International Journal of Humanities Social Science and Management (IJHSSM)
Volume 5, Issue 4, Jul. - Aug., 2025, pp: 790-805 ISSN: 3048-6874
www.ijhssm.org

Private And Public Investment on Economic Growth in Nigeria: A Causality Analysis

Udeze Chike Romanus, PhD.
Department of Economics, Faculty of Social Sciences, Enugu State University of Science and Technology, Agbani Enugu (ESUT).

Onwuka Irene Nkechi, PhD.
Department of Economics. Faculty of social sciences. Nnamdi Azikiwe University Awka, Anambra state.
Corresponding Author: Onwuka Irene Nkechi

Date of Submission: 12-08-2025 Date of Acceptance: 25-08-2025

ABSTRACT
This work carried out causality *analysis of private and public investment on economic growth in Nigeria over the period 1986 to 2021 using annual time series data on real gross domestic product, private investment (proxied by gross fixed capital formation), public investment (proxied by government capital expenditure), exchange rate, and interest rate spread. The study employed ARDL Bounds Testing methodology in determining whether long run relationship exists between private and public investment and economic growth in Nigeria over the period. What is the causality relationship between private and public investment and economic growth in Nigeria the specific objectives include ascertain the causality relationship between private and public investmentand economic growth in Nigeria Hypotheses of the Study H_0: there is no significant causality relationship between private and public investmentand economic growth in Nigeria? The result indicated that the variables in the model are co-integrated. The* result of Pairwise Granger *Causality Tests indicated that there is no significant directional causality relationship between private investment and public investment and economic growth in Nigeria over the period covered.The study therefore recommends that government should design investment policies to encourage the growth of private and public investment in Nigeria to include the provision of the necessary infrastructure at reduced economic cost and creation of business environment conducive enough, not only to attract private investment, but for sound investment that would stimulate sustainable economic growth in the country.*

Keywords: ARDL, *Economic Growth,* Nigeria*, Private and Public Investment, Real Gross Domestic Product.*

I. INTRODUCTION.

One of the major tools at the disposal of any nation for achieving rapid and sustainable economic growth is investment. As Jongwanich and Kohpaiboon (2008) had it, investment plays essential and vital role in expanding a country's productive capacity and also in promoting long term economic growth. Higher investment rate triggers economic growth. Investment, however, exists in two major components - public investment and private investment - in an economy. Public investment by federal, state, and local governments builds the capital stock of a nation by devoting resources to the basic physical infrastructure (such as roads, bridges, rail lines, airports, and water distribution), innovative activity (basic research), green investments (clean power sources and weatherization), and education (both primary and advanced, and also job training) that leads to higher productivity and/or higher standards of living. Private actors also invest in these areas, but to a much smaller degree, in part because the gains from public investment accrue not only to those undertaking the investment, but equally to a wide range of people and businesses. As Udeze and Onwuka (2025) advocated, growth is meaningful when the rate of growth is much higher than population growth because it has to lead to improvement in human welfare.According to Levine and Renelt (1992), investment in capital goods is the most robust and vital determinant of economic growth. Gross domestic investment boosts economic growth by way of increasing physical capital directly and indirectly through technological spillovers

International Journal of Humanities Social Science and Management (IJHSSM)
Volume 5, Issue 4, Jul. - Aug., 2025, pp: 790-805 ISSN: 3048-6874
www.ijhssm.org

Over the years, Nigeria policy makers pursued a structural adjustment program which shifted emphasis from public sectors to private sectors in an effort to encourage private domestic savings, private domestic investment and capital formation in order to enhance economic growth. To achieve this objective, resources were diverted from current consumption to investment in capital formation through privatization and commercialization of state enterprises. Despite the structural reform carried out by Nigeria government, research has shown that the country is still saddled with several economic maladies which include low level of savings and investment, high rate of inflation, wide spread poverty and high level of unemployment. Nigeria investment accounted for 33.8 % of its Nominal GDP in Dec 2021, compared with a ratio of 27.5 % in the previous year. The expected role of private investment as an engine of growth in the economy is yet to materialize. This study deems it necessary to carry out casual analysis of private and public investments on economic growth in Nigeria for period 1986 to 2021.The following research question is therefore raised to guide the study: What is the causality relationship between private and public investment and economic growth in Nigeria The specific objectives include ascertain the causality relationship between private and public investment and economic growth in Nigeria Hypotheses of the Study H_0: there is no significant causality relationship between private and public investment and economic growth in Nigeria

II. LITERATURE REVIEW

Conceptual Literature

The Concept of Public Investment

Public investment refers to investment by the government sector primarily, not exclusively in the area of social and economic infrastructure. Public investments can be seen as an impetus for total investment. Public investment could be investment in infrastructure or non-infrastructural investment. This is consistent with Blejer and Khan (1984) who decomposed public investment into infrastructural and non-infrastructural investment. Government investment in infrastructure is complementary to private investment whereas other types of government investment are not. Balassa (1988) in the study of 30 countries showed the presence of a negative relationship between private investment and public investment. The negative relationship could probably be as a result of reduced access to funds in the capital market on the part of private domestic investors. Competition between the public domestic investors and private domestic investors in the market for finished products is another problem. This competition could be as a result of the heavy tax levied on the income of private investors which could escalate the prices of the product of the private investors because consumers will only patronize the product with moderate prices.

Private investment

According to Kumo (2006), private investment involves capital outlays made by private businesses with the aim of generating profit. Adekunle and Aderemi (2012) further elucidated that real domestic investment comprises expenditures intended to expand a nation's total capital stock through the attainment of income-generating and capital-producing assets within the domestic economy. Investments in physical assets, in particular, contribute directly to capital stock accumulation. Achieving sustainable economic development requires growth rates that surpass what domestic savings alone can support. Therefore, investment financing is supplemented by the corporate sector, bank credit, and household savings. So, savings no longer act as a limiting factor for meeting investment demand.

Additionally, short-term investments are mostly supported by external funding sources, whereas long-term investments are likely to rely heavily on domestic capital. This discrepancy partly explains why foreign aid demonstrates less in promoting sustained long-term growth. When interest rates are low, asset prices by and large rise, reflecting higher discounted present values. This upward trend augments both the attractiveness and volume of asset acquisition, afterwards driving aggregate demand. Thus, investment is less controlled by the level of aggregate savings and more swayed by domestic interest rates. Accordingly, investment can be explained further as a function of both savings and newly created money accessible to Deposit Money Banks.

Keynes Theory of Investment

Keynes (1936) advanced his theory of investment based on 'animal spirits'. He stated that despite the fact that investment and savings must be identical export, savings and investment decisions are generally taken by different decision-makers hence there was no reason why *ex post* savings should equal *ex ante* investments. Keynes formulated an investment function of the form $I = I_0 + i(r)$, where I is investment, I_0 is autonomous investment and i(r) is interest rates. Investment is

International Journal of Humanities Social Science and Management (IJHSSM)
Volume 5, Issue 4, Jul. - Aug., 2025, pp: 790-805 ISSN: 3048-6874
www.ijhssm.org

inversely proportional to interest rates. The higher the interest rate, the less likely the firm will be willing to undertake any given investment project. In this regard, Keynes stated that firms rank various investment projects depending on the internal rate of return (IRR), or marginal efficiency of investment. Given a certain rate of interest, firms would choose projects whose IRR exceeded the rate of interest. The criticism of this theory was that ranking of investments may most likely be dependent on interest rates.

Theories of Economic Growth
Endogenous Growth

The Endogenous Growth Theory, as advanced by Mukhopadhyay 2019,shifts the focus from external determinants to internal mechanisms of growth, asserting that investments in human capital, technological innovation, and knowledge creation are fundamental catalysts of sustained economic growth. The theory advocates a bottom up approach to development, by highlighting the significance of unique regional strengths and networks. Its effectiveness is closely linked to various macroeconomic factors such as policy stability, institutional quality, and economic infrastructure. It further emphasizes the role of positive externalities and spillover effects inherent in a knowledge-based economy, which contribute significantly to economic development. A central tenet of endogenous growth theory is that long-term economic growth is largely influenced by policy interventions. For instance, government support in the form of subsidies for research and development or education can enhance innovation incentives, thereby accelerating the economy's growth rate in certain endogenous growth models. The Endogenous Growth Theory explains the long-term growth rate of an economy to internal (endogenous) factors, in contrast to the Neoclassical Growth Theory, which relies on external (exogenous) influences. It highlights the importance of elements such as technological advancement driven by investment activities, the accumulation of physical capital, and the development of human capital as central to sustained economic growth.

Empirical Literature

Ghazali (2010) identified the causal relationship between private domestic investment and economic growth (GDP) in Pakistan over the period 1981 to 2008 using VECM. He discovered that there is a bi-directional causality between private domestic investment and economic growth; increased economic growth encouraged large private domestic investment, and vice versa. The co-integration results from his study showed that there is a long run relationship between private domestic investment and economic growth. From the result, it is obvious that private domestic investment in Pakistan spurs economic growth. Government should create enabling environment for private investors.

Tan and Tang (2011) investigated the dynamic relationship between private domestic investment (DI), the user cost of capital and economic growth in Malaysia over the period of 1970 to 2009. The result showed that PDI, the user cost of capital, and economic growth were co-integrated in Malaysia. The Granger causality test showed that there was a unidirectional causality running from PDI to economic growth and from PDI to the user cost of capital in the long run.

III. METHDOLOGY

Research Design

Research design for this study is Ex-Post Facto research design in which the phrase "after the fact" or "retrospectively" refers to those studies that investigate possible cause-and-effect relationship by observing an existing condition or state of affairs and searching back in time for plausible causal factors. In Ex-Post Facto design, the independent variable or variables have already occurred and the researcher starts with the observation of a dependent variable or variables (Kerlinger, 1970). The research design establishes a causal link between the dependent and the independent variable(s). Thus, the researcher has no control over the variables under study as those variables have already been manipulated before they were applied in this work. From the foregoing, this study will examine and anchor its analysis on already published data.

Theoretical Framework

This study is anchored onSolow-Swan type aggregate production function as applied in Ghura (1997) and Beddies (1999). Thus, to determine the impact of private and public investment on economic growth in Nigeria, the work utilized a Solow-Swan aggregate production function, modified to account for three types of capital stocks: private capital stock and government physical capital stock, and human capital stock. The production function takes the form:

$$Y_t = A_t(K_t^p)^{\propto}(K_t^g)^{\beta}(Z_t^p)^{y} \qquad Z_t = L_t \text{ and } HL_t \qquad (3.1)$$

International Journal of Humanities Social Science and Management (IJHSSM)
Volume 5, Issue 4, Jul. - Aug., 2025, pp: 790-805 ISSN: 3048-6874
www.ijhssm.org

where Y is output; A represents technology; K^p and K^g are the private and government physical capital stocks, respectively; Z represents labor (L) adjusted for human capital development (HL_t); and t is a time index.
Equation (3.1) can be expressed in growth rate terms as follow

$$y = a + \propto K^p + \beta K^g + yK^z \quad (3.2)$$

where a small letter for a variable denotes its growth rate. Equation (3.2), which represents a long-run economic growth relationship, can be estimated, provided that data are available for capital stocks. Unfortunately, such data are typically unavailable for developing economies, including Nigeria. Nevertheless, equation (3.2) can be transformed into an estimable form as equation (3.3) by making some simplifying assumptions regarding physical capital stocks.

$$y = a + \propto PIY_t + \beta GIY_t + yHL_t + \varpi PIY_t + \boldsymbol{\varepsilon}_t \quad (3.3)$$

where
Y = real output
A = technological progress
K^P = private physical capital stock
K^g = public physical capital stock
Z = labor force (L) augmented by human capital development HL and
t = time index.

The parameters $\propto, \beta,$ and y =elasticities of output with respect to private, government, labor force and human capital stocks respectively.

Pre-estimation Tests

Unit Root Test

To prevent the issue of spurious correlations in the regression analysis, the time-series characteristics of the variables are examined using the standard Augmented Dickey-Fuller (ADF) unit root test under two alternative hypotheses. This test is employed to determine whether the time series data used in the study are stationary or non-stationary, thereby ensuring the reliability of the regression results. This is to avoidthe emergence of spurious regression due to a non-stationary series. In considering the levels, the data could be said to be integrated of the same order. The Augmented Dickey-Fuller (ADF) test statistic will be evaluated against the critical values at the 5% significance level. If the absolute value of the ADF statistic exceeds the corresponding critical value, the time series at the tested level is considered stationary. The ADF test operates by testing the null hypothesis that a unit root is present—indicating non-stationarity—against the alternative hypothesis of stationarity.The tests are conducted with or without a deterministic trend (t) for each of the series. The three models that represent pure random walk, random walk with drift, and random walk with drift and trend are used to estimate the general form of the ADF test:

$$\Delta\psi_t = \Omega\psi_{t-1} + \sum_{i=1}^{p}\beta_i\Delta\psi_{t-1} + \varepsilon_t$$

$$\Delta\psi_t = \alpha_0 + \Omega\psi_{t-1} + \sum_{i=1}^{p}\beta_i\Delta\psi_{t-i} + \varepsilon_t$$

$$\Delta\psi_t = \alpha_0 + \Omega\Psi + \beta_2 t + \sum_{i=1}^{p}\beta_i\Delta\psi_{t-1} + \varepsilon_t$$

where: $\Omega = (\lambda - 1)$.

The null hypothesis is $H_0 : \Omega = 0$ and the alternative hypothesis is $H_a : \Omega < 0$. If ADF test statistic (t-statistic of lagged dependent variable) is less than the critical value, we reject the null hypothesis and conclude that the series is stationary (there is no unit root).

Co – integration Test

Co-integration test is used to test if a long-run relationship exists between the variables under investigation. The Engel-Granger methodology or Auto Regressive Distributed Lag (ARDL) Bounds test for Cointegration will be used to test if a long-run relationship exists between the variables under investigation. The long-run equilibrium relationship is estimated with the following equation for the Engel-Granger methodology:

$$X_t = \alpha_0 + \alpha_1 Z_t + \varepsilon_t$$

If there is co-integration, α_0 and α_1 estimates reveal "super-consistent" estimators in the OLS regression.

In this estimation fitted values of ε_t series is tested for stationarity. In this analysis DF or ADF may be used. However, in hypothesis testing, critical values constructed by McKinnon (1991) is used. If this series is stationary, we can conclude that there is cointegration between X and Z_t.

The fitted values of ε_t may be used as error correction term of the model.

Decision Rule
If the ADF statistics of residual series is absolutely greater than the critical values at 5% level of significance, then there exists a long-run relationship between the variables and if otherwise, there exists no long-run relationship among the variables.

Auto Regressive Distributed Lag (ARDL) Bounds Test for Co-integration

Auto Regressive Distributed Lag (ARDL) model is an estimation procedure that deals with a situation in which there are mixed order of integrations among the variables under consideration such as a mixture of order zero and order one in the preliminary test of the time series (variables).

To empirically examine the long run and short run coefficients of the variables in the study, Auto Regressive Distributed Lag (ARDL) bounds cointegrationdeveloped by as well as Pesaran, Shin and Smith (2001) will be utilized in the analysis. According to Harris and Sollis (2003), ARDL approach is advantageous because it gives unbiased estimates of the long run model. The equation of ARDL model is shown in equation 3.6 below. In the equation, the generic ARDL model indicates that the models are characterized by lags of the dependent variable and lags perhaps of the current value of other variables as the repressors.

Model Specification
Following from equation (3.3) above, the model for this study is expressed as follows:
RGDP = f(PRINV, PUBINV, PRINV*PUBINV, EXCH, INTR) (3.4)
where
RGDP = Real gross domestic product (proxy for economic growth).
LNPRINV = Private investment (proxied by Gross Fixed Capital Formation)
LNPUBINV = Public Investment (proxied by Government Capital Expenditure)
LNPRINV*LNPUBINV = Interactive Term (for private and public investment Interaction)
EXCH = Exchange Rate
INTR = Interest rate spread
β_1 - β_7 = Parameters to be estimated for each independent variable.
U = error term
A priori: $\beta_1 > 0$, $\beta_2 > 0$, $\beta_3 > 0$, $\beta_4 > 0$, $\beta_5 < 0$.
All the variables in equation (3.4), with the exception of exchange rate and interest rate, are transformed into logarithmic form to reduce them to the same form and also to maintain the growth status. Interest rate and exchange rate are already in rates and therefore not logged. Equation (3.4) is further expressed in econometric form thus

$$LNRGDP = \beta_0 + \beta_1 LNPRINV + \beta_2 LNPUBINV + \beta_3 LNPRINV*LNPUBINV + \beta_4 EXCH + \beta_5 INTR + U \quad (3.5)$$

to be estimated as ARDL modelspecified in equation (3.6):

$$\Delta LNRGDP = \beta_0 + \beta_1 LNPRINV_{t-1} + \beta_2 LNPUBINV_{t-1} + \beta_3 LNPRINV*LNPUBINV_{t-1} + \beta_4 EXCH_{t-1} + \beta_5 INTR_{t-1} + \sum_{i=1}^{k} \delta_{1i}\Delta LnRGDP_{t-1} + \sum_{i=1}^{k} \delta_{2i}\Delta LNPRINV_{t-1} + \sum_{i=1}^{k} \delta_{3i}\Delta LNPUBINV_{t-1} + \sum_{i=1}^{k} \delta_{4i}\Delta LNPRINV*LNPUBINV_{t-1} + \sum_{i=1}^{k} \delta_{5i}\Delta EXCH_{t-1} + \sum_{i=1}^{k} \delta_{6i}\Delta INTR_{t-1} + \delta_{7i} ECM_{t-1} + \varepsilon_t \quad (3.6)$$

Method of Evaluation
The Method of Evaluation for this work will include Unit root Test, Co-integration Test, Error Correction Mechanism and Granger Causality Test.

Unit Root Test
In order to mitigate the risk of spurious correlations in the regression analysis, the time-series properties of the variables are rigorously examined through the application of the standard Augmented Dickey-Fuller (ADF) and Phillips-Perron unit root tests, both conducted under two alternative hypotheses.

Cointegration Test
Cointegration Test is conducted to test if a long-run relationship exists between the variables under investigation. Auto Regressive Distributed Lag (ARDL) Bounds test for Cointegration is used to

International Journal of Humanities Social Science and Management (IJHSSM)
Volume 5, Issue 4, Jul. - Aug., 2025, pp: 790-805 ISSN: 3048-6874
www.ijhssm.org

test if a long-run relationship exists between the variables under investigation.

Granger Causality Test

Although, regression analysis examines the dependence of one variable on another, it does not inherently imply causation. In other words, the identification of a statistical relationship between variables does not establish the existence or direction of a causal link (Gujarati, 2004). The primary objective of causality analysis, specifically through the application of the Granger Causality Test is to determine whether a causal relationship exists between the variables under investigation. Accordingly, the Granger Causality Test is employed to assess the presence of causality between the growth of the manufacturing sector and the explanatory variables included in the model. As noted by Engle and Granger (1987), if two variables are cointegrated, there exists a potential for causality between them, at least in one direction. The general form of the Granger Causality Test for the series is expressed as follows:

$$\mathrm{LNRGDP}_t = \beta_o + \sum_{i=1}^{i=n} \beta_1\,\mathrm{LNPRINV}_{t-1} + \sum_{i=2}^{i=n} \beta_2\,\mathrm{LNPUBINV}_{t-2} + \sum_{i=3}^{i=n} \beta_3\,\mathrm{LNPRINV} * \mathrm{LNPUBINV}_{t-3} \sum_{i=4}^{i=n} \beta_4\,\mathrm{EXCH}_{t-4} + \sum_{i=5}^{i=n} \beta_5\,\mathrm{RINTR}_{t-5} + \sum_{i=6}^{i=n} \beta_6\,\mathrm{LNRGDP}_{t-6} + \mu t \quad 3.9$$

$$\mathrm{LNPRINV}_t = \beta_o + \sum_{i=1}^{i=n} \beta_1\,\mathrm{LNPRINV}_{t-1} + \sum_{i=2}^{i=n} \beta_2\,\mathrm{LNPUBINV}_{t-2} + \sum_{i=3}^{i=n} \beta_3\,\mathrm{LNPRINV} * \mathrm{LNPUBINV}_{t-3} \sum_{i=4}^{i=n} \beta_4\,\mathrm{EXCH}_{t-4} + \sum_{i=5}^{i=n} \beta_5\,\mathrm{RINTR}_{t-5} + \sum_{i=6}^{i=n} \beta_6\,\mathrm{LNRGDP}_{t-6} + \mu t \quad 3.10$$

$$\mathrm{LNPUBINV}_t = \beta_o + \sum_{i=1}^{i=n} \beta_1\,\mathrm{LNPRINV}_{t-1} + \sum_{i=2}^{i=n} \beta_2\,\mathrm{LNPUBINV}_{t-2} + \sum_{i=3}^{i=n} \beta_3\,\mathrm{LNPRINV} * \mathrm{LNPUBINV}_{t-3} \sum_{i=4}^{i=n} \beta_4\,\mathrm{EXCH}_{t-4} + \sum_{i=5}^{i=n} \beta_5\,\mathrm{RINTR}_{t-5} + \sum_{i=6}^{i=n} \beta_6\,\mathrm{LNRGDP}_{t-6} + \mu t \quad 3.11$$

$$\mathrm{LNPRINV} * \mathrm{LNPUBINV}_{\,t} = \beta_o + \sum_{i=1}^{i=n} \beta_1\,\mathrm{LNPRINV}_{t-1} + \sum_{i=2}^{i=n} \beta_2\,\mathrm{LNPUBINV}_{t-2} + \sum_{i=3}^{i=n} \beta_3\,\mathrm{LNPRINV} * \mathrm{LNPUBINV}_{t-3} \sum_{i=4}^{i=n} \beta_4\,\mathrm{EXCH}_{t-4} + \sum_{i=5}^{i=n} \beta_5\,\mathrm{RINTR}_{t-5} + \sum_{i=6}^{i=n} \beta_6\,\mathrm{LNRGDP}_{t-6} + \mu t \quad 3.12$$

$$\mathrm{EXCHt} = \beta_o + \sum_{i=1}^{i=n} \beta_1\,\mathrm{LNPRINV}_{t-1} + \sum_{i=2}^{i=n} \beta_2\,\mathrm{LNPUBINV}_{t-2} + \sum_{i=3}^{i=n} \beta_3\,\mathrm{LNPRINV} * \mathrm{LNPUBINV}_{t-3} \sum_{i=4}^{i=n} \beta_4\,\mathrm{EXCH}_{t-4} + \sum_{i=5}^{i=n} \beta_5\,\mathrm{RINTR}_{t-5} + \sum_{i=6}^{i=n} \beta_6\,\mathrm{LNRGDP}_{t-6} + \mu t \quad 3.13$$

International Journal of Humanities Social Science and Management (IJHSSM)
Volume 5, Issue 4, Jul. - Aug., 2025, pp: 790-805 ISSN: 3048-6874
www.ijhssm.org

$$INTR_t = \beta_o + \sum_{i=1}^{i=n} \beta_1 LNPRINV_{t-1} + \sum_{i=2}^{i=n} \beta_2 LNPUBINV_{t-2} + \sum_{i=3}^{i=n} \beta_3 LNPRINV * LNPUBINV_{t-3} \sum_{i=4}^{i=n} \beta_4 EXCH_{t-4} + \sum_{i=5}^{i=n} \beta_5 RINTR_{t-5} + \sum_{i=6}^{i=n} \beta_6 LNRGDP_{t-6} + \mu t \quad 3.14$$

where
t = the current period of the variables and t-i = the lagged period of the variables, $\beta_1$to β_6= the coefficients of the lagged variables and μt = mutually uncorrelated white noise error terms. The Granger causality analysis decision rule follows F-distribution. Therefore, rejected null hypothesis if the p(F-statistic) < 0.05; otherwise accept.

Error Correction Mechanism (ECM)

This test is employed to assess the existence of short-run relationships among the variables. Additionally, it serves to correct disequilibrium when the variables are found to be cointegrated. The coefficient of the lagged error correction term [ECM (-1)] represents the speed of adjustment of the dependent variable towards long-run equilibrium. A statistically significant and negative coefficient indicates that deviations from equilibrium in the previous period have been partially corrected, thereby confirming the system's tendency to return to equilibrium in the short run.

Subtract y_{t-1} from both sides and add and subtract $\beta_1 x_{t-1}$ from the RHS:

$$\boxed{\Delta y_t = \beta_1 \Delta x_t - (1-\alpha)(y_{t-1} - \theta x_{t-1}) + e_t}$$

It shows how y_t responds, in the short run (SR), to changes in x_t and to deviations from long run (LR) equilibrium, $(y_{t-1} - \theta x_{t-1})$. The ECM model thus shows that the growth rate in y is explained by the growth rate in x and past disequilibrium between these variables.

- $\theta x_{t-1} = y_{t-1}$ Or $\theta x = \bar{y}$, is the LR equilibrium value of y. Thus, if $\alpha < 1$, then y rises when $y_{t-1} < \bar{y}$ and y falls when $y_{t-1} > \bar{y}$. This dynamic makes y to converge towards its LR equilibrium.
- $1-\alpha$ = the speed of adjustment to the LR.

The higher is α , the faster is the adjustment to new equilibrium because the faster it takes for the error to disappear.

The error correction specification necessitates that the variables are I(1) and co-integrated. Then their first difference is I(0), and the ECM term is I(0), hence the error term is stationary. Thus the spurious equation situation will no longer exist since all stochastic trends disappear. More generally:

$$\Delta y_t = \alpha_0 + \beta(y_{t-1} - \theta x_{t-1}) + \sum \alpha_{yi} \Delta y_{t-i} + \sum \alpha_{xi} \Delta x_{t-i} + e_t$$

IV. DATA PRESENTATION AND ANALYSIS

Descriptive Statistics of the variables

The descriptive statistics test of the variables in the model was performed to ascertain the nature and characteristics of variables in the model. Table 4.1 below indicates the descriptive statistics result of the data covering the period under study using thirty-six observations in each of the variables. It gives information about the Mean, Standard deviation, Skewness, Kurtosis and Jarque-Bera of the variables. The Mean provides the average value in the series, the Standard deviation provides the volatility of the data or amount of variation of the data from the average, the skewness measures whether the distribution of the data is symmetrical or asymmetrical and the Kurtosis measures the peak of the data compared to normal data.

Table 4.1 Descriptive Statistics of the variables

	RGDP	PRINV	PUBINV	INTR	EXCH
Mean	38944.70	9047.405	627.6461	6.890556	123.0894
Median	33365.00	4284.975	468.3650	4.140000	123.4000
Maximum	73593.89	58293.95	2522.470	18.80000	399.9600
Minimum	15237.99	108.8700	6.370000	1.410000	2.020000
Std. Dev.	20358.25	12784.77	635.9739	5.310500	109.2162
Skewness	0.413059	2.325750	1.320059	0.935364	0.854806
Kurtosis	1.622219	8.373787	4.374181	2.306666	3.004773
Jarque-Bera	3.871129	75.77107	13.28789	5.970497	4.384190
Probability	0.144343	0.000000	0.001302	0.050527	0.111683
Sum	1402009.	325706.6	22595.26	248.0600	4431.220
Sum Sq. Dev.	1.45E+10	5.72E+09	14156197	987.0492	417486.6
Observations	36	36	36	36	36

Source: Researcher's computation from Eviews

The variables RGDP, PRINV, PUBINV, INTR and EXCH with skewness of 0.413059, 2.325750, 1.320059, 0.935364 and 0.854806 respectively are positively skewed or are rightward skewed. This indicates that the distribution of the data is symmetrical and has a long tail toward large value within the study period. The fact that the values of skewness fall between the range -1.96 and +1.96, indicates that the data are normally distributed. The kurtosis of 1.622219 for RGDP, 8.373787 for PRINV, 4.374181 for PUBIN PUBINV, 2.306666 for INTR, and 3.004773 for EXCH suggest that the data used for the study are normally distributed.

Unit Root Test

Augmented Dickey Fuller (ADF) unit root test is conducted at 5% level of significance to verify the stationarity property of the variables in the model; whether the mean value and variances of the variables are time invariant, in other words constant over time or fixed over time, in order to avoid generating spurious regression. The null hypothesis states that the series has a unit root if t-statistic is less than the critical value at 5%, otherwise the study rejects it. The result of the unit root test is presented in table 4.2 below.

Table 4.2: Unit Root Test Result

Level			First Difference			
Variables	**ADF Statistic**	**5% Critical Value**	**ADF Statistic**	**5% Critical Value**	**Remarks**	**Rank**
LNRGDP	-0.431234	-2.948404	-4.934456	-2.951125	Stationary	I(1)
LNPRINV	-1.251888	-2.948404	-4.301417	-2.951125	Stationary	I(1)
LNPUBINV	-1.723993	-2.948404	-6.702385	-2.951125	Stationary	I(1)
PRINV_PUBINV	-1.693887	-2.948404	-5.271169	-2.951125	Stationary	I(1)
EXCH	2.239303	-2.948404	-3.908831	-2.951125	Stationary	I(1)
INTR	-0.841000	-2.948404	-6.616034	-2.951125	Stationary	I(1)

Source: Researcher's computation from Eviews

The result showed that all the variables - Real gross domestic product (RGDP); Private investment (LNPRINV) proxied by Gross Fixed Capital Formation; Public Investment (LNPUBINV) proxied by Government Capital Expenditure; Private and Public Investment interaction term (LNPRINV_LNPUBINV); Exchange Rate (EXCH); and Interest rate spread (INTR) – in the model are integrated of order one, I(1). Thus, the result fulfilled the underlying conditions for ARDL bound testing proposed by Pesaran et al., (2001) since none of the variables in the model is integrated of order two, I(2). In view of this, the co-integration estimation is carried out using ARDL bounds test framework to test the sufficient condition for the error correction model after satisfying the stationary requirements.

Co-integration Test - ARDL Bounds Test

The result of ARDL Bounds test performed to test for the presence of co-integration among the variables in the model is presented in table 4.2 below.

Table 4.3 ARDL Bounds Test

Null Hypothesis: No long-run relationships exist

Test Statistic	Value	k
F-statistic	4.570874	5

Critical Value Bounds

Significance	I0 Bound	I1 Bound
10%	2.26	3.35
5%	2.62	3.79
2.5%	2.96	4.18
1%	3.41	4.68

Source: Eviews 9 Regression Output

The result showed that the computed F-Statistic for the equation is 4.570874 which exceeded the upper bounds critical value of 3.79 at 5% level of significance. The null hypothesis of no co-integration is therefore rejected. The result therefore showed that the variables in the model are co-integrated; long run relationship exists among variables in the model.

Model Selection Method

Table 4.4. ARDL (4, 4, 0, 0, 2, 0) Regression Model

Dependent Variable: LNRGDP

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
LNRGDP(-1)	0.093527	0.250031	0.374059	0.7133
LNRGDP(-2)	0.223148	0.220981	1.009808	0.3276
LNRGDP(-3)	0.474686	0.211744	2.241787	0.0395
LNRGDP(-4)	-0.267503	0.134692	-1.986028	0.0644
LNPRINV	-0.099062	0.086912	-1.139792	0.2711
LNPRINV(-1)	-0.032342	0.110617	-0.292376	0.7738
LNPRINV(-2)	-0.169072	0.124412	-1.358964	0.1930
LNPRINV(-3)	-0.013179	0.114684	-0.114915	0.9099
LNPRINV(-4)	0.291446	0.094615	3.080327	0.0072
LNPUBINV	-0.353652	0.142183	-2.487307	0.0243
LNPRINV_LNPUBINV	0.039019	0.013210	2.953671	0.0093
EXCH	-0.001985	0.000472	-4.205297	0.0007
EXCH(-1)	-0.000496	0.000999	-0.497055	0.6259
EXCH(-2)	0.002052	0.000758	2.708856	0.0155
INTR	-0.005933	0.008835	-0.671567	0.5114

International Journal of Humanities Social Science and Management (IJHSSM)
Volume 5, Issue 4, Jul. - Aug., 2025, pp: 790-805 ISSN: 3048-6874
www.ijhssm.org

C	5.592428	1.403633	3.984251	0.0011

R-squared	0.996644	Mean dependent var	10.52367
Adjusted R-squared	0.993497	S.D. dependent var	0.501132
S.E. of regression	0.040412	Akaike info criterion	-3.272546
Sum squared resid	0.026130	Schwarz criterion	-2.539678
Log likelihood	68.36073	Hannan-Quinn criter.	-3.029621
F-statistic	316.7396	Durbin-Watson stat	2.431011
Prob(F-statistic)	0.000000		

*Note: p-values and any subsequent tests do not account for model selection.

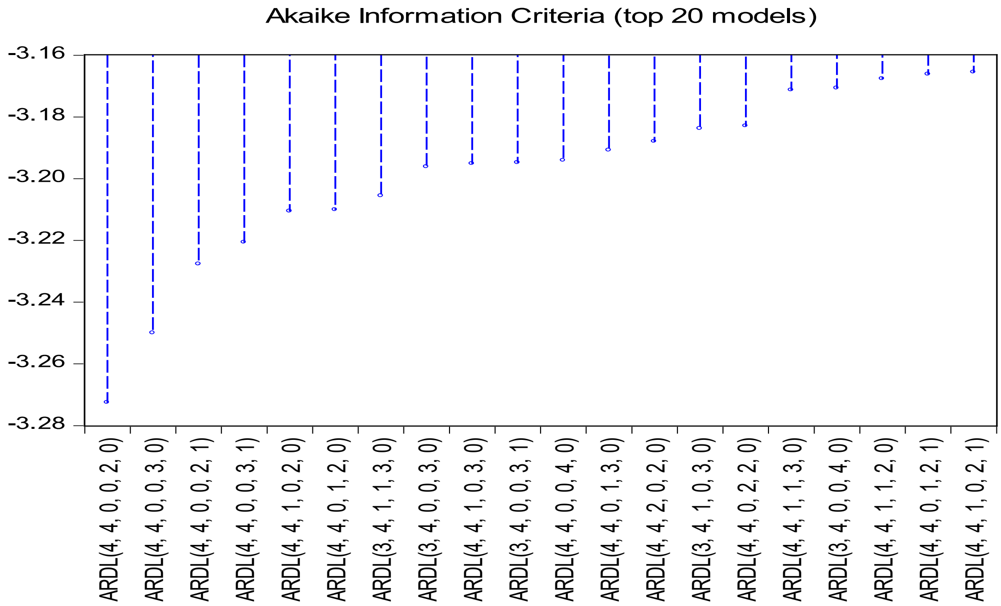
Source: Eviews 9 Regression Output

The Akaike Information Criterion (AIC) model selection method was employed to determine the optimal lag length for the dependent and independent variables in the model and to select (by automatic selection) the ARDL (4, 4, 0, 0, 2, 0) model presented in figure 4.1 above.

Optimum Lag Length Selection

The Optimum Lag Length Selection for the dependent and the independent variables in the model was obtained through Akaike Information Criterion (AIC). The result is presented in figure 4.1 below.

Fig 4.1 ARDL Optimum Lag Length Selection



Source: Eviews 9 Regression Output.

The result showed that ARDL(4, 4, 0, 0, 2, 0) regression model was selected using Akaike Information Criterion (AIC) after 20 models generated automatically.

Regression Model

Basic Regression Model

The Basic Regression Model is specified with no interactive term to determine the impact of private and public investment on economic growth in Nigeria.

International Journal of Humanities Social Science and Management (IJHSSM)
Volume 5, Issue 4, Jul. - Aug., 2025, pp: 790-805 ISSN: 3048-6874
www.ijhssm.org

Table 4.5 Basic Regression Model

Dependent Variable: LNRGDP

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
LNRGDP(-1)	0.314903	0.213359	1.475929	0.1594
LNRGDP(-2)	0.093941	0.239308	0.392552	0.6998
LNRGDP(-3)	0.351082	0.196737	1.784528	0.0933
LNPRINV	-0.079563	0.090522	-0.878932	0.3924
LNPRINV(-1)	-0.053835	0.121040	-0.444770	0.6624
LNPRINV(-2)	-0.226022	0.132119	-1.710741	0.1064
LNPRINV(-3)	0.051127	0.121019	0.422468	0.6783
LNPRINV(-4)	0.210025	0.094595	2.220249	0.0412
LNPUBINV	0.043494	0.046902	0.927349	0.3675
EXCH	-0.001805	0.000491	-3.674471	0.0020
EXCH(-1)	0.000890	0.000927	0.960204	0.3512
EXCH(-2)	0.000877	0.000925	0.947399	0.3575
EXCH(-3)	0.001486	0.000841	1.767199	0.0963
EXCH(-4)	0.000679	0.000619	1.097697	0.2886
INTR	-0.009572	0.009446	-1.013336	0.3260
C	3.122816	0.844571	3.697516	0.0020

R-squared	0.996127	Mean dependent var	10.52367
Adjusted R-squared	0.992495	S.D. dependent var	0.501132
S.E. of regression	0.043413	Akaike info criterion	-3.129270
Sum squared resid	0.030155	Schwarz criterion	-2.396402
Log likelihood	66.06832	Hannan-Quinn criter.	-2.886345
F-statistic	274.3173	Durbin-Watson stat	2.398664
Prob(F-statistic)	0.000000		

*Note: p-values and any subsequent tests do not account for model selection.

Source: Eviews 9 Regression Output

TABLE 4.6 ARDL Bounds Test

ARDL Bounds Test
Null Hypothesis: No long-run relationships exist

Test Statistic	Value	K
F-statistic	4.656726	4

Critical Value Bounds

Significance	I0 Bound	I1 Bound
10%	2.45	3.52
5%	2.86	4.01
2.5%	3.25	4.49
1%	3.74	5.06

International Journal of Humanities Social Science and Management (IJHSSM)
Volume 5, Issue 4, Jul. - Aug., 2025, pp: 790-805 ISSN: 3048-6874
www.ijhssm.org

The ARDL bounds test for the basic model revealed that co-integration exists among the variables in the model. Therefore, to determine the impact of private and public investment on economic growth in Nigeria, we estimated the Basic Regression Model with no Interactive term using ARDL model. The result is presented in table 4.6 above.
The result of the Basic Regression Model with no Interactive term using ARDL model presented in table 4.6 above revealed that neither private investment nor public investment has statistically significant impact on economic growth in Nigeria in both the short and long run within the period of the study.

Granger Causality Test

The decision rule for Granger causality analysis follows F-distribution. The result of Granger causality test conducted to determine the causality relationship between private investment and public investment and economic growth in Nigeria is presented in table 4.7 below:

Table 4.7 Granger Causality Test

Pairwise Granger Causality Tests

Null Hypothesis:	Obs	F-Statistic	Prob.
LNPRINV does not Granger Cause LNRGDP	34	0.88020	0.4255
LNRGDP does not Granger Cause LNPRINV		0.07599	0.9270
LNPUBINV does not Granger Cause LNRGDP	34	0.67446	0.5172
LNRGDP does not Granger Cause LNPUBINV		0.56498	0.5745

Source: Eviews 9 Regression Output.

The result of Pairwise Granger Causality Tests in table 4.7above indicates that there is no significant directional causality relationship between private investment and public investment and economic growth in Nigeria over the period covered.

Post-estimation Tests

Serial Correlation LM Test
Breusch-Godfrey Serial Correlation LM Test was carried out to verify whether the residuals from the model are serially correlated. The result presented in Table 4.8 below indicatesObs*R-squared p-value of 0.0007 which is less than 0.05. What this means is that there is serial correlation problem in the model.

Table 4.8 Serial Correlation LM Test

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	5.752084	Prob. F(2,14)	0.0150
Obs*R-squared	14.43424	Prob. Chi-Square(2)	0.0007

Source: Eviews 9 Regression Output

Correction of Heteroskedasticity and Autocorrelation Problem
The serial correlation problem identified in the model is however corrected using Newey-West HAC standard errors and covariance Test. What Newey-West HAC does, in essence, is to correct the standard error and make it robust. The result of the test is presented in table 4.10 below.

Table 4.9 Newey-West HAC standard errors and covariance Test.

Dependent Variable: LNRGDP
HAC standard errors & covariance (Bartlett kernel, Newey-West fixed bandwidth = 4.0000)

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
LNRGDP(-1)	0.093527	0.298802	0.313005	0.7583
LNRGDP(-2)	0.223148	0.158771	1.405478	0.1790
LNRGDP(-3)	0.474686	0.295738	1.605092	0.1280
LNRGDP(-4)	-0.267503	0.133286	-2.006987	0.0620
LNPRINV	-0.099062	0.078759	-1.257783	0.2265
LNPRINV(-1)	-0.032342	0.077488	-0.417381	0.6819
LNPRINV(-2)	-0.169072	0.042369	-3.990430	0.0011
LNPRINV(-3)	-0.013179	0.105037	-0.125468	0.9017
LNPRINV(-4)	0.291446	0.114833	2.537997	0.0219
LNPUBINV	-0.353652	0.165025	-2.143017	0.0478
LNPRINV_LNPUBINV	0.039019	0.015296	2.550968	0.0214
EXCH	-0.001985	0.000354	-5.607567	0.0000
EXCH(-1)	-0.000496	0.000978	-0.507378	0.6188
EXCH(-2)	0.002052	0.000795	2.580182	0.0201
INTR	-0.005933	0.004756	-1.247525	0.2302
C	5.592428	1.513209	3.695741	0.0020

Source: Eviews 9 Regression Output

The above table shows the Newey-West HAC standard errors and covariance Test method employed to correct for the serial correlation problem in the model. The changes in the standard error, therefore, showed that the serial correlation problem in the model has been corrected.

Heteroskedasticity Test
The result of heteroskedasticity test presented in table 4.10 below also revealed that the residuals are homoskedastic. Thus, the model has no serial correlation since the Prob. Chi-Square is 0.5029 which is greater than 0.05.

Table 4.10 Heteroskedasticity Test

Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	0.861843	Prob. F(15,16)	0.6110
Obs*R-squared	14.30067	Prob. Chi-Square(15)	0.5029
Scaled explained SS	2.766588	Prob. Chi-Square(15)	0.9998

Source: Eviews 9 Regression Output

Ramsey RESET Test
Ramsey RESET Test is a specification test for checking whether the model estimated was correctly specified. It makes use of f-statistics. The null hypothesis is that the model was correctly specified. If the probability value of f-statistic is less than 0.05, reject the null hypothesis, otherwise do not reject null hypothesis. The result in table 4.11 showed f-statistics probability value of 0.9416 which is greater than 0.05; meaning that null hypothesis should not be rejected. Thus, estimated model was correctly specified.

International Journal of Humanities Social Science and Management (IJHSSM)
Volume 5, Issue 4, Jul. - Aug., 2025, pp: 790-805 ISSN: 3048-6874
www.ijhssm.org

Table 4.11Ramsey RESET Test

Ramsey RESET Test
Omitted Variables: Squares of fitted values

	Value	Df	Probability
t-statistic	0.074559	15	0.9416
F-statistic	0.005559	(1, 15)	0.9416

F-test summary:

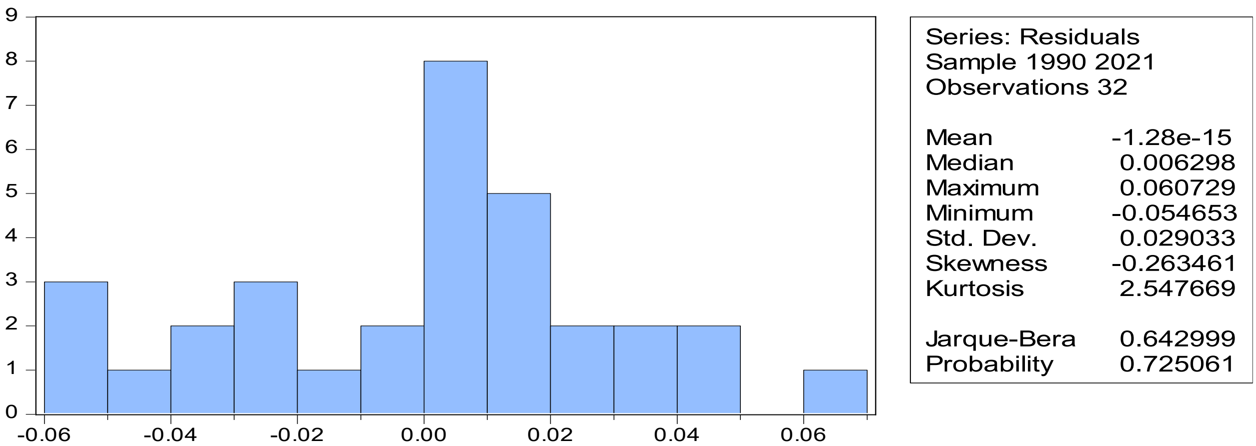
	Sum of Sq.	Df	Mean Squares
Test SSR	9.68E-06	1	9.68E-06
Restricted SSR	0.026130	16	0.001633
Unrestricted SSR	0.026120	15	0.001741

Source: Eviews 9 Regression Output.

Normality Test

Jarque-Bera Test was carried out to determine whether the residuals followed the normal distribution postulated by classical OLS assumptions. The result presented in figure 4.2 indicates that Jarque – Bera probability is 0.725061 which is greater than 0.05. This means that the residuals followed normal distribution; the assumptions of normal distribution are satisfied.

Figure 4.2 Jarque-Bera Test

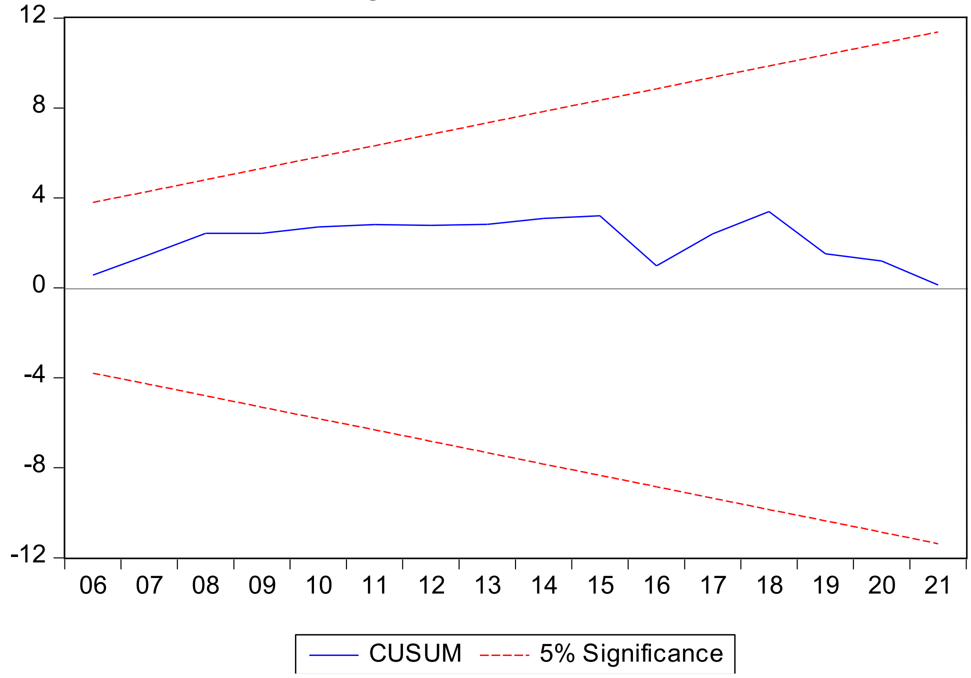


Source: Eviews 9 Regression Output.

Stability Tests (CUSUM) of the Model

Figure 4.3 below shows the plot of stability tests (CUSUM) of the model. The CUSUM are plotted against the critical bounds at 5% level of significance. The result indicated that the model is stable since the critical bounds at 5% fell in between the two 5% lines.

Figure 4.3 CUSUM TEST



Source: Eviews 9 Regression Output

Test of Hypotheses
The study tested the hypotheses and there is no significant causality relationship between private and public investment and economic growth in Nigeria.Granger causality test result equally indicated that there is no significant directional causality relationship between private investment and public investment, and economic growth in Nigeria over the period covered.

V. SUMMARY, CONCLUSION AND RECOMMENDATIONS

SUMMARY OF FINDINGS
This work carried out causality analysis of private and public investment on economic growth in Nigeria over the period 1986 to 2021 using annual time series data on real gross domestic product, private investment (proxy by gross fixed capital formation), public investment (proxy by government capital expenditure), exchange rate, and interest rate spread. The study employed ARDL Bounds Testing methodology in determining whether long run relationship exists between private and public investment and economic growth in Nigeria over the period. The hypotheses showed there is no significant causality relationship between private and public investment and economic growth in Nigeria. The result indicated that private and public investment has statistically insignificant impact on economic growth in Nigeria in the short run as well as in the long run over the period studied. Granger causality test result equally indicated that there is no significant directional causality relationship between private and public investment, and economic growth in Nigeria over the period covered.

CONCLUSION
This work carried out causality analysis of private and public investment on economic growth in Nigeria over the period 1986 to 2021 using annual time series data on real gross domestic product, private investment (proxy by gross fixed capital formation), public investment (proxy by government capital expenditure), exchange rate, and interest rate spread. The study employed ARDL Bounds Testing methodology in determining whether long run relationship exists between private and public investment and economic growth in Nigeria over the period.The objectives of the study wereto ascertain the causality relationship between private and public investment and economic growth in Nigeria. Based on findings, the study concludes that there is no significant directional causality relationship between private and public investment, and economic growth in Nigeria over the period covered.

RECOMMENDATIONS

Based on the findings, the study recommends that government should design investment policies to encourage the growth of private and public investment in Nigeria and include the provision of the necessary infrastructure at reduced economic cost and creation of business environment conducive enough not only to attract private investment but for sound investment that would stimulate sustainable economic growth in the country. Government should, as a matter of necessity, adequately address the issue of poor investment climate which include poor infrastructure, power shortage; poor transport; poor telecom connectivity of business locations and inefficient tax administration, to promote private sector investment.

There is need for government to also improve the public sector productivity and develop an analytical framework to stimulate private investment. Policy support to facilitate the private investment and skilled labor force would go a long way to ensure a stable macroeconomic environment and sustainable economic growth in Nigeria. Government should equally endeavor to stabilize exchange rate of naira and create enabling environment for domestic investment to rise through the adoption of macroeconomic policies which will boost investment opportunities in the economy thereby contributing to the growth of the economy.

References

[1]. Adekunle, K. A., and Aderemi A. K. (2012). Domestic investment, capital formation and population growth in Nigeria; Developing Country Studies; 2(7), 2012

[2]. Balassa, B. (1988). "Public Finance and Economic Department", PPR Working Paper No.31, World Bank, Washington, D.C. B

[3]. Blejer, M and M Khan. June 1984, "Government policy and private investment in developing countries"IMF Staff Papers, vol.31, no.2.

[4]. Ghazali, A. (2010). Analyzing the relationship between foreign direct investment, domestic investment and economic growth for Pakistan. *International Research Journal of Finance and Economics, 47*, 123-131.

[5]. Harris, R. and Sollis, R. 2003. "Applied Time Series Modelling and Forecasting". Wiley, West Sussex

[6]. Jongwanich, J., and Kohpaiboon, A. (2008). Private Investment: Trends and Determinants in Thailand. *World Development*, *36*(10), 1709–1724. https://doi.org/10.1016/J.WORLDDEV.2008.01.010

[7]. Kerlinger, G. (1970). The importance of foreign direct investments on economic development in transitional countries. *European Scientific Journal, 12(7), 288-305. https://doi.org/10.19044/esj.2016.v12n7p288*

[8]. Keynes, J.M. (1936). The General Theory of Employment, Interest and Money. 1964 reprint, *New York: Harcourt Brace.*

[9]. Levine, R. and Renelt, D., (1992). A sensitivity analysis of cross-country regressions. *American Economic Review*, 82 (4): 942-963.

[10]. Mukhopadhyay, S. (2019). Regional Development Models. *International Encyclopedia of Human Geography, Second Edition*, 281–295. https://doi.org/10.1016/B978-0-08-102295-5.10119-2

[11]. Potters, C,(2021). Economic Growth; Microeconomics. https://www.investopedia.com/term/e/economic growth.asp.

[12]. Pesaran, M. H., Shin, Y., and Smith, R. J. (2001). Bounds testing approaches to the analysis of level relationships. *Journal of Applied Econometrics*, *16*(3), 289–326. https://doi.org/10.1002/JAE.616

[13]. Romer, P. (1990). Endogenous technological change. *Journal of Political Economy,* 98, 71–103.

[14]. Tan, B. W., and Tang, C. F (2011). The dynamic relationship between private domestic investment, the user cost of capital and economic growth in Malaysia.*MPRA Paper No. 27964, Posted 08 January 2011/ 02:24. Online at http://mpra.ub.uni-muenchen.de/27964/*

[15]. Udeze, C. R., Attamah, N., Onwuka, I. N., Ugwunna, O. T., Okaforocha, C. M., and Ezeife, A. O. (2025). Impact of public-private investment interaction on economic growth: Evidence from Nigeria. *African Journal of Economics and Sustainable Development*, *8*(2), 5.