

Macroeconomic Determinants of Investment Dynamics in Nigeria: Evidence from Cointegration and Fully Modified Least Squares Estimation

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ABSTRACT

Macroeconomic conditions affect investment by affecting the rate of financing cost, price stability, exchange rate conditions, economic activity and public expenditure. In this study, the long run relationship between investment and inflation, interest rate, exchange rate, economic growth and government expenditure in Nigeria is examined. The 45 observations of annual time series data were analysed with the Augmented Dickey Fuller unit root test, the bounds testing approach to cointegration and Fully Modified Ordinary Least Squares estimation. The unit root tests yield a mix of $I(0)$ and $I(1)$ variables with investment, exchange rate, and government expenditure being integrated of order one, and inflation and economic growth being stationary at level. The number of interest rates is held fixed at 10 percent significance level. The F test yields an F statistic of 4.145917, which is greater than the upper critical value of 3.38 at 5 percent significance level, thus implying the presence of long run relationship between the variables. According to estimates from the FMOLS, the relationships of interest rate and exchange rate with investment are positive and statistically significant and that of government expenditure is negative and statistically significant. There is a negative but not statistically significant relationship between inflation and investment, while there is a negative and statistically significant relationship between economic growth and investment at the 10 percent level, but not at the 5 percent level. The results suggest a link between the monetary sector, external sector, fiscal and economic activity conditions with the investment dynamics in the long run in Nigeria.

Keywords: Macroeconomic determinants, investment dynamics, FMOLS, cointegration, Nigeria, inflation, interest rate, exchange rate, government expenditure, economic growth.

INTRODUCTION

Investment is the engine of economic growth and development as it increases productive capacity, helps technological progress and enhances productivity. In the study, Wei et al. (2020) showed that investment contributes to productive efficiency in terms of adopting and diffusing new technologies. Acquah & Ibrahim (2020) conclude that domestic and foreign capital inflows can mitigate financing constraints in the developing economies and boost the economic growth of the developing economies. Kwilinski et al. (2023) also report that investments play a role in the generation of jobs and structural change. The results confirm the importance of investment as a determinant of economic performance and have given a renewed relevance to the identification of investment determinants in developing economies.

There are several macroeconomic variables that may affect investment and the determinants of expected returns, financing conditions, production costs and economic activity. One of these variables is inflation. Agyapong and Abaidoo (2023) show that inflation uncertainty has a significant negative effect on private investment, which is in turn negatively associated with investment activity. Unstable inflation has adverse effects on credit provision and on financial intermediation efficiency, as found by Mandeya and Ho (2022). Similarly, Adamgbe et al. (2025) conclude that inflation hampers the informational efficiency of the markets, making investment decisions

more difficult. The present study measures inflation instead of an explicit measure of inflation, and these results offer empirical support for the use of inflation to explain investment results.

Interest rate is a factor of the cost of financing the capital projects, which in turn influences investment. Rising interest rates will rise the user cost of capital and decrease investment demand, according to Sharpe and Suarez (2021). The interest rate sensitivity of investment in emerging markets is especially pronounced, as financial systems in these markets may have less ability to supply credit, Abdeljawad et al. (2024) conclude. According to Adelakun and Rudzi (2025), monetary policy uncertainty has an impact on the timing and magnitude of investment decisions. The results indicated that interest rate was a suitable explanatory variable for investment and this was included in the current model.

The other channel for the effect on investment is through exchange rate conditions. According to Salomao and Varela 2022, exchange rate fluctuations can affect investment on the firm level by affecting both the firms trade exposure and profitability. Farounbi et al. (2021) discover that exchange rate volatility has a negative effect on investment of firms with international trade exposure. The high volatility of exchange rates makes financing decisions more complex and investment less efficient, according to Ashraf et al. (2025). These studies focus on the effects of exchange rate changes and instability, but the present study takes the actual exchange rate as an explanatory variable instead of creating a new measure of exchange rate.

Economic growth (GDP growth rate) is also relevant since there is a close link between investment and economic activity. According to Mohammed (2024) investment causes the output to grow by increasing the productive capacity. An increase in the level of economic activity stimulates companies to expand their productive capacity, and thus invest more, as per de Medeiros Braga (2020). According to Sadashiv (2023), if the Economic growth (GDP growth rate) is sustained, then investors would gain confidence and more funds would flow into the country. The results validate the use of GDP as an indicator of economic activity in the investment model.

Government spending can affect investment in the provision of infrastructure and through fiscal conditions. Investment in productive public goods like infrastructure can crowd in private investment if it lowers the transaction costs of the private sector, and thus generate productivity gains for the private sector, as reported by Babu et al. (2022). Shankar and Trivedi (2021), in contrast, find that fiscal expansion can displace private investment. According to Park and Meng (2024), the impact of fiscal policy on investment is influenced by the mix and impact of government spending. The results suggest that the government can have varying impact on investment depending on the method of financing and allocation of government funds.

These relationships are important in the context of Nigeria. According to Adegboye and Nnadozie (2025), the structural vulnerabilities that undermine the macroeconomic outlook of Nigeria are oil dependence and external shocks and policy inconsistencies. Yahaya (2026) indicated that oil price shocks have an impact on public investment potential and wider investment results. The study by Oyeleke and Onatunji (2024) concludes that fiscal and monetary policy shocks affect investment behaviour by affecting the macroeconomic environment. The findings have shown the relevance of study of the individual macroeconomic variables in the Nigeria economy.

Existing literature also shows that the results of investment responses may vary depending on the variables used and the research methodologies applied. Uncertainty can raise the value of having the option of delaying investment, and can make firms more hesitant to commit capital, according to Sen (2020). Financing constraints and institutional quality are identified as important factors determining investment behaviour in developing country by Farooq et al. (2022). Long run relationships between macroeconomic variables have to be interpreted with care as the studies of Abdulkarim and Saidatulakmal (2021) indicated that methodological differences are to be taken into consideration. Such observations can then serve as a foundation for further analysis via an econometric specification which is identical with the variables being observed.

Given this, the aim of the study is to analyse the role of macroeconomic factors (inflation, interest rate, exchange rate, economic growth (GDP growth rate) and government expenditure) on investment behaviour in Nigeria. The empirical model is given as investment being a function of the five variables: $INV = f(INF, INT, EXR, GDP,$

GEX). The study thus analyzes the link between investment and the observed values of the chosen macroeconomic indicators, instead of calculating individual volatilities. This distinction clarifies the conceptual mis-match between the original framing of the study and its empirical specification.

In order to analyze the time series characteristics as well as the long run relationships among the variables, the study employs Augmented Dickey Fuller unit root test, bounds testing methodology to cointegration, and Fully Modified Ordinary Least Squares (FMOLS) estimation. The revised focus gives consistency to the research problem, research title, objectives, measurement of variables, the specification of the model and the econometric estimation. The study, therefore, aims at determining the relationship between inflation rate, interest rate, exchange rate, Economic growth (GDP growth rate) and government expenditure on the investment dynamics in Nigeria.

CONCEPTUAL REVIEW

Theories and concepts of investment and investment behaviour.

In general, investment refers to the use of financial resources for productive purposes from which benefits are expected in the future, and it is still a major source of capital accumulation and economic growth. At the macro level, investment helps to grow the productive capacity, create jobs, and drive long term Economic growth (GDP growth rate). Firms make investment decisions at the micro level based on their expectation of profitability, on cost conditions and on the economic signals. The notion of investment is thus more than just an idea of "spending money" – it's an expression of strategic resource allocation in uncertain situations. Research literature indicates that investment efficiency is subject to the effectiveness of capital allocation by firms to market signals and institutional environment, which eventually determines the economic performance (Gao and Yu, 2020).

Investment behaviour is the processes and determinants that affect the investment decisions of individuals, firms and governments. Future economic prospects, perceived risks and access to finance are often influential on these decisions. When uncertainty is high, investment activity becomes very responsive to macroeconomic indicators like movement of the inflation rate, interest rate, exchange rate etc. In particular, the role of expectations is significant, because investors take into account the state of the market today, as well as the expected state in the future. It is consistent with the theory that uncertainty will lead to lower investment due to risk aversion (Sen, 2020) and delay in capital commitments. In addition, a lack of financing and institutional quality have been found to be important factors for influencing investment behavior, particularly in developing countries where access to capital markets is limited (Farooq et al., 2022).

Structural issues such as poor financial systems, policy volatility, external shocks and many other factors may affect investment behavior in developing countries. All of these conditions contribute to uncertainty, which makes it difficult to make long-term investments and encourages short-term decision making. Consequently, investment is often volatile in these economies and not as sensitive to growth opportunities. This highlights the need to ensure macroeconomic stability and proper policy frameworks for an investment-friendly environment.

Macroeconomic Determinants of Investment

Macroeconomic determinants of investment: These are the economic variables which affect the conditions in which investment decisions are taken. These determinants include in the present study; inflation, interest rate, exchange rate, Economic growth (GDP growth rate), and government expenditure. The selected variables are the same as those in the empirical model, in which investment is directly dependent upon inflation, interest rate, exchange rate, GDP growth rate and government expenditure.

Inflation refers to changes in the overall price level and may impact investment in terms of production costs and expected returns. Abaidoo and Agyapong (2023) find that inflation uncertainty greatly dampens private investment. This discovery gives the justification to put the inflation into the investment model as an explanatory variable.

Interest rate is the financial price of financing an investment. The sensitivity of investment to interest rates is influenced by financing conditions and institutional settings, Sharpe and Suarez (2021) report. Therefore, interest rate is included to explain its relationship with investment in Nigerian economy.

Exchange rate is the rate of the domestic currency against an international currency, which can influence investment via external trade and investment profitability. According to Salomão and Varela (2022), exchange rate changes affect investment on the firm level by affecting both trade exposure and profitability.

The annual GDP growth rate (%) is an indicator of economic growth and reflects the changes of economic activity. Better economic performance leads to firms expanding capacity and investment, according to de Medeiros Braga (2020).

Government expenditure is public spending and what it could do to affect private sector investment. Fiscal expansion can crowd out investment by the private sector, according to Shankar and Trivedi (2021). The government expenditure is therefore included to establish if there is any correlation between government expenditure and investment in Nigeria.

Discuss the relationship between inflation and investment.

Inflation is crucial in determining investment choices, since it impacts on the value of returns and production costs. In the context of maintaining price stability, inflation in the medium and stable range would help to sustain economic growth by fostering spending and investment, whereas high and fluctuating inflation would negatively impact investment. This is because inflation erodes the value of money, and uncertainty in the price signal results in making poor investment choices.

Empirical evidence confirms that inflation uncertainty has a negative impact on investment, as it raises the risk of future returns. Inflation that is fluctuating from time to time gives investors trouble in predicting costs and income, and discourages long term investments. This is especially the case in economies with more volatile and less predictable inflation, such as those in development. There is a belief that high inflation has a negative impact on the efficiency of investment, as it causes resource allocation and macroeconomic instability (Mandeya and Ho, 2022).

Moreover, inflation interacts with other macroeconomic variables like interest rate and exchange rate in affecting investment. For example, high inflation is typically accompanied by higher interest rates, which makes it more expensive to borrow and lower investment demand. Likewise, inflation can impact exchange rate movements which can impact the cost of imported capital goods. The empirical results corroborate that inflation uncertainty is a significant factor influencing investment performance, especially in countries with poor institutional development (Abaidoo and Agyapong, 2023).

The interest rate-investment nexus is examined. The relationship between interest rates and investment is explored.

Interest rate is one of the most important factors that influences the decision of investment because it is the opportunity cost of capital and the cost of borrowing. In the general sense, a higher rate of interest would inhibit the investment while a lower rate of interest would stimulate the investment. The link between interest rate and investment is thus a key determinant of macroeconomic policy and Economic growth (GDP growth rate).

Results of previous analyses suggest that interest rates are important for investment, especially in economies that are highly dependent on external finance. High interest rates can make investment projects less profitable and less likely to get credit, which can be limiting investment activity. But the reaction of investment to interest rate changes will vary according to various factors like financial development and expectations of investors. Research shows that in certain situations investment sensitivity to interest rates may be constrained by financing constraints and uncertainty (Sharpe and Suarez, 2021).

In less developed economies, structural characteristics like imperfect financial markets, and imperfect monetary transmission mechanisms make interest rate policy less effective. Because of this, fluctuations in the interest rates may not necessarily reflect fluctuations in investment patterns. Despite this, interest rate is still a crucial factor affecting investment, especially in the context of macroeconomic stability and policy coordination (Keloharju et al., 2022).

Review the factors that influence exchange rates and investment decisions.

Exchange rates are the price of the domestic currency against the foreign currency and they can affect investments by making imported factors of production more or less expensive, by making exports more or less competitive, and by affecting the expected profitability of the investment. The net effects of exchange rate fluctuations can therefore affect the profitability of investment projects, especially for companies engaged in international transactions and/or activities that require foreign capital.

Salomão and Varela (2022) have found that exchange rate fluctuations have an impact on the investment of firms via their trade exposure and profitability. The present investment model includes exchange rate due to this finding. The study thus focuses on the link between the exchange rate observed and investment, not on the estimation of a separate index of exchange rate volatility.

Changes in exchange rates conditions can be of significance in the Nigerian context since transactions in foreign currency, intermediate inputs for manufacturing and machines sourced from abroad are all important for the functioning of firms. According to Farounbi et al. (2021), the decisions of financing objectives for corporations are influenced by exchange rate conditions. The present study consequently includes exchange rate as one of the selected macroeconomic determinants of investment.

Government Expenditure and Investment

The government has a dual role in affecting investment, with the crowding in and crowding out effect. On the other hand, private investment could encourage public investment by offering a return on their initial capital expenditure. Private investment could stimulate public investment through reducing costs and creating a favorable business climate; public investment could stimulate private investment through the returns gained on the initial investment in infrastructure and social services. Private investment, on the other hand, can be crowded out of the economy by excessive government spending financed by borrowing, which can drive up interest rates and restrict access to credit.

There is empirical evidence on how government spending affects investment that relies on the nature and effectiveness of government spending. These are productive investments that can better attract private investment, and possibly unproductive investments may have the reverse effect. Research indicates that investments in infrastructure improve the productivity of the private sector and provide an incentive to the private sector to invest because the transaction cost is reduced (Babu et al., 2022).

In many developing economies, however, public spending inefficiencies and lack of strong institutions can reduce the benefits of government spending on investment. This highlights the need for fiscal discipline and good public investment management to stimulate investment (Park and Meng, 2024).

GDP Growth Rate (economic growth) and investment linkages

When examined in this study, economic growth (as measured by the annual GDP growth rate) has a close relationship with investment as changes in economic activity affect firms' expectations of future demand, profitability, and productive capacity. Economic growth can provide greater incentives to companies to grow production and invest further; investment can also stimulate productive capacity and boost production. The relationship therefore indicates an interaction between the level of economic activity and the investment decisions.

The relevance of economic activity in investment decisions is corroborated by empirical evidence. According to De Medeiros Braga (2020) when the level of economic activity rises, firms tend to invest in greater productive capacity. This is a direct reason for the use of GDP growth rate as an explanatory variable in this study. Wei et al. (2020) then show that investment promotes productive efficiency via the process of technology adoption and diffusion, suggesting that investment will enhance the productive foundation upon which economic growth takes place.

The correlation between GDP growth rate and investment, however, may or may not be the same depending on the prevailing macroeconomic situation. Based on the above, Acquah and Ibrahim (2020) conclude that capital inflows play a role in promoting economic growth in developing economies through easing financing constraints. The investment response to an economic opportunity may be partially dependent on the availability of financial resources. When macroeconomic conditions are unstable, uncertainty can reduce the incentive to invest in the long-term when there are opportunities to grow.

GDP growth rate is therefore taken into consideration in this study as an indicator of economic activity and is expected to have a positive correlation with investment. The empirical model thus investigates if the difference in the growth rate of annual GDP is related to the differences in investment in Nigeria over the long run.

METHODOLOGY

Theoretical Framework

The study has been based on Keynesian, neoclassical and accelerator theories of investment. The Keynesian approach focuses on expectations and on the expected profitability of an investment. The neoclassical theory of investment deals with the desired capital stock and the user cost of capital. According to Keloharju et al. (2022), the factors that influence the user cost of capital are interest rates, tax and depreciation costs.

The theory of the accelerator is the basis for the connection between economic activity and investment. De Medeiros Braga (2020) states that growth in economic activity stimulates productive capacity, and therefore, investment.

The three theoretical perspectives are used to analyse the impact of inflation, interest rate, exchange rate, Economic growth (GDP growth rate) and government expenditure on investment behaviour in Nigeria.

Model Specification

The study is empirical and used to analyse the relationship between investment and the selected macroeconomic determinants in Nigeria, is an empirical model is specified. The explanatory variables are the inflation rate, the interest rate, the exchange rate, the growth rate of GDP and the expenditure of the government. These variables have been chosen because they have been reported to be related to investment. Abaidoo and Agyapong (2023) suggest that inflation uncertainty lowers levels of private investment, and Sharpe and Suarez (2021) note that interest rate conditions will affect investment via the cost of capital. Salomão & Varela (2022) conclude that exchange rate fluctuations impact firms' investment on trade exposure and profitability. Indeed, de Medeiros Braga (2020) shows that economic activity variations affect firms' investment in productive capacity, and Shankar and Trivedi (2021) conclude that fiscal expansion can crowd out private sector investment. In this study, GDP is the same as the annual percentage growth rate of real gross domestic product; for this reason, throughout the empirical analysis, GDP and economic growth are synonymous with each other.

From these relationships, investment is defined as a function of inflation, interest rate, exchange rate, GDP growth rate and government expenditure.

$$INV_t = f(INF_t, INT_t, EXR_t, GDP_t, GEX_t)$$

The econometric model is specified as:

$$INV_t = \beta_0 + \beta_1 INF_t + \beta_2 INT_t + \beta_3 EXR_t + \beta_4 GDP_t + \beta_5 GEX_t + \varepsilon_t$$

where INV_t represents investment, INF_t represents inflation, INT_t represents interest rate, EXR_t represents exchange rate, GDP_t represents Economic growth (GDP growth rate) measured by the GDP growth rate, GEX_t represents government expenditure, β_0 is the intercept, β_1 to β_5 are the estimated coefficients, and ε_t is the error term.

The coefficients are a measure of the association between investment and the changes in the explanatory variables. Based on the reported evidence of the negative relationship between inflation and private investment (Abaidoo & Agyapong, 2023), inflation is expected to have a negative relationship with investment. There is a negative relationship between interest rate and investment, as reported in the literature, but with varying degrees of sensitivity of investment to financing conditions (depending on the interest rate) (Sharpe & Suarez, 2021).

The sign of the exchange rate coefficient is not limited to being negative since an exchange rate change may impact investment via trade exposure and profitability. Salomão and Varela (2022) refer to this particular relationship at company level. The economic growth (GDP growth rate) is anticipated to be positively correlated with investment, because when economic activity increases, there is an increase in the capacity for productive activities (Demedeiros Braga, 2020). The relationship between government spending and the private sector could be either positive or negative, depending on how it affects the private sector; Shankar and Trivedi (2021) found some evidence of government spending crowding out private spending.

The study tests the statistical significance at 5 percent, and also reports the 10 percent level where it is applicable.

Description and Definition of Variables

This study compares the variable investment and explanatory variables of inflation, interest rate, exchange rate, economic growth and government expenditure. The variables are defined as they are measured in the empirical model so that they are consistent with the conceptual model, data analysis and econometric estimation.

Investment (INV): Gross capital formation is used as a measure of investment and is used to measure the amount of money being spent on fixed assets that will be used to increase the productive capacity of the Nigerian economy. It is the dependent variable, and measures the amount of capital investment during the study period.

Consumer Price Index (INF): The inflation rate is defined as the annual percentage change of the Consumer Price Index. It measures the overall changes in the price level and its ability to affect the level of investment through the affect in the cost of production, purchasing power and expected returns due to price conditions.

Interest Rate (INT): Interest rate is measured using the monetary policy rate. It is the policy determined cost of funds and an indicator of monetary conditions in which the investment decision is made. Interest rate can influence investment due to the borrowing costs and finance availability.

Exchange Rate (EXR): Exchange rate is the price of the Nigerian currency in terms of the United States dollars. It records movements in the external value of the domestic currency and considers conditions that could impact the cost of imported capital goods, intermediate goods, foreign currency obligations, export competitiveness and returns on investment.

Economic Growth (GDP): GDP growth rate is measured as a percentage of the growth for one year. For the purpose of this study, the variable GDP is used in the empirical model and tables while in terms of the economic concept the term economic growth is used. In the model, GDP is not a level of GDP but rather the annual rate of change (growth) in real GDP. The variable measures the overall economic activity and indicates the growth or decline of productive activity in Nigeria.

Government Expenditure (GEX): This is an amount of public expenditure made by the government within the study period. It embodies the financial aspects of the investment context and the potential impact of public investment on private and overall investment due to infrastructure provision, aggregate demand, financing conditions and resource allocation.

Table 3.1 variable summary table

Variable	Symbol	Measurement	Role in model
Investment	INV	Gross capital formation	Dependent variable
Inflation	INF	Annual percentage change in CPI	Explanatory variable
Interest rate	INT	Monetary policy rate (%)	Explanatory variable
Exchange rate	EXR	Nigerian naira per US dollar	Explanatory variable
Economic growth	GDP	Annual GDP growth rate (%)	Explanatory variable
Government expenditure	GEX	Government expenditure	Explanatory variable

Data Sources and Measurement

This study utilizes data of annual secondary time series with 45 observations for Nigeria. The data set used includes data on investment, inflation, interest rate, exchange rate, growth rate of GDP, and government expenditure. The variables chosen were in direct correspondence with the theory that was proposed for the study and the empirical model specified for the study.

The dependent variable is investment (as expressed in the gross capital formation) and the independent variables are inflation, the interest rate, the exchange rate, the growth rate of GDP and government expenditure. GDP in the empirical analysis is defined as the annual growth rate of GDP in percentage terms, rather than the level of GDP.

Observations were drawn, for each year, from available and defined macro-economic data sources such as the World Development Indicators and the appropriate official statistical and monetary data sources for Nigeria. Prior to estimation, data were compiled into a uniform series of yearly observations. The annual observations allow for a consistent time periodicity for all variables and allow for the analysis of the long-term correlation between variables.

All the variables were fed into EViews 10 for empirical analysis. The order of integration of each series was first determined by using the Augmented Dickey Fuller test. The results confirmed that the variables were a combination of $I(0)$ as well as $I(1)$ and no variables were integrated at $I(2)$. In the case of this property, the bounds testing procedure was appropriate to analyze if a long run relationship existed. Once it was found that the series were cointegrated, the long run coefficients were estimated using FMOLS.

Estimation Techniques

The study uses a sequential econometric method to determine the characteristics of the variables in the time series and the long-term relationship between the variables and investment. Augmented Dickey Fuller test is used first to test if the variables are stationary at level or after first differencing. Diniz et al. (2020) state that the Augmented Dickey Fuller procedure can be used to check if the time series is stationary or needs differencing. The resulting orders of integration give the clue on what type of cointegration procedure to choose.

A bounds testing method is then used to test for the presence of a long run relationship between investment and the selected macroeconomic determinants. The procedure can be used if the variables consist of a combination of $I(0)$ and $I(1)$ processes, but not $I(2)$. Salisu et al. (2025) recognize the bounds approach as appropriate for models with variables with mixed integration properties, and Dao and Staszewski (2023) use the procedure to analyze long run relations of variables with mixed integration properties. The corrected unit root results indicate that the variables are all either $I(0)$ or $I(1)$ and no variables are $I(2)$ as required for the bounds test.

The bounds test is applied to determine if investment and the variables considered as the macroeconomic determinants are co-integrated in a long run relationship. The computed F statistic is 4.145917 which is greater than the upper critical boundary of 3.38 at the 5 percent significance level, thus showing cointegration in the system. After this result, Fully Modified Ordinary Least Squares (FMOLS) is used to estimate the long run

coefficients. Yahyaoui and Bouchoucha (2021) state that FMOLS is able to deal with endogeneity and serial correlation when estimating in the long run. The estimates are thus employed to assess the sign, strength and statistical significance of the long run relationships between investment and inflation, interest rate, exchange rate, GDP and government expenditure.

Diagnostic and Stability Tests

A group of diagnostic tests are performed to assure reliability and validity of the estimated model. These are tests for serial correlation, heteroscedasticity and normality of the residuals. The serial correlation does not exist means that the error terms are not correlated. The constant variance in the residuals means that the homoscedasticity is maintained. Correctly assuming that the residuals are normally distributed is a key requirement for properly making statistical inferences and for the validity of the hypothesis testing procedures.

In addition, the stability tests are used to assess stability of the model during time. These tests are used to test the stability of the estimated coefficients over the study period, as it is crucial for the reliability of the conclusions to be drawn from the model for the purpose of policy recommendations. Both diagnostic and stability tests are considered essential for improving the robustness and credibility of the econometric analysis (Dao and Staszewski, 2023).

RESULTS

Descriptive Statistics Analysis

Table 4.1: Presentation of Descriptive Statistics

Variables	INV	INF	INT	EXR	GDP	GEX
Mean	3194457	19.19267	17.05311	153.2769	0.406444	8.495778
Median	1829335	13.01	16.94	120.97	1.11	8.27
Maximum	6754959	72.84	29.8	712.36	12.21	17.46
Minimum	1018907	5.39	7.75	0.61	-15.76	5.15
Skewness	0.751383	1.830262	0.391894	1.657164	-0.97486	1.593526
Kurtosis	1.806288	5.412162	3.64543	5.255177	5.346369	6.386136
Jarque Bera	6.906107	36.03369	1.932942	30.13236	17.45037	40.54354
Probability	0.031649	0	0.380423	0	0.000162	0
Observations	45	45	45	45	45	45

Source: Researcher's computation from EViews 10

Unit Root Test Results

Table 4.2: Augmented Dickey Fuller Unit Root Test Results

Variable	ADF Level t statistic	Probability	ADF First Difference t statistic	Probability	Correct Order of Integration
INV	-0.098425	0.9620	-4.0961099	0.0025	I(1)
INF	-3.140730	0.0307	—	—	I(0)
INT	-2.615500	0.0977	—	—	I(0) at 10%
EXR	-3.362097	1.0000	-5.147920	0.0001	I(1)
GDP	-3.446030	0.0146	—	—	I(0)
GEX	-2.045310	0.2672	-10.660500	0.0000	I(1)

Source: Researcher's computation from EViews 10.

Note: The null hypothesis of a unit root is rejected when the probability value is below the applicable significance level. INV, EXR, and GEX are non stationary at level but become stationary after first differencing and are therefore classified as I(1). INF and GDP are stationary at level because their probability values are below 0.05 and are therefore classified as I(0). INT is stationary at the 10% significance level because its probability value of 0.0977 is below 0.10, and is therefore classified as I(0) at 10%. None of the variables is integrated at order two, I(2).

Cointegration Results

Table 4.3.1: Bounds Test for Cointegration

Statistic	Value
F statistic	4.145917
Critical value I(0)	2.39
Critical value I(1)	3.38
Decision	Cointegration exists

Source: Researcher's computation from EViews 10

FMOLS Long Run Estimates

Table 4.4: FMOLS Long Run Estimates

Variable	Coefficient	Std Error	Prob
INF	-11956.6	9086.822	0.1961
INT	87734.9	41604.47	0.0416
EXR	8215.085	1116.347	0.0000
GDP	-63234.6	33358.44	0.0656
GEX	-280076	62650.43	0.0001
Constant	2896156	717518.7	0.0003

Source: Researcher's computation from EViews 10

Post Estimation Diagnostic Tests

Table 4.5: Serial Correlation Test

Statistic	Value
F statistic	3.485221
Prob	0.0055
Corrected F statistic	0.458811
Corrected Prob	0.9352

Source: Researcher's computation from EViews 10

Table 4.6: Heteroskedasticity Test

Statistic	Value
F statistic	1.846788
Prob	0.1183

Source: Researcher's computation from EViews 10

Figure 4.1: CUSUM Stability Test

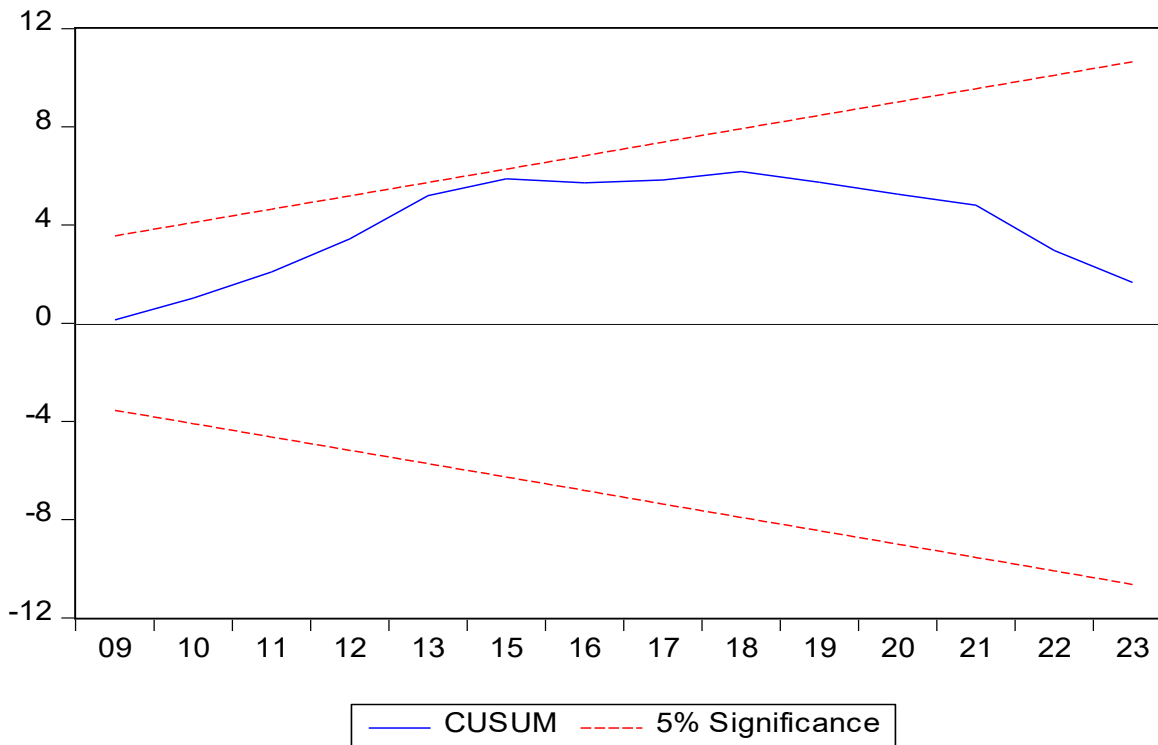
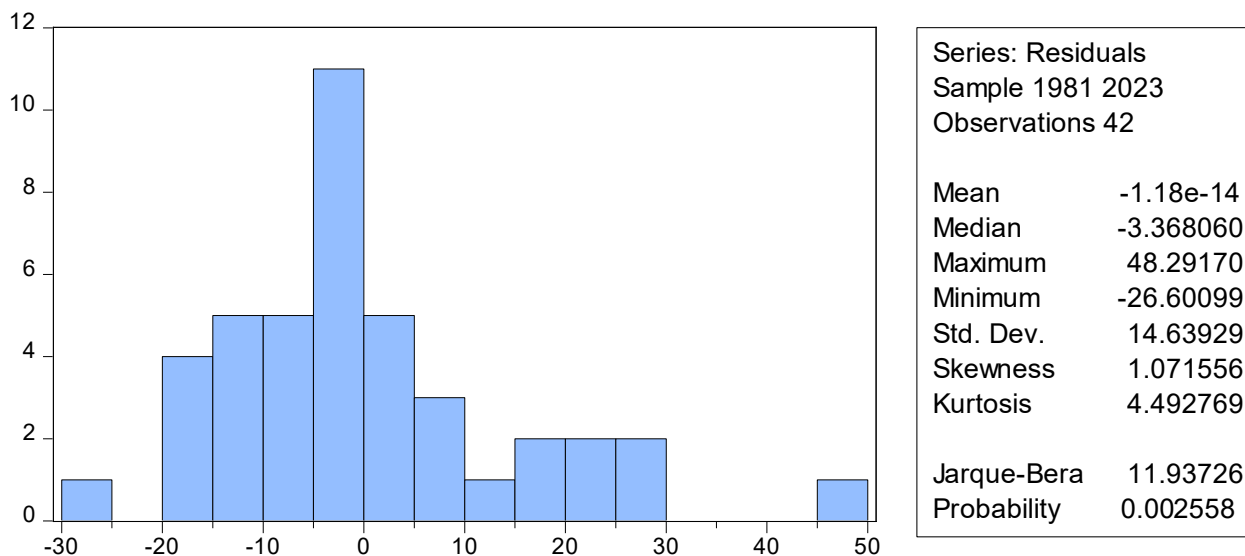


Figure 4.2: Normality Test of Residuals



DISCUSSION

The outcomes indicate that in the long run, there is a significant relationship between investment and inflation, interest rate, exchange rate, economic growth and government expenditure in Nigeria. The F statistic value from the bounds test reported in Table 4.3 is 4.145917 and is greater than the upper bound of 3.38 at the 5% level. This suggests that, over the long run, both variables change together, and hence allows for the interpretation of the FMOLS estimates in Table 4.4. The result is in line with Abdulkarim and Saidatulakmal (2021), who pointed out the need to identify the long run characteristics of macroeconomic variables before interpreting the relationship between them.

The coefficient for inflation from the FMOLS in Table 4.4 is negative, with the value being $-11,956.6$, but the relationship is not statistically significant ($p = 0.1961$). So, while the estimated sign points to a negative relationship between inflation and investment effects, the evidence is not strong enough to conclude that inflation has a negative effect on investment in the long run. The result is inconsistent with Abaidoo and Agyapong (2023), who in particular conclude that the higher the level of inflation uncertainty, the lower the level of private investment. The difference is significant since the present study captures the inflation rate observed, not inflation uncertainty. Mandeya and Ho (2022) also addressed unstable inflation and found that this adversely affected the credit allocation and financial intermediation processes. The fact that the coefficient in Table 4.4 is small in absolute terms, however, implies that the direct impact of inflation on aggregate investment may be smaller than the impact through inflation instability or uncertainty.

From Table 4.4 it can be seen that the coefficient of interest rate is statistically significant and positive at $87,734.9$ at a 4% level of significance. This means that the positive relationship between the two variables in the estimated long run. It is opposite to the normal cost of capital expectation and also contrary to the findings of Sharpe and Suarez (2021) that a rise in the interest rates would raise the user cost of capital, which would lead to a decrease in the investment demand. The outcome can be due to the special characteristics of the Nigerian financial sector, as the policy interest rate observed could not just be an indicator of the cost of borrowing, but also the broader monetary and macroeconomic environment. Abdeljawad et al. (2024) have concluded that the interest rate sensitivity of investments differs across emerging markets, depending on the type of financing and availability of credit. This positive coefficient should thus be read as a Nigerian phenomenon, rather than as a general phenomenon that higher financing costs make investment more likely.

The explanatory variables have the highest statistically significant positive correlation with one another, as represented in exchange rate. Table 4.4 shows a coefficient of 8215.085 and a probability value of less than 0.001 . The findings show that the observed exchange rate changes are associated with significant changes in the investment in the long run. Salomão and Varela (2022) identified that the impact of exchange rate fluctuations on the investment of firms occurs through trade exposure and firm profitability. The results of their study may offer a viable explanation to the long-standing relationship found in the current study, since an exchange rate change may influence the profitability of firms involved in export business and the domestic value of foreign currency transactions. The study by Farounbi et al., (2021) also pointed out the exchange rate conditions as relevant to the corporate financing decisions. The present finding therefore substantiates the role of exchange rate conditions in understanding the investment dynamics in Nigeria but the positive sign means that the relationship explained is not straightforward as adverse effect of exchange rate depreciation.

GDP is negatively associated with the GDP growth rate, with a coefficient of $-63,234.6$ and a P value of 0.0656 , which is close to the 5% significance threshold. The coefficient is statistically significant at the 10% level but not at the 5% level as indicated in Table 4.4. The result is across from De Medeiros Braga (2020) who concluded that growth in economic activity prompts companies to grow productive capacity and boost investment. The findings indicate that growth in GDP per year did not necessarily increase in tandem with the investment during the period under study. This may suggest that the growth of aggregate production in Nigeria has not necessarily been accompanied by the same growth in productive investment. Wei et al. (2020) showed that technology takes the place of productive efficiency through investment and that it is important to separate out output growth from investment induced output growth.

Government expenditure has a negative and statistically significant coefficient of $-280,076$ ($p = 0.0001$) in Table 4.4. This suggests that there is a high negative long run relationship between government spending and investment. The findings offer empirical support to the crowding out view that fiscal expansion may crowd out private investment, which is in line with Shankar and Trivedi (2021). It differs from Babu et al. (2022), who argued that transaction costs may be lowered through the provision of public goods and thus productive public spending on infrastructure can crowd in private investment. Park and Meng (2024) also found that fiscal policy is effective depending on its composition and effectiveness. The negative coefficient found here might be due to failure to distinguish between the productive infrastructure expenditures and expenditure that could create competitive pressures on private investment.

The diagnostic evidence is additional evidence of the reliability of the estimated relationship. Table 4.5 starts with a serial correlation probability of 0.0055, which might suggest serial correlation. The corrected statistic however has a probability of 0.9352, which means that there is no statistically significant residual serial correlation after correction. Table 4.6 shows that the probability of heteroskedasticity is 0.1183 which exceeds 5% and thus gives no evidence of heteroskedasticity. Other relevant information in terms of the stability of the estimated relationship over the sample period is given in the CUSUM stability assessment shown in figure 4.1. Figure 4.2 provides the residual normality assessment and is to be interpreted in conjunction with the descriptive statistics in Table 4.1 which show a few variables with deviations from normality.

CONCLUSION

This study investigated the long run determinants of investment in Nigeria with inflation, interest rate, exchange rate, GDP growth rate as a proxy for economic growth and government expenditure as the variables investigated. The results of the unit root tests in Table 4.2 yield a combination of $I(0)$ and $I(1)$ variables, while no variables are in $I(2)$. Table 4.3 Bounds test shows a long run relationship between the variables. The interest rate and exchange rate are found to be positively and significantly related to investment whereas the government expenditure is found to be negatively and significantly related to investment as observed in the FMOLS estimates in Table 4.4. The coefficient of inflation is negative, but of low significance, while the coefficient of economic growth is negative and significant at the 10% level, but not at the 5% level of significance.

The results showed that no single macroeconomic condition explains the investment dynamics in Nigeria. The statistical relationship between exchange rate variables and fiscal expenditure is very high, while the relationship between monetary conditions and investment is also positive but not statistically significant, suggesting a need for caution in interpreting the relationship between the two in Nigeria's financial structure.

Policy Implications

The high exchange rate coefficient in Table 4.4 suggests that policies are needed to enhance exchange rate stability and reduce foreign currency transactions' uncertainty. Monetary and fiscal policy should further enhance measures to promote a predictable foreign exchange climate, given that exchange rate fluctuations are very much related to investment.

The negative and significant coefficient of government spending indicates that the composition and efficiency of government spending needs to be a focus in fiscal policy. The use of government resources should focus on productive infrastructure investment and public investments that can lower the operating costs of the private sector, as Babu et al. (2022) found.

The important interest rate relationship also argues for a careful calibration of monetary policy. Policy measures should not be based on a linear assumption that lower interest rates will automatically boost investment; rather, the transmission mechanism and credit availability in the financing landscape should be considered as explained by Abdeljawad et al. (2024).

The study has some limitations and future research topics:

Limitations and Future Research

The study suffers from lack of data for 45 years of observations and the use of the aggregate measurement of investment and government expenditure. The government expenditure variable fails to separate capital expenditure from recurrent expenditure, making it less useful to identify the parts of the government expenditure that are crowding out and crowding in. Likewise, the exchange rate variable is not a measure of volatility or depreciation but the observed exchange rate.

Future studies will therefore need to break up government spending into capital and recurrent items and between private and public investment. Exchange rate volatility, uncertainty of inflation, financial development, foreign

direct investment, and institutional quality can also be taken into consideration in further research. Such extensions would help to explain the dynamics of investment in Nigeria in a more detailed manner.

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