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TRENDS ANALYSIS OF PUBLIC EXPENDITURE ON INFRASTRUCTURE AND ECONOMIC GROWTH IN NIGERIA

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ABSTRACT

This study critically analyze the trends analysis of public expenditure on infrastructure and economic growth in Nigeria, from 1970 to 2010. The objective of the study is to examine the trend in public expenditure on infrastructure in Nigeria between 1970 to 2010; to compare the trend in public expenditure between the various regimes in Nigeria between 1970 to 2010; to evaluate the relationship between expenditure on infrastructure and long-run economic growth; access the factors that influence public expenditure growth in infrastructure; test for the stability of growth in public expenditure on infrastructure over time and derive policy recommendations based on the findings of the study.

Keywords: Democratic government**,** Economic growth, Infrastructure, Military, Nigeria, Public expenditure, Regimes, Trend.

JEL Classification:013, 021, 054.

1. INTRODUCTION

The centrality of public expenditure, particularly on infrastructure as an important instrument in the development process have long be acknowledged by development economist world wide. Public expenditure has remained a crucial issue in economic development, most especially in the less developing countries of Sub-Saharan Africa, where their economies is characterized by poor infrastructural service delivery, declining productivity, high level corruption and policy instability. This poor infrastructure in almost all the third world nations has led to researchers aimed at investigating whether public expenditure on infrastructure has yielded significant results over time. There are a lot of factors that have influenced public expenditure on infrastructure, they include : rate of urbanization, openness, government revenue, external reserves, population density, type of government *regimes and policy instability*. Public expenditure, refers to the expenses

Government incurs for its own maintenance, society and the overall economy. Public expenditure is found to be increasing overtime continuously. This continuous increase in public expenditure is as a result of some fiscal operations which are recognized as major tools for the management of the economy and stimulation of economic growth and development (Agenor and Moreno, 2006; Edame, 2012).

Government expenditure varies and ranges from education, defense, general administration, health, to water supply, electricity generation and supply, roads, telecommunications among others. On the other hand, public expenditure on infrastructure has been an issue for policy discourse among researchers and scholars all over the continent. Research have shown that investment in infrastructure has tremendous positive impact on a country's economic growth and development Adenikinju (2005).

Different government policies in Nigeria have led to infrastructure decay, which has brought about poor erratic power supply, inefficient telecommunication, poor urban and rural road networks and this have resulted in a near stagnant economic performance (Bureau of Public Enterprises (BPE), 2003; Edame and Effiong, 2013).

The importance of the need for investment in infrastructure and other public goods as a way of increasing urban and rural productivity and national economic growth and development has become an important subject of renewed attention in almost less developing countries.

As a result of the inadequacy of empirical studies on the trend of public expenditure on infrastructure and economic growth in Nigeria makes this study justifiable to be carried out, given the essential nature of investment in infrastructure on the overall development of any nation's economy. Therefore, the main objective of this paper is to analyze the trend of public expenditure on infrastructure and economic growth in Nigeria using available time series data in the country from 1970 to 2010.

2. Theoretical Issues

Thus, government expenditure is a function of the developmental stage of an economy (see equation 2.1).

$$GE = f(Pop, Rev, GDP, Pp, BA \text{ ---------- } (X_n) \text{ ---------- } (2.1).$$

Where:

GE = Government Expenditure;

Pop = Population;

Rev = Revenue;

GDP = Gross Domestic product;

Pp = Price of Crude Oil;

BA = Budget Allocation;

Xn = other indices such as health services delivery, transportation, road network, education, etc.

The prescribed theory is on the time pattern of government expenditure. Rostow (1961 in (Edame, 2012)), in his stages of economic development is of the view that at the early stages of economic growth and development, public sector investment as a proportion of total investment of

the economy is found to be high. He affirmed that the public sector provides social over heads such as roads, transportation system, sanitation system, law and order. While others include; health, education and housing. According to Rostow,in (Edame, 2012); this expenditure is essential to propel the economy into the take-off stage (see equation 2.2).

$$G\sum a \frac{1}{Ps} \text{ ----------(2.2)}$$

Where: G $\sum$ = Government expenditure;

K = Constant maturity stage (in years);

Ps = Private Sector

More over, there is the need for government expenditure to increase in order to deal with the problem of market failure in the economy (Musgrave, 1969). On the other hand , the theory of public expenditure growth trys to relate the demand for public services to the stage of economic development of a country.

Main while, at a high level of per capita income which is associated with the advanced countries economies, the rate of public sector growth tends to fall or reduce as more basic needs are satisfied by the citizens. In other words, private sector expenditure rises while government expenditure falls at this stage (see equation 2.2).

From the importance of Rostow's five stages of economic growth, the first three are relevant to the third world countries with the take-off stage being central in Rostow's model. The plausible explanation for this is that as development expands, the rate of productive investment increases from 5% or less to over 10% of national income (Khan and Reinhart, 1990; BECAO, 1992; Nyong, 2000).

According to (Brett, 1988) Rostow's (1961) in (Edame, 2012) provocative application of a stage approach to development process provides broad-sweeping views of economic growth and development. While Wagner's law of increasing state activity states that as per capita income in an economy grows; the relative size of the public sector will equally grow. He divided government expenditure into three major areas, namely, administration and defense, cultural and welfare functions, and provision of direct services by government in cases of market failure.

On the other hand, instead of allow for monopoly to emerge, government atimes establishes statutory corporations such as Power Holding Company of Nigeria (PHCN) former NEPA, Water Boards, Nigeria Airways, NITEL, Post Office *etc to* cushion harsh economic situation of her citizens (Edame *et al.*, 2011). In addition, he further pointed out that as the economy becomes industrialized, urbanization and high population density as well as high cost of living become the result. This according to (Nyong, 2000) would invariably leads to market failure or externalities and congestion which would require government intervention and regulation.

Further more (World Bank, 1981; Meier, 1984; Swansen and Terferra, 1989; Nyong, 2000) are of the view that, the growth in public expenditure on education, recreation, health, and welfare services is explained in terms of their income-elastic want. While , Wagner further aggreed that as real income increase public expenditure on education, health, transportation, road network etc

would increase more than proportion. This was reported by Nyong (1998) in his public policy assessment of Nigeria expenditure situation. He explains that the rising ratio of government expenditure to gross national product GNP) was as a result of the poor infrastructure in the country.

public expenditure is based on the political theory of public expenditure by Peacock and Wiseman theory which state that "government like to spend more money and that citizens do not like to pay more taxes, and as a result government need to pay some attention to the aspiration and wishes of their people". Their view is that government expenditure does not grow in a smooth and gradual manner, but in stepwise fashion which they refer to as the displacement hypothesis.

According to Ajibola (2005) the occurrence of unexpected social disturbance would necessitate an increase in government expenditure. For example , the bomb blast in United States of America, London, Ikeja in Lagos, the UN building in Abuja – Nigeria in recent times, etc necessitated government spending money to repair the damage done to lives and property in the affected areas.

From the public policy stance, public expenditure is seen as the key policy instrument, that rest therefore on the fact that the functioning of the market cannot by itself, activate the signaling response and mobility of economic agents to achieve efficiency in both static or allocative efficiency and dynamic or shift in the production frontier (Chakraborty, 2003)

The theoretical and empirical advancement towards public policy and development intervention in providing infrastructural development reflect the community's growing concern with social aspects of development, roads, water supply, electricity, steel-mills, dams and machine building industries have now been displaced from the commanding heights of development strategy, on the other hand, the so-called soft sectors such as education, health, telecommunication and transportation have occupied the centre stage of development (Edame and Effiong, 2013) However, there are certain public goods such as defense, administration, a clean environment, etc that cannot be provided by the market, because no consumer can be excluded once these services are provided and hence consumers will not "buy" these services (Edame, 2012).

3. METHODOLOGY

3.1. The Model

The structural relationship between public expenditure growth and the factors that influence it consist of a number of regression equations with expenditure on the specified infrastructure being the dependent variable. The model for the trend analysis of public expenditure on infrastructure is a modified version of Chakraborty (2003),Fan and Rao (2003),Chakaravorty and Mazumdar (2006). The structural form of the model is specified as follows: $FYit = \Phi Zit + \beta X it + Uit$ ---------- (3.1)

Where:

FYit = growth of expenditure on the specified infrastructure

Z = Vector of conditioning variables; Zit = Vector of fiscal variables on infrastructure in time t; Φ = Vector of parameters of conditioning variables; β = Vector of parameters of fiscal variables; Uit = error term

PE = βo + β1 GREV + β3POPD + β7EXTRES + β9OPN + β10URB+ β12PEt-1 + β13DUM + Ut…… (3.2)

Where:

PE = Public expenditure (N million)

GREV = Government revenue (N million) (β1> O)

POPD = Population density (β3 > O)

EXTRES=External reserves (N) (β7 > O)

OPN = Openness. This is measured as fraction of imports and exports in GDP(X_+M)/GDP (β9 > O)

URB = Rate of urbanization. This is the annual percentage of total population living in urban areas (β10 >0)

PE_{t-1} = Lagged public expenditure (β12< O)

DUM= Dummy, indicating transition from military to democratic rule between 1970-1983 and 1985-1999(military rule);=1 1979 -1983 and 1999 -2010 (Civilian rule)=2

Ut = Error term, assumed to be distributed as *white noise*.

The estimation of the model follows the Johnasen procedure in co-integration.

This approach is necessary because it has been found that a large number of time-series data used in econometric analysis are non-stationary which means they have tendency to increase or decrease over time. The consequence of this behaviour is that the asymptotic convergence theorems, which underpin statistical estimation theory, are violated and hence such data cannot be used in regressions, since such regressions yield spurious results (Phillp, 1971; Granger and Newbold, 1974; Engle and Granger, 1987).

3.2. The Data

The study made use of secondary time series data. The data were sourced from various issues of the Central Bank of Nigeria (CBN) Statistical Bulletin, World Bank, the International Financial Statistics (IFS) of the International Monetary Fund (IMF) and the Federal Bureau of Statistics (FBS).

4. RESULTS

4.1. Stationarity Test.

The results of the unit root tests shows the presence of a unit root (non-stationarity) tested against the alternative hypothesis of the absence of a unit root (stationarity), PE(public expenditure), GREV (Government Revenue), URB (rate of urbanization and DUM (Dummy – Administration) for the various regimes between the Military and the civilian administrations were not stationary at their levels Thus, they were differenced once each to make them stationary.

On application of the ADF test on their first differences, they all became stationary as indicated by the value of their respective ADF statistic which are both larger (in absolute terms) than the standard critical values, thus leading to the rejection of the null hypothesis. Following from the above findings, it becomes clear that the variables matched in order 1, meaning 1 in order (1) Conversely, POPD (population density), OPN (openness) and EXTRESS (External reserves)

were stationary at their levels as the null hypothesis of the presence of a unit root in the series was rejected as shown by the higher values (in absolute terms) of the calculated ADF statistics compared with their respective critical values. In this case, we say that these series are integrated of order zero that is 1 (0). We then proceed to discuss the results of the multivariate cointegration analysis. Since the time series are non-stationary, it became necessary to test for cointegration. By using the log-level form of the series, we estimate a multivariate cointegration relationship to establish the existence of a long-man equilibrium relationship.

4.2. Cointegration Tests

From our results, it is evident that both the trace test and maximum eigen value test indicate one cointegrating equation as the null hypothesis of r=0 is rejected. Thus, we conclude that there is a unique long-man equilibrium relationship between public expenditure on infrastructure, government revenue, population density, openness, external measures, rate of urbanization and administration.

However, the Johanson model is a form of VECM and where only one cointegrating vector exists, its parameters can be interpreted as estimates of the long-run cointegrating relationship between the variables concerned. Our cointegration coefficients normalized on the determinants of public expenditure on infrastructure in Nigeria are presented as long-run estimates in Table 4.3 (see Appendix 1).

4.3. The Estimates of Vector Error Correction Model (VECM)

The VECM estimates for the trend analysis of public expenditure on infrastructure and economic growth in Nigeria shows both the long and short-run estimates, the parameter constancy (Edame, 2012) cum diagnostics are presented. From the results, it can be observed that the model fits the observed data fairly well as indicated by the adjusted R^2 (0.9763) and F-statistic (152.3468) of the relevant error correction model. Moreso, the signs of the coefficients meet *a priori* expectations. This therefore, implies that government revenue, population, density, openness and external reserves jointly explain public expenditure growth on infrastructure during the periods under study.

The findings are over bearing and carry with them some important policy implications. In the short-run government revenue is inelastic (0.1201) but with the sign conjectured, while in the long-run, government revenue is 0.0909 (inelastic). Clearly, both coefficients are inelastic and suggest that 10% increase in government revenue increases public expenditure by 1.201% in the short-run while less than unity (0.909%) in the long-run. This therefore shows that government policy geared towards increasing public expenditure by increasing government revenue may not achieve its purpose, at least in the short-run.

Siminarly , the elasticity of the population density is -0.884 in the long-run, while the short-run estimate is 0.0248 both of which are inelastic and not significant respectively. Albeit the short-run estimate is appropriately signed in contrast to the long-run. This implies that a 10% rise in population density would reduce public expenditure by 0.884% in the long-run, while the same amount of increase in population density would increase public expenditure by 0.248% in the

short-run. Therefore, a rise in population density would evoke a proportionate increase in public expenditure growth in the long-run.

Only the short-run estimates were significant at 10% level of the openness of the economy with outside world. These findings indicate that a 10% increase in openness would have a corresponding increase of 1.461% and 0.953% in public expenditure growth for long and short-run respectively.

Therefore, this means some policy actions that would significantly encourage openness in the economy will be meaningful in the long-run compared to the short-run estimates. Furthermore, the long-run (0.1749) and short-run (0.0403) elesticities of the external reserves are inelastic though not appropriately singed at the long-run. Clearly, the external reserve is more desirable in the short-run than the long-run estimates. Thus, increasing external reserves by 10%, for instance, would increase public expenditure growth by 0.403% in the short-run .

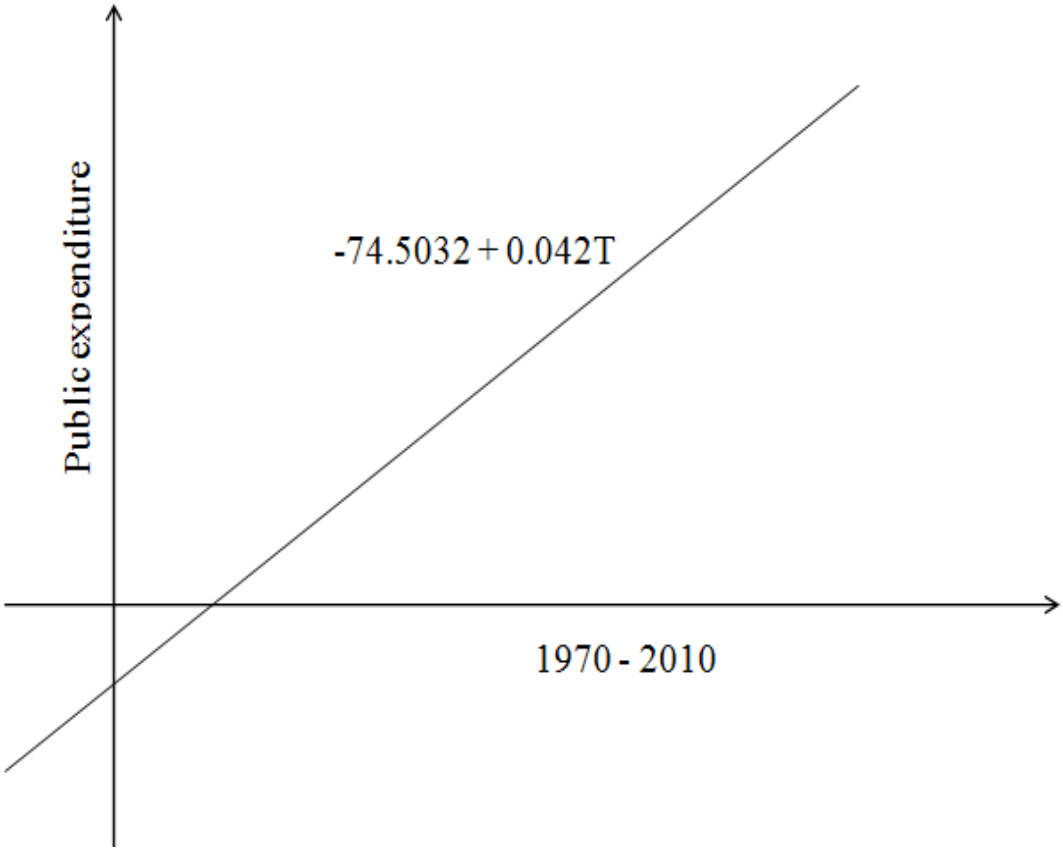
The elasticity of rate of urbanization is – 2.0409 in the long-run, while the short-run estimates are – 0.0772 though with the expected signs, and not significant respectively.

This implies that, a 10% rise in rate of urbanization would reduce public expenditure growth by 20.409% in the long-run, while the short-run changes are 0.772% based on *a priori* consideration. In the theoretical sense, a 10% rise in the rate of urbanization, evokes a greater than proportionate (about 20%) increase in public expenditure growth, at least in the long-run while a 0.772% could be achieved in the short-run during the prescribed periods.

The dummy (Military Regime – Civilian Administration) showed an inverse relationship, but significant at the 1% level and explain changes in public expenditure growth. This result indicates that the administration (Military/Civilian) impacted negatively though significantly on the growth in public expenditure during the periods under study. The speed of adjustment towards long-run equilibrium carries the expected negative sign and it is very significant at the 1% level. The coefficient indicates a feedback of about 99.38% of the previous year's disequilibrium from the long-run elasticity of government revenue, population density, openness, external reserves and rate of urbanization. This means that the speed with which government revenue, population density, openness, external reserves and rate of urbanization adjust from short-run disequilibrium to changes in public expenditure growth in order to attain long-run equilibrium is 99. 38% within one year.

From fig.4.1 below, it presents a graphical illustration of trend analysis for public expenditure in aggregate spanning 1970 to 2010. From the trend equation, about 4.2% of the public expenditure is used in pursuance of economic growth and infrastructure over time for the prescribed periods. Therefore, the development in the sector is positive and is capable of enhancing growth in the economy, at least in the long-run.

Fig-4.1. Trend Analysis showing annual aggregated public expenditure on infrastructure in Nigeria



In summary, based on the granger causality test results, there is a strong evidence that administration, external reserves, government revenue, population density and rate of urbanization could collectively or individually influence infrastructural growth vis-à-vis long-run economic growth.

Table-4.2. Trend Analysis and annual growth rates for disaggregated and aggregated public expenditure on infrastructure in Nigeria between 1970-2010

Public infrastructure	Trend equation	t-test	Growth rate (%)
Roads	Y = 354.28 + 0.181T	22.22***	18.10%
Water	Y = -296.496+0.1529T	10.76***	15.29
Electricity	Y = -98.3793+0.054T	10.05***	5.40
Transport	Y = -351.629+0.1796T	11.21***	17.96
Housing & Environment	Y = -69.0201+0.0385T	23.75***	3.85
-	Y = -74.5032+0.042T	20.24***	4.20

Notes: *** = significant at 1% level

Source: computed from Appendix data

Table 4.2. Presents annual growth trend analysis for disaggregated expenditure within the study periods. From our estimates, all the public expenditure on infrastructure were significant at the 1% level, albeit, the were low for an economy desirable of achieving growth beyond the subsistence level. Although, the level of significance for individual infrastructure cannot sustain

any economy in the world. For instance, the annual growth rate in electricity supply is quite lamentable as it merely recorded 5.4%, while housing/environment had an annual growth rate of 3.85%.

4.4. Conclusions and Recommendations

One interesting thing about this study is that it attempt to compare methodological empirical studies conducted by early researchers to the present one, which made use of he vector error correction approach. The study analyzed the trend of public expenditure on infrastructure and economic growth in Nigeria from 1970 to 2010.

Findings shows that the response of rate of urbanization, openness, government revenue, external reserves, population density and type of government to public expenditure is high, particularly in the short-run and with a higher adjustment toward long-run static equilibrium. Therefore, short-run changes in rate of urbanization, openness, government revenue, external reserves, population density and type of government regimes (Military regime or civilian administration), remarkably shaped growth on public expenditure in Nigeria. On the contrary, the Vector Error Correction (VEC) show that the level of public infrastructure (road construction, water supply, electricity supply, transport/ telecommunication and housing/ environment is very low, particularly in the short-run and with a weak adjustment toward long-run static equilibrium. This result is very informative as it clearly shows the deterioration in our public utilities, which suggests that expenditure in the aforementioned infrastructure, has not yielded positive results over time period.

The analysis further revealed that public expenditure on infrastructure in Nigeria has been stable between 1970 and 2010 based on the Chow test results. This indicates that public expenditure have been having predictable effect on the variables which influence it.

The study has shown that rate of urbanization, government revenue, population density, external reserves and type of government jointly or individually influence public expenditure on infrastructure in Nigeria, as indicated in the findings. Based on this analysis and our earlier findings, it is concluded that although expenditure on infrastructure has significantly influenced its growth. It is pertinent too, to investigate whether huge public expenditure truly influences development.

The study recommends the need for government and it agencies to monitor the expenditure on infrastructure, adhere strictly to *dueprocess* in accordance with the enabling fiscal policy and the Millennium Development Goal (MDG) blue prints. Specifically, these can be achieved via the following media;

(a) Government should adhere strictly on *dueprocess* as a pre-condition for the released of funds for execution of contracts in the affected areas,

(b) Government should appraise the state of infrastructure and include same in the annual budget with a view to monitoring the implementation after disbursing funds to the affected ones.

(c) A project (infrastructure) policy should be evolved to guide prospective contractors on the need to utilize funds meant for project on public utilities

(d) As a matter of policy, the presidency in collaboration with states government should legislate against liquidity not spent on budgeted projects and retired same to the government treasury on specific interval of time. This will guide against corruption and facilitate swift implementation of projec`ts as specified by the "white paper" empowering such project.

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Table- 4.3. Estimates of Long and Short-run Vector Error Correction (VEC) on Public Expenditure on infrastructure in Nigeria

Regressor	Coefficient			Standard error		t-statistic
			LONG-RUN ESTIMATES			
Ln PE (1)	1.000					
Ln GREV (1)	0.0909			0.0683		
Ln POPD (1)	-0.0884			0.0474		-1.8655
Ln OPN (1)	0.1461			0.0305		4.7868***
Ln EXTRES (1)	-0.1749			0.0457		-3.8256***
Ln URB (1)	-2.0409			0.6988		-2.9205***
Constant	-0.2983		**SHORT-RUN ESTIMATES**			
Error correction:	ΔLnPE	ln GREV	Ln POPD	Ln OPN	Ln EXTRES	Ln URB
Coint,Eq.1(ECM(-1))	-0.9938***	-0.1998	-0.0498	-0.3861	0.1168	0.0027
ΔLnPE (-1)	(0.0609)	(0.1726)	(0.2033)	(0/3540)	(0.2059)	(0.0077)
	-0.0354	0.2211	0.0326	0.0271	-0.0723	-0.0027
ΔLn GREV(-1)	(0.0405)	(0.1150)	(0.1354)	(0.2358)	(0.1372)	(0.0051)
	0.1201***	-0.7038	0.2371	0.4384	0.1289	0.0083
Ln POPD (-1)	(0.0557) ***	(0.1580)	(0.1860)	(0.3240)	(0.1884)	(0.0070)
	0.0248	0.0208	-0.5549	0.3686	0.0527	2.07E-05
Ln OPN (-1)	(0.0437)	(0.1240)	(0.1461)	(0.2544)	(0.1480)	(0.0055)
	0.9537	-0.0045	-0.0057	-0.5349	0.0422	0.0008
Ln EXTRES(-1)	(0.0211)	(0.0598)	(0.0704)	(0.1226)	(0.0713)	(0.0026)
	0.0403*	-0.0558	0.0341	-0.6982	-0.2802	-0.1442
ΔLn URB (-1)	(0.0571)	(0.1618)	(0.1906)	(0.3320)	(0.1931)	(0.0072)
	-0.772*	-3.0728	10.6926	-6.6791	1.7168	-0.3899

Continue

Constant	(1.1309)***	(3.2057)	(3.7756)	(6.5742)	(3.8240)	(0.1430)
	0.2085	0.0285	0.0004	0.0093	0.0050	-0.0058
Ln DUM	(0.0520)	(0.1474)	(0.1736)	(0.3022)	(0.1758)	(0.0065)
	-7.2893***	-0.9417	0.2909	1.0942	0.0816	0.0419
Diagnostics:	(0.3243)	(0.9192)	(1.0827)	(1.8852)	(1.0965)	(0.0413)
R^2	0.9827	0.5523	0..5478	0.7122	0.1817	0.4322
Adjusted R^2	09763	0.3845	0.3783	0.6043	-0.1251	0.2192
S.E equation	0.2982	0.8454	0.9958	1.7338	1.0085	0.0377
F-statistic	152.3468	3.2906	3.2315	6.6019	0.5922	2.0298
Log Likelihood	-1.1927	-36.6162	-42.1796	-61.0353	-42.612	69.1033
Akaike AIC	0.6583	2.7421	3.0693	4.1785	3.0948	-3.4766
Schwarz Criteria (Sc)	1.1073	3.1910	3.5183	4.6274	3.5437	-3.0277
(Edame, 2012) (27,11)	1.8214					

Figures in parenthesis are standard errors: (Edame, 2012) (27, 11); critical value at 5% = 2.580; ***= 1% significant .