

**EMPIRICAL PAPER**

# Foreign Direct Investment, Money Supply, and Economic Growth in Nigeria: Evidence from an Autoregressive Distributed Lag (ARDL) Approach (2010Q1–2023Q4)

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## DOI

[10.65820/ejems-8vol2-  
issue2-2026](https://doi.org/10.65820/ejems-8vol2-issue2-2026)

## Abstract

**Purpose:** This study examined the relationship between foreign direct investment (FDI), money supply, and economic growth in Nigeria using quarterly data from 2010Q1 to 2023Q4. It addresses the persistent debate and mixed empirical evidence regarding the long-run and short-run effects of FDI and monetary policy on economic growth.

**Methodology:** An ex post facto research design was adopted. Quarterly secondary data were obtained from the Central Bank of Nigeria Statistical Bulletin (2024). The Autoregressive Distributed Lag (ARDL) model was employed to examine both the short-run and long-run relationships among the variables.

**Results:** The findings revealed that FDI has no significant long-run effect on economic growth but exerts a positive and statistically significant impact in the short run. In contrast, money supply has a significant positive long-run effect on economic growth, while its short-run effect is negative and statistically significant.

**Novelty and Contribution:** This study contributes to the literature by providing updated quarterly evidence spanning 2010Q1–2023Q4 and distinguishing between the short-run and long-run effects of FDI and money supply on Nigeria's economic growth using the ARDL framework.

**Practical and Social Implications:** The findings suggest that policymakers should promote sector-specific FDI incentives targeting manufacturing, agro-processing, and technology to enhance sustainable growth. Additionally, the Central Bank of Nigeria should align money supply expansion with real sector output through effective monetary policy measures to control inflation and foster long-term economic stability.

**Keywords:** ARDL, Economic growth, Foreign Direct Investment, Money Supply, Nigeria

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## How to cite this article:

Danladi, G. P. (2026). Foreign direct investment, money supply, and economic growth in Nigeria: Evidence from an autoregressive distributed lag (ARDL) approach (2010Q1–2023Q4). *Elicit Journal of Economics and Management Studies*, 2(2), 122-138. [https://doi.org/10.65820/ejems-8vol2-  
issue2-2026](https://doi.org/10.65820/ejems-8vol2-issue2-2026)

## 1 Introduction

Foreign Direct Investment (FDI) and monetary policy have remained central pillars in global development discourse, particularly in the quest for sustained economic growth in both developed and developing economies. Globally, FDI is regarded as a critical channel for transferring capital, technology, managerial expertise, and market access, thereby stimulating productivity and growth. In Africa, and more specifically Sub-Saharan Africa (SSA), FDI inflows have been relatively volatile and unevenly distributed, reflecting structural weaknesses, macroeconomic instability, and institutional fragility across many economies. While some SSA countries have benefited from resource-driven FDI inflows, these investments have often failed to translate into broad-based and inclusive economic growth. Against this backdrop, Nigeria — Africa's largest economy — has experienced fluctuating FDI inflows alongside persistent macroeconomic challenges, including inflationary pressures, exchange rate instability, and inconsistent monetary policy outcomes. These dynamics raise important questions about how foreign capital inflows and domestic monetary conditions interact to influence economic growth, thereby motivating a rigorous empirical investigation within the Nigerian context (Ninyio, 2025).

From a theoretical perspective, economic growth theories provide important insights into the transmission mechanisms through which FDI and money supply affect output growth. Neoclassical growth theory emphasises capital accumulation as a key driver of growth, suggesting that FDI supplements domestic savings and accelerates capital formation. Endogenous growth theory extends this argument by highlighting the role of technology transfer, human capital development, and knowledge spillovers associated with FDI in sustaining long-term growth. Similarly, monetary theories underscore the importance of money supply in influencing economic activity through interest rates, credit availability, investment, and consumption channels. The Keynesian framework posits that expansionary monetary policy stimulates aggregate demand and output in the short run, while monetarist theory emphasises the long-run relationship between money supply and nominal income. Together, these theories raise a core empirical inquiry: to what extent do FDI and money supply independently and jointly drive economic growth, and how do their short-run and long-run effects differ within a developing economy such as Nigeria? (Davison, 2024).

In Nigeria, the volatility of FDI inflows appears to be closely intertwined with monetary shocks and weak institutional frameworks. Periods of expansionary monetary policy, often associated with efforts to stimulate growth or finance fiscal deficits, have frequently resulted in inflationary pressures, exchange rate depreciation, and heightened macroeconomic uncertainty. Such conditions can undermine investor confidence and discourage long-term foreign investments. Moreover, weak institutions — manifested in policy inconsistency, regulatory inefficiencies, corruption, and governance challenges — have constrained the productive utilisation of both foreign capital inflows and domestic liquidity. Consequently, while short-run surges in FDI or money supply may temporarily boost economic activity, their long-run growth effects may be dampened by structural rigidities and institutional weaknesses. Understanding how these contextual factors shape the FDI–money supply–growth nexus is therefore essential for explaining Nigeria's mixed growth outcomes over time (Odumisor, 2019; Muhammad et al., 2024; Nwisiwenyi & Okaro, 2024).

Empirical evidence on the relationship between FDI, money supply, and economic growth remains inconclusive, with findings differing across countries, time periods, and methodological approaches. For instance, Ozili (2025) and Irmiya et al. (2024) found that FDI had no significant impact on economic growth in Nigeria, attributing growth performance to domestic factors such as population dynamics, interest rates, entrepreneurship, and financial system development. In contrast, Mohammed and Nasiru (2021), using the ARDL approach, reported that FDI exerted a positive influence on economic growth in both the short and long run. Similarly, studies on monetary factors present mixed but insightful results. Bereksi et al. (2024) demonstrated that money supply shocks have asymmetric effects on economic growth in Algeria, while Dingela and Khobai (2017) found a significant positive relationship between broad money supply and growth in South Africa. Differences in geographical focus, institutional settings, data frequency, and econometric techniques contribute to these divergent outcomes, suggesting that country-specific dynamics and model specifications matter significantly.

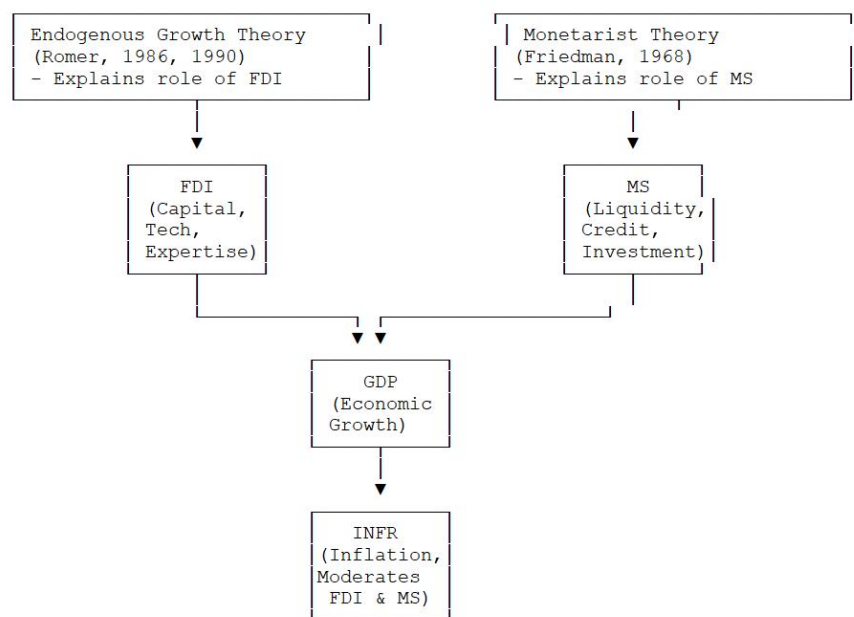
Despite the growing body of literature, several notable gaps remain, providing a rationale for the present study. First, many existing studies rely on annual data, which may obscure important short-run dynamics and adjustment processes captured more effectively with quarterly data. Second, limited attention has been given to jointly examining FDI and money supply within a unified dynamic framework that distinguishes between short-run and long-run effects. Third, the interaction between macroeconomic variables and institutional or policy environments is often

inadequately explored. This study addresses these gaps by employing a quarterly ARDL framework to analyse the dynamic relationship between FDI, money supply, and economic growth in Nigeria from 2010Q1 to 2023Q4. By capturing both short-run and long-run effects within a single coherent model, the study contributes original empirical evidence that enhances understanding of how foreign capital inflows and monetary conditions jointly shape Nigeria's growth trajectory, thereby informing more effective macroeconomic and investment policies.

## 2 Literature Review

### Conceptual Framework

The conceptual framework illustrates the relationship between Foreign Direct Investment (FDI), Money Supply (MS), Inflation (INFR), and Gross Domestic Product (GDP) within the theoretical context of Endogenous Growth Theory (Romer, 1986, 1990) and Monetarist Theory (Friedman, 1968). FDI, guided by Endogenous Growth Theory, contributes to economic growth by providing capital, technology transfer, and managerial expertise, while MS, grounded in Monetarist Theory, influences GDP by improving liquidity and facilitating investment and consumption. Inflation acts as a moderating variable, potentially weakening or enhancing the effects of FDI and MS on economic growth depending on price stability. Overall, the framework posits that sustainable GDP growth in Nigeria depends on the combined effects of foreign investment, monetary conditions, and inflation management, highlighting the interdependence of these variables in driving short-run and long-run economic outcomes.



**Figure 1** Conceptual Review

### Foreign Direct Investment (FDI)

Foreign direct investment (FDI) is a form of investment where a company or individual from one country makes a substantial financial investment in business interests in another country. This can include acquiring control over assets, establishing new operations, or expanding existing businesses to achieve a lasting interest in the foreign economy (Shabani, 2024).

FDI involves the transfer of capital, technology, and managerial expertise from a foreign investor to a host country. It typically encompasses investments such as establishing subsidiaries, joint ventures, or acquiring a significant stake in an existing foreign company. FDI is driven by the expectation of long-term financial returns and strategic market advantages (Husain, 2024).

FDI is the process through which a company or individual invests in a foreign business to gain substantial influence or control. This investment can take various forms, including mergers and acquisitions, setting up new facilities, or reinvesting profits earned from overseas operations. FDI aims to tap into new markets, access resources, and leverage cost advantages (Xiaoling et al., 2025).

Foreign direct investment (FDI) refers to an investment made by a firm or individual in one country into business interests located in another country. It usually involves acquiring a lasting interest or effective control in a foreign business, such as by purchasing shares, establishing new facilities, or expanding existing operations. FDI brings capital, technology, and management expertise to the host country, often contributing to economic growth, job creation, and development. However, it also involves risks, such as political instability or regulatory changes that can impact the investment's success.

## **Money Supply**

Money supply refers to the total amount of money available in an economy at a specific time, including cash, coins, and balances held in demand and savings accounts. It serves as a key indicator of the liquidity and purchasing power in the economy (Ali, 2024). Money supply encompasses the stock of monetary assets circulating within an economy, which can be classified into different measures, such as M1 (currency in circulation and demand deposits), M2 (M1 plus savings accounts and small-time deposits), and M3 (M2 plus large-time deposits and other larger liquid assets) (Alaskar et al., 2024). Money supply is the aggregate quantity of money controlled and regulated by a central bank to influence economic variables such as inflation, interest rates, and economic growth. It is a crucial tool in implementing monetary policy (Kudar, 2024).

Money supply refers to the total quantity of money available within an economy at a given time, including currency in circulation, demand deposits, and other liquid assets held by individuals, businesses, and institutions. It is classified into different measures such as M1 (physical cash and checking accounts), M2 (M1 plus savings deposits and small-time deposits), and M3 (M2 plus large-time deposits and other broader financial instruments). The money supply plays a critical role in determining economic activity, influencing inflation, interest rates, and overall economic growth. Central banks, such as the Central Bank of Nigeria, regulate the money supply through monetary policy to achieve macroeconomic stability.

## **Economic Growth**

Economic growth refers to the increase in a country's production of goods and services over a specific period, typically measured by the rise in its real Gross Domestic Product (GDP). It indicates an improvement in the economy's capacity to meet the needs and wants of its population (Olufemi & Omorogiuwa, 2024). Economic growth is the sustained increase in the value of goods and services produced within an economy, adjusted for inflation, reflecting a quantitative expansion in economic activity and productivity over time (Abdulkadr et al., 2024). Economic growth encompasses not only increments in output and income levels but also improvements in living standards, employment opportunities, technological advancements, and resource utilisation, contributing to broader socioeconomic development (Feng & Qi, 2024).

Economic growth is the sustained increase in the production of goods and services within an economy over a specific period, typically measured by the growth in real Gross Domestic Product (GDP). It reflects the economy's ability to produce more output, driven by factors such as improved productivity, technological advancements, capital investment, and labour force expansion. Economic growth is essential for raising living standards, creating employment opportunities, and enhancing overall societal well-being. It is a key indicator of a country's economic health and progress, often influencing policy decisions aimed at fostering long-term development.

## **Theoretical Framework**

This study is grounded in the Endogenous Growth Theory and the Monetarist Theory.

Endogenous Growth Theory, propounded by Romer (1986), asserts that economic growth is primarily driven by internal factors such as human capital, innovation, knowledge spillovers, and technology, rather than relying solely on

exogenous forces. The principle of the theory is that investments in productive activities, research and development, and technology adoption lead to sustained increases in output and productivity. In the context of this study, FDI acts as a channel for transferring technology, managerial expertise, and capital into Nigeria, enhancing domestic productivity and promoting long-term economic growth. The theory is relevant here because it provides the rationale for examining how FDI contributes to growth, especially when complemented by domestic institutional capacity and investment in productive sectors.

Monetarist Theory, propounded by Friedman (1968), emphasises that the supply of money in an economy is a primary determinant of economic activity. The principle of the theory is that changes in money supply influence aggregate demand, investment, and consumption, thereby affecting short-run and long-run economic growth. In this study, money supply (MS) is considered a key driver of growth because adequate liquidity can finance productive investments, stimulate consumption, and facilitate economic expansion, while excessive money supply may generate inflationary pressures. The theory is relevant as it explains the mechanism through which monetary factors affect GDP in Nigeria, complementing the role of FDI. By integrating these theories, this study examines the combined effects of FDI and money supply on Nigeria's economic growth (GDP), with inflation (INFR) included to capture potential moderating effects. This theoretical foundation guides the empirical analysis using the ARDL approach, enabling an assessment of both short-run and long-run dynamics in the FDI–MS–GDP relationship.

## **Empirical Review**

### **FDI–Economic Growth Studies**

Empirical studies examining the relationship between foreign direct investment (FDI) and economic growth report mixed and context-specific findings. For Nigeria, Ozili (2025) employed the Ordinary Least Squares (OLS) method and found that FDI does not significantly influence economic growth, attributing growth dynamics instead to population size, real interest rates, and domestic private credit. Similarly, Irmiya et al. (2024), using Pearson's correlation and regression analysis, reported a negative but statistically insignificant relationship between FDI and economic growth in Nigeria, recommending greater emphasis on entrepreneurship development, financial system strengthening, and domestic savings mobilisation. In contrast, Mohammed and Nasiru (2021), applying the Autoregressive Distributed Lag (ARDL) approach, found that FDI exerts a positive and significant effect on economic growth in both the short run and the long run, underscoring the importance of methodological choice in shaping empirical outcomes. Beyond Nigeria, Adam (2022) showed that FDI does not significantly promote sustainable economic growth in the short run in Sudan, although financial development and trade openness enhance growth. Amade et al. (2022) further demonstrated that while domestic investment significantly drives long-run growth in Nigeria, the effects of foreign investment remain mixed. More recent cross-country and sectoral studies, such as Raihan et al. (2025) for Egypt and Kubaje et al. (2025) for African economies, report positive growth effects of FDI but emphasise complementarities with renewable energy adoption and effective tax systems. These findings collectively suggest that the growth impact of FDI is conditional on domestic structural and institutional factors, as well as the econometric framework employed.

### **Money Supply–Economic Growth Studies**

Studies on the money supply–growth nexus generally affirm the relevance of monetary factors in shaping economic performance, although the magnitude and direction of effects vary across countries and time horizons. In Nigeria, Chude and Chude (2016) found a positive and significant relationship between broad money supply (M2) and economic growth using OLS, supported by unit root, cointegration, and Granger causality tests. Galadima and Ngada (2017), employing Johansen cointegration and Vector Error Correction Model (VECM) techniques, confirmed a long-run positive impact of money supply on economic growth, while revealing a negative short-run effect of lagged money supply, reflecting adjustment costs and possible inflationary pressures. Similar evidence is observed in other African economies. Dingela and Khobai (2017) reported a statistically significant positive relationship between broad money supply (M3) and economic growth in South Africa using the ARDL approach, while Bereksi et al. (2024) documented asymmetric effects of money supply shocks on growth in Algeria, indicating the non-neutrality of money. More recent panel-based evidence by Bajrami et al. (2025) further confirms that money supply positively and significantly influences economic growth, while inflation exerts a negative effect. Collectively, these studies highlight

the critical role of monetary policy in both the short-run stabilisation and long-run growth processes of developing economies.

Despite the rich empirical literature, important gaps remain. First, most Nigerian studies examine FDI or money supply in isolation, rather than within a unified framework that captures their joint and dynamic effects on economic growth. Second, many studies rely on annual data, which may conceal short-run adjustments and volatility that are better captured using higher-frequency data. Third, limited attention has been given to disentangling short-run and long-run effects within a single coherent econometric framework, particularly in the presence of macroeconomic volatility and institutional weaknesses. This study differs from existing studies by employing quarterly data (2010Q1–2023Q4) and an ARDL framework to simultaneously analyse the short-run and long-run dynamics of FDI and money supply on economic growth in Nigeria. By integrating these key macroeconomic variables within a dynamic setting, the study provides more nuanced and policy-relevant insights into how foreign capital inflows and monetary conditions interact to shape Nigeria's growth trajectory, thereby extending and refining the existing body of empirical evidence.

### 3 Methodology

#### Research design

This study used an ex post facto research design. The use of an ex post facto research design is justified in this study because it enables the examination of the causal relationships between Foreign Direct Investment (FDI), money supply, and economic growth in Nigeria without manipulating these variables. Given the historical nature of these economic variables and the ethical and practical constraints associated with experimental manipulation, the ex post facto design permits the researcher to study the effects of these variables retrospectively (Gwaison, 2021). This approach is particularly useful for identifying patterns and associations in economic data, providing valuable insights into how past values of FDI and money supply have influenced economic growth over time.

#### Nature and Sources of Data

The data for this study consists of secondary data (time series data), encompassing various economic indicators related to Foreign Direct Investment (FDI), money supply, and economic growth in Nigeria. This data includes quarterly data for GDP, FDI inflows, and money supply M2 from 2010–2023. The data were sourced from the Central Bank of Nigeria (CBN) statistical bulletin of 2024. Quarterly data are used to capture short-run dynamics and policy effects more precisely, as they provide higher-frequency information that improves the estimation of both short-run and long-run relationships among the variables.

**Table 1** Definition and Measurement of Variables

| Variable                        | Definition                                                                                                                                                                | Measurement                                                                                               | Expected Sign                                                        |
|---------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------|
| Gross Domestic Product (GDP)    | GDP represents the total monetary value of all final goods and services produced within Nigeria's economy over a given period and is used as a proxy for economic growth. | Gross Domestic Product, measured in constant prices to eliminate the effect of inflation; quarterly data. | Dependent variable                                                   |
| Foreign Direct Investment (FDI) | FDI refers to cross-border investment by foreign entities involving a lasting interest and significant control in Nigerian productive activities.                         | Net FDI inflows measured in monetary value (e.g., naira or US dollars), quarterly data.                   | Positive (+)                                                         |
| Money Supply (MS)               | Money supply captures the total amount of money available in the economy, reflecting monetary policy stance and liquidity conditions.                                     | Broad money supply (M2), measured in monetary value, quarterly data.                                      | Positive (+) in the long run; negative (–) possible in the short run |
| Inflation (INFR)                | Inflation reflects the rate at which the general price level of goods and services increases, reducing purchasing power.                                                  | Inflation rate measured by the Consumer Price Index (CPI), expressed as a percentage, quarterly data.     | Negative (–)                                                         |

## Model specification

To examine the relationship among foreign direct investment (FDI), money supply (MS), and economic growth (GDP). Inflation rate is included in the model to control for the effects of price level changes on economic growth, as high inflation can erode purchasing power, distort investment decisions, and influence the effectiveness of both FDI and money supply in stimulating growth. The model can be specified as follows:

$$GDP_t = \beta_0 + \beta_1 FDI_t + \beta_2 MS_t + INFR_t + \epsilon_t$$

Where:

$GDP_t$  : Economic growth, proxied by GDP growth rate at time t

$FDI_t$  : Foreign direct investment inflows measured in USD or as a percentage of GDP at time t

$MS_t$  : Money supply measured by M2 at time t

$INFR_t$  : Vector of control variables (inflation rate)

$\beta_0$ : Constant term

$\beta_1, \beta_2, \beta_3$  : Coefficients of the explanatory variables

$\epsilon_t$  : Error term

The ARDL representation is specified as:

$$\Delta GDP_t = \alpha_0 + \sum_{i=0}^p \beta_i \Delta GDP_{t-i} + \sum_{i=0}^q \beta_2 \Delta FDI_{t-i} + \sum_{i=0}^r \beta_3 \Delta MS_{t-i} + \sum_{i=0}^s \beta_4 \Delta INFR_{t-i} + \lambda_5 GDP_{t-1} + \lambda_1 FDI_{t-1} + \lambda_2 INFR_{t-1} + \lambda_3 MS_{t-1} + \epsilon_t$$

Where:

$\Delta$ : First difference operator

p,q,r,s: Optimal lag lengths for respective variables

$\alpha_0$ : Constant term

$\beta_1, \beta_2, \beta_3$ : Short-run coefficients of the lagged differences

$\lambda_1, \lambda_2, \lambda_3$ : Long-run coefficients of the level variables

$\epsilon_t$  : Error term

This model captures both the short-run dynamics and the long-run relationship among the variables (Gwaison & Ogba, 2021). The ARDL Bounds Testing approach can then be applied to test for cointegration and determine whether a stable long-run relationship exists between economic growth, foreign direct investment, and money supply in Nigeria.

## Method of Data Analysis

The study employed the Autoregressive Distributed Lag (ARDL) approach to investigate the relationship among foreign direct investment (FDI), money supply (MS), and economic growth (GDP) in line with the work of Mohammed and Nasiru (2021). ARDL is suitable for analysing both long-run and short-run relationships among variables, irrespective of whether the data series are stationary at level  $I(0)$ , first difference  $I(1)$ , or a mix of both, but not at the second difference  $I(2)$ . The ARDL bounds testing procedure allows for testing cointegration between the variables, making it particularly effective for small sample sizes. The model estimates coefficients for both short-run dynamics and long-run equilibrium relationships through the use of lagged values of the dependent and independent variables. The study assessed the goodness of fit of the model using the  $R^2$  and adjusted  $R^2$ , while diagnostic tests like the Breusch-Godfrey serial correlation test, White's heteroskedasticity test, and the Jarque-Bera normality test will ensure the model's robustness. Cumulative Sum of Recursive Residuals (CUSUM) and CUSUM of Squares (CUSUMSQ), to assess the stability of the model over time. Additionally, the error correction term (ECT) from the ARDL model will capture the speed at which deviations from the long-run equilibrium adjust in subsequent periods.

**Pre-estimation test.** Before estimating the ARDL model, pre-tests were conducted to determine the stationarity of the variables using unit root tests like the Augmented Dickey-Fuller (ADF). This step ensures no variable is integrated at

the second difference  $I(2)$ , as this would invalidate the ARDL methodology. Descriptive statistics test, correlation matrix and lag selection criteria test. Following this, a bounds test for cointegration will establish whether a long-run relationship exists among the variables.

## 4 Result presentation

**Table 2** Descriptive Statistics

| Variables    | GDP      | FDI       | MS       | INFR     |
|--------------|----------|-----------|----------|----------|
| Mean         | 30668.69 | 3.13E+09  | 26930.21 | 14.09391 |
| Median       | 27068.70 | 2.46E+09  | 21759.20 | 12.89500 |
| Maximum      | 67668.48 | 8.84E+09  | 78831.12 | 27.96000 |
| Minimum      | 12790.38 | -1.87E+08 | 10907.30 | 8.050000 |
| Std. Dev.    | 13487.99 | 2.57E+09  | 15458.85 | 4.496493 |
| Skewness     | 0.805322 | 0.677819  | 1.420765 | 0.989408 |
| Kurtosis     | 2.889618 | 2.358725  | 4.567290 | 3.790363 |
| Jarque-Bera  | 2.081502 | 1.247644  | 2.57160  | 1.59424  |
| Probability  | 0.147799 | 0.172525  | 0.17015  | 0.125006 |
| Sum          | 1717446. | 1.75E+11  | 1508092. | 789.2590 |
| Sum Sq. Dev. | 1.00E+10 | 3.62E+20  | 1.31E+10 | 1112.015 |
| Observations | 56       | 56        | 56       | 56       |

**Source** Authors' Computation, EViews 12.0

The Jarque-Bera (JB) statistic tests whether a dataset follows a normal distribution by analysing its skewness and kurtosis. In Table 1, the JB statistics for GDP (2.081502), FDI (1.247644), MS (2.57160), and INFR (1.59424) all have high p-values (0.147799, 0.172525, 0.17015, and 0.125006, respectively), indicating that none of these variables significantly deviate from normality. Since the p-values are above the conventional 0.05 threshold, we fail to reject the null hypothesis of normality for all variables, suggesting that they approximately follow a normal distribution.

**Table 3** correlation matrix

| Covariance  |                        |                        |                      |                      |
|-------------|------------------------|------------------------|----------------------|----------------------|
| Correlation | GDP                    | FDI                    | MS                   | INFR                 |
| GDP         | 1.79E+08<br>1.000000   |                        |                      |                      |
| FDI         | -2.40E+13<br>-0.306345 | 6.47E+18<br>1.000000   |                      |                      |
| MS          | 1.98E+08<br>0.267279   | -2.55E+13<br>-0.254353 | 2.35E+08<br>1.000000 |                      |
| INFR        | 49771.99<br>0.135582   | -6.61E+09<br>-0.282913 | 60703.49<br>0.289176 | 19.85741<br>1.000000 |

**Source** Authors' Computation, EViews 12.0



Table 3 presents the correlation matrix showing the degree of association among GDP, Foreign Direct Investment (FDI), Money Supply (MS), and Inflation (INFR). The results indicate that GDP has a moderate negative correlation with FDI ( $-0.306$ ), suggesting that increases in FDI are weakly associated with declines in GDP within the sample period, while GDP exhibits a positive correlation with money supply ( $0.267$ ), implying that higher liquidity tends to move in the same direction as economic growth. The relationship between GDP and inflation is weakly positive ( $0.136$ ), indicating a limited direct association. Furthermore, FDI is negatively correlated with both money supply ( $-0.254$ ) and inflation ( $-0.283$ ), suggesting that periods of higher FDI inflows are associated with lower monetary expansion and inflationary pressures. In contrast, money supply shows a positive correlation with inflation ( $0.289$ ), consistent with monetary theory. Overall, the relatively low correlation coefficients suggest the absence of severe multicollinearity among the explanatory variables, supporting their suitability for inclusion in the regression model.

**Table 4** Phillips-Perron (PP) Unit Root test

| Variables | PP Statistics | P-value | Order of integration | Remark                           |
|-----------|---------------|---------|----------------------|----------------------------------|
| GDP       | -8.012470     | 0.0000  | 1(1)                 | Stationarity at first difference |
| FDI       | -5.251302     | 0.0004  | 1(0)                 | Stationarity at level            |
| MS        | -6.739187     | 0.0000  | 1(1)                 | Stationarity at first difference |
| INFR      | -2,747376     | 0.0165  | 1(1)                 | Stationarity at first difference |

**Source** Authors' Computation, EViews 12.0

Table 4 presents the results of the Phillips-Perron (PP) unit root test, which examines the stationarity of GDP, FDI, MS, and INFR. A variable is considered stationary if its PP statistic is sufficiently negative, with a p-value below 0.05 indicating significance. The results show that FDI is stationary at level ( $I(0)$ ) with a PP statistic of  $-5.251302$  and a p-value of  $0.0004$ , meaning it does not require differencing. However, GDP ( $-8.012470$ ), MS ( $-6.739187$ ), and INFR ( $-2.747376$ ) are non-stationary at level but become stationary after first differencing ( $I(1)$ ), as indicated by their highly negative PP statistics and p-values below 0.05. This implies that GDP, MS, and INFR exhibit trends over time, requiring transformation to achieve stationarity, while FDI is naturally stable in its level form.

**Table 5** ARDL bound test

| F-Bounds Test  |          | Null Hypothesis: No levels relationship |      |      |
|----------------|----------|-----------------------------------------|------|------|
| Test Statistic | Value    | Signif.                                 | I(0) | I(1) |
| F-statistic    | 6.919236 | 10%                                     | 2.37 | 3.2  |
| K              | 3        | 5%                                      | 2.79 | 3.67 |
|                |          | 2.5%                                    | 3.15 | 4.08 |
|                |          | 1%                                      | 3.65 | 4.66 |

**Source** Authors' Computation, EViews 12.0

Table 5 presents the ARDL Bounds Test, which examines the existence of a long-run relationship among the variables by comparing the calculated F-statistic ( $6.919236$ ) against the critical value bounds at different significance levels. The null hypothesis states that there is no levels relationship (i.e., no long-run association). If the F-statistic exceeds the upper bound ( $I(1)$ ), the null hypothesis is rejected, indicating a long-run relationship. In this case, the F-statistic ( $6.919236$ ) is greater than all the upper-bound critical values at 10% ( $3.2$ ), 5% ( $3.67$ ), 2.5% ( $4.08$ ), and 1% ( $4.66$ ), confirming a significant long-run relationship between the variables at all levels of significance. Therefore, the results suggest that the dependent and independent variables in the model are cointegrated, meaning they move together in the long run.

**Table 6** Lag Order Selection Criteria Test

| Lag | LogL      | LR        | FPE       | AIC       | SC        | HQ        |
|-----|-----------|-----------|-----------|-----------|-----------|-----------|
| 0   | -2446.924 | NA        | 3.11e+34  | 90.77496  | 90.92229  | 90.83178  |
| 1   | -2221.459 | 409.1769  | 1.33e+31  | 83.01700  | 83.75366  | 83.30110  |
| 2   | -2180.073 | 68.97733* | 5.26e+30* | 82.07676* | 83.40275* | 82.58815* |

**Source** Authors' Computation, EViews 12.0

Table 6 presents the results of the Lag Order Selection Criteria Test, which helps determine the optimal lag length for a time series model. The table compares different lag lengths (0, 1, and 2) based on several criteria: Log-Likelihood (LogL), Likelihood Ratio (LR) test, Final Prediction Error (FPE), Akaike Information Criterion (AIC), Schwarz Criterion (SC), and Hannan-Quinn Criterion (HQ). Asterisks (\*) indicate the preferred lag order based on each criterion. In this case, lag 2 is selected as optimal since it has the lowest values for FPE (5.26e+30), AIC (82.07676), SC (83.40275), and HQ (82.58815), as well as a significant LR test statistic (68.97733). This suggests that a lag length of 2 is most appropriate for capturing the dynamics of the model, balancing model fit and complexity.

**Table 7** ARDL Long-Run Form

| Variable | Coefficient | Std. Error | t-Statistic | Prob.  |
|----------|-------------|------------|-------------|--------|
| FDI      | -3.74E-07   | 2.66E-07   | -1.406904   | 0.1662 |
| MS       | 1.048606    | 0.102121   | 10.26824    | 0.0000 |
| INFR     | -254.0146   | 221.6495   | -1.146019   | 0.2577 |
| C        | 9632.206    | 2687.353   | 3.584273    | 0.0008 |

**Source** Authors' Computation, EViews 12.0

Table 7 presents the long-run coefficients from the ARDL model, examining the relationship between Foreign Direct Investment (FDI), Money Supply (MS), and Inflation rate (INFR) on Economic Growth (GDP) in Nigeria. The coefficient for FDI (-3.74E-07) is negative but statistically insignificant ( $p = 0.1662$ ), suggesting that FDI does not have a significant long-run impact on GDP. MS has a positive and highly significant effect (coefficient = 1.048606,  $p = 0.0000$ ), indicating that an increase in money supply significantly boosts economic growth. INFR has a negative but insignificant effect on GDP (coefficient = -254.0146,  $p = 0.2577$ ), implying that infrastructure may not directly influence long-run economic growth in this model. The constant term (C) is significant ( $p = 0.0008$ ), showing a positive baseline level of GDP. Overall, the findings suggest that money supply plays a crucial role in driving economic growth, while FDI and infrastructure do not have a statistically significant long-run impact in Nigeria.

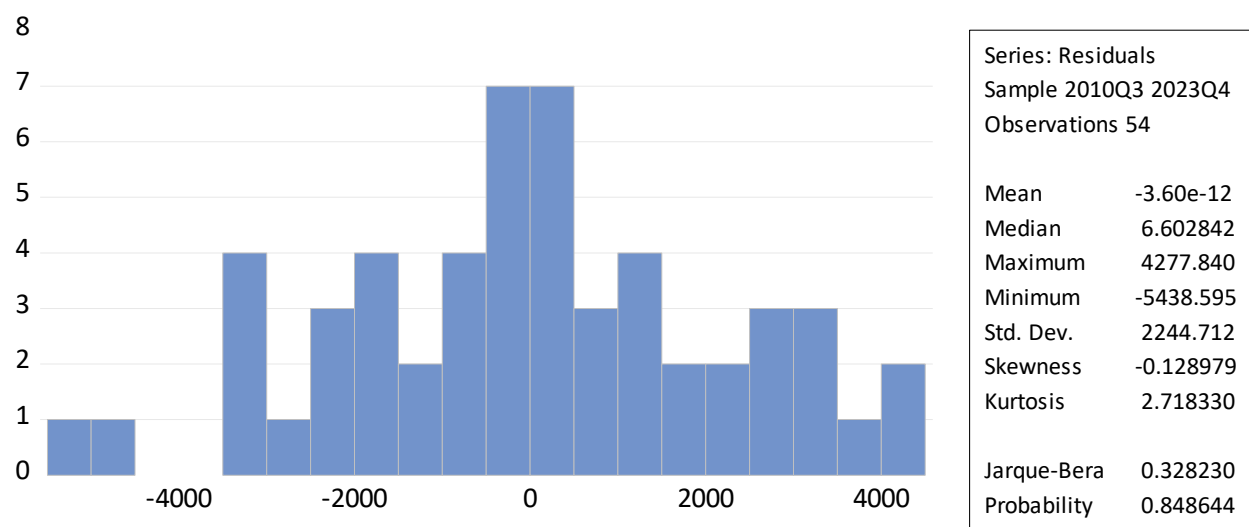
**Table 8** ARDL Short-Run Form

| ECM Regression                           |             |                       |             |          |
|------------------------------------------|-------------|-----------------------|-------------|----------|
| Case 2: Restricted Constant and No Trend |             |                       |             |          |
| Variable                                 | Coefficient | Std. Error            | t-Statistic | Prob.    |
| D(FDI(-1))                               | 0.293388    | 0.120516              | 2.434440    | 0.0189   |
| D(INFR)                                  | -0.098750   | 0.153556              | -0.643092   | 0.5234   |
| D(MS(-1))                                | -0.713201   | 0.240946              | -2.960004   | 0.0048   |
| CointEq(-1)*                             | -0.757348   | 0.123502              | -6.132254   | 0.0000   |
| R-squared                                | 0.454577    | Mean dependent var    |             | 1009.759 |
| Adjusted R-squared                       | 0.421852    | S.D. dependent var    |             | 3039.443 |
| S.E. of regression                       | 2311.073    | Akaike info criterion |             | 18.40000 |

|                    |           |                      |          |
|--------------------|-----------|----------------------|----------|
| Sum squared resid  | 2.67E+08  | Schwarz criterion    | 18.54733 |
| Log likelihood     | -492.8000 | Hannan-Quinn criter. | 18.45682 |
| Durbin-Watson stat | 1.775798  |                      |          |

**Source** Authors' Computation, EViews 12.0

Table 8 presents the short-run results of the ARDL model using the Error Correction Model (ECM) regression. The coefficient of  $D(FDI(-1))$  (0.293388,  $p = 0.0189$ ) indicates that past changes in Foreign Direct Investment have a positive and statistically significant short-run impact on GDP. However,  $D(INFR)$  (-0.098750,  $p = 0.5234$ ) is insignificant, suggesting that short-run changes in infrastructure do not significantly affect economic growth. The coefficient of  $D(MS(-1))$  (-0.713201,  $p = 0.0048$ ) is negative and significant, implying that past changes in money supply have a contractionary short-run effect on GDP. The error correction term,  $CointEq(-1)$  (-0.757348,  $p = 0.0000$ ), is highly significant and negative, confirming a strong adjustment toward the long-run equilibrium at a speed of 75.73% per period. The model's R-squared (0.454577) shows that about 45.46% of the variations in GDP are explained by the independent variables in the short run. The Durbin-Watson statistic (1.775798) suggests no strong autocorrelation issues. Overall, the results indicate that FDI has a positive short-run impact, money supply negatively affects GDP in the short run, and the economy corrects deviations from long-run equilibrium relatively quickly.



**Figure 2** Normality Test

**Source** Authors' Computation E-view 12.0

The histogram and descriptive statistics show the residual distribution from a regression model for the period 2010Q3 to 2023Q4 with 54 observations. The Jarque-Bera test statistic (0.328230) and its high probability (0.84644) suggest that the residuals follow a normal distribution, as skewness (-0.128979) and kurtosis (2.718330) are close to the expected values for normality.

**Table 9** Serial Correlation Test (Breusch-Godfrey L. M. Test)

|               |          |                     |        |
|---------------|----------|---------------------|--------|
| F-statistic   | 1.508208 | Prob. F(2,44)       | 0.1424 |
| Obs*R-squared | 1.29554  | Prob. Chi-Square(2) | 0.2403 |

**Source** Authors' Computation, EViews 12.0

Table 9 presents the results of the Breusch-Godfrey Lagrange Multiplier (LM) test for serial correlation in the residuals of the regression model. The F-statistic (1.508208,  $p = 0.1424$ ) and the Obs\*R-squared value (1.29554,  $p = 0.2403$ )

indicate that there is no significant evidence of serial correlation in the residuals, suggesting that the model does not suffer from autocorrelation issues.

**Table 10** Multicollinearity Test (Variance Inflation Factor - VIF)

| Variable | CoefficientVariance | Uncentered VIF | Centered VIF |
|----------|---------------------|----------------|--------------|
| GDP      | 0.015823            | 3.4369         | 2.71053      |
| FDI      | 2.59E-14            | 7.92697        | 4.813651     |
| INFR     | 31369.24            | 8.77632        | 6.466908     |
| MS       | 0.063443            | 7.367          | 1.6229       |
| C        | 8461954.            | 147.3404       | NA           |

**Source** Authors' Computation, EViews 12.0

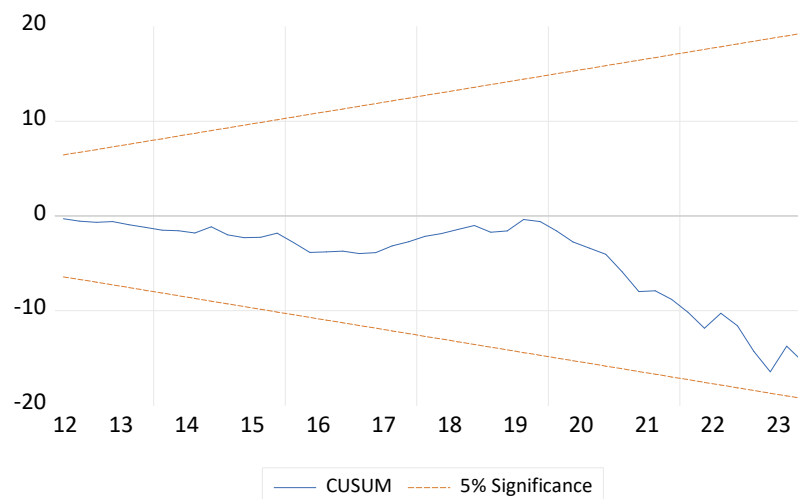
Table 10 presents the results of the multicollinearity test using the Variance Inflation Factor (VIF) for the explanatory variables in the model. The VIF measures how much the variance of an estimated regression coefficient is increased due to multicollinearity among the independent variables. For the centred VIF, which adjusts for mean differences, all values are below the commonly accepted threshold of 10, with GDP at 2.71, FDI at 4.81, INFR at 6.47, and MS at 1.62. This indicates that multicollinearity is not severe among the explanatory variables, and their inclusion in the regression model is appropriate.

**Table 11** Heteroskedasticity Test (Breusch-Pagan Test)

| F-statistic         | 1.275493 | Prob. F(7,46)       | 0.1266 |
|---------------------|----------|---------------------|--------|
| Obs*R-squared       | 1.96263  | Prob. Chi-Square(7) | 0.3121 |
| Scaled explained SS | 11.19888 | Prob. Chi-Square(7) | 0.1302 |

**Source** Authors' Computation, EViews 12.0

Table 11 presents the results of the Breusch-Pagan test for heteroskedasticity in the regression model. The F-statistic (1.275493,  $p = 0.1266$ ), Obs\*R-squared (1.96263,  $p = 0.3121$ ), and Scaled Explained SS (11.19888,  $p = 0.1302$ ) all indicate that there is no significant evidence of heteroskedasticity, suggesting that the model's residuals have constant variance.



**Figure 2** CUSUM test

**Source** Authors' Computation, EViews 12.0

The CUSUM stability test plot shows that the cumulative sum (CUSUM) statistic remains within the 5% significance boundaries for most of the period but trends downward toward the lower boundary. Since the CUSUM line does not cross the significance limits, the model appears to be stable over the observed period.

### **Statistical test of Hypothesis**

#### **Hypothesis 1: Foreign direct investment has no long-run impact on economic growth in Nigeria**

The coefficient of Foreign Direct Investment (FDI) in the ARDL long-run model is  $-3.74\text{E-}07$  with a t-statistic of  $-1.406904$  and a p-value of  $0.1662$ . Since the p-value is greater than the conventional significance levels ( $0.01$ ,  $0.05$ , and  $0.10$ ), we fail to reject the null hypothesis ( $H01$ ). This implies that FDI does not have a statistically significant long-run impact on economic growth in Nigeria.

#### **Hypothesis 2: Foreign direct investment has no short-run impact on economic growth in Nigeria**

The coefficient of Foreign Direct Investment ( $D(\text{FDI}(-1))$ ) in the ARDL short-run model is  $0.293388$  with a t-statistic of  $2.434440$  and a p-value of  $0.0189$ . Since the p-value is less than  $0.05$ , we reject the null hypothesis ( $H02$ ) and conclude that Foreign Direct Investment has a statistically significant short-run impact on economic growth in Nigeria.

#### **Hypothesis 3: Money supply has no long-run impact on economic growth in Nigeria**

The coefficient of Money Supply (MS) is  $1.048606$  with a t-statistic of  $10.26824$  and a p-value of  $0.0000$ , which is highly significant at all conventional significance levels. Since the p-value is less than  $0.05$ , we reject the null hypothesis ( $H03$ ) and conclude that money supply has a significant long-run impact on economic growth in Nigeria.

#### **Hypothesis 4: Money supply has no short-run impact on economic growth in Nigeria**

The coefficient of Money Supply ( $D(\text{MS}(-1))$ ) is  $-0.713201$  with a t-statistic of  $-2.960004$  and a p-value of  $0.0048$ , which is significant at the 5% level. Given that the p-value is less than  $0.05$ , we reject the null hypothesis ( $H04$ ) and conclude that Money Supply has a significant short-run impact on economic growth in Nigeria. However, the negative coefficient suggests that an increase in Money Supply in the short run may negatively affect economic growth.

## **5 Discussion of Findings**

The ARDL long-run results showed that the coefficient of FDI is negative ( $-3.74\text{E-}07$ ) with a t-statistic of  $-1.406904$  and a p-value of  $0.1662$ , which is greater than the  $0.05$  significance level. This indicates that FDI does not have a statistically significant long-run effect on economic growth in Nigeria. As a result, we fail to reject the null hypothesis, implying that while FDI plays a role in economic activities, its long-run effect on GDP is not significant. This could be due to challenges such as poor infrastructure, policy instability, or the repatriation of profits by foreign investors. This finding is consistent with the study by Irmiya et al. (2024), which reported that foreign direct investment has a negative but statistically insignificant association with economic growth in Nigeria. Also, Ozili (2025) agreed with this finding that foreign direct investment inflows do not have a significant effect on economic growth in Nigeria.

The ARDL short-run model results revealed that the coefficient of the FDI variable ( $D(\text{FDI}(-1))$ ) is  $0.293388$ , with a t-statistic of  $2.434440$  and a p-value of  $0.0189$ , which is statistically significant at the 5% level. This means that FDI positively influences economic growth in Nigeria in the short run. Consequently, the null hypothesis is rejected, confirming that FDI has a significant short-run effect on economic growth. This finding suggests that while FDI may not yield long-term benefits, it provides short-term economic gains through capital inflows, job creation, and technology transfer. This finding agrees with the work of Mohammed and Nasiru (2021) that foreign investment has a positive impact on economic growth in the short run.

The ARDL long-run results indicated that the coefficient of MS is  $1.048606$  with a t-statistic of  $10.26824$  and a p-value of  $0.0000$ , which is highly significant. This leads to the rejection of the null hypothesis, confirming that Money Supply has a strong and positive long-run impact on economic growth. This implies that an increase in Money Supply facilitates investment, consumption, and overall economic expansion in the long run, supporting monetary policies

aimed at economic growth stimulation. This finding corroborates the work of Dingela and Khobai(2017) that there is a statistically significant positive relationship between money supply and economic growth in the long run.

The ARDL short-run model showed that the coefficient of Money Supply ( $D(MS(-1))$ ) is -0.713201, with a t-statistic of -2.960004 and a p-value of 0.0048, which is significant at the 5% level. Given the negative coefficient, we reject the null hypothesis, indicating that Money Supply has a significant but negative short-run impact on economic growth. This suggests that excessive liquidity in the economy may lead to inflationary pressures or inefficient allocation of resources in the short run, which can hinder economic growth. This finding is inconsistent with the results of Dingela and Khobai (2017), who found a statistically significant positive relationship between money supply and economic growth in the short run.

## **Economic Implications**

The findings of this study have several important economic implications for Nigeria's growth and policy framework. First, the positive short-run impact of Foreign Direct Investment (FDI) on economic growth suggests that foreign capital inflows can temporarily stimulate production, employment, and technology adoption, highlighting the importance of creating an investor-friendly environment. However, the insignificant long-run effect of FDI implies that without supportive domestic policies, infrastructure, and institutional quality, foreign investments alone are insufficient to sustain long-term economic growth. This underscores the need for the government to focus on productive sectors and mechanisms that convert FDI into lasting development outcomes.

Second, the strong long-run positive effect of Money Supply (MS) on economic growth indicates that adequate liquidity provision is critical for financing investments, expanding production, and promoting aggregate demand. However, the negative short-run impact of MS suggests that excessive or poorly managed monetary expansion can lead to inflationary pressures, exchange rate instability, and macroeconomic distortions. This emphasises the importance of prudent monetary policy that balances growth objectives with price stability, ensuring that money supply supports sustainable economic expansion.

Third, the findings highlight the interdependence between FDI, money supply, and institutional frameworks. Policies that improve governance, reduce corruption, and strengthen financial institutions can enhance the absorptive capacity of the economy, allowing FDI and monetary expansion to translate into tangible growth outcomes. Without such measures, the benefits of foreign capital and liquidity injections may be eroded by inefficiencies and structural bottlenecks.

Finally, the results have implications for sectoral investment priorities. The government should strategically direct both domestic and foreign resources toward sectors with high growth and employment potential, such as manufacturing, agriculture, and technology. Such targeted investments can maximise the growth impact of FDI and monetary policies while fostering structural transformation in the Nigerian economy.

## **6 Conclusion/Recommendations**

This study investigated the relationship between Foreign Direct Investment (FDI), Money Supply (MS), and economic growth in Nigeria using the ARDL approach. The empirical findings indicate that while FDI contributes positively to economic growth in the short run, it does not exert a statistically significant influence in the long run, suggesting that its growth-enhancing effects are largely transitory and dependent on the structure of the economy. In contrast, money supply demonstrates a strong and positive long-run effect on economic growth, underscoring the importance of monetary expansion in supporting productive economic activities, although its negative short-run effect reflects possible inflationary pressures and adjustment costs. The study concludes that sustainable economic growth in Nigeria depends not only on attracting foreign capital and expanding liquidity but also on the effectiveness of policy coordination, institutional quality, and the productive utilisation of financial resources. Based on the findings, the following recommendations were made;

- i. The Nigerian government should design and implement sector-specific FDI incentive frameworks that prioritise long-term investments in manufacturing, agro-processing, and technology, including tax incentives tied to performance benchmarks such as local content utilisation, employment creation, and technology transfer.

- ii. The Central Bank of Nigeria should strengthen its inflation-targeting framework by closely aligning money supply growth with real sector output, using open market operations and macroprudential tools to manage excess liquidity and minimise inflationary pressures.
- iii. Public investment should be strategically directed toward critical infrastructure — particularly power, transport, and digital infrastructure — to enhance the economy's absorptive capacity and enable both domestic and foreign investments to translate into sustained long-term growth.
- iv. Government should reinforce institutional and regulatory frameworks by improving policy consistency, strengthening anti-corruption agencies, and enhancing transparency in public finance management, thereby creating a stable and predictable business environment that supports the long-term effectiveness of FDI and monetary policy in driving economic growth.

### **Limitation of the Study**

Despite its contributions, this study is subject to certain limitations. First, the study focuses solely on Nigeria, which may limit the generalizability of the findings to other countries with different economic structures, institutional frameworks, or FDI patterns. Second, the study relies on quarterly data from 2010Q1 to 2023Q4, which, although relatively detailed, may not capture longer-term structural shifts or policy changes that influence the FDI–money supply–growth nexus. Third, the study considers only three key explanatory variables—FDI, money supply, and inflation—while other potential determinants of economic growth, such as fiscal policy, trade openness, human capital, and political stability, are excluded, which may introduce omitted variable bias. Fourth, while the ARDL approach effectively captures both short-run and long-run dynamics, it assumes linear relationships among variables and may not fully account for potential nonlinearities or asymmetric effects. Lastly, the study does not explicitly account for global economic shocks or external crises, such as fluctuations in oil prices or global financial instability, which could influence both FDI inflows and macroeconomic performance in Nigeria.

### **Suggestions for Future Study**

Based on the limitations and scope of this study, several recommendations can guide future research. First, future studies could adopt a comparative or cross-country approach to examine the FDI–money supply–economic growth relationship across different African economies or other developing regions, enhancing the generalizability of the findings. Second, researchers could extend the time horizon or use higher-frequency data, such as monthly observations, to better capture short-run dynamics and structural changes that may influence growth. Third, subsequent studies could incorporate additional macroeconomic, institutional, and policy variables, such as fiscal policy, trade openness, human capital, governance indicators, and political stability, to provide a more comprehensive analysis of the determinants of economic growth. Fourth, future research could explore nonlinear or asymmetric relationships between FDI, money supply, and economic growth using advanced econometric techniques, such as NARDL, threshold models, or regime-switching models, to capture more complex dynamics. Finally, examining the interactive effects of FDI and money supply with institutional quality or financial development could provide deeper insights into the conditions under which these variables effectively contribute to sustainable economic growth.

### **Funding**

The authors declare that no financial support, grant, sponsorship, or external funding was received for the conduct of this study, preparation of the manuscript, or its publication.

### **Data Availability Statement**

The data used in this study are secondary data obtained from the Central Bank of Nigeria (CBN) Statistical Bulletin (2024). These data are publicly available and can be accessed through the official publications and online repository of the Central Bank of Nigeria.

## Conflict of Interest

The authors declare that there are no conflicts of interest regarding the publication of this study.

## Declaration of Use of Generative AI

In line with Elicit Publishing Limited's commitment to ethical publishing and research integrity, the authors declare that generative AI tools were used solely to support editorial refinement, including language improvement, grammar correction, and formatting alignment. The use of AI did not extend to the study's conceptualisation, research design, methodology, data collection, econometric analysis, interpretation of findings, or formulation of conclusions and recommendations. The authors accept full responsibility for the accuracy, originality, and scholarly integrity of this work.

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