British Journal of Applied Science & Technology
16(6): 1-16, 2016, Article no.BJAST.26268
ISSN: 2231-0843, NLM ID: 101664541

SCIENCEDOMAIN *international*
www.sciencedomain.org

Optimising the Capacity of Nigeria Construction Sector for Socio-economic Sustainability

Peter Uchenna Okoye[1*]

[1]Department of Building, Nnamdi Azikiwe University, Awka, Anambra State, Nigeria.

Author's contribution

The sole author designed, analysed and interpreted and prepared the manuscript.

Article Information

DOI: 10.9734/BJAST/2016/26268
Editor(s):
(1) Hui Li, School of Economics and Management, Zhejiang Normal University, China.
(2) Singiresu S. Rao, Prof. at Department of Mechanical and Aerospace Engineering, University of Miami, Coral Gables, USA.
Reviewers:
(1) António Bento Caleiro, Universidade de Évora, Portugal.
(2) E. M. Ekanayake, Bethune-Cookman University, USA.
(3) Abdul Razak Bin Chik, Universiti Utara Malaysia, Malaysia.
(4) Alex Reuben Kira, University of Dodoma, Tanzania.
Complete Peer review History: http://sciencedomain.org/review-history/15302

Original Research Article

Received 7th April 2016
Accepted 29th June 2016
Published 7th July 2016

ABSTRACT

Aims: In this period of economic quandary, Nigeria needs to make workable and precise economic policies and decisions based on accurate information in all sectors of the economy. However, dearth of empirical study on construction sector for economic decisions has made this aspiration more tasking. This study therefore, was aimed at examining the capacity of the construction sector in the socio-economic development of Nigeria using economic data on the construction sector and the aggregate GDP.
Study Design: Quarterly data on construction sector and gross domestic product (GDP) between 2010 and 2015 were obtained from various electronic publications of the National Bureau of Statistics (NBS). The study chose 2010 as the base year because the re-based National Account of Nigerian economy was at the 2010 basic price.
Place and Duration of Study: Department of Building, Nnamdi Azikiwe University, Awka Nigeria between August 2015 and May, 2016.
Methodology: Econometric techniques such as unit root test, cointegration test, Granger causality test as well as ordinary least square regression method were employed to analyse the capacity and relationship of construction sectors output with the aggregate economy (GDP).
Results: The study established that there is significant strong positive relationship (**R = 0.709**)

**Corresponding author: E-mail: pu.okoye@unizik.edu.ng;*

between the construction sector and the real GDP. The study further established that there is strong bi-directional causal relationship between the aggregate real GDP and the construction sector output of Nigeria. The study also found that about **50.33%** (**$R^2 = 0.503305$**) of the proportion of variations in the real GDP can be explained by the construction sector output. Using a regression model, the study finally developed a model through which the real GDP can be predicted by the construction sector output.

Conclusion: The result implied that the construction sector Granger causes the total GDP and vice versa. It also implied that both the construction sector and aggregate GDP greatly influenced each other in large proportion. It can therefore be deduced from the result of this study that the Nigeria construction sector holds great potentials for improving the national economy through its networks of activities. In this regard, the economic policy makers should closely study and monitor the construction sector because of its propensity for achieving socio-economic sustainability through GDP improvement, improvement in Gross Capital Formation and employment generation.

Keywords: Capacity; construction sector; GDP; national economy; sustainability.

1. INTRODUCTION

The quest for socio-economic sustainability has been the concern of many countries especially the developing countries. However, the construction industry has been adjourned to be one of the drivers of social and economic development of any nation [1-5]. For example, the construction industry through its extensive forward and backward linkages with other sectors of the economy generates one of the highest multiplier effect [4,6] in terms of economic and social development. This is basically due to the fact that almost all other sectors of the economy in one way or another depend solely on the products and services of the construction industry in order to carry out their operations. It further implies that whatever happens to the sector will directly and indirectly affect other industries and ultimately the wealth and well being of the nation [7]. The industry is also the world's largest industrial employer (111 million employees) and in most countries it accounts for more than half of capital investment and as much as 10 per cent of GNP [8]. According to Roodman and Lennsen [9] one-tenth of global economy is dedicated to constructing, operating and equipping buildings, and this activity accounts for 40% of the material flow entering the world economy, with much of the rest destined for roads, bridges and vehicles to connect the buildings. Cochrane [3] notes that construction industry worldwide is predicted to have a total growth of 30% from 2010 to 2015, giving it an approximated total value of over $3,000 billion (US) by 2015.

Furthermore, the construction industry participates in every phase of the development, from investment and financing to site planning, engineering, and architecture; through project execution; and even into facilities management. It is clear then, that the construction industry plays a central role in the economic development. Summarily, the importance of the construction industry according to Wahab [10] can be appreciated from four major features: Its contribution to Gross Domestic Product (GDP) and Gross Fixed Capital Formation; the high level of employment created by the activities of the industry, which include professionals, technicians, skilled/unskilled craftsmen and artisan, and pool of labourers; Many countries use the industry as leverage at the time of recession to mop up unemployment; and the three tiers of Government are the largest clients particularly in the developing countries. To this end, Ofori [11] opines that the capacity of construction industry indicates its ability to meet the demand put to it.

Regrettably, dearth of construction sector data for economic decisions in Nigeria has being a source of concern for policy makers and economic planners over the years, despite the fact that construction sector is one of the sectors that received significantly higher new estimates of their shares in GDP after re-basing of Nigeria economy [12]. As a result, policy-makers and economic planners may be misguided or destructive, even though the need for good economic policy has been stressed. But in this period of economic quagmire, Nigeria needs to make workable policies based on accurate information in all sectors of the economy so as to ascertain which sector has greater potentials for liberating the economy from its current state. According to Giang and Pheng [13] the construction industry is vastly affected by the economic growth trends and the fluctuations in

these trends, because the process of the economic growth is closely related especially to the sufficiency of the public infrastructure investments even if there are fluctuations. Buttressing the above position, Kargi [14] studied the Turkish construction industry and found that the growth rate of the construction industry in the developing countries is more than the GDP growth rate, and that the percentage it takes in the GDP of developed countries relatively diminishes. Kargi [14] maintains that construction industry's growth in the economic fluctuation periods, in the aftermath of a recession, is more than the GDP.

In Nigeria, the problem is compounded by the recent challenges in macroeconomic management related to weakening oil revenues and volatile short-term capital flows. Declining oil revenues relative to the size of the Nigerian economy are already necessitating fiscal adjustment [10]. Therefore, the economic impact of construction sector represents an important aspect that needs to be taken into consideration in the development and planning of a country. Unfortunately, there is dearth of empirical study in this area. Few existing studies have been peripheral and on general terms [15-17]; or were based on the pre-rebasing data [7,18,19]; or rather on other sectors of economy [20]. Only [7] have investigated the linkages between the construction sector and other sectors of Nigerian economy from 1981 t0 2005 using econometric models. However, none of these studies have considered the post-rebasing contribution of construction industry to the socio-economic development of Nigeria using the current re-based Nigeria economic data.

Interestingly also, [21] reports that the Nigerian economy has experienced a great change in terms of the volume of activities covered in all sectors of the economy as the post-rebasing data in the construction sector shows a much more optimistic picture, as more modern construction activities have been captured, and prices correctly deflated. Sequel to this fact and in addition to construction sector being one of the sectors that have received significantly higher new estimates in their shares of GDP after re-basing of Nigeria economy [10], it is worthwhile to investigate the economic capacity of the Nigeria construction sector as it affects the growth of national economy and sustainable development. This is in line with Dlamini [22] who claims that the construction industry has a potential of positive impact on economic growth and it's an important component in the investment programmes in developing economies.

2. LITERATURE REVIEW

Construction activities and its output is an integral part of a country's national economy and industrial development especially in developing countries [23]. In terms of size and structure, Nigeria construction industry consists mainly of small and medium construction organisations with very few large firms which are foreign multinationals that control about 95% of construction investment [24-26]. The industry consists of public and private sector clients, design, management and professionals but mostly characterised by is a prevalence of private sector investments [27]. Its activities included the procurement of goods and services as well as the execution of a variety of physical structures and infrastructures (Building, Civil Engineering, Power and Energy, Industrial/Commercial complexes, including land improvement, etc) [21]. The industry is dominated by the foreign multinationals [10,28-30], most of who came from Germany, Italy, France, Korea, Japan, Britain, America, India, China, even the Middle East Asia and Arab world, etc despite that the local content bill for construction services which was passed into law by the act of the National Assembly in April 2014 was meant to give indigenous construction companies a level playing field as their international counterparts, as well as, making it easier for local businesses to thrive in the industry.

Notwithstanding, the reports of the National Bureau of Statistics and the Central Bank of Nigeria showed that the Nigeria building and construction sector sustained its strong growth trend in 2009 as it registered 11.97% growth rate. This however represents a slight decline from the 13.07% growth rate recorded in the preceding year. The sector's contribution to overall GDP increased to 1.92% exceeding the 1.84% achieved in 2008. The contribution of the sector to total growth stabilised at 0.22% for 2008 and 2009 [31,32]. The building and construction sector registered strong growth, standing at 12.09 per cent in 2010, compared to 11.97 per cent in 2009, reflecting greater investments in both residential and non-residential building and other construction activities. Growth in land improvement related activities rose by 12.24 per cent in 2010 as

against 11.97 per cent in 2009. However, the current re-based exercise of Nigeria economy increases these figures reported by [31,32].

Meanwhile, key factors that have contributed to the growth in the construction and property sector include high demand for buildings across all sectors of the economy; the focus on infrastructural development by state and federal governments; the adoption of privatisation and commercialisation as instruments of federal government policy and attempts at controlling regulations relating to how the construction business is carried out in the country [33]. According to [18], the major driver of building and construction output are its lag value, government capital expenditure, the nominal exchange rate and the maximum lending rate. In addition, some major projects that were executed in 2010 impacted the sector's performance and they include: national roads rehabilitation totalling 1,975 km; Presidential Initiative Projects adding up to 853.82 km of roads; PPP projects; several housing unit types, dredging of River Niger and railway lines [34]. The nominal value of activity in the sector amounted to ₦393.53 billion in 2010 or equivalent of 2.0 per cent of overall real GDP, as against ₦347.69 billion, or 1.92 per cent in 2009 while the sector's share of GDP growth declined from 3.16 per cent in 2009 to 2.95 per cent in 2010 [17,34]. However, at 2010 constant price, the contributions of construction sector were higher than what was previously reported.

In terms of employment, the construction sector has equally contributed its quota. Out of 47.33 million labour force estimated in 2009 in Nigeria, industry sector which construction belongs contributed 10%; Agriculture 70%; and service 20% [35]. This estimate does not include the number of casual and temporary construction workers. For example, in terms of new job, the construction sector accounted for 0.79% of the new jobs in the formal sector in the fourth quarter of 2014 [36]. Nigeria Construction Industry's workforce is male dominated. Females have much less or limited involvement in construction works like in most developing countries. Unfortunately, construction workers in Nigeria have a very low literacy rate (limited to reading and writing abilities); they are poorly paid with long working hours and poor working environment which involves dangerous manual work. These workers are of transitory nature (either casual or temporary), usually migrating from rural areas to urban centres. The employment within the construction industry is often for the short-term, intermittent, and generally involves living away from home for months on end.

The data contained in Table 2 shows that the total number of persons engaged in construction's formal sector was 6,415,082 persons engaged in 2010, the total number of persons increased by 3.21% or 205,760 to reach 6,620,842 in 2011 and it also increased by 4.42% or 292,694 to reach 6,913,536 in 2012. The Nigerian male employee constitutes a very large portion of the total number of persons employed in the sector with a percentage share of 91.38% in 2010, 91.61% in 2011 and 91.52% in 2012. The Nigerian female employee stood at 398,403 in 2010, 396,602 in 2011 and 420,779 in 2012. While there was a steady increase in the number Nigerian male employees for all three years, the females saw a decline in their numbers by 0.45% between 2010 and 2011, but an increase by 6.10% for 2012 [21].

The contribution of construction sector can also be seen in its share of Gross Fixed Capital Formation (GFCF). Lopes [37] reveals that it is only the construction sector that appears twice in the national account of every nation. However, the concept of capital formation in construction relates to all kinds of building and civil engineering construction works. Capital formation in construction is the total value of all new construction and all capital alternatives or extensions that significantly improve upon the utility or extend the life of the projects and therefore add to the productive capacity (improvement) of the economy. It includes expenditure for reclamation and improvement of land and for the development and extension of mines, plantations, and all kinds of agricultural purposes [27]. Olatunji and Bashorun, [38] report that in 2006, the construction industry is responsible for an average of 5-7% improvement of the GDP growth and over 42% of the fixed capital formation over the last four (4) decades. Table 2 shows that the Gross Capital Formation (GCF) saw a decline by 8.91% from ₦204, 665.57 million in 2010 to N186, 439.63 million in 2011. GCF in 2012 saw an even greater decline by ₦64, 538.77 million to ₦121, 900.86 million [21]. Though there was a continued decline in the contribution of the construction sector to the GCF between 2010 and 2012, construction sector still holds an appreciable proportion of Nigerian GCF.

Table 1. Employment size by gender (Nigerian and Non Nigerian) 2010-2012

Employment size	2010	2011	2012
Nigerian male	5,861,845	6,065,033	6,327,377
Nigerian female	398,403	396,602	420,779
Non Nigerian male	147,633	150,719	157,664
Non Nigerian female	7,202	8,488	7,716
Total	6,415,082	6,620,842	6,913,536

Source: [21]

Table 2. Gross capital formation (Naira million) (from 2010 - 2012)

	2010	2011	2012
Building			
Purchase or construction of residential building	1,994.95	3,465.26	4,137.30
Purchase or construction of non-residential building	2,258.78	2,824.89	3,353.06
Purchase or construction of other building structure	1,822.73	2,308.10	2,828.17
Major repairs and renovations	1,825.15	2,579.58	2,976.34
Equipment			
Purchase of machinery and equipment	190,227.59	168,769.17	103,327.66
Purchase of office furniture and equipment	718.07	1,381.98	911.60
Transport			
Purchase of transport equipment	5,818.31	5,110.66	4,366.72
Total gross capital formation	204,665.57	186,439.63	121,900.86

Source [21]

Empirically, few studies have studied the contribution of the construction industry to Nigeria economy. The study conducted by [15] showed the relationship between the construction sector and the national economy depicted that the evolution pattern of the share of Construction Value Added (CVA) in GDP in the developing countries of Sub-Saharan Africa is markedly different according to the country's stage of economic development as determined by GNI per capita. Saka and Lowe [7] investigated the linkages between the construction sector and other sectors of Nigerian economy. Data on sectoral outputs of the economy used for the study were extracted from the Central Bank of Nigeria Statistical Bulletin vol. 18, 2007. The study used econometric techniques such as unit root test, co integration test as well as Granger causality test to analyse the significance of construction linkages with other sectors of the economy. The results indicated that construction significantly leads many sectors and virtually all economic sectors feedback into the construction sector, hence mutual inter dependence of construction with sectors of the economy. The study concluded that the Nigerian construction sector is very important because of its significant forward and backward linkages and multipliers on sectors of the economy.

Isa et al. [17] reviewed the contribution of construction sector to Nigeria economy towards sustainable development based on historical data obtained from the Central Bank of Nigeria (CBN) and Nigeria Bureau of Statistics (NBS). This brings to the fore the contributions of construction sector over the years in the nation's Gross Domestic Products (GDP) and its multi-sectoral outcomes. They found that construction contribution to the GDP ranges between 3 and 6% from independence to the 80's before crumbling to about 1% over the last decades. According to the study, the last four years saw an upward progression in its actual contribution, which stood at about 3% in 2012, due to an improved budgetary implementation and private sector participation. The study noted that the all-inclusive effects of this sector, and especially its employment generating potentials, makes it a veritable platform for sustainable development especially if proper mechanisms are put in place for the growth of the sector to be stimulated.

Anyanwu et al. [16] used multiple regression analysis to examine the relationship between the

Gross Domestic Product and the shares of agriculture, industry, building and construction, wholesale and retail, trade and services, covering the period 1960 to 2008. Their results showed that agriculture share of the GDP was the highest, followed by services sector, then wholesale and retail trade sector, then industry sector, while building and construction made the least contribution to the GDP. The results also showed that agriculture dominated Nigerian GDP from 1960 to 1989, while from 1990 to 2008, Industry dominated Nigeria's GDP. The results however showed that building and construction consistently made the least contribution to the GDP from 1960 to 2008. This result was collaborated with that of [26] who noted that though building and construction industry in Nigeria is a fast growing sector of the economy, which recorded a growth rate of more than 20% between 2006 and 2007, This growth has, however, not been commensurate with the growth of Nigeria's total GDP as the overall contribution of the construction sector to the country's GDP remains very low at 1.83% in 2008.

A study conducted by [39] to examine the effect of fiscal policy on sectoral output growth in Nigeria for the period of 1970-2013 using Autoregressive Distributed lag (ARDL) and Error Correction Model (ECM), showed that the total fiscal expenditure (TEXP) have positively contributed to all the sectors output with an exception of agriculture sector. The findings established that manufacturing sector has a positive relationship with all the determinant variables, while inflation rate has negatively impacted output growth of the various sectors with an exception of manufacturing sector. The study concluded that the existence of disparity in the sectoral response to fiscal policy variables underscored the difficulty in conducting uniform and economic wide fiscal policy in Nigeria. The study suggested that the best policy approach is to adopt sector specific policy based on their relative strength and significance in each sector of the economy within the overall fiscal policy mechanism framework.

Therefore, an investigation into the contribution of construction industry in nation Gross Domestic Product (GDP) conducted by [20] revealed that the construction industry is significantly related with all the sectors of Nigeria economy. The results of the Independent t- tests of the study showed that all p- values were greater than 0.05. Therefore, the study averred that the construction industry plays significant roles in all the sectors of the Nigerian economy. The study also shown that a medium strength relationship (R= 0.43015) exist between the construction industry and the Nigerian Annual % Growth Rate (NA%GR) which also indicated that the construction industry adds to the gross value of the Nigerian economy. In addition, the study developed a model for forecasting the construction Industry's GDP.

In the like manner, [40] estimated the linkage between the manufacturing sector and other sectors of the Nigerian economy with the aid of a more dynamic estimating tool. It departed from the static Leontief's input-output framework used by earlier studies and adopted the Granger causality test and the vector auto regression method, to determine the impact of changes in manufacturing output on the output of the other sectors and the effects of changes in output of other sectors on the manufacturing sector. Using quarterly time series data over the periods 1986 to 2010 the result showed a weak linkage between the manufacturing sector and other sectors of the Nigerian economy. The manufacturing sector output showed no causal relationship with real economic activities as measured by the real gross domestic product. It also had no causal relationship with the financial sector output. Only two major sectors, building and construction and hotel and restaurant seems to be driving the manufacturing sector with the later exhibiting a bi-directional relationship with the manufacturing sector.

Although these studies have considered the relationship between the construction sector and the Nigeria economy in one way or the other, none has studied the current capacity of the construction sector in the Nigeria economy now the country is the largest economy in Africa after rebasing her national account at 2010 constant basic price. The re-computation and revision of Nigeria economic variables have altered a lot things thus, the need to investigate the current capacity of Nigeria construction sector in the social and economic development of Nigeria. Besides, several changes have occurred in Nigeria in recent years. For instance, the new economic policies which have affected all sectors of the economy need to be factored into perspective. Another twist is the declining Nigeria economic growth in the recent time due to fall in the international oil price and security crises in the country, where there has been a negative growth trend thereby signalling an economic

recession. The above scenarios and inability of the previous studies to capture the current trends in the construction sector and Nigeria economy have formed the thrust of this study. Hence, this study is aimed at examining the capacity of Nigeria construction sector as it affects the growth of national economy and sustainable development.

3. METHODOLOGY

This study is mainly a survey research. Data for this study are sourced from the secondary sources. Electronically published data on construction sector from various reports of the National Bureau of Statistics (NBS) formed the basis for data generation. A simple statistical and econometric analysis are used to know the general properties of data and to see the relationship among variables of interest, that is construction sector total output (CONS) and total GDP Nigeria (RGDP).This study uses time series quarterly data (2010q1 to 2015q4) to demonstrate the causal relationship between construction sector and GDP in Nigeria.

3.1 Data and Descriptive Statistical Analysis

The quarterly data for the period 2010Q1 to 2015Q4 are being used for empirical analysis. Construction sector output (CONS) and Total Gross Domestic Product (RGDP) data in local currency is employed to analyse the dynamic relationship between GDP and construction sector. Contemporaneous correlation is examined while evidence of Granger causality between these two variables is checked. Table 3 presents the real GDP and total output contribution of construction sector to GDP at 2010 constant basic price quarter-on-quarter from 2010q1 to 2015q4 and percentage contribution of construction sector for the same period. Quarterly observations of GDP

Table 3. Real GDP and construction Sector Output at 2010 constant basic price quarter-on-quarter

Quarterly observation	Total GDP (₦)	Construction sector output (₦)	Construction sector % contribution to GDP
2010 q1	12,583,478.33	401,383.52	3.19
2010 q2	12,934,530.67	388,550.30	3.00
2010 q3	14,304,438.44	369,190.91	2.58
2010 q4	14,789,816.74	411,848.73	2.78
2011 q1	13,450,716.68	423,202.98	3.15
2011 q2	13,757,732.02	396,928.67	2.89
2011 q3	14,819,619.26	409,798.04	2.30
2011 q4	15,482,973.81	587,900.13	3.80
2012 q1	13,915,506.03	464,059.99	3.33
2012 q2	14,323,047.77	554,283.67	3.87
2012 q3	15,645,434.73	457,864.51	2.93
2012 q4	16,045,904.51	513,256.12	3.20
2013 q1	14,535,420.95	532,140.14	3.66
2013 q2	15,096,763.55	628,357.70	4.16
2013 q3	16,454,372.46	520,965.66	3.17
2013 q4	17,132,164.77	590,913.19	3.45
2014 q1	15,438,679.50	627,286.61	4.06
2014 q2	16,084,622.31	695,565.83	4.32
2014 q3	17,479,127.58	579,913.75	3.32
2014 q4	18,150,356.45	665,698.56	3.67
2015 q1	16,050,601.38	697,366.62	4.34
2015 q2	16,463,341.91	740,204.22	4.50
2015 q3	17,976,234.59	579,297.92	3.22
2015 q4	18,533,752.07	663,347.24	3.58

Source: Author's Compilation from Various NBS Reports

and construction sector data are taken from various reports of the National Bureau of Statistics which include; Revised and Final GDP Rebasing Results by Output Approach [41], Nigerian Construction Sector Summary Report 2010-2012 [21], Nigerian Gross Domestic Product Quarterly Report, Quarter Four 2014 [42] and Nigerian Gross Domestic Product Quarterly Report, Quarter Four 2015 [43].

3.2 Unit Root Test

A time series is a sequence of values or readings ordered by a time parameter, such as hourly, quarterly and yearly readings. When time series data is used for analysis in econometrics, several statistical techniques and steps must be undertaken. Under current practice the unit root test is conducted to check the stationarity of data series. This step is very important because if non-stationary variables are not identified and used in the model, it will lead to a problem of spurious regression [44], whereby the results suggest that there are statistically significant relationships between the variables in the regression model when in fact all that is evidence of contemporaneous correlation rather than meaningful causal relations [44,45]. The unit root test is also known as augmented Dickey Fuller (ADF) test [46], typically based on the following mathematical formulation.

$$\Delta Y_t \alpha_0 + \alpha_1 T + \alpha_2 Y_{t-1} + \sum_{i=1}^{n} \gamma_i \Delta Y_{t-1} + \mu_t \qquad (1)$$

Where $\Delta Y_t = Y_t - Y_{1;}$ α_0 is a drift term and T is the time trend with the null hypothesis, H_0: $\alpha_2 = 0$ and its alternative hypothesis H_1: $\alpha_2 \neq 0$, n is the number of lags necessary to obtain white noise and μ_t is the error term. However, the implied t statistic is not the Student t distribution, but instead is generated from Monte Carlo simulations [47]. The null hypotheses of non-stationarity are performed at the usual one percent, five percent and ten percent levels using the Mackinnon [48] critical value for rejection of hypothesis of a unit root. Note that failing to reject H_0 implies the time series is non-stationary. Unit-root test are classified into series with and without unit roots, according to their null hypothesis, in order to conclude whether each variable is stationary. The test results for this study are based upon estimating the following equations:

$$\Delta RGDP_t = \alpha_0 - \alpha_1 T + \alpha_2 RGDP_{t-1} + \sum_{i=1}^{n} \gamma_i \Delta RGDP_{t-i} + \mu_{t1} \qquad (2)$$

$$\Delta CONS = \beta_0 - \beta_1 T + \beta_2 CONS_{t-1} + \sum_{i=1}^{n} \delta_i \Delta CONS_{t-i} + \mu_{t2} \qquad (3)$$

To test for the existence of unit roots and to determine the degree of differences in order to obtain the stationary series of CONS and RGDP, Dickey- Fuller Test (DF), Augmented Dickey-Fuller Test (ADF) [46] and Phillips Perron (PP) [49] unit root test are applied in this study. For each time series, the DF, the ADF and the PP tests are run in two different times: first, a constant was included (this assumes that the series does not exhibit any trend and has a nonzero mean); second, a constant and a trend was included (this assumes that the series contains a trend). Also, the number of lagged first difference terms (in case of the ADF test) and the number of periods of serial correlation to include in the test regression (in case of the PP test) was determined for each time series. A '1' in Table 5 indicates that the series is integrated at order one (i.e., has one unit root) and a '0' denotes that the series is stationary at level. If the time series data of each variable is found to be non-stationary at level, then there may exists a long run relationship between these variables, CONS and RGDP. Both tests control for higher-order serial correlation in the series. The ADF approach controls for higher-order correlation by adding lagged difference terms of the dependent variable Y to the right-hand side of the regression [50]. The PP test makes a correction to the t-statistic of the (coefficient from the first-order autoregressive model to account for the serial correlation in [50].

3.3 Granger Causality Test

The conventional practice in testing the direction of causation between two variables has been to use the standard Granger framework. Granger causality tests require the use of stationary time-series data [44]. However, the basic concept of the Granger causality tests is that future values cannot predict past or present values. If past values of construction sector do contribute significantly to the explanation of real GDP, then construction sector is said to Granger-cause GDP. This means that construction sector is Granger-causing GDP when past values of construction sector have predictive power of the

current value of GDP even if the past values of GDP are taken into consideration. Conversely, if GDP is Granger-causing construction sector, it would be expected that GDP change would take place before a change in construction sector. The Granger causality test is used in the present study, fitted with quarterly data from 2010 q1 to 2015 q4 to test whether construction sector stimulates aggregate economy (GDP) or aggregate economy leads the construction sector output, or if there exist feedback effects between construction sector and the real GDP, The Granger causality test consists of estimating the following equations:

$$RGDP_t = \beta_0 + \sum_{i=1}^{n} \beta_{1i} RGDP_{t-i} + \sum_{i=1}^{n} \beta_{2i} CONS_{t-i} + U_t \quad (4)$$

$$CONS_t = \alpha_0 + \sum_{i=1}^{n} \alpha_{1i} CONS_{t-i} + \sum_{i=1}^{n} \alpha_{2i} RGDP_{t-i} + V_t \quad (5)$$

Where, U_t and V_t are uncorrelated and white noise error term series. Causality may be determined by estimating equation 1 and 2 and testing the null hypothesis that

$\sum_{i=1}^{n} \beta_{2i} = 0$ and $\sum_{i=1}^{n} \alpha_{2i} = 0$ against the alternative hypothesis that $\sum_{i=1}^{n} \beta_{2i} \neq 0$ and $\sum_{i=1}^{n} \alpha_{2i} \neq 0$ for equation (4) or equation (5) respectively.

If the coefficients of β_{2i} are statistically significant, but α_{2i} are not statistically significant, then GDP is said to have been caused by LCNS (uni-directional). The reverse causality holds if coefficients of α_{2i} are statistically significant while β_{2i} are not. But if both α_{2i} and β_{2i} are statistically significant, then causality runs both ways (Bi-directional).

3.4 Co-integration Test

The stationary linear combination is called the co-integrating equation and may be interpreted as a long-run equilibrium relationship between variables. Although there are several co-integration techniques available for the time series analysis, their common objective is to determine the most stationary linear combination of the time series variables under consideration. Consequently, Johansen's [51,52] co-integration technique has been employed for the investigation of stable long run relationships between construction sector output and total gross domestic product. The following equations were estimated with VAR lag 1 and assume that the series does not contain deterministic linear trends. Johansen's Co-integration Test (consider a VAR of order p).

$$Y_t = \alpha_1 Y_{t-1} + \ldots + \alpha_p Y_{t-p} + \beta X_t + \varepsilon_t \quad (6)$$

Where Y_t is a K-vector of non-stationary I(1) variables, X_t is a d-vector of deterministic variables, and ε_t is a vector of innovations.

3.5 Regression Analysis

When data series are stationary at the same level of integration, the Ordinary Least Square Method is used to regress the series to get results. Under certain assumptions, the method of least squares has some very attractive statistical properties that have made it one of the most powerful and popular methods of regression analysis. Least squares or ordinary least square (OLS) is a mathematical optimisation technique which, when given a series of measured data, attempts to find a function which closely approximates the data (a "best fit"). It attempts to minimise the sum of the squares of the ordinate differences (called residuals) between points generated by the function and corresponding points in the data. Specifically, it is called least mean squares (LMS) when the number of measured data is 1 and the gradient descent method is used to minimise the squared residual. LMS is known to minimise the expectation of the squared residual, with the smallest operations (per iteration). In this case, OLS is used to determine the impact of construction sector output on the real GDP of Nigeria. Mathematically, the relationship between the Real GDP (RGDP) and construction sector output (CONS) is represented in the regression model as:

$$RGDP = f(CONS, \varepsilon) \quad (7)$$

Where RGDP = total real GDP, TCONS = Construction sector output, ε = Error term

The model specification is then given as:

$$RGDP = \beta_0 + \beta_1 CONS + \varepsilon \quad (8)$$

Meanwhile, the entire analyses are carried out with EViews, version 7.0, an econometric software package used for economic and financial data. The results are presented in the section below.

4. RESULTS AND DISCUSSION

From Table 4, the total real Gross domestic product (RGDP) stood at ₦15,477,027 million on the average from first quarter of 2010 to the last quarter of 2015 in Nigeria. The maximum GDP within this period is ₦18,533,752 million while the minimum GDP stood at ₦12,583,478 million. The skewness and kurtosis values indicate that GDP within the period is positively skewed and has no excess kurtosis. While the Jarque-Bera statistic value of 0.689579 and the corresponding probability value of 0.708370 show that the Nigerian economic data are normally distributed. Likewise, the total construction output (CONS) stood at average of ₦537,471.9 million from the first quarter of 2010 to the last quarter of 2015 in Nigeria. The maximum and minimum values are ₦740,204.2 million and ₦369,190.9 million respectively. The skewness and kurtosis values indicate that CONS within the period is positively skewed and has no excess kurtosis. While the Jarque-Bera statistic value of 1.562471 with the corresponding probability value of 0.457840 show that Nigerian construction output is normally distributed.

Table 4. Descriptive statistics

Statistics	RGDP	CONS
Mean	15477027	537471.9
Maximum	18533752	740204.2
Minimum	12583478	369190.9
Std. Dev.	1634457	113449.5
Skewness	0.160831	0.077428
Kurtosis	2.234421	1.759641
Jarque-Bera	0.689579	1.562471
Probability	0.708370	0.457840
Observation	24	24

Table 5 shows the results of the unit root of the considering variables (CONS and RGDP). The results from the DF tests indicate that the two data series (CONS and RGDP) are stationary in their level form especially when trend was included in the test regression. Hence, the null hypothesis of unit root with time trend is rejected at all conventional levels of significance except RGDP series without time trend which is not significance at all levels. The ADF test statistics reject the hypothesis of a unit root at all conventional levels of significance, suggesting that both series (CONS and RGDP) appear to be first difference stationary (i.e. I(1)). Meanwhile, results from the PP tests strongly support the conclusion that each of the series is stationary after first differencing at the 1% significance level. This means that only differenced data should be used in the model. Since both test variables are integrated of the same order I(1), it is possible to apply Johansen's co integration tests to determine whether there exists a stable long run relationship between the construction sector (CONS) and Real Gross Domestic Product (RGDP) in Nigeria.

The result of causality from construction sector output (CONS) to gross domestic product (RGDP) and from RGDP to construction sector output (CONS) in Nigeria is shown in Table 6. The result reveals that construction sector output Granger cause GDP. This means that there is strong causality between construction industry and the nation's GDP, which is true for lag order two in case of Nigeria. This implies that Construction sector leads economic GDP of Nigeria by two quarters. Likewise, the real GDP Granger cause construction sector output at the same order of two lag. This causal linkage can be interpreted as the forward and backward linkages of the construction sector with the real GDP.

On the other hand, from the *F* statistics, the null hypotheses: CONS does not Granger Cause RGDP and RGDP does not Granger cause CONS are both rejected. Thus, the sample is statistically accepted that the causal affect running from economic GDP to the construction sector in first-differences of the data and vice versa. The Granger causality in this case indicates that there is bi-directional relationship between the construction sector output and the aggregate real GDP of Nigeria. This also implies that both the construction sector and aggregate GDP greatly influenced each other.

Table 7 indicates that the result of the Johansen cointegration test rejects the null hypotheses of no cointegration between CONS and RGDP, since the likelihood ratios (**57.97591**) and trace statistic (**59.11427**) are greater than the associate critical values (**14.26460**) and (**15.49471**) respectively at 5% significance level. Since cointegration exists, then it could be inferred that there is a long–term equilibrium contemporaneous relationship between the variables and they have a common trend. With

the establishment of cointegration, this also rules out the possibility of a spurious relationship between the variables, and also suggests that a causal relationship must exist in at least one direction. Thus, the values of likelihood ratios and trace statistic indicate one cointegrating equation at 5% significance level. The normalised co-integrating relation assuming one cointegrating relation (i.e. r = 1) is shown in Table 8.

The Ordinary Least Square regression result in Table 9 shows that there is positive relationship between the construction sector output (CONS) and the real gross domestic product (RGDP) of Nigeria. The coefficient value (**10.22084**) of the construction sector output with t-statistic value (**4.721525**) and the corresponding ***P-value*** (**0.0001<0.05**) shows that the construction sector has a significant positive effect on the total real GDP. The $\mathbf{R^2}$ value (**0.503305**) indicates that about **50.33%** of the proportion of variations in the real GDP can be explained by the construction sector output. This corresponds with the result of Table 10 which shows that there is strong positive correlation (**0.709440**) which is equally significant at 5% significance level between the construction sector output (CONS) and the real gross domestic product (RGDP) of Nigeria. Meanwhile, the Durbin-Watson statistic value (**1.607162**) following the rule of the thumb indicates that there is no autocorrelation present in the model. From the above result, the relationship between the construction sector output (CONS) and the total real GDP (RGDP) can be represented in the model below.

RGDP = 9983612 + 10.22084CONS

Table 5. Unit root tests

	DF test at level		ADF test in 1st difference		PP test in 1st difference		Order of integration
Series	**No trend**	**With trend**	**No trend**	**With trend**	**No trend**	**With trend**	
RGDP	-1.330276	-4.473351*	-4.790469*	-4.668999*	-6.703999*	-6.460145*	I(1)
CONS	-1.750528***	-5.953177*	-8.856630*	-8.688911*	-19.76965*	-22.26587*	I(0)
Mackinnon critical values for rejection of hypothesis of a unit root							
Critical values							
1%	-2.669359	-3.770000	-3.769597	-4.440739	-3.769597	-4.440739	
5%	-1.956406	-3.190000	-3.004861	-3.632896	-3.004861	-3.632896	
10%	-1.608495	-2.890000	-2.642242	-3.254671	-2.642242	-3.254671	

Note: *, ** and * denote the rejection of unit root at 1 %, 5% and 10% significance level, respectively*

Table 6. Granger causality between construction sector output and real GDP

Null hypothesis	Lag order	F-statistics	Probability
CONS does not Granger Cause RGDP	2	36.4248	7.E-07*
RGDP does not Granger Cause CONS	2	10.9612	0.0009*

**Note that * indicates significant at the 1%, 5% and 10% significance levels. The null hypothesis of no causality is rejected if the F statistics exceed the critical values 7.22, 4.05 and 2.82 at 1%, 5% and 10% significance levels respectively*

Table 7. Results of Johansen's cointegration test

Hypothesised no. of CE(s)	Eigenvalue	λmax test		Trace test		Probability
		Statistic	**0.05 critical value**	**Statistic**	**0.05 critical value**	
None*	0.928300	57.97591	14.26460	59.11427	15.49471	0.0000
At most 1	0.050428	1.138367	3.842466	1.138367	3.842466	0.2860

Note: Max-eigenvalue test and trace test indicated 1 cointegrating eqn(s) at the 0.05 level
** denotes rejection of the hypothesis at the 0.05 level, **MacKinnon-Haug-Michelis [53] P-values*

Table 8. Normalised co-integrating relation

CONS	RGDP
1.000000	-12.19052
	(0.47507)
Log Likelihood	-578.9209

**Note: (standard error in parentheses)*

Table 9. Results of the ordinary least square regression analysis

Dependent variable: RGDP
Method: Least Squares
Date: 05/25/16 Time: 20:21
Sample: 2010Q1 2015Q4
Included observations: 24

Variable	Coefficient	Std. error	t-statistic	Prob.
C	9983612	1188063.	8.403269	0.0000
CONS	10.22084	2.164733	4.721525	0.0001
R-squared	0.503305	Mean dependent var		15477027
Adjusted R-squared	0.480728	S.D. dependent var		1634457.
S.E. of regression	1177798.	Akaike info criterion		30.87585
Sum squared residual	3.05E+13	Schwarz criterion		30.97402
Log likelihood	-368.5102	Hannan-Quinn criter.		30.90189
F-statistic	22.29279	Durbin-Watson stat		1.607162
Prob(F-statistic)	0.000104			

The result of this study is in tandem with the results of the previous studies on the link between the construction sector and Nigeria economy. Most of these studies found that the construction sector has a significant relationship with all sector of the economy [7,15,16,20,40] which indirectly implies the aggregate economy as established by the current study. Firstly, the unit root test shows that all the data series are stationary at first differencing even though they are also stationary at level form when the trend is introduced into the model. In this case, they can be said to be cointegrated in the order of one I(1). Although some of the previous study found that the construction sector has a unidirectional causal relationship with different sectors of the economy, this study established that the construction sector has a strong positive causal relationship with the aggregate GDP which is bi-directional. Specifically, [7] found that construction significantly leads many sectors and virtually all economic sectors feedback into the construction sector, hence mutual inter dependence of construction with sectors of the economy. While [20] found that the construction sector has a medium strength relationship with the Nigerian economy, this study found a strong positive bi-directional relationship which may be attributed to the effect of the re-basing exercise on the contribution of the construction sector to the GDP. This can be attested by the proportion of variations in the real GDP that can be explained by the construction sector output. Statistically, the aggregate GDP can be estimated through a regression model as developed by this study. Generally, the result of this study implies that there is an improvement in the capacity of the construction sector to improving the socio-economic development of Nigeria after the re-basing of the nation's national account.

Table 10. Correlation matrix

	RGDP	CONS
RGDP	1.000000	0.709440
CONS	0.709440	1.000000

5. CONCLUSION

The significance of the construction industry especially in the social and economic development of developing countries can never be doubted. This is seen in this study which examines the capacity of the construction sector in the social and economic development of Nigeria through it contribution to the Nigerian gross domestic product (GDP) after re-basing of the national account. The study has successfully demonstrated that there is significant positive relationship between the construction sector output and total real GDP through an ordinary

least square regression model. Given the regression model, the study further established that the total gross domestic product of Nigeria can be predicted by the construction sector output. This is further confirmed by the significant strong positive correlation between the construction sector and aggregate GDP.

Furthermore, using the concepts and methods of the co-integration and Granger causality test, this study explored the short term dynamic relations as well as long-term equilibrium conditions; and established that there is strong causal relationship between the aggregate real GDP and the construction sector output of Nigeria. This relation is bi-directional in the sense that the construction sector Granger causes the total GDP and vice versa. This implies that both the construction sector and aggregate GDP greatly influenced each other in large proportion.

In view of the result of this study, this study becomes a veritable tool in the hands of economic planners and policy makers in that it would inform them on where to place more emphasis in terms of growing the GDP and national economy. More importantly, investors in the construction sector would see the need to invest more in the sector, since it holds greater share of investment opportunity. This study would also be a guide for government interventions in the sector especially now the country is going through hard economic time. Since no known study has investigated the post re-basing capacity of the Nigeria construction sector in the socio-economic development of Nigeria, the novelty of this study is however not in doubt. Thus, the study has added to the growing body of knowledge and would serve as a research tool and reference material for further research for the construction, business and economic researchers.

Based on the result of this study, it is recommended that economic policy makers should examine the construction sector closely as it has the potentials for improving the overall wellbeing of the economy. More emphasis should be placed on this sector in terms of increased construction inputs, favourable policies and programmes, human capital development and capacity building. It is also recommended increase collaboration between the foreign and indigenous firm in the areas of knowledge sharing and transfer; and increased foreign direct investments in the sector. The study recommended further study to determine the inter-sectoral relationships between the construction sector and other sector of the Nigeria economic and aggregate economy using the post re-basing economic data.

COMPETING INTERESTS

Author has declared that no competing interests exist.

REFERENCES

1. Stawińska A. The EU-27 construction sector: from boom to gloom. Industry, trade and services. Eurostat Statistics in Focus. 2010;7.
   Available:http://ec.europa.eu/eurostat
   (Assessed 13 August 2015)
2. Adelekan I. Private sector investment decisions in building and construction: increasing, managing and transferring risks: Case study of Lagos, Nigeria. Background paper prepared for the global assessment report on disaster risk reduction. The United Nations Office for Disaster Risk Reduction, Geneva, Switzerland; 2013.
3. Cochrane J. Growth of construction in India: Great expectations for the construction industry in India. Thought Leadership; 2013.
4. Osei V. The construction industry and its linkages to the Ghanaian economy-polices to improve the sector's performance. International Journal of Development and Economic Sustainability. Published by European Centre for Research Training and Development UK. 2013;1(1):56-72.
   Available:www.ea-journals.org
   (Assessed 10 August 2015)
5. Rhodes C. The construction industry: statistics and policy, Economic policy and statistics, House of Common Library; 2014.
6. World Bank. The construction industry: Issues and strategies in developing countries. International Bank for Reconstruction and Development. World Bank. Washington, DC; 1984.
7. Saka N, Lowe J. An assessment of linkages between the construction sector and other sectors of the Nigerian economy, The Construction, Building and Real Estate Research Conference of the Royal Institution of Chartered Surveyors

held at Dauphine Université, Paris, 2-3 September; 2010.
8. Du Plessis C. Agenda 21 for sustainable construction in developing countries. A discussion document. Report for the CIB and UNEP-IETC, CSIR Building Construction and Technology, Pretoria; 2001.
9. Roodman MD, Lennsen N. Our buildings, ourselves. World Watch. 1994;7(6):21-29.
10. Wahab KA. Due process: The construction industry and the builders. Proceedings of the 35th Annual General Meeting/ conference of the Nigerian Institute of Building. Aba, Abia State. 2005;63-75.
11. Ofori G. The construction industry: Aspects of its economics and management. Singapore: Singapore University Press; 1990.
12. World Bank. Nigeria economic report, Document of the World Bank, 89630; 2014.
13. Giang TH, Pheng LS. Role of construction in economic development: Review of key concepts in the past 40 years. Habitat International. 2011;35:118-125.
14. Kargi B. Interaction between the economic growth and the construction industry: A time series analysis on Turkey (2000-2012). Emerging Markets Journal. 2013;3:19-34.
DOI: 10.5195/emaj.2013.37
15. Lopes JP, Oliveira RA, Abreu MI. The construction industry and the challenges of the millennium development goals, Management and Innovation for a Sustainable Built Environment, 20–23 June, 2011, Amsterdam, The Netherlands.
16. Anyanwu SO, Offor US, Adesope OM, Ibekwe UC. Structure and growth of the gross domestic product (1960 -2008): implications for small-scale enterprises in Nigeria. Global Advanced Research Journal of Management and Business Studies. 2013;2(6):342-348.
Available:http://garj.org/garjmbs/index.htm
(Assessed 2 February 2016)
17. Isa RB, Jimoh RA, Achuenu E. An overview of the contribution of construction sector to sustainable development in Nigeria. Net Journal of Business Management. 2013;1(1):1-6.
18. Central Bank of Nigeria (CBN). Modelling the real sector of the Nigerian economy, Research Department; 2013.
Available: www.cbn.gov.ng
(Assessed 13 August 2015)
19. Yusuf MA. An investigation into the contribution of construction industry in nation gross domestic product (GDP). Proceedings of the Academic Conference on Agenda for Sub-Sahara Africa. University of Abuja, Teaching Hospital, Conference Hall, Gwagwalada, Abuja FCT-Nigeria. 2016;4(1).
20. Anyanwu SO, Ibekwe UC, Adesope OM. Agriculture share of the gross domestic product and its implications for rural development. Report and Opinion. 2010;2(8):26-31.
21. National Bureau of Statistics (NBS). Nigerian construction sector. Summary report: 2010-2012; 2015a.
Available:www.nigeranstat.gov.ng
(Assessed 2 February 2016)
22. Dlamini S. Relationship of construction sector to economic growth. CIB Paper 2012, International Congress on Construction Management, Canada; 2012.
23. Khan RA. Role of construction sector in economic growth: Empirical evidence from Pakistani economy. Advancing and integrating construction education, research & practice. First International Conference on Construction in Developing Countries (ICCIDC–I), Karachi, Pakistan; 2008.
24. Ogbebor PO. Enhancing indigenous construction industry as a national goal in Nigerian development. In: Akintunde I, editor. The Nigerian construction industry: Past, present, problems and prospects. Ibadan: Ibadan University Printery. 2002; 230-239.
25. Oseni FA. Need to revive our national development plans. In: Akintunde I, editor. The Nigerian construction industry: Past, present, problems and prospects. Ibadan: Ibadan University Printery. 2002;17-55.
26. National Industrial Revolution Plan (NIRP). NIRP Release 1.0; 2014.
27. Johnson C, Adelekan I, Bosher L, Jabeen H, Kataria S, Marome AW, et al. Private sector investment decisions in building and construction: Increasing, managing and transferring risks. A background paper produced by development planning unit (DPU). University College London, for the United Nations National Strategy on Disaster Risk Reduction (UNISDR), Global Assessment Report for Disaster Risk Reduction (GAR13). Prepared for Bina Desai and Andrew Maskrey; 2013.

28. Husseini AA. The importance of man power training and management to the construction industry. In: Olateju B, editor. Effective contract management in the construction industry. Proceedings of the National Seminar of the Nigerian Institute of Building. Lagos Nigeria. 1991;119-130.
29. Ogunbiyi MA. The Nigerian construction industry: Prospect of the labour force (the builders' view). The professional builder. Journal of the Nigerian Institute of Building (NIOB). 2004;45-50.
30. Aniekwu N. Accidents and safety violation in the Nigerian construction industry. Journal of Science and Technology, (Ghana). 2007;27(1):81-89.
31. Central Bank of Nigeria (CBN). Annual Reports; 2010.
Available:http://www.cenbank.org/
(Assessed 13 August 2015)
32. National Bureau of Statistics (NBS). GDP report for Q1, 2010. Building & Construction; 2010a.
Available:www.nigeriastat.gov.ng
(Assessed 13 August 2015)
33. Trade Invest Nigeria. The four factors driving growth in construction and property; 2012.
Available:http://www.tradeinvestnigeria.com/news/1141421.htm
(Assessed 12 August 2015)
34. Central Bank of Nigeria (CBN). Annual reports; 2011.
Available:http://www.cenbank.org/
35. National Bureau of Statistics (NBS). Labour force survey march, 2009. Statistical News, Labour Force Statistics; 2010b.
Available:www.nigeranstat.gov.ng
(Assessed 13 August 2015)
36. National Bureau of Statistics (NBS). Selected tables from job creation and employment generation survey, 4th quarter 2014; 2015b.
Available:www.nigeranstat.gov.ng
(Assessed 27 January 2016)
37. Lopes J. The construction industry and macroeconomy in Sub-Saharan Africa post 1970. Construction Management and Economics. 1998;16(6):637-649.
38. Olatunji OA, Bashorun N. A system view of the labour profile structure of the construction industry in the developing countries: Nigeria, a case study. Proceedings at the International Conference in the Built Environment in the 21st Century (ICIBE), Kuala Lumpur, Malaysia; 2006.
39. Osinowo OH. Effect of fiscal policy on sectoral output growth in Nigeria. Advances in Economics and Business. 2015;3(6):195-203.
DOI: 10.3189/aeb.2015.030601
40. Salami D, Kelikume I. Empirical analysis of the linkages between the manufacturing and other sectors of the Nigerian economy. WIT Transactions on Ecology and the Environment. 2011;150:687-698.
DOI: 10.2495/SDP110571
41. National Bureau of Statistics (NBS). Revised and final GDP rebased result by output approach; 2014.
Available:www.nigeranstat.gov.ng
(Assessed 19 November 2015)
42. National Bureau of Statistics (NBS). Nigerian gross domestic product report, Quarter Four 2014. 2015c;4.
Available:www.nigeranstat.gov.ng
(Assessed 2 February 2016)
43. National Bureau of Statistics (NBS). Nigerian gross domestic product report, Quarter Four 2015. 2016;8.
Available:www.nigeranstat.gov.ng
(Assessed 6 May 2016)
44. Granger CWJ, Newbold P. Spurious regressions in econometrics. Journal of Econometrics. 1974;2:111–20.
45. Harris R. Using cointegration analysis in econometric modelling. New Jersey: Prentice-Hall Englewood Cliffs; 1995.
46. Dickey DA, Fuller WA. Distributions of the estimators for autoregressive time series with a unit root. Journal of the American Statistical Association. 1979;74:427-431.
47. Engle RF, Granger CWJ. Cointegration and error correction representation, estimating and testing. Econometrica. 1987;55(2):251-76.
48. MacKinnon JG. Numerical distribution functions for unit root and cointegration tests. Journal of Applied Econometrics. 1996;11:601-618.
49. Phillips P, Perron P. Testing for a unit root in time series regression. Biometrica. 1988;75:335-46.
50. Quantitative Micro Software. EViews 5.1 User's Guide. United States of America: Quantitative Micro Software LLC; 2005.
Available:www.eviews.com
(Assessed 6 May 2016)
51. Johansen S. Estimation and hypothesis testing of cointegration vectors in

gaussian vector autoregressive models. Econometrica. 1991;59:1551-1580.

52. Johansen S. Likelihood-based inference in cointegrated vector autoregressive models. Oxford: Oxford University Press; 1995.

53. MacKinnon JG, Haug AA, Michelis L. Numerical distribution functions of likelihood ratio tests for cointegration, Journal of Applied Econometrics. 1999;1:563-577.

Peer-review history:
The peer review history for this paper can be accessed here:
http://sciencedomain.org/review-history/15302