Interest Rates, Money Supply, Institutional Quality, and Investment Growth in Nigeria: Empirical Investigation from Autoregressive Distributed Lag Model

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Abstract

Several academics argue that a country's economic performance, especially its economic growth, is determined by investment, which in turn is influenced by interest rates. They argue further by saying that interest rate management is one of the main monetary policy tools used by decision-makers to guide and regulate an economy. Nigerian officials initiated several initiatives aimed at stimulating private sector investment and advancing economic growth. However, it is uncertain how impactful these economic strategies are in achieving the desired outcomes. Therefore, this study investigated the impact of interest rates, money supply growth, and institutional quality on investment growth in Nigeria.

The study utilised 68 quarters of time series data (2006Q1 to 2022Q4) based on an ex-post facto research design. The Autoregressive Distributed Lag (ARDL) model was utilized to assess the impact of interest rates, money supply expansion, and institutional quality on the growth of investment in Nigeria.

The study found that interest rates have a long-run significant co-integrating relationship with investment growth in Nigeria (Adj R2 = 0.811; F-stat (4, 63) = 98.323, p < 0.05). The study found that prime lending rate, monetary policy rate, money supply growth, and institutional quality are significant factors influencing changes in investment growth in Nigeria. The study

recommends that the monetary authority adopt interest rate levels that would attract investment into the productive sectors of the economy and also consider the appropriate channeling of money supply to important economic sectors that require more liquidity support.

Keywords: Interest Rate, Investment Growth, Money Supply, Institutional Quality, Gross Capital Formation.

JEL Classifications: E00, E02, E23, E40, E59

1.0 Introduction
Interest rate is the amount that indicates what a borrower refunds to the lender for the use of the money lent. Interest rates help banks and non-bank financial firms fulfil their financial intermediation responsibilities by facilitating the flow of credit throughout the economy. This suggests that interest rates affect economic activity in a big way. It also influences the level of consumption as well as the type and quantity of investments. High interest rates stimulate a downturn in the economy because they make borrowing less desirable. Conversely, low interest rates encourage borrowing and economic growth because, under other circumstances, businesses should only pay a small portion of their income in interest on loans. In other words, lower interest rates are associated with higher expected earnings (Mahmudul & Gazi-Salah, 2019).

Monetary Policy Rate is the benchmark interest rate that the monetary authorities set in order to influence the evolution of the main monetary variables in the economy such as inflation, exchange rate, expansion in credit and money supply etc while Prime Lending Rate is the rate that commercial banks charge their most creditworthy customers, generally corporations (Awopegba *et al*., 2022).

Money supply is the total volume of currency in circulation at a particular point in time in an economy. The currency in circulation involves currency in printed notes, money in the deposit accounts and in the form of other liquid assets (Buthelezi, 2023). Institutional quality is a measure of the quality of governance and institutions in a country. It is a fulcrum upon which other drivers of inclusive growth rest and revolve. The factors of institutional quality include governance, voice and accountability, political stability, government effectiveness, regulatory quality, rule of law and control of corruption (Uddin *et al*., 2023).

Investment plays a major role in aggregate demand, and it is a key driver of economic growth since it can boost the economy's output capacity; hence investment growth which is the increase in the stock of commitment of resources on physical goods and non-physical goods in a particular time period, is a very important economic consideration. Investment plans are necessary to ensure that future desires and financial goals are met.

In general, rapid and sustained economic growth may be possible with a strong investment potential. The money supply that keeps the economy running is supported by investments in banks and other financial institutions (Thuy *et al*., 2020).

Private investment is one of the main variables affecting an economy's capacity to prosper economically. Foreign direct investment (FDI) introduces technology, facilitates the adoption of new production methods, creates jobs, and increases productivity by creating competition in the

market. Furthermore, FDI imparts administrative and organizational skills and reveals unrealized economic potential. FDI reduces barriers to technology adoption and raises the calibre of capital and labour inputs in the host economy.

Investments are an essential source of human capital and expertise, and by disseminating information, they can encourage economic progress. Investments and growth are mutually dependent. Iamsiraroj (2016) found a positive feedback loop, according to which investment stimulates economic growth, which in turn attracts more investment flows and so promotes even more growth. Hatmanu et al. (2020) assert that, in economies with a high absorption capacity especially, foreign direct investment plays an important part in promoting economic growth through knowledge transfer.

Tawiri (2010) asserts that countries experiencing increased investment rates also experience faster economic growth, while those experiencing declining investment rates observe slower growth. According to Oni (2015), the goal of increasing an economy's growth rate has led most developing countries to concentrate on bolstering their institutional, human, and infrastructure capacities. Investment, in turn, drives economic growth.

Mahmudul and Gazi-Salah (2009) noted that high interest rates make borrowing more costly, which has a negative impact on the amount of investment. They argued that this is explained in part by the fact that individuals, businesses, and governments frequently borrow money from banks and other financial institutions to fund their investments. Likewise, high interest rates make economic agents to increase their savings in order to maximize profits. Furthermore, low interest rates reduce the cost of borrowing and signal an increase in investment. With the hope of obtaining a higher rate of return, businesses usually search for outside funding to invest in new factories, more productive machinery, raw materials, etc. However, if interest rate is higher than the anticipated return on investment, or vice versa, then it would not be economically viable to make such an investment. As a result, companies tend to invest more when borrowing rates are reduced (Acha & Acha, 2011).

Since financial access is still a requirement for attaining sustainable and inclusive economic growth, favourable interest rates are a precondition (Idris, 2019). According to Ajayi et al., (2017), investment, which is impacted by interest rates, is necessary for a country's economic performance, especially its economic development. Interest rate management is one of the main tools of monetary policy that decision-makers employ to guide and control an economy (Li *et al.*, 2021). To control the amount of money in an economy, policy interest rates are crucial (Bernanke, 2020). This is because raising interest rates would limit the amount of money that is available, which would decrease demand for money since getting money would become more expensive.

In addition to encouraging savings and investment, Nigeria's interest rate policy seeks to promote favourable exchange rate stability, financial stability, and a decrease in the strain on the balance of payments (Ajayi et al., 2017; Uko & Mike, 2019). Since the financial sector partially deregulated interest rates in 1987 in response to changes in the supply and demand for loanable money, interest rates have fluctuated. The Central Bank of Nigeria (CBN) fully deregulated interest rates in 2006 in an effort to mobilize savings and steer them into investments and other

economically productive areas. (Uko & Mike, 2019; Ndubuaku*et al*., 2017). Therefore, it is essential to look into how interest rates impact Nigeria's macroeconomic variables' performance.

Macroeconomic policy efforts have been introduced by Nigerian policymakers in an attempt to increase GDP and improve the living standards of the nation's citizens. Government policies primarily aim to improve the state and citizen welfare as well as macroeconomic performance (Adodo, 2022). To attain the intended better standard of life, macroeconomic stability—which is supported by robust institutional arrangements—is required. Low inflation, steady foreign exchange, full employment, higher productivity, and a positive balance of payments are a few instances of this stability. However, these institutional structures are not as strong in developing countries like Nigeria as they are in the developed nations. Abere and Akinbobola (2020) claim that social vices like institutional corruption have harmed Nigeria's economy and made it challenging for people in public office to diligently offer the people and the economy with effective governance.

Nigeria's economy has consistently had an inadequate growth rate over time, despite the efforts of policymakers and regulatory authorities to achieve a healthy and sustainable macroeconomic performance in the nation. High inflation combined with stagnating private consumption keeps restricting domestic demand. Public debt and the central bank's ever-more complex policy procedures limit the growth of lending to the private sector. Nigeria's economy faces external risks due to the depletion of its fiscal buffers and the susceptibility of its foreign reserves to movements of hot money. This can be the result of insufficient focus on interest rates, an important macroeconomic tool.

The impact of interest rates, societal and institutional constraints, and a shortage of funding all contribute to the economy's slow growth by creating a bottleneck that discourages investment in Nigeria. The Nigerian economy, which is a frontier and developing nation plagued by a lack of capital, has not had a good opportunity to mobilize money to support growth and development from the banking sector. According to Ajayi et al. (2017), a significant increase in general interest rates, can have catastrophic effects on significant macroeconomic variables, severely taxing the commercial and economic sectors.

Thus, interest rates, money supply growth, and the quality of an economy's institutions influence the basic processes of production and consumption through the transmission mechanism of capital formation and investment flow-through.

This study examines the impact of interest rates on investment growth over the study period and makes recommendations for future development in an effort to better understand how interest rates work as a tool for policymakers to stimulate or discourage investment in the nation.

2.0 Review of the Literature

2.1 Theoretical Framework
The study is based on the Classical Theory of Interest Rate and the Neoclassical Theory of Investment due to their essential links between interest rates and investment growth. While the Classical Theory of Interest Rate highlights the importance of interest rates as a reward for

savings and investment, which fosters economic growth, the Neoclassical Theory of Interest discusses the relationship between interest rate and investment.

The classical theory of interest rates holds that capital supply and saving are equal as individuals cut their consumption costs to free up capital. It was therefore asserted that the rate of interest impacted both investments and savings and that this factor balanced them both. They suggested an investing schedule that sloped downward. This suggests that business enterprises, or investors, will decide to take on bigger loans at a lower interest rate. However, the relationship between investments and savings determines the interest rate. Stated differently, when savings and investment are equal, there is an equilibrium interest rate. The level of income has no effect on this equilibrating mechanism as full employment is assumed. The fastest pace of economic expansion is predicted to occur at this time.

Neoclassical theory of investment holds that investment, or the addition of new capital to the stock of capital already present in an economy, is determined by the user cost of capital, sometimes referred to as the real rental cost of capital, and marginal product of capital (MPK). The marginal product of capital, or MPK, is a measure of the increase in production that results from using one more unit of capital while maintaining the same levels of labour and technology. All other things being equal, however, the law of diminishing returns causes the marginal product of capital to decline as more units of capital are utilized for production. The user cost of capital, or the rental for capital that a business owns or controls, is a measure of the opportunity cost of the money spent to generate or buy capital equipment, simply known as interest rates.

2.1.1 The Classical Theory of Interest Rate
The Classical Theory of Interest Rate was developed in the 18th century. The theory states that interest rates are determined by the supply and demand for capital, or savings. The classical economists believed that there is an inverse relationship between the interest rate and the supply of savings or investments and called this the "real theory of interest" since it maintains that interest rates are wholly unaffected by monetary conditions (Suman, 2022).

The theory was predicated on the following premises: (i) the factor market is subject to perfect competition; (ii) all resources are fully employed; (iii) economic agents behave rationally in order to maximize economic benefit; (iv) the price level is presumed to be constant; and (v) money is neutral and functions only as a medium of exchange rather than as a store of value. According to Hayes (2021), classical economists contended that the act of saving and lowering consumption expenditures by individuals results in the availability of capital. As a result, they claimed that interest rates, or the cost of capital, determined both savings and investment and that this was the component that balanced both.

However, these assumptions have been questioned by the English economist John Maynard Keynes (Keynes). Keynes argued that the conventional philosophy of investing was arbitrary. The saving curve's placement is controlled by income levels, and the interest rate is determined by the intersection of the investment and saving curves. This implies that until we know the income level, we won't be aware of the interest rate. However, we cannot determine the income level until we first know the amount invested, which requires us to know the interest rate in

advance. The classical theory of interest is unable to offer a solution since it cannot anticipate the rate of interest until we certainly know the interest rate.

The theory is relevant to this study to determine the importance of interest rate in influencing savings and investment in the economy. An increase in savings would increase the amount of money that can be lent to the productive sector, thus promoting economic growth.

2.1.2 The Neoclassical Theory of Investment
The central focus of neoclassical economics is that supply and demand dictate the creation, distribution, and pricing of goods and services. The theory debuted in 1900 as a competitor to the more established classical economic theories. The publications of Léon Walras, Carl Menger, and William Stanley Jevons served as the foundation for this technique, which was developed in the late 1800s. Capital transfers between countries were explained by the concept of portfolio capital movements, which maintains that differences in interest rates between countries are the main cause of international capital flows, before the 1960s.

The fundamental premise of the theory is that investment is influenced by users' cost of capital and output level. However, the cost of capital goods, the real interest rate, and the rate of capital asset degradation all affect the users' cost of capital. According to Olweny and Chiluwe (2012), this theory also connects investment to adjustments in monetary and fiscal policy. They pointed out that an expansionary fiscal policy—one characterized by high government spending and low personal taxation—would encourage private investment when paired with a tax policy like a larger investment tax credit because it will raise expected firm output and income levels as well as the level of desired capital stock, which will encourage investment. However, expansionary monetary policy lowers interest rates, which lowers the rental cost of capital and raises the anticipated capital stock{(Pérez-Montiel & Erbina, 2020, Twine *et al*., 2015)}. Thus, through the transmission mechanism and application of monetary and fiscal policy, long- and short-term interest rates are connected with investment behaviour.

Critics of this theory noted that the strong assumptions of the neoclassical models limit their ability to explain foreign portfolio investment in real-world scenarios. As a result, it is generally agreed upon that the assumptions of perfect competition, instantaneous and freely transferable technology, homogeneity of inputs, continuous returns to scale, and absence of transaction costs are unrealistic in real-world situations.

This theory maintained that supply and demand control the production, pricing, and consumption of goods and services as well as the amount of foreign exchange that enters an economy. Hence, this theory is relevant to this study as it shows the link between interest rates and supply of money and the growth in account of investment capital available.

2.2 Empirical Review
Using interest rates and the total money supply as proxies for monetary policy and green finance as a proxy for investment, Goshu *et al*., (2022) investigated the link between monetary policy and investment. The conclusions drawn from the data are incongruous. They found that there is a strong inverse relationship between interest rates and green finance in the short and long runs. On the other hand, a large money supply over time influences green finance positively.

Olusola (2020) examined the impact of interest rates on domestic savings after the implementation of Nigeria's Structural Adjustment Program (SAP) using the autoregressive distributed lag (ARDL) technique in line with the financial liberalization hypothesis. The findings demonstrated the long-term co-integration of interest rate and gross domestic savings. According to the analysis, since Nigeria's economic reforms in 1986, capital formation has had a beneficial impact on domestic savings, whilst interest rates had a negative impact. A study also identified a long-term relationship between interest rates and domestic private investments.

Solomon and Kofi (2020) investigated how interest rates affect private investment and identified the point at which interest rates have a negative effect on private investment in Ghana. The autoregressive distributed lag (ARDL) model and annual time series data from 1986 to 2016 were used in the study. The interest rate threshold was estimated using the quadratic function and conditional least squares methods. The results of the ARDL model, which demonstrate that interest rates have a positive long- and short-term impact on private investment, corroborate the McKinnon-Shaw hypothesis in Ghana. Nonetheless, the conditional least square model and quadratic function results indicated that there is a threshold of 23.59% and 24%, respectively, beyond which the interest rate has a negative impact on private investment in Ghana.

The study by Thuy *et al.,* (2020) used the system generalized method of moment (GMM) framework and Vietnamese province data to provide new insights on the relationship between monetary policy and private investment. The numerous ways to gauge the effect of monetary policy, including, money supply, interest rate, exchange rate, and domestic loans to the private sector were all examined. They discover that respective monetary policies have a positive impact on private investment through the channels of interest rates, broad money, and domestic credit, even in the absence of strong evidence indicating the influence of exchange rates. Examining the unique features of the economy during its two stages of development (pre- and post-2012), the study` discovered an unexpected correlation between real interest rates and private investment.

The purpose of the study by Kayode *et al*. (2020) was to look into the effects of Nigeria's money supply over a seventeen-year period on savings and investments. The study found a substantial correlation between money supply and savings and investments.

Using time series analysis, Nooreen and Muhammad (2020) examined the connection between investment, interest rates, and inflation for the years 1973 through 2018. Their study gave a fresh perspective on call money rates, which could improve Pakistani investment opportunities. To capture the dynamics of the variables in the model over both the short and long terms, the ARDL Bound Testing Approach and ECM were used. The study's findings showed that inflation and call money rates have a big impact on investment, which in turn affects economic growth. In order to assist Pakistan's economic growth, the study recommended that financial policies on inflation and interest rates that are favourable to investment should be created and put into effect.

Hatmanu et al. (2020) argued that low interest rates in Romania have a negative effect on macroeconomic performance by limiting foreign direct investment, which lowers capital inflow and depreciates currency. Their empirical analysis focused on the short-term impact of interest rates on economic growth. They went on to add that although low interest rates could be beneficial for the economy in the short run, they could also have negative long-term implications

because of malinvestment and relative pricing distortion. A less-than-ideal use of resources—money, time, attention, or energy—that usually results from errors, inefficiencies, insufficient information, or artificially low interest rates is referred to as malinvestment (Cutsinger, 2020).

Benson *et al.,* (2019) examined how interest rates and exchange rates affected foreign direct investment in Nigeria between 2006 and 2018. The results of the study showed that the relationship between foreign direct investment (FDI) and the exchange rate is positive and statistically significant. However, although the relationship between interest rate (INT) and foreign direct investment (FDI) is negative, the long-run co-integrating equation was not statistically significant.

Inimino *et al.,* (2018) conducted a study on interest rates and domestic private investment in Nigeria between 1980 and 2015. The study adopted monetary policy rate, prime lending rate, and maximum lending rate as proxies for interest rates. The two primary analytical techniques were the Augmented Dickey-Fuller test and the Autoregressive Distributed Lag (ARDL) model. A long-term association between the variables was found using the ARDL Bounds test. Furthermore, the outcome showed that monetary policy rate has negative short- and long-term effects on domestic private investment. Maximum lending rate has a positive and significant impact on domestic private investment in the short and long runs while prime lending rate has a negative and insignificant impact on domestic private investment in both the short run and the long run.

Apere and Akarara (2018) investigated the relationship between interest rates and investments in Nigeria between 1981 and 2015. In order to analyze the data, the study evaluated the Johansen Multivariate Co-integration model and the Error Correction Model (ECM). The results of the co-integration test demonstrated the long-term link between investment, as measured by gross fixed capital formation (GFCF), and the proxies for interest rates—maximum lending rate, monetary policy rate and savings rate. The ECM results show that maximum lending rate and monetary policy rate have a statistically significant negative impact on investment in Nigeria. However, even with increased funding, savings rate offers no statistically significant advantages.

3.0 Methodology

3.1 Research Design
Using an *ex-post facto* research design, the study looked at how interest rates affected the growth of investments in Nigeria from 2006Q1 to 2022Q4. The research methodology was adopted since it has been applied in previous studies, there were proven theoretical correlations between the interest rate and investment, and there was valuable data available for this investigation. This research design has been used in other investigations such as (Akadiri & Akadiri, 2021; Gambacorta & Mistrulli, 2014; Nampewo, 2021).

3.2 Statement of Hypotheses
The objective of this study is to analyse the effect of interest rates on Investment Growth in Nigeria. Therefore, the testable hypotheses are:

$H_0 1$: Interest rates have no significant effect on investment growth in Nigeria.

H_a1: Interest rates have significant effect on investment growth in Nigeria.

3.3 Method of Data Analysis
This study used time series data that was evaluated using both descriptive and inferential statistics to investigate the relationship between interest rates and the growth of investments in Nigeria. Statistical metrics including mean, minimum, maximum, and standard deviation were used in the descriptive analysis. The degree of correlation among the explanatory variables and the presence of multicollinearity were assessed using the Variance Inflation Factor (VIF) and Pearson's Product Moment Correlation.

Unit root tests were performed on the variables to look at their time series qualities before estimating the regression analysis. The Augmented Dickey Fuller unit root test and the Phillip and Perron unit root test were both carried out. The time series regression was estimated using the linear autoregressive distributed lag model (ARDL). The ARDL approach's applicability to variables with varying orders of cointegration serves as one of the econometric technique's defenses (Pesaran & Pesaran, 1997). This happens when variables like (1) have a mixed order of I(0) and I. Secondly, as mentioned by Pesaran *et al.*, (2001), the ARDL technique can be applied to small or finite sample sizes. Thirdly, the long-term and short-term parameters are computed concurrently. Fourthly, the method could take structural breaks in time series data.

3.4 Model Specification
The model used to evaluate how interest rates affected the growth of investments was based on the Neoclassical Theory of Investment and the Classical Theory of Interest Rates. The findings of both theories indicate that interest rates are determined by the supply and demand for capital, or savings, with the supply of savings or investments having an inverse relationship with the interest rate, which is also referred to as the cost of capital. Subsequently, the study established the functional link depicted in equation (1) below by utilizing and modifying models obtained from the research conducted by Nkemgha et al., (2021).

INVG= f(MPR, PLR, MSG, INSTQ)   …………………………………………..(1)

Where INVG is the investment growth rate over the previous period, PLR is prime lending rate, MPR is monetary policy rate, MSG is the money supply growth, and INSTQ is the institutional quality. The estimable form of equation (1) is specified in equation (2).

$$INVG_t = \beta_0 + \beta_1 MPR_t + \beta_2 PLR_t + \beta_3 MSG_t + \beta_4 INSTQ_t + \mu_t \quad …………………(2)$$

β_0 is the constant term and μ_t is the disturbance term. The parameters β_i(i= 1, 2 . . , 4) are the coefficient of the respective variables.

The ARDL model for investment growth is shown below:

$$\Delta INVG_t = \alpha_0 + \sum_{i=0}^{n1} \alpha_1 \Delta INVG_{t-i} + \sum_{i=0}^{n2} \alpha_2 \Delta PLR_{t-i} + \sum_{i=0}^{n3} \alpha_3 \Delta MPR_{t-i} + \sum_{i=0}^{n4} \alpha_4 \Delta MSG_{t-i}$$

$$+ \sum_{i=0}^{n5} \alpha_6 \Delta INSTQ_{t-i} + \beta_1 PLR_{t-1} + \beta_2 MPR_{t-i} + \beta_3 MSG_{t-1} + \beta_4 INSTQ_{t-1}$$

$$+ u_t \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (3)$$

3.5 Apriori Expectation

The Classical Theory of Interest Rate and Neoclassical Theory of Investment state that interest rate is determined by the supply and demand of capital and that there is an inverse relationship between interest rate and investment. This is because high borrowing costs brought on by rising interest rates tend to dissuade people from borrowing money for investments. As a result, the study predicted that while more money supply and higher institutional quality (which promotes capital attraction) would boost investment growth, higher lending and monetary policy rates would have the opposite effect.

4. Presentation of Results and Analysis of Findings
4.1 Descriptive Statistics and Correlation
4.1.1 Descriptive Statistics

The study examined quarterly data from Nigeria from 2006Q1 to 2022Q4. Table 1 displays the descriptive data for each of the dependent and independent variables, together with the mean, maximum, minimum, standard deviations, and number of observations. Each dependent and independent variable was reviewed separately.

Table 1: Descriptive Statistics of Interest Rates, Money Supply, Institutional Quality and Investment Growth

Variables	Mean	Maximum	Minimum	Std. Dev.	Obs
INVG	5.207	83.388	-39.938	19.360	68
PLR	16.027	19.420	11.200	2.010	68
MPR	11.504	16.170	6.000	2.484	68
MSG	4.031	27.691	-7.269	5.289	68
INSTQ	0.011	0.427	-0.402	0.248	68

Source: Researcher's Computation 2023

Notes: Table 1 shows the mean, maximum, minimum and standard deviation of the variables. The dependent variable is Investment Growth (INVG). The regressors are Prime Lending Rate (PLR), Monetary Policy Rate (MPR), Money Supply Growth (MSG), and Institutional Quality (INSTQ). The sample period is from 2006Q1-2022Q4 representing 68 quarterly observations. The estimation process was facilitated using EVIEWS 12.

4.1.1.1 Interpretation

Investment growth has a mean value of 5.21 and a standard deviation of 19.36. The mean value indicates that Nigeria's investment growth averaged 5.21 percent between 2006Q1 and 2022Q4. On the other hand, the very high standard deviation of 19.36 indicates that investment growth is

highly variable between 2006Q1 and 2022Q4. The lowest number of -33.94 and the highest value of 83.39 represented the different rates of investment growth in Nigeria during the review period. This implies that during the research period, both positive and negative investment growth were observed.

4.1.2 Pearson Correlation Analysis

This section discusses the degree of association between the interest rates variables of Prime Lending Rate (PLR), Monetary Policy Rate (MPR), Money Supply Growth (MSG), and Institutional Quality (INSTQ) and Investment Growth (INVG)for the period 2006Q1-2022Q4 in Nigeria.

Table 2 Correlation Matrix for Interest Rates, Money Supply, Institutional Quality and Investment Growth

Variables	INF	RGDPG	INVG	EXR	PLR	MPR	MSG	INSTQ	VIF
INVG	-0.108	0.021	1.000						N/A
PLR	-0.442	0.253	0.010	-0.644	1.000				1.108
MPR	0.188	-0.611	-0.006	0.539	-0.236	1.000			2.517
MSG	0.177	0.132	0.505	-0.132	-0.089	-0.110	1.000		1.040
INSTQ	0.293	-0.694	0.040	0.518	-0.058	0.752	-0.170	1.000	2.415

Source: Researcher's Computation 2023

Notes: Table 2 shows the Pearson pairwise correlation matrix. The dependent variables are Inflation Rate (INF), Real Gross Domestic Product Growth (RGDPG), Investment Growth (INVG), and Exchange Rate (EXR). The regressors are Prime Lending Rate (PLR), Monetary Policy Rate (MPR), Money Supply Growth (MSG), and Institutional Quality (INSTQ). The sample period is from 2006Q1-2022Q4 representing 68 quarterly observations. The estimation process was facilitated using EVIEWS 12. The correlations are below the major diagonal and the last row titled VIF is the test for multicollinearity.

4.1.2.1 Interpretation

The correlation analysis in Table 2 shows that increases in the prime lending interest rate, money supply growth, and institutional quality are positively correlated with investment growth. Consequently, if these variables rise, so too will the level of investment in Nigeria. Conversely, a greater increase in the monetary policy rate will result in a decrease in Nigeria's level of investment spending.

Additionally, a multicollinearity test was run, and the variance inflation factor (VIF) for each explanatory variable was less than 10. The VIF were 1.108, 2.517, 1.040, and 2.415 for the prime lending interest rate, monetary policy rate, money supply growth, and institutional quality. Thus, the four regressors used in the estimated model were not correlated with one another.

4.1.3 Result of the Stationarity Test

A stationarity test was conducted to examine the time series properties of the variables over the course of the study. Two particular tests, the Augmented Dickey Fuller (ADF) test and the Phillip-Perron unit root test, were employed to determine if the series was stationary. Table 3 presents the findings.

Table 3: Result of the Unit Root Test

Variables	ADF	PP	Remarks
INVG	-1.606	-1.306	
ΔINVG	-12.772***	-50.997***	I(1)
PLR	-2.001	-2.318	
ΔPLR	-6.871***	-6.861***	I(1)
MPR	-2.261	-2.443	
ΔMPR	-4.694***	-4.766***	I(0)
MSG	-5.847***	-8.547***	
ΔMSG	-10.634***	-37.186***	I(1)
INSTQ	-2.241	-2.139	
ΔINSTQ	-3.721***	-3.567***	I(1)

Source: Researcher's Computation 2023

Notes: Table 3 presents the unit root test. The dependent variables are Inflation Rate (INF), Real Gross Domestic Product Growth (RGDPG), Investment Growth (INVG), and Exchange Rate (EXR). The regressors are Prime Lending Rate (PLR), Monetary Policy Rate (MPR), Money Supply Growth (MSG), and Institutional Quality (INSTQ). The sample period is from 2006Q1-2022Q4 representing 68 quarterly observations. The estimation process was facilitated using EVIEWS 12. The critical value at 5% for intercept and trend is -3.50 and for intercept alone is -2.93. ** and *** indicates significant at 5 and 1 percent respectively.

4.1.3.1 Interpretation

The results of the unit root test presented in Table 3, as well as the stationarity tests conducted on the data using the Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) tests, indicate that Investment Growth (INVG) is stationary after first difference. The outcome seen can be attributed to the unit root statistics for the ADF and PP unit root tests exhibiting higher negative values compared to the critical values at the 5 percent significance level. Furthermore, the data indicates that all the regressors, including the Monetary Policy Rate (MPR), exhibit first difference stationarity. Notably, the MPR demonstrates stationarity at a significance level of 5 percent. Some of the regressors considered in this study are Prime Lending Rate (PLR), Money Supply Growth (MSG), and Institutional Quality (INSTQ). The analysis employed the Autoregressive Distributed Lag (ARDL) model method to cointegration proposed by Pesaran and Pesaran (2001), which accounts for the varying orders of integration of the variables. This model enables the integration of both levels and first difference stationary variables. The concurrent assessment of both the long- and short-term dynamics of the model provide further validation for the utilization of the autoregressive distributed lag (ARDL) approach to cointegration.

4.2.3 Hypothesis Testing

Research Objective Three: Determine the effect of Interest Rates on Investment Growth in Nigeria.

Research Question Three: What effect does Interest Rates has on Investment Growth in Nigeria?

Research Null Hypothesis : Interest rates have no significant effect on investment growth in Nigeria.

Table 4: Interest Rates, Money Supply, Institutional Quality and Investment Growth

Panel A: Long Run Estimates

Dependent Variable: INVG

Variable	Coefficient	S.E	t-stat	Prob
C	15.048	18.192	0.827	0.413
PLR	-0.685	0.185	-3.710	0.000
MPR	-0.849	0.239	-3.548	0.001
MSG	0.951	0.371	2.565	0.030
INSTQ	10.567	9.103	1.161	0.252

Panel B: Short -Run Estimates

Variable	Coefficient	S.E	t-stat	Prob
D(INVG(-1))	0.280	0.141	1.985	0.054
D(PLR)	-3.484	2.747	-1.268	0.212
D(PLR(-1))	-3.749	2.550	-1.470	0.149
D(MPR)	-5.889	2.588	-2.276	0.028
D(MPR(-1))	5.148	2.858	1.801	0.079
D(MSG)	0.197	0.431	0.457	0.650
D(MSG(-1))	0.098	0.469	0.209	0.835
D(INSTQ)	-10.950	58.211	-0.188	0.852
D(INSTQ(-1))	12.635	70.651	0.179	0.859
ECT(-1)	-0.647	0.126	-5.138	0.000

Panel C: Diagnostic Tests	**Statistic**	**Prob.**
Bound Test	7.893	0.000
Adjusted R-square	0.811	
F-Statistic	98.323	0.000
Serial Correlation	0.572	0.569
Heteroscedasticity	0.772	0.739
Linearity Test	0.792	0.433
Normality	1.282	0.527
	CUSUM	CUSUMSQ
Stability Test	Stable	Stable

Source: Researcher's Computation 2023

Notes: Table 4 reports the long-run estimates, short run estimates and the diagnostic tests for the relationship between interest rates and investment growth. The dependent variable is Investment Growth (INVG) and the regressors are Prime Lending Rate (PLR), Monetary Policy Rate (MPR), Money Supply Growth (MSG), and Institutional Quality (INSTQ).

4.2.3.1 Interpretation
Based on the estimated model in Table 4, the estimated equation is given as:

$$INVG_t = \beta_0 + \beta_1 MPR_t + \beta_2 PLR_t + \beta_3 MSG_t + \beta_4 INSTQ_t + \mu_t$$

$$INVG_t = 15.048 - 0.849MPR_t - 0.685PLR_t + 0.951MSG_t + 10.567INSTQ_t$$

4.2.3.2 Bound Test

The application of the bound test to determine the potential existence of a long-term association reveals that the obtained bound test statistic of 7.893 exhibits statistical significance at a 5 percent significance level. This phenomenon can be attributed to the statistical significance of the 7.893 data point, which surpasses the critical values of 4.26, 3.5, and 3.13 at a significance level of one percent. This suggests the possibility of a cointegrating link between the variables over a long-term period. Based on the underlying hypothesis positing a potential long-term association between interest rates and investment growth, the study proceeds to calculate the elasticity in both the long-run and short-run. Table 4 displays the empirical findings of the model that investigates the effects of interest rates on investment growth in both the short and long run.

4.2.3.3 The Long-Run Dynamics

The long-run coefficients, also known as elasticities, for the ARDL model have been computed and are presented in Panel A of Table 4. Existing research suggests that there exists a significant and adverse long-term relationship between the prime lending rate and investment growth in Nigeria. This implies that an upward adjustment in the lending rate will lead to a subsequent decline in investment growth. Hence, it can be observed that a 1% rise in the prime lending rate corresponds to a reduction of 0.685 percent in investment growth. Furthermore, the findings of the study revealed a statistically significant association (PLR = -0.685, t-test = -3.710, $p < 0.05$) between the increase in investments and the prime lending rate in Nigeria.

The findings additionally demonstrate a negative correlation between investment growth and monetary policy rate, suggesting that an increase in policy rates will result in a decrease in investment growth. Consequently, an increase of one percent in investment growth will result in a decrease of 0.849 percent. Based on the findings, a noteworthy correlation has been observed between the increase in investment and the monetary policy rate in Nigeria (MPR = -0.849, t-test = -3.548, $p < 0.05$).

Moreover, there is empirical data suggesting a positive association between the expansion of the money supply and the growth of investment. This implies that an augmentation in the money supply will result in an increase in investment growth. Therefore, a marginal increase of 1% in the money supply will result in a corresponding growth rate of investments that is estimated to be approximately 0.951%. The findings of the study revealed a statistically significant association (MSG = 0.951, t-test = 2.565, $p < 0.05$) between the expansion of investments and the rise of money supply in Nigeria.

Research suggests that there is a positive correlation between improvements in institutional quality and investment growth, indicating that greater institutional quality is likely to result in increased investment. Hence, it can be inferred that a mere 1% enhancement in institutional quality would result in a substantial 10.567% surge in investment growth. The findings of the study indicate that there is no statistically significant association (INSTQ = 10.567, t-test = 1.161, $p > 0.05$) between the rise in Nigerian investment and the quality of institutions.

Based on the aforementioned data, it can be observed that prime lending rate, money supply, and monetary policy rate exhibit notable significance as determinants of investment growth in Nigeria. Conversely, the impact of institutional quality on changes in investment growth appears to be rather insignificant.

Short-run Dynamics

The findings indicate that, within a limited time frame, there exists a tenuous and adverse correlation between the escalation of investments in Nigeria and the prime lending rate. The aforementioned correlation differs from the observed correlation in terms of its long-term nature, considerable magnitude, and negative direction. Additionally, there is empirical evidence that supports a robust and adverse short-term relationship between the monetary policy rate and investment growth, which aligns with findings observed over a longer time horizon. The findings additionally suggested that in the medium term, there was a modest nevertheless favourable influence of both money supply and institutional quality on the growth of investment in Nigeria.

The cointegrating term in the Nigerian context exhibits the anticipated sign and demonstrates statistical significance, aligning with the expectations derived from the short-run data. This suggests that any divergence from the steady state may be readily explained within the Nigerian framework. Consequently, the coefficient of 4.6 estimated for the ECTt-1 variable, as presented in Panel B, exhibits a negative value and demonstrates statistical significance (ECT = -0.647, t-test = -5.138, $p < 0.05$). This suggests that adjustments from the investment growth equilibrium path are rectified by a magnitude exceeding 65 percent throughout the subsequent quarter. In other words, Nigeria has a somewhat elevated level of adaptability. The statistical significance of the ECTt-1 provides more empirical support for the existence of a long-term equilibrium association between interest rates and investment growth in Nigeria.

The obtained Adjusted R-square value of 0.811 indicates that when considering the combined effects of money supply growth, institutional quality, monetary policy rate, and prime lending rate, approximately 81% of the variability in investment growth in Nigeria can be explained. It is important to note that the remaining 19% of the fluctuations in Nigeria's investment growth are likely attributable to factors not included in the current model.

The F-test is employed to assess the overall adequacy of the model by testing the null hypothesis that all coefficients in the model are equal to zero. In the present scenario, the F-test demonstrates statistical significance at a significance level of 5%, suggesting that the model is typically suitable for explaining the observed data. The F-test result of 98.323, accompanied by a probability value of 0.000, suggests that several major variables, such as prime lending rate, monetary policy rate, money supply growth, and institutional quality, collectively influence the growth of investment in Nigeria.

Decision Rule

The null hypothesis, which posits that there is no significant relationship between interest rates and investment growth in Nigeria, was rejected based on the F-test statistic of 98.323 at a 5% level of significance and with degrees of freedom of (4, 63). Conversely, the alternative hypothesis, which suggests that interest rates do have a significant impact on investment growth in Nigeria, was accepted.

Post-Estimation test

The assessment of the parameter estimates' validity and reliability, as well as the ability to derive appropriate inferences from the data, was conducted through the implementation of five distinct diagnostic tests. The initial approach employed to assess the possibility of uncorrelated error term is the serial correlation test. The second stage involves determining if the error terms have equal finite variances. The aforementioned assumption is commonly referred to as homoscedasticity. Heteroscedasticity is the term used to describe a departure from this underlying principle. The final assessment is the normality test, which evaluates the level of flatness, peakiness, and asymmetry in the distribution. The assumption of normalcy is made when the Jarque-Bera test yields non-statistically significant outcomes. The linearity of the model is indicated by the lack of significance in the Ramsey RESET test, prompting the inclusion of the linearity test as the fourth evaluation. The stability test, which is ranked fifth, utilizes the CUSUM and CUSUMSQ methods. In order to ensure stability of the estimated model, it is necessary for the plot of the CUSUM and CUSUMSQ statistics, depicted as two linear functions, to remain under a significance threshold of 5%.

The obtained results fail to provide evidence to reject the null hypothesis, which states that there is no serial correlation present in the residuals. This is indicated by the F-statistic of 0.572 and the associated probability value of 57%, both of which exceed the predetermined significance threshold of 5%. Consequently, it can be inferred that the consecutive error terms do not exhibit serial association. The findings of the study indicated a lack of correlation between the sequential error components within the estimated model for interest rates and the growth of investment in Nigeria. Given that the F-statistic is 0.772 and the associated probability value is 74%, it can be concluded that the statistical significance of this result is not seen at the 5% level of significance. Consequently, the outcomes of the heteroscedasticity study indicate that the variance of the error terms is homoscedastic. This suggests that the null hypothesis of homoscedasticity cannot be rejected.

Moreover, the linearity test conducted using the Ramsey RESET does not yield any statistically significant results. The probability value of this observation is 43%, indicating a relatively low likelihood of occurrence. Additionally, the F-statistic for this observation is 0.792, which exceeds the critical value of 5 per level. The results of this study indicate a direct correlation between interest rates and investment growth in Nigeria, supporting the hypothesis that the estimated model is accurately specified. The Jarque-Bera statistic was used to test the normality assumption. The resulting F-statistic was found to be 1.282, with a corresponding probability statistic of 53%. This probability is greater than the predetermined significance level of 5%. Therefore, based on these findings, we fail to reject the null hypothesis that the data follows a normal distribution. Moreover, the stability of the estimated model is evidenced by the CUSUM and CUSUMSQ values presented in Panel C and Figures 1 and 2. These figures depict the CUSUM and CUSUMSQ statistics, represented by two linear lines, consistently remaining under a 5% significance threshold.
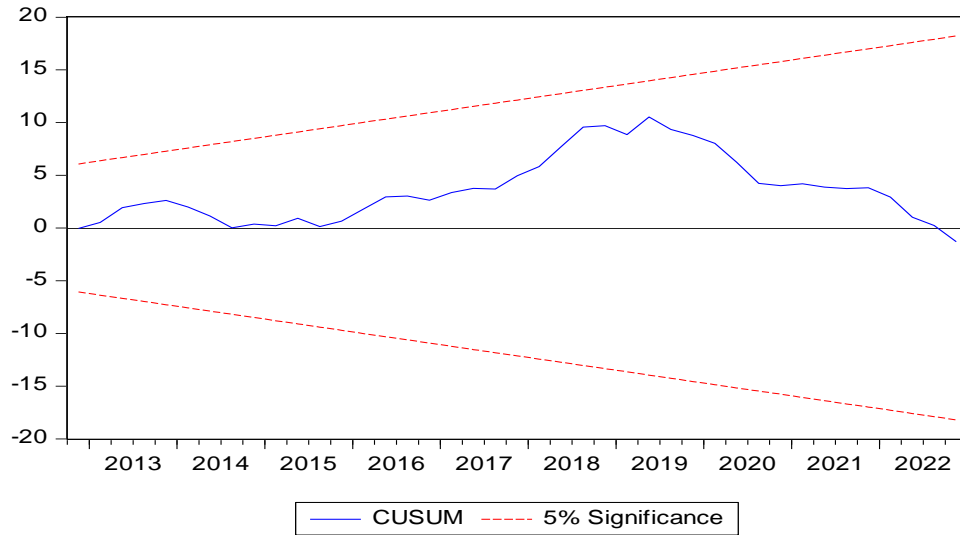
Figure 1: Stability Test - Plots of Cumulative Sum of Residual
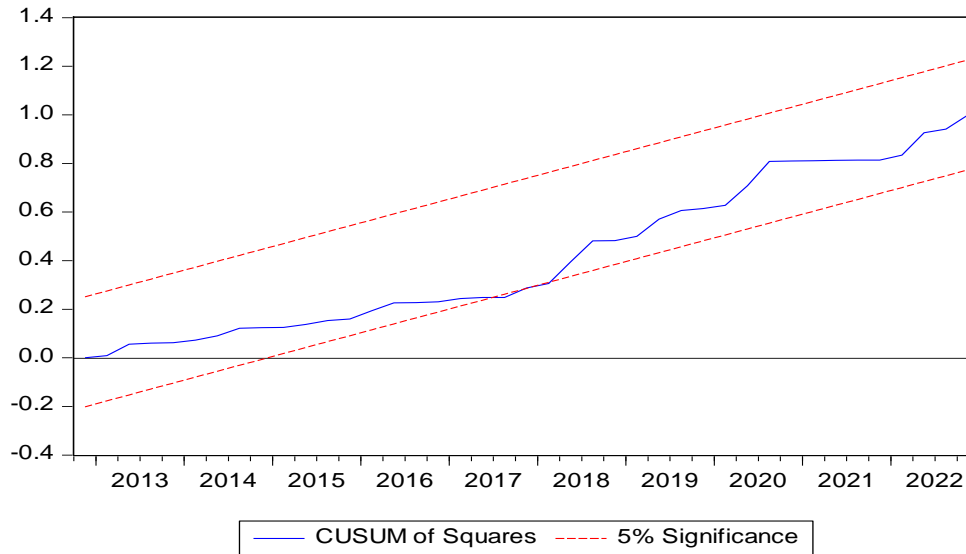
Figure 2: Stability Test - Plots of Cumulative Sum of Square Residual

4.3 Discussion of Empirical findings

The study employed the Autoregressive Distributed Lag (ARDL) model to achieve its objective, and the results indicate the presence of a long-term cointegrating association between interest rates and investment growth in Nigeria. The empirical findings indicate that, when considering a long-run cointegrating relationship, the elasticities of investment growth in Nigeria are influenced by various factors. Specifically, in the long run, there is evidence supporting a positive relationship between the growth of the money supply and institutional quality with investment growth. Conversely, a negative relationship is observed between the prime lending interest rate and the monetary policy rate with investment growth. Moreover, empirical evidence

suggests the existence of a robust and enduring correlation between the expansion of the money supply, the prime lending rate, and the monetary policy rate in Nigeria. However, it is worth noting that no substantial long-term association has been observed between investment growth in Nigeria and the quality of institutions.

The findings of this study align with previous research conducted by Nooreen and Muhammad (2020), which examined the relationship between the call money rate (interest rate) and investment in Pakistan from 1973 to 2018. Their study revealed a significant impact of the call money rate on investment. In a study conducted by Kayode *et al.,* (2020), the researchers examined the influence of money supply on savings and investment in Nigeria. Their findings revealed a significant correlation between money supply and both savings and investments. Similarly, Thuy *et al.,* (2020) conducted a study investigating the connection between monetary policy and private investment in Vietnam. Their research demonstrated that private investment is positively impacted by specific monetary policies, specifically through the channels of broad money, domestic credit, and interest rates. Solomon and Kofi (2020) conducted a study to examine the impact of interest rates on private investment in Ghana during the period of 1986 to 2016. Their findings revealed a positive effect of interest rates on private investment in both the short and long run, thus providing support for the McKinnon-Shaw hypothesis in the Ghanaian context. In a similar vein, Inimino *et al.,* (2018) investigated the relationship between interest rates and domestic private investment in Nigeria from 1980 to 2015. Their study identified the presence of a long-term association between the variables under consideration. The results of the study indicate that the maximum lending rate had a statistically significant positive impact on domestic private investment in the short run. However, in the long run, the effect of the maximum lending rate on domestic private investment was positive but not statistically significant. On the other hand, the prime lending rate had a negative and statistically insignificant impact on domestic private investment in both the short and long terms.

5. Conclusion

The primary aim of this study is to analyze the impact of interest rates, money supply growth, and institutional quality on investment growth within the context of Nigeria. The study employed the Autoregressive Distributed Lags (ARDL) approach to examine the hypothesis, revealing a strong influence of interest rates on investment growth in Nigeria. Consequently, the research findings established that interest rates have a substantial impact on investment expansion within the Nigerian context.

Over the course of an extended period, empirical evidence indicates a discernible and statistically significant inverse relationship between the prime lending interest rate and investment growth in Nigeria. Likewise, there exists a negative and statistically significant correlation between the monetary policy rate and investment growth in Nigeria. Conversely, a positive and statistically significant correlation is observed between money supply growth and investment growth in Nigeria. Lastly, institutional quality demonstrates a positive correlation with investment growth in Nigeria, albeit lacking statistical significance.

The results of the study suggest that there exists a positive correlation between the expansion of money supply and investment growth in Nigeria in the short term. However, factors such as the

prime lending rate, monetary policy rate, and institutional quality exhibit negative associations with investment growth. Moreover, empirical evidence suggests that, within a limited time frame, the sole determinant that exerts a substantial impact on investment expansion in Nigeria is the level of monetary policy, specifically the prime lending rate. Conversely, variables such as growth in the money supply and the quality of institutions do not exhibit statistically significant effects on investment growth in Nigeria. Furthermore, the outcomes of the hypothesis testing align with the decision to reject the null hypothesis, which posits that interest rates do not exert a significant influence on investment growth in Nigeria, and accept the alternative hypothesis, which posits that interest rates do have a significant impact on investment growth in Nigeria.

The study substantiated the hypothesis that elevated interest rates have an adverse impact on investments, as they impede the rate of growth of these assets. The findings of the study indicate that a significant portion, specifically 81.1%, of investment growth in Nigeria may be ascribed to factors such as interest rates, growth in money supply, and institutional quality. This implies that these variables should be given utmost priority when formulating policies aimed at attracting investments into the economy.

The study recommends that the monetary authority should establish interest rates at a level that promotes investment in the productive sectors of the economy. Additionally, policymakers should carefully consider the most effective means of directing the money supply towards the key economic sectors that require increased liquidity support.

5.1 Suggestions for Further Studies
The study makes suggestions for extending the frontiers in knowledge and for further research studies in relation to interest rates and investment growth. Since the study investigated the effect of interest rates and investment growth in Nigeria, further research should consider cross-country studies sharing similar political and economic structure especially in countries in other continents other than Africa to determine the factors affecting their investment growth. This will help in the development of global policies and practices specific to different continents that will engender macroeconomic performance. Studies should also investigate the relationship between interest rates and investment growth further by using monthly data. This was a major limitation of the present study as information available did not support the use of monthly data which may have enhanced the reliability of results.

6. Acknowledgments

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