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The Correlation Between Infrastructural Development and the Nigerian Economy

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ABSTRACT: There were many conversations and empirical studies around infrastructural development and its impact on economic growth in Nigeria and the rest of the world with different results: positive, negative and non-linear relationship. This necessitated this study which empirically examined the correlation between infrastructural development and the Nigerian economy. It employed the Vector Error Correction Model (VECM) to achieve its objective using annual data from1986 to 2024. This technique was important not only for providing useful information on the long run equilibrium relationship of the variables but also for the purposes of forecasting analysis. It was supported by unit root and co-integration tests. The unit root test indicated that the variables were stationary at first difference while the Co-integration showed that there was a long run relationship between infrastructural development and the growth of the Nigerian economy. VECM results revealed that there was a positive correction between infrastructural development and economic growth in Nigeria. It was striking to note that transport, education and electricity had positive and significant relationship with the growth of the Nigerian economy while telecommunication had negative impact on economic growth in Nigeria. The study recommended that government should increase budgetary allocation to infrastructural development such as transport, education, electricity and telecommunication sectors to enhance their services as they were the drivers of economic growth in Nigeria.

KEYWORDS: Infrastructure, Development, Nigerian Economy, Correlation and VECM.

1.0 INTRODUCTION

Over the years, Nigeria has suffered poor infrastructural development, which has affected its economic growth. There have been many conversations around infrastructural development and several presentations of blueprints for mega projects by successive governments with little or no action in reality. Infrastructures are the basic essential facilities and services that should be put in place for development. It facilitates and accelerates economic development, such that where there are no infrastructures, economic development and growth would be difficult to achieve. Economic development or growth is virtually impossible without a thriving infrastructural sector.
(Jackson et al, 2018).

Infrastructure encompasses facilities and services provided by the government to enhance economic productivity and elevate citizens' quality of life. A robust infrastructure foundation enables the delivery of improved services, contributing to higher overall economic output. Investments in infrastructure, such as roads, electricity, and water supply, act as essential inputs for production processes. The critical role that infrastructure plays in boosting productivity and enhancing citizens' living standards makes the assessment of Nigeria's infrastructural progress a matter of significant importance.

However, despite its importance, prior studies pointed to ongoing issues such as inadequate infrastructure, funding shortages, and regulatory hurdles, which have hindered progress and efficiency in service delivery. For example, limited access to dependable transportation and electricity has negatively impacted economic activities and the broader developmental trajectory of the country (Obi et al., 2019; Eze et al., 2021). Establishing a solid infrastructure base is crucial for fostering economic growth, as it enhances productivity and facilitates more effective service delivery. Furthermore, investments in key sectors like transportation, electricity, and water resources are fundamental to achieving economic stability and long-term development.

Infrastructure refers to physical systems that enhance societal living standards, such as healthcare and agricultural facilities, transportation networks, telecommunication systems, energy infrastructure, and water provision services (Babu et al.,

2022; Baig et al., 2022). Infrastructure services significantly enhance the productivity of other economic factors and are often referred to as the "unpaid factor of production." Moreover, investment in infrastructure attracts additional resource inflows to a region (Mukwaya & Mold, 2018). While the economic contributions of infrastructure may take time to materialize, they remain a reliable path for developing countries to achieve long-term economic sustainability (Chan et al., 2022). Strategic planning, political will, and a robust procurement approach are crucial for realizing the long-term benefits of infrastructure development.

Infrastructure is critical as it provides services essential for daily consumption and serves as inputs into private-sector production. It drives the productivity of capital and labour in producing goods and services, forming the backbone of national economies and supporting livelihoods through employment and income generation (Bilal et al., 2022). Recent studies emphasized the wide range of services encompassed by infrastructure, including highways, roads, safety standards, mass transit, airport facilities, electricity, gas and water supply systems, waste water treatment, solid waste management, storm water drainage, and sewerage disposal systems. Other critical facilities include correctional institutions, educational facilities, public health delivery systems, emergency response systems, and law enforcement (World Bank, 2022).

These systems played a crucial role in supporting sustainable economic development by improving supply chain effectiveness and lowering the costs associated with infrastructural development (Yang et al., 2020). Thus, the interrelationship between infrastructural development and economic growth nexus cannot be over-emphasized and indeed has come to stay. This has given rise to an intense debate among researchers and other academics about whether development in infrastructure boosts economic development. As a result, academics and researchers have conducted a number of empirical studies to ascertain the impact of infrastructural development on economic growth in Nigeria and the rest of the world.

Many of such studies have evaluated the relationship between infrastructure development and economic growth trajectory and came with different strands: positive, negative and non-linear relationship. For instance, Audu et al (2024), Bennee (2021), Ogbaro et. al. (2017), Ogunlana et. al. (2016), Fidelis et al (2014), Ehizuelen (2017), reported long run positive relationships between infrastructural development and economic growth while others revealed mixed results of both positive and negative functional relationship between infrastructural development and economic growth (Kupoluyi et. al., 2025, Olugbenga et. al.,2025, Olawumi et. al., 2025, Owolabi-Merus, 2015). According to World Bank (2022), corruption, misallocation of funds and bureaucratic inefficiencies weaken the impact of such expenditures on infrastructural development.

This paper extends the current literature between infrastructural development and economic growth in a number of significant ways. Firstly, this study uses the Vector Error Correction Model (VECM) because of its importance not only for providing useful information on the long run equilibrium relationship of the variables but also for purposes of forecasting analysis. It shows long run interactions among the variables concerned unlike previous studies like Ogunlana et. al. (2016) employed Engel Granger, Co-integration and Error Correction Model (ECM); Ehizuelen (2014); Owolabi-Merus (2015); and Ogbaro et. al. (2017) explored Ordinary Least Squares (OLS) and Granger Causality; while Kupoluyi et. al. (2025); Olugbenga et. al. (2025), and Olawumi et. al. (2025) used Autoregressive Distributed Lag Model (ARDL); and Oluwaseyi et. al. (2019) utilized the Vector Autoregressive model (VAR) to determine the relationship between infrastructural development and economic growth. Secondly, this study extends its scope beyond those of earlier studies by extending the period from 1986 to 2024 which captures development in infrastructural relationship with economic growth in the 80s, 90s, 2000, and beyond.

Some of the empirical studies have shown positive impact of infrastructural development on economic growth while some others reported negative and/or inconclusive impact of infrastructural development on economic growth in Nigeria, Africa and the rest of the world. These contradictory and/or inconclusive findings created a knowledge gap to be filled by this study. This study used annual time series data for the period of 1986 to 2024 and sourced from Central Bank of Nigeria (CBN), World Development Indicators (WDI) and the Nigerian Bureau of Statistics (NBS). The paper is structured into five sections. Following the introductory section is section two which provides the literature review. Section three discusses the research methodology while section four presents the empirical results and discussion. Section five concludes the study and makes appropriate policy recommendations.

2.0 LITERATURE REVIEW

Conceptually, Kim and Ahn (2020), economic growth refers to the sustained increase in a country's productive capacity, often measured by the rise in gross domestic product (GDP) over time. It is a fundamental objective of macroeconomic policy and a critical indicator of a nation's economic health and standard of living. Economic growth enhances a country's ability to create jobs, reduce poverty, improve infrastructure, and invest in social services such as healthcare and education. A growing economy also attracts both domestic and foreign investments, which further stimulate production, income, and consumption levels (Ershov et al., 2021).

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According to Bhattacharya and Bose (2023), infrastructure development refers to the construction, expansion, and maintenance of essential physical systems and facilities that support economic growth and improve the quality of life in society. These include transportation networks, energy supply, water and sanitation systems, healthcare facilities, and educational institutions. A well-developed infrastructure is fundamental to national development, as it enhances productivity, facilitates trade, and attracts foreign investments. In developing countries like Nigeria, infrastructure development is often seen as a critical driver of economic transformation, reducing poverty and promoting sustainable growth (Opoku & Yan, 2019).

Chugunov et al. (2021) viewed government expenditure as the total amount of money that a government spends on goods, services, and public projects to promote economic growth and ensure social welfare. It is a crucial tool for fiscal policy, influencing macroeconomic stability, employment levels, and income distribution. Governments allocate spending across various sectors, including infrastructure, healthcare, education, defense, and social protection, to enhance national development and improve the standard of living for citizens (Kousar et al., 2023). In Nigeria, government expenditure plays a critical role in driving economic activities, particularly in infrastructure development, poverty reduction, and public service delivery.

In the **theoretical review**, the endogenous growth theory is considered here. Endogenous growth theory holds that economic growth is primarily the result of endogenous and not external forces (Romer, 1994). Endogenous growth theory holds that investment in human capital, technological innovation, and knowledge are significant contributors to economic growth. The theory also focuses on positive externalities and spillover effects of a knowledge-based economy which will lead to economic development. The endogenous growth theory primarily holds that the long run growth rate of an economy depends on policy measures. For example, subsidies for research and development (R & D) or education increase the growth rate in some endogenous growth models by increasing the incentive for innovation. Unlike neoclassical models that rely on external input, this theory emphasizes the power of policy and private sector initiatives to nurture innovation and drive growth. Learn how key components like government policies, R & D investment, and intellectual property play crucial roles in advancing economic development.

Empirically, Toader et al. (2018) investigated European Union countries' ICT infrastructure effects on GDP per capita and found positive results that differed according to technological characteristics and economic conditions. Research findings confirmed that infrastructure and ICT assets served as essential elements for enhancing economic performance. Ibahimov et al. (2023) validated the positive relationship between infrastructure investments and GDP per capita using data from ten countries including Azerbaijan and Mexico. The research revealed that inland transport together with road investments produced statistically important effects which appeared after a delay of three years. Seidu et al. (2020) demonstrated through UK research that infrastructure development created employment opportunities yet required stable policies and precise funding allocation to achieve best results in regional growth areas. The Autoregressive Distributed Lag (ARDL) analysis by Sabir and Shamshir (2020) in Pakistan showed contradictory results because energy consumption and electricity use and education and life expectancy enhanced per capita GDP yet road infrastructure had a negative influence. The authors suggested that sustainable growth required a unified investment method that connected infrastructure development with human resource development and social programs.

Considering the work done in Nigeria, Osakede (2021) ascertained government expenditure on health and its effect on Nigeria's healthcare infrastructure. They applied a panel data regression model on health sector funding from 2000 to 2019 across different states. The study revealed that increased spending on health facilities significantly reduced mortality rates and improved healthcare accessibility. However, inefficiencies in fund allocation, mismanagement, and delays in project implementation limited the full impact of government allocations. Kupoluyi (2025) examined the effect of government expenditures on infrastructure development in economic growth in Nigeria. He explored the effect of public spending across key sectors on economic growth and used four proxies for government sectoral expenditure: expenditure on agriculture, education, health, and transportation which covered the period from 1990 to 2023. The Autoregressive Distributed Lag (ARDL) technique was used and the results showed that government expenditure in agriculture, education, health, and transportation had not yielded a statistically significant impact on economic growth in Nigeria over the study period. Oseni et al. (2020) analyzed the role of government spending on social community services in Sub-Saharan Africa, focusing on Nigeria, Ghana, and South Africa. They used a comparative case study approach and secondary data from government financial reports from 1995 to 2020. Their results demonstrated that increased public spending on social services such as housing, sanitation, and welfare significantly improved the quality of life. However, the study highlighted disparities in fund distribution, with urban centers benefiting more than rural areas. They recommended inclusive policies to ensure equitable access to social services across different population groups.

Olawumi et al (2025) evaluated infrastructural development as a correlate of economic growth in Nigeria spanning 1981 to 2023. The study employed Autoregressive Distributed Lag (ARDL) technique. The result showed that the variables had a long run significant impact on economic growth in Nigeria which revealed a mixed significant relationship between infrastructural development and economic growth. The findings concluded that education, infrastructure, and telecommunications had

significant impacts on economic growth, whereas, health and water availability had negative impacts on economic growth in Nigeria. The study recommended amongst others that, government should increase its budgetary allocation to road construction infrastructure and education to enhance economic growth. Chijioke and Amadi (2020) determined the impact of public expenditure on infrastructure development in Nigeria. Using a time series analysis covering 1990 to 2022, they employed regression techniques to analyze the effect of government spending on roads, energy, and water supply. Their findings indicated a positive and significant relationship, suggesting that increased government investment in infrastructure led to economic growth and improved living standards. However, they identified challenges such as corruption, inefficiencies in fund allocation, and poor maintenance culture as major obstacles to achieving long-term benefits from infrastructure investments.

3.0 RESEARCH METHODOLOGY

Theoretical Framework: This study anchored on the endogenous growth theory developed in the 1980s by economists Paul Romer (1986, 1990) and Robert Lucas (1988) as an extension of the Solow-Swan growth model. Unlike neoclassical growth theories, which attributed economic growth to external technological advancements, endogenous growth theory argued that growth was primarily driven by internal factors within the economy, such as investment in human capital, innovation, and knowledge spillovers (Ehrlich & Pei, 2020). The theory suggested that government policies, research and development (R&D), infrastructure investment, and education played critical roles in enhancing productivity and driving long-term economic growth (Wang & Zhang, 2020). It emphasized that technological progress and knowledge accumulation were not exogenous (external) but were the result of economic incentives and policies (Song et al., 2019).

Methodology

To fully underscore the correlation between infrastructural development and the Nigerian economy as set out in the literature, this study makes use of Vector Error Correction Model (VECM) technique. The VECM estimation is important not only for providing useful information on the long run equilibrium relationship of the variables but also for purposes of forecasting analysis (Agbonkhese & Oligbi). For series which are non-stationary, integrated in the same order, and lead to co-integrating relationship, a Vector Error Correction Model (VECM) is estimated.

To arrive at the VECM, we re-parameterize the basic VAR(p). The VECM model takes the form:

$$\Delta Y_t = \prod Y_{t-1} + A_1 \Delta Y_{t-2} + ... + A_{p-1} \Delta Y_{t-p+1} + \mu \quad .....(1)$$

Where: $\prod = -(I_k - A_1 - ..... - A_p)$ that is $\prod = \sum_{i=1}^{p} A_i - I_k$, for $i = 1,.....p-1$, and

$A_i = -(A_{i+1} + ... + A_p)$ that is $A_i = -\sum_{j=i+1}^{p} A_j$ for $i = 1,....., p-1$.

The $\prod$ is interpreted as a long run coefficient matrix, since in equilibrium, all the Y_{t-i} is to be zero, and setting the error terms, μ_t to their expected value of zero leaves $\prod Y_{t-p} = 0$. The assumption that all variables can be at most $I(1)$ implies that the term $\prod Y_{t-1}$ is the only one which includes $I(1)$ variables. This is to say $\prod Y_{t-1}$ must also be $I(0)$. Thus, it contains the co-integrating relations. The $\prod Y_{t-1}$ is sometimes referred to as the long run or long term part. $A_i (i = 1,...., p-1)$ often refers to as short run parameter matrices. Thus, the VECM equation which re-parameterizes the basic VAR(p) can be rewritten as:

$$\Delta Y_t = \alpha\beta' Y_{t-1} + A_1 \Delta Y_{t-2} + ... + A_{p-1} \Delta Y_{t-p+1} + \mu_t \quad ..... (2)$$

The parameter matrices α and β in equation (2) have dimensions Kxr and r. They specify the long run part of the model with β containing the co-integrating relations (interpreted as the distinct co-integrating vectors) whereby $\beta' Y_t$ form a linear stationary process. The α's are the error correction coefficients (or loading factors or coefficients) which indicates the speed of adjustment toward long run equilibrium. The VECM representation which includes deterministic terms and stochastic exogenous variables is represented in the form:

$$\Delta Y_t = \prod Y_{t-1} + A_1 \Delta Y_{t-2} + ... + A_{p-1} \Delta Y_{t-p+1} + CD_t + BZ_t + \mu_t \quad .....(3)$$

The VECM representing the empirical counterpart of equation (3) is in model specification.

Augmented Dickey Fuller Unit Root Test: An important step in the estimation of the VEC model is to test for the stationarity of the variables to ensure that none of the variables is integrated of order two. Vector Error Correction Model (VECM) allows for a

mix of I(0) and I(I) variables in an estimation. The Augmented Dickey Fuller test (Dickey & Fuller, 1981) unit root test is used to establish the order of integration of the variables and is generally modelled as:

$$\Delta Y_t = \varpi_1 + \delta Y_{t-1} + \sum_{i=1}^{n} \alpha_i \Delta Y_{t-1} + \varepsilon_t \quad \text{..... (1)}$$

$$\Delta Y_t = \varpi_1 + \varpi_t + \eta Y_{t-1} + \sum_{i=1}^{n} \beta_i \Delta Y_{t-1} + \varepsilon_t \quad \text{..... (2)}$$

Where Δ is the first difference of Y, while ϖ_1 and ϖ_t are the intercept term and time trend respectively while n is the lag value. The Augmented Dickey-Fuller test is taken as superior to the Dickey Fuller because the Dickey Fuller test does not take account of possible autocorrelation in the error process (Uko & Nkoro, 2016).

Model Specification

In view of the synthesis above and particularly following empirical variables in the study, a simple model of Vector Error Correction (VEC) framework is hypothesized to capture the dynamics of the relationship between infrastructural development and economic growth whilst avoiding the pitfalls of endogeneity and integration of the variables. The endogenous variables as defined under the VEC model except that they enter the model in their first differences are: $\alpha, \beta, \delta, \gamma, \lambda, \psi$ and ϕ are coefficients for variables GDP, TRANS, EDUC, TELCOM, ELECT and ECM respectively. The μ_t 's are the error terms. The relevant variables in the empirical estimation are: Gross domestic product (GDP) - proxy for economic growth, Transport (TRANS), Education (EDUC), Telecommunication (TELCOM), and Electricity (ELECT). The specification of the Vector Error Correction Model (VECM) is specified below.

$$\Delta GDP_t = \alpha_1 + \sum_{i=1}^{m} \beta_1, \Delta TRANS_{t-1} + \sum_{i=1}^{n} \delta_1, \Delta EDUC_{t-1} + \sum_{i=1}^{k} \gamma_1, \Delta TELCOM_{t-1} + \sum_{i=1}^{j} \lambda_1, \Delta ELECT_{t-1} +$$

$$\sum_{i=1}^{h} \psi_1, \Delta GDP_{t-1} + \sum_{i=1}^{q} \phi_1, ECM_{t-1} + \mu_{1,i} \text{.....(1)}$$

$$\Delta EDUC_t = \alpha_3 + \sum_{i=1}^{m} \beta_3, \Delta TRANS_{t-1} + \sum_{i=1}^{n} \delta_3, \Delta EDUC_{t-1} + \sum_{i=1}^{k} \gamma_3, \Delta TELCOM_{t-1} + \sum_{i=1}^{j} \lambda_3, \Delta ELECT_{t-1} +$$

$$\sum_{i=1}^{h} \psi_3, \Delta GDP_{t-1} + \sum_{i=1}^{q} \phi_3, ECM_{t-1} + \mu_{3,i} \text{.....(3)}$$

$$\Delta TELCOM_t = \alpha_4 + \sum_{i=1}^{m} \beta_4, \Delta TRANS_{t-1} + \sum_{i=1}^{n} \delta_4, \Delta EDUC_{t-1} + \sum_{i=1}^{k} \gamma_4, \Delta TELCOM_{t-1} + \sum_{i=1}^{j} \lambda_4, \Delta ELECT_{t-1} +$$

$$\sum_{i=1}^{h} \psi_4, \Delta GDP_{t-1} + \sum_{i=1}^{q} \phi_4, ECM_{t-1} + \mu_{4,i} \text{.....(4)}$$

$$\Delta ELECT_t = \alpha_5 + \sum_{i=1}^{m} \beta_5, \Delta TRANS_{t-1} + \sum_{i=1}^{n} \delta_5, \Delta EDUC_{t-1} + \sum_{i=1}^{k} \gamma_5, \Delta TELCOM_{t-1} + \sum_{i=1}^{j} \lambda_5, \Delta ELECT_{t-1} +$$

$$\sum_{i=1}^{h} \psi_5, \Delta GDP_{t-1} + \sum_{i=1}^{q} \phi_5, ECM_{t-1} + \mu_{5,i} \text{.....(5)}$$

4.0 RESULTS AND DISCUSSION

Unit Root Test Results

Table 1: Augmented Dickey-Fuller (ADF) Test Statistic Results at Levels and First Difference

Variables		ADF TEST STATISTIC	CRTICAL VALUE	ORDER OF INTEGRATION	CONCLUSION
LNRGDP	Level	-3.4185(0.0638)	-3.5331	1(0)	Not Stationary
	First Diff.	-6.1898(0.0001)**	-3.5403	1(1)	Stationary

LNTRANS	Level	-0.7711(0.9596)	-3.5331	1(0)	Not Stationary
	First Diff.	-4.6604(0.0033)**	-3.5366	1(1)	Stationary
LNEDUC	Level	-2.6182(0.2757)	-3.5875	1(0)	Not Stationary
	First Diff.	-5.9756(0.0002)**	-3.5875	1(1)	Stationary
LNTELCOM	Level	-3.2545(0.0922)	-3. 5578	1(0)	Not Stationary
	First Diff.	-7.2712(0.0000)**	-3.5366	1(1)	Stationary
LNELECT	Level	-2.6084(0.2807)	-3.6908	1(0)	Not Stationary
	First Diff.	-6.3279(0.0000)**	-3.5485	1(1)	Stationary

Note: Probabilities are in parentheses. **All the variables are significant at 5% level.

Source: Authors' Estimation Results, 2026.

Table 1 presents the result of the Augmented Dickey-Fuller test at levels and first difference. It shows that none of the variable is stationary or integrated at levels while they are stationary at order one or integrated of the same order. Therefore, a co-integration relationship can be established to determine the existence of a long run equilibrium relationship between infrastructural development and the Nigerian economy from 1986 to 2024 using annual time series data.

Co-integration Test Results

Having verified that all empirical variables were stationary and integrated of the same order, the study tests for the existence of long run equilibrium relationship between the variables in the model. A vector of variables integrated of order one is integrated if there exists linear combination of the variables which are stationary.

The result of the multivariate Johansen co-integration test for the model is shown in Tables 2a and b below.

Tables 2a and b: Results of Multivariate Johansen Co-integration Tests

Table 2a: Results of Unrestricted Co-integration Rank Test **(Trace)**

Hypothesized No. of Co-integrating Equations (r)		**Eigen value**	**Trace test statistic** K = 2		**Prob.****
Ho	**HA**		**(λ trace)**	**Critical Value (0.05)**	
r ≤ 0	r > 0	0.691396	86.72442	69.81889	0.0013
r ≤ 1	r > 1	0.485282	50.27779*	47.85613	0.0291
r ≤ 2	r > 2	0.422391	29.68958	29.79707	0.0514
r ≤ 3	r > 3	0.206332	12.67496	15.49471	0.1273
r ≤ 4	r > 4	0.162873	5.511171*	3.841466	0.0189

Note: Trace test indicates 2 co-integrating equation(s) at the 0.05 level

Table 2b: Results of Unrestricted Co-integration Rank Test (Maximum Eigenvalue)

Hypothesized No. of Co-integrating Equations (r)		**Eigen value**	**Max-Eigen Statistic** K = 2		**Prob.****
Ho	HA		**(λ Max)**	**Critical Value (0.05)**	
r = 0	r = 1	0.691396	36.44664	33.87687	0.0241
r = 1	r = 2	0.485282	20.58820	27.58434	0.3019
r = 2	r = 3	0.422391	17.01462	21.13162	0.1713
r = 3	r = 4	0.206332	7.163790	14.26460	0.4699
r = 4	r = 5	0.162873	5.511171	3.841466*	0.0189

Note: Max-Eigen value statistic indicates 1 co-integrating equation(s) at the 0.05 level *denotes rejection of the hypothesis at the 0.05 (5%) level; r represents number of co-integrating vectors; k represents number of lags in the unrestricted VAR model. **MacKinnon-Haug-Michelis (1999) P-values.

Source: Authors' Estimation Results, 2026.

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The results reveal that both the trace statistic and maximum Eigen value statistic confirm the existence of co-integrating equations among the variables of interest. This is because the likelihood ratio is greater than critical values at 5%. It is evident that the trace test indicates two co-integrating equations while maximum Eigen value test reveals one co-integrating equation in the model, as the null hypothesis of no co-integration is rejected. Since the variables are co-integrated, this satisfies the convergence property, indicating a co-integrating relationship as well as a unique long run equilibrium relationship between infrastructural development and the Nigerian economy.

Table 3: Vector Error Correction Model (VECM) Results.

Variable	D (LNGDP)	D (LNTRANS)	D(LNEDUC)	D(LNTELCOM)	D (LNELECT)
ECT/ECM	-1.479650	0.509651	0.677383	-0.926317	-1.565934
	(0.76294)	(0.20690)	(0.33273)	(0.62904)	(0.37981)
	[-1.93942]**	[2.46330]***	[2.03581]**	[-1.47258]*	[-4.12299]***
D(LNGDP(-1))	0.549187	-0.178599	-0.481027	-0.150499	0.241074
	(0.59619)	(0.16168)	(0.26001)	(0.49156)	(0.29680)
	[0.92116]	[-1.10466]	[-1.85002]**	[-0.30617]	[0.81226]
D(LNGDP(-2))	0.205086	0.006258	-0.288723	0.187876	0.345117
	(0.54608)	(0.14809)	(0.23816)	(0.45024)	(0.27185)
	[0.37556]	[0.04226]	[-1.21232]	[0.41728]	[1.36951]*
D(LNTRANS(-1))	0.404037	-0.134844	-0.039670	-0.022701	-0.183000
	(0.76049)	(0.20623)	(0.33167)	(0.62703)	(0.37859)
	[0.53129]	[-0.65384]	[-0.11961]	[-0.03620]	[-0.48338]
D(LNTRANS(-2))	1.563854	0.120409	-0.566919	2.533399	1.001367
	(1.00377)	(0.27221)	(0.43777)	(0.82762)	(0.49970)
	[1.55798]*	[0.44234]	[-1.29502]	[3.06108]***	[2.00394]**
D(LNEDUC(-1))	1.430051	0.260888	-0.017248	1.176994	0.975849
	(0.60086)	(0.16294)	(0.26205)	(0.49541)	(0.29912)
	[2.38002]**	[1.69109]**	[-0.06582]	[2.47580]***	[3.26240]***
D(LNEDUC(-2))	-0.354065	0.147187	-0.026593	-0.718644	0.493641
	(0.65231)	(0.17690)	(0.28449)	(0.53783)	(0.32473)
	[-0.54279]	[0.83205]	[-0.09348]	[-1.33619]*	[1.52015]*
D(LNTELCOM(-1))	-0.617005	-0.021729	0.165667	0.057461	-0.112209
	(0.30972)	(0.08399)	(0.13507)	(0.25536)	(0.15418)
	[-1.99217]**	[-0.25871]	[1.22648]	[0.22502]	[-0.72776]
D(LNTELCOM(-2))	-0.073268	0.052252	0.117455	-0.191195	-0.247361
	(0.36928)	(0.10014)	(0.16105)	(0.30447)	(0.18383)
	[-0.19841]	[0.52177]	[0.72930]	[-0.62795]	[-1.34556]*
D(LNELECT(-1))	0.581042	0.143187	-0.086650	0.592865	0.107225
	(0.38973)	(0.10569)	(0.16997)	(0.32133)	(0.19401)
	[1.49090]*	[1.35480]*	[-0.50980]	[1.84502]**	[0.55266]
D(ELECT(-2))	0.182686	-0.072403	0.034097	0.310496	0.105928
	(0.34905)	(0.09466)	(0.15223)	(0.28779)	(0.17376)
	[0.52339]	[-0.76490]	[0.22399]	[1.07890]	[0.60962]
Constant (C))	-0.424692	0.095413	0.364304	-0.365473	-0.203041
	(0.29189)	(0.07916)	(0.12730)	(0.24067)	(0.14531)
	[-1.45495]*	[1.20536]	[2.86173]***	[-1.51857]*	[-1.39728]*
Summary of Statistics					
R^2	0.654884	0.671187	0.331686	0.721567	0.858906
Adj. R^2	0.417617	0.445128	-0.127780	0.530144	0.761905
S.E. Equation	0.473797	0.128487	0.206634	0.390649	0.235866

The Correlation Between Infrastructural Development and the Nigerian Economy

F- Statistic	2.760111	2.969081	0.721895	3.769493	8.854543
AIC	1.641452	-0.968446	-0.018203	1.255510	0.246425
Schwarz	2.212397	-0.397502	0.552741	1.826455	0.817370

Note: Standard Errors are in parenthesis and t-Statistics are in brackets

/**/ = Significant at 10%, 5% and 1% levels

Source: Authors' Estimation Results, 2026.

The estimated Vector Error Correction Model (VECM) evaluates the short run behaviour and the adjustment to the long run model. Here, the short run dynamics for Nigeria are estimated using the error correction representation of the model that include two lags for each of the first differences for the five variables and the equilibrium error correction terms (ECT). Error correction coefficient can be treated as a mechanism, which ties the short run behaviour to its long run value. It simply shows the speed with which the system converges to equilibrium. From table 3, the error correction coefficient (-1.479650) which measures the speed of adjustment towards long run equilibrium has the required negative sign, lies within the accepted region of less than unity and significant at 5% level. The coefficient of Vector Error Correction (VEC) indicates a speed of about 147.97% of the previous period disequilibrium from the long run economic growth. This also implies that the speed with which the variables (TRANS, EDUC, TELCOM, and ELECT) adjust from short-run disequilibrium to changes in economic growth (GDP) in order to attain long run equilibrium is 147.97% within one period. The coefficient also suggests that the speed of adjustment towards equilibrium is quite reasonable and all the variables are significant to the Error Correction Term (ECT) from 10%, 5% and 1% respectively.

The error correction estimate of 0.509651 for TRANS indicates that 50.96% of the preceding period's disequilibrium is eliminated in the current period, with immediate adjustments captured by the difference terms. The EDUC, TELCOM, and ELECT indicate 67.74%, 92.63%, and 156.59% respectively, of the preceding periods' disequilibria that are eliminated in the current period. In the lagged economic growth (GDP), all the variables are statistically significant and have positive relationships with economic growth except telecommunication (TELCOM) with negative relationship with the growth of the Nigerian economy in lag 1 while in lag 2 none of these variables is significant except only transport (TRANS) that is significantly and positively related to economic growth. The negative relationship between telecommunication and the growth of the Nigerian economy may not be unconnected with the incessant poor network which pervades all the telecommunications outfits in Nigeria. The other variables – transport, education and electricity supply though their contributions are significant, the quanta of their contributions are marginal due to poor budgetary allocations to these sectors. Coupled with the epileptic power supply that has almost crippled small and medium scale businesses in the country. Overall, the results of this research reveal that there is a positive and significant relationship between infrastructural development and the growth of the Nigerian economy.

A look at the ECT with particular reference to the explanatory variables, the followings are discernible from the results. The estimated error correction terms (ECT) regarding TRANS and EDUC are in conformity with the a-prior expectations of positive signs while TELCOM and ELECT are negative and not in tandem with the a-prior expectations. This further shows that the speed of adjustment to the long run relationship in the equations are 50.96%, 67.74%, 92.63% and 156.59% respectively.

Considering the impact of infrastructural development on the Nigerian economy which is key to this study, it is evident from table 3 that in row one of GDP($_{-1}$), column 2, and subsequent columns (3-5), that 1% increase in economic growth (GDP) is brought about by 17.86% decrease in transport (TRANS), 48.10% decrease in education (EDUC), 15.05% decrease in telecommunication (TELCOM), and 24.11% increase in electricity (ELECT), respectively. Similarly, row two of GDP($_{-2}$), column 2, and subsequent columns (3-5), a 1% increase in economic growth (GDP) leads to 0.63% decrease in TRANS, 28.87% decrease in EDUC, 18.79% increase in TELCOM, and 34.51% increase in ELECT in the short run respectively.

The F-statistic shows that the overall goodness of fit of the model as well as the functional linear relationship between infrastructural development and the Nigerian economy is good and statistically significant at 1% level.

It is striking to note that overall, the results of this research reveal that there is a positive and significant relationship between infrastructural development and the growth of the Nigerian economy. This is in tandem with the findings of Owolabi-Merus (2015), Bennee et al (2021), Ogbaro et al (2017), Audu et al (2024) and Ehizuelen (2017). The results further reveal that transport (TRANS) and education (EDUC) are positively and significantly related to the Nigerian economy. These findings are in consonance with Olawumi (2025), Fidelis et al (2014) and Ibahimov (2023) who found that these variables were positive and significant to economic growth. These findings are contrary to Kupoluyi et al (2025), Olugbenga et al (2025) and Sabir and Shamshir (2020) who found that these variables were not positive and statistically significant to the growth of the economy.

Electricity (ELECT) is found to be positively and statistically significant to economic growth by this study and similar to the findings of Sabir and Shamshir (2020) and Chijioke and Amadi (2020) who found that education and electricity, transport and electricity were positively and significantly related to economic growth. Telecommunication (TELCOM) was negatively and

statistically significant to the growth of the Nigerian economy. This result has not aligned with that of Olugbenga et al (2025), Olawumi (2025) and Ogbaro et al (2017) who found that telecommunication had positive and significant relationship with economic growth.

Stability Test: The method used by Brown, Durbin, and Evans (1975) to examine the short-run stability of the model's parameters is examined in the study. They did this by plotting the cumulative sum of recursive residuals (CUSUM). The CUSUM test is particularly useful for detecting systematic changes in the regression coefficients. The result of the CUSUM experiment is depicted in figure 1 below. Essentially, parameter instability is established if the CUSUM of residuals fall outside the bands denoted by the two crucial lines (dotted lines). According to the graph in figure 1, the CUSUM remains inside the 5% critical line throughout the period under examination, suggesting parameter stability throughout the estimating period.

Parameters Stability Test Result

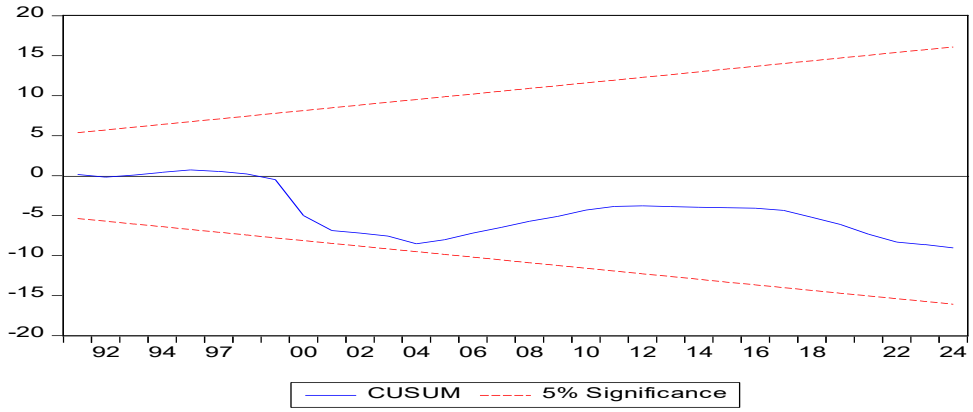


Figure 1: Cumulative Sum of Recursive Residual (CUSUM)
Source: Authors' Graphed, 2026.

5.0 CONCLUSION AND RECOMMENDATIONS

Economic development is virtually impossible without a thriving infrastructural sector. Over the years, Nigeria has suffered poor infrastructural development, which has affected its economic growth. There have been many conversations around infrastructural development and several presentations made by successive governments with little or no action in reality. This study investigated the correlation between infrastructural development and the Nigerian economy and found that infrastructural development is very important to economic growth in Nigeria. The study concludes that existing infrastructural development is grossly inadequate to drive meaningful and sustained economic growth in Nigeria.

From the findings, the study makes the following specific recommendations:

(i) The study recommended that government should increase budgetary allocation to infrastructural development such as transport, education, electricity and telecommunication sectors to enhance their services as they are the drivers of economic growth in Nigeria.

(ii) Government should also create an enabling environment such as favourable macroeconomic policies like lowering the costs associated with infrastructural development to encourage the private sector investment in the sector; possibly engage in public-private partnership to fast track infrastructural development that will enhance the growth of the Nigerian economy.

(iii) Nigerian government and policy makers should demonstrate greater commitment and political will to develop our infrastructure such as roads, rail services, education, electricity, and telecommunication, and stop the current lip service being paid to infrastructural development in Nigeria if it (infrastructural development) will lead to the desired economic growth in the country.

(iv) Government should develop and implement policies such as 'sanctioning' service providers like telecommunication and electricity outfits for their poor services to Nigerians and corporate organizations. This will go a long way to improve on their services and contribute their quota to the growth of the Nigerian economy.

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