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Energy Demand, Financial Development and Nigerian Economic performance. An Autoregressive Distributed Lag Bound Testing Approach

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ABSTRACT: The study examined the relationship among energy demand, financial development and economic groth in Nigeria over the period 1985 and 2017 using Autoregressive Distributed Lag (ARDL) Boud Testing Approach. While the findings of the study show a negative and significant relationship between financial development and economic growth, it found a positive and statistically significant relationship between energy consumption and economic growth within the period under review. The study recommends that the fight against money laundering and other financial corruptions should be sustained and steps up so as to see the desired impact of financial development on economic growth. Finally, it also suggested that a greater use of energy at the domestic and industrial sectors should be encouraged in the country.

KEY WORDS: *Energy Consumption, Financial Development, Economic Growth*

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I. INTRODUCTION

Across the globe, most economic activities require the use of energy in different forms, and with industrialization, energy has become an indispensable input in the production process making it an important source of economic prosperity .In like manner, economic growth can spur a greater use of more energy because industrial and services sectors of the economy will require a higher amount of energy to produce goods and services both for domestic and foreign markets. Starting with the work of kraft and kraft (1978), the debate on the nature of the relationship between energy demand and economic growth has aroused the interest of many researchers particularly in the field of energy economics. Empirical findings on the causal relationship between energy demand and economic growth has varied ranging from positive, negative and neutral, depending on the method adopted in the sturdy, the development stage of the country and variables used in the study among others.

Also like energy, a more efficient financial system in a country will trigger a faster economic growth because it will enhance an efficient allocation of scarce resources to the most productive investments. Analogously, as a nation experiences growth, the financial sector develops new technologies that will help to serve the real sector better. As a recent development, some researchers have focused on the link between financial development and energy demand. For instance Sadorsky (2010), contends that a well-developed financial system enhances easy access to fund for individuals and firms alike thereby stimulating consumption of consumer durables for individuals and the growth of on- going businesses for firms (both of which require greater use of energy). Hence the roles of financial development on energy demand and consequently on economic growth is incorporated in this study.

The debate on the relationship between energy demand, financial development and economic growth is an on-going one because one can impact the other through various channels. One hypothesis is that financial development stimulates economic growth, leading to more energy demand. On the contrary, financial development can enhance the development of new technologies that results in energy efficiency which brings about a reduction in energy demand (Sadorsky 2010). In the light of this, a re-examination of the causal relationship between energy demand, financial development and economic growth is very important.

The rest of the study is organized as follow: The next section presents a survey of the related literature. The third section introduces the data and methodology and the fourth section presents the empirical results of the study. The last section concludes the paper.

II. LITERATURE REVIEW

2.1.1 Energy Demand Economic Growth Nexus

There have been many studies on energy demand and economic growth for both the developed and developing countries over the past decade. Nevertheless, the results obtained showed different directions of causality depending on the econometry method adopted, the variables included, the level of development of the country, the political environment etc. Some of these related studies are examined as below:

In examining the relationship between economic growth and energy consumption in OECD countries between 1965 and 2011 using Bound testing approach, Daria (2012), found a unidirectional causality running from economic growth to energy consumption for the UK, Sweden, Denmark and Finland. Using Co-integration technique, Gbadebo and Chinedu(2009), examined energy consumption and Nigerian economic performance between 1975 and 2005. The finding shows a positive relationship between current period energy consumption and economic growth but negative relationship with lagged energy consumption. Molem and Ndifor (2016), using 1980 to 2014 data for the Cameroonian economy, examined the effect of energy consumption on economic growth in Cameroon using Generalized method of moment technique. He found that population growth rate and petroleum prices have positive relationship with petroleum consumption. Okoligwe and Okezie (2014), examined the relationship between electricity consumption and economic growth in Nigeria using error-correction mechanism. The result of the study showed that there is no causality between the GDP and energy demand within the period under review.

2.1.2 Financial Development Economic Growth Nexus

On financial development and growth, Tari and Oliver (2017), carried out a study on "Financial development and economic growth nexus in Nigeria: Supply – leading or demand – following?" using augmented granger causality test, he found a unidirectional causality from financial depeening to growth. Also, Phouphet, Gazi and Muhammed (2014), examined the nexus between financial development and economic growth in Laos using ARDL bound testing approach to co- integration. The study shows the presence of feedback between both variables. However, in a study carried out by Eugene (2016), on the impact of financial development on economic growth between 1981 and 2011 in Nigeria using autoregressive distributed lag approach, he found that the relationship between financial development and economic growth follows the pattern of those of oil dependent economies which shows negative non-significant relationship in the long run and significantly negative in the short run.

2.1.3 Energy demand, Financial Development and Economic Growth

On the studies investigating combined relationship of energy demand and financial development on economic growth, Magazzino (2017), examined energy consumption, real GDP and financial development nexus in Italy between 1960 and 2014 using autoregressive distributed bound testing approach. He found that an increase in GDP and oil prices have a significant effect on energy consumption in the long run, Also, Kim-song, Kamrul and Grant (2014), using vector error-correction model investigated the relationship between financial development, energy consumption and economic growth using the United states of America data between 1966 and 2011. He found that financial development causes economic growth in the long run but not the other way round. He also found that financial development does not cause energy consumption.

Lira, Retselistitsoe and Letsie (2016), examined the roles of financial development, industrialization and urbanization on electricity consumption in Lesotho using co-integration analysis. Their findings show that economic growth, financial development and urbanization are positively related to electricity consumption in the long run. However, urbanization has no significant effect on energy consumption. In a study by Muhammed, Thi, Mantu and David (2017), investigating the relationship between energy consumption, financial development and economic growth in India with the use of non-linear autoregressive distributed lag bounds testing approach, it was found that only negative shocks to both energy consumption and financial development have impacts on economic growth.

III. METHODOLOGY

3.1 Theoretical Framework

The theoretical framework of this study is based on the new growth model of economic growth which stresses capital, labour and technological progress (which is endogenous) as the main determinants of economic growth. According to the new growth model, the relationship between economic growth and these variables is expressed in the form of a production function as follow:

$Y = f(K, L, T)$ - (3.1).

Where Y = gross domestic products (GDP),

K = stock of capital,

L = number of labour force and,

T = technological progress.
It is imperative to state here that while the model above will be implemented, the main variable of interest is endogenous technological progress in the form of energy demand and financial development .

3.2 Model Specification

The empirical analysis of this study is based on the new growth model of economic growth as Stated in the theoretical framework. The model specified the GDP growth rate (GDPGR) (proxy for economic performance) as a function of gross fixed capital formation (GCF), labour force, financial development (proxied by M2/GDP ratio), and energy demand (proxy by energy use per capita kg of oil equivalence)
The model for the study is now specified as:
$GDPGR = f(GCF, LAF, M2/GDP, ECPC)$ - - - - - - - - - - - - - - - - - - - (3.2).
Where GDPGR = gross domestic products growth rate,
GCF = gross fixed capital formation (proxy for the stock of capital),
LAF = Labour Force Population,
M2/GDP = Brood Money Supply as percentage of GDP (Proxy for Financial Development)
ECPC = Energy consumption per capita kg of oil Equivalence (proxy for Energy Demand)
Expressing the model in econometric form gives:
$GDPGR = \beta 0 + \beta 1 lnGCF + \beta 2 lnLAF + \beta 3 M2/GDP + \beta 4 IECPC + \mu$ - - - - - (3.3)
Where β0 = constant intercept term,
β1 – β4 = parameters,
μ = stochastic error term.

3.3 Data Sources:

Annual time series data from 1981 to 2017 was employed in this study. The data on M2/GDP ratio, GDP growth rate and energy use per capita were sourced from the World Bank World Development Indicators (2018), while the data on Gross Capital Formation and Labour force were obtained from the CBN Statistical Bulletin.

3.4 Estimation Procedure:

The estimation procedure adopted in this study is the Autoregressive Distributed Lag Bound Testing approach. One important advantage of this approach is that it obviates the need to categorize the variables into either I(1) or I(0). In order to avoid spurious regression, the unit root characteristics of the variables needs to first be examined. This was carried out using the Argumented Dickey Fuller Unit root Test. In examining the existence of long run (i.e co-integrating) relationship among the variables, the study adopted the ARDL Bound Testing Approach using F- statistics. Also in order to examine the characteristics of the residuals, diagnostic tests such as LM serial correlation test, Jarque-Bera test, Wald Test, and Ramsey reset Test were performed on the residuals.

IV. EMPIRICAL RESULTS

Table 4.1: Unit Root Test

From the result presented in table one, it is observed that while the growth rate of GDP is stationay at level, labour force, gross capital formation, energy use per capita and M2/GDP ratio are stationary at first diference.

Variables	ADF T-Statistics	ADF Critical @ 5%	Order of Integration
GDPGR	-4.641779	-2.957110	I(0)
LAF	-4.396759	-2.957110	I(1)
GCF	-4.673031	-2.963972	I(1)
ECPC	-6.065893	-2.960411	I(1)
M2/GDP	-5.097731	-2.960411	I(1)

Source: Author' computation

The results of table 4.1 shows that the variables are a mixture of I(1) and I(0). Based on this reason, ARDL approach is used for the cointegration of the model. The main advantage of this approach is that it obviates the need to classify variables into I(1) and I(0).

Table 4. 2: ARDL Bound Test for Cointegration

Variables	F-Statistics	Coitegration
	19.65529	Coitegration Exists
Critical Value	Lower Bound	Upper Bound
1%	3.75	3.52
5%	2.86	4.01
10%	2.45	5.06

Source: Author's computation

Notes; ***, **, * Statistical Significance at 1%, 5%, and 10% respectively. The lag length based on the Akaike information Criteria (AIC). Critical values are obtained fron Narayan (2005) case III for 30 observations. The numbers of regressors are four.

Source: Authors Computation

Going by the underlining assumptions of ARDL Model, one set of the variables assumed that all the variables in the model are I(1) and the other assumes that they are all I(0). If the calculated F-Statistics exceeds the upper critical bounds value, then, co-integration exists and so we reject the null hypothesis of no co-integation. If the F-Statistics falls within the bounds, then the test is inconclusive. Lastly if the F-Statistics falls below the lower bounds, then there is no cointegration. Going by the result of the Bound test in table 4. 2 above, the F- statistics value is (19.65529) which is greater than the upper bounds values (3.52 at 1%, 4.01 at 5% and 5.06 at 10%). Based on this result, we conclude that there exists co-integration among GDP growth rate, labor force, gross capital formation, energy use per capita and M2/GDP.

Table 4. 3: Short run Result
Energy Demand, Financial Development and Economic Growth in Nigeria

Variable	Coefficient	Stand error	T-Stat	P-Value
D(GDP(-1))	0.495865	0.153462	3.231186	0.0144
D(LOGGCF)	16.586358	7.537114	2.200625	0.0637
D(LOGGCF(-1))	3.852746	8.647726	0.445521	0.6694
D(LOGGCF(-2))	-40.651626	9.135798	-4.449707	0.0030
D(LOGGCF(-3))	30.410569	6.652439	4.571341	0.0026
D(LOGLAF)	-868.775019	173.340704	-5.011950	0.0015
D(LOGLAF(-1))	275.712991	158.710058	1.737212	0.1259
D(LOGLAF(-2))	-645.583023	201.472891	-3.204317	0.0150
D(LOGLAF(-3))	-298.214941	155.283816	-1.920451	0.0963
D(M2_GDP)	-0.104719	0.306077	-0.342132	0.7423
D(M2_GDP(-1))	1.356029	0.398973	3.398794	0.0115
D(M2_GDP(-2))	-0.011762	0.315437	-0.037289	0.9713
D(M2_GDP(-3))	1.574771	0.324858	4.847573	0.0019
D(ECPC)	0.474706	0.127354	3.727455	0.0074
D(ECPC(-1))	0.412804	0.136067	3.033833	0.0190
D(ECPC(-2))	-0.259739	0.101153	-2.567794	0.0371
CointEq(-1)	-2.020983	0.238287	-8.481305	0.0001
R-squared	0.956512		F-statistic	7.331572
Prob(F-statistic)	0.005858			

Source: Author's Computation

Our empirical evidence reveals that about 95% of variation in economic growth is caused by variations in the explanatory variables. This is evident by the value of the R-square which is 0.956512. The F-value calculated is 7.33157 with probability value of 0.005858 and this shows that the whole model is statistically different from zero. On M2/GDP ratio as well as energy consumption per capita which are the main variables of interest, the result shows that over the short run, the M2/GDP ratio which is a measure of financial deepening is negative and statistically not significant in the current period. However, when lagged by one period, it became both positive and statistically significant. As for Energy consumption per capita (ECPC) which is a proxy for

energy demand, the result shows that over the short run period, its relationship with the growth rate of the GDP is both positive and statistically significant both at the current and previous period.

Table 4.4: Longrun Coefficient

Long Run Coefficients				
Regressors	Coefficient	Std Error	t-Statistis	Prob.
LOGGCF	42.679279	6.994036	6.102239	0.0005
LOGLAF	-413.900104	69.439895	-5.960552	0.0006
M2_GDP	-0.773769	0.203453	-3.803183	0.0067
ECPC	0.273536	0.049621	5.512458	0.0009
C	6525.896332	1132.330131	5.763245	0.0007

Source: Author's Computation

According to table 4.4, the estimated coefficients of the long-run relationship is negative and significant for M2/GDP. This is in line with the findings of Muhammad S. et all (2017), and Eugene I (2016), who found a negative and significant relationship between financial sector development and economic growth. The negative and significant relationship between the GDP growth rate and financial development may be due to the fact that the greater amount of money in circulation in the country is concentrated in the hands of few politicians and top government officials who do not engage the money on any productive activities but rather hide the money in various secret accounts and places. Concerning the relationship between energy demand proxy by energy consumption per capita (ECPC) and economic growth, the long run result shows a positive and statistically significant relationship. This finding is in conformity with that of Gbadebo and Chinedu (2009), and Okoli et all (2014), who established a positive and significant relationship between energy consumption and economic growth in their studies. This finding is not surprising because across the nation, energy use has been the major driver of all economic activities ranging from as small as barbing to those of large industries. Also, on daily basis, every individual either rich or poor makes use of one form of energy or the other. Also Similarly, the coefficient of cointEq(-1) is also negative and significant as expected for the short run coefficients. This exhibited a very high speed of adjustment from the long run to the short run.

Table 4.5: Diagnostic Tests Results

	X^2 Statistic	***Probability***
Breusch-Godfrey Serial Correlation LM test	0.612199	0.4340
Jarque-Bera test	1.761815	0.414407

Source: Authors computation

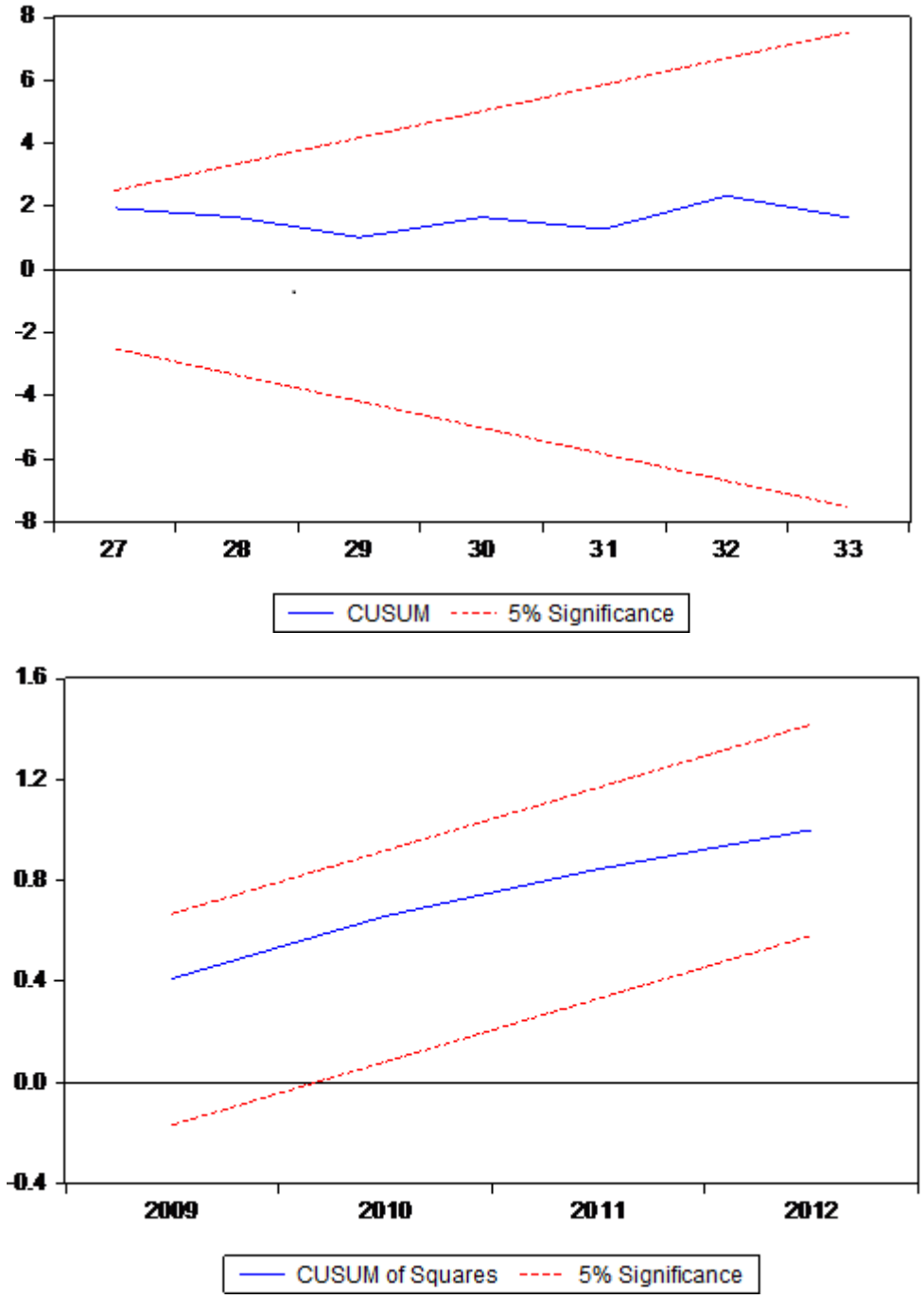
In order to ensure that the residual of the model is well behaved, some diagnostic tests were also carried out on the residuals. Based on the results of table 4.6 above, the P-value of the serial correlation LM test is 0.4340 which is less than 5% significant level. This shows that the model does not have serial correlation. Also the p-value of the Jarque- bera normality test of 0.414407 is evidence that the residuals of the model are normally distributed.

Stability Tests

CUSUM and CUSUMSQ stability test for estimated error correction model was also performed. This is important in order to investigate whether the above long and short run relationships found are stable for the entire period of study. The methodology used is based on the Cumulative Sum (CUSUM) and the Cumulative Sum of Squares (CUSUMSQ) tests proposed by Brown *et al.* (1975). The CUSUM test uses the CUSUM of recursive residuals based on the first n observations and is updated recursively and plotted against the break point. The CUSUMSQ makes use of the squared recursive residuals and follows the same procedure.

Figure 1 shows that the plots of CUSUM and CUSUMSQ are within the five per cent critical bound, thus providing evidence that the parameters of the model do not suffer from any structural instability over the period of study. In other words, all the coefficients in the error correction model are stable.

Figure 1:



V. CONCLUSION AND RECOMMENDATION

This study investigated the relationship between energy demand, financial development and economic growth in Nigeria. The unit root test result shows that the GDP growth rate was stationary at level while labour, capital formation, energy consumption per capita and M2/GDP ratio were all integrated of order one. The ARDL F-statistics shows evidence of long run relationship among all the variables. The proxy for financial development (M2/GDP) is negative and statistically insignificant both in the short run and in the long run. However, in the case of energy demand, the coefficient was positive and significant both in the short run and in the long run. In the light of the findings if this study, it is recommended that government at all levels should continue and step up the ongoing anticorruption fights thereby preventing unscrupulous politicians and government officials from stealing and keeping idle the money that would have been well- utilized in meaningful economic activities in the country. Doing this will make financial development to have its rightful impact on the nation's economy. Also, since energy use has been found to have a positive and significant impact on the GDP, government should encourage a greater use of energy at the domestic, transportation and

the industrial sectors in order to move the economy forward. This can be done by taking measures that will lead to an increase in the household incomes towards enabling them to acquire more consumers durables and hence more energy use. Again, in ensuring greater industrial use of energy, government should encourage the establishment of more energy driving industries in the country.

REFERENCES:

[1]. Daria,K.(2012). Economic growth and energy consumption in OECD countries; A causality analysis. Masters thesis, city college of New York.

[2]. Doaa, M.S. & Eyad, M.A. (2014). What is the role of financial development and energy consumption on economic growth? New evidence from North African countries. International Journal of finance and banking studies. 3 (137 – 149)

[3]. Eugene, I.(2016). The impact of financial development on economic growth in Nigeria. Journal of monetary and economic integration 12(2)

[4]. Fidelis,O.O & Afees A.S(2010). Financial development and economic growth in Nigeria. Journal of monetary and economic integration 12(2).

[5]. Gbadebo O.O, & Chinedu O. (2009): Does energy consumption contribute to economic performance? Empirical evidence from Nigeria. Journal of Economics and international finance 1(2), 044 – 052

[6]. Kraft, J., & Kraft, A.(1978). On the relationship between energy and GNP. The Journal of Energy and

[7]. Development 3, 401-403.

[8]. Le, K.S; Hassan, K; Gasbarro, D & Cullen, G. (2014). The relationship between financial development, energy consumption and economic growth: Emperical evidence from United States. In 27th Australian Finance and banking conference, 16-18 December, Sydney Australian.

[9]. Magazzino C.L. (2016). Energy consumption, real GDP, andfinancial development nexus in Italy: an application of an auto-regressive distributed lag bound testing approach. WIT Transaction on ecology and the environment, Vol205

[10]. Molem, C.S & Ndofor, R.T.(2016). The effect of energy consumption on economic growth in Cameroon. Asian Economic and Financial Review 6(9): 510-521

[11]. Muhammad H.A, Muhammad R.S, & Anam A.(2016) Finacial development, energy consumption and trade openness Nexus: Empirical evidence from selected south Asian countries. Pakistan Journal of social sciences. 1(36)

[12]. Olabanji, O.E., & Henry, O. (2013): Is there a link between financial sector development and economic growth in Nigeria. International Journal of financial Economics 1(4) 108 – 118

[13]. Okoligue, N.E, Okezie, A. I. (2014). Relationship between electricity consumption and economic growth: evidence from Nigeria. Academic Journal of interdisciplinary studies. Volume 3 No 5. (137 – 1520)

[14]. Sadorsky, P.(2011). Financial development and energy consumption in Central and Eastern Europe frontier economies. Energy Policy 39, 999-1006.

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