

# Financial Disintermediation and Financial Inclusion: Do Digital Financial Platforms Expand Access to Finance?

Aremu Oluwasegun Babatunde \*, Emmanuel Ayodeji\* Ajala Rosemary Bukola\*, Ojeagbase Ohio Okhaide\*, Bello Babatunde Gafari\*, Hope Oduma\*

Department of Business Administration, Afe Babalola Business School, Afe Babalola University, Ibadan, Nigeria.

DOI: <https://doi.org/10.47772/IJRISS.2026.1026EDU0473>

Received: 17 July 2026; Accepted: 22 July 2026; Published: 31 July 2026

## ABSTRACT

This study examined the relationship between financial disintermediation and financial inclusion in Nigeria, with particular emphasis on whether digital financial platforms have expanded access to financial services. The study investigated the effects of financial disintermediation, mobile money transactions, electronic payment values, bank branch density, and internet usage on financial inclusion using annual time-series data spanning the period 1990–2025. The study employed the Augmented Dickey–Fuller (ADF) and Dickey–Fuller Generalized Least Squares (DF-GLS) tests to determine the stationarity properties of the variables, while the Johansen cointegration test was used to examine the existence of a long-run relationship among the variables.

Furthermore, the Autoregressive Distributed Lag (ARDL) model was employed to estimate the short-run and long-run dynamics, and Pairwise Granger Causality tests were conducted to determine the direction of causality among the variables. The empirical findings revealed that financial disintermediation and bank branch expansion exert significant positive effects on financial inclusion, while mobile money transactions, electronic payment values, and internet usage exhibited mixed short-run effects but contributed to the long-run dynamics of financial inclusion. The Johansen cointegration results confirmed the existence of a stable long-run relationship among the variables, whereas the Granger causality results indicated both bidirectional and unidirectional causal relationships, suggesting strong interactions between digital financial services and financial inclusion.

The study concludes that digital financial platforms have significantly transformed the Nigerian financial system by complementing traditional banking services and improving financial access, although their effectiveness depends on supportive regulatory frameworks, adequate digital infrastructure, and improved financial literacy. Consequently, the study recommends that policymakers strengthen digital financial infrastructure, promote fintech innovation through enabling regulations, expand broadband connectivity, improve consumer protection, and intensify financial literacy programmes to accelerate inclusive financial development in Nigeria.

**Keywords:** Financial Disintermediation; Financial Inclusion; Digital Financial Platforms; Mobile Money; Electronic Payments; Fintech; Internet Usage; ARDL; Johansen Cointegration; Nigeria.

**JEL:** M00, M41, M49

## INTRODUCTION

Financial intermediation has traditionally been regarded as a fundamental pillar of economic development because it facilitates the mobilization of savings, efficient allocation of financial resources, payment services, and risk management, thereby promoting investment and sustainable economic growth Olayowola, K., & Aregbesola, R. (2022), Efobi, U., Beecroft, I., & Osabuohien, E. (2021). Aker, J. C., & Mbiti, I. M. (2019). Ozili, P. K. (2018), Levine, (2005).

For decades, commercial banks served as the dominant financial intermediaries, linking surplus economic units with deficit units through conventional banking channels. However, the rapid advancement of information and communication technology has transformed the financial services landscape by introducing innovative digital

financial platforms such as mobile money services, digital banks, peer-to-peer lending platforms, crowdfunding platforms, and fintech payment systems Demirgüç-Kunt et al., (2022), Aker & Mbiti, (2019), Camara, N., & Tuesta, D. (2017).

These technological innovations have altered the traditional structure of financial intermediation, giving rise to financial disintermediation, whereby many financial transactions and services are increasingly conducted outside conventional banking institutions. Rather than eliminating financial intermediaries entirely, digital financial platforms have redefined the process of financial intermediation by utilizing advanced technologies, data analytics, artificial intelligence, and digital networks to deliver financial services more efficiently, conveniently, and at lower transaction costs Demirgüç-Kunt, A., Klapper, L. F., Singer, D., & Ansar, S. (2022). Cornelli et al., (2020).

Consequently, financial inclusion has emerged as a critical development objective, particularly in developing economies where a substantial proportion of the population remains excluded from formal financial systems. Enhanced financial inclusion contributes to poverty reduction, enterprise development, improved household welfare, and greater macroeconomic stability through broader participation in formal financial markets Demirgüç-Kunt et al., (2022), Efobi, U., Beecroft, I., & Osabuohien, E. (2021).

The increasing convergence of digital finance, financial disintermediation, and financial inclusion has generated significant interest among researchers and policymakers regarding whether digital financial platforms genuinely expand access to finance or merely redistribute existing financial services among already banked populations. Existing empirical evidence suggests that the impact of digital financial platforms is context-dependent. In countries such as Kenya, digital financial innovations have significantly increased financial access, improved household resilience, and enhanced financial inclusion through mobile money and agency banking networks (Suri & Jack, 2016; GSMA, 2023).

Conversely, some studies argue that digital finance may reinforce existing inequalities where challenges such as poor digital infrastructure, low financial literacy, inadequate consumer protection, and limited internet access persist (Ozili, 2018; Cornelli et al., 2020). This debate is particularly relevant in Nigeria, where rapid expansion in fintech services, mobile banking, electronic payments, and agency banking has transformed the financial sector while a considerable proportion of the population remains financially excluded due to structural barriers including poverty, inadequate digital infrastructure, limited internet penetration, and low levels of financial literacy (Central Bank of Nigeria, 2022; Efobi *et al.*, 2021; Olayowola and Aregbesola, 2022).

Against this background, this study examines the relationship between financial disintermediation and financial inclusion in Nigeria, with particular emphasis on the role of digital financial platforms in expanding access to financial services. The study is anchored on the proposition that digital financial platforms represent a transformation rather than the disappearance of financial intermediation, and that their effectiveness in promoting inclusive finance depends largely on supportive regulatory frameworks, institutional quality, technological infrastructure, and sustained investments in digital and financial literacy. This study is structured into six sections: an introduction, a literature review, methodology and trend analysis, results, discussions, and conclusion and policy recommendations to strengthen financial disintermediation and financial inclusion: do digital financial platforms expand access to finance?

## LITERATURE REVIEW

### Conceptual Review

#### Financial Disintermediation

The concept of financial disintermediation has undergone substantial evolution as financial systems and technologies have changed. In its early usage, disintermediation referred primarily to situations in which borrowers and lenders bypassed deposit-taking institutions to interact directly in capital markets, often in response to high interest rates, regulatory ceilings, or other distortions that made bank intermediation costly or

unattractive (Levine, 2005). In this classical view, disintermediation was largely cyclical and episodic, reflecting macroeconomic conditions and regulatory rigidities rather than a permanent restructuring of financial systems.

In the digital era, however, financial disintermediation has acquired a more structural and complex character. Rather than simply removing intermediaries, digitalization has enabled **new forms of intermediation** undertaken by technology-enabled non-bank actors. Platform-based providers such as mobile money operators, digital lenders, big-tech firms and crowdfunding platforms perform functions traditionally associated with banks, including payments processing, screening, monitoring and, in some cases, liquidity provision (Cornelli et al., 2020; Ziegler et al., 2019). These entities do not eliminate intermediation; instead, they reorganize it within data-driven, algorithmic and network-based ecosystems, with distinct incentive structures and risk profiles.

## Financial Inclusion

By contrast, **financial inclusion** is concerned with the ability of individuals and firms to access and effectively use a broad range of affordable, appropriate and responsibly delivered financial services. Contemporary frameworks view inclusion as multidimensional, encompassing access, usage, quality, and impact (Demirgüç-Kunt et al., 2022). An inclusive financial system enables households to smooth consumption, accumulate savings, invest in human capital, and manage shocks, while providing micro, small and medium-sized enterprises (MSMEs) with the credit and payment tools needed to innovate, expand and generate employment (Aker & Mbiti, 2019; Levine, 2005). In this sense, financial inclusion is not merely a financial objective but a foundation for broader economic and social development. In addition, the inclusion includes mobile money index, electronic payment index, bank branches index, and internet user index.

## Theoretical Review

### Financial Intermediation Theory

The **Financial Intermediation Theory**, developed by **John G. Gurley and Edward S. Shaw (1960)**, explains the role of financial intermediaries in mobilizing savings and channeling funds from surplus economic units to deficit units. According to the theory, financial institutions such as commercial banks reduce transaction costs, minimize information asymmetry, diversify risk, and improve the efficient allocation of financial resources.

Financial intermediaries therefore enhance economic efficiency by providing liquidity, maturity transformation, payment services, and credit allocation. With the emergence of digital financial platforms, however, many traditional banking functions are increasingly performed through technology-driven channels such as mobile money, digital banks, peer-to-peer lending, and fintech payment systems.

Although these innovations reduce dependence on traditional banks, the theory suggests that financial intermediation is not eliminated but transformed into more efficient and technology-enabled forms. This theory is relevant because it provides the conceptual foundation for understanding how financial disintermediation influences financial inclusion.

### Financial Innovation Theory

The **Financial Innovation Theory**, advanced by **William L. Silber (1983)**, argues that financial institutions continuously develop new financial products, delivery channels, and technologies to overcome market imperfections, regulatory constraints, and rising transaction costs. Financial innovations improve the efficiency of financial markets by reducing information costs, increasing competition, and expanding access to financial services.

The emergence of digital financial platforms—including mobile banking, electronic payments, digital lending, and fintech applications—is a practical manifestation of financial innovation. These innovations lower the cost of delivering financial services, improve convenience, and extend financial services to previously underserved populations. The theory therefore explains how technological advancement drives financial disintermediation and promotes financial inclusion through innovative financial solutions.

## Financial Inclusion Theory

The **Financial Inclusion Theory**, proposed by **Mandira Sarma (2008)**, emphasizes that inclusive financial systems should provide affordable, accessible, and sustainable financial services to all members of society, particularly low-income households and small businesses. The theory identifies three major dimensions of financial inclusion: accessibility, availability, and usage of financial services. According to Sarma, improving these dimensions promotes poverty reduction, income generation, and inclusive economic growth.

Digital financial platforms contribute to financial inclusion by reducing geographical barriers, lowering transaction costs, and providing convenient access to financial products. However, the theory also recognizes that factors such as digital literacy, infrastructure, regulation, and income levels determine the extent to which individuals benefit from financial services. This theory directly supports the study's objective of examining whether digital financial platforms enhance financial inclusion in Nigeria

## Diffusion of Innovation Theory

The **Diffusion of Innovation Theory**, developed by **Everett M. Rogers (1962)**, explains how new technologies and innovations spread within a society over time. The theory argues that adoption depends on perceived usefulness, ease of use, compatibility with users' needs, and social influence.

In financial services, innovations such as mobile money, internet banking, electronic payment systems, and digital lending are adopted gradually as consumers gain confidence in their usefulness and security. The theory categorizes adopters into innovators, early adopters, early majority, late majority, and laggards, highlighting that technology adoption varies across socioeconomic groups. This theory is relevant because financial inclusion depends not only on the availability of digital financial platforms but also on the willingness and ability of individuals to adopt and continuously use them.

## Empirical Review

### Studies on Nigerian and African Literature

Empirical evidence from Africa provides considerable support for the role of digital financial services in promoting financial inclusion, although the magnitude of the impact varies across countries. The pioneering study by Suri and Jack (2016) demonstrated that Kenya's M-Pesa mobile money platform significantly improved household welfare by facilitating risk sharing, income smoothing, and poverty reduction, with an estimated 194,000 households escaping poverty through increased access to digital financial services.

Similar findings have been reported in Tanzania, Uganda, and Ghana, where mobile money and agent banking have expanded account ownership, increased transaction volumes, and improved access to formal financial services (Aker & Mbiti, 2019; Kikulwe et al., 2021). Longitudinal evidence from Sub-Saharan Africa further indicates that digital financial services strengthen household resilience, improve consumption smoothing, and facilitate low-cost payment services, although the uptake of more sophisticated financial products such as savings, insurance, and digital credit remains relatively limited (Mbiti & Weil, 2016; GSMA, 2023).

Within Nigeria, empirical studies present a more nuanced assessment of digital financial inclusion. Efobi et al. (2021) and Olayowola and Aregbesola (2022) found that mobile money services and agency banking have substantially improved financial outreach by reducing geographical barriers and extending financial services to rural and previously underserved populations. Data from the Central Bank of Nigeria (2023) similarly indicate that the rapid expansion of agent banking networks and mobile money accounts has contributed significantly to increased financial access.

However, evidence suggests that the benefits of digital finance remain unevenly distributed. Okoye and Eze (2023) observed that fintech credit products are predominantly utilized by younger, urban, and better-educated individuals, indicating that disparities in digital literacy, education, and income continue to constrain broader participation.

Likewise, Olayemi (2022) reported that individuals with stable income sources and higher educational attainment are considerably more likely to adopt digital financial products than their lower-income counterparts. Furthermore, while fintech lending has relaxed collateral requirements, its developmental impact is constrained by relatively high interest rates and short repayment periods, limiting its contribution to productive investment and poverty reduction.

Similar patterns have been documented in Ghana and Uganda, where digital financial platforms have primarily enhanced payment services without significantly deepening long-term financial relationships (Efobi et al., 2021). Overall, empirical evidence from Nigeria and Sub-Saharan Africa suggests that although digital financial platforms have expanded financial access, their effectiveness in promoting comprehensive financial inclusion depends on complementary investments in digital infrastructure, financial literacy, consumer protection, and supportive regulatory frameworks.

### **Studies Focuses on Foreign Literature**

Evidence from outside Africa further demonstrates that the impact of digital financial platforms on financial inclusion is highly dependent on institutional quality, technological readiness, and regulatory support. In India, the integration of the Aadhaar biometric identification system with digital banking infrastructure significantly expanded financial account ownership and improved the efficiency of government-to-person transfers (Demirgüç-Kunt et al., 2022).

Burgess, Pande, and Wong (2020) found that digital identification systems enhanced transparency and reduced leakages in public subsidy programme, although Kapoor and Bansal (2021) cautioned that increased account ownership did not necessarily translate into sustained account usage, particularly in rural communities characterized by low digital literacy and limited trust in formal financial institutions.

In Latin America, fintech development has generally complemented rather than displaced traditional banking institutions. Studies conducted in Mexico, Brazil, and Colombia reveal that digital financial platforms operate alongside commercial banks to broaden financial outreach and improve service delivery (Camara & Tuesta, 2017; Cull et al., 2020).

Brazil's introduction of instant payment systems and open banking reforms significantly accelerated financial inclusion by encouraging competition and improving payment interoperability. However, Trujillo-Barrera (2020) noted that countries with weak regulatory frameworks or limited competition experienced less inclusive outcomes, as digital financial services largely benefited existing bank customers.

Research on peer-to-peer lending and crowdfunding similarly suggests that although these platforms initially expanded access to entrepreneurial finance (Ziegler et al., 2019), their long-term evolution has increasingly favoured institutional investors and lower-risk borrowers, thereby reducing their inclusive potential (Cornelli et al., 2020).

Additional evidence from Southeast Asia reinforces the importance of supportive government policies. Yoshino and Taghizadeh-Hesary (2020) reported that digital financial platforms significantly increased household savings and improved access to finance for micro, small, and medium-sized enterprises (MSMEs) in Indonesia and the Philippines when accompanied by strong regulatory oversight, extensive agent networks, and reliable digital infrastructure.

Furthermore, cross-country studies by Ozili (2018), Klapper and Singer (2021), the World Bank (2022), and GSMA (2023) consistently conclude that digital finance contributes most effectively to financial inclusion where countries invest in broadband infrastructure, digital literacy, consumer protection, and interoperable payment systems.

Conversely, in countries characterized by weak institutions, fragmented regulations, and inadequate digital infrastructure, technological innovation alone has produced only modest and often short-lived improvements in financial inclusion. Collectively, the foreign empirical literature suggests that digital financial disintermediation

represents an important catalyst for financial inclusion, but its success depends fundamentally on the broader institutional and policy environment within which digital financial systems operate.

Although the Financial Intermediation Theory, Financial Innovation Theory, Financial Inclusion Theory, and Diffusion of Innovation Theory each explain different dimensions of digital finance, none independently provides a comprehensive explanation of how **financial disintermediation** through digital financial platforms influences **financial inclusion** in developing economies. Financial Intermediation Theory primarily focuses on the role of traditional financial institutions, while Financial Innovation Theory emphasizes technological change without fully addressing access and inclusion.

Similarly, Financial Inclusion Theory concentrates on expanding access to financial services but pays limited attention to the changing structure of financial intermediation, and Diffusion of Innovation Theory explains technology adoption rather than its broader financial sector implications. Consequently, this study integrates these complementary theories to provide a more comprehensive framework for understanding how digital financial platforms reshape financial intermediation and expand financial inclusion in Nigeria.

## METHODOLOGY

The methodology used for examining financial disintermediation and financial inclusion: do digital financial platforms expand access to finance? is based on regression analysis. Regression equations of financial disintermediation index, financial inclusion index, mobile money transactions index, electronic payment value index, bank branches index and internet users index from 1990 to 2025.

The data sourced from Central Bank of Nigeria (CBN) Statistical Bulletin and National Bureau of Statistics (NBS), and World Bank Development Indicator. Data set sourced were tested using the Descriptive Statistics, OLS, Unit Root Tests, Johansen's Co-integration Tests, Augmented Dickey-Fuller (ADF) and Autoregressive Distributed Lag Models (ARDL).

### Stylized Form of the Regression Equation

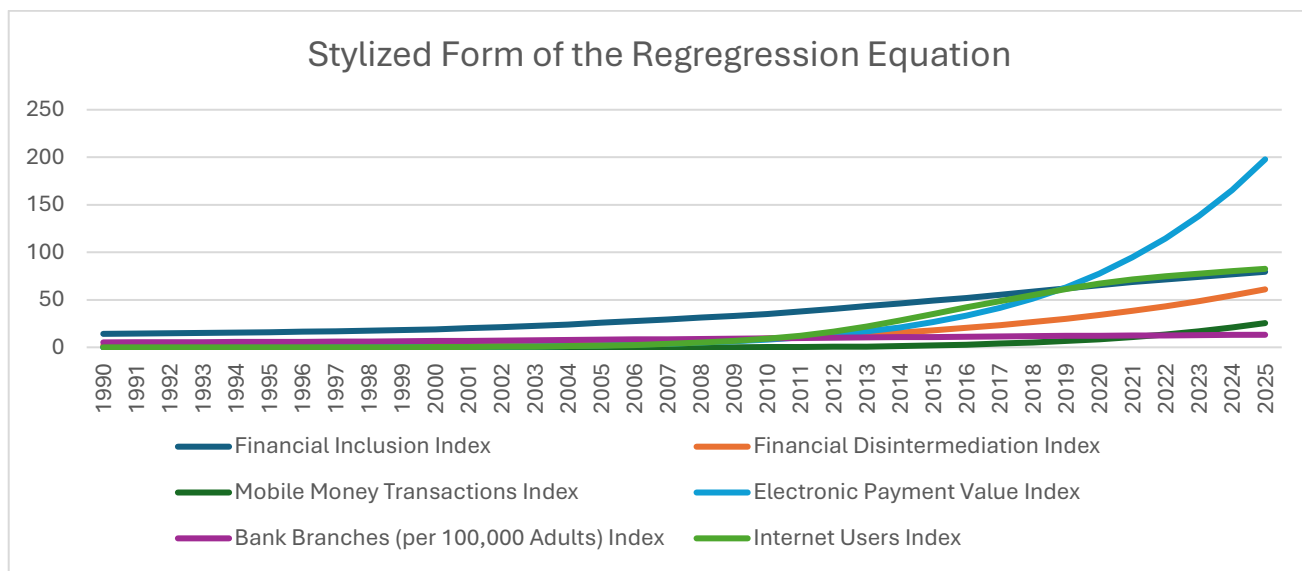
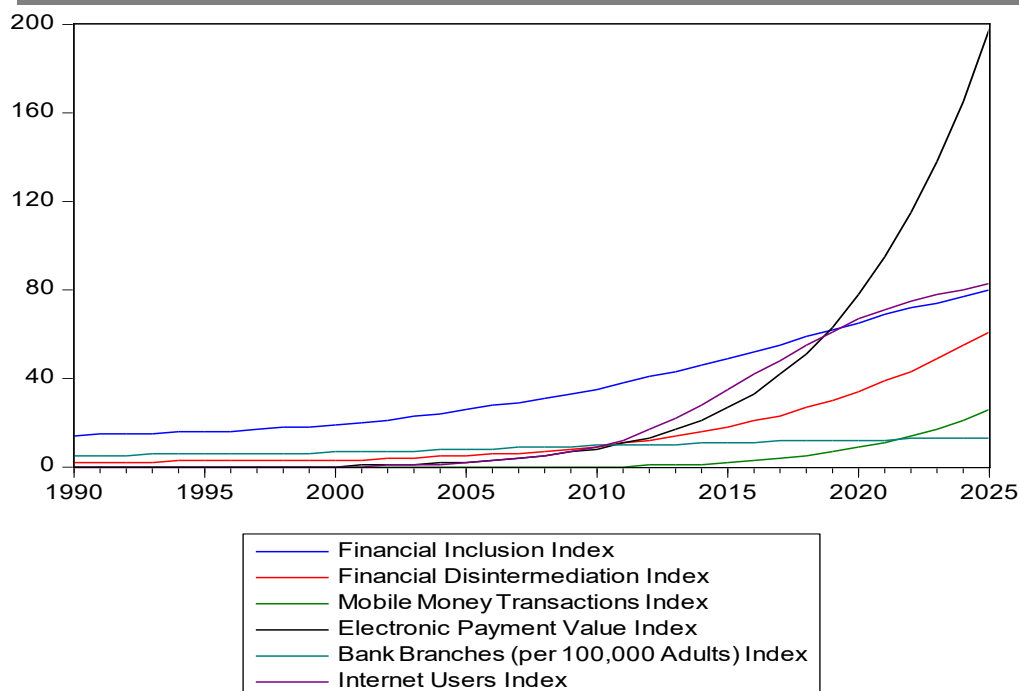


Figure 1: Trend in Financial Disintermediation and Financial Inclusion: do Digital Financial Platforms Expand Access to Finance?

Source: Authors Computation using Excel



**Source:** Authors Computation using Eviews 10

### 3.1 Model Specification

$$F_{Inct} = \beta_0 + \beta_1 F_{Dist} + \beta_2 M_{obt} + \beta_3 E_{lept} + \beta_4 B_{anbbt} + \beta_5 I_{ntUser} + \mu_t$$

where:

$F_{Inct}$  = Financial Inclusion Index

$F_{Dist}$  = Financial Disintermediation Index

$M_{obt}$  = Mobile Money Transactions Index

$\beta_0$  = Constant term

$\beta_1, \beta_2, \beta_3, \beta_4$  and  $\beta_5$ , = Coefficients for Financial Disintermediation

and Financial Inclusion respectively

$\mu_t$  = Error term

## RESULTS

### Descriptive Statistics Table

|           | FINANCIAL<br>INCLUSION<br>INDEX | FINANCIAL DISI<br>NTERMEDIATIO<br>N_INDEX | MOBILE_<br>MONEY_T<br>RANSACT<br>IONS_IND<br>EX | ELECTRONI<br>C_PAYMEN<br>T_VALUE_I<br>NDEX | BANK_BRA<br>NCHES_PE<br>R_100_000<br>ADULTS_I<br>NDEX | INTERNE<br>T_USERS<br>_INDEX |
|-----------|---------------------------------|-------------------------------------------|-------------------------------------------------|--------------------------------------------|-------------------------------------------------------|------------------------------|
| Mean      | 36.97222                        | 14.97222                                  | 3.388889                                        | 30.58333                                   | 8.916667                                              | 22.41667                     |
| Median    | 30.00000                        | 6.500000                                  | 0.000000                                        | 4.500000                                   | 9.000000                                              | 4.500000                     |
| Maximum   | 80.00000                        | 61.00000                                  | 26.00000                                        | 198.0000                                   | 13.00000                                              | 83.00000                     |
| Minimum   | 14.00000                        | 2.000000                                  | 0.000000                                        | 0.000000                                   | 5.000000                                              | 0.000000                     |
| Std. Dev. | 21.22598                        | 16.62955                                  | 6.539016                                        | 51.12471                                   | 2.697883                                              | 29.45444                     |

|              |          |          |          |          |          |          |
|--------------|----------|----------|----------|----------|----------|----------|
| Skewness     | 0.651556 | 1.386501 | 2.125363 | 1.917684 | 0.098437 | 0.967023 |
| Kurtosis     | 2.053577 | 3.805281 | 6.624147 | 5.743396 | 1.605705 | 2.319617 |
|              |          |          |          |          |          |          |
| Jarque-Bera  | 3.890722 | 12.50702 | 46.80468 | 33.35439 | 2.974229 | 6.305187 |
| Probability  | 0.142936 | 0.001924 | 0.000000 | 0.000000 | 0.226024 | 0.042741 |
|              |          |          |          |          |          |          |
| Sum          | 1331.000 | 539.0000 | 122.0000 | 1101.000 | 321.0000 | 807.0000 |
| Sum Sq. Dev. | 15768.97 | 9678.972 | 1496.556 | 91480.75 | 254.7500 | 30364.75 |
|              |          |          |          |          |          |          |
| Observations | 36       | 36       | 36       | 36       | 36       | 36       |

**Source:** Authors Computation using Eviews 10

### OLS Tests

|                                               |             |                       |             |          |
|-----------------------------------------------|-------------|-----------------------|-------------|----------|
| Dependent Variable: FINANCIAL_INCLUSION_INDEX |             |                       |             |          |
| Method: Least Squares                         |             |                       |             |          |
| Date: 07/11/26 Time: 05:55                    |             |                       |             |          |
| Sample: 1990 2025                             |             |                       |             |          |
| Included observations: 36                     |             |                       |             |          |
|                                               |             |                       |             |          |
| Variable                                      | Coefficient | Std. Error            | t-Statistic | Prob.    |
|                                               |             |                       |             |          |
| FINANCIAL_DISINTERMEDIATION_INDEX             | 2.079297    | 0.438945              | 4.737037    | 0.0000   |
| MOBILE_MONEY_TRANSACTIONS_INDEX               | -0.423265   | 0.925865              | -0.457157   | 0.6507   |
| ELECTRONIC_PAYMENT_VALUE_INDEX                | -0.300892   | 0.206746              | -1.455372   | 0.1556   |
| BANK_BRANCHES__PER_100_000_ADULTS__INDEX      | 1.937658    | 0.210381              | 9.210215    | 0.0000   |
| INTERNET_USERS_INDEX                          | -0.034769   | 0.069867              | -0.497638   | 0.6223   |
|                                               |             |                       |             |          |
| R-squared                                     | 0.997692    | Mean dependent var    |             | 36.97222 |
| Adjusted R-squared                            | 0.997394    | S.D. dependent var    |             | 21.22598 |
| S.E. of regression                            | 1.083486    | Akaike info criterion |             | 3.126491 |
| Sum squared resid                             | 36.39221    | Schwarz criterion     |             | 3.346424 |
| Log likelihood                                | -51.27683   | Hannan-Quinn criter.  |             | 3.203253 |
| Durbin-Watson stat                            | 1.543553    |                       |             |          |

**Source:** Authors Computation using Eviews 10

## Unit Root Tests

|                                                            |             |                       |             |          |
|------------------------------------------------------------|-------------|-----------------------|-------------|----------|
| Null Hypothesis: FINANCIAL_INCLUSION_INDEX has a unit root |             |                       |             |          |
| Exogenous: Constant                                        |             |                       |             |          |
| Lag Length: 3 (Automatic - based on SIC, maxlag=9)         |             |                       |             |          |
|                                                            |             |                       | t-Statistic | Prob.*   |
| Augmented Dickey-Fuller test statistic                     |             |                       | -1.446345   | 0.5473   |
| Test critical values:                                      | 1% level    |                       | -3.653730   |          |
|                                                            | 5% level    |                       | -2.957110   |          |
|                                                            | 10% level   |                       | -2.617434   |          |
| *MacKinnon (1996) one-sided p-values.                      |             |                       |             |          |
| Augmented Dickey-Fuller Test Equation                      |             |                       |             |          |
| Dependent Variable: D(FINANCIAL_INCLUSION_INDEX)           |             |                       |             |          |
| Method: Least Squares                                      |             |                       |             |          |
| Date: 07/11/26 Time: 05:57                                 |             |                       |             |          |
| Sample (adjusted): 1994 2025                               |             |                       |             |          |
| Included observations: 32 after adjustments                |             |                       |             |          |
| Variable                                                   | Coefficient | Std. Error            | t-Statistic | Prob.    |
| FINANCIAL_INCLUSION_INDEX(-1)                              | -0.018128   | 0.012534              | -1.446345   | 0.1596   |
| D(FINANCIAL_INCLUSION_INDEX(-1))                           | 0.287139    | 0.142472              | 2.015401    | 0.0539   |
| D(FINANCIAL_INCLUSION_INDEX(-2))                           | 0.095309    | 0.146968              | 0.648504    | 0.5221   |
| D(FINANCIAL_INCLUSION_INDEX(-3))                           | 0.815445    | 0.169141              | 4.821089    | 0.0000   |
| C                                                          | 0.504970    | 0.195455              | 2.583562    | 0.0155   |
| R-squared                                                  | 0.827265    | Mean dependent var    |             | 2.031250 |
| Adjusted R-squared                                         | 0.801675    | S.D. dependent var    |             | 1.121185 |
| S.E. of regression                                         | 0.499305    | Akaike info criterion |             | 1.591402 |
| Sum squared resid                                          | 6.731250    | Schwarz criterion     |             | 1.820423 |
| Log likelihood                                             | -20.46243   | Hannan-Quinn criter.  |             | 1.667316 |
| F-statistic                                                | 32.32730    | Durbin-Watson stat    |             | 2.145026 |
| Prob(F-statistic)                                          | 0.000000    |                       |             |          |

Source: Authors Computation using Eviews 10

## Johansen Co-Integration Tests

|                                                                                                                                                                                                        |            |           |                |         |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|-----------|----------------|---------|
| Date: 07/11/26 Time: 05:58                                                                                                                                                                             |            |           |                |         |
| Sample (adjusted): 1992 2025                                                                                                                                                                           |            |           |                |         |
| Included observations: 34 after adjustments                                                                                                                                                            |            |           |                |         |
| Trend assumption: Linear deterministic trend                                                                                                                                                           |            |           |                |         |
| Series: FINANCIAL_INCLUSION_INDEX FINANCIAL_DISINTERMEDIATION_INDEX<br>MOBILE_MONEY_TRANSACTIONS_INDEX ELECTRONIC_PAYMENT_VALUE_INDEX<br>BANK_BRANCHES__PER_100_000_ADULTS__INDEX INTERNET_USERS_INDEX |            |           |                |         |
| Lags interval (in first differences): 1 to 1                                                                                                                                                           |            |           |                |         |
| Unrestricted Cointegration Rank Test (Trace)                                                                                                                                                           |            |           |                |         |
| Hypothesized                                                                                                                                                                                           |            | Trace     | 0.05           |         |
| No. of CE(s)                                                                                                                                                                                           | Eigenvalue | Statistic | Critical Value | Prob.** |
| None *                                                                                                                                                                                                 | 0.855343   | 173.7281  | 95.75366       | 0.0000  |
| At most 1 *                                                                                                                                                                                            | 0.771309   | 107.9928  | 69.81889       | 0.0000  |
| At most 2 *                                                                                                                                                                                            | 0.506827   | 57.82970  | 47.85613       | 0.0044  |
| At most 3 *                                                                                                                                                                                            | 0.410985   | 33.79529  | 29.79707       | 0.0164  |
| At most 4 *                                                                                                                                                                                            | 0.367769   | 15.79899  | 15.49471       | 0.0450  |
| At most 5                                                                                                                                                                                              | 0.006157   | 0.209990  | 3.841466       | 0.6468  |
| Trace test indicates 5 cointegrating eqn(s) at the 0.05 level                                                                                                                                          |            |           |                |         |
| * denotes rejection of the hypothesis at the 0.05 level                                                                                                                                                |            |           |                |         |
| **MacKinnon-Haug-Michelis (1999) p-values                                                                                                                                                              |            |           |                |         |
| Unrestricted Cointegration Rank Test (Maximum Eigenvalue)                                                                                                                                              |            |           |                |         |
| Hypothesized                                                                                                                                                                                           |            | Max-Eigen | 0.05           |         |
| No. of CE(s)                                                                                                                                                                                           | Eigenvalue | Statistic | Critical Value | Prob.** |
| None *                                                                                                                                                                                                 | 0.855343   | 65.73534  | 40.07757       | 0.0000  |
| At most 1 *                                                                                                                                                                                            | 0.771309   | 50.16309  | 33.87687       | 0.0003  |
| At most 2                                                                                                                                                                                              | 0.506827   | 24.03442  | 27.58434       | 0.1335  |
| At most 3                                                                                                                                                                                              | 0.410985   | 17.99630  | 21.13162       | 0.1300  |
| At most 4 *                                                                                                                                                                                            | 0.367769   | 15.58900  | 14.26460       | 0.0307  |
| At most 5                                                                                                                                                                                              | 0.006157   | 0.209990  | 3.841466       | 0.6468  |
| Max-eigenvalue test indicates 2 cointegrating eqn(s) at the 0.05 level                                                                                                                                 |            |           |                |         |

|                                                                    |                                   |                                 |                                |                                        |                      |
|--------------------------------------------------------------------|-----------------------------------|---------------------------------|--------------------------------|----------------------------------------|----------------------|
| * denotes rejection of the hypothesis at the 0.05 level            |                                   |                                 |                                |                                        |                      |
| **MacKinnon-Haug-Michelis (1999) p-values                          |                                   |                                 |                                |                                        |                      |
|                                                                    |                                   |                                 |                                |                                        |                      |
| Unrestricted Cointegrating Coefficients (normalized by b'S11*b=I): |                                   |                                 |                                |                                        |                      |
|                                                                    |                                   |                                 |                                |                                        |                      |
| FINANCIAL_INCLUSION_INDEX                                          | FINANCIAL_DISINTERMEDIATION_INDEX | MOBILE_MONEY_TRANSACTIONS_INDEX | ELECTRONIC_PAYMENT_VALUE_INDEX | BANK_BRANCHES_PER_100_000_ADULTS_INDEX | INTERNET_USERS_INDEX |
| -0.138451                                                          | 0.658931                          | -0.713345                       | -0.399442                      | -0.090971                              | -0.232281            |
| -0.862146                                                          | -0.138010                         | -6.115227                       | 0.968686                       | 2.053427                               | 0.151936             |
| 0.029114                                                           | -2.086683                         | 0.791193                        | 0.368947                       | 2.960821                               | 0.316966             |
| 0.515868                                                           | -3.318537                         | -0.980634                       | 0.694515                       | -0.097372                              | 0.418523             |
| 0.855074                                                           | -1.692184                         | -6.559138                       | 1.244825                       | -2.309259                              | -0.005416            |
| 0.394794                                                           | -2.357165                         | 3.127089                        | 0.171288                       | -0.131203                              | -0.038084            |
|                                                                    |                                   |                                 |                                |                                        |                      |
| Unrestricted Adjustment Coefficients (alpha):                      |                                   |                                 |                                |                                        |                      |
|                                                                    |                                   |                                 |                                |                                        |                      |
| D(FINANCIAL_INCLUSION_INDEX)                                       | 0.123025                          | -0.064952                       | 0.301510                       | -0.139371                              | -0.000586            |
| D(FINANCIAL_DISINTERMEDIATION_INDEX)                               | -0.063707                         | 0.012371                        | 0.220860                       | 0.050823                               | 0.086324             |
| D(MOBILE_MONEY_TRANSACTIONS_INDEX)                                 | -0.067766                         | 0.154708                        | -0.051550                      | -0.025764                              | 0.003185             |
| D(ELECTRONIC_PAYMENT_VALUE_INDEX)                                  | -0.670458                         | -0.038897                       | -0.012066                      | -0.200277                              | 0.012574             |
| D(BANK_BRANCHES_PER_100_000_ADULTS_INDEX)                          | -0.023783                         | -0.228297                       | -0.101307                      | 0.015464                               | 0.136422             |
| D(INTERNET_USERS_INDEX)                                            | 0.250158                          | 0.182722                        | -0.031143                      | -0.315751                              | 0.136976             |
|                                                                    |                                   |                                 |                                |                                        |                      |

|                                                                       |                                   |                                 |                                |                                        |                      |  |
|-----------------------------------------------------------------------|-----------------------------------|---------------------------------|--------------------------------|----------------------------------------|----------------------|--|
|                                                                       |                                   |                                 |                                |                                        |                      |  |
| 1 Cointegrating Equation(s):                                          |                                   | Log likelihood                  | -83.88216                      |                                        |                      |  |
|                                                                       |                                   |                                 |                                |                                        |                      |  |
| Normalized cointegrating coefficients (standard error in parentheses) |                                   |                                 |                                |                                        |                      |  |
| FINANCIAL_INCLUSION_INDEX                                             | FINANCIAL_DISINTERMEDIATION_INDEX | MOBILE_MONEY_TRANSACTIONS_INDEX | ELECTRONIC_PAYMENT_VALUE_INDEX | BANK_BRANCHES_PER_100_000_ADULTS_INDEX | INTERNET_USERS_INDEX |  |
| 1.000000                                                              | -4.759324                         | 5.152340                        | 2.885087                       | 0.657067                               | 1.677718             |  |
|                                                                       | (2.28393)                         | (5.59214)                       | (1.01298)                      | (1.93379)                              | (0.34375)            |  |
|                                                                       |                                   |                                 |                                |                                        |                      |  |
| Adjustment coefficients (standard error in parentheses)               |                                   |                                 |                                |                                        |                      |  |
| D(FINANCIAL_INCLUSION_INDEX)                                          | -0.017033                         |                                 |                                |                                        |                      |  |
|                                                                       | (0.01443)                         |                                 |                                |                                        |                      |  |
| D(FINANCIAL_DISINTERMEDIATION_INDEX)                                  | 0.008820                          |                                 |                                |                                        |                      |  |
|                                                                       | (0.01025)                         |                                 |                                |                                        |                      |  |
| D(MOBILE_MONEY_TRANSACTIONS_INDEX)                                    | 0.009382                          |                                 |                                |                                        |                      |  |
|                                                                       | (0.00586)                         |                                 |                                |                                        |                      |  |
| D(ELECTRONIC_PAYMENT_VALUE_INDEX)                                     | 0.092825                          |                                 |                                |                                        |                      |  |
|                                                                       | (0.01140)                         |                                 |                                |                                        |                      |  |
| D(BANK_BRANCHES_PER_100_000_ADULTS_INDEX)                             | 0.003293                          |                                 |                                |                                        |                      |  |
|                                                                       | (0.01048)                         |                                 |                                |                                        |                      |  |
| D(INTERNET_USERS_INDEX)                                               | -0.034635                         |                                 |                                |                                        |                      |  |
|                                                                       | (0.01651)                         |                                 |                                |                                        |                      |  |
|                                                                       |                                   |                                 |                                |                                        |                      |  |
|                                                                       |                                   |                                 |                                |                                        |                      |  |
| 2 Cointegrating Equation(s):                                          |                                   | Log likelihood                  | -58.80061                      |                                        |                      |  |
|                                                                       |                                   |                                 |                                |                                        |                      |  |
| Normalized cointegrating coefficients (standard error in parentheses) |                                   |                                 |                                |                                        |                      |  |
| FINANCIAL_INCLUSION_INDEX                                             | FINANCIAL_DISINTERMEDIATION_INDEX | MOBILE_MONEY_TRANSACTIONS_INDEX | ELECTRONIC_PAYMENT_VALUE_INDEX | BANK_BRANCHES_PER_100_000_ADULTS_INDEX | INTERNET_USERS_INDEX |  |
| 1.000000                                                              | 0.000000                          | 7.029877                        | -0.993133                      | -2.282878                              | -0.115903            |  |
|                                                                       |                                   | (1.14544)                       | (0.16036)                      | (0.25613)                              | (0.04103)            |  |

|                                                                       |                                   |                                 |                                |                                        |                      |  |
|-----------------------------------------------------------------------|-----------------------------------|---------------------------------|--------------------------------|----------------------------------------|----------------------|--|
| 0.000000                                                              | 1.000000                          | 0.394497                        | -0.814868                      | -0.617723                              | -0.376865            |  |
|                                                                       |                                   | (1.14298)                       | (0.16001)                      | (0.25558)                              | (0.04094)            |  |
|                                                                       |                                   |                                 |                                |                                        |                      |  |
| Adjustment coefficients (standard error in parentheses)               |                                   |                                 |                                |                                        |                      |  |
| D(FINANCIAL_INCLUSION_INDEX)                                          | 0.038966                          | 0.090029                        |                                |                                        |                      |  |
|                                                                       | (0.09031)                         | (0.06963)                       |                                |                                        |                      |  |
| D(FINANCIAL_DISINTERMEDIATION_INDEX)                                  | -0.001845                         | -0.043686                       |                                |                                        |                      |  |
|                                                                       | (0.06460)                         | (0.04981)                       |                                |                                        |                      |  |
| D(MOBILE_MONEY_TRANSACTIONS_INDEX)                                    | -0.123998                         | -0.066004                       |                                |                                        |                      |  |
|                                                                       | (0.02575)                         | (0.01985)                       |                                |                                        |                      |  |
| D(ELECTRONIC_PAYMENT_VALUE_INDEX)                                     | 0.126360                          | -0.436418                       |                                |                                        |                      |  |
|                                                                       | (0.07161)                         | (0.05521)                       |                                |                                        |                      |  |
| D(BANK_BRANCHES_PER_100_000_ADULTS_INDEX)                             | 0.200118                          | 0.015836                        |                                |                                        |                      |  |
|                                                                       | (0.05331)                         | (0.04110)                       |                                |                                        |                      |  |
| D(INTERNET_USERS_INDEX)                                               | -0.192168                         | 0.139620                        |                                |                                        |                      |  |
|                                                                       | (0.09930)                         | (0.07656)                       |                                |                                        |                      |  |
|                                                                       |                                   |                                 |                                |                                        |                      |  |
|                                                                       |                                   |                                 |                                |                                        |                      |  |
| 3 Cointegrating Equation(s):                                          |                                   | Log likelihood                  | -46.78340                      |                                        |                      |  |
|                                                                       |                                   |                                 |                                |                                        |                      |  |
| Normalized cointegrating coefficients (standard error in parentheses) |                                   |                                 |                                |                                        |                      |  |
| FINANCIAL_INCLUSION_INDEX                                             | FINANCIAL_DISINTERMEDIATION_INDEX | MOBILE_MONEY_TRANSACTIONS_INDEX | ELECTRONIC_PAYMENT_VALUE_INDEX | BANK_BRANCHES_PER_100_000_ADULTS_INDEX | INTERNET_USERS_INDEX |  |
| 1.000000                                                              | 0.000000                          | 0.000000                        | 5.502151                       | -10.95131                              | 2.208201             |  |
|                                                                       |                                   |                                 | (0.63804)                      | (2.88460)                              | (0.53567)            |  |
| 0.000000                                                              | 1.000000                          | 0.000000                        | -0.450371                      | -1.104171                              | -0.246443            |  |
|                                                                       |                                   |                                 | (0.02975)                      | (0.13448)                              | (0.02497)            |  |
| 0.000000                                                              | 0.000000                          | 1.000000                        | -0.923954                      | 1.233084                               | -0.330604            |  |
|                                                                       |                                   |                                 | (0.09071)                      | (0.41010)                              | (0.07615)            |  |
|                                                                       |                                   |                                 |                                |                                        |                      |  |
| Adjustment coefficients (standard error in parentheses)               |                                   |                                 |                                |                                        |                      |  |

|                                                                       |                                   |                                 |                                |                                        |                      |  |
|-----------------------------------------------------------------------|-----------------------------------|---------------------------------|--------------------------------|----------------------------------------|----------------------|--|
| D(FINANCIAL_INCLUSION_INDEX)                                          | 0.047744                          | -0.539126                       | 0.547992                       |                                        |                      |  |
|                                                                       | (0.07414)                         | (0.18606)                       | (0.52674)                      |                                        |                      |  |
| D(FINANCIAL_DISINTERMEDIATION_INDEX)                                  | 0.004585                          | -0.504550                       | 0.144535                       |                                        |                      |  |
|                                                                       | (0.05240)                         | (0.13151)                       | (0.37230)                      |                                        |                      |  |
| D(MOBILE_MONEY_TRANSACTIONS_INDEX)                                    | -0.125499                         | 0.041564                        | -0.938518                      |                                        |                      |  |
|                                                                       | (0.02420)                         | (0.06074)                       | (0.17196)                      |                                        |                      |  |
| D(ELECTRONIC_PAYMENT_VALUE_INDEX)                                     | 0.126009                          | -0.411239                       | 0.706584                       |                                        |                      |  |
|                                                                       | (0.07162)                         | (0.17975)                       | (0.50887)                      |                                        |                      |  |
| D(BANK_BRANCHES_PER_100_000_ADULTS_INDEX)                             | 0.197168                          | 0.227232                        | 1.332898                       |                                        |                      |  |
|                                                                       | (0.05044)                         | (0.12658)                       | (0.35836)                      |                                        |                      |  |
| D(INTERNET_USERS_INDEX)                                               | -0.193075                         | 0.204606                        | -1.320477                      |                                        |                      |  |
|                                                                       | (0.09921)                         | (0.24899)                       | (0.70489)                      |                                        |                      |  |
|                                                                       |                                   |                                 |                                |                                        |                      |  |
|                                                                       |                                   |                                 |                                |                                        |                      |  |
| 4 Cointegrating Equation(s):                                          |                                   | Log likelihood                  | -37.78526                      |                                        |                      |  |
|                                                                       |                                   |                                 |                                |                                        |                      |  |
| Normalized cointegrating coefficients (standard error in parentheses) |                                   |                                 |                                |                                        |                      |  |
| FINANCIAL_INCLUSION_INDEX                                             | FINANCIAL_DISINTERMEDIATION_INDEX | MOBILE_MONEY_TRANSACTIONS_INDEX | ELECTRONIC_PAYMENT_VALUE_INDEX | BANK_BRANCHES_PER_100_000_ADULTS_INDEX | INTERNET_USERS_INDEX |  |
| 1.000000                                                              | 0.000000                          | 0.000000                        | 0.000000                       | -7.201648                              | -0.046956            |  |
|                                                                       |                                   |                                 |                                | (0.92705)                              | (0.17000)            |  |
| 0.000000                                                              | 1.000000                          | 0.000000                        | 0.000000                       | -1.411094                              | -0.061850            |  |
|                                                                       |                                   |                                 |                                | (0.20451)                              | (0.03750)            |  |
| 0.000000                                                              | 0.000000                          | 1.000000                        | 0.000000                       | 0.603419                               | 0.048096             |  |
|                                                                       |                                   |                                 |                                | (0.12781)                              | (0.02344)            |  |
| 0.000000                                                              | 0.000000                          | 0.000000                        | 1.000000                       | -0.681490                              | 0.409868             |  |
|                                                                       |                                   |                                 |                                | (0.44576)                              | (0.08174)            |  |
|                                                                       |                                   |                                 |                                |                                        |                      |  |
| Adjustment coefficients (standard error in parentheses)               |                                   |                                 |                                |                                        |                      |  |
| D(FINANCIAL_INCLUSION_INDEX)                                          | -0.024153                         | -0.076618                       | 0.684664                       | -0.097614                              |                      |  |

|                                                                       |                                   |                                 |                                |                                        |                      |  |
|-----------------------------------------------------------------------|-----------------------------------|---------------------------------|--------------------------------|----------------------------------------|----------------------|--|
|                                                                       | (0.08151)                         | (0.31953)                       | (0.50485)                      | (0.10525)                              |                      |  |
| D(FINANCIAL_DISINTERMEDIATION_INDEX)                                  | 0.030803                          | -0.673208                       | 0.094697                       | 0.154214                               |                      |  |
|                                                                       | (0.06001)                         | (0.23524)                       | (0.37168)                      | (0.07749)                              |                      |  |
| D(MOBILE_MONEY_TRANSACTIONS_INDEX)                                    | -0.138790                         | 0.127063                        | -0.913253                      | 0.140019                               |                      |  |
|                                                                       | (0.02764)                         | (0.10834)                       | (0.17117)                      | (0.03568)                              |                      |  |
| D(ELECTRONIC_PAYMENT_VALUE_INDEX)                                     | 0.022692                          | 0.253388                        | 0.902982                       | 0.086583                               |                      |  |
|                                                                       | (0.07301)                         | (0.28620)                       | (0.45220)                      | (0.09427)                              |                      |  |
| D(BANK_BRANCHES_PER_100_000_ADULTS_INDEX)                             | 0.205146                          | 0.175912                        | 1.317733                       | -0.238284                              |                      |  |
|                                                                       | (0.05849)                         | (0.22931)                       | (0.36230)                      | (0.07553)                              |                      |  |
| D(INTERNET_USERS_INDEX)                                               | -0.355961                         | 1.252438                        | -1.010840                      | -0.153707                              |                      |  |
|                                                                       | (0.09658)                         | (0.37861)                       | (0.59819)                      | (0.12471)                              |                      |  |
|                                                                       |                                   |                                 |                                |                                        |                      |  |
|                                                                       |                                   |                                 |                                |                                        |                      |  |
| 5 Cointegrating Equation(s):                                          | Log likelihood                    |                                 | -29.99076                      |                                        |                      |  |
|                                                                       |                                   |                                 |                                |                                        |                      |  |
| Normalized cointegrating coefficients (standard error in parentheses) |                                   |                                 |                                |                                        |                      |  |
| FINANCIAL_INCLUSION_INDEX                                             | FINANCIAL_DISINTERMEDIATION_INDEX | MOBILE_MONEY_TRANSACTIONS_INDEX | ELECTRONIC_PAYMENT_VALUE_INDEX | BANK_BRANCHES_PER_100_000_ADULTS_INDEX | INTERNET_USERS_INDEX |  |
| 1.000000                                                              | 0.000000                          | 0.000000                        | 0.000000                       | 0.000000                               | -0.351098            |  |
|                                                                       |                                   |                                 |                                |                                        | (0.16328)            |  |
| 0.000000                                                              | 1.000000                          | 0.000000                        | 0.000000                       | 0.000000                               | -0.121444            |  |
|                                                                       |                                   |                                 |                                |                                        | (0.04955)            |  |
| 0.000000                                                              | 0.000000                          | 1.000000                        | 0.000000                       | 0.000000                               | 0.073579             |  |
|                                                                       |                                   |                                 |                                |                                        | (0.01319)            |  |
| 0.000000                                                              | 0.000000                          | 0.000000                        | 1.000000                       | 0.000000                               | 0.381087             |  |
|                                                                       |                                   |                                 |                                |                                        | (0.07335)            |  |
| 0.000000                                                              | 0.000000                          | 0.000000                        | 0.000000                       | 1.000000                               | -0.042232            |  |
|                                                                       |                                   |                                 |                                |                                        | (0.04176)            |  |
|                                                                       |                                   |                                 |                                |                                        |                      |  |
| Adjustment coefficients (standard error in parentheses)               |                                   |                                 |                                |                                        |                      |  |
| D(FINANCIAL_INCLUSION_INDEX)                                          | -0.024654                         | -0.075627                       | 0.688505                       | -0.098343                              | 0.763073             |  |

|                                           |           |           |           |           |           |  |
|-------------------------------------------|-----------|-----------|-----------|-----------|-----------|--|
|                                           | (0.10659) | (0.34725) | (0.72975) | (0.14518) | (0.34398) |  |
| D(FINANCIAL_DISINTERMEDIATION_INDEX)      | 0.104616  | -0.819283 | -0.471512 | 0.261672  | 0.480833  |  |
|                                           | (0.07519) | (0.24495) | (0.51477) | (0.10241) | (0.24265) |  |
| D(MOBILE_MONEY_TRANSACTIONS_INDEX)        | -0.136067 | 0.121674  | -0.934141 | 0.143983  | 0.166370  |  |
|                                           | (0.03613) | (0.11770) | (0.24735) | (0.04921) | (0.11659) |  |
| D(ELECTRONIC_PAYMENT_VALUE_INDEX)         | 0.033444  | 0.232111  | 0.820510  | 0.102235  | -0.064140 |  |
|                                           | (0.09542) | (0.31085) | (0.65325) | (0.12996) | (0.30792) |  |
| D(BANK_BRANCHES_PER_100_000_ADULTS_INDEX) | 0.321797  | -0.054938 | 0.422924  | -0.068463 | -1.083118 |  |
|                                           | (0.06776) | (0.22074) | (0.46389) | (0.09229) | (0.21866) |  |
| D(INTERNET_USERS_INDEX)                   | -0.238836 | 1.020650  | -1.909282 | 0.016803  | -0.025327 |  |
|                                           | (0.12117) | (0.39472) | (0.82952) | (0.16503) | (0.39101) |  |
|                                           |           |           |           |           |           |  |
|                                           |           |           |           |           |           |  |

**Source:** Authors Computation using Eviews 10

### Granger Causality Tests

|                                                                                    |     |             |        |
|------------------------------------------------------------------------------------|-----|-------------|--------|
| Pairwise Granger Causality Tests                                                   |     |             |        |
| Date: 07/11/26 Time: 06:02                                                         |     |             |        |
| Sample: 1990 2025                                                                  |     |             |        |
| Lags: 2                                                                            |     |             |        |
|                                                                                    |     |             |        |
| Null Hypothesis:                                                                   | Obs | F-Statistic | Prob.  |
|                                                                                    |     |             |        |
| FINANCIAL_DISINTERMEDIATION_INDEX does not Granger Cause FINANCIAL_INCLUSION_INDEX | 34  | 11.4988     | 0.0002 |
| FINANCIAL_INCLUSION_INDEX does not Granger Cause FINANCIAL_DISINTERMEDIATION_INDEX |     | 9.21161     | 0.0008 |
|                                                                                    |     |             |        |
| MOBILE_MONEY_TRANSACTIONS_INDEX does not Granger Cause FINANCIAL_INCLUSION_INDEX   | 34  | 11.8664     | 0.0002 |
| FINANCIAL_INCLUSION_INDEX does not Granger Cause MOBILE_MONEY_TRANSACTIONS_INDEX   |     | 8.10556     | 0.0016 |
|                                                                                    |     |             |        |
| ELECTRONIC_PAYMENT_VALUE_INDEX does not Granger Cause FINANCIAL_INCLUSION_INDEX    | 34  | 9.13613     | 0.0008 |

|                                                                                                    |    |         |        |
|----------------------------------------------------------------------------------------------------|----|---------|--------|
| FINANCIAL_INCLUSION_INDEX does not Granger Cause<br>ELECTRONIC_PAYMENT_VALUE_INDEX                 |    | 16.3369 | 2.E-05 |
|                                                                                                    |    |         |        |
| BANK_BRANCHES_PER_100_000_ADULTS_INDEX does not Granger Cause<br>FINANCIAL_INCLUSION_INDEX         | 34 | 13.5406 | 7.E-05 |
| FINANCIAL_INCLUSION_INDEX does not Granger Cause<br>BANK_BRANCHES_PER_100_000_ADULTS_INDEX         |    | 0.31265 | 0.7339 |
|                                                                                                    |    |         |        |
| INTERNET_USERS_INDEX does not Granger Cause<br>FINANCIAL_INCLUSION_INDEX                           | 34 | 9.43581 | 0.0007 |
| FINANCIAL_INCLUSION_INDEX does not Granger Cause<br>INTERNET_USERS_INDEX                           |    | 4.91312 | 0.0145 |
|                                                                                                    |    |         |        |
| MOBILE_MONEY_TRANSACTIONS_INDEX does not Granger Cause<br>FINANCIAL_DISINTERMEDIATION_INDEX        | 34 | 6.82924 | 0.0037 |
| FINANCIAL_DISINTERMEDIATION_INDEX does not Granger Cause<br>MOBILE_MONEY_TRANSACTIONS_INDEX        |    | 10.1602 | 0.0005 |
|                                                                                                    |    |         |        |
| ELECTRONIC_PAYMENT_VALUE_INDEX does not Granger Cause<br>FINANCIAL_DISINTERMEDIATION_INDEX         | 34 | 6.58553 | 0.0044 |
| FINANCIAL_DISINTERMEDIATION_INDEX does not Granger Cause<br>ELECTRONIC_PAYMENT_VALUE_INDEX         |    | 27.0673 | 2.E-07 |
|                                                                                                    |    |         |        |
| BANK_BRANCHES_PER_100_000_ADULTS_INDEX does not Granger Cause<br>FINANCIAL_DISINTERMEDIATION_INDEX | 34 | 8.32485 | 0.0014 |
| FINANCIAL_DISINTERMEDIATION_INDEX does not Granger Cause<br>BANK_BRANCHES_PER_100_000_ADULTS_INDEX |    | 0.26831 | 0.7665 |
|                                                                                                    |    |         |        |
| INTERNET_USERS_INDEX does not Granger Cause<br>FINANCIAL_DISINTERMEDIATION_INDEX                   | 34 | 6.24385 | 0.0056 |
| FINANCIAL_DISINTERMEDIATION_INDEX does not Granger Cause<br>INTERNET_USERS_INDEX                   |    | 3.59593 | 0.0403 |
|                                                                                                    |    |         |        |
| ELECTRONIC_PAYMENT_VALUE_INDEX does not Granger Cause<br>MOBILE_MONEY_TRANSACTIONS_INDEX           | 34 | 10.9918 | 0.0003 |
| MOBILE_MONEY_TRANSACTIONS_INDEX does not Granger Cause<br>ELECTRONIC_PAYMENT_VALUE_INDEX           |    | 13.1772 | 8.E-05 |
|                                                                                                    |    |         |        |
| BANK_BRANCHES_PER_100_000_ADULTS_INDEX does not Granger Cause<br>MOBILE_MONEY_TRANSACTIONS_INDEX   | 34 | 5.63070 | 0.0086 |
| MOBILE_MONEY_TRANSACTIONS_INDEX does not Granger Cause<br>BANK_BRANCHES_PER_100_000_ADULTS_INDEX   |    | 0.91981 | 0.4099 |
|                                                                                                    |    |         |        |
| INTERNET_USERS_INDEX does not Granger Cause<br>MOBILE_MONEY_TRANSACTIONS_INDEX                     | 34 | 7.21513 | 0.0029 |
| MOBILE_MONEY_TRANSACTIONS_INDEX does not Granger Cause<br>INTERNET_USERS_INDEX                     |    | 1.40403 | 0.2618 |

|                                                                                                |    |          |        |
|------------------------------------------------------------------------------------------------|----|----------|--------|
| BANK_BRANCHES__PER_100_000_ADULTS__INDEX does not Granger Cause ELECTRONIC_PAYMENT_VALUE_INDEX | 34 | 8.18122  | 0.0015 |
| ELECTRONIC_PAYMENT_VALUE_INDEX does not Granger Cause BANK_BRANCHES__PER_100_000_ADULTS__INDEX |    | 0.31605  | 0.7315 |
| INTERNET_USERS_INDEX does not Granger Cause ELECTRONIC_PAYMENT_VALUE_INDEX                     | 34 | 33.18293 | E-08   |
| ELECTRONIC_PAYMENT_VALUE_INDEX does not Granger Cause INTERNET_USERS_INDEX                     |    | 4.65132  | 0.0177 |
| INTERNET_USERS_INDEX does not Granger Cause BANK_BRANCHES__PER_100_000_ADULTS__INDEX           | 34 | 0.13370  | 0.8754 |
| BANK_BRANCHES__PER_100_000_ADULTS__INDEX does not Granger Cause INTERNET_USERS_INDEX           |    | 4.91718  | 0.0145 |

**Source:** Authors Computation using Eviews 10

### Elliott–Rothenberg–Stock Dickey Fuller Tests

|                                                            |             |            |             |             |
|------------------------------------------------------------|-------------|------------|-------------|-------------|
| Null Hypothesis: FINANCIAL_INCLUSION_INDEX has a unit root |             |            |             |             |
| Exogenous: Constant                                        |             |            |             |             |
| Lag Length: 3 (Automatic - based on SIC, maxlag=9)         |             |            |             |             |
|                                                            |             |            |             | t-Statistic |
| Elliott-Rothenberg-Stock DF-GLS test statistic             |             |            |             | -2.655708   |
| Test critical values:                                      | 1% level    |            |             | -2.639210   |
|                                                            | 5% level    |            |             | -1.951687   |
|                                                            | 10% level   |            |             | -1.610579   |
| *MacKinnon (1996)                                          |             |            |             |             |
|                                                            |             |            |             |             |
|                                                            |             |            |             |             |
| DF-GLS Test Equation on GLS Detrended Residuals            |             |            |             |             |
| Dependent Variable: D(GLSRESID)                            |             |            |             |             |
| Method: Least Squares                                      |             |            |             |             |
| Date: 07/11/26 Time: 06:16                                 |             |            |             |             |
| Sample (adjusted): 1994 2025                               |             |            |             |             |
| Included observations: 32 after adjustments                |             |            |             |             |
| Variable                                                   | Coefficient | Std. Error | t-Statistic | Prob.       |
| GLSRESID(-1)                                               | -0.015930   | 0.005998   | -2.655708   | 0.0129      |

|                    |           |                       |          |          |
|--------------------|-----------|-----------------------|----------|----------|
| D(GLSRESID(-1))    | 0.274055  | 0.124516              | 2.200965 | 0.0361   |
| D(GLSRESID(-2))    | 0.084820  | 0.135001              | 0.628295 | 0.5349   |
| D(GLSRESID(-3))    | 0.794881  | 0.132300              | 6.008146 | 0.0000   |
|                    |           |                       |          |          |
| R-squared          | 0.827007  | Mean dependent var    |          | 2.031250 |
| Adjusted R-squared | 0.808472  | S.D. dependent var    |          | 1.121185 |
| S.E. of regression | 0.490674  | Akaike info criterion |          | 1.530395 |
| Sum squared resid  | 6.741306  | Schwarz criterion     |          | 1.713612 |
| Log likelihood     | -20.48632 | Hannan-Quinn criter.  |          | 1.591126 |
| Durbin-Watson stat | 2.114737  |                       |          |          |
|                    |           |                       |          |          |
|                    |           |                       |          |          |

**Source:** Authors Computation using Eviews 10

### ARDL Tests

|                                                                    |             |            |             |        |
|--------------------------------------------------------------------|-------------|------------|-------------|--------|
| Dependent Variable: FINANCIAL_INCLUSION_INDEX                      |             |            |             |        |
| Method: ARDL                                                       |             |            |             |        |
| Date: 07/11/26 Time: 06:05                                         |             |            |             |        |
| Sample (adjusted): 1994 2025                                       |             |            |             |        |
| Included observations: 32 after adjustments                        |             |            |             |        |
| Maximum dependent lags: 4 (Automatic selection)                    |             |            |             |        |
| Model selection method: Akaike info criterion (AIC)                |             |            |             |        |
| Dynamic regressors (4 lags, automatic): FINANCIAL_DISINTERMEDIATIO |             |            |             |        |
| N_INDEX MOBILE_MONEY_TRANSACTIONS_INDEX                            |             |            |             |        |
| ELECTRONIC_PAYMENT_VALUE_INDEX BANK_BRANCHES_PE                    |             |            |             |        |
| R_100_000_ADULTS_INDEX INTERNET_USERS_INDEX                        |             |            |             |        |
| Fixed regressors: C                                                |             |            |             |        |
| Number of models evaluated: 12500                                  |             |            |             |        |
| Selected Model: ARDL(4, 4, 4, 3, 4, 3)                             |             |            |             |        |
|                                                                    |             |            |             |        |
| Variable                                                           | Coefficient | Std. Error | t-Statistic | Prob.* |
|                                                                    |             |            |             |        |
| FINANCIAL_INCLUSION_INDEX(-1)                                      | 1.017238    | 0.213814   | 4.757593    | 0.0089 |
| FINANCIAL_INCLUSION_INDEX(-2)                                      | -1.029773   | 0.203480   | -5.060812   | 0.0072 |
| FINANCIAL_INCLUSION_INDEX(-3)                                      | 1.172581    | 0.183486   | 6.390582    | 0.0031 |
| FINANCIAL_INCLUSION_INDEX(-4)                                      | -1.106870   | 0.380403   | -2.909729   | 0.0437 |
| FINANCIAL_DISINTERMEDIATION_INDEX                                  | 1.311328    | 0.365494   | 3.587820    | 0.0230 |
| FINANCIAL_DISINTERMEDIATION_INDEX(-1)                              | 0.493878    | 0.259169   | 1.905621    | 0.1294 |
| FINANCIAL_DISINTERMEDIATION_INDEX(-2)                              | -0.834260   | 0.192994   | -4.322726   | 0.0124 |
| FINANCIAL_DISINTERMEDIATION_INDEX(-3)                              | 0.251107    | 0.232004   | 1.082343    | 0.3400 |

|                                                                              |           |                       |           |           |
|------------------------------------------------------------------------------|-----------|-----------------------|-----------|-----------|
| FINANCIAL_DISINTERMEDIATION_INDEX(-4)                                        | 0.947663  | 0.258229              | 3.669856  | 0.0214    |
| MOBILE_MONEY_TRANSACTIONS_INDEX                                              | 0.127271  | 0.777867              | 0.163615  | 0.8780    |
| MOBILE_MONEY_TRANSACTIONS_INDEX(-1)                                          | 1.351760  | 0.538445              | 2.510490  | 0.0660    |
| MOBILE_MONEY_TRANSACTIONS_INDEX(-2)                                          | 0.460768  | 0.834314              | 0.552271  | 0.6102    |
| MOBILE_MONEY_TRANSACTIONS_INDEX(-3)                                          | 0.230127  | 0.436336              | 0.527407  | 0.6258    |
| MOBILE_MONEY_TRANSACTIONS_INDEX(-4)                                          | 3.286298  | 0.732347              | 4.487353  | 0.0109    |
| ELECTRONIC_PAYMENT_VALUE_INDEX                                               | -0.663360 | 0.204369              | -3.245893 | 0.0315    |
| ELECTRONIC_PAYMENT_VALUE_INDEX(-1)                                           | 0.464537  | 0.276695              | 1.678877  | 0.1685    |
| ELECTRONIC_PAYMENT_VALUE_INDEX(-2)                                           | 0.013537  | 0.224096              | 0.060409  | 0.9547    |
| ELECTRONIC_PAYMENT_VALUE_INDEX(-3)                                           | -0.902007 | 0.188670              | -4.780884 | 0.0088    |
| BANK_BRANCHES__PER_100_000_ADULTS__INDEX                                     | 0.696099  | 0.240665              | 2.892392  | 0.0445    |
| BANK_BRANCHES__PER_100_000_ADULTS__INDEX(-1)                                 | 0.710153  | 0.186312              | 3.811643  | 0.0189    |
| BANK_BRANCHES__PER_100_000_ADULTS__INDEX(-2)                                 | -0.451912 | 0.314234              | -1.438138 | 0.2238    |
| BANK_BRANCHES__PER_100_000_ADULTS__INDEX(-3)                                 | 1.756377  | 0.254531              | 6.900454  | 0.0023    |
| BANK_BRANCHES__PER_100_000_ADULTS__INDEX(-4)                                 | -0.154216 | 0.272618              | -0.565686 | 0.6018    |
| INTERNET_USERS_INDEX                                                         | 0.927782  | 0.195239              | 4.752034  | 0.0090    |
| INTERNET_USERS_INDEX(-1)                                                     | -1.560077 | 0.314836              | -4.955199 | 0.0077    |
| INTERNET_USERS_INDEX(-2)                                                     | 0.566939  | 0.209204              | 2.709978  | 0.0535    |
| INTERNET_USERS_INDEX(-3)                                                     | 0.123858  | 0.141459              | 0.875574  | 0.4307    |
| C                                                                            | -5.703704 | 2.136022              | -2.670246 | 0.0558    |
|                                                                              |           |                       |           |           |
| R-squared                                                                    | 0.999989  | Mean dependent var    |           | 39.75000  |
| Adjusted R-squared                                                           | 0.999918  | S.D. dependent var    |           | 20.90377  |
| S.E. of regression                                                           | 0.189680  | Akaike info criterion |           | -0.816400 |
| Sum squared resid                                                            | 0.143914  | Schwarz criterion     |           | 0.466119  |
| Log likelihood                                                               | 41.06240  | Hannan-Quinn criter.  |           | -0.391281 |
| F-statistic                                                                  | 13944.42  | Durbin-Watson stat    |           | 2.595400  |
| Prob(F-statistic)                                                            | 0.000000  |                       |           |           |
|                                                                              |           |                       |           |           |
| *Note: p-values and any subsequent tests do not account for model selection. |           |                       |           |           |

**Source:** Authors Computation using Eviews 10

## DISCUSSIONS

### Discussions on Descriptive Statistics

The descriptive statistics reveal significant changes in Nigeria's financial sector between 1990 and 2025. The

**Financial Inclusion Index (FII)** recorded an average value of **36.97**, with a minimum of **14.00** and a maximum of **80.00**, reflecting a steady improvement in access to formal financial services over the study period. The **Financial Disintermediation Index (FDI)** had a mean of **14.97**, ranging from **2.00** to **61.00**, suggesting a significant expansion of alternative financial channels such as fintech platforms and digital financial services. **Mobile Money Transactions (MMT)** exhibited a relatively low mean of **3.39**, with a median of **0.00**, indicating that mobile money activity was virtually non-existent during the early years but increased considerably in later years, reaching a maximum value of **26.00**. Similarly, the **Electronic Payment Value Index (EPVI)** recorded a mean of **30.58**, a median of **4.50**, and a maximum of **198.00**, highlighting the rapid growth of electronic payment systems, particularly in the last decade.

The **Bank Branches per 100,000 Adults Index (BBI)** had a mean of **8.92**, with values ranging from **5.00** to **13.00**, indicating a gradual expansion of the banking network, although the relatively low standard deviation (**2.70**) suggests modest changes compared to the digital finance variables. The **Internet Users Index (IUI)** averaged **22.42**, increasing from **0.00** to **83.00**, reflecting the remarkable growth in internet penetration that has supported. The Jarque–Bera normality test indicates that the Financial Inclusion Index ( $p = 0.1429$ ) and Bank Branches Index ( $p = 0.2260$ ) are approximately normally distributed, as the null hypothesis of normality cannot be rejected at the 5% significance level. In contrast, the Financial Disintermediation Index ( $p = 0.0019$ ), Mobile Money Transactions ( $p < 0.001$ ), Electronic Payment Value ( $p < 0.001$ ), and Internet Users Index ( $p = 0.0427$ ) deviate from normality, reflecting the rapid and uneven growth of digital financial technologies in Nigeria.

### Discussions on OLS

The regression results indicate that the model provides an excellent fit, with an **R-squared of 0.9977** and an **adjusted R-squared of 0.9974**, implying that approximately **99.77%** of the variation in the **Financial Inclusion Index** is explained by the explanatory variables included in the model. The **Financial Disintermediation Index** has a positive and statistically significant effect on financial inclusion ( $\beta = 2.0793$ ,  $p < 0.01$ ), suggesting that increased financial disintermediation significantly enhances access to financial services in Nigeria.

Similarly, **Bank Branches per 100,000 Adults** exerts a positive and highly significant influence ( $\beta = 1.9377$ ,  $p < 0.01$ ), indicating that the expansion of banking infrastructure remains an important driver of financial inclusion. Conversely, **Mobile Money Transactions**, **Electronic Payment Value**, and **Internet Users** exhibit negative coefficients but are statistically insignificant ( $p > 0.05$ ), implying that their individual effects on financial inclusion are not significant within the study period after controlling for other variables. The **Durbin–Watson statistic of 1.54** suggests a slight presence of positive autocorrelation in the residuals, although it is not severe. Overall, the findings suggest that financial disintermediation and the availability of bank branches are the major determinants of financial inclusion in Nigeria over the period 1990–2025.

### Discussions on Unit Root Tests

The **Augmented Dickey–Fuller (ADF) Unit root test** results indicate that the **Financial Inclusion Index** is **non-stationary at level**. The computed ADF test statistic of **−1.4463** is less negative than the 1%, 5%, and 10% critical values of **−3.6537**, **−2.9571**, and **−2.6174**, respectively. In addition, the associated **p-value of 0.5473** exceeds the 5% significance level, implying that the null hypothesis of a unit root cannot be rejected.

This suggests that the Financial Inclusion Index contains a unit root and exhibits a stochastic trend over the study period (1990–2025). Consequently, the series is not stationary in its level form and requires differencing before further time-series analysis. The regression equation underlying the ADF test shows that the lagged level coefficient is negative but statistically insignificant, further confirming the presence of a unit root. Therefore, the Financial Inclusion Index is expected to become stationary after first differencing, indicating that it is likely integrated of order one,

### Discussions on Johansen Co-Integration Tests

The **Johansen cointegration test** results indicate the existence of a **long-run equilibrium relationship** among the **Financial Inclusion Index**, **Financial Disintermediation Index**, **Mobile Money Transactions Index**, **Electronic Payment Value Index**, **Bank Branches per 100,000 Adults Index**, and **Internet Users Index** in

Nigeria over the period 1992–2025. The **Trace test** rejects the null hypothesis of no cointegration and identifies **five cointegrating equations** at the 5% significance level, while the **Maximum Eigenvalue test** identifies **two cointegrating equations**, as evidenced by probability values below 0.05.

Since both tests confirm at least one cointegrating relationship, the null hypothesis of no long-run relationship is rejected. This implies that although the individual variables may be non-stationary in the short run, they move together and converge towards a stable long-run equilibrium over time. Consequently, changes in financial disintermediation, mobile money transactions, electronic payment values, banking infrastructure, and internet usage have a sustained long-term relationship with financial inclusion in Nigeria, justifying the use of a **Vector Error Correction Model (VECM)** or other cointegration-based estimation techniques to examine both the short-run dynamics and long-run equilibrium relationships among the variables.

### Discussions on Granger Causality Tests

The **Pairwise Granger Causality Test** results reveal significant causal relationships among the study variables over the period 1990–2025. There is **bidirectional Granger causality** between **Financial Inclusion and Financial Disintermediation, Mobile Money Transactions, Electronic Payment Value, and Internet Users**, as the null hypotheses are rejected in both directions at the 5% significance level ( $p < 0.05$ ). This suggests that these variables mutually reinforce one another, implying that improvements in digital financial services promote financial inclusion while increased financial inclusion also stimulates the adoption of digital financial technologies.

However, the results indicate **unidirectional causality** running from **Bank Branches per 100,000 Adults to Financial Inclusion**, as bank branch expansion significantly predicts financial inclusion ( $p = 0.00007$ ), whereas financial inclusion does not Granger-cause bank branch expansion ( $p = 0.7339$ ). Similar unidirectional causal relationships are observed from **Bank Branches to Financial Disintermediation, Mobile Money Transactions, and Electronic Payment Value**, while internet usage is found to Granger-cause electronic payment value and mobile money transactions.

Overall, the findings demonstrate that both traditional banking infrastructure and digital financial innovations play important roles in driving financial inclusion in Nigeria, with digital finance variables exhibiting strong dynamic interactions that support the ongoing transformation of the country's financial system.

### Discussions on Elliott–Rothenberg–Stock Dickey Fuller Tests

The **Elliott–Rothenberg–Stock Dickey–Fuller Generalized Least Squares (DF-GLS) unit root test** results indicate that the **Financial Inclusion Index is stationary at level** under the GLS detrending procedure. The computed **DF-GLS test statistic of  $-2.6557$**  is more negative than the **1% critical value of  $-2.6392$** , as well as the 5% and 10% critical values, leading to the rejection of the null hypothesis that the series contains a unit root.

This finding suggests that the Financial Inclusion Index does not exhibit a stochastic trend after GLS detrending and is therefore **stationary at level,  $I(0)$** . Furthermore, the lagged level coefficient is negative and statistically significant ( $p = 0.0129$ ), reinforcing the conclusion of stationarity. The **Durbin–Watson statistic of 2.1147** also indicates the absence of serious autocorrelation in the residuals, while the overall regression statistics confirm the reliability of the estimation. Consequently, the DF-GLS results imply that shocks to the Financial Inclusion Index are temporary and the series tends to revert to its long-run mean over time.

### Discussions on ARDL Tests

The **Autoregressive Distributed Lag (ARDL)** estimation results indicate a very strong dynamic relationship between **financial inclusion** and its determinants in Nigeria over the period 1994–2025. The selected **ARDL (4,4,4,3,4,3)** model, chosen using the Akaike Information Criterion (AIC), exhibits an excellent fit with an **R-squared of 0.999989** and an **adjusted R-squared of 0.999918**, indicating that approximately **99.99%** of the variation in the Financial Inclusion Index is explained by the model. The overall model is highly significant (**F-statistic = 13,944.42;  $p < 0.01$** ), while the **Durbin–Watson statistic of 2.5954** suggests the absence of serious autocorrelation. In the short run,

**Financial Disintermediation Index, Bank Branches per 100,000 Adults, and Internet Users Index** exert positive and statistically significant effects on financial inclusion, highlighting the important roles of digital financial innovation, banking infrastructure, and internet accessibility in promoting financial access. **Mobile Money Transactions** exhibit a positive but mixed effect, with the current value being insignificant while the fourth lag is positive and significant, suggesting that its contribution to financial inclusion materializes over time. Conversely, the **Electronic Payment Value Index** has a significant negative contemporaneous effect, although its lagged coefficients indicate that its influence varies across time.

The significant lagged values of the dependent variable further confirm the dynamic nature and persistence of financial inclusion, implying that current financial inclusion is strongly influenced by its past levels. Overall, the ARDL results provide strong evidence that both traditional banking infrastructure and digital financial development are key drivers of financial inclusion in Nigeria, with their effects occurring both immediately and through lagged adjustments over time.

## CONCLUSION

The findings of this study demonstrate that financial disintermediation plays a significant role in enhancing financial inclusion in Nigeria. The empirical results reveal the existence of a stable long-run relationship among financial inclusion, financial disintermediation, mobile money transactions, electronic payment values, bank branch expansion, and internet usage. The ARDL and Granger causality results further indicate that financial disintermediation and banking infrastructure significantly promote financial inclusion, while digital financial innovations such as mobile money and electronic payments exert dynamic effects that become more pronounced over time. Overall, the study concludes that the combined growth of digital financial platforms and traditional banking infrastructure has substantially improved access to financial services, thereby fostering greater financial inclusion and supporting the transformation of Nigeria's financial sector.

## RECOMMENDATIONS

Based on the findings, the study recommends that the Nigerian government, the Central Bank of Nigeria (CBN), and financial service providers should strengthen policies that encourage digital financial innovation while ensuring financial system stability.

- Investments in digital infrastructure, particularly reliable internet connectivity in underserved and rural areas, should be prioritized to expand access to digital financial services.
- Financial institutions and fintech companies should collaborate to develop affordable, secure, and user-friendly digital financial products that meet the needs of low-income and unbanked populations.
- Furthermore, policymakers should promote financial literacy programme to improve public awareness and adoption of digital financial services, while continuing to expand banking infrastructure through agency banking and strategically located bank branches to complement digital channels.

## Policy Implications

The findings have important policy implications for Nigeria's financial sector development strategy.

- First, regulators should formulate policies that support fintech innovation while maintaining effective oversight to safeguard consumer interests and financial stability.
- Second, policies aimed at accelerating digital transformation—including improved broadband penetration, mobile network expansion, and digital payment infrastructure—should be strengthened to deepen financial inclusion.
- Third, the continued expansion of agency banking and banking infrastructure should complement digital financial services to ensure inclusive access, particularly in rural and underserved communities.

- Finally, government agencies should foster collaboration among banks, fintech firms, telecommunications companies, and regulatory institutions to create an enabling environment that promotes innovation, increases financial access, and contributes to sustainable economic development.

### Authors Declaration

All the authors declared that there is no conflict of interest.

### Data Availability

Data will be made available on request

### REFERENCES

1. Aker, J. C., & Mbiti, I. M. (2019). *Mobile phones and economic development in Africa. Annual Review of Economics*, 11(1), 395–424. <https://doi.org/10.1146/annurev-economics-080218-030243>
2. Camara, N., & Tuesta, D. (2017). *Measuring financial inclusion: A multidimensional index. BBVA Research Working Paper No. 17/06*. <https://www.bbvaresearch.com>
3. Central Bank of Nigeria. (2022). *National financial inclusion strategy (revised edition)*. Abuja, Nigeria: Author.
4. Cornelli, G., Frost, J., Gambacorta, L., Rau, R., Wardrop, R., & Ziegler, T. (2020). *Fintech and Big Tech credit: Drivers and policy implications* (BIS Working Paper No. 887). Bank for International Settlements. <https://www.bis.org/publ/work887.htm>
5. Demirgüç-Kunt, A., Klapper, L. F., Singer, D., & Ansar, S. (2022). *The Global Findex Database 2021: Financial inclusion, digital payments, and resilience in the age of COVID-19*. World Bank Publications. <https://doi.org/10.1596/978-1-4648-1897-4>
6. Diamond, D. W. (1984). Financial intermediation and delegated monitoring. *Review of Economic Studies*, 51(3), 393–414. <https://doi.org/10.2307/2297430>
7. Efobi, U., Beecroft, I., & Osabuohien, E. (2021). Access to and use of mobile banking in Nigeria: Evidence from microdata. *Information Technology for Development*, 27(4), 662–679. <https://doi.org/10.1080/02681102.2020.1811942>
8. European Commission. (2020). *A digital finance strategy for the European Union*. Publications Office of the European Union. <https://finance.ec.europa.eu>
9. GSMA. (2023). *State of the industry report on mobile money 2023*. GSM Association. <https://www.gsma.com/mobilefordevelopment>
10. Klapper, L., Singer, D., & Ansar, S. (2022). *Digital financial inclusion: Addressing the last-mile barriers* (World Bank Policy Research Working Paper No. 10122). World Bank Group.
11. Levine, R. (2005). Finance and growth: Theory and evidence. In P. Aghion & S. Durlauf (Eds.), *Handbook of Economic Growth: Vol. 1A* (pp. 865–934). Elsevier Academic Press.
12. Morawczynski, O., & Pickens, M. (2009). *Poor people using mobile financial services: Observations on customer usage and impact from M-PESA*. CGAP Brief. <https://www.cgap.org/research/publication>
13. OECD. (2021). *The regulatory sandbox approach: Achieving balance between innovation and regulation*. OECD Policy Briefs on the Future of Finance. <https://doi.org/10.1787/9a4f71d4-en>
14. Olayowola, K., & Aregbesola, R. (2022). Digital platforms and financial inclusion in Nigeria. *Journal of African Business*, 23(2), 202–224. <https://doi.org/10.1080/15228916.2021.1954973>
15. Ozili, P. K. (2018). Impact of digital finance on financial inclusion and stability. *Borsa Istanbul Review*, 18(4), 329–340. <https://doi.org/10.1016/j.bir.2017.12.003>
16. Reserve Bank of India. (2021). *Master directions on digital payment security controls*. Mumbai, India: Author. <https://rbi.org.in>
17. Suri, T., & Jack, W. (2016). The long-run poverty and gender impacts of mobile money. *Science*, 354(6317), 1288–1292. <https://doi.org/10.1126/science.aah5309>
18. World Bank. (2022). *Responsible digital financial services: Policy and practice*. World Bank Group. <https://doi.org/10.1596/978-1-4648-1698-7>
19. Ziegler, T., Shneor, R., Garvey, K., & Wenzlaff, K. (2019). *The global alternative finance market benchmarking report*. University of Cambridge Centre for Alternative Finance.

20. Levine, R. (2005). Finance and growth: Theory and evidence. In P. Aghion & S. Durlauf (Eds.), *Handbook of economic growth* (Vol. 1, pp. 865–934). Elsevier. [https://doi.org/10.1016/S1574-0684\(05\)01012-9](https://doi.org/10.1016/S1574-0684(05)01012-9)
21. Ozili, P. K. (2018). Impact of digital finance on financial inclusion and stability. *Borsa Istanbul Review*, 18(4), 329–340. <https://doi.org/10.1016/j.bir.2017.12.003>
22. Ozili, P. K. (2020). Financial inclusion research around the world: A review. *Forum for Social Economics*, 49(4), 457–479. <https://doi.org/10.1080/07360932.2019.1715238>
23. Philippon, T. (2016). The fintech opportunity. *NBER Working Paper No. 22476*. National Bureau of Economic Research. <https://doi.org/10.3386/w22476>
24. Sahay, R., Čihák, M., N'Diaye, P., Barajas, A., Mitra, S., Kyobe, A., Mooi, Y. N., & Yousefi, S. R. (2015). *Financial inclusion: Can it meet multiple macroeconomic goals?* IMF Staff Discussion Note SDN/15/17. <https://www.imf.org/en/Publications/Staff-Discussion-Notes>
25. World Bank. (2022). *Nigeria digital economy diagnostic report*. Washington, DC: World Bank. <https://openknowledge.worldbank.org/handle/10986/36775>
26. World Bank. (2023). *Global financial development report: Financial inclusion*. Washington, DC: World Bank. <https://openknowledge.worldbank.org/handle/10986/38699>