**PUBLIC INFRASTRUCTURE EXPENDITURE AND**

**ECONOMIC GROWTH IN NIGERIA**

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**Abstract -** The relationship between capital expenditure that serves public infrastructure purposes and economic growth measured as real gross domestic product (real GDP) in Nigeria is ascertained in this research paper. Further, the trend of capital expenditure and real GDP individually and in relationship to one another is determined. Secondary sources of data were used in this research and the data were obtained from published Central Bank of Nigeria Statistical Bulletin 2021 (Public Finance and Real sector) for a period of 20 years (2002-2021). Using descriptive statistics, and ordinary lest square regression via the SPSS statistical software, the study reveals that the trend of capital expenditure is erratic but that of real GDP evenly progressing over the years. Capital expenditure is found to be positively and significantly related with real GDP in a bi-directional relationship. This study recommends that the government of Nigeria should place notable emphasis on capital expenditure to boost infrastructure development and invariably economic growth; and that Nigeria’s economic strength should be correspondingly geared towards effective capital allocations.

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***Key words:***Infrastructure, Real GDP, Capital Expenditure, Nigeria, Trend Analysis, Relationship

**1. INTRODUCTION**

One specific function of every government is to generate revenue and make expenditures for the wellbeing of its people. Expenditures could be on recurrent issues mostly of personnel and overheads; or on capital matters involving capital assets of land, infrastructure, and equipment. Such expenditures could be new or additional facilities of governments for public services. Government capital expenditure is a direct expenditure for public infrastructure projects and improvements of public facilities, for purchases of land and equipment, and for payments on capital leases. The term public infrastructure (hard infrastructure) refers to physical facilities or structures that enhance the society and economy, and encompass municipal infrastructure, utilities, transportation, telecommunications, and social infrastructure (Wilkins and Zurawski, 2014).

Government capital expenditures are the bedrock of infrastructure development in any nation. Thus this paper assumes that budgeted capital expenditure, which depicts the value placed by government on public infrastructure, is that actually spent on infrastructure, not minding inflation and other distorting factors. The vital role public infrastructure plays in enhancing national development and economy cannot really be over emphasised as the level of advancement of any nation is proved by the quality and quantity of infrastructure it has. Estache and Garsous (2012) rightly posited that the productivity of human and physical capital and hence growth can directly be influenced by the quantity and quality of infrastructure that exists.

The link between public infrastructure expenditure and economic growth has been observed to have a positive significant relationship. Various research works suggest that there is a positive impact of federal capital expenditure on the Nigerian economic growth (Darma, 2014; Onakoya and Somoye , 2013; Muritala and Taiwo, 2011; Ahuja and Pandit, [2020](https://www.tandfonline.com/doi/full/10.1080/23322039.2023.2191449)). The reverse condition of economic growth positively impacting capital expenditure can be said to be inevitable. This is because government with good economy should, without a second thought, invest in capital assets. Statistical relationship tests may however, prove otherwise depending on the country. An economically buoyant nation may still show laxity in the provision of necessary infrastructure, particularly in some developing countries. The reasons might be chiefly due to bad governance, lack of vision and corruption.

The need therefore arises in this study to test the relationship between public infrastructure and economic growth in Nigeria within the period 2002-2021, with the intention of getting findings that will help in enhancing the infrastructure and economic capacity of the country. The major objectives are:

1. To analyse the trend of the variables (public infrastructure expenditure end economic growth) as they relate to each other and to themselves over the given 20 years period.
2. To ascertain the statistical relationship (bi-directionally) between public infrastructure expenditure and economic growth.

The hypothesis to test is:

H1: There is no significant relationship between public infrastructure expenditure and economic growth in Nigeria.

**2. LITERATURE REVIEW**

**2.1 Theoretical Literature**

Public expenditures consist of capital and recurrent expenditures. Capital expenditures encompass capital goods and services like various technological/engineering construction activities. Recurrent expenditures consist of regular expenditures on things like administration, public workers wages and salaries and internal security. Public infrastructure developments are usually funded through the capital expenditure vein of government expenditure. One way that capital expenditure can impact economic growth is employment creation (Isedu, 2002). Beyond employment the infrastructural framework that supports business, professional and career growth, institutional progress and effective functioning of agencies, are established all in favour of economic growth of the country.

Gross Domestic Product (GDP), a measure of economic growth can also impact capital expenditure. The law of increasing state activity by Adolph Wagner explains that “as the economy develops overtime, the activities and functions of government increases”, (Wagner, 1890). The implication of this law means that public sector expenditures will expand when there is growth in the economy.

 Developing countries in Sub-Saharan Africa, with economies characterized by weak support services, institutional framework, structural rigidities, dovetailing productivity, policy instability and high rated corruption, has led to research studies aimed at investigating whether public spending on infrastructure has yielded significant results over time (Edame, 2014).

**2.2 Empirical Literature**

On the subject of public expenditure and economic growth, a number of researches have been undertaken over the years to empirically ascertain relationships. It will be necessary to discuss some of them here. Darma (2014) using multiple regression, Ordinary Least Squares model, on secondary data, Showed result of a positive impact of federal capital expenditure on economic growth in Nigeria. A study to investigate the influence of disaggregated functional government capital expenditure on economic growth in Nigeria between the periods of 1970 to 2013 was carried out by Oyeleke, Raheem and Falade (2016), using error correction technique. The results indicated that there exists a long run relationship between the variables of public capital expenditure and economic growth.

Usman and Esther (2015) examined the relationship between government expenditure and economic growth in Nigeria using a co-integration and error correction model for the period 1970-2010. The results show that in the long run recurrent and capital expenditures have positive and significant relationship with economic growth, but in the short run the relationship is negative with capital expenditure. Investigation of the impact of Nigerian government expenditure (capital and recurrent) on economic growth was done by Aluthge, Jubir and Abdu (2021), using time series data from1970-2019. One major finding of the study is that both in the short run and long run, capital expenditure impacts economic growth positively and significantly.

Korkmaz and Guvenoglu (2021) carried out a Granger causality test on the relationship between public capital expenditure, inflation and economic growth in 9 randomly selected OECD countries. The result of the analysis showed a bidirectional causality relationship between economic growth and inflation in the period analyzed a unidirectional causality relationship from inflation to government expenditures and from government expenditures to economic growth.

Noted that there are considerable empirical proofs in favour of the positive impact of government expenditure on economic growth, there are yet other research findings that oppose the status quo. In the study of Oteng-Abayie ([2011](https://journalofeconomicstructures.springeropen.com/articles/10.1186/s40008-020-0186-7#ref-CR33)) for some West African countries, between government spending and economic growth, there exists no causal relationship. Egbetunde and Fasanya ([2013](https://journalofeconomicstructures.springeropen.com/articles/10.1186/s40008-020-0186-7#ref-CR22)) working on 1970 to 2010 data, opines that the aggregated expenditure of government has a negative impact on Nigeria’s economic growth, but disaggregated recurrent expenditures show slight positive impacts.

Usman et al. ([2011](https://journalofeconomicstructures.springeropen.com/articles/10.1186/s40008-020-0186-7#ref-CR44)) carried out a study that reveals public expenditure as having no impact on economic growth in Nigeria in the short run, but in the long run there exists a positive significant relationship. Guseh ([1997](https://journalofeconomicstructures.springeropen.com/articles/10.1186/s40008-020-0186-7#ref-CR25)) in an empirical study carried out on some middle-income countries, obtained results of negative impact of government spending on economic growth. Abu-Bader and Abu-Qarn ([2003](https://journalofeconomicstructures.springeropen.com/articles/10.1186/s40008-020-0186-7#ref-CR1)) posits on the basis of their study, that robust government military expenditure retards economic growth in some countries like Israel, Egypt and Syria.

The empirical studies on a general note have been concerned more with relating aggregated or total government expenditure with economic growth. The results have also been diverse revealing positive relationships (unidirectional or bi-directional), negative relationships and long run and short run differences, depending on the area and period of study. Studies on disaggregated government spending of capital expenditure as it impacts economic growth (real GDP) are limited, and the few studies are unidirectional relationship studies. This study is apt in considering a bi-directional approach to the relationship between capital expenditure and economic growth.

**3. Methodology**

The quantitative type of research method is used in this study. The research design adopted is descriptive, hypotheses testing and ascertaining relationship. Secondary sources of data were used in this research and data were obtained from published Central Bank of Nigeria Statistical Bulletin 2021 (Public Finance and Real sector). The period of study was 20 years (2002-2021). The proposed methods of data analysis used are the descriptive statistical means for basic trend analysis and relationship analysed by means of simple linear regression through the use of SPSS soft ware. The linear regression equation is as follows: Y = b0 + b1X1

 Where: X1 = distinct independent or predictor variables, Y = predicted or expected value of the dependent variable, b0 = value of Y when the independent variables X1 is equal to zero, b1 = the estimated regression coefficients. The variables are capital expenditure and GDP analyzed bi-directionally, that is each serving as dependent variable and in the reverse case independent variable.

**4. Data, Results and Tests of Hypothesis**

Table 1 shows capital expenditure (designated as infrastructure expenditure) and economic growth (calculated as real GDP) in Billions of Naira, covering a period of 20 years (2002-2021). Objective 1 of this research is to analyse the trend of the variables (public infrastructure expenditure end economic growth) as they relate to each other and to themselves over the given 20 years period. It is evident that real GDP increases every year 15.69% averagely, and capital expenditure 16.03% averagely. There is a steady progressive growth over the years in real GDP as shown in the Table 1 and depicted in figure 1. Capital expenditures however, show an erratic sequence of positive and negative increases over the years and indicate that government capital expenditure cannot be predicted. The Nigerian government appears to have an unsteady focus on capital expenditure over the years. Figure 2 depicts unpleasant undulations (quite sharp between 2009 – 2010, 2012 – 2014, 2015 – 2016, and 2019 – 2021) of capital expenditure trend over the years. Figure 3 assesses the trend of real GDP over capital expenditure and proves that a fairly corresponding growth pattern is evident over one another.

**Table 1. Capital Expenditure and Economic Growth in Nigeria**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Year** | **Real GDP** **(N’ Billion)** | **% Annual GDP Increase** | **Capital Expenditure (N’billion)** | **% Annual Capital increase** |
| 2002 | 11,383.66 |  | 321.4 |  |
| 2003 | 13,418.01 | 17.87 | 241.7 | - 24.80 |
| 2004 | 17,938.38 | 33.69 | 351.3 | 45.35 |
| 2005 | 22,884.90 | 27.58 | 519.5 | 47.88 |
| 2006 | 30,063.96 | 31.37 | 552.4 | 6.33 |
| 2007 | 34,318.67 | 14.15 | 759.3 | 37.45 |
| 2008 | 39,542.43 | 15.22 | 960.9 | 26.55 |
| 2009 | 43,012.51 | 8.78 | 1,152.8 | 19.97 |
| 2010 | 54,612.26 | 26.97 | 883.9 | - 23.33 |
| 2011 | 62,980.40 | 15.32 | 918.5 | 3.91 |
| 2012 | 71,713.94 | 13.87 | 874.7 | - 4.77 |
| 2013 | 80,092.56 | 11.68 | 1,108.4 | 26.72 |
| 2014 | 89,043.62 | 11.18 | 783.1 | - 29.35 |
| 2015 | 94,144.96 | 5.73 | 818.4 | 4.51 |
| 2016 | 101,489.49 | 7.80 | 653.6 | - 20.14 |
| 2017 | 113,711.63 | 12.04 | 1,242.3 | 90.07 |
| 2018 | 127,736.83 | 12.33 | 1,682.1 | 35.40 |
| 2019 | 144,210.49 | 12.90 | 2,289.0 | 36.08 |
| 2020 | 152,324.07 | 5.63 | 1,614.9 | - 29.45 |
| 2021 | 173,527.66 | 13.92 | 2,522.5 | 56.20 |
|  |  | **15.69% Average Annual Increase** |  | **16.03% Average Annual Increase** |

Source: Central bank of Nigeria Statistical Bulletin, 2021 Statistical Bulletin- Public Finance and Real Sector. Annual % increases calculated by Author.

**4.1. Test of Hypotheses**

Objective 2 of this study is to ascertain the statistical relationship (bi-directionally) between public infrastructure expenditure and economic growth. This can be achieved through hypothesis testing statistics of linear regression. The null hypothesis states that there is no significant relationship between public infrastructure expenditure and economic growth in Nigeria. The SPSS analysis is shown in tables 2 - 5. The adjusted R square is shown in table 2 as 0.744 which implies that only 74.4% of the GDP variance can be explained by capital expenditure, the independent variable. This shows an above average relationship between capital expenditure and GDP. The F-statistics value is 56.337 and p-value of 0.000 < 0.05.

**Figure 1. Real GDP trend over the years**

This proves that capital expenditure is significantly positively related with real GDP in Nigeria. Thus the null hypothesis is rejected. The coefficients table 3 suggests that capital expenditure is significantly related with real GDP (0.000 < 0.05) and the relationship is positive (with t- value 7.506).

By considering a reverse regression analysis by keeping capital expenditure as dependent variable on GDP, independent variable, the adjusted R square is shown in table 4 as still 0.744 which implies that only 74.4% of the GDP variance can be explained by capital expenditure. This indicates an above average relationship between capital expenditure and real GDP. Table 4 shows an F-statistics value of 56.337 and p-value of 0.000 < 0.05.

**Figure 2. Capital Expenditure trend over the years**

**Figure 3. Real GDP Vs Capital Expenditure trend over the years**

Thus, capital expenditure is significantly positively related with GDP in Nigeria. The null hypothesis is therefore rejected. The coefficients table 5 tells that real GDP is significantly related with capital expenditure (0.000 < 0.05) and the relationship is positive (with t- value 7.506).

**Table 2:** Regression Summary of Capital expenditure Vs GDP

|  |
| --- |
| **Model Summaryb** |
| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate | Change Statistics |
| R Square Change | F Change | df1 | df2 | Sig. F Change |
| 1 | .871a | .758 | .744 | 24973.17908 | .758 | 56.337 | 1 | 18 | .000 |
| a. Predictors: (Constant), Capital Expenditure |
| b. Dependent Variable: Real GDP( Billion) |

**Table 3:** Regression Coefficients ofCapital expenditure Vs GDP

 **Coefficientsa**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Model | Unstandardized Coefficients | Standardized Coefficients | t | Sig. | 95.0% Confidence Interval for B | Collinearity Statistics |
| B | Std. Error | Beta | Lower Bound | Upper Bound | Tolerance | VIF |
| 1 | (Constant) | 2661.324 | 11012.894 |  | .242 | .812 | -20475.907 | 25798.555 |  |  |
| Capital Expenditure | 70.364 | 9.375 | .871 | 7.506 | .000 | 50.669 | 90.060 | 1.000 | 1.000 |

**Table 4:** Regression Summary of GDP Vs Capital expenditure

|  |
| --- |
| **Model Summaryb** |
| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate | Change Statistics |
| R Square Change | F Change | df1 | df2 | Sig. F Change |
| 1 | .871a | .758 | .744 | 308.97022 | .758 | 56.337 | 1 | 18 | .000 |
| a. Predictors: (Constant), Real GDP( Billion) |
| b. Dependent Variable: Capital Expenditure |

**5. FINDINGS AND DISCUSSION**

In the result analysis it is evident Nigeria’s real GDP trend is progressive at an annual average rate of 15.69% over 20 years. This progress is commendable but needs to be improved meaningfully for the country to experience bumper economic status. In relation to capital expenditure trend, Nigeria has an undulating, unpredictable profile that is not healthy for effective infrastructural development. Steady rise in capital expenditure over the years will induce corresponding infrastructure growth in the country.

**Table 5:** Regression Coefficients ofGDP Vs Capital expenditure

**Coefficientsa**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Model | Unstandardized Coefficients | Standardized Coefficients | t | Sig. | 95.0% Confidence Interval for B | Collinearity Statistics |
| B | Std. Error | Beta | Lower Bound | Upper Bound | Zero-order | Tolerance | VIF |
| 1 | (Constant) | 216.512 | 126.573 |  | 1.711 | .104 | -49.408 | 482.431 |  |  |  |
| Real GDP( Billion) | .011 | .001 | .871 | 7.506 | .000 | .008 | .014 | .871 | 1.000 | 1.000 |

Taking an aggregate position of positive and negative annual percentage increases of capital expenditure, Nigeria’s capital annual growth rate is 16.03%. This progress needs to be improved if capital assets are expected to be meaningfully high.

Relationship assessment of the variables show that capital expenditure is significantly related with real GDP (p value = 0.000 < 0.05) at 95% confidence interval or 0.05 significant level, and the relationship is positive (with t- value = 7.506). In other words capital expenditure positively impacts real GDP. With reverse regression analysis, keeping capital expenditure as dependent variable against real GDP (independent variable) also proves that real GDP is significantly positively related with capital expenditure in Nigeria. Thus, real GDP positively impacts capital expenditure (p value = 0.000 < 0.05; t-value = 7.506). The relationship is such that 74.4% of each variable can be explained by the other (adjusted R square = 0.744 for both variables). Therefore capital expenditure and real GDP has a bi-directional significant relationship that is positive.

**6. CONCLUSION AND RECOMMEN DATION**

The relationship between capital expenditure and economic growth has been analyzed. Capital expenditure is significantly and positively related with real GDP in a bi-directional relationship. A model regression equation to predict one of the variables from the other could have been formed if the regression result has sufficient strength of adjusted R square value up to 0.90. This study concludes that capital expenditure influences real GDP and this is in line with previous empirical studies. Real GDP has been found to impact capital expenditure as well, though known empirical studies have not been major in this vein. Thus the variables impact each other significantly and positively. In the trend analysis of the variables using descriptive statistics, this study concludes that real GDP growth rate over the years is progressive and commendable. However, in the case of capital expenditure, it is worth concluding that Nigeria does not give progressive and meaningful attention to capital expenditure, and thus infrastructure development.

This study recommends that the Nigerian government should place notable emphasis on capital expenditure, the bedrock of infrastructure development as a means of positively impacting the economic growth of the country. It is recommended also that Nigeria should ensure that their economic strength should be correspondingly felt in infrastructural development through judicious capital allocation.

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