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Nexus between Financial Exclusion and Sustainable Development in Nigeria: An ARDL Approach

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Abstract

Inadequacy in the provision of financial services is deterring meaningful development in Nigeria. Therefore, the relationship between financial exclusion and sustainable development in Nigeria is examined. The study made use of the Autoregressive Distributed Lag (ARDL) method to analyze data obtained from the Central Bank of Nigeria statistical bulletin and World Bank financial indicators between 1981 and 2022. The results show the existence of long and short-run relationships among the financial inclusion variables and sustainable development. Also, the ECM of -0.408 means that 40.8 of the previous period's deviation from the long-term equilibrium is corrected within the current period. In conclusion, the study contributes to existing works by providing a broad theoretical and methodological basis that links financial exclusion and sustainable development in Nigeria, using robust econometric techniques. Therefore, the policy implication of our results informs the need for a significant shift to be made by the banks to embark on a strategy that promotes broad-based patronage of traditional banking services and account ownership's upsurge. The paper recommended that, given the increase in growth rate of unbanked and high cash-based economy experienced in Nigeria, designing a formal financial infrastructure is paramount, which has the prospect to minimize heavy cash transactions in Nigeria.

Keywords: *Cash-Based Economy, Developing Countries, Financial Services, Financial Exclusion, and Sustainable Development*

JEL Classification: *F10 and F13*

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Introduction

Financial exclusion policies have attracted global attention, but the contention is the greatest challenge stunting the pace of development which remains the inability to meet the desires, most especially financing of the growing population in a just and equitable manner within the organic capacity of the developing economies. That is why financial exclusion reduction has been a key issue of the development agenda, exemplified in the Sustainable Development Goals (SDGs) 2030 (World Bank, 2025). The global effort to reduce financial exclusion to the barest minimum level is due to its direct and indirect channels in reducing extreme poverty, employment generation that boosts sustainable economic growth, and achieving rapid development (Demirguc-Kunt and Klapper, 2012; Demirguc-Kunt and Singer, 2017; World Bank, 2014; Anthony, Hadrat, George, Kwasi, and Samuel, 2021).

Barboni, Cassar, and Demount (2017), cited in Pomerai and Mangwende (2024), emphasized further that financial exclusion is a dimension of social exclusion, and both are strongly linked to poverty and its associated indicators, such as unemployment and inequality (Pinilla and S´aez, 2021). This is corroborated by Murphy (2021) that the lack of bank account ownership caused people with low or no income to benefit less from the government stimulus checks program than they would have if they had maintained accounts in the USA.

Globally, about 1.4 billion (24%) adults do not have access to traditional banking services (Demirgüç-Kunt & Klapper, 2012), and further corroborated by the Global Findex 2025 report that over 1.3 billion adults are financially excluded. This varies greatly by region, with developing nations experiencing much higher exclusion rates (e.g., 40-50% in MENA/Africa) compared to developed countries (Klapper, Singer, Starita, and Norris, 2025, and World Bank, 2025).

In many developing countries, there is an increase in financial exclusion as a result of an underdeveloped financial system and low level of financial deepening that invariably retarding their development (Chen, Li, Wang, & Zhang, 2021; Nwosu, Itodo, & Ogbonnaya-Orji, 2021). For instance, Klapper, Singer, Starita, and Norris (2025) argued that the prevailing low depth of financial deepening in emerging economies has increased the percentage of unbanked, which is also expanding financial exclusion of the underserved. The gap in account ownership among underserved groups in developing countries requires immediate attention so as to ensure easy accessibility to financial services by their citizens for effective, sustainable development to take place (UNCED, 1992b; Klapper, Singer, Starita, and Norris, 2025). This is corroborated by Demirguc-Kunt, Klapper, Singer, and Van Oudheusden (2015) that in 2014, over 2 billion (38%) of adults were financially excluded. The slight improvements were 37 percent in 2017 and 27 percent in 2022, driven by services like digital banking (mobile money) (Klapper, Singer, Starita, and Norris, 2025). This calls for the clamor to develop core rural and urban financial strategies that can stimulate a sustainable financial system and economic development (Anagnostopoulos, 2018; Ding, Chong, Kuo Chuen, and Cheng, 2018).

Cognizant of the significance of SDGs, Ostry, Berg, and Tsangarides (2014) argued that the long-term sustainability of growth depends on its being fair and supported by easy accessibility to financial services (Berg and Ostry 2011; Berg, Ostry, and Zettelmeyer,

2012). This makes reduction of financial exclusion a key driver for viable, stable development as exemplified in the SDGs, 2030. Unfortunately, in emerging economies, people are financially excluded due to an underdeveloped financial system (low in-depth financial deepening), which poses a hindrance to the prosperity, improvement of socio-economic wellbeing, and advancement of human self-esteem (Iniodu and Ukpak, 1996; Chen, Li, and Adegboyega, 2019; Wang and Zhang, 2021).

HM Treasury (2004) and Santiago, Rafael and Francisco (2007) argued further that in emerging economies low patronage of financial services is due to high bank charges (Chiweshe, Chaora and Cross, 2023) and lack of collateral (FAO, 2023) but broader accessibility to such services can promote financial and sustainable development (Ajide, 2014 and Ajisafe and Ajide, 2017). This informs the argument of Zhou, Arner, and Buckley (2018) that for sustainable development to be maintained, it becomes obvious to reduce high levels of financial exclusion and develop sustainable inclusive finance (Gomber, Kauffman, Parker, and Weber 2018a; Salampasis and Mention, 2018).

Despite various efficient and effective financial systems developed in Nigeria, the majority of the populace still engage in heavy cash transactions, with a large amount of cash in circulation increased persistently (Adeyeye and Ajinaja, 2014). An increase in financial exclusion occurs due to large cash holdings that bypass banks, meaning less money is deposited, reducing loanable funds for productive investments and hindering economic growth. Okeke, Mbonu, and Ndubuisi (2018) argued further that in the period preceding financial inclusion initiatives, the Nigerian economy was characterized by a heavy reliance on cash transactions, as much of the money circulated actually outside the formal banking system. According to money and credit statistics from the Central Bank of Nigeria (CBN), currency in circulation increased from N4.952tn in September to N5.058tn in October 2025, with N4.646tn held outside banks. This indicates 91.9% of physical cash is outside the formal banking system, leaving about 8.1% within banks, reflecting a trend of cash moving out of formal channels. Also, it reflects a thriving informal system that promotes financial exclusion.

Yaqub, Bello, Adenuga, and Ogundeji (2013) argued further that many emerging economies, including Nigeria, rely heavily on cash transactions; however, the cost of managing this physical currency within Nigeria's financial system is both high and increasing. Concerning this, Nigeria remains a significant outlier, with approximately 36.8% of its population (over 30 million people) remaining financially underserved as of 2018 (EFInA, 2020; Muhammad and Ngah, 2021; and Akpene, Amidu, Coffie, and Abor, 2022). Also, among the Sub-Saharan African countries, Nigeria has the largest percentage of unbanked (EFInA, 2020), and 43.6 million out of 99.6 million adults have a bank verification number (BVN) as of 2020 (World Population Review, 2021). In addition, Adegboyega (2017) observed that the rising rate of adult financial exclusion is more pronounced in rural areas than in urban areas in Nigeria. For instance, for convenience majority of farmers prefer to save their money under mattresses at home (Adegboyega, 2017). This was degenerated by shallow financial development in Nigeria (Adegboyega, 2019). Therefore, Nigeria’s slow economic growth can be linked to the existing financial exclusion gap.

Furthermore, Sanusi (2011) explained that in Nigeria, the financial exclusion of the poorest has been on the increase due to poor banking sector reform, while Mbutor and

Uba (2013) also emphasized that the establishment of bank branches is based on the profitability of the location rather than making financial services accessible to the financially excluded. All this made the unbanked to patronize informal financial agents that charge exploitive costs. (Sinclair, 2001; Onaolapo, 2015; Neaime and Gaysset, 2018 & Osakwe, 2020). Even the high growth rate in Nigeria is not inclusive, and it has been attributed partly to a high level of financial exclusion, which itself is linked to financial illiteracy among the financially excluded groups. So, financial exclusion has become both a social and financial phenomenon as a result of abject poverty and illiteracy (Anyanwu and Anyanwu, 2017 & Nkwede, Nkwede, and Nkwagu, 2021).

In addressing this issue, the CBN made it mandatory in its 'Maya Declaration' to decrease those excluded to 20% by the year 2020, but this could not be achieved (Osakwe, 2020). In addition, the cashless policy was made in 2011 by CBN in curtailing negative consequences of a cash-based economy, introducing digital payment services, and removing the obstacles subjecting Nigerians to exclusion bondage (Taiwo, Ayo, Afieroho, and Agwu, 2016, and CBN, 2018).

Nevertheless, the goal was not met by 2020 (Osakwe, 2020), as more than 38.9 percent of people were financially excluded, and by 2024, slightly reduced to 36 percent, which indicates that 28.8 million adults remain financially excluded in Nigeria (EFInA, 2024). The report also showed that the facilities in the provision of financial services are inadequate and require immediate attention in their improvement and effectiveness. Though digital banking outlets are making efforts in reaching and tapping into the underserved and unserved markets, their efforts have not yielded many results (EFInA, 2024). Other factors attributed by many scholars that contributed to the large number of financially excluded and underserved in the country are a high unemployment rate (Anyanwu and Anyanwu, 2017), lack of proper identification to open an account (Choudhury and Bagchi, 2016; Daneji, Hamidu, Kakanda & Fudamu, 2019), low income (Oyelami, Saibu and Adekunle, 2017 & Daneji, Hamidu, Kakanda and Fudamu, 2019), amongst others.

In light of the above and considering the large number of unbanked in Nigeria, it is pertinent to examine whether financial exclusion in Nigeria is a problem that needs addressing by policymakers. Also, does the existence of unbanked individuals justify intervention?

In addition, there have been conflicting findings from prior studies that examined the relationship between financial exclusion and economic growth in Nigeria, with growing arguments in both the theoretical and empirical perspectives showing diverse views offered by different authors. From the facts available to us, no previous study examined this aspect of the sustainable development nexus.

Many scholars have conducted research using various financial exclusion measurements, and many of them are restricted in scope to primary data. For instance, Achugamonu, Adetiloye, Adegbite, Babajide, and Akintola (2020) using GMM found that the reduction of financial exclusion significantly boosts growth in Nigeria. Also, Muhammad, Alhaj Dauda, and Mamman (2018) research using the survey method revealed that the faith doctrine in the banking system led to a large number of unbanked in the northeast of Nigeria. In addition, Daneji, Hamidu, Kakanda, and Fudamu (2019) using PLS-SEM approach; their results showed that age, usage of financial services, low

income, and literacy level caused financial exclusion in Nigeria. In the same vein, Omojolabi, Okudo, and Shojobi (2019), using descriptive analysis techniques, found that the low literacy level of women deterred them from accessing digital banking in Nigeria.

Furthermore, Osakwe's (2020) findings using comparative analysis revealed that Nigeria was unable to meet its target of reducing the percentage of adults without bank accounts to 20% as of 2020. In the same vein, Nkwede, Nkwede, and Nkwagu (2021) study on comparative analysis that Nigerian adults have lower patronage of financial services than South African adults. In order to reconcile the existing literature and show the real position of their linkage, the mixed and inconclusive findings call for additional research. Therefore, this study deviates from them and fills this gap by providing an in-depth investigation of the intricate association of financial exclusion to sustainable development in Nigeria. This also serves as our contribution to knowledge.

Also, in this study, we conducted a literature assessment on financial exclusion and sustainable development based on the current conjectural and empirical backgrounds. This study examined the broader linkage of financial exclusion to sustainable development beyond the 2030 SDGs goals of poverty and inequality (Tao et al., 2023, & Demir et al., 2022), and using the unemployment rate variable, which is the composite of the two goals. In addition, we included a variable, such as currency outside the banking system (COB signifies high financial exclusion), not examined in previous studies as a method to overcome financial exclusion obstacles. Bridging this gap moves outside combined relationships, evolving the channels through which financial exclusion affects sustainable development and contributing to the ongoing discourse.

In addition, methodological errors such as omitted variable bias and inefficiency when estimating long-run associations (Greene, 2018) that occurred using some statistical techniques were properly addressed in this study. By resolving the problems of endogeneity and serial correlation, we used a robust ARDL technique that offers strong substitutes and produces estimates of both short and long-term relationships, which are more reliable.

The rest of the paper includes a literature review in section 2, methodology is in section 3, while results analysis is in section 4, and section 5 contains the conclusion and recommendations.

Literature Review

Theoretical Review

Basically, the majority of polices targeted to reduce financial exclusion are mainly focused on a wider scope of exclusions, such as social and economic exclusion, which hinge on value theory and finance growth theories that form the conjectural bases of this work. The finance growth theory's assumption of Schumpeter (1911), Goldsmith (1969), and King and Levine (1993) emphasizes that finance, which serves as a vital element of growth, must be inclusive and encompasses effective participation of the poor. The value theory satisfactorily addresses the bearings of sustainable development on pertinent issues of justice, fairness, and equity, which are absent in developing countries, Nigeria in particular.

From the conjectures of these two theories, one can presume that some of the Sustainable Development Goals (SDGs, 2030) to achieve the reduction of financial exclusion are embedded. Finance growth theory emphatically postulates that financial exclusion is a serious issue accountable for continuing income disparity and lesser growth, which formed the basis of sustainable development principles.

Reasonably, cheap and convenient access to finance can promote growth, decrease income inequalities and poverty; thus, providing prospects for less privileged and financially underserved individuals. Sarma (2012) argued further that this will not only incorporate them into the mainstream, but they will vigorously contribute to the growth process and then protect them against unforeseen circumstances. Thereby, the poorer sections of society's sustainability are centered on reconciling collective justice with eco-friendly and economic expectations to achieve incessant and enhanced wellbeing.

This aspect of continuity in maintaining well-being is only attainable through a monitored self-regulatory financial system that creates a productive environment for development. This strategic shift is what Ekardt (1986) believed could lead to financial and social benefits in the long run because contemporary social order is frequently reliant on post-development (Fücks, 2013; Herrmann-Pillath, 2015; Ekardt, 2016). Such an area of society that has tended towards growth is the banking system, which provides financial services to people at affordable prices and in a sustainable manner to enable them engage in economic activities that promote their well-being.

Consequently, for the efficiency of providing financial services effectively, banks should be self-regulated. This formed the basis of the argument of Makinnon (1973) and Shaw (1973) on fiscal domination, with the contention that the interest rate repression retards growth and imposes extra cost on transaction costs, which hinders financial accessibility. Therefore, financial liberalization with little government control and utilizing regulatory extension to deliver services to the excluded through private sector participation can make the desired growth of the developing nations achievable. This requires a free flow of information within the financial market.

This lends credence to an aspect of institutional theory of Ozili (2020) that assumes that the existence of incomplete information about how to access formal financial services denied the people opportunities to patronize banks. In this aspect, it is the only efficient and sustainable financial system development approach that can really correct the deficiencies of the financial market, without triggering negative inducement effects. Demirgüç-Kunt and Levine's (2007) argument is that a reduction in financial market imperfections to expand individual opportunities creates positive, not negative, incentive effects.

In order to mitigate the problems of financial exclusion, certain incentives need to be provided by the financial institutions to the unbanked. In line with this, Schumpeter's (1911) argument for the supply-leading hypothesis is that meeting the financial desires of people lawfully by financial institutions can improve the economic enablement of the individuals and, in sequence, strengthen financial expansion. Goldsmith (1969), Calderon and Liu (2003), and Balago (2014) elaborated more on this and found evidence for this relationship in developing countries, Nigeria, in particular.

Whereas, the demand side hypothesis is allied with the Keynesian opinion of financial expansion, which is also in line with Gurley and Shaw (1967), Omotor (2007),

and Ndlovu (2013) argue that full participation of people in economic undertakings engendering jobs creation and wages, thereby arises request for several types of financial services modify for their desires. Apergis and Levine's (2007) neutral hypothesis assertion is that the association between financial development and economic growth does not exist, a characteristic of developing countries, such as Nigeria, in particular.

These opinions are in line with contemporary advanced philosophies that emphasize placing financial segment transformations that reduce exclusion at the center of the development agenda is critical (Črnjar and Črnjar, 2009). Pelenc, Ballet, and Dedeurwaerdere (2015) argued further that the critical aim of sustainable expansion is to enhance social competencies and well-being because each replacement of financial resources at the current phase has magnitudes in the looming.

Therefore, in this direction, financial services have to be provided and affordable when and where required, and services have to be tailored to the precise requirements of the people. Overall, in Nigeria, a more developed financial system that promotes sustainable advancement for the well-being of the future is paramount.

Conceptual Review

Financial exclusion denotes a course at which individuals cannot access or use financial services and products in the conventional market that are applicable to their needs, which prevents them from living a moderate lifestyle. Therefore, various aspects of exclusions exist (Achugamu et al, 2020). Kempson and Whyley (1999) describe financial exclusion as individuals who cannot patronize traditional banking services. In another perspective, financial exclusion is the inability to obtain suitable banking services due to some fundamental factors (Kempson, 2006 & Bayero, 2015). Aduda and Kalunda (2015) described financial exclusion as a situation of depriving people within a community from patronizing banking services. World Bank (2014) and Shretha and Nursamsu, (2020) define voluntary financial exclusion as a situation when individuals decide not to patronize banking because of faith doctrine or the services are not essential. While involuntary financial exclusion occurs as a result of low income and status of individuals, or discrimination, market weakness, and deficiencies. In his own view, Adegboyega (forthcoming) classified voluntarily financially excluded individuals as individuals who transact in cash personally or for business without positive outlay ventures. While involuntarily excluded individuals are considered not commercially viable as banks' customers, in terms of suitability obstacles (e.g., lack of documentation). Du et al. (2022) described financial exclusion as the inability of the weak segment of the community to patronize minimum banking services at affordable prices.

Basically, sustainable development is defined as the point at which a society formulates and achieves a certain level of economic well-being, which can accomplish the fulfillment of the main requirements of both the current and incoming generations. In his own view, Lele (1991) described sustainable advancement as the procedure and set of aims recurring constantly. Also, Vander-Merwe and Van-der-Merwe (1999) described sustainable advancement as the plan that alters the economic advancement procedure that guarantees the elementary valuable lifetime, guarding valued environments and societies concurrently. Beck and Wilms (2004) perceived it as a dominant international paradox of

the present-day Western philosophy and existence. In addition, Vare and Scott (2007) described sustainable advancement as a procedural change, where capital is raised, resolution in deciding the course of investments is made, the expansion of expertise is absorbed, and the activity of various organizations is coordinated; the potential for realizing social wants and requirements is also augmented.

Furthermore, Sterling (2010) defined sustainable advancement as the process that puts the economy and the environment on the same pace of advancement that permits the enduring sustainable advancement of humanity. In another perspective, Marin, Dorobanțu, Codreanu, and Mihaela (2012) observed that sustainable development allows for an infinite time interface amongst community, environments, and others in the system, devoid of denying them vital resources. More so, Duran, Gogan, Artene, and Duran (2015) described sustainable advancement as an expansion that safeguards the environment, because sustainable environments enable sustainable advancement.

In a nutshell, sustainable advancement is the expansion that meets the desires of the current without conceding the capability of forthcoming generations to fulfil their desires (Brundtland, Khalid, Agnelli, Al-Athel and Chidzero, 1987). In line with this study, sustainable development is described as the process that offers easy access to financial services to all presently without compromising the capability of incoming generations to enjoy the same financial services (Adegboyega, Forthcoming).

Empirical Review

Most of the research works examined the association between financial exclusion and economic growth, and with mixed results. Makoni (2014) found that rural communities' patronage of banking services increased, even though there was a limited number of bank branches. Also, Nwankwo and Nwankwo's (2014) findings revealed that the financial exclusion of rural dwellers deters growth in Nigeria. In his own study, Bagchi's (2016) results showed that financial exclusion occurred due to work status, lack of savings habits by the head of the family, low literacy, and location in India.

As for Coffinet and Jadeaus' (2017) study, which found that the majority of people could not access banking services due to old age, low income, unemployment, and low education. In addition, Muhammad, Alhaj Dauda, and Mamman (2018) found that a high rate of financial exclusion occurred in the northeast of Nigeria due to their faith doctrine. Daneji, Hamidu, Kakanda, and Fudamu (2019) using PLS-SEM approach; their results showed that age, usage of financial services, low income, and qualification level increase financial exclusion.

Omojolabi, Okudo, and Shojobi (2019) used descriptive analysis techniques on primary data; their results showed that women were unable to access traditional banking services due to low literacy level, which deters them from accessing internet banking. Rashid's (2019) findings revealed that the economically marginalized people in Guwahati, India, were financially excluded due to low literacy level, lack of documentation, and low interest rate for savings, among others. Osakwe's (2020) findings using comparative analysis revealed that Nigeria was unable to meet its target of reducing the percentage of adults without a bank account to 20% as of 2020.

Achugamonu, Adetiloye, Adegbite, Babajide, and Akintola's (2020) study revealed a positive and long-term association between financial exclusion and growth, but the short-run exhibits an insignificant but positive association between financial exclusion and growth. Nkwede, Nkwede, and Nkwagu (2021) results showed that more South African adults patronize banking services than their Nigerian counterparts. Attoukou and Nchare (2022) showed that lack of documentation, high cost of financial services, long distance, and lack of trust caused financial exclusion. Muhammad, Ngah, and Obad's (2022) results revealed a positive association between susceptible group philosophy (faith and poverty drive) and financial exclusion in Nigeria.

Alonso et al. (2023) found that in the procedure of relocation and financial exclusion reduction, there is inconsistency across Aragonese municipalities in Spain. Pomerai and Mangwende's (2024) findings revealed that the absence of Know Your Customer (KYC) requests required by banks to open bank accounts and access loans for income-creating schemes by women in Zimbabwe made them unbanked. Young's (2025) findings indicate that income levels and the intensity of using mainstream banking services are the primary drivers of financial exclusion in America.

Based on the existing literature in this area of research, there is no research work that provided a direct pragmatic indication of the association of financial exclusion and sustainable development in Nigeria. Also, our study examined whether those excluded used informal sources and cash favors as alternates or supplements for conventional financial intermediaries by using the percentage of currency outside the banking sector to the broad money supply (COBS_M2) variable in our analysis. This study reinforces the dynamic relationship between financial exclusion and sustainable development in Nigeria. So, filling these gaps are parts of our contribution to existing knowledge.

Table 1. Justification for the Selection of Variables

Variables	Justification
HDI	In this study, sustainable development is proxied by the human development index (HDI) because it measures average national achievement in health, education, and income, focusing on well-being; but Green Growth aims for economic expansion with reduced environmental impact (decoupling); while Inclusive Growth ensures development benefits are shared, tackling inequality and poverty by creating opportunities for all.
COBS_M2 – financial openness	It signifies high financial exclusion, as people hoard cash due to distrust, poor banking services, or illicit activities, making them vulnerable and hindering economic growth. High currency outside banks (COB) increases financial exclusion: More cash held at home means less use of formal banking services.
FD	Financial deepening means developing a more robust, liquid, and efficient financial system with broader access to diverse services for all societal levels. Low-level financial deepening reflects an underdeveloped financial system and signifies high financial exclusion
UNEMPR	Unemployment's negative effects are profound, causing financial hardship, poverty, and reduced economic growth. Reduce demands for financial services that increase financial exclusion.
LR	Bank lending rate's negative consequences of financial exclusion include a higher interest rate on loans. Low financial exclusion can be achieved through reasonable deposit money banks' lending rates.
INTR	The savings rate is determined by the CBN's monetary policy. Low savings rate reduces banks' patronage, which increases financial exclusion.

Source: Author's Collation (2024)

Method

In this study, we examined the nexus of financial exclusion and sustainable development in Nigeria using the ARDL method to analyze data obtained from the Central Bank of Nigeria statistical bulletin and World Bank financial indicators between 1981 and 2022. Sustainable development was proxied by the human development index (HDI). The reason for using HDI is that it is the most accepted development indicator, which incorporates different classes of socio-ethnic, religious, financial, environmental, and civil development of particular areas (Willis, 2005; United Nations Development Programme, 2019; World Bank, 2019). Also, it is based on the definition of voluntary financial exclusion, which is a situation when individuals decide not to patronize banking because the services are not essential for them or of ethnic/spiritual motives (World Bank, 2014 & Shretha and Nursamsu, 2020). While financial exclusion is proxy as percentage of currency outside the banking sector to the broad money supply (COBS_M2), financial deepening (FD), unemployment rate (UNEMPR), lending rate (LR), and interest rate (INTR).

Model Specification

The model of our study is based on the Solow-growth model (1956), which centers on the model of Harrod –Domar (1946) of the wealth aggregate in the form of:

$$\check{K} = sY - dK \quad (1)$$

where $\check{K}$ = variation in wealth stock, sY = gross investment, dK= reduction in the course of production progression. With scientific operation, Solow derives the wealth increase equation in terms of per worker, that is, $SY- (n+d) k$. This implies that the variation in wealth per labor is a function of investment per labor, reduction per labor, and population growth.

Also, the endogenous growth model of Bencivenga and Smith (1991) & King and Levine (1993) also assumes that financial intermediaries are the main channels of wealth formation. They also provide the economy with several kinds of financial services and decrease investment possibilities (liquidity and efficiency risks). These financial services increase the efficacy and capacity of investment and output progression, which are the conduits of transmission from financial intermediation to economic progression. Therefore, the study presumed the economy where affluence hinges on human wealth, physical wealth, and technical evolution and financial intermediation, so the aggregate production function can be written by including financial intermediation in the form of:

$$Y = AL^{\alpha}1K^{\alpha 2}FI^{\alpha 3} \quad (2)$$

where Y is the productivity stocks, A is the technical advancement, K is the wealth stocks, L represents labor stocks, and FI is financial intermediation. From equation (2), in line with our study expectation, Y is transformed into *HDI,* and making capital, labour, and technology constant, financial intermediation (FI) is transformed into financial exclusion (FE). While α, α^2, and α^3 are the output elasticities of technological progress, labor, capital stock, and financial intermediation, respectively (which are typically assumed to be positive).

Therefore, the aggregate production function can be transformed into a linear equation by introducing both sustainable development and financial exclusion variables as follows:

$$HDI = f(COBS\_M2, FD, UNEMPR, LR, INTR) \quad (3)$$

The operation of the variables of the study is presented in Table 2.

Table 2: Operation of the Variables

Variable	Type	Measurement	Source
Human Development Index (HDI)	Dependent	It measures average national achievement in health, education, and income, focusing on well-being.	United Nations Development Programme, 2019; World Bank, 2019 World Bank Data Indicator, 2022
Currency outside the banking sector (COBS_M2)	Independent	Percentage of currency outside the banking sector (COBs) to the stock of broad money supply (M2) – financial openness	Oluba, 2008, Okeke, Mbonu, Ndubuisi (2018) CBN (2024) CBN statistical bulletin 2022
Financial deepening (FD)	Independent	Percentage of Bank Private credit to GDP	Nwosu, Itodo, and Ogbonnaya-Orji (2021). CBN statistical bulletin 2022
Unemployment rate (UNEMPL)	Independent	The percentage of the Unemployed divided by the Labor Force x 100%.	Barboni et al (2017) cited in Pomerai and Mangwende (2024), Demirguc-Kunt and Singer, 2017; Anthony, Hadrat, George, Kwasi, and Samuel, 2021. CBN statistical bulletin 2022
Interest rate (INTR)	Independent	The savings rate is determined by the CBN's monetary policy	Rashid (2019); Chiweshe, Chaora, and Cross (2023). CBN statistical bulletin 2022
Lending rate (LR)	Independent	Prime lending rate on loans	Chiweshe, Chaora, and Cross (2023). CBN statistical bulletin 2022

Source: Author's Compilation (2024)

Analytical Technique

Therefore, following the adopted modified models of Achugamonu, Adetiloye, Adegbite, Babajide and Akintola (2020) of ARDL technique for analysis, which used a period subscript (t) and first variance operator (Δ), we then model the association of financial exclusion to sustainable development in the form of:

$$lg\Delta HDI_t = f(lg\Delta COBS\_M2_t, lg\Delta FD_t, lg\Delta UNEMPR_t, lg\Delta INTR_t\ lg\Delta LR_t) \quad (4)$$

Practically, to determine the long-term association of financial exclusion to sustainable development, the conversion of equation (4) into a linear equation takes the form of:

$$lg\Delta HDI_t = \varrho + \Theta\ lg\Delta COBS\_M2_t, + \text{Ш}\ lg\Delta FD_t, + \check{O}\ lg\Delta UNEMPR_t, + \text{Ƨ}\ lg\Delta INTR_t + \gamma\ lg\Delta LR_t) \quad (5)$$

where (HDI) is a proxy for sustainable development, and the percentage of the currency outside the banking sector to the broad money supply (COBS_M2), financial deepening (FD), unemployment rate (UNEMPR), lending rate (LR), and interest rate (INTR) are proxies for financial exclusion. Also, *lg* is the normal logarithm of the inconstant, and the approximations of $\boldsymbol{\Theta}$, $\boldsymbol{\text{Ш}}$, $\boldsymbol{\check{O}}$, $\boldsymbol{\delta}$, and $\boldsymbol{\gamma}$ represent resistance. The error term ϵ_t is presumed to be white noise, generally and equally dispersed. The motives for using the ARDL method are that it has the benefit of not demanding a precise proof of identity of the direction of the fundamental data, as it permits a combination of I(1) and I(0) variables as regressors, that is, the direction of incorporation of suitable variables might not essentially be identical. Also, it avoids the small influence of unit root tests and the subsequent degree of ambiguity concerning the order of incorporation of the fundamental variables. In addition, it is appropriate for a small or limited sample magnitude (Pesaran, Shin and Smith, 2001).

In carrying out the constraints test, equation (5) is transformed into an unrestricted error correction model (UECM) formula:

$$lg\ \Delta HDI_t = \varrho\ + \sum_{k=1}^{n} \delta \sum_{k=1}^{n} \delta_1 lg\Delta HDI_{t-k} + \sum_{k=0}^{n} \delta \sum_{k=0}^{n} \delta_2\ lg\ \Delta\ COBS\_M2_{t-k} + \sum_{k=0}^{n} \delta \sum_{k=0}^{n} \delta_3 lg\Delta FD_{t-k} + \sum_{k=0}^{n} \delta \sum_{k=0}^{n} \delta_4 lg\Delta\ UNEMPR_{t-k} + \sum_{k=0}^{n} \delta \sum_{k=0}^{n} \delta_5 lg\Delta INTR_{t-k} + {}_6\sum_{0}^{n} \Theta_6 lg\Delta LR_{t-k} + \Theta\ lg\ COBS\_M2_{t-1} + \text{Ш}\ lg\ FD_{t-1} + \check{O}\ lg\ UNEMPR_{t-1} + \delta\ lg\ INTR_{t-1} + \gamma\ lg\Delta LR_{t-k} + \epsilon_t \quad (6)$$

where ϱ is the point module, Δ signifies the first variance operator, and ϵ_t are white noise errors. In this arrangement, the short-term impacts are contingent on the symbol and consequence of the approximations of $\boldsymbol{\delta_1, \delta_2, \delta_3, \delta_4, \delta_5}$, and $\boldsymbol{\delta_6}$, while the long-term impacts are contingent on the symbol and consequence of the approximations of $\boldsymbol{\Theta}$, $\boldsymbol{\text{Ш}}$, $\boldsymbol{\check{O}}$, $\boldsymbol{\delta}$, and $\boldsymbol{\gamma}$. Equation (6) specifies that sustainable development tends to be swayed and elucidated by its previous values. The structural lags are recognized by means of the lowest Akaike's information criteria (AIC). The Wald test (F-statistics) was similarly calculated to distinguish the long-term association between the study variables.

As all the variables in the model seem to be drifting, a second ARDL-UECM with a drift term $(\mathfrak{s}_t)$ is offered as below:

$$lg\ \Delta HDI_t = \varrho + \mathfrak{s}_t + \sum_{k=1}^{n} \delta \sum_{k=1}^{n} \delta_1 lg\Delta HDI_{t-k} + \sum_{k=0}^{n} \delta \sum_{k=0}^{n} \delta_2\ lg\ \Delta\ COBS\_M2_{t-k} + \sum_{k=0}^{n} \delta \sum_{k=0}^{n} \delta_3 lg\Delta FD_{t-k} + \sum_{k=0}^{n} \delta \sum_{k=0}^{n} \delta_4 lg\Delta\ UNEMPR_{t-k} + \sum_{k=0}^{n} \delta \sum_{k=0}^{n} \delta_5 lg\Delta INTR_{t-k} + {}_6\sum_{0}^{n} \Theta_6 lg\Delta LR_{t-k} + \Theta\ lg\ COBS\_M2_{t-1} + \text{Ш}\ lg\ FD_{t-1} + \check{O}\ lg\ UNEMPR_{t-1} + \delta\ lg\ INTR_{t-1} + \gamma\ lg\Delta LR_{t-k} + \mathfrak{s}_t \quad (7)$$

In this situation, the insignificant proposition of no cointegration, i.e., no long-term association ($H_0 = \boldsymbol{\Theta} = \boldsymbol{\text{Ш}} = \boldsymbol{\check{O}} = \boldsymbol{\delta} = \boldsymbol{\gamma} = 0$), is verified alongside the substitute of long-term association (H_1: $\boldsymbol{\Theta} \neq \boldsymbol{\text{Ш}} \neq \boldsymbol{\check{O}} \neq \boldsymbol{\delta} \neq \boldsymbol{\gamma} \neq 0$) by means of the acquainted F-test with critical values set out by Pesaran, Shin, and Smith (2001). Consequently, it is conjectured that the approximations of $\boldsymbol{\Theta}$, $\boldsymbol{\text{Ш}}$, $\boldsymbol{\check{O}}$, $\boldsymbol{\delta}$, and $\boldsymbol{\gamma}$ are positive and statistically important, hence ratifying the financial exclusion-led development assumption.

Results and Discussion

Descriptive Statistics

Table 3 showed a noteworthy disparity in the drifts of the variables throughout the sample frame due to large differences between the extreme and lowest estimates of the sequences. It exhibits more with COB_M2, which is a reflection that Nigeria is a highly cash-based economy. It means less money flows into financial intermediaries (like banks), reducing their ability to lend, fund investments, and perform their core functions, leading to higher liquidity premiums, potentially stifled economic growth, increased reliance on less efficient informal systems, and challenges for monetary policy. There is a need to enhance the conventional financial arrangement, which has the potential to lessen the usage of currency for economic transactions. The coefficient values of all the variables oscillating between -3 and +3 show that Skewness has a normal curve. Only three variables (COB_M2, FD, and INT) are platykurtic in nature, as their respective kurtosis values of about 1.61, 1.55, and 2.51 are less than 3, but a small number of cases at the tail of the distribution show that kurtosis is positive. At a 5 percent critical value, HDI and INTR are normally distributed, but the null hypothesis under the Jarque-Bera statistic was accepted for COB_M2, FD, LR, and UNEMPR. This is examined more with the unit root test if there is a problem of trended data.

Table 3. Descriptive Statistics Result .

	HDI	COB_M2	FD	INTR	LR	UNEMPR
Mean	0.080833	20.11571	15.62357	6.917619	17.19024	4.061905
Median	0.464500	21.63000	12.90000	4.495000	17.38000	3.800000
Maximum	8.300000	39.30000	24.90000	18.80000	29.80000	7.000000
Minimum	3.10000	5.300000	8.460000	1.410000	7.750000	1.800000
Std. Dev.	3.732356	10.63075	5.450919	4.991223	4.646897	1.058520
Skewness	1.386882	-0.020620	0.485199	0.933915	0.307216	0.618763
Kurtosis	7.528765	1.609490	1.545082	2.510171	3.466629	3.634733
Jarque-Bera	49.35608	3.386634	5.352302	6.525267	1.041722	3.385128
Probability	0.000000	0.183908	0.068828	0.038287	0.594009	0.184047
Observations	42	42	42	42	42	42

Source: Author's Computation, 2024

Correlation Matrix

In Table 4, the results of the correlation matrix show that HDI is positively related to all the variables under consideration except COB_M2 and UNEMPR. This indicates that an increase in FD, INTR, and LR increases sustainable development (HDI) in Nigeria. These variables promote financial inclusion that thrive sustainable development. While an increase in COB_M2 and UNEMPR decreases HDI, this reveals that a rise in currency outside the banking industry and unemployment rate in Nigeria reduces sustainable development (HDI) in Nigeria. These results indicate that between the forecaster variables nonexistence of multi collinearity identified.

Table 4. Correlation Matrix Results

	HDI	COB_M2	FD	INTR	LR	UNEMPR
HDI	1.000000					
COB_M2	-0.101994	1.000000				
FD	0.147406	-0.899675	1.000000			
INTR	0.027899	0.697037	-0.619632	1.000000		
LR	0.330492	0.285917	-0.169388	0.399162	1.000000	
UNEMPR	-0.114171	-0.431550	0.235320	-0.065752	-0.420473	1.000000

Source: Author's Compilation, 2024

Unit Root Test

In Table 5, unit root test results indicate that all variables are stationary at both level I(0) and first difference 1(I) of the combination. The null hypothesis is rejected because all the variables' probability values are less than the 0.05 critical value and significant. Therefore, using the Autoregressive Distributed Lag (ARDL) technique to analyze the study's data is appropriate.

Table 5. ADF Unit Root Test Results

Variables	ADF Tests Statistic	Critical Value ADF (1%)	Order of Combination	Remarks (Stationary)
HDI	-7.309057	-3.600987	I(0)	Level
COB_M2	-6.466054	-3.605593	I(1)	Difference
FD	-5.874874	-3.605593	I(1)	Level
INT	-6.534410	-3.605593	I(1)	Difference
LR	-6.058825	-3.610453	I(1)	Difference
UNEMPR	-6.255886	-3.605593	I(1)	Difference

Source: Author's Computation, 2024

Autoregressive Distributed Lag Test

Short Run Dynamics Test

In Table 6, the results contain the short run vibrant of the variables under consideration. The significance of HDI at first, second, third, and fourth lag (*, *,*, *) respectively implies that the current value of rural transformation will have an influence on all the variables under consideration in the next four years. The results also show that the previous year of HDI had a negative effect on the present HDI for the next four years.

However, the relationship between past HDI and present is inflexible; hence, 1% rise in the previous year's HDI makes the present to the next four years decrease by 0.55%, 1.17%, 0.71% and 0.59%, respectively. This is corroborated by Anyanwu and Anyanwu (2017) that abject poverty and illiteracy in Nigeria hinder many poor to access banking services. Also, COB_M2 is significant at the third lag (**) and implies that the current value of COB_M2 will influence HDI in the third year. Nevertheless, COB_M2 has a negative impact on HDI.

Therefore, 1% increase in COB_M2 causes HDI to decrease by 0.38%. What is attributed to this is the large volume of cash in circulation that increases financial exclusion, which deters development. This is affirmed by Yaqub, Bello, Adenuga, and Ogundeji (2013), Adeyeye and Ajinaja (2014) & Adegboyega (2017) that Nigeria is a

cash-based economy and calls for serious attention for the enhancement of banking facilities, which have the prospects to lessen the use of cash transactions.

Also, FD, which is significant at current and third lag (**, ***), implies that the past year value of financial deepening will have an influence on sustainable development during the current and third year. FD with positive and negative effects (0.31% and 0.39%) in the current and third year, respectively, on HDI shows that 1% rise in FD makes HDI rise and decrease by 0.31% and 0.39 respectively. The little rise and decline in value are due to the shallowness of financial markets in Nigeria, and it is consistent with Adegboyega's (2019) affirmation.

INT is significant at current, first, and third lag (*, ***, *) and implies that the past year value of interest rate will have an influence on sustainable development in the current, first, and third year. The negative impact of INT (0.67% and 0.38%) in the current and first year indicates that 1% increase in INT causes HDI to decrease by 0.67 and 0.38%, respectively. While the positive impact of INT (0.49%) in the third year shows that 1% rise in INT makes HDI rise by 0.49%.

This is a true reflection of an inconsistency in monetary policy on interest rates in Nigeria, which is frequently discouraging savings. The implication is that low interest rate discourages savings, and individuals would prefer to hold cash. This is supported by the assertion of Okeke, Mbonu, and Ndubuisi (2018) that in the period preceding financial inclusion initiatives, the Nigerian economy was characterized by a heavy reliance on cash transactions. It is also corroborated by Adegoyega (2017) that for conveniences majority of farmers prefer to save their money under mattresses at home.

LR is significant at current, first, and second year (**, *, **) and implies that the past year value of the lending rate will have an influence on sustainable development in the current, first, and second year. The positive impact of LR (0.25%, 0.32%, and 0.21%) in the current, first, and second year, respectively, shows that 1% rise in LR makes HDI rise by 0.25%, 0.32%, and 0.21%, respectively. This shows that money borrowed has been used prudently. As for UNEMPR, which is significant at the fourth lag (**) and implies that the current year value of the unemployment rate will influence sustainable development in the fourth year. The positive impact of UNEMPR (1.41%) in the fourth year shows that 1% increase in UNEMPR causes 1.41% increase in HDI.

This is a good result, which requires more unemployment reduction policies to be introduced. This is corroborated by Young's (2025) findings indicate that income levels and the intensity of using mainstream banking services are the primary drivers of financial exclusion in America. In a nutshell, as the probability of the F- statistic for all the variables is significant (*), and also, the result is genuine and dependable for policy formulation because the value of the Durbin-Watson statistic is bigger than the R- squared.

In addition, the negative impact of currency outside the banking (COB_M2), financial deepening (FD), and interest rate (INTR) on the short-run dynamics of sustainable development necessitates an urgent review of government policy on financial inclusion strategy that will facilitate cheap, functional, and easy access banking services to the unbanked. For instance, lowering COBs can reduce financial exclusion, in terms of encouragement of bank account ownership, mobile banking, and other formal services, which can attract more people into the economic system.

Table 6. Autoregressive Distributed Lag Model of HD COB_M2 FD INTR LR UNEMPR

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
HDI(-1)	-0.549801	0.129245	-4.253929	0.0011
HDI(-2)	-1.166381	0.109093	-10.69160	0.0000
HDI(-3)	-0.705054	0.143764	-4.904251	0.0004
HDI(-4)	-0.587249	0.072191	-8.134622	0.0000
COB_M2(-3)	-0.382447	0.153425	-2.492738	0.0283
FD	0.311225	0.141122	2.205357	0.0477
FD(-3)	-0.393915	0.202821	-1.942182	0.0760
INTR	-0.665472	0.201977	-3.294787	0.0064
INTR(-1)	-0.382862	0.208949	-1.832326	0.0918
INTR(-3)	0.486586	0.152477	3.191218	0.0078
LR	0.245838	0.091013	2.701116	0.0193
LR(-1)	0.316568	0.098082	3.227580	0.0073
LR(-2)	0.211003	0.094212	2.239664	0.0448
UNEMPR(-4)	1.405982	0.580997	2.419945	0.0323
R-squared	0.966906	S.E. of regression	0.996620	
Adjusted R-squared	0.897960	S.D. dependent var	3.119934	
F-statistic	14.02418	Akaike info criterion	3.046847	
Prob(F-statistic)	0.000014	Durbin-Watson stat	1.348850	

* 1%, ** 5%, *** 10%

Source: Author's Compilation, 2024

Long Run Equilibrium

Table 7 contains the results of the long-term dynamics of the variables under consideration. In the long-term, COB_M2 has no effect on HDI and is also not significant, but a 1% rise in COB_M2 results in a decrease of 0.02% in HDI. This result is the same for short-run dynamics because Nigeria is a cash-based economy. Effective and efficient cashless policy reforms need to be put in place. Also, FD has an effect on HDI and is not significant, but a 1% rise in FD results to 0.004% increase in HDI, which is very minimal. This occurs due to the shallow depth of the financial market in Nigeria.

INT has an effect on HDI and is very significant, but a 1% rise in INT results in a 0.09% decrease in HDI. The low savings rate is discouraging people from saving in Nigeria, and this has also contributed to the cash-based syndrome. The implication is that low interest rate discourages savings, and individuals would prefer to hold cash. This is supported by the assertion of Okeke, Mbonu, and Ndubuisi (2018) that in the period preceding financial inclusion initiatives, the Nigerian economy was characterized by a heavy reliance on cash transactions. It is also corroborated by Adegoyega (2017) that for conveniences majority of farmers prefer to save their money under mattresses at home.

Also, LR is highly significant and impacted positively on HDI, and a 1% rise in LR results to 0.19% rise in HDI. Affordable lending rate encourages borrowing that stimulates investment, which promotes sustainable development. UNEMPR is insignificant, and a 1% increase in UNEMPR increases HDI by 0.17%. This is a good result, which requires more unemployment reduction policies to be introduced because abject poverty is a social factor contributing to the upsurge of financial exclusion (Anyanwu and Anyanwu, 2017). This is corroborated by Young's (2025) findings indicate that income levels and the intensity of using mainstream banking services are the primary drivers of financial

exclusion in America. Generally, it has become necessary for the CBN to embark on a strategy that will encourage the expansion of financial markets, improve/increase financial services, income capability, job creation, etc., to make banking services accessible to the unbanked.

In conclusion, the long and short-term equilibrium exists among the variables under consideration (COB-M2, FD, INT, LR, UNEMPR) and sustainable development (HDI). However, there is a relatively slow adjustment in sustainable development when other variables change. The implication of a cash-based economy in Nigeria means less money flows into financial intermediaries (like banks), reducing their ability to lend, fund investments, and perform their core functions, leading to higher liquidity premiums, potentially stifled economic growth, increased reliance on less efficient informal systems, and challenges for monetary policy. The implication of these is the increase in financial exclusion that deters growth.

Overall, the results are appropriate to assist policy makers to formulate the short- and medium-term policies given to the recent CBN release in October 2025 that N4.646tn was held outside banks, which shows that 91.9 per cent of all currency in circulation is outside the recognized banking system. This is an indication that the informal financial system is thriving in Nigeria and that a high percentage of adults are financially excluded. It calls for concern. Thus, the gap between the short- and long-term growth rates can be connected by considering the dynamic impacts of the policies.

ECM Test

ECM coefficient of -0.408 (see Table 7) shows that any deviance from the long-term symmetry among variables will be adjusted by around 40.8% each period. ECM elucidates that annually the system modifies its past period instability at a speed of 40.8% yearly, which is a high speed.

Bound Test

In Table 8, the result of the F-statistics of 30.73991 is higher than 1% critical value for the upper bound, and the null hypothesis of no long-run association among the variables is strongly rejected.

Post-Estimation Diagnostic Tests

To establish that the variables used in this study are mutually important in clarifying the impact of financial exclusion on sustainable development in Nigeria, autocorrelation, heteroscedasticity, normality, and Ramsey stability tests were carried out (see Table 9). The results established that the model is unrestricted from autocorrelation, homoscedastic, and the variables are normally distributed. Ramsey RESET specification test showed that the model is free from omitted variables' problem and linearity postulation at 5% significant level. So, the model is steady for policy inference.

Table 7. Cointegrating Form

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(HDI(-1))	2.458685	0.213883	11.495465	0.0000
D(HDI(-2))	1.292303	0.165821	7.793376	0.0000
D(HDI(-3))	0.587249	0.072191	8.134622	0.0000
D(COB_M2(-2))	0.382447	0.153425	2.492738	0.0283
D(FD)	0.311225	0.141122	2.205357	0.0477
D(FD(-2))	0.393915	0.202821	1.942182	0.0760
D(INTR)	-0.665472	0.201977	-3.294787	0.0064
D(INTR(-2))	-0.486586	0.152477	-3.191218	0.0078
D(LR)	0.245838	0.091013	2.701116	0.0193
D(LR(-1))	-0.211003	0.094212	-2.239664	0.0448
D(UNEMPR(3))	-1.405982	0.580997	-2.419945	0.0323
CointEq(-1)	-0.408486	0.301677	-13.287330	0.0000
Cointeq = HDI - (-0.0203*COB_M2 + 0.0038*FD -0.0890*INTR + 0.1929 *LR + 0.1685*UNEMPR -2.8857)				
Long Run Coefficients				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
COB_M2	-0.020304	0.025180	-0.806365	0.4357
FD	0.003777	0.042724	0.088409	0.9310
INTR	-0.089048	0.027263	-3.266247	0.0068
LR	0.192943	0.026314	7.332422	0.0000
UNEMPR	0.168530	0.121842	1.383185	0.1918
C	-2.885663	1.389206	-2.077203	0.0599

1% = * 5% = ** 10% = ***

Source: Author's Compilation 2024

Table 8. Critical Value Bounds

Null Hypothesis: No long-run relationships exist		
Test Statistic	Value	K
F-statistic	30.73991	5
Significance	I(0) Bound	I(1) Bound
10%	2.26	3.35
5%	2.62	3.79
2.5%	2.96	4.18
1%	3.41	4.68

Source: Author's Computation, 2024

Table 9. Post-Estimation Diagnostic Tests Results

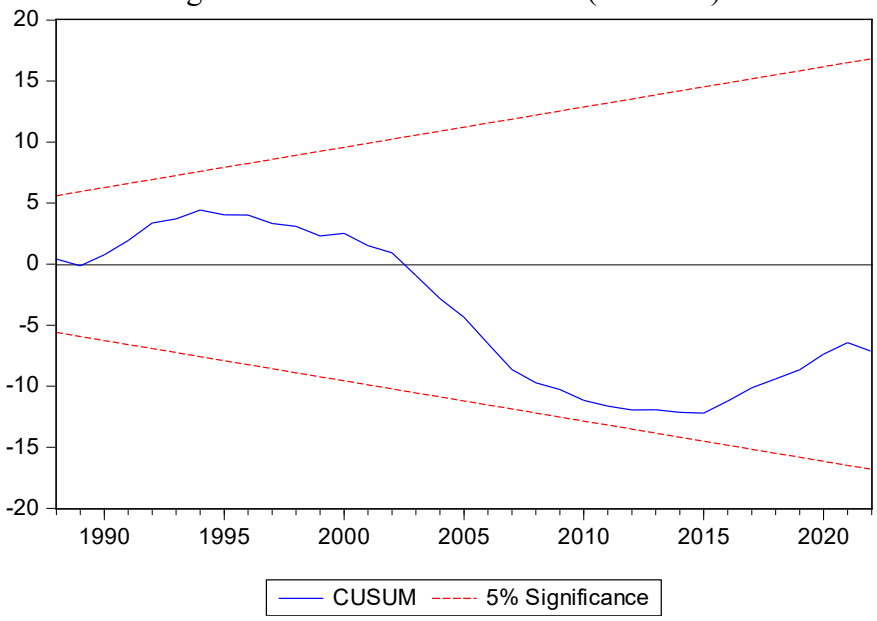
Test	F-Statistic	t-Statistic	Obs.*R-Square	Prob. Value
Breusch-Godfrey Serial Correlation LM Test	1,976450	-	10.76552	0.1891
Heteroskedasticity Test Breusch-Pagan-Godfrey	0.899793	-	24.78063	0.6062
Jargue-Bera	2.542985	-	38	0.2804
Ramsey Stability Test	8.672632	2.944933	-	0.0133

Source: Author's Computation, 2024

The CUSUM Test

Figure 1 indicates that the blue line is inside the critical red lines showed that the result of the CUSUM steadiness test confirms the stability of the model at the 5% significant level. It is evidence that the model did not have problems with structural unsteadiness during the study period. By insinuation, the ECM model is steady.

Figure 1. Cumulative Sum Chart (CUSUM)



Source: Author's Compilation, 2024

Conclusion and Recommendations

Conclusion

This study investigated the nexus between financial exclusion and sustainable development in Nigeria. In this study, we made valuable contributions to the theoretical and methodological background that associates financial exclusion with sustainable development in Nigeria, using a robust econometric technique, Autoregressive Distributed Lagged (ARDL), to analyze data.

Our estimation followed Achugamonu, Adetiloye, Adegbite, Babajide, and Akintola (2020) by decomposition of the variables, which helps in circumventing the intrinsic shortfalls that exist in consequences from either extreme short or long-term, as the method is a transition between the two.

The long-term results showed that COB_M2 has no effect on HDI and not significant but a 1% rise in COB_M2 results to a decrease of 0.02% in HDI; FD has no effect on HDI and not significant but a 1% rise in FD results to 0.004% increase in HDI, which is very minimal, LR is highly significant and impacted positively on HDI, and a 1% rise in LR results to 0.19% increase in HDI; INT has effect on HDI and significant but a 1% rise in INT results to 0.09% decrease in HDI; and UNEMPR is insignificant and a 1% increase in UNEMPR is increasing HDI by 0.17%.

In the short run, 1% increase in COB_M2 causes HDI to decrease by 0.38%; 1% rise in FD makes HDI to increase by 0.31% and significant; the negative impact of INT of 0.67% indicates that 1% rise in INT makes HDI to decrease by 0.67 but significant; 1% rise in LR makes HDI to rise by 0.25% and significant; and 1% increase in UNEMPR causes 1.41% increase in HDI and significant. The implication of the negative effect of COB_M2 on sustainable development underscores the fundamental problem of the highly cash-based Nigerian economy.

Overall, short and long-term relationships exist among sustainable development (HDI) and financial inclusion (COB_M2, FD, INT, LR, UNEMPR) in Nigeria. Also, the ECM coefficient of -0.408 shows that any deviance from the long-term symmetry among variables will be adjusted by around 40.8% each period. The findings establish that a reduction in financial exclusion is a vital driver of sustainable development. The study outcomes recommend important strategy directions which are appropriate to assist policy makers to formulate the short- and medium-term policies in Nigeria.

In terms of focusing policy ideas on moderating interest rates, lending rate and excessive use of cash transactions, which have the prospect to increase financial services outreach to the unbanked. These will stimulate the financially excluded to have the opportunity to be involved in income-generating schemes that can ultimately generate jobs for them and positively impact development. The specific limitations of this study are non-availability of the current dataset and the inability to fully capture some specific variables. These can be addressed by future research.

Recommendations

Extracting from the study discussions and outcomes, the following recommendations that can reduce financial exclusion and stimulate development are made. Given the increase in the percentage of unbanked, as well as the high cash-based economy experienced in Nigeria, designing formal financial infrastructure is paramount, which has the prospect to lessen the use of currency for economic transactions.

Putting in place strategic policies that will promote bank account ownership, mostly in rural areas.

Improving digital banking innovations in the payment system gives the unbanked the opportunity to patronize banks. There is a need for the proper implementation of policies and strategies geared towards financial deepening in Nigeria. It is highly essential to make policies and research ideas that concentrate on involuntary financial exclusion.

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