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ELECTRICITY POWER SUPPLY AND ECONOMIC GROWTH IN NIGERIA

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Abstract

The study investigated the effect of electricity power supply on economic growth in Nigeria. The scope of the study covered a thirty-year period, spanning from 1993 to 2023. The data for the study were obtained from sources such as, the Central Bank of Nigeria (CBN), the World Bank World Development Indicators (WDI), and Enerdata. The dependent variable of the study is real gross domestic product (RGDP), while the independent variables were comprised of power generation (PG), electric power transmission and distribution losses (PD), and electricity consumption (EC). These data were analyzed using the Augmented Dickey Fuller (ADF) method of unit root testing, the Autoregressive Distributed Lag (ARDL) method of estimation and post estimation analytical tests like, the Serial Correlation LM test, Heteroskedasticity Test, Ramsey RESET, and CUSUM test. The unit root test result showed that PG and EC had no unit root and were stationary at level. However, after first differencing RGDP, and PD became stationary. Further analysis revealed that PG had a significant positive impact on RGDP both in the immediate period and in the lagged periods while PD and EC on the other hand exerted significant influence on RGDP in the lagged period but not in the current or immediate period. The long run result showed that the performance of Nigeria's RGDP was influenced by PD in the long run. However, PG and EC had no long run effect on RGDP within the evaluation period. The result of the post-estimation tests showed that the models of the study were free from the problems of serial correlation, heteroskedasticity, and model misspecification and that the coefficients of the models are constant throughout the sample period as suggested by the CUSUM test result. The study recommends that policy makers aiming to boost manufacturing should ensure reliable power generation but also address complementary factors such as infrastructure and financing.

Key words: *electricity power supply, economic performance, real gross domestic product (RGDP), power generation, electric power transmission and distribution losses, electricity consumption, Augmented Dickey Fuller (ADF).*

Introduction

Nigeria's natural gas reserves ranked tenth globally and its crude oil reserves ranked eleventh, as of 2022, proving that the nation is abundant in energy resources. Less well-known are Nigeria's abundant solar and hydropower resources, which the nation can use to generate electricity. Gas accounts for approximately 80 percent of power generation in Nigeria, but most of the nation's energy resources go unused, so the power sector is not up to par compared to other African nations like Ghana and Mauritius. In April 2020, the installed capacity of electric power in Nigeria was 12,522 MW, with a generating rate of approximately 4,000 MW and a peak generation rate of 5,000 MW, which was below 40 percent of the installed capacity. Because of the Joule effect, which causes energy to be wasted as heat in power lines and transformers, over 20 percent of the produced electricity is unable to be transported to power stations. World Bank and International Energy Agency statistics show that transmission and distribution losses can eat away at produced power by as much as sixteen percent. This has exacerbated the problem of limited access to energy, which affects around 18 million homes that do not have grid-connected power and another 9 million homes that have fewer than four hours of grid power daily. There are serious consequences for economic performance stemming from the present status of Nigeria's power sector supply, which is a major obstacle to the expansion and competitiveness of the economy. Inadequate and irregular power supply has been a continuous concern, affecting the productivity and worldwide competitiveness of households, businesses, industries, government agencies, and general economic activity. The International Energy Agency (IEA) reports that frequent power outages in Nigeria affect many households, businesses, and institutions, making it difficult to run daily operations and impede production (IEA, 2022). Not only do these interruptions drive up operational expenses, but they also deter investors, businesses, and institutions from setting up or growing their industrial facilities in the nation. In agreement with the World Bank (2023), one of the biggest obstacles to Nigeria's economic growth has been the nation's unreliable electricity supply. Industrial development, healthcare services, job creation, company expansion and investment, the cost of living, and the state of Nigeria's power supply are just a few areas that have been substantially impacted by the nation's power outages. Regular power outages, insufficient infrastructure, and excessive electricity bills are some of the persistent difficulties that have slowed development in these domains. In agreement with Onyido and Aroh (2020), an unstable power supply has an adverse influence on industrial development since it raises operational costs, hinders output, and makes local companies less competitive. This reduces the likelihood of new business formation and investment, which in turn reduces the number of available jobs (Amadi et al., 2021). The unpredictable electricity supply in Nigeria has a major influence on the healthcare industry as well. Electricity is essential for the operation of medical equipment, refrigeration, and lighting in healthcare facilities and hospitals. Problems with patient treatment and healthcare delivery arise because of the unreliability of the power supply, which in turn lowers the quality of healthcare services.

Investors lose faith in the economy due to the electricity grid's unreliability, which slows down development and growth (Okafor et al., 2020). Electric generators, solar panels, and other alternative power sources are prohibitively expensive, adding insult to injury for Nigerians already struggling to make ends meet (Eneh et al., 2021). Unreliable electricity supply causes households to spend more money on living expenses and less money for discretionary spending.

In agreement with global electricity consumption patterns, Nigeria and other African nations have some of the lowest rates. Like many other developing nations, especially those in Africa, the nation's populace was expanding at a rapid pace, leading to an upsurge in demand for electricity that the supply could not keep up with. It is necessary to convert other substantial energy sources, primarily renewable energy, nuclear power, and fossil fuels, into electricity power because it is not naturally occurring. To this day, fossil fuels are still the most common way to generate energy, both globally and in Nigeria. The percentage of the world's electricity generation that came from fossil fuels decreased from 66 percent in 2015 to 61 percent in 2020, in agreement with the Energy Information Administration (EIA) (2020). Thermal and hydropower are the primary means by which Nigeria produces electrical power. Nonetheless, fossil fuels, particularly gas, provide most of the nation’s electrical generating (approximately 81 percent of the total), with hydropower and other forms of energy making up the smaller amounts. The nation's electricity value chain has infrastructure inadequacies, which caused power generation and transmission to fluctuate. In agreement with the Nigerian energy Regulatory Commission (NERC), 2020, stakeholders in the power industry feel that the nation's present energy power capacity is becoming more inadequate to meet the power needs of Nigeria's growing populace.

Statement of the Problem

Nigeria has an abundance of natural and human resources; the nation's economy has struggled since gaining independence in 1960. There are many signs that the Nigerian government is failing its citizens. Many people are going hungry, there is a lot of debt, there is a lot of fraud, there is a lot of crime in large towns, manufacturing companies have collapsed, there is malpractice in the public service, there is little progress in entrepreneurial growth, and the electricity supply is unstable. Achieving long-term economic growth becomes more challenging when these issues are present. Power (electricity) is one of the issues that is hindering Nigeria's economic growth and development. There has been no commensurate improvement in electricity supply despite the massive yearly expenditures on the power sector. Until 2005, the Nigerian government controlled the nation's electricity market through the National Electric Power Authority (NEPA), a name that had been in use for decades. With all the serious issues that come with a public monopoly, NEPA oversees power plants that produce, transmit, and distribute electricity. The power supply was unable to keep up with the rapid expansion of both the populace and the economy because of this extreme centralisation. With a populace of over 210 million and an electrical demand of fewer than 4000 megawatts, Nigeria has the largest electricity demand-supply mismatch in the world. The disparity in power generation between South Africa (populace: below 50 million) and Brazil (populace: more than 100,000 megawatts), an emerging economy like Nigeria's, has far-reaching consequences for the improvement of the business climate, the maintenance of economic growth, and the social well-being of Nigerians. Only over a third of the populace's power needs are being satisfied, even though nearly half of the populace has access to electricity. Constant power outages have impacted the Nigerian economy and the lives of many Nigerians to the point where 90 percent of industrial customers and a large portion of residential and non-residential customers generate their own power. Out of a total installed capacity of 8,000 MW, only 4,000 MW are currently operational, with around 1,500 MW made accessible for power generation. Nigeria has one of the world's lowest per capita electricity consumption rates, at 125 kWh. Nigerians spend a fortune on self-generation due to the nation's erratic power supply; as a result, the nation has one of the world's highest electricity consumption costs. On top of the health risks, several families have lost loved ones due to generator emissions. Many businesses have been unable to open their doors due to the high cost of power generation, which has exacerbated poverty and unemployment in Nigeria.

All types of users, from households to businesses, rely on a reliable supply of electric power. The long, somewhat strategic, and mostly uneventful road to a sustainable electric power supply in Nigeria has resulted in the failure to meet the majority of its electric power supply objectives. The capacity of Nigeria's generating system is still unpredictable and unreliable, and it is unable to keep up with the rising demand for electricity. Despite extensive reform in the electricity business, consumers have not seen any changes to their power supply.

Any nation's social and economic progress cannot happen without a consistent supply of electricity. Industrialisation, innovation, and general economic progress all rely on it. To run machinery, upsurge production, and maintain global competitiveness, industries rely on reliable power. In addition, a steady supply of electricity encourages investment and entrepreneurship in a wide range of industries, which in turn creates jobs. Small and medium-sized businesses (SMEs) can grow with its help, and the adoption of technology boosts productivity and earnings. In addition, better healthcare, education, and communication networks are possible with consistent access to energy. Schools require electricity for instructional materials and connection, whereas hospitals depend on it to run refrigeration systems, lights, and medical equipment. Improved digital inclusion and the ability to launch e-learning programs are two ways in which consistent access to electricity helps build human capital.

Due to a lack of funding and available resources, the value chain's transmission and distribution (T&D) components function below par. Due to its peak capacity design of just 7,500 MW and its extensive network of more than 20,000km of transmission lines, the existing T&D network would be inadequate to handle incrementally produced power. Inadequate transmission capacity contributes to the daily dispatch of below 4,000 MW of electricity to the grid. New power generating projects have so come to a standstill. With the goal of constructing grid-connected solar farms, NBET inked fourteen power purchase agreements (PPAs) in 2016 totalling 1,125 MW of solar production. Transmission constraints do not allow for the evacuation of all produced power, which has slowed down the projects and prevented the construction of any solar farms. Other substantial obstacles that have delayed construction comprise tariffs, partial risk guarantees, and a breakdown in the Counterparty Negotiations of Put-Call Option Agreements (PCOA) meant to protect creditworthiness.

While solar distributed production assets have made some progress, a reliable power supply is still a way off due to the underwhelming performance of the grid-connected power infrastructure, which accounts for more than 98 percent of power generation. The grid-connected portion of the nation's power sector has faced several challenges and obstacles, i.e. uncertain financial and macroeconomic conditions, a lack of funding for capital-intensive grid and generation projects, an inadequate system for collecting payments, an inadequate infrastructure for generating electricity, and unclear and insufficient oversight and maintenance. There is a severe lack of stability in Nigeria's power supply due to the sector's current generating, transmission, and distribution capacities. Transmission wheeling capacity is 5,300 MW at present, in congruent with NERC records; this is more than the average operational generation capacity, which is 3,879 MW, but still inadequate. There is a clear lack of redundancy in the generation capacity and in the existing transmission capacity, as the total installed generation nameplate capacity of 12,522 MW is far larger than the transmission capacity. Improving stability, reducing transmission losses, and rising energy supply necessitates a substantial investment in expanding wheeling capacity and network transmission. Over the next five years, the Nigerian government will modernise the grid by enhancing the transmission and distribution parts of the value chain. To do this, they have recently launched a strategic government-to-government cooperation with Germany-via power producing powerhouse Siemens AG. The Presidential Power Initiative's (PPI) pre-engineering and concessionary finance processes have begun. Bloomberg reports that the first stage of Siemens AG's three-part proposal to upgrade the Nigerian grid will cost at least 2 billion Euros. This massive undertaking will automate electricity distribution, transmission, and generation assets; upsurge transmission capacity to 25,000 MW by 2025; and upgrade and install multiple power substations, transformers, and distribution lines. To boost the industrial sector and the economy, Nigeria needs a steady supply of affordable energy that can power enterprises, entice investors, and enhance people's quality of life. But there are major problems in the nation's electrical industry, which is affecting the economy. Given the massive efforts made to upsurge Nigeria's power supply thus far, it is necessary to investigate the effects of the power sector on the nation's economy.

Objectives of the Study

The objectives of the study are:

1. examine the effect of electricity Power generation on real gross domestic product in Nigeria

2. examine the effect of electricity power transmission and distribution losses on real domestic product in Nigeria

3. Investigate the effect of electricity power consumption on real gross domestic product in Nigeria.

Theoretical Review

This study anchored on the endogenous growth theory because it effectively explains the electricity power supply trend in Nigeria. Romar (1986) proposed the idea of endogenous growth. The exogenous theory was another name for Solow's growth theory, which maintained that technological advancements were independent factors in economic expansion. Assumptions, i.e. a constant savings rate, a competitive market equilibrium, and declining returns to labour and capital are foundational to the Solow model. The most important part of the Solow model, though, is how it accounts for the pace of technical progress—an external factor—to explain the long-term per capita upsurge. An alternative to the neoclassical (exogenous) growth theory, the endogenous (or new) growth theory arose in response to its shortcomings. In his 1986 presentation of endogenous growth theory, Romar comprised knowledge into the production function. This idea sought to explain growth in the long run by focusing on technological advancements or upsurges in productivity.

The major assumptions of the theory are:

1. Positive externalities leading to augmented returns on investment
2. The development of new technology and human capital, which comprise people's education, experience, and expertise, are crucial to sustainable economic growth.
3. Technological advancements are mostly driven by private investment in research and development.
4. A non-rival good is knowledge or technical advancements.

In agreement with the new growth theory, which is as per the idea that more investment in human capital and R&D is possible with higher levels of savings and capital formation, the savings rate influences long-term economic growth. Assuming there is an infinite supply of innovative ideas and technical advances, the model indicates that the economy can expand indefinitely. Romar states that production function of a firm in the following form: $Y = A(R) F(Ri, Ki, Li)$ where:

A – public stock of knowledge from research and development (R)

Ri – Stock of upshots from the stock of expenditure on research and development.

Ki – Capital stock of firm i

Li – Labour stock of firm i

Accordingly, Romar considers investment in research technologies to be an endogenous component in the process by which rational profit maximization enterprises acquire new knowledge. From the foregoing, we may obtain the aggregate production function of the endogenous theory as follows: Y=F (A, K, L) where Y = aggregate real output.

K = capital stock.

L = stock of labour.

A = Technology (or technological advancement)

It is worthy of note that A (technological advancement) is as per the investment on research technology. Energy may have a connection to technology, which is considered an endogenous element. Historically, the availability of practical energy sources has been the lynchpin of most technological advancements. Here, "technology" means things like plants, machines, and the like. These technologies are essentially worthless in the absence of a sufficient energy source, such as electricity or petroleum. Since "no industrial process can be propelled without energy conversion," this is at least partially supported by the law of thermodynamics. While it is true that energy is not the only aspect of technology, it is essential for its use. The process of transforming energy from its raw form into a usable form is heavily focused on technology.

Methodology Research Design

The study adopted an ex post facto research design in examining the nexus between electricity power sector and economic performance in Nigeria. The choice of this research design is motivated by nature of this study, especially its reliance on existing data which are devoid of any form of control or manipulation. Another rationale for the use of ex post facto research design in this study is because the numerical data for each of the underlying variables shall be adopted from public documentary sources.

Collection and Sources

This study collected the annual time series data from public archive sources. Specifically, annualized time series on electricity power sector and other control explanatory variables are sourced from various documentary sources including the Central Bank of Nigeria Statistical Bulletin, World Development Indicators (WDI), and Enerdata. Additionally, data on economic performance indicators, especially manufacturing output and real gross domestic product were sourced from CBN Statistical Bulletin and Nigerian manufacturing Annual Reports. These are complemented by data from the World Federation of Exchanges database, IMF Financial Statistics, Ministry of power and World Bank WDI.

Model Specification

For the purpose of estimation, it is necessary to re-write the model in its functional, mathematical and econometric forms respectively.

The functional form of the models is stated as follows:

RGDP = f (PG, PD, EC) (3.1)

Mathematical form of the model

$RGDP_t = b_0 + b_1PG_t + b_2PD_t + b_3EC_t$ (3.2)

Econometrical form of the model

$RGDP_t = b_0 + b_1PG_t + b_2PD_t + b_3EC_t + U_{it}$ (3.3)

Formulating the Autoregressive Distributed Lag (ARDL) long-run model gives.

$\Delta(RGDP)t = b_\circ$ n + b_1 PG)t n b_2 n (+ $(PD)t$ + $b_3(PT)t$ + $b_4(EC)t$ + +

$\sum_{i=1}$ $\Delta\lambda_1(PG)_{t-1} + \sum_{i=1} \Delta b_2(PD + \sum_{i=1} \Delta b_4(EC + \mu_{2t}$ (3.4) Where: *RGDP = Real Gross domestic product, PG = Power generation, PD= Electric power transmission and distribution losses, EC = Electricity consumption, □₀ = intercept, □₁- □₅ = short run dynamic co-efficient of the explanatory factors, ß₁ – ß₃ = long run multipliers,* e_t *= White noise error process,□= first difference operator,□ₜ = random error term.*

Data Analysis Techniques

The study employed the ARDL model to estimate the dynamic relationship between economic performance and the underlying explanatory variables. The choice of this analytical technique is based on the fact the variables in the model are fractionally integrated (evidence of I(0) and I(1) series). It is also considered useful in representing the dynamic short and long run relationships in a single equation set up (Pesaran, Shin & Smith, 2001). Aside from the ARDL, this study also applied the ECM to estimating the dynamic relationships between the dependent variables and independent variables. The choice of the ECM shall follow the evidence of difference stationary process in the series.

DATA PRESENTATION AND DISCUSSION OF RESULTS

Descriptive Statistics

Descriptive analysis of the series was undertaken to gain more information about each variable. The basic statistics for each of the variables in the models are presented below:

Table 4.2: Summary of Descriptive Statistics for the Variables

	RGDP	PG	PD	EC
Mean	4.117742	3.290323	17.00229	4.327742
Median	4.200000	2.000000	14.99909	2.240000
Maximum	15.33000	39.00000	20.00000	42.16000
Minimum	-2.040000	-12.00000	13.77063	-11.67000
Std. Dev.	3.835037	10.85109	2.766573	11.22099
Skewness	0.520451	1.710179	0.14194	1.690361
Kurtosis	3.756644	6.242618	1.091462	5.945892
Jarque-Bera	2.138983	28.69233	4.809009	25.97227
Probability	0.343183	0.000001	0.09031	0.000002
Sum	127.65	102	527.0711	134.1600

Sum Sq. Dev.	441.2253	3532.387	229.6177	3777.317
Observations	31	31	31	31

Source: Author's computation from Eviews software, 2025

The descriptive statistics of the variables in Table 4.2 show that the mean RGDP is 4.12 percent. On the other hand, PG, PD, and EC had corresponding mean values of 3.29 percent, 17.00 percent, and 4.33 percent. In respect to their standard deviations, the result shows that the observations of PG clustered around the mean value.

Unit Root Test

Using the ADF approach, the results of the unit root test are shown below.

Table 4.3: Augmented Dickey Fuller (ADF) Unit Root Test Results

Factor	ADF Test Stat.	5 percent Critical Value	P-value	Order of Integration	Test Option	Remark
RGDP	-7.481167	-3.574244	0.0000	I(1)	Trend & Intercept	Integrated of order 1
PG	-6.600591	-3.568379	0.0000	I(0)	Trend & Intercept	Integrated of order 0
PD	-5.276516	-3.574244	0.0010	I(1)	Trend & Intercept	Integrated of order 1
EC	-6.133033	-3.568379	0.0001	I(0)	Trend & Intercept	Integrated of order 0

Source: Computation done by author utilising Eviews software, 2025

Table 4.3 indicates that the PG and EC series are integrated of order zero [I(0)]. This suggests that the series are stationary, that is, the mean and variance of the series do not vary systematically over time. This result is borne on the fact that at 5 percent level, the ADF test statistic values (-6.600591 and -6.133033) of the PG and EC series respectively are more negative than their corresponding critical values of -3.568379. On the other hand, RGDP, and PD became stationary at 5 percent level after first differencing meaning they are integrated of order one [I(1)]. This implies that variables of the study have mixed order of integration

Cointegration Test Result

ARDL bounds cointegration test method was used to test for the existence of long run relationship between the dependent variable and the independent variables. The result is given as follow:

Table 4.4: ARDL Bound test Result of the RGDP Model

Test Statistic	Value	Signif.	I(0)	I(1)	Decision
F-statistic	4.976518	10%	2.37	3.2	

RGDP Model	K	3	5%	2.79	3.67	Cointegrated
			2.5%	3.15	4.08	
			1%	3.65	4.66	

Note: K denotes number of explanatory variables

Source: Author's computation from Eviews software, 2025

The result in Table 4.4 points to the existence of long run relationship in the RGDP model. because computed F-statistic value of 4.976518 from the bounds test result greater than the upper critical bound value of 3.67 at 5 percent level. This confirms the presence of a cointegration relationship between the RGDP and the independent variables.

Model Estimation

The results of the ARDL estimation of the RGDP model are presented below:

Table 4.6: ARDL Long and Short Run Results of RGDP Model

Dependent Variable: RGDP

	Short run results			
Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(RGDP(-1))	0.004635	0.107794	0.042998	0.9669
D(RGDP(-2))	-0.260755	0.110981	-2.349551	0.0511
D(RGDP(-3))	-0.932370	0.143120	-6.514601	0.0003
D(PG)	0.231249	0.062305	3.711558	0.0075
D(PG(-1))	0.399767	0.089248	4.479279	0.0029
D(PG(-2))	0.379011	0.092595	4.093221	0.0046
D(PG(-3))	0.201894	0.048958	4.123810	0.0044
D(PD)	0.620094	0.425442	1.457527	0.1883
D(PD(-1))	-2.003101	0.489834	-4.089347	0.0046
D(PD(-2))	-1.643346	0.554508	-2.963610	0.0210
D(PD(-3))	1.438392	0.551646	2.607458	0.0350
D(EC)	-0.092860	0.065249	-1.423157	0.1977
D(EC(-1))	-0.345347	0.091540	-3.772643	0.0070
D(EC(-2))	-0.241059	0.089441	-2.695163	0.0309
D(EC(-3))	0.073970	0.030940	2.390734	0.0481
CointEq(-1)*	-0.936494	0.149765	-6.253097	0.0004
	Long run results			
PG	0.056798	0.232489	0.244305	0.8140
PD	1.021590	0.294950	3.463606	0.0105
EC	0.177916	0.156561	1.136401	0.2932
C	-13.55536	4.460802	-3.038773	0.0189
R-squared	0.945500			

Adjusted R-squared	0.871183
Durbin-Watson stat	1.633319

Source: Author's computation from Eviews software, 2025

Table 4.6 shows that in the short run, PG at 5 percent level had significant positive effect on RGDP both in the immediate period and the lagged periods. Although in the long run a positive effect was registered it was not significant. This is because the probability value (0.8140) generated in this period is greater than 0.05. In the immediate or current period, PD had no significant influence on RGDP, however, mixed significant negative impact was recorded in the first and second lag periods while the third lag period was recorded a positive impact of PD on RGDP at 5 percent level. In the same vein, there is evidence that in the long run result PD had a positive and significant impact on RGDP at 5 percent level. In addition, the coefficient of 1.021590 in this long run implies that for every 1 percent increase in PD, RGDP in Nigeria will increase by 1.021590 percent. This result demonstrates that within the evaluation period, changes in PD significantly influence the performance of RGDP in Nigeria. Thus, the study rejects the HO2 hypothesis at level.

Further, EC had negative but insignificant impact on RGDP in the current period at 5 percent level. But in the first and second lag periods it had a significant positive impact on the latter, nevertheless, in the third lag period, a significant and positive impact was recorded. However, long run result shows that EC had a positive but insignificant impact on RGDP within the evaluation period. Following this development, the study fails to reject HO4 hypothesis at level.

In another light, the model yielded an R-squared value of 0.945500 which suggests that about 94.55 percent of the variations in RGDP are determined by the independent variables. This gives credence to the fact that the model has a good fit. The model is adjudged to be free of the problem of autocorrelation because it yielded a Durbin-Watson value of 1.633319 which is approximately 2.

Post-estimation Tests Results

The results of the diagnostic tests for the RGDP model are presented as follows:

	RGDP MODEL			
Breusch-Godfrey serial correlation LM test	F-statistic	0.329245	Prob. F(1,6)	0.5870
	Obs*R-squared	1.404531	Prob. Chi-Square(1)	0.2360
Breusch-Pagan-Godfrey Heteroskedasticity test	F-statistic	0.283170	Prob. F(19,7)	0.9866
	Obs*R-squared	11.73372	Prob. Chi-Square(19)	0.8967
Ramsey RESET	t-statistic	1.289949	Prob. Value	0.2446

F-statistic	1.663969	Prob. Value	0.2446

Table 4.7: Result of Serial Correlation, Heteroskedasticity, Ramsey RESET Tests

Source: Author's computation from Eviews software, 2025

The result in Table 4.7 shows that the RGDP model is void of the issues of serial correlation and heteroskedasticity on the basis that the Obs*R-squared of the Breusch-Godfrey serial correlation LM test and Breusch-Pagan-Godfrey Heteroskedasticity had corresponding probability values of 0.2360 and 0.8967 which are greater than 0.05. Further, the result of the Ramsey RESET shows that the F-statistic yielded a value of 0.2446 which is greater than 0.05 and suggests that the model has no cases of misspecification errors.

Discussion of Findings

The result of the study shows that power generation had a positive and significant impact on real GDP in Nigeria within the short run. This result aligns with the a priori expectation and the theoretical underpinnings. The positive and significant coefficient confirms that power generation is a key driver of economic growth in the short run. Electricity is critical for industrial production, services, and infrastructure, directly boosting RGDP and the overall development of the Nigerian economy. This result corroborates with the findings of Awad and Yossof (2016). The inability of PG to establish a significant impact on RGDP in the long run is surprising and could be attributed to the fact that in the long run, RGDP growth in Nigeria may be limited by factors like capital, labour, or technology, overshadowing the role of power generation in the economy.

Further investigation showed that the PD had no effect on RGDP in the immediate period, however, in the first and second lag periods PD exerted a significant negative impact on the latter which aligns with the a priori expectation. The result suggests that losses in the previous period reduce effective power supply, constraining economic activity in Nigeria. This underscores the importance of grid efficiency for growth. In the long run though, a significant positive impact of PD was witnessed on RGDP which is counterintuitive, as higher losses should reduce effective electricity supply and constrain economic growth. Nevertheless, in this case of Nigeria it could be that the illegal or unauthorized electricity connections which amount to losses go a long way in boosting economic growth in Nigeria.

The Nigerian economy within the evaluation period, witnessed a negative significant impact of EC on RGDP in the lagged periods even though in the immediate period no evidence of significant impact was witnessed. However, the negative coefficients were unexpected, and the presence of the negative lagged effects suggest that prior increases in consumption may strain power supply or increase energy costs thus, constraining economic growth in the country. This result disagrees with the work of Sama and Tah (2016) in which electricity consumption was found to have positive effect on economic growth.

Conclusion and Recommendations Conclusion

The study analysed the effect of electricity power supply on economic performance in Nigeria from 1993 to 2023. The ARDL method was used in the estimation of the models of the study and the results it yielded inform the following assertions by the study that, electric power transmission and distribution losses and electricity consumption had lagged effect on Nigeria's Real GDP in the short run. On the other hand, in the long run, while power generation and electricity consumption did not significantly influence growth in Real GDP, the electric power transmission and distribution losses had significant positive impact on Real GDP growth in Nigeria's economy.

RECOMMENDATIONS

The following recommendations are made based on the findings:

i. Policymakers aiming to boost manufacturing should ensure reliable power generation but also address complementary factors such as infrastructure and financing.

ii. Government should invest in modernizing transmission and distribution infrastructure, such as upgrading transformers, improving grid maintenance, and adopting smart grid technologies. These efforts will minimize losses, enhance reliability, and ensure that electricity reaches productive sectors, thereby supporting long-term economic growth.

iii. Government should implement demand-side management policies, such as differential tariffs, time-of-use pricing, or incentives for energy efficiency in non-industrial sectors, to prioritize electricity supply for industrial and growth-enhancing activities.

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