

*Full Length Research Paper*

# Causal relationship between gross domestic product and personal consumption expenditure of Nigeria

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Accepted 23 July, 2009

**This study employed regression analysis to investigate the casual relationship between gross domestic product and personal consumption expenditure of Nigeria using data from 1994 - 2007. A non insignificant value of 0.0514 was obtained as a slope coefficient indicating that an increase in gross domestic product has no significant effect on the personal consumption expenditure of Nigeria. This was further evidenced by the value of the coefficient of determination which was only 0.035 implying that the gross domestic product only explained about 3.5% of the personal consumption expenditure of Nigeria.**

**Key words:** Causal relationship, coefficient of determination, gross domestic product, personal consumption expenditure, investment, government spending, consumer price index, implicit price deflator.

## INTRODUCTION

The most common measure of the amount of stuff produced in the whole economy is termed Gross Domestic Product (GDP) (ECON, 2006). GDP is total currency value of all final goods and services produced in an economy over some time period /year. For example U.S. GDP in 2005 was \$12,000 trillion while the GDP per capita (per person) was \$12 trillion/300 million = \$40,000. The U.S. GDP is by far the largest in the world followed by China with about \$3 trillion. U.S. GDP per capita is not the highest. National income (NI) can be defined as income earned by a nation's citizens for supplying resources (land, labor and capital) to producers. It includes compensation of employees, proprietor's income, rental income, corporate profits and interest income (net interest).

Expenditures on goods and services include Personal Consumption Expenditures (PCE), gross private domestic investment, government purchases of goods and services, exports of goods and services and imports of goods and services. Personal consumption expenditures are spending by households on new goods and services to the exclusion of new houses (ECON, 2006). The relationship between GDP and consumption expenditure is an important subject of analysis. It has attracted considerable interest among economist and policy makers. The GDP account is broken down into consumption expenditure, investment, government spending and

export. On the other hand, consumption expenditure is composed of consumer spending on goods and services which is often divided into spending on durable goods, non durable goods and services.

A number of empirical studies have been focused on the causal relationship between economic growth and consumption expenditure. Keynes (1936) discovered from his empirical studies that government expenditure is an exogenous factor which can be utilized as a policy instrument to stimulate economic growth. Fölster and Henrekson (1999) argued that there is no agreement regarding the direction of causality between economic growth and consumption expenditure. Kweka and Morrissey (1998) who worked on the impact of economic growth on consumption expenditure using Granger causality test with time series data of Tanzania, reported no evidence of impact of GDP on consumption expenditure of Tanzania.

Earlier workers had suggested that the reason for the conflicting results was due to the different nature of political climate and economic system. Youris (2006) on the other hand adduced that study with the employment of time series data in some countries may produce spurious outcome. Given all these viewpoints, questions of interest arise which might include: what conclusion do we have to make on Nigeria regarding the causality relationship between gross domestic product and

**Table 1.** Estimation of the parameters of the model in millions of US dollar (\$).

Year	In millions of US dollar (\$)	
	Gross domestic product (X)	Personal consumption expenditures (Y)
1994	41,800	279
1995	90,400	310
1996	129,000	388
1997	134,300	408
1998	129,600	391
1999	970,000	419
2000	950,000	434
2001	840,000	454
2002	900,000	468
2003	900,000	488
2004	1,000,000	509
2005	1,400,000	630
2006	1,400,000	622
2007	22,000,000	812

X is independent variable and Y is dependent variable.

**Table 2.** Estimation of the parameters of the model in millions of Nigerian Naira (₦).

Year	In millions of Nigerian Naira (₦)	
	Gross domestic Product (X)	Personal Consumption expenditures (Y)
1994	911,100	6,511,330
1995	1,977,700	6,785,900
1996	2,823,900	8,493,320
1997	29,395,000	8,931,120
1998	2,837,200	8,558,990
1999	83,400,600	36,025,620
2000	97,375,000	44,485,000
2001	93,249,000	50,394,000
2002	108,450,000	56,394,000
2003	115,650,000	62,708,000
2004	134,000,000	68,206,000
2005	182,210,000	81,994,500
2006	171,510,000	76,195,000
2007	259,050,000	95,966,250

X is independent variable and Y is dependent variable.

consumption expenditure?

The success in implementing an effective fiscal policy targeting the control of the budget deficit in Nigeria and also to promote the private sector so that it can compete efficiently and effectively in the global economy rests mainly on the nature of the relationship that exists between economic growth and consumption expenditure. Therefore the causal relationship between economic growth and consumption expenditure warrants close investigation. The empirical evidence on this issue would clarify the nature of the causal relationship between them and provide useful recommendations for Nigerian government.

## METHODOLOGY

### Source of Data

This study was designed to appraise the fundamental economic relationship between Gross Domestic Product and Personal Consumption Expenditure of Nigeria using time series data from 1994 - 2007. The data used for this study were obtained from Federal Office of Statistics and Central bank of Nigeria Annual report and statement of accounts (FOS and CBN, 2001); Central Intelligence Agency (CIA) (The World fact book, 2007) and United Nations Standards National Account (UNSNA, 2007). The data on Gross Domestic Product and Personal Consumption Expenditure were collected in millions of US dollar (\$) (Table 1). Using the exchange rate history of Nigeria for 1994 – 2007, the Gross Domestic Product and Personal Consumption Expenditure of Nigeria were obtained in Nigerian Naira (₦) (Table 2).

### Regression analysis

Gross Domestic Product influences personal consumption expenditures. As a result, the dependent variable will be personal consumption expenditures and the independent variables will be GDP. The study employed the method of regression analysis to verify the causal relationship between gross domestic product and consumption expenditure of Nigeria.

A regression model is a mathematical equation that describes the relationship between 2 or more variables. A simple regression model includes only 2 variables: one independent and one dependent. The dependent variable is the one being explained and the independent variable is the one used to explain the variation in the dependent variable.

### Model equation

Although regression analysis deals with the dependence of one variable on the other, it does not necessarily imply causation. Therefore, to detect the direction of causality between any 2 variables, the Granger procedure has gained a lot of popularity, partly due to its simplicity (Shamim, 2007). The relationship between 2 variables in a regression analysis is called the regression equation or model. A regression equation that gives a straight line relationship between 2 variables is called a linear regression model.

The model is specified as:

$$Y_t = \beta_0 + \beta_1 X_t + \lambda_t \quad (1)$$

Where  $Y_t$  is the consumption expenditure at time  $t$ ,  $X_t$  is the Gross domestic product at time  $t$ ,  $\lambda_t$  is the error term at time  $t$ .  $\beta_0$  and  $\beta_1$  are intercept and slope coefficients of the regression model. Assuming that the expected value of the error term is zero, the average consumption expenditure at time  $t$  for a given gross domestic product is given as:

$$E(Y_t / X_t) = \beta_0 + \beta_1 X_t \quad (2)$$

Observing all the assumptions of ordinary least squares and minimizing the error sum of squares, the least squares estimators of the regression parameter  $\beta_0$  and  $\beta_1$  are given as

$$\hat{\beta}_0 = \frac{\sum X^2 \sum Y - \sum X \sum XY}{n \sum X^2 - (\sum X)^2} \quad (3)$$

$$\hat{\beta}_1 = \frac{n \sum XY - \sum X \sum Y}{n \sum X^2 - (\sum X)^2} \quad (4)$$

Using equations (3) and (4), estimates of the intercept and slope coefficients were obtained for the model stated in (2). The significance of the slope coefficient of our model was tested to actually ascertain where the causal relationship between gross domestic product and personal consumption expenditure is statistically significant using the test statistic

$$t_{cal} = \frac{\hat{\beta}_i - \beta_{i0}}{S \hat{\beta}_i} \quad (5)$$

Where  $\hat{\beta}_i$  is the estimated value of  $\beta_i$  and  $\beta_{i0}$  is the hypothesized value of  $\beta_i$  which in this study is equal to 0.  $S \hat{\beta}_i$  is the standard error of  $\hat{\beta}_i$ . Afterwards, a decision rule was applied to the test statistic namely.

If  $t_{cal} > t_{tab}$  reject  $H_0$  and accept otherwise where  $t_{tab}$  is the tabulated value of the student's distribution and  $t_{cal}$  is the calculated value using (5). 95% confidence intervals were determined for the coefficients using,

$$\hat{\beta}_i \pm t_{\alpha/2, n-k} S \hat{\beta}_i \quad (6)$$

Where  $t_{\alpha/2, n-k}$  is the tabulated value of the t distribution at 95% confidence.

## RESULTS AND DISCUSSION

The results of the causal relationship between Gross

Expenditure of Nigeria were derived from equation (2) and presented below as estimated regression model as reported in literature (Gujarati, 2005).

$$\begin{aligned} Y_t &= 36000767 + 0514 X_t \\ Se &= (9,158,111.159) \quad (0.0333) \\ t &= (3.93) \quad (1.54) \\ R^2 &= 0.035 \end{aligned}$$

The result of the analysis shows that the overall constant expenditure for Nigeria is 36,000,767. This explains the consumption expenditure when there is no contribution from the GDP. A value of 0.0514 was obtained for the slope coefficient which shows a very poor explanatory power of GDP to consumption expenditure. This is evidenced by the fact that the slope coefficient is statistically very insignificant, indicating that an increment in gross domestic product in Nigeria has no significant effect on the consumption expenditure.

Personal consumption expenditures as defined (Sutberry, 1998) include domestic goods and services purchased by individuals, operating expenses of nonprofit institutions serving individuals and the value of food, fuel, clothing, housing and financial services received in kind by individuals. Many local policy makers and administrators are familiar with the Consumer Price Index (CPI) as a measure of inflation in relation to employee wage contracts and media reports, but they have had no reason or opportunity to deal with this new measure, the implicit price deflator (IPD) for personal consumption expenditures.

Sutberry (1998) explained that the IPD is a nation-wide indicator of the average increase in prices for all domestic personal consumption. The IPD for personal consumption expenditures measures average price changes for all domestic personal consumption for the entire nation which are revisable after initial publication. It also tends to measure lower price differentials. The IPD is derived from the national income and gross domestic product (GDP). The percentage change in the implicit price deflator for Personal Consumption Expenditures can be defined as inflation.

The overall mean of the consumption expenditure remains constant every year irrespective of any increase in GDP. This is further evidenced by the value of the coefficient of determination which is only 0.035 showing that GDP only explains about 3.5% of total variation in consumption expenditure in Nigeria. The estimated model does not show a good fit in terms of  $R^2$  and the slope. There is a relation between the dependent and the independent variable so between GDP and PCEs. Shamim (2007) who reported a positive and strong relationship between GDP and PCEs stated that it meant that in real life, if people earn more they also spend more

**Table 3.** Analysis of variance table for the data

Source of Variation	Sum of Square	Degree of Freedom	Mean square
Due to regression	$3.5483 \times 10^{14}$	1	$3.5483 \times 10^{14}$
Error	$9.9158 \times 10^{15}$	12	$8.2632 \times 10^{14}$
<b>Total</b>	$1.0271 \times 10^{16}$	13	$7.9008 \times 10^{14}$

F – ratio: = 0.4294

However, results and findings in this study indicated that the GDP does not necessarily increase the consumption expenditure. The findings in literature showed apparently contrasting view points (Fölster and Henrekson, 1999; Kweka and Morrissey, 1998). Historical evidence show that resource-abundant developing countries have performed markedly worse in terms of GDP development than resource-poor countries (Helge et al., 2000). Oil booms have increased public spending, but neither the poor nor the future (in terms of spending on health and education) have benefited. Thus there seem to be glaring contradiction between the natural abundance and the miserable social and economic condition in most oil rich countries. Ellis (2007) reported that the variation in PCE explained hardly any of the future variation in stock returns based on the  $R^2$  statistic value of just 0.03. There was very weak evidence that PCE is a contrary indicator for stock returns 2 quarters hence. It was concluded that PCEs is not a leading indicator for the stock market. From these varied reports, one can conclude that positive or negative relationship between GDP and PCEs depended on the country/region and on the analytical method employed (Kweka and Morrissey, 1998). Taking GDP as an indicator of economic development, resource abundant developing countries have performed far worse than resource poor countries. Countries rich in minerals have done worse than non-mineral resource rich countries. In this regard one should note that the resource rent largely accrue to the state in mineral-rich countries, whereas this is to a lesser extent typical for non-mineral rich countries.

Helge et al. (2000) reported that countries like Iran, Nigeria, Algeria, Angola and Venezuela, have shown some strikingly similar development paths in the wake of petroleum revenue inflow despite major differences in political structure and in economic, social and cultural conditions. All of them have shown a decline in per capita GDP.

Test of significance of the slope coefficient of the regression parameter further confirmed that there is no significant relationship between Gross Domestic Product and consumption expenditure of Nigeria. Further

analysis was carried out on the study to apportion the total variation into independent sources of variation (Table 3). The F ratio from the Table was quite small at 5% level of significance showing that the source of variation in consumption expenditure due to GDP is highly insignificant. Much of the source of variation in the causal relationship of PCE and GDP was from unexplained stochastic source called the error component. Corruption and war have major damaging effects on economic development.

## Conclusion

The results of this study showed that the effect of increasing the gross domestic product of Nigeria does not necessarily lead to higher consumption expenditure. The policy recommendations that could be reasonably made from this study include that human resource expenditure should be more prioritized, assuming economic growth is the utmost goal for the Nigerian government. The causal relationship between the gross domestic product which could measure economic growth and consumption expenditure of Nigeria seems to grow from increase in consumption expenditure to increase in gross domestic product. The Nigerian Federal government needs to increase investment in inventories, state and local spending, increase productivity, diversify the economy and industrialize the country to have various consumer goods and services. This of course will boost consumption expenditure, reduce unemployment, increase the labor force, increase export and reduce import as large amount of consumption and investment spending are spent on imported goods. As these are done, the economy will grow and the general living standard of her citizens will improve since economic growth is of utmost importance in any country.

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