EXPLORING THE EFFECT OF PREPAID ELECTRICITY SERVICES ON ECONOMIC GROWTH IN NIGERIA

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ABSTRACT
The use of lights measured from space to proxy for economic activity drives home the importance of electricity for economic growth and development. Access to safe, cheap and convenient electricity services is important to socio-economic growth and development. The study examined the effects of prepaid electricity services on economic growth in Nigeria Quarterly time series data ranging from 2007^{Q1} to 2023^{Q4}, obtained from the Central Bank of Nigeria (CBN) and National Bureau of Statistic (NBS) statistical bulletin. The variables in the model include gross domestic product (GDP) as the dependent variable while electricity generation (EG), electricity consumption per household (ECH) and consumer price index of electricity (CPIE) were captured in the model as the explanatory variables. The study employed autoregressive distributed lag (ARDL) model to analyze the time series data. It was found that electricity generation, electricity consumption per household and consumer price index of electricity has a long run impact on gross domestic product. Finding from the study revealed that electricity generation (EG), prepaid electricity generated income (PGI), electricity consumption per household (ECPH) and consumer price index to electricity (CPIE) were statistically significant. In view of the findings, the study recommends that power holding company of Nigeria should install more prepaid meters under prepaid billing system. This will help to control appropriation of electricity in a better way than traditional metering; also, government should encourage investment in generation capacity expansion by engaging into power generation mix through the harnessing of other renewable energy resource such as solar and wind power which is currently not fully exploited.

Keywords: GDP, Electricity, Consumer Price Index of Electricity, ARDL.
JEL Codes: E01, L94, E31, C22

1 INTRODUCTION

The notion of electricity as a basic human right is becoming more accepted and adopted in countries across the globe (Adam, 2010). It is arguable that inadequate supply of electricity services is one of contributing factor to slow productive growth. Prepaid electricity services have become increasingly popular in many countries especially Africa, this model allows consumers to prepay for their electricity usage typically through the use of a prepaid meter or smart meter system (Sovacool, et al. 2021). In recent years, prepaid metering has gained significant attention as the means to improve revenue collection by utility companies and enhance access to electricity for consumers. One of the main benefits of prepaid electricity services is that they can help to improve energy access for low-income households. In many countries, traditional postpaid electricity services require consumers to pay a large upfront deposit or have a good credit history, which can be a barrier for many low-income households. Prepaid electricity services eliminate this barrier and allow consumers to access electricity based on their actual needs and ability to pay. Additionally, prepaid electricity services can help to reduce electricity theft and non-payment issues, which are common in many developing countries by requiring consumers to prepay for their electricity usage which will in turn help to improve their financial stability and ability to invest in infrastructure and service improvements (Ogujor 2010).

Prepaid electricity services have been gaining traction in Africa as a way to improve access to electricity, address affordability issues, and promote financial inclusion. Historically, access to electricity has been a major challenge in many African countries. Report from the International Energy Agency (IEA) 2020) indicate that over 580 million people in sub-Saharan Africa lack access to electricity, with rural areas particularly underserved. Prepaid electricity services offer a potential solution to this problem by making electricity more affordable and accessible to a wider range of consumers, including those in low-income and off-grid areas.

In contrast, the implications of prepaid electricity services on economic growth in Nigeria are multifaceted and significant. According to data from (World Bank2023), 54.2% of Nigerians had access to electricity in 2014. In 2016 it rises to 59.3% and fluctuated downward until 2020 before peaking to 59.5% in 2021. Beside prepaid metered customers were 43.13% in 2018 the percentages of metered customers stood at 42.82% declining by about 0.13% though it rose to 44.97% in 2021 (National Bureau of Statistics 2023). Some other identified challenges are absence of vending infrastructure, lack of expertise in repairing the meters, non-tripping of the contractor, the cost of acquiring the meter and delays in receiving and installation of prepaid meters (Makanjuola, et al, 2015). According to Sayema (2012) 80% of the total theft detected in Nigeria is from residential buildings and 20% from commercial and industrial premises. Problem of phobia and psychological effects (i.e. fear and bogus believe of vanishing of units) as believed by customers, this phobia has led to the reduction in the revenue generation from sale of unit (Yang, 2010). In an environment of high collection losses and low regulated tariffs, the distribution companies have been unable to generate enough revenue to cover their costs and this has had a negative impact on their ability to undertake new investments. It has also contributed to the poor quality of services delivered to end users. Lack of actual power consumption awareness and huge bills for unmetered customers are the major fears associated with the existing prepaid metering models (Okafor, 2017). In the light of the forgoing, the objective of this study is to examine the effect of prepaid electricity services on economic Growth in Nigeria, as well as identifying the key policy recommendations for optimizing the use of this technology to support economic growth in Nigeria.

2 LITERATURE REVIEW

2.1 Theoretical literature

This study reviews two theories that relate prepaid electricity services and economic growth in Nigeria. These include: Endogenous Growth Theory and Keynesian growth theories.

2.1.1 Endogenous Growth Theory

Endogenous theory is a recent growth theory that was developed by (Romer, Arrow and Lucas in 1990). The theory explains the long-run growth rate of an economy on the basis of endogenous factors as against exogenous factors of the neoclassical growth model. By building macroeconomic models out of microeconomic foundations, the growth models developed by (Romer 1990) and (Aghion and Howitt 1992) mainly provide a production approach, whereby growth is driven by technological change that is stressed by an innovations process based on human capital, Resource and Development. In contrast to the neoclassical model, the seminal contribution is that the growth of technological progress is model-endogenously explained and involves growth-generating processes that prevent diminishing marginal products of the rate of investment, physical and human capital. The endogenous growth model is state as follows:

$$\Delta A = f(K_A, H_A, A) \dots\dots\dots\dots\dots\dots\dots\dots\dots eqn2.1$$

Where, Δ A is the increasing technology, K_A is the amount of capital invested in producing the new design (or technology), H_A is the amount of human capital (labour) employed in research and development of the new design, A is the technology of designs, and f is the production function for technology. The production function shows that technology is endogenous when more human capital is employed for research and development of new designs, then technology increases by a larger amount. Thus, the production of new technology (knowledge or idea) can be increased through the uses of capital, human capital and existing technology.

2.1.2 Keynesian growth theories

Keynesian growth theory was formulated in 1930s. Keynesian economics sometimes Keynesianism, named after British economist John Maynard Keynes are the various macroeconomics theories and model of how aggregate demand (total spending in the economy) strongly influence economic output. In the Keynesian view, aggregate demand does not necessarily equal the productive capacity of the economy instead, it is influence by a host of factors sometimes behaving erratically affecting production and employment. The theory involves government intervention to stabilize the economic cycle e.g, expansionary fiscal policy, cutting tax and increasing spending. The main plank to Keynesian theory is the assertion that aggregate demand measures as a sum of spending by households businesses and government as the most important drive in the economy.

2.2 Empirical Review

There appears to be a lack of specific empirical studies on the relationship between prepaid electricity and economic growth in Nigeria. However, we can draw inferences from existing research on the broader topic.

In terms of economic growth, the implementation of prepaid electricity metering in Nigeria has the potential to create a more efficient and reliable electricity supply, which can attract investments and stimulate economic activities. Study by Martinez khan and walker (2024).

Evaluated the implementation of prepaid electricity system in various region of Nigeria and examine their influence on economic development. The findings of the study suggested that the implementation of prepaid electricity systems had a significant influence on economic development in Nigerian region.

Olayemi and Bernard (2024), examined productivity growth on the Nigerian electricity distribution company from 2014-2020. The result of the estimation showed that the industry had a marginal growth of about 0.03% over the period through technology and innovation, pure efficiency change which typifies changes in marginal capability had a natural impact on slight growth. Based on findings the research recommend that Discos precede on process automation since technology is a major productivity drive also innovation idea should be encouraged and natured by the distribution companies. Etim et al (2023). Examine the causality between electricity consumption and economic growth in Nigeria, the study employed ARDL model. The outcome of the co-integration test revealed the existence of a long run relationship between the variable, the study further recommended that the government should implement a strategic reform to promote investment in the electricity sector to help boost consumption and contribute to economic development in the country.

Modupe and Sani (2022), examined the relationship between energy consumption and economic growth in Nigeria, the result of the findings shows that there exist a long run relationship between the variable in the model. The causality test also revealed the absent of bi-directional causality between energy consumption and economic growth. The findings recommend that more access to energy diversification should be encouraged. Timothy and Felix (2021). Investigated access to electricity and economic growth in sub-saharan Africa using panel date for 30 countries covering from 1907-2017. Panel co-integration suggested a long-run relationship of the variable the regression result of the random effect model and fully modified (OLS) are negative and significant relationship between access to electricity and economic growth. The findings recommends that government of Sub-saharan African should formulate and implement good policies that will boost electricity generation in their country in order to propel economic growth and improve living standard.

Adebisi and Oluwasusi (2020) Also discovered that improved access to electricity through prepaid metering can contribute to economic growth by increasing productivity, reducing operational costs for businesses, and enhancing overall quality of life for consumers. Furthermore, prepaid metering can also promote energy efficiency and conservation, which can help reduce the country's dependence on expensive and environmentally harmful sources of energy. This can ultimately lead to cost savings for both consumers and the government, while also contributing to a more sustainable energy future for Nigeria.

2.4 LITERATURE GAP

On the research gap in the literature on the effect of prepaid electricity on economic growth in Nigeria is the lack of in-depth empirical studies that specifically examine the relationship between prepaid electricity usage and various indicators of economic development, such as GDP growth, while there is some literature available on the overall impact of electricity access on economic growth in Nigeria in developing countries, there is limited focus on the unique implications of prepaid electricity system on the Nigeria economy.. Additionally, there is a need for research that consider economic factors that may influence the effectiveness of prepaid electricity in driving economic growth in Nigeria, such as prepaid generated income, consumers price index of electricity and electricity generation given the infrastructural level and quality. This gap necessitates further research to provide a more nuanced understanding of

the potential benefits and challenges of prepaid electricity in promoting economic growth and development in Nigeria.

3. METHODOLOGY

The aim of this study is to examine the effect of prepaid electricity services on economic growth in Nigeria. This study is vent on qualitative research, Quarterly time series data ranging from 2007^{Q1} to 2023^{Q4}, obtained from the Central Bank of Nigeria (CBN) and National Bureau of Statistic (NBS) statistical bulletin. The variables in the model include gross domestic product (GDP) as the dependent variable while electricity generation (EG), electricity consumption per household (ECPH) and consumer price index of electricity (CPIE) were captured in the model as the explanatory variables.

3.1 Theoretical Framework

The theoretical framework of the study is anchored on Keynesian aggregate demand framework. In a simple Keynesian framework, the desired aggregate in the Keynesian framework is expressed as; $Y= C + I + G + X\text{-}M$ *eqn3.1*

In the equation set, GDP=Y=AE

Were; GDP = gross domestic product, Y=AE=I, C = Consumption, I= Investment, G= Government expenditure, X= Export and M= Import

The algebraic framework is flexible and useful in predicting how economic and policy actions affect real GDP.

3.2 Model Specification

To examine the effect of prepaid electricity services on economic growth in Nigeria, the study makes used of autoregressive distributed lag (ARDL) model approach as developed by Pesaran *et al* (2001) to empirically analysis the nexus between the dependent and independent variables. The logic behind the use of the approach are, first, ARDL can be applied regardless of whether the variables are stationary at level value I (0) or after first difference I (1) or combination of two mutually. Second, it can generate robust and reliable results even if the sample size is small or large. Finally, it generates long run and short run result at a time (Pesaran *et al*, 2001). This permits us to empirically answer the research questions, address the specific objectives, and to test the research hypotheses. In this study, equation 3.2 is modified to suit the study, to have the following functional equation:

$GDP = f(EG, ECPH, PGI, CPIE)$ ……*eqn3.2*

$GDP = \beta_0 + \beta_1 EG_{t\text{-}1} + \beta_2 ECPH_{t\text{-}2} + \beta_3 PGI_{t\text{-}3} + \beta_4 CPIE_{t\text{-}4} + \varepsilon_t$ ……*eqn3.3*

$logGDP = \beta_0 + \beta_1 EG_{t\text{-}1} + \beta_2 logECPH_{t\text{-}2} + \beta_3 logPGI_{t\text{-}3} + \beta_4 CPIE_{t\text{-}}$……*eqn3.4*

Where; $\beta_{0=}$ constant term, $\beta_0 - \beta_7$ = Coefficients, ε_t= Error Term.

Thus, the ARDL model is specified as:

$$\text{GDP} = \delta_0 + \pi_1 GDP_{t-1} + \pi_2 EGN_{t-1} + \pi_3 ECPH_{t-1} + \pi_4 PGI_{t-1} + \pi_5 + \sum_{t=1}^{a} \sigma_i \Delta GDP_{t-i} + \sum_{t=0}^{b} \partial_i \Delta EGN_{t-i} + \sum_{t=0}^{c} \gamma_i \Delta ECPH_{t-i} + \sum_{t=0}^{d} \lambda_i \Delta EPGI_{t-i} + \sum_{t=0}^{e} \lambda_i \Delta CPIE_{t-i} + \varepsilon_t \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots eqn3.5$$

Where;

δ_0 is the drift component; Δ is the first difference operator; π_i= Long-run multipliers (for i= 1,2,…,5); the terms with summation sings are used to model the short-run dynamic

structure;σ_i,∂_i,λ_i,γ, ϖ_i = Short-run multipliers; a,b,c,d,e = Lag lengths for the short-run dynamic structure; ε_t= Error Term; and t= Time. Appropriate lag length will be selected based on the Schwartz-Bayesian Criterion (SBC). The short run multipliers here will help me to confirm the evidence of long-run relationship among the variables; this implies that any disequilibrium in the economy the system will correct itself from the short run towards reaching long-run equilibrium.

3.4 Granger Causality

The Granger Causality test as proposed by Granger (1969) and Sims (1972) shall be used to test whether one variable is useful in forecasting another variable and vice-versa. In general, a time series X is said to Granger cause another time series Y if it can be shown that the series X values provide statistically significant information about the future values of series Y, if not, X does not Granger cause Y. In a two variable model X and Y, the following two equations are estimated;

$$Y_t = \sum_{i=1}^{m} \alpha_i X_{t-1} + \sum_{i=1}^{m} \beta_i Y_{t-1} + U_{1t} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots eqn3.7$$

$$X_t = \sum_{i=1}^{m} \gamma_i Y_{t-1} + \sum_{i=1}^{m} \rho_i X_{t-1} + U_{2t} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots eqn3.8$$

Where $U_{1i}$and $U_{2i}$are serially uncorrelated random disturbances with zero mean.

Decision Rule

If X Granger causes Y;

H_0: $\alpha_1 = \alpha_2 = \alpha_3 \ldots\ldots\ldots = \alpha_m$= 0 is rejected in favour of the alternative hypothesis. This implies that there is statistical evidence to accept the alternative hypothesisH_1.

Similarly, if Y Granger causes X,

H_0: $\gamma_1 = \gamma_2 = \gamma_3 \ldots\ldots\ldots = \gamma_m$= 0 is rejected in favour of the alternative hypothesis. This implies that there is statistical evidence to accept the alternative hypothesis H_1.

4. RESULTS AND DISCUSSION OF FINDINGS

4.1 Descriptive Statistics

Table 4.1: Summary of Descriptive Statistics Result

	GDP	EG	PGI	ECPH	CPIE
Mean	193771.5	11.66308	519852.6	35930.74	172.3892
Median	80092.62	11.80000	582635.8	40780.53	162.1800
Maximum	384308.0	4.500003	167421.6	10924.86	71.20502
Minimum	8248.845	1.359592	817913.2	5325.326	20.91000
Std. Dev.	405440.3	3.538993	1430172.	8413.249	69.76572
Skewness	3.126744	0.130415	-0.275102	-0.935683	0.351510
Kurtosis	10.89391	2.567234	1.304716	2.257170	1.767285
Jarque-Bera	54.93581	0.138298	1.720719	2.195813	1.090822
Probability	0.000000	0.933188	0.423010	0.333569	0.579604
Sum	251902.9	151.6200	675808.4	467099.7	2241.060
Sum Sq. Dev.	1.97E+12	150.2937	2.45E+13	8.49E+08	58407.06
Observations	68	68	68	68	68

Source: E-views result 2024.

Table 4.1 shows the descriptive statistics of the variables. The series have a total of 68 observations. The mean of GDP is 193771.59 with a standard deviation of 405440.3, while the maximum GDP value is 384308.0 with a minimum value of 8248.845 while the mean of EG is 11.66308 with a standard deviation of 3.538993% while the maximum EG value is 4.500003 % with a minimum value of 1.359592% Also, average PGI is 5198526 with a standard deviation of 1430172. While maximum GPI value is 1674421.6. with a minimum value of

817913.2, the mean annual average ECPH is 35930.74 with a standard deviation of 20.9100.While maximum ECPH participation is 10924.86 with a minimum value of 5325.306 with no exception all other variables are positively skewed. Also, all the kurtosis showed that the variables are positively skewed. This implies that the variables are flatter to the left as compared to the normal distribution. Lastly, the Jarque-Bera statistic values showed that GDP is normally distributed while EGN, PGI, ECPH and CPIE are not normally distributed. This result is supported by the skewness and kurtosis statistics for the series.

4.2 Unit Root

Note: (**) Indicates the rejection of the null hypothesis of existence of unit root at 5% significance level. Lags are selected based on Schwarz Information Criteria (SIC). This means that GDP and PGI have mean, variance and covariance that are not constant overtime. However, after at level, each of these time series variables tested became stationary.

Table 4.2, Augmented–Dickey Fuller (ADF) Test Result

Variables		Unit Root	Unit Root	Remark
	Critical Value	**Level**	**First Difference**	**I(0), or I(1)**
GDP	-3.259808	0.863500	3.688740**	I(1)
EG	-3.175352	-3.360673**	-4.231241**	I(0) (1)
PGI	-3.212696	-1.679652	-3.566157**	I (1)
ECPH	-3.212696	-5.458565**	-3.588971**	I(0) (1)
CPIE	-3.320969	-3.588971**	0.697769	I(0)

Source: E-views result 2024.

The ADF unit root test results as reported in table 4.2 shows that CPIE was stationary at level while GDP and PGI were stationary at first difference. Also EG and ECPH were stationary at both level and first difference. This means that GDP and PGI have mean, variance and covariance that are not constant overtime. However, after at level, each of these time series variables tested became stationary. The implication of the unit root test results is that GDP and PGI are integrated of order one, i.e., I(1) while CPIE is integrated of order zero, i.e., I(0), also EG and ECPH are integrated of both order zero and order one, i.e., I (0) (1).

4.3 ARDL Bound Cointegration Test Result

Table 4.3, ARDL Bound Test Result for Cointegration

Null Hypothesis	**No long-run relationships exist**	
Test Statistic	Value	K
F-statistic	3.736507	6
	Critical Value Bounds	**Critical Value Bounds**
Significance	I(0) Bound	I(1) Bound
10%	2.12	3.23
5%	2.45	3.61
2.5%	2.75	3.99
1%	3.15	4.43

Source: E-views result 2024.

The lag length was selected based on the Schwartz Information Criterion. K is the number of regressors. The result of the ARDL bound test for the presence of long-run relationship between the variables is reported in table 4.3 above. Since this study employed annual data, the study follows the tradition of Narayan and Smyth (2005) and set the maximum lags in the ARDL model to 2 ($i_{max} = 2$). The estimated model of the ARDL-bounds test is based on minimizing the Schwartz Information Criterion (SIC). The bounds *F*-test for Cointegration test yields evidence of a long-run relationship between the concerned variables. The computed *F* statistic ($F_C = 3.736507$) is greater than the upper bound at 5% critical value resulting in the rejection of the null hypothesis of no long-run relationship between the examined variables. This evidence from finding implies that a long-run relationship exists between the variables and rules out the possibility of estimated relationship being spurious.

4.4 Analysis of Long run and Short run Dynamics

The result presented in table 4.4 below, shows that the coefficient, standard error, t-statistics and probability estimate, is useful in the estimation of long run coefficient of ARDL model. Following the analysis of the relationship between the two set of variables that was carried out using the model, the result indicate that on long-run bases, the coefficient of electricity generation is 93.30231 with it probability value of 0.0086 and electricity consumption per house hold with coefficient of 30.29371 and probability of 0.0393, indicating that electricity generation and electricity consumption per house hold has both positive and significant impact on GDP in Nigeria. More so the coefficient value for prepaid generated income -0.306194 with it probability value at 0.1456 and the coefficient of the consumers price index is -16.85831 with it probability value of 0.3134 which both implies negative impact on GDP in Nigeria. It is important to establish the short run correlation between the variable after estimating the long-run coefficient.

Table 4.4: Estimated Short-run and Long-run Coefficients for the ARDL Model

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(EGN)	93.30231	19.38531	4.813041	0.0086
D(PGI)	-0.306194	0.169767	-1.803613	0.1456
D(ECPH)	30.29371	31.67457	0.956405	0.0393
D(CPIE)	-16.85831	14.63066	-1.152259	0.3134
CointEq(-1)	-0.875321	14.96594	0.058487	0.9562
Variable	Coefficient	Std. Error	t-Statistic	Prob.
EG	-10.65921	18.27225	-0.058336	0.9563
PGI	0.349808	6.073088	0.057600	0.9568
ECPH	-34.60871	58.57889	-0.059081	0.9557
CPIE	19.25959	32.38498	0.059471	0.9554
C	109255.8	16482.26	0.066287	0.9503
R-squared	**0.947239**	**Mean dept. var**	**207169.5**	
Adjusted R-squared	0.854908	S.D. dept. var	420452.0	
S.E. of regression	160153.9	Akaike info criterion	27.04038	
Sum squared resid	1.03E+11	Schwarz criterion	27.36365	
Log likelihood	-154.2423	Hannan-Quinn criter.	26.92069	
F-statistic	10.25917	Durbin-Watson stat	2.214050	
Prob(F-statistic)	0.020051			

Source: E-views result 2024.

Further in table 4.4, the table shows the coefficient, standard error, t-statistics and probability estimate, is useful in the estimation of short-run coefficient of ARDL model. Following the analysis of the relationship between the two set of variables that was carried out using the model, the result indicate that on short-run bases, the value of electricity generation is -10.65921 with it probability value of 0.9563 and electricity consumption per house hold with coefficient of -34.60871 and probability of 0.9554, indicating that electricity generation and electricity consumption per house hold has negative relationship with GDP in Nigeria. However the coefficient value for prepaid generated income 0.349808 with it probability value at 0.9568 and the coefficient of the consumers price index is 19.25959 with it probability value of 0.9554 which both implies positive impact on GDP in Nigeria.

The autoregressive distributed lag model was carried out to examine parameters estimates for error correction mechanism. In testing this hypothesis, gross domestic product (GDP) were regressed against the independent variable of electricity generation (EG), prepaid generated income (PGI), electricity consumption per household (ECPH) and consumer price index of electricity (CPIE). From the error correction mechanism result, the coefficient of the loading factor (error correction term i.e., ECT) is correctly signed and statistically significant at 5% level of significance. It implies that an error correction mechanism exists so that the deviation from short run to the long-run equilibrium will have a significant impact on economic growth (gross domestic product) in Nigeria. The value of -0.87 implies that 87% of the disequilibria in GDP of the previous year's shocks adjust back to the long-run equilibrium in the current period. It also implies that adjustment to long-run equilibrium growth is moderate.

The F-statistic which was used to examine the overall significance of regression model revealed that the result is significant, as indicated by the value of F-statistic above which is significant at the 0.05 percent level. That is, the F-statistic P-value of 0.020 is less than 0.05. The R^2 (R-square) value of 0.947239 revealed that prepaid electricity services have a very good effect on economic growth in Nigeria. It indicates that about 94 percent of the variation in economic growth (proxy as gross domestic product) was caused by prepaid electricity services, while the remaining unaccounted variation of 0.052 percent is captured by the white noise error term. Durbin Watson (DW) Statistic It was used to test for the presence of autocorrelation among the error terms. The acceptable Durbin- Watson range is between 0 and 2.5. The model also indicates that there is absence of autocorrelation among the variables as indicated by Durbin Watson (DW) statistic of 2.21. This demonstrates that the estimates are unbiased and can be relied upon for economic decisions.

4.6 Granger Causality

Table 4.6: Pair wise Granger Causality Test

Null Hypothesis:	Obs	F-Statistic	Prob.
EG does not Granger Cause GDP	68	0.49374	0.0500
GDP does not Granger Cause EG		0.00603	0.9398
PGI does not Granger Cause GDP	68	1.25839	0.0210
GDP does not Granger Cause PGI		0.05310	0.8229
ECPH does not Granger Cause GDP	68	1.57470	0.2411
GDP does not Granger Cause ECPH		0.06444	0.8053
CPIE does not Granger Cause GDP	68	0.11755	0.7396
GDP does not Granger Cause CPIE		0.01895	0.8936

Source: E-views result 2024.

Table 4.5 comprises the results of the Pairwise Granger causality test, according to Gujarati and Porter (2009), a variable Granger causes the other variable if it helps forecast its future values. Based on the p-value associated with the F-statistic (0.5000) do not reject the null hypothesis that electricity generation (EG) does not Granger cause gross domestic product (GDP) at 5% level of significance. Also, the F-statistic and the associated p-value indicate that the study do not reject the null hypothesis that gross domestic product does not Granger cause (EG), The granger causality test therefore showed a unidirectional causality between (EG), and (GDP). That is electricity generation granger causes gross domestic product but gross domestic product do not cause electricity generation. Also the F-statistic and the associated p-value indicate that the study do not reject the null hypothesis that gross domestic product (GDP) does not Granger cause (PGI), The granger causality test therefore showed a unidirectional causality between (PGI), and (GDP). That is prepaid generated income granger causes gross domestic product (GDP) but gross domestic product does not cause prepaid generated income (PGI), at 5% level of significance. The granger causality test therefore showed a unidirectional causality between (PGI) and (GDP). The granger causality test showed no causality between (ECPH), (CPIE) and gross domestic product.

5. CONCLUSION AND POLICY RECOMMENDATIONS

The success of prepaid electricity services on economic prosperity largely depends on a better energy conservation as well as need based energy management of resources, the prepaid electricity services of customers premises offers solutions to the experienced problems inadequate supplies, corrupt practice been perpetrated by officials of utility companies at the customer end and new possibilities. The use of prepaid meters as a measure for need based energy management will help the consumers in no small measures of the need to adapt to the changing needs and requirement that introduces feature that give the consumers the ability to be flexible in their usage and at the same time eliminate loopholes of drains in the income of the utility company. Thus, there is a great demand to improve on the customer's awareness of the benefits of the use of prepaid meters to enjoy a better reliability in the system. Also a need to allow other interest group in the industrial chain to be able to supply customers the prepaid meters with specified standard including meter data and history, data exchange format and software specification; that will make different energy service providers activation cards to be compatible in order to maintain the success of the prepaid electricity services in Nigeria in other to enhance the economic growth of the nation economy.

In line with the finding objectives, the study proffers the following recommendations,

i. The power holding company of Nigeria should install more prepaid meters under prepaid billing system. This will help to control appropriation of electricity in a better way than traditional metering.
ii. Due to dwindling revenues from pre-paid meters to enhance the nation economy the study recommends that government should encourage investment in generation capacity expansion by engaging into power generation mix through the harnessing of other renewable energy resource such as solar and wind power which is currently not fully exploited. It is in the long-term interest of the country to strengthen efforts to diversify the energy generation mix that will increase power reliability and strengthening of the sector infrastructure facilities to ensure efficient delivery of electricity to the consumers.
iii. The Nigerian Electricity Regulatory Commission should direct the PHCN to put all new customers in pre-paid meters to invariably generate more revenue for the nation economy.

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