

## **A VECTOR ERROR CORRECTION MODEL (VECM) APPROACH ON NIGERIAN ECONOMIC GROWTH AND FINANCIAL INCLUSION**

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### **ABSTRACT**

*This paper examined the impact of financial inclusion on the Nigerian economic growth for the period 1980-2019. The paper considered the three objectives during the review period. The main objective of the study is to evaluate financial inclusion significant impact on poverty reduction in Nigeria and ascertain the significant positive impact of financial inclusion on savings and investment growth in Nigerian economy. Secondary time series data were used to carry out the empirical analysis. The study specified two models that were used to examine the objectives with the aid of vector error correction model (VECM) approach, Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) tests, Co-integration Test and Granger Causality. Based on the above econometric and statistic techniques conducted, it was observed that financial inclusion has significant positive impacts on poverty reduction in Nigeria. Furthermore, financial inclusion has significant positive impact on the Nigerian savings and investment growth in Nigeria during the period of study 1980-2019. The results revealed a bidirectional nature of causality relationship between the variables in the model during the period of the study 1980-2020. These empirical results do support that one percent decrease in the interest rate (IR), inflation rate (FR) and exchange rate (EXCR) at lag (-2) will leads to [31% (IR)-2), 53%(FR)-2), and 8%(EXCR)-2)] increases on the aggregate saving (ASE) quall to investment in Nigeria. 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 leads to [38%(DRA)-2), 92%(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 banks may consider having their forms in some locations in the officially recognized local language of the people in different regions because financial inclusion is not about ability to speak English language but access to and use of banking services. There is need for stable electricity supply to drive the infrastructural facilities provided by banks, telecommunication companies and electronic money banking/payment system such as ATMs and point of sales terminals.*

**Keywords: Financial Inclusion, Economic growth, Poverty reduction, savings, investment, Nigeria.**

### **INTRODUCTION**

In an effort to promote financial inclusion, the Central Bank of Nigeria has intensified its push on banks to invest in less expensive branchless channels like ATMs and point-of-sale (POS). In contrast to the 59 in South Africa, 13 in Indonesia, 42 in Argentina, 120 in Brazil, and 56 in Malaysia, there were 9,640 ATMs in use by the end of 2011. The goals of the cashless policy

are to lower banking costs, modernize the payment system, and increase the efficiency of monetary policy. With the advancement of the cashless project in Lagos, there were 18,874 active and deployed point of sale systems in March 2011 compared to 5,300 in June 2010. The quantity of POS systems in use, though, has not increased. Martinez (2011) posits that access to finance is an essential policy tool used by governments and policy makers to stimulate economic growth. By making finance available and affordable to economic agents, there is a growth of economic activities and hence growth of output (Okoye et al, 2020).

Extensive literature suggests that countries boasting high financial inclusion indices typically experience rapid economic progress and expansion (Khan, 2011). It has become evident that increasing financial inclusivity among the populace leads to heightened investment in productive activities, resulting in elevated output, per capita income, and overall economic advancement (Ashraf et al., 2006). To support this argument, during the visit of Queen Maxima of the Netherlands, who serves as the UN Secretary-General's Special Advocate for Inclusive Finance for Development (UNSGSA), to Abuja, Nigeria in November 2017, the Vice President of Nigeria, Prof. Yemi Osinbanjo emphasized the critical importance of financial inclusion for the economy. He emphasized the necessity of ensuring access to financial products for all citizens, regardless of their location or proximity.

### **Statement of the Problem**

The most impoverished individuals are typically excluded from formal financial services due to their limited understanding of such services, often stemming from illiteracy, or because the available products do not adequately meet their needs. Additionally, financial service providers may actively exclude them, viewing them as too risky and costly to serve (Smith et al., 2015). Many nations have committed to ambitious targets for financial inclusion. Nigeria's Financial Inclusion Strategy, established by the Central Bank of Nigeria in 2012, aims to include 70% of the population in formal financial services by 2020, up from a baseline of 30%, and to reduce the proportion of financially excluded individuals from nearly half to one fifth. This target necessitates the inclusion of numerous chronically poor households. Specifically, the goal is to achieve a 70% inclusion rate for payments, 60% for savings, and 40% for credit, insurance, and pensions. While previous global efforts on financial inclusion mainly focused on extending credit, there is now conflicting evidence regarding its effectiveness in addressing the challenges faced by poor individuals. Consequently, inclusion efforts are shifting towards savings and insurance as potentially more effective starting points (Smith et al., 2015).

Meanwhile, Using data from the World Bank's Global Findex database, the findings indicate that the educated, rich and employed population are more likely to be financially included than the poor, uneducated, and unemployed population. In addition, borrowings and savings outside financial institutions (using family, friends or saving clubs) significantly contributed to economic growth than borrowing and savings through financial institutions (Ozili, 2020). However, with reputed international organizations and agencies like the World Bank, the G20 and 52 nations having committed to implementing the strategies and raising financial access to the world's 1.7 billion unbanked adults (Global Findex, 2017, AFI, 2013, Cihak and Singh, 2013) impeding social and economic development (World Bank, 2017). The motivation is with idea that financial inclusion gives households and firms the opportunity to reduce their risk and transaction costs in cash flow. It also promotes the accumulation of capital for huge

investment through savings, development of entrepreneurship, and allows better participation in economic activities by the population (AfDB, 2013). Owning a bank account serves as an entry point into the formal financial system which allows the poor to create a credit history that can aid future access to credit for investment and education (Papworth, 2014). Accordingly, economic productivity may increase the creation of economic opportunities for the unemployed or become self-employed, therefore increasing wellbeing and reducing poverty (Griffith-Jones et.al, 2013; Klapper, 2016). Therefore, against this backdrop, this study seeks to investigate the impact of financial inclusion on the Nigerian Economic growth from 1980 to 2020 using vector error correction approach.

### **Objectives of the Study**

The overall objective of this study is to estimate the impact of Financial Inclusion on the Nigerian Economic growth using vector error correction approach. Specifically, this work intends to achieve the following objectives:

- i. evaluate financial inclusion significant impact on poverty reduction in Nigeria.
- ii. ascertain the significant positive impact of financial inclusion no savings and investment growth in Nigerian economy.

### **Scope of the Study**

This research will examine how financial inclusion has influenced the economic growth of Nigeria from 1980 to 2019. The selected study period aligns with the timeframe during which the majority of Nigeria's strategies were implemented to enhance financial inclusion within the economy. However, it is important to acknowledge the limitations of this study, particularly regarding the potential impact of unreliable data and irregular record-keeping practices in Nigeria. These factors could affect the quality of the data used in the research and subsequently impact the accuracy of the findings and predictive capabilities of the results. Despite these limitations, it is anticipated that any discrepancies in the data will have minimal effect on the overall outcomes, as they are typically insignificant enough to invalidate the estimation results

## **LITERATURE REVIEW**

### **Financial inclusion concept**

Financial inclusion entails granting access to finance and services to various economic actors at an affordable rate, particularly those with lower incomes (Mbutor and Uba, 2013). It can also be defined as delivering financial services at reasonable costs to segments of society that are unbanked or have low incomes. Conversely, financial exclusion occurs when these services are neither accessible nor affordable to certain economic groups, especially those with lower incomes (Umaru, 2014).

According to World Bank research, a country's level of banking development serves as a reliable predictor of economic growth, capital accumulation, and productivity enhancement. Hence, enhancing financial inclusion in an economy has a direct positive impact on its growth trajectory. Nations with well-developed financial systems witness quicker reductions in poverty levels (Umaru, 2014). Additionally, it reduces the amount of money circulating outside the banking sector, facilitating more effective monetary policy decisions by government agencies such as central banks. Financial inclusion is instrumental in ensuring

that poor individuals, who form the backbone of the economy, are not excluded or marginalized (Uma et al., 2013). Progress in financial inclusion serves as a unique avenue for monetary policy to achieve its objectives by discouraging savings, loans, and the hoarding of money in the informal sector outside the financial system. Financial inclusion encompasses the integration of unbanked individuals and businesses into formal financial systems, granting them access to services like insurance, savings, transfers, and credit.

Regarding the measurement of financial inclusion, policymakers, banks, and academia generally accept a comprehensive financial system (Ozili, 2018). However, empirical literature on financial inclusion reveals no singular standard measure for evaluating the level of financial inclusion in an economy (Sarma, 2007; 2008). Indicators commonly used include the percentage of substantial deposit accounts (current and savings) among the adult population, the percentage of loan accounts relative to the adult population, the number of ATMs and bank branches per million people, as well as the amount of bank deposits and credit (Sarma, 2007; 2008).

Additionally, other indices such as the Eurobarometer Survey 60.2 (European Commission 2008) and Patrick Honohan's Index of access to finance focus on the dimension of access. Therefore, in this study, we will adopt both Sarma's (2007, 2008) definition and the composite measurement for financial inclusion. Utilizing a single-digit measurement facilitates cross-country assessments, enables the examination of trends, and facilitates evaluating a nation's progress with policy implementation and addressing academic inquiries, such as the relationship between financial inclusion and economic development.

### **Financial Inclusion: Access or Use**

The core issues within financial inclusion revolve around access to financial services and their utilization by individuals. When considering financial inclusion, it's important to distinguish between access to financial services and their actual usage. Some individuals may have access to financial services but choose not to utilize them, whereas others may desire integration into the financial system but lack access due to geographical or institutional barriers. This discrepancy between access and usage of financial services is prevalent in developing nations, particularly in sub-Saharan Africa, where a significant portion of the population is excluded from full participation in the financial sector due to various constraints beyond their control (Serrao et al., 2013).

Access to financial inclusion refers to the ability to utilize available financial services from formal financial providers, contingent upon factors such as the proximity of banks to individuals and the associated costs of maintaining a bank account (Serrao et al., 2013). Findings by Uma et al. (2013) underscore this point, revealing that it took a considerable amount of time for a majority of respondents to activate their accounts 1after submitting the required application forms. Moreover, a significant proportion of individuals opt to keep their money at home rather than depositing it in a bank, further highlighting the barriers to accessing formal financial services.

Financial empowerment derived from access to finance can exacerbate disparities between different socioeconomic groups, as those with formal financial access have greater

opportunities to enhance their financial capabilities through various services offered by formal financial institutions. The lack of access to finance serves as a critical factor in perpetuating income inequality and slower economic growth, influencing resource allocation and economic opportunities within the population (Serrao et al., 2013).

Usage in financial inclusion refers to the regularity, duration, and frequency of utilizing financial services over time, encompassing the combination of services used by individuals (Serrao et al., 2013). Simply increasing the number of bank branches may not necessarily translate into improved financial inclusion, especially if these branches are situated in areas already served by existing banks. However, establishing bank branches in underserved areas where banking services are scarce can significantly enhance financial inclusion by opening new accounts for previously unbanked individuals.

In Nigeria, achieving meaningful financial inclusion faces challenges, as observed by Mbutor and Uba (2013). Merely increasing the absolute number of bank branches does not guarantee enhanced financial inclusion, as the practice of clustering multiple branches in close proximity often results in customer poaching rather than genuine inclusion. Furthermore, the closure of bank branches, as seen in the recent sale of some banks, can exacerbate exclusion, particularly for individuals residing in areas where the closed branches were the sole banking option. In such cases, incentivizing the retention of bank branches in underserved areas is essential for fostering inclusive economic growth.

### **The Relevance of Financial Inclusion**

The global average for financial inclusion, defined as the percentage of adults with access to financial services, stands at less than 50.0%. This issue is particularly pronounced in developing countries, with African nations facing significant challenges. (Ardic et al, 2011). Efforts have been directed towards eliminating barriers such as education, gender, age, irregular income, regulation, and geographical location, all of which contribute to the widespread lack of access to finance and services among billions of adults worldwide.

Sanusi (2011) identified the challenges of financial exclusion as a contributing factor to the increasing poverty levels in Nigeria. He argued that achieving an optimal level of financial inclusion in Nigeria would involve empowering 70.0% of the population living below the poverty line. This, in turn, would stimulate economic activities, drive national output growth, and ultimately reduce poverty levels. Theoretically, increased access to deposit facilities enhances the capacity of financial intermediaries to gather savings, while improved access to finance fosters economic growth by enabling households to engage in productive investments (Andrianaivo and Kpodar, 2011).

The consequence of financial exclusion is a reduction in the scale of economic activities that can be financed, thereby limiting the potential for higher economic growth. Financial inclusion necessitates attention to human and institutional factors, including access quality, product affordability, provider sustainability, and outreach to the most excluded populations. Financial inclusion ensures improved access for poor individuals to savings, credit, and payment services throughout their lifetime.

In addition to traditional financial intermediation, financial inclusion encompasses:

- Basic banking accounts for payment transactions
- Savings products tailored to the cash flow patterns of low-income households
- Money transfer services
- Insurance coverage (both life and non-life).

### **Financial System Strategy 2020 (FSS2020)**

One of the key steps taken in this direction was the integration of financial inclusion as a fundamental goal within the Nigerian Financial System 2020 (FSS 2020). The FSS 2020 serves as a comprehensive and strategic blueprint for the development of the Nigerian financial sector, aiming to transform it into a driving force for economic growth, ultimately positioning Nigeria among the world's top 20 economies by 2020. The Financial System Strategy (FSS 2020) identified six key stakeholders within the financial sector, comprising providers of financial services who are considered essential participants in promoting financial inclusion. This group encompasses banking institutions, non-bank financial entities, insurance firms, players in the capital market, pension organizations, and technology providers, along with their respective regulatory bodies, all playing vital roles in advancing financial inclusion efforts. Among the six initiatives outlined to fortify the domestic financial market, four directly target financial inclusion. These initiatives encompass the development of diverse financial products, improvement of payment systems, establishment of credit mechanisms, and promotion of a savings culture. The strategy delineated the objectives of financial inclusion as ensuring that adults (individuals aged 18 and above) have convenient access to a wide array of formal financial products that are suitable, affordable, and provided with dignity for the clients.

- Kama and Adigun (2013) emphasize the importance of providing easy access to financial institutions and services for the unbanked, ensuring smooth and convenient procedures for customers.

## **THEORETICAL LITERATURE**

### **Vulnerable Group Theory of Financial Inclusion**

The vulnerable group theory of financial inclusion targets vulnerable members of society, such as poor, young, women, and the elderly through government-to-person social cash transfers. This approach reduces financial exclusion and encourages individuals to join the formal financial sector. However, it has drawbacks, such as not prioritizing everyone and ignoring non-vulnerable individuals. The systems theory of financial inclusion suggests that financial inclusion outcomes are achieved through existing sub-systems, such as economic, social, and financial systems. Changes in these sub-systems can impact the success of a financial inclusion agenda.

### **Financial Literacy Theory of Financial Inclusion**

The financial literacy theory suggests that raising citizens' financial literacy levels through education is the best way to achieve financial inclusion. It helps people understand available financial services and products, enhances their well-being, and provides access to additional services like mortgage and investment products. Financial literacy also helps people save money, plan for retirement, and differentiate between needs and wants, promoting self-sufficiency and financial stability. However, it doesn't necessarily improve the capacity to

participate in the formal financial sector, which is the key issue in financial inclusion funding theories.

### **Neoclassical Theory of Financial Inclusion**

Neoclassical theory suggests that government intervention in the economy can lead to imbalances and sabotage growth in a deregulated economy. This theory suggests that consumer decisions and poor government policy are responsible for financial exclusion. However, deregulation may promote financial inclusion, as market-driven tactics often result in the emergence of financial products. This paradox suggests that deregulation should have led to financial inclusion rather than financial exclusion.

### **New-Keynesian Theory of Financial Inclusion/Exclusion**

The micro-economy, or information asymmetries, causes market distortions in the financial system, leading to credit limitations and financial exclusion. Accurate information about lenders and borrowers contributes to financial exclusion, perpetuating income and asset inequality, and fragmenting credit markets.

### **Interdisciplinary Theories of Financial Inclusion/Exclusion**

Political economy, institutional theory, and poverty and community analyses are some examples of disciplines that contribute to an interdisciplinary theory (Buckland, 2012). These theories drew heavily from geography, psychology, sociology, and economics. By using experimental methods instead of assuming human rationality, behavioural economics can expand on its questions about how low-income agents behave when facing financial exclusion. Scott (2008) does note that the scope is not as broad as some other interdisciplinary approaches (Buckland, 2012). Political economy theories are also crucial for comprehending financial exclusion because they account for the state, social structures, and political arena (Buckland, 2012). In order to surpass bank division and financialization in terms of customer segmentation in the least advantaged services, this political-economic framework is crucial (Aitken, 2006; Buckland, 2012). However, the institutional analysis provides crucial insights regarding financial exclusion. It alludes to analyses that aim to grasp the major institutions and the overall context of the problem under investigation. In order to understand financial exclusion, it emphasizes the role that institutions and history have played in creating efficient markets, communities, societies, and governments (Buckland, 2012).

Household economy, geographic spatial analyses, poverty and community-based analyses are some other interdisciplinary theories. Community-based analyses take into account the systems that perpetuate poverty and inequality in order to concentrate on the realities and experiences of the financially excluded. The findings indicate that low-income consumers typically act in highly rational ways based on how different financial service types compare in terms of costs and benefits (Buckland, 2012). It enables the household economy to be unpacked, particularly in terms of decision-making, resource allocation, and gender relations. Hashemi, Schuler, & Riley (1996) and Kabeer (2001) are two studies that support the gender impact on credit inclusion. Regarding geographic and spatial analyses of financial exclusion, it looks into whether conventional banks are few in a given area and peripheral banks are overextended in low-income areas (Buckland, 2012).

### **Empirical literature**

Cyn-Young and Ragelio (2015) examined the relationship between financial inclusion, poverty and income inequality in Asia. The study, which focused, employed a cross sectional and panel data Regression model for selected 37 developing Asian countries. They find that demographic factors and per capita income significantly affect financial inclusion. The study also shows that financial inclusion reduces income inequality and poverty. The study suggests that strong financial regulatory oversight, rule of law and enforcement of financial contract would improve financial inclusion efforts.

Migap et al (2015) examined financial inclusion as a strategy for inclusive growth in Nigeria. The study employed primarily data and system question comparative analysis in comparing Nigerian financial inclusion index with other emerging economies in the upper middle-income strata. They find that Nigerian financial inclusion indicator is still shallow compared to emerging economies both within and outside Africa. The study suggests that active participation of media and educational institutions should be encouraged to promote financial literacy in Nigeria

Nkwede (2015) examined financial inclusion and economic growth in Africa, using Nigeria as a case study; applying the Generalized Method of Moments (GMM) and Generalized Least Squares (GLS) with a sample of 1981 to 2013. The study shows a negative relationship between financial inclusion and growth of Nigerian economy. He attributes the finding to high level of financial exclusion of adults from financial services.

Onaolapo and Odetayo (2012) studied financial inclusion in Nigeria from the perspective of microfinance banks using a survey design method. They find that access to financial services through microfinance institutions by less privileged people promotes employment generation, reduction in poverty and overall economic growth.

Joseph and Varghese (2014) studied the role of financial inclusion in the development of Indian economy. The study made use of panel dynamic system GMM regression methods investigating the activities of five private sector banks and five state banks from June to November 2013. Onsite and offsite ATM usage, number of bank branches, credit cards and debit cards per customers were used as proxies for financial inclusion variable focusing on rural and semi-urban areas in India. They find that quite a number of people are still excluded from financial services even after the introduction of inclusive banking initiatives in the country.

### **RESEARCH METHODOLOGY**

Expost-facto research design is adopted in the research.

#### **Model Specification**

Economic growth refers to the sustained rise in the economic activities over a given period of time within a country. Economic growth in this study is measured by Gross Domestic Product (GDP); while financial inclusion is measured by loan-to-deposit ratio (LDR) and liquidity ratio (LQR). Financial deepening refers to an increase in financial services to a wider spectrum of a larger society geared towards the development of a nation (Nwagwugwu, 2008). The model assumes a linear relationship between the dependent and independent variables. Based on



this background, this study adopts with modification of the model developed by Ozii 2020, Onaolapo, 2015 and Okoye, et al (2020).

Modeling investment growth and Financial inclusion as;

$$PCI = (DRA, LRA, AA, EMB, NCB) \dots \quad (1)$$

$$I = ASE = (IR, FR, CPS, AA \text{ and } EXCR) \dots \quad (2)$$

Where: GDP is the aggregate worth of an economy, M2 is the ratio of broad money to GDP (M2/GDP), CPS is credit to private sector to GDP (CPS/GDP), RLD is Ratio of loan to deposit, LRC is the liquidity ratio of commercial banks, ASE is aggregate saving in the economy, IR is interest rate, FR is the inflation rate, exchange rate (EXCR) and NCB is number of commercial bank branches in the country.

### Vector Error Correction Model (VECM)

According to Granger's representation theorem, if there is cointegration there must exist Granger causality in at least one direction and therefore one can reformulate the VAR into a VECM in which error correction terms are included; using the above variables of interest. Thus, we formulate the VECM to obtain the following system of equations.

#### Objective One

$$InPCI_t = \beta + \beta_1 LRA_t + \beta_2 DRA_t + \beta_3 AA_t + \beta_4 EMB_t + \beta_5 NCB_t + e \dots \dots (2)$$

VECM for Equestrian .... (2)

$$\begin{aligned} \Delta PCI_{it} &= \sum_{k=1}^p \lambda_k v_{kt-1} + \sum_{s=1}^p \alpha_{1,s} \Delta PCI_{t-s} + \sum_{s=1}^p \alpha_{2,s} \Delta DRA_{t-s} + \sum_{s=1}^p \alpha_{3,s} \Delta AA_{t-s} + \sum_{s=1}^p \alpha_{4,s} \Delta BFI_{t-s} + \sum_{s=1}^p \alpha_{5,s} \Delta DC_{t-s} + \sum_{s=1}^p \alpha_{6,s} \Delta DC_{t-s} + \sum_{s=1}^p \alpha_{7,s} \Delta EMB_{it} + \sum_{s=1}^p \alpha_{8,s} \Delta NCB_{it} + \zeta_{1,t} \\ \Delta DRA_{it} &= \sum_{k=1}^p \lambda_k v_{kt-1} + \sum_{s=1}^p \alpha_{1,s} \Delta PCI_{t-s} + \sum_{s=1}^p \alpha_{2,s} \Delta DRA_{t-s} + \sum_{s=1}^p \alpha_{3,s} \Delta AA_{t-s} + \sum_{s=1}^p \alpha_{4,s} \Delta BFI_{t-s} + \sum_{s=1}^p \alpha_{5,s} \Delta DC_{t-s} + \sum_{s=1}^p \alpha_{6,s} \Delta DC_{t-s} + \sum_{s=1}^p \alpha_{7,s} \Delta EMB_{it} + \sum_{s=1}^p \alpha_{8,s} \Delta NCB_{it} + \zeta_{2,t} \\ \Delta AA_{it} &= \sum_{k=1}^p \lambda_k v_{kt-1} + \sum_{s=1}^p \alpha_{1,s} \Delta PCI_{t-s} + \sum_{s=1}^p \alpha_{2,s} \Delta DRA_{t-s} + \sum_{s=1}^p \alpha_{3,s} \Delta AA_{t-s} + \sum_{s=1}^p \alpha_{4,s} \Delta BFI_{t-s} + \sum_{s=1}^p \alpha_{5,s} \Delta DC_{t-s} + \sum_{s=1}^p \alpha_{6,s} \Delta DC_{t-s} + \sum_{s=1}^p \alpha_{7,s} \Delta EMB_{it} + \sum_{s=1}^p \alpha_{8,s} \Delta NCB_{it} + \zeta_{3,t} \\ \Delta BFI_{it} &= \sum_{k=1}^p \lambda_k v_{kt-1} + \sum_{s=1}^p \alpha_{1,s} \Delta PCI_{t-s} + \sum_{s=1}^p \alpha_{2,s} \Delta DRA_{t-s} + \sum_{s=1}^p \alpha_{3,s} \Delta AA_{t-s} + \sum_{s=1}^p \alpha_{4,s} \Delta BFI_{t-s} + \sum_{s=1}^p \alpha_{5,s} \Delta DC_{t-s} + \sum_{s=1}^p \alpha_{6,s} \Delta DC_{t-s} + \sum_{s=1}^p \alpha_{7,s} \Delta EMB_{it} + \sum_{s=1}^p \alpha_{8,s} \Delta NCB_{it} + \zeta_{4,t} \\ \Delta DC_{it} &= \sum_{k=1}^p \lambda_k v_{kt-1} + \sum_{s=1}^p \alpha_{1,s} \Delta PCI_{t-s} + \sum_{s=1}^p \alpha_{2,s} \Delta DRA_{t-s} + \sum_{s=1}^p \alpha_{3,s} \Delta AA_{t-s} + \sum_{s=1}^p \alpha_{4,s} \Delta BFI_{t-s} + \sum_{s=1}^p \alpha_{5,s} \Delta DC_{t-s} + \sum_{s=1}^p \alpha_{6,s} \Delta DC_{t-s} + \sum_{s=1}^p \alpha_{7,s} \Delta EMB_{it} + \sum_{s=1}^p \alpha_{8,s} \Delta NCB_{it} + \zeta_{5,t} \\ \Delta SF_{it} &= \sum_{k=1}^p \lambda_k v_{kt-1} + \sum_{s=1}^p \alpha_{1,s} \Delta PCI_{t-s} + \sum_{s=1}^p \alpha_{2,s} \Delta DRA_{t-s} + \sum_{s=1}^p \alpha_{3,s} \Delta AA_{t-s} + \sum_{s=1}^p \alpha_{4,s} \Delta BFI_{t-s} + \sum_{s=1}^p \alpha_{5,s} \Delta DC_{t-s} + \sum_{s=1}^p \alpha_{6,s} \Delta DC_{t-s} + \sum_{s=1}^p \alpha_{7,s} \Delta EMB_{it} + \sum_{s=1}^p \alpha_{8,s} \Delta NCB_{it} + \zeta_{6,t} \end{aligned}$$

#### Objective Two

$$ASE_t = \alpha + \alpha_1 IR_t + \alpha_2 CPS_t + \alpha_3 AA_t + \alpha_4 EXR_t + e \dots \dots (3)$$

VECM for Equestrian .... (3)

$$\begin{aligned} \Delta ASE_{it} &= \sum_{k=1}^p \lambda_k v_{kt-1} + \sum_{s=1}^p \beta_{1,s} \Delta ASE_{t-s} + \sum_{s=1}^p \beta_{2,s} \Delta IR_{t-s} + \sum_{s=1}^p \beta_{3,s} \Delta CPS_{t-s} + \sum_{s=1}^p \beta_{4,s} \Delta AA_{t-s} + \sum_{s=1}^p \beta_{5,s} \Delta EXR_{t-s} + \zeta_{1,t} \\ \Delta IR_{it} &= \sum_{k=1}^p \lambda_k v_{kt-1} + \sum_{s=1}^p \beta_{1,s} \Delta ASE_{t-s} + \sum_{s=1}^p \beta_{2,s} \Delta IR_{t-s} + \sum_{s=1}^p \beta_{3,s} \Delta CPS_{t-s} + \sum_{s=1}^p \beta_{4,s} \Delta AA_{t-s} + \sum_{s=1}^p \beta_{5,s} \Delta EXR_{t-s} + \zeta_{2,t} \\ \Delta CPS_{it} &= \sum_{k=1}^p \lambda_k v_{kt-1} + \sum_{s=1}^p \beta_{1,s} \Delta ASE_{t-s} + \sum_{s=1}^p \beta_{2,s} \Delta IR_{t-s} + \sum_{s=1}^p \beta_{3,s} \Delta CPS_{t-s} + \sum_{s=1}^p \beta_{4,s} \Delta AA_{t-s} + \sum_{s=1}^p \beta_{5,s} \Delta EXR_{t-s} + \zeta_{3,t} \\ \Delta AA_{it} &= \sum_{k=1}^p \lambda_k v_{kt-1} + \sum_{s=1}^p \beta_{1,s} \Delta ASE_{t-s} + \sum_{s=1}^p \beta_{2,s} \Delta IR_{t-s} + \sum_{s=1}^p \beta_{3,s} \Delta CPS_{t-s} + \sum_{s=1}^p \beta_{4,s} \Delta AA_{t-s} + \sum_{s=1}^p \beta_{5,s} \Delta EXR_{t-s} + \zeta_{4,t} \end{aligned}$$

$$\Delta \text{EXR}_{it} = \sum_{k=1}^p \lambda_k \text{EXR}_{it-k} + \sum_{s=1}^p \beta_1 \Delta \text{ASE}_{t-s} + \sum_{s=1}^p \beta_2 \Delta \text{IR}_{t-s} + \sum_{s=1}^p \beta_3 \Delta \text{CPS}_{t-s} + \sum_{s=1}^p \beta_4 \Delta \text{AA}_{t-s} + \sum_{s=1}^p \beta_5 \epsilon_{it}$$

### Estimation Procedures

Standard econometric approaches will be used in the research to examine the effect of financial inclusion on economic growth in Nigeria; these econometric approaches include the unit root test through the application of the Augmented Dickey-Fuller (ADF) stationarity test, and, Impulse response analysis in VAR models, Co-integration Test and Granger Causality Test. The estimation of the econometric approaches follows the estimation procedures below.

### Unit Root Test

The unit root test will be utilized to examine the rank of integration of the time series by applying the approach of the Augmented Dickey-Fuller (ADF) unit root test. The ADF test focuses on rejecting a null hypothesis of non-stationary and accepting the alternative hypotheses of stationarity, if the ADF statistic is greater than 5% chosen critical value. The test would be

$$\Delta y_t = \alpha_0 + \alpha_1 y_{t-1} + \sum_{n=1}^n \alpha_n \Delta y_t + \epsilon_t \tag{12}$$

$$\Delta y_t = \alpha_0 + \alpha_1 y_{t-1} + \sum_{n=1}^n \alpha_n \Delta y_t + \delta_t + \epsilon_t \tag{13}$$

Where; Y is a time series, t = linear time trend, Δ = first difference operator in a manner that Δy<sub>t-1</sub> = Δy<sub>t</sub> – y<sub>t-1</sub>, α<sub>0</sub> = constant term, n = is the optimum number of lags, and ε<sub>t</sub> is the stochastic term. ADF test fails to reject the test at all levels and first differences but rejects the test at second differences, it implies that the series contain two unit roots and it is of integrated of order

### Impulse response analysis in VAR models with near unit roots identified by long-run restrictions.

Impulse response analysis in VAR models with near unit roots identified by long-run restrictions. This case is best illustrated in the context of the Blanchard and Quah (1989) model for which:

$$Y_t = (\Delta Y_t ; U_t).$$

Where Y<sub>t</sub> is the gross domestic product (log real GDP) and U<sub>t</sub> is the fall in aggregate saving in the economy, A(GDP) = λ(ASE)<sup>-1</sup> (PCI<sub>2</sub> γ IR) per capital income and interest rate

$$\text{and } \beta_0 = \begin{bmatrix} 1 & & \\ & -b_{12}^{(0)} & \\ & -b_{12}^{(0)} & 1 \end{bmatrix}$$

The structural shocks ε<sub>t</sub> = β<sub>0</sub>e<sub>t</sub> can be interpreted as gross domestic product, aggregate saving in the economy, per capital income and interest rate (ε<sup>s<sub>t</sub></sup>, ε<sup>d<sub>t</sub></sup>). The long-run identifying restriction that the demand shocks ε<sup>d<sub>t</sub></sup> have no long-run effect on output imposes a lower triangular structure on the moving average matrix A(1)<sup>-1</sup>B<sub>0</sub><sup>-1</sup>. Hence, under this identifying restriction, the matrix of long-run multipliers in the structural model, B(1) = B<sub>0</sub>A(1); is also lower triangular.

### Co-integration Test

The co-integration property requires all variable to converge in the long run. To carry out the co-integration test, we employ Johansen co-integration method. Using this method, the null hypothesis of no co-integration is rejected if the calculated value is greater than the tabular value (at a chosen relevant significance level), or otherwise Johansen, S., & Juselius, K. (1990).

### Granger Causality Test

To determine the causal elements in our analysis, we specify the model for granger causality test. This is carried out based on the following equations Granger, C.W.J. (1986):

(GDP<sub>t</sub> → PCI<sub>t</sub>, ... ASE<sub>t</sub>)

$$GDP_t = \sum_{i=1}^n \beta_i GDP_{t-i} + \sum_{j=1}^n \lambda_j CPI_{t-j} + \dots + \sum_{u=1}^n \lambda_u ASE_{t-u} + U_{1t} \quad 4$$

(PCI<sub>t</sub>, ... ASE ← GDP)

$$PCI_t = \sum_{i=1}^n \beta_i PCI_{t-i} + \sum_{j=1}^n \lambda_j ASE_{t-j} + \dots + \sum_{k=1}^n \lambda_k GDP_{t-k} + U_{2t} \quad 5$$

aggregate saving in the economy, per capital income and interest rate

Equation (4) states that current gross domestic product, value is depends on its pat value of aggregate saving in the economy, per capital income and interest rate and other variables.

Equation (5) postulates that per capital income, aggregate saving in the economy and interest rate and other variables past value is granger causing impact on the current values (GDP) The decision rule for granger causality test is that if F-statistic value is greater than P-value, we accept Ho, or otherwise.

### Sources of Data

Time series data will be utilized in this investigation to achieve empirical results on the influence of bank credits on private domestic investment in Nigeria from 1980 to 2019. Data on the variables will be obtained from the Central Bank of Nigeria (CBN) statistical bulletin publications and 2017 Annual Report National Financial Inclusion Strategy Implementation and E-views 10 is be used for this study.

## RESULTS

**Table 1: Vector Error Correction Estimates**

Vector Error Correction Estimates

Date: 06/07/21 Time: 12:20

Sample (adjusted): 1982 2019

Included observations: 35 after adjustments

Standard errors in ( ) & t-statistics in [ ]

Cointegrating	
Eq:	CointEq1
RGDP(-1)	1.000000
M2(-1)	-129506.2 (21694.4)

		[-5.96955]
CPS(-1)	0.202742 (0.01396) [14.5273]	
RLD(-1)	0.593382 (0.06628) [8.95312]	
LRC(-1)	-1405.999 (745.684) [-1.88552]	
ASE(-1)	400.6672 (36.1135) [ 11.0947]	
IR(-1)	-11199.84 (1650.13) [-6.78723]	
NCB(-1)	176.2207 (14.4292) [ 12.2128]	
C	-103009.1	

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Error								
Correction:	D(RGDP)	D(M2)	D(CPS)	D(RLD)	D(LRC)	D(ASE)	D(IR)	D(NCB)
CointEq1	0.002034 (0.00207) [ 0.98229]	1.23E-06 (1.4E-06) [ 0.87012]	2.712772 (0.68309) [ 3.97131]	0.752384 (0.49356) [ 1.52440]	2.30E-05 (2.7E-05) [ 0.85906]	0.001607 (0.00134) [ 1.19515]	-2.39E-06 (9.7E-06) [-0.24531]	4.27E-05 (0.00066) [ 0.06448]
D(RGDP(-1))	0.647883 (0.16728) [ 3.87315]	0.000119 (0.00011) [ 1.04306]	-76.77320 (55.1869) [-1.39115]	10.55091 (39.8747) [ 0.26460]	0.000882 (0.00216) [ 0.40744]	0.062881 (0.10863) [ 0.57885]	-0.001182 (0.00079) [-1.50087]	0.022722 (0.05353) [ 0.42443]
D(M2(-1))	-165.1248 (369.208) [-0.44724]	0.484027 (0.25150) [ 1.92457]	401896.3 (121808.) [ 3.29943]	-202410.1 (88010.9) [-2.29983]	3.973125 (4.77676) [ 0.83176]	515.4603 (239.767) [ 2.14984]	1.413675 (1.73802) [ 0.81338]	78.48903 (118.162) [ 0.66425]
D(CPS(-1))	0.000431 (0.00032) [ 1.35447]	1.71E-07 (2.2E-07) [ 0.79071]	0.476579 (0.10495) [ 4.54121]	-0.025905 (0.07583) [-0.34164]	-9.07E-06 (4.1E-06) [-2.20496]	-0.000238 (0.00021) [-1.15143]	1.58E-07 (1.5E-06) [ 0.10536]	6.45E-06 (0.00010) [ 0.06340]

D(RLD(-1))	-0.000522	-1.01E-06	0.583948	-0.067350	1.83E-05	-0.001507	-8.81E-07	-0.000498
	(0.00109)	(7.4E-07)	(0.36000)	(0.26012)	(1.4E-05)	(0.00071)	(5.1E-06)	(0.00035)
	[-0.47802]	[-1.36446]	[ 1.62207]	[-0.25892]	[ 1.29863]	[-2.12666]	[-0.17152]	[-1.42504]
D(LRC(-1))	6.756998	-0.001855	13359.69	-6234.227	-0.120053	-22.00443	0.015845	8.994809
	(17.7803)	(0.01211)	(5866.00)	(4238.42)	(0.23004)	(11.5467)	(0.08370)	(5.69041)
	[ 0.38003]	[-0.15315]	[ 2.27748]	[-1.47089]	[-0.52188]	[-1.90569]	[ 0.18930]	[ 1.58070]
D(ASE(-1))	-0.214944	0.000316	-843.7291	-51.34797	-0.007600	-0.270955	0.000619	-0.043151
	(0.54047)	(0.00037)	(178.311)	(128.837)	(0.00699)	(0.35099)	(0.00254)	(0.17297)
	[-0.39770]	[ 0.85967]	[-4.73179]	[-0.39855]	[-1.08682]	[-0.77198]	[ 0.24315]	[-0.24947]
D(IR(-1))	72.06410	0.006691	43234.36	-6458.011	0.519326	-18.23278	-0.519229	11.55433
	(40.7342)	(0.02775)	(13438.9)	(9710.11)	(0.52701)	(26.4532)	(0.19175)	(13.0366)
	[ 1.76913]	[ 0.24113]	[ 3.21712]	[-0.66508]	[ 0.98542]	[-0.68925]	[-2.70780]	[ 0.88630]
D(NCB(-1))	0.054138	-0.001155	270.8586	98.93180	-0.002992	-0.148012	0.000801	0.105998
	(0.69082)	(0.00047)	(227.913)	(164.676)	(0.00894)	(0.44863)	(0.00325)	(0.22109)
	[ 0.07837]	[-2.45342]	[ 1.18843]	[ 0.60077]	[-0.33474]	[-0.32992]	[ 0.24620]	[ 0.47943]
C	-620.4454	0.278638	392584.0	117130.0	2.309235	269.8872	1.020061	69.32939
	(387.752)	(0.26413)	(127926.)	(92431.5)	(5.01668)	(251.810)	(1.82532)	(124.097)
	[-1.60011]	[ 1.05493]	[ 3.06884]	[ 1.26721]	[ 0.46031]	[ 1.07179]	[ 0.55884]	[ 0.55867]
R-squared	0.742159	0.775142	0.892517	0.344046	0.289771	0.597665	0.318642	0.227103
Adj. R-squared	0.649336	0.694193	0.853824	0.107903	0.034089	0.452825	0.073353	-0.051140
Sum sq. resids	19035882	8.832842	2.07E+12	1.08E+12	3186.379	8028057.	421.8327	1949771.
S.E. equation	872.6026	0.594402	287885.7	208008.9	11.28960	566.6765	4.107713	279.2684
F-statistic	7.995449	9.575713	23.06619	1.456937	1.133324	4.126371	1.299047	0.816203
Log likelihood	-280.7764	-25.56760	-483.7357	-472.3613	-128.6105	-265.6672	-93.22491	-240.9007
Akaike AIC	16.61579	2.032434	28.21347	27.56351	7.920598	15.75241	5.898566	14.33718
Schwarz SC	17.06018	2.476820	28.65786	28.00789	8.364983	16.19680	6.342951	14.78157
Mean dependent	1581.543	0.745318	354980.9	-2.093437	-0.201316	411.3119	0.266196	140.8571
S.D. dependent	1473.571	1.074872	752976.5	220229.6	11.48709	766.0764	4.267199	272.3902
Determinant resid covariance (dof adj.)		5.09E+38						
Determinant resid covariance		3.45E+37						
Log likelihood		-1909.878						
Akaike information criterion		114.1644						
Schwarz criterion		118.0750						

Source: *Researcher's Estimate from Eview 9.0 (2021)*

The above table 1 shows Vector Error Correction Mechanism (VECM) regressed with these variables; Real gross domestic product (RGDP), broad money supply (M2), credit to private sector (CPS), Ratio of loan to deposit (RLD), liquidity ratio of commercial banks (LRC) and interest rate (IR), aggregate saving in the economy (ASE) and number of commercial bank branches in the country (NCB). The table is divided into two; the upper side of the table represents the short run estimate equation without error correction value while the lower parts of the table represent the long run estimate equation with error correction estimation value.

The short run coefficients of the broad money supply (M2), liquidity ratio of commercial banks (LRC) and interest rate (IR) had a negative impact relationship on Real Gross Domestic Product (RGDP). This implies that increase in value of these variables as a proxy of financial inclusion will lead decrease on economic growth as captured to be Real Gross Domestic Product (RGDP) in Nigeria by [129506.2M2, 1405.999LRC and -11199.84IR] respectively, during the periods of the study.

The short run coefficients of credit to private sector (CPS), Ratio of loan to deposit (RLD), aggregate saving in the economy (ASE) and number of commercial bank branches in the country (NCB) were positive relationship with Real Gross Domestic Product (RGDP). This implies that increase in number of these variables proxy of Financial inclusion will lead to an increase on economic growth as captured to be Real Gross Domestic Product (RGDP) in Nigeria by [400.6672ASE, 0.202742CPS, 0.593382RLD and 176.2207NCB] respectively, during the periods of the study.

Moreover, the result further shows that the sign of the coefficient of Real Gross Domestic Product (RGDP) the constant is negative [-103.009] it implies that if all other variables being held constant, the dependent variable will stand at 103 percent in the short run.

The sign borne by the short run parameter estimates of (ASE, CPS, RLD and NCB), are in not conformity with the economic a priori expectation while (M2, RLC and IR) are in conformity with the economic a priori expectation at the short run (i.e. (-1)) estimate.

Meanwhile, the long run estimate equation shows that the coefficients of Ratio of loan to deposit (RLD), liquidity ratio of commercial banks (LRC) interest rate (IR), and aggregate saving in the economy (ASE) at lag one, had a negative impact relationship on Real Gross Domestic Product (RGDP). This implies that increase in value and number of these four variables representing financial inclusion, will lead to decrease on economic growth (Real Gross Domestic Product (RGDP) at lag (-1) one of the long run equation in Nigeria under the period of the study by [0.067350D(RLD), -0.120053D(RLC), -0.270955D(ASE), and -0.519229D(IR)] respectively. Thus, the result also revealed that the coefficients of broad money supply (M2), credit to private sector (CPS) and number of commercial bank branches in the country (NCB) at lag one, had a positive impact relationship on Real Gross Domestic Product (RGDP) in Nigeria during the periods of the study. This implies that increase in value and number of these three variables will lead to increases on Real Gross Domestic Product (RGDP) at lag (-1) one of the long run equation by [0.484027D(M2), 0.476579D(CPS), and 0.105998D(NCB)] respectively.

The result further revealed that the sign of coefficient of the Error Correction Mechanism (ECM) was negative and statistically significant. On the other hand, the value of ECM [-6.20] being negative and statistically significant is an indication of power of adjustment to the equilibrium in the existing relationship between financial inclusion and economic growth (i.e. Real Gross Domestic Product (RGDP) in Nigeria. The result of the error correction transmission indicates that it will take the about 6 years for the model to adjust back to the equilibrium after a shock in the short run.

The result further disclosed as thus:

- One percent decrease in financial inclusion proxy by these variables; Ratio of loan to deposit (RLD) and liquidity ratio of commercial banks (LRC) at lag one (-1) will leads to 1% and 12% decrease on economic growth (i.e. Real Gross Domestic Product (RGDP) respectively at the long run in Nigeria during the periods of the study.
- One percent decrease in financial inclusion proxy by these variables; interest rate (IR), and aggregate saving in the economy (ASE) at lag one (-1) will leads to 27% and 51% decrease on economic growth (i.e. Real Gross Domestic Product (RGDP) respectively at the long run in Nigeria during the periods of the study.
- Whereas one percent increase in financial inclusion proxy by these variables; broad money supply (M2), credit to private sector (CPS) and number of commercial bank branches in the country (NCB) at lag one (-1) will leads to by 48%, 47%, and 10% respectively at the long run in Nigeria during the periods of the study.

## Financial Inclusion and Poverty Reduction Equation 2

**Table 2: Vector Error Correction Estimates**

**Date: 06/07/21 Time: 12:44**

Sample (adjusted): 1988 2019

Included observations: 32 after adjustments

Standard errors in ( ) & t-statistics in [ ]

Cointegrating Eq:	CointEq1
PCI(-1)	1.000000
DRA(-1)	0.066240 (0.00664) [ 9.97016]
LRA(-1)	-0.008911 (0.00065) [-13.6623]
AA(-1)	0.000204 (5.4E-05) [ 3.81616]
EMB(-1)	-1.774657 (0.18802) [-9.43878]

NCB(-1)	-0.799185 (0.12267) [-6.51472]					
C	-1246.722					
Error Correction:	D(PCI)	D(DRA)	D(LRA)	D(AA)	D(EMB)	D(NCB)
CointEq1	0.105443 (0.05510) [ 1.91353]	6.623184 (5.01891) [ 1.31965]	-47.32378 (50.7244) [-0.93296]	0.148581 (0.33659) [ 0.44143]	0.177238 (0.11664) [ 1.51959]	0.202717 (0.05585) [ 3.62965]
D(PCI(-1))	-0.138216 (0.28605) [-0.48319]	-66.37759 (26.0536) [-2.54774]	638.6483 (263.315) [ 2.42542]	-6173.054 (2598.92) [-2.37524]	-0.730033 (0.60546) [-1.20574]	-0.898745 (0.28992) [-3.09994]
D(PCI(-2))	0.291110 (0.22125) [ 1.31574]	-56.74193 (20.1518) [-2.81573]	121.0314 (203.667) [ 0.59426]	-5815.271 (2010.20) [-2.89288]	-0.153190 (0.46831) [-0.32711]	0.329537 (0.22425) [ 1.46952]
D(DRA(-1))	-0.002680 (0.00405) [-0.66186]	0.888470 (0.36884) [2.40881]	1.764601 (3.72776) [ 0.47337]	-73.65443 (36.7930) [-2.00186]	-0.010824 (0.00857) [-1.26278]	-0.020776 (0.00410) [-5.06183]
D(DRA(-2))	-0.000592 (0.00357) [-0.16566]	0.380637 (0.32531) [1.17007]	-3.045065 (3.28783) [-0.92616]	-78.99620 (32.4509) [-2.43433]	-0.004355 (0.00756) [-0.57609]	-0.006292 (0.00362) [-1.73817]
D(LRA(-1))	0.000396 (0.00043) [ 0.91774]	0.085608 (0.03932) [ 2.17721]	0.699479 (0.39739) [1.76017]	9.669709 (3.92227) [ 2.46533]	0.001366 (0.00091) [ 1.49478]	0.001207 (0.00044) [ 2.75858]
D(LRA(-2))	-0.000281 (0.00033) [-0.84604]	0.049886 (0.03022) [ 1.65074]	0.923772 (0.30543) [3.02450]	9.211613 (3.01459) [ 3.05567]	0.001144 (0.00070) [ 1.62869]	0.001288 (0.00034) [ 3.83073]
D(AA(-1))	-0.000108 (3.7E-05) [-2.90197]	0.007031 (0.00337) [ 2.08363]	-0.031638 (0.03410) [-0.92773]	1982.329 (500.650) [ 3.95951]	-5.31E-05 (7.8E-05) [-0.67735]	4.51E-06 (3.8E-05) [ 0.12023]
D(AA(-2))	-2.96E-05 (5.1E-05) [-0.58496]	-0.008584 (0.00461) [-1.86272]	0.169344 (0.04658) [ 3.63590]	0.590991 (0.45970) [1.28560]	-0.000128 (0.00011) [-1.19348]	-0.000147 (5.1E-05) [-2.87103]
D(EMB(-1))	-0.010171 (0.11515)	19.04824 (10.4882)	-63.48809 (106.001)	1973.164 (1046.23)	0.269658 (0.24374)	0.006808 (0.11671)



	[-0.08833]	[ 1.81615]	[-0.59894]	[ 1.88597]	[1.10634]	[ 0.05833]
D(EMB(-2))	-0.044983 (0.09399) [-0.47858]	8.543400 (8.56082) [ 0.99797]	-8.081316 (86.5214) [-0.09340]	638.1646 (853.967) [ 0.74729]	0.039551 (0.19895) [ 0.19880]	-0.328714 (0.09526) [-3.45054]
D(NCB(-1))	0.174932 (0.15953) [ 1.09654]	1.994532 (14.5302) [ 0.13727]	-264.7341 (146.852) [-1.80273]	-6.429665 (1449.43) [-0.00444]	0.004104 (0.33767) [ 0.01216]	0.176822 (0.16169) [ 1.09357]
D(NCB(-2))	-0.003577 (0.12918) [-0.02769]	23.42257 (11.7654) [ 1.99079]	-90.28300 (118.909) [-0.75926]	-471.5622 (1173.64) [-0.40180]	0.356209 (0.27342) [ 1.30279]	0.307171 (0.13093) [ 2.34615]
C	-173.1173 (92.0950) [-1.87977]	14483.28 (8388.08) [ 1.72665]	-60801.96 (84775.6) [-0.71721]	3369884. (836736.) [ 4.02742]	186.2419 (194.933) [ 0.95542]	316.4954 (93.3424) [ 3.39069]
R-squared	0.633746	0.763632	0.741975	0.944383	0.379300	0.805990
Adj. R-squared	0.369230	0.592921	0.555624	0.904215	-0.068984	0.665871
Sum sq. resids	526822.7	4.37E+09	4.46E+11	4.35E+13	2360271.	541190.1
S.E. equation	171.0787	15581.98	157481.9	1554348.	362.1135	173.3958
F-statistic	2.395865	4.473252	3.981590	23.51095	0.846115	5.752191
Log likelihood	-200.7482	-345.1241	-419.1463	-492.4103	-224.7429	-201.1787
Akaike AIC	13.42176	22.44525	27.07164	31.65065	14.92143	13.44867
Schwarz SC	14.06302	23.08651	27.71290	32.29191	15.56269	14.08993
Mean dependent	50.98731	6704.433	16581.83	1849157.	-21.53541	127.1875
S.D. dependent	215.4072	24422.12	236241.0	5022271.	350.2346	299.9725
Determinant resid covariance (dof adj.)		1.64E+44				
Determinant resid covariance		5.19E+42				
Log likelihood		-1846.126				
Akaike information criterion		121.0079				
Schwarz criterion		125.1303				

Source: *Researcher's Estimate from Eview 9.0 (2021)*

The above table 2 presented the variables; Per capita income (PCI), demand deposit from the rural areas (DRA), loan to rural areas (LRA), account owners of any type (AA), Electronic money banking/payment system (EMB) and number of commercial bank branches in the country (NCB). The table is divided into two; the upper side of the table represents the short run estimate equation without error correction value while the lower parts of the table represent the long run estimate equation with error correction estimation value.

The short run result of the Vector Error Correction Mechanism (VECM) regression presented in table 2 above, shows that coefficient of demand loan to rural areas (LRA), Electronic money

banking/payment system (EMB) and number of commercial bank branches in the country (NCB) at lag one had a negative impact relationship with Per capita income (PCI). This implies that decrease in value, charges and number of these financial inclusion variables will lead increase on Per capita income (PCI) in the short run in Nigeria by [-0.008911LRA, -1.774657EMB and -0.799185NCB ] at 5% level of significance respectively, during the periods of the study.

The short run coefficients of demand deposit from the rural areas (DRA) and account owners of any type (AA) at lag one were positive relationship with Per capita income (PCI). This implies that increase in volumes and number of these two financial inclusion variables will lead increase on Per capita income (PCI) at short run in Nigeria by [0.066240DRA and 0.000204AA] at 5% level of significance respectively, during the periods of the study.

Moreover, the result further shows that the sign of the coefficient of Per capita income (PCI) the constant is negative [-1246.722]. It implies that if all other variables being held constant, the dependent variable will stood at 12 percent in the short run.

The sign borne by the short run parameter estimates of [LRA, EMB and NCB], are not in conformity with the economic a priori expectation while [DRA and AA] are in conformity with the economic a priori expectation at the short run (i.e. (-1)) estimate.

Meanwhile, the long run estimate equation shows that the coefficients of deposit from the rural areas (DRA), loan to rural areas (LRA), account owners of any type (AA) Electronic money banking/payment system (EMB) and number of commercial bank branches in the country (NCB) had a positive impact relationship with Per capita income (PCI). This implies that increase in value, volumes and number of these variables representing financial inclusion, will lead to decrease on Per capita income (PCI). at lag (-1) one and lag (-2) two of the long run equation in Nigeria under the period of the study, by [0.888470d(DRA)-1), and 0.380637D(DRA)-2), 0.699479 D(LRA)-1) and 0.923772D(LRA)-2), 0.59099D(AA)-2) 0.269658D(EMB)-1) and 176822D(NCB)-1) and 0.307171D(NCB)-2)] respectively.

The result further revealed that the sign of coefficient of the Error Correction Mechanism (ECM) was negative and statistically significant. On the other hand, the value of ECM [173.1173] being negative and statistically significant is an indication of power of adjustment to the equilibrium in the existing relationship between financial inclusion and Per capita income (PCI) in Nigeria. The result of the error correction transmission indicates that it will take the about 17 years for the model to adjust back to the equilibrium after a shock in the short run.

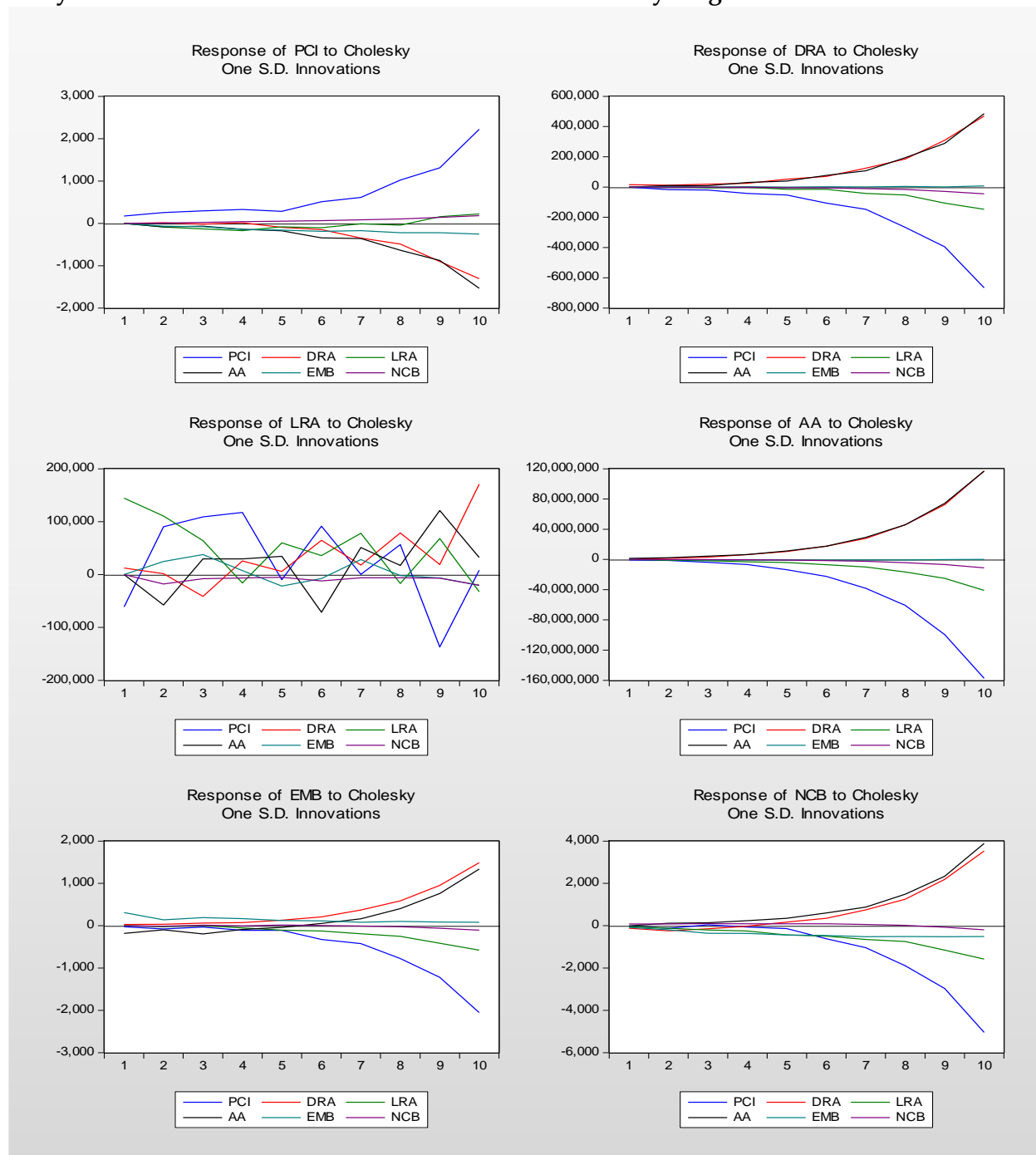
The result further disclosed as thus:

- 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 [88%(DRA)-1), 38%(DRA)-2), 69%(LRA)-1) and 92%(LRA)-2), 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 [14% (AA)-1) [59%(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) and tow (-2) will leads to by 17% and 30% increase on the Per capita income (PCI) respectively, in the long run in Nigeria during the periods of the study.

**Figure 1: Financial inclusion and Poverty Reduction in equation. Impulse response analysis in VEC models with near unit roots indentified by long-run restrictions.**



Source: *Researcher's Estimate from Eview 9.0 (2021).*

Figure 1 displays the impulse response functions of the log of first differences of the variables; [DRA, LRA, AA, EMB and NCB] to one standard deviation structural shocks. The combined graphs are based on the output of the unrestricted VEC with analytic response standard error over 10 periods and Cholesky degrees of freedom adjusted, which show the response to Cholesky one standard deviation innovation. Each graph as shown in plots in Figure 2 includes a point estimation of impulse response functions as well as lower and upper bounds for a 95% confidence interval. As usual, the solid lines depict the variable percent change in response to a standard deviation of one in the respective employed variable whereas the dotted lines represent the 95% error bands.

The graph DRA, LRA, AA, EMB, NCB and Per capita income (PCI) are consistent and positive which implies that the equations are stable since [DRA, LRA, AA, EMB, and NCB] response on Per capita income (PCI) slopes all decline to zero. This also means that shock and short-run values of the variables in question converge to the long-run equilibrium values. It shows also a persistent over the time horizons, since it lies within the bounds line of the 95% confidence interval. The [DRA, LRA, AA, EMB, and NCB] response graphs lines took similar direction. [DRA, LRA, AA, EMB, and NCB] all starts first by causing the deviation between the short-run equilibrium values of Per capita income (PCI) to rise, but after an unanticipated decreases in [DRA, LRA, AA, EMB, and NCB] declined to zero and remains within the bounds line of the 95% confidence interval.

From the results we have observed that impulse response functions we employed produce the time path of the dependent variables in the VEC, shocks from all the explanatory variables, proved that the system of equations is stable, while the shocks from these explanatory variables [DRA, LRA, AA, EMB, and NCB] declined to zero. We then conclude that the short-run values of the variables in question converge to the long-run equilibrium values.

### Financial Inclusion and Investment Growth Equation 3

**Table: 2 Vector Error Correction Estimates**

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Sample (adjusted): 1983 2019

Included observations: 37 after adjustments

Standard errors in ( ) & t-statistics in [ ]

Cointegrating Eq:	CointEq1
ASE(-1)	1.000000
IR(-1)	-17.89830 (31.8954) [-0.56116]
FR(-1)	- 37.38613 (11.9154) [-3.13763]
CPS(-1)	0.000698

	(9.2E-05)					
	[7.57064]					
AA(-1)	0.001426					
	(0.00023)					
	[6.12566]					
EXCR(-1)	-40.75962					
	(7.41456)					
	[-5.49724]					
C	-6338.568					
Error Correction:	D(ASE)	D(IR)	D(FR)	D(CPS)	D(AA)	D(EXCR)
CointEq1	-0.362983	0.000216	0.000928	326.3230	79.23880	-0.004296
	(0.11543)	(0.00069)	(0.00295)	(73.8161)	(250.673)	(0.00314)
	[-3.14452]	[ 0.31331]	[ 0.31469]	[ 4.42075]	[ 0.31610]	[-1.37008]
D(ASE(-1))	-0.153704	4.47E-05	0.002430	604.7821	5.094155	-0.004589
	(0.18106)	(0.00108)	(0.00462)	(115.781)	(393.182)	(0.00492)
	[-0.84892]	[ 0.04128]	[ 0.52552]	[ 5.22350]	[ 0.01296]	[-0.93314]
D(ASE(-2))	-0.115714	0.000268	0.002579	1136.917	12.75040	0.018481
	(0.22430)	(0.00134)	(0.00573)	(143.435)	(487.092)	(0.00609)
	[-0.51588]	[ 0.19958]	[ 0.45025]	[ 7.92635]	[ 0.02618]	[ 3.03323]
D(IR(-1))	-16.70289	0.417875	1.055229	-20099.87	-44994.97	-0.470154
	(34.6140)	(0.20701)	(0.88392)	(22134.6)	(75167.0)	(0.94021)
	[-0.48255]	[2.01859]	[ 1.19381]	[-0.90808]	[-0.59860]	[-0.50005]
D(IR(-2))	-13.84884	0.031064	1.797205	-32450.89	-5235.107	-0.184129
	(31.8007)	(0.19019)	(0.81208)	(20335.6)	(69057.7)	(0.86380)
	[-0.43549]	[ 0.16333]	[ 2.21310]	[-1.59577]	[-0.07581]	[-0.21316]
D(FR(-1))	11.40845	0.103659	-0.059974	-11443.83	-5432.896	0.060097
	(8.24253)	(0.04930)	(0.21048)	(5270.84)	(17899.3)	(0.22389)
	[ 1.38410]	[ 2.10282]	[ -0.28493]	[-2.17116]	[-0.30353]	[ 0.26842]
D(FR(-2))	12.02217	-0.044643	-0.535056	-9768.286	691.6014	-0.081497
	(8.33282)	(0.04984)	(0.21279)	(5328.57)	(18095.3)	(0.22634)
	[ 1.44275]	[-0.89580]	[-2.51447]	[-1.83319]	[ 0.03822]	[-0.36006]
D(CPS(-1))	3.19E-05	-5.35E-07	-1.51E-06	0.415402	-2.060985	-7.99E-06
	(0.00016)	(9.5E-07)	(4.0E-06)	(0.10136)	(0.34423)	(4.3E-06)
	[ 0.20127]	[-0.56436]	[-0.37222]	[ 4.09809]	[-5.98731]	[-1.85560]

D(CPS(-2))	-0.000460 (0.00030) [-1.55588]	4.79E-07 (1.8E-06) [ 0.27108]	4.44E-06 (7.5E-06) [ 0.58875]	0.244101 (0.18899) [ 1.29162]	2.270414 (0.64179) [ 3.53765]	-1.06E-05 (8.0E-06) [-1.31557]
D(AA(-1))	-0.000238 (0.00019) [-1.25681]	3.83E-07 (1.1E-06) [ 0.33808]	1.94E-06 (4.8E-06) [ 0.40072]	0.247347 (0.12125) [ 2.04005]	1.790359 (0.41174) [ 4.34828]	-6.30E-06 (5.2E-06) [-1.22297]
D(AA(-2))	-0.000405 (0.00012) [-3.49011]	6.87E-08 (6.9E-07) [ 0.09893]	-2.87E-06 (3.0E-06) [-0.96840]	0.063924 (0.07421) [ 0.86140]	0.322728 (0.25201) [ 1.28063]	5.35E-07 (3.2E-06) [ 0.16987]
D(EXCR(-1))	-4.180666 (5.32491) [-0.78512]	0.033607 (0.03185) [ 1.05528]	0.040078 (0.13598) [ 0.29474]	-544.5091 (3405.11) [-0.15991]	-1368.942 (11563.4) [-0.11839]	-0.268321 (0.14464) [-1.85511]
D(EXCR(-2))	8.337808 (5.41869) [ 1.53871]	-0.027128 (0.03241) [-0.83709]	0.001605 (0.13837) [ 0.01160]	15623.72 (3465.08) [ 4.50890]	28006.50 (11767.1) [ 2.38007]	-0.083019 (0.14719) [-0.56404]
C	-1325.274 (390.682) [-3.39221]	-0.244250 (2.33652) [-0.10454]	-4.811119 (9.97662) [-0.48224]	-1016967. (249829.) [-4.07066]	-545688.5 (848395.) [-0.64320]	16.78002 (10.6120) [ 1.58123]
R-squared	0.718368	0.484382	0.356739	0.861129	0.947459	0.647704
Adj. R-squared	0.559184	0.192946	-0.006844	0.782637	0.917762	0.448580
Sum sq. resids	8858563.	316.8505	5776.751	3.62E+12	4.18E+13	6536.005
S.E. equation	620.6085	3.711618	15.84812	396859.4	1347698.	16.85747
F-statistic	4.512825	1.662051	0.981176	10.97091	31.90411	3.252771
Log likelihood	-281.6413	-92.22970	-145.9383	-520.6849	-565.9200	-148.2228
Akaike AIC	15.98061	5.742146	8.645313	28.90189	31.34703	8.768797
Schwarz SC	16.59015	6.351682	9.254849	29.51142	31.95656	9.378334
Mean dependent	558.0506	0.202398	-0.118308	417259.2	1614251.	9.763551
S.D. dependent	934.7361	4.131539	15.79417	851224.9	4699549.	22.70132
Determinant resid covariance (dof adj.)		2.63E+34				
Determinant resid covariance		1.52E+33				
Log likelihood		-1728.472				
Akaike information criterion		98.29577				
Schwarz criterion		102.2142				

Source: *Researcher's Estimate from Eview 9.0 (2021)*

The above table 2 presented the variables; aggregate saving in the economy (ASE), interest rate (IR), inflation rate (FR) and exchange rate, credit to private sector (CPS), account owners of any type (AA) and exchange rate, exchange rate (EXCR). The table is divided into two; the

upper side of the table represents the short run estimate equation without error correction value while the lower parts of the table represent the long run estimate equation with error correction estimation value.

The short run result of the Vector Error Correction Mechanism (VECM) regression in table 2, shows that coefficient of interest rate (IR), inflation rate (FR) and exchange rate had a negative impact relationship with aggregate saving in the economy (ASE) which is equal to investment. This implies that decrease in value, rate of interest rate (IR), inflation rate (FR) and exchange rate, it will increase financial inclusion which in turn lead to increase on the aggregate saving in the economy (ASE) which is equal to investment in the Nigerian economy in the short run. Thus, the rate at by which financial inclusion impacts on aggregate saving in the economy (ASE) which is equal to investment through rate of interest rate (IR), inflation rate (FR) and exchange rate are; [- 37.38613FR, -17.89830IR and -40.75962EXCR] at 5% level of significance respectively, during the periods of the study.

The short run coefficients of credit to private sector (CPS) and account owners of any type (AA) were positive relationship with aggregate saving in the economy (ASE) which is equal to investment in the Nigerian economy. This implies that increase in volumes and number of these two financial inclusion variables will lead increase on aggregate saving in the economy (ASE) which is equal to investment in the Nigerian economy at short run by [ 0.000698CPS, and 0.001426AA] at 5% level of significance respectively, during the periods of the study.

Moreover, the result further shows that the sign of the coefficient of aggregate saving in the economy (ASE) which is equal to investment in the Nigerian economy the constant is negative [6338.568]. It implies that if all other variables being held constant, the dependent variable will stand at 63 percent in the short run. The sign borne by the short run parameter estimates of [IR, FR, EXCR, AA and CPS], are all in conformity with the economic a priori expectation at the short run (i.e. (-1)) estimate.

Meanwhile, the long run estimate equation shows that the coefficients of interest rate (IR), account owners of any type (AA) and credit to private sector (CPS) at their lag 1 and 2, had a positive impact relationship with aggregate saving in the economy (ASE) which is equal to investment in the Nigerian economy. This implies that increase in value, volumes and number of these variables representing financial inclusion, will lead to increase on aggregate saving in the economy (ASE) which is equal to investment in the Nigerian economy in their long run equation. Thus, the rate at by which financial inclusion impacts on aggregate saving in the economy (ASE) which is equal to investment through interest rate (IR), account owners of any type (AA) and credit to private sector (CPS) are; [0.417875D(IR)(-1), 0.031064D(IR)-2), 0.415402D(CPS)-1), 0.244101D(CPS)-2), 1.790359D(AA)-1), 0.322728D(AA)-2)] respectively.

Whereas inflation rate (FR) and exchange rate in their relationship with aggregate saving in the economy (ASE) which is equal to investment in the Nigerian economy shows negative impact. This means the a decrease in inflation rate (FR) and exchange rate will increase financial inclusion which in turn will impacts increase on aggregate saving (ASE) which is equal to investment in the Nigerian economy. their values of the impacts at their both lag 1

and 2 are; [0.059974D(FR)-1), -0.535056D(FR)-2) and -0.268321D(EXCR)-1), -0.083019D(EXCR)-2)] during the period of the study 1980 to 2019.

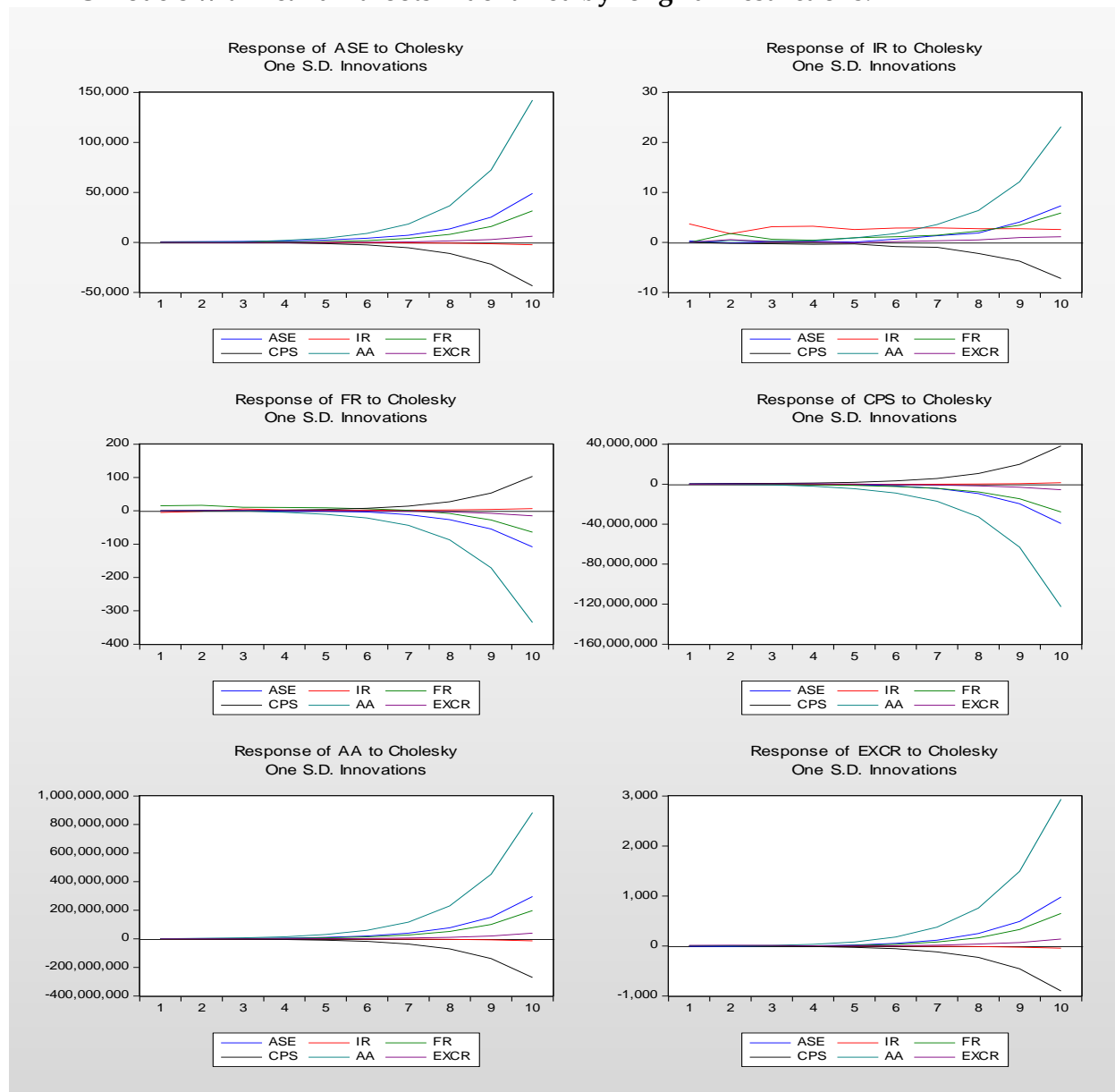
The result further revealed that the sign of coefficient of the Error Correction Mechanism (ECM) was negative and statistically significant. On the other hand, the value of ECM [1325.274] being negative and statistically significant is an indication of power of adjustment to the equilibrium in the existing relationship between financial inclusion and aggregate saving (ASE) which is equal to investment in the Nigerian economy. The result of the error correction transmission indicates that it will take the about 13 years for the model to adjust back to the equilibrium after a shock in the short run.

The result further disclosed as thus: 41%, 24%, and 2%, 32%

- One percent increases in the financial inclusion variables such as account owners of any type (AA) and credit to private sector (CPS) at lag (-1) and (-2), will leads to [41%(CPS)-1), 42%(CPS)-2) and 2%(AA)-1), 32%(AA)-2) increases on aggregate saving (ASE) which is equal to investment in the Nigerian economy respectively in their long run, during the periods of the study.
- One percent increases in the interest rate (IR) at lag one (-1) and (-2) will leads to 41(IR)-1), and 31(IR)-2) increase on the aggregate saving (ASE) which is equal to investment in the Nigerian economy respectively, in the long run during the periods of the study.
- Whereas one percent decrease in the inflation rate (FR) and exchange rate at lag (-1) and (-2) will leads to 5%(FR)-1), 53%(FR)-2) and 26%(EXCR)-1), 8%(EXCR)-2) increase on the aggregate saving (ASE) which is equal to investment in the Nigerian economy respectively, in the long run during the periods of the study.



**Figure 2: Financial Inclusion and Investment Growth Equation Impulse response analysis in VEC models with near unit roots indentified by long-run restrictions.**



Source: Researcher's Estimate from Eview -9.0 (2021).

Figure 2 displays the impulse response functions of the log of first differences of the variables; [IR, FR, AA, CPS and EXCR] to one standard deviation structural shocks. The combined graphs are based on the output of the unrestricted VEC with analytic response standard error over 10 periods and Cholesky degrees of freedom adjusted, which show the response to Chelosky one standard deviation innovation. Each graph as shown in plots in Figure 3 includes a point estimation of impulse response functions as well as lower and upper bounds for a 95% confidence interval. As usual, the solid lines depict the variable percent change in response to a standard deviation of one in the respective employed variable whereas the dotted lines represent the 95% error bands.

The graph IR, FR, AA, CPS and EXCR and aggregate saving (ASE) which is equal to investment in the Nigerian are consistent and positive which implies that the equations are stable since [IR, FR, AA, CPS and EXCR] response on aggregate saving (ASE) which is equal to investment in the Nigerian shows all decline to zero. This also means that shock and short-run values of the variables in question converge to the long-run equilibrium values. It shows also a persistence over the time horizons, since it lies within the bounds line of the 95% confidence interval. The [IR, FR, AA, CPS and EXCR] response graphs lines took similar direction. [IR, FR, AA, CPS and EXCR] all starts first by causing the deviation between the short-run equilibrium values of aggregate saving (ASE) which is equal to investment in the Nigeria to rise, but after an unanticipated decrease in [IR, FR, AA, CPS and EXCR] declined to zero and remains within the bounds line of the 95% confidence interval.

From the results we have observed that impulse response functions we employed produce the time path of the dependent variables in the VEC, shocks from all the explanatory variables, proved that the system of equations is stable, while the shocks from these explanatory variables [IR, FR, AA, CPS and EXCR] declined to zero. We then conclude that the short-run values of the variables in question converge to the long-run equilibrium values.

### **Conclusion**

Given the plethora of financial inclusion plans central Bank of Nigeria (CBN) put in place at different time and by different regimes in Nigeria to boost the economy and promote economic growth and welfare, this paper sought to examine the impact of Financial Inclusion on the Nigerian Economic growth 1980 to 2019. 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, inflation rate, exchange rate and NCB is number of commercial bank branches in the country, loan to rural areas and number of account owners of any type.

We analyzed the state of financial inclusion in Nigeria based on the following objectives; examine evaluate financial inclusion significant impact on poverty reduction in Nigeria, ascertain the significant positive impact of financial inclusion on savings and investment growth in Nigerian economy. Consequently, based on the results obtained and interpreted in chapter four, the null hypotheses that stated, "Financial inclusion has no significant impact on poverty reduction in Nigeria" and 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 is 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 88% and 92% significantly contributed to economic growth. This implies that borrowing and savings through outside financial institutions (using family, friends or saving clubs) have reduce its influences to people in the Nigerian economy.

From the foregoing, therefore, we conclude that level of financial inclusion in Nigeria is high which significant 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**

The findings have some policy implications below:

- 1 Due to Nigeria's geographical and cultural diversity, the financial inclusion agenda will differ. This can be seen in the implementation of the cashless policy of the Central Bank, which started with major commercial cities before it was spread to a few other states using different parameters. To make banking services more accessible, banks may consider having their forms in some locations in the officially recognized local language of the people in different regions because financial inclusion is not about ability to speak English language but access to and use of banking services.
- 2 There is need for stable electricity supply to drive the infrastructural facilities provided by banks, telecommunication companies and other related service providers such that fluctuation in internet and other network communication is reduced to the barest minimum if not fully eliminated, this also include Electronic money banking/payment system such as ATMs and point of sales terminals. This will ensure stability and wider network coverage of these services as more ATM, POS, mobile money etc are deployed to areas not yet covered.
- 3 The Nigeria Communications Commissions should revisit call rates and ensure that communication companies improve on quality of service delivery. This is important if patronage of mobile money is to be increased.
- 4 Increase in public enlightenment campaign is required to low income earners, emphasizing the benefits of financial inclusion to everybody using different languages, rather than just the middle class and the elite as it is currently done. This should not be left for the banks alone. This is a collective responsibility of the government, CBN and banks to develop a robust translation unit in their public relations department whose task will be that of making CBN policies on financial inclusion available in the major indigenous languages.

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