private sector, Ratio of loan to deposit interest rate, and increase number of commercial bank branches in the country, loan to

rural areas and number of account owners of any type.

Having analysed the state of financial inclusion in Nigeria, and based on the results obtained and interpreted the null hypotheses that stated, “Financial inclusion has no significant impact on the Nigerian economic growth.” (2) “Financial inclusion has no significant impact on poverty reduction in Nigeria” and (3) financial inclusion has no significant positive impact on the Nigerian savings and investment growths in Nigeria were rejected. Thus, given the prevailing policy environment in Nigeria, these explanatory variables, has significantly impacted and did improve the growth of the Nigerian economy. Savings behaviour in average showing 51%, number of account owners of any type having 59%, and electronic money banking/payment system showing 26% influences to economic growth and poverty reduction in Nigeria. Finally, the econometric estimation shows that borrowings and loans from financial institutions are having 8% and 3.2% significantly contributed to economic growth. This implies that borrowing and savings through outside financial institutions (using family, friends or saving clubs) still pave way to reduce influences to people in the Nigerian economy. From the foregoing, therefore, we conclude that level of financial inclusion in Nigeria is high which significantly affected positively on the Nigerian economic growth, poverty reduction in Nigeria

and Nigerian savings and investment growths during the period of this study.

Policy Recommendations

- 1 Given that financial inclusion has significant impact on the Nigerian economic growth, the study recommends that “Nigeria governments that have limited public funds, or limited tax revenue, to fund financial inclusion programs should prefer to use financial literacy as a national strategy for financial inclusion because it is relatively cheaper to educate the population about financial management and the benefits of using formal financial services”.
- 2 Since financial inclusion has significant impact on poverty reduction in Nigeria, the study then recommends that “stable electricity supply to drive the infrastructural facilities provided

by banks, telecommunication companies and other related service providers such availability and affordability of financial services in Nigeria; however, there is a need to ensure stress-free accessibility to financial services which will be reflected on the deposits by private individuals.

- 3 The study established that financial inclusion has significant impact on the Nigerian savings growth, the study recommends that “Nigerian monetary authority (CBN) should increase the number of formal account ownership by building up trust securities in financial institutions operation in Nigeria, remove all obstacles for account ownership such as income and age bracket bias, distance in location and education discrimination in the delivery and use of financial services

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