

Monetary Policy And Infrastructural Growth: Further Evidence From Nigeria

Justin Chisom Obidiwe

Graduate Student, Department Of Economics,
University Of Benin, P.M.B. 1154, Benin City,
Edo State, Nigeria

Sunday Osahon Igbiniedion

Ph.D, Senior Lecturer, Department of economics,
University of Benin, P.m.b 1154, Benin City,
Edo state, Nigeria

ABSTRACT

Extant economic literature has acknowledged monetary policy as a key factor influencing infrastructural growth through different channels, such as affordable housing and efficient transportation, among others. However, in recent times, the Nigeria's experience suggests a conflicting position on the above supposition. It is against this backdrop that this study set out to investigate the nexus between monetary policy and infrastructural growth within the Nigerian context, time series data from 1981 to 2018, and utilizing the Fully Modified Least Squares (FMOLS) estimation technique. The results show that both real interest rate and inflation rate exerted negative and statistically significant impact on infrastructural growth, while federal government capital expenditure and net official development assistance impacted positively on the level of infrastructural growth in the period under assessment. In the light of the study's findings, the study recommends that, the monetary authority should carefully review existing lending interest rate downward to a single digit that will be investment driven particularly in the face of current global economic uncertainties occasioned by the COVID-19 pandemic that has led to the collapse of many economies across the world.

Key Words: Monetary Policy, Infrastructural growth, FMOLS, Nigeria.

INTRODUCTION

The determination of appropriate economic policy dose for the provision of sustainable infrastructures, such as improved affordable housing, quality education, quality health care services, effective transportation and communication channels etc., has remained a core debate in Africa for a number of decades. Consequently, this informs the need to adopt various economic policies for the realisation of the nation's growth and development objectives. The most prominent among these economic policies are fiscal and monetary policies. Monetary policy has therefore become one of those veritable tools for attaining both internal and external economic equilibrium.

In recent times, sequel to the increasing volatility of the Nigeria financial sector, most of the monetary policies adopted in Nigeria have been geared towards swift economic reform agendas with a view to building workable infrastructure to facilitate viable economic advancements (Ebiringa, 2014). For instance, the structural adjustment programme (SAP) was introduced in 1986 to control the supply of money, regulate the rate of interest, facilitate trade liberalization, as well as ensuring stable foreign exchange. Between 1992 and 1996, most of the reform activities were centred on the administration of interest rate. The most utilised monetary policy instruments during the reform eras include, setting of moderately low interest rates, selective credits control, which dictates the dynamics and direction of commercial bank loans and advances to the private sector. This was to boost the productive sectors, while controlling price rigidities. Sometimes, the CBN mandates commercial banks to make special deposits with the apex monetary institution in order to depress the credit-generating strength of the banks.

Regrettably, there have been series of policy failures, especially in the Nigeria financial sector, notwithstanding the volume of resources expended yearly, with a view to giving fresh breath to the economy. For instance, a number of industries that existed in the 1980s/90s have long collapsed and delayed. Examples of such companies include the Ajaokuta Steel company, the Steel company in Aladja, Delta state, Nigeria, Bata Shoe company in the northern part of Nigeria among others. Some of the roads in Nigeria are in a terrible condition, while others no longer exist as matter of practical experience.

In August, 2020, the Central Bank of Nigeria (CBN) gained the consent of the Federal Government for the establishment of an infrastructure development corporation worth about a \$39.4 billion (N15 trillion) in partnership with the Sovereign Wealth Fund (Olisah, 2020). The aim of these development is to invest in the nation's critical transport network for an initial period of 5-year. In the submission of Olisah (2020), if the initiative is properly executed, it will go a long way in assisting the nation in fixing the nation's dilapidating road system and railway lines, while addressing critical infrastructure needs of the country following years of infrastructural deterioration that has inhibited the spate of growth of the Nigerian economy.

However, experts have raised concerns about the credibility of the implementation procedures of this undertaking, given the fact that, the poor state of infrastructure and the vast infrastructure shortage in Nigeria has seriously puts the country at risk. Thus, the credibility of the implementation process is questioned on ground of the high taste for corruption among those managing the nation's economy. This is because a number of infrastructural projects that have received budgetary allocations in previous years ended up as white elephant projects, while the funds were diverted to private pockets (Olisah, 2020).

Essentially, monetary policy dynamics have great implications for infrastructural growth through improved affordable housing, effective transportation and communication channels etc. However, controversy arises on why there is a rising shortage of infrastructural facilities in Nigeria, notwithstanding the upsurge in the volume of money and efforts to regulate the rate of interest in the economy. In order to examine whether this poor infrastructural growth is elicited by wrong application of the various monetary policy instruments, the study of this nature becomes germane. It is against this backdrop that this study evaluated the effect of monetary policy on infrastructural growth in the contest of Nigeria.

LITERATURE REVIEW

Conceptual issues

Many countries across the world have pushed for the establishment of a number of regulatory institutions saddled with the responsibility of designing appropriate policies, with the broad aim of improving the general well-being of the citizens as well as the attainment of a long-lasting macroeconomic strength. The Central Bank of Nigeria (CBN) for instance, was established in 1958 as the apex monetary authority for the provision and promotion of monetary stability and a stable financial environment in the country. This is achieved through the use of monetary policy instruments such as money supply (through the open market operation), interest rate; cash reserve ratio, moral suasion etc., which are often aimed at attaining sustainable employment, swift economic expansion, price stability, as well as balance of payment equilibrium (Fasanya, 2013). In addition to its traditional focus of growth and developmental objectives, the CBN amended Act, 1991 offered the apex authority more legal teeth to carry out regulatory activities in the area of price stability (Adeoye, 2014).

Monetary policy is a fundamental economic stabilisation tool employed by the monetary authority with the aim of influencing the volume, accessibility, price and direction of money and credits in an economy for accomplishing certain macroeconomic policy targets (Sanni, 2011). It is therefore a deliberate action taken by concerned apex monetary authority in the determination of the pattern of credit allocation, optimal interest rate administration as well as the volume of money that is allowed to float in an economy. The implementation of such policy is centred on the deliberate manipulation of various monetary variables such as lending rates, open market operations, discriminatory credit controls as well as cash reserve requirements. Monetary policies are designed for the realisation of specific macroeconomic goals such as minimum inflation, full employment, exchange rate stability and economic expansion.

Theoretical Review

A number of theoretical explanations have been offered with respect to the decision of any nation to adopt specific monetary policy instruments. In what follows, this study attempts to explain the most relevant theories, which establish the various channels through which proper implementation of monetary policy instruments translates into sustainable infrastructural growth. First, the classical theory championed by Jean Baptist Say, Adam Smith, David Ricardo, Pigou among others, emphasised the role of money as it relates to savings and investment. The classical ideology is that, the economy is always self-equilibrating in the direction of full employment. This is a scenario whereby the system automatically adjusts to demand and supply situations. In their view, the classists believe that the general price level is determined by the quantity of money in circulation and this is established through an equation of exchange given as $MV = PT$. where M is the quantity of money, V is the circulation velocity which is assumed to be fixed, P is the general price level, while T denote the constant transaction volume. The key assumption here is that, the economy is always at full employment and the general price level is determined by the supply of money in the economy.

Second is the Keynesian model of income determination, which is an improvement of the classical theory. The theory rejects the notion of full equilibrium and further explained that output and not prices is the main determinant of economic phenomena. It therefore calls for government intervention in regulating key economic fundamentals, since it is impossible for an economy to always attain full employment equilibrium. From the Keynesian point of view, monetary policy will

only be effective when the government influences aggregate investments through interest rate regulation and this according to Keynes will occasion changes in output and income through the multiplier effect.

Third is the monetarist theory, which further lends credence to the Fisher exchange equation with significant swift from the focus of price determination. Friedman, a major proponent of this theory was of the opinion that, money supply determines the wellbeing of an economy and as such, the supply of money ought to grow at a constant rate as against the deliberate manipulation by the monetary authorities. This will help achieve steady economic growth rate. This theory further avers that, the supply of money exerts both direct and indirect impact on aggregate investment and expenditures, since money is supplied in exchange for financial assets such as bonds, as well as goods and services. Such effects according to the monetarist theory will manifest through relative rates of return or the various assets substitutes that enhance wealth creation.

Empirical Review

In order to have a full glimpse of the contributions of previous studies in relation to the subject matter, a good number of these were reviewed under three major headings; coverage area, the various methodologies adopted by each study, as well as their major empirical findings on the subject matter. In terms of coverage area, Isedu (2013) assessed the effects of monetary policy on macro economic performance in the context of Nigeria. Osasohan (2014) assessed the impact of monetary policy on the economy of the United Kingdom using a sample range from 1940 to 2012. Rabia (2017) also examined whether the I-S monetary policy is necessary for the economic development of less developed countries with special reference to Pakistan by employing time series data from 1982 to 2009. Enock and Nicholas (2017) further examined whether Monetary Policy drives economic growth with empirical evidence from Tanzanian time series variables from 1975 to 2013; Khaysy and Gang (2017) studied the impact of monetary policy on the economic development with evidence from Lao People Democratic Republic, using a sample of 28 years (1989-2016).

A substantial number of earlier studies such as Onyeiwu (2012), Michael and Ebibai (2014), Adigwe, Echekeba and Justus (2015), Nwoko, Ihemeje and Anumadu (2016), Akinjare (2016), Rabia (2017), Ufoeze, et al. (2018), Eugene (2019), as well as Miftahu (2019) that have examined the relationship between monetary policy and economic growth/development, though, with different proxies, collectively adopted the Ordinary Least Square (OLS) regression technique, while other studies, such as Ismail, Adegbelemi and Agboluaje (2013), Michael and Ebibai (2014), Anowor, and Okorie (2016), Khaysy and Gang (2017) as well as Ajibola and Adeyemi (2018), employed the error correction modelling approach. However, a very few studies such as Osasohan (2014), Udude (2014), Moses, Oloruntoba and Martins (2018) and Eugene (2019), have so far adopted Structural Vector Autoregression (SVAR)/Vector Error Correction Mechanism (VECM), while Enock and Nicholas (2018) used autoregressive distributed lag (ARDL) bounds-testing approach.

Furthermore, Onyeiwu (2012), Sulaiman (2014), Osasohan (2014), Michael and Ebibai (2014), Adigwe, Echekeba and Justus (2015), Anowor, and Okorie (2016), Rabia (2017), Ajibola and Adeyemi (2018), Moses, Oloruntoba and Martins (2018), Ufoeze, et al. (2018), as well as Miftahu (2019), among others, established a significant positive correlation between money supply and economic growth/development. It was further averred that, when there is a significant rise in the

volume of money in an economy, economic activities would increase. Such up surge in aggregate economic activities will boost aggregate outputs, which in turns leads to an increase in per capita, given that the increase in aggregate output outweighs the corresponding rise the country's total population.

Conversely, Udude (2014), Nwoko, Ihemeje and Anumadu (2016), Akinjare (2016), Enock and Nicholas (2017) as well as Enock and Nicholas (2018), revealed that Money supply has insignificant impact on growth in Nigeria. This could be due to frequent policy reversals and the problem of policy lags. Similarly, the impact of interest rate on growth was found to be negative and statistically significant in the studies of Nwoko, Ihemeje and Anumadu (2016), Khaysyt and Gang (2017), Miftahu (2019), among others. The implication of this is that, when interest rate is high, people find it difficult to borrow from banks, and this affects the ability to invest. Consequently, a rise in the cost of borrowing will cripple the level of investment in an economy, which in turns leads to a decrease in aggregate output. A contraction in output level will also occasion shrinkage in income per capita. However, it was insignificant from the findings of Enock and Nicholas (2017), and Ufoeze, et al. (2018).

Empirical Gaps

Studies have examined the impact of monetary policy on economic growth/development in general. However, from literature, it could be seen that no concrete study has been carried out on the direct impacts of monetary policy on infrastructural growth. Specifically, most studies such as Ismail, Adegbemi and Agboluaje (2013), Sulaiman (2014), Adigwe, Echeboba and Justus (2015), Nwoko, Ihemeje and Anumadu (2016), Khaysyt and Gang (2017), Moses, Oloruntoba and Martins (2018), and Eugene (2019), amongst others, have considered GDP as a proxy for infrastructural growth without taking into account the channel such as infrastructural growth, through which economic growth can be enhanced. This study therefore considered the impacts of monetary policy on infrastructural growth.

In addition, other studies employed the Ordinary Least Squares and Error Correction Method, but this study will adopt the Fully Modified Ordinary Least Squares. Furthermore, the most recent study by Eugene (2019) employed time series data covering a period of 32 years (1986 to 2017), while this present study will be expanded to a coverage period of 38 years (1981 to 2018). This is to allow for more degree of freedom in the empirical analysis, and to further account for the various reforms that have taken place in the Nigerian economy during the period under review.

THE RESEARCH METHODOLOGY

Theoretical framework

The theoretical framework of this study is hinged on the Keynesian philosophy of output determination, which emphasises government intervention through the regulation of key macroeconomic fundamentals, such as money supply, interest rate among others, in other to attain the desired output growth. From the Keynesian point of view, monetary policy will only be effective when the government influences aggregate investments (including investments in infrastructures) through interest rate (r) regulation and this, according to Keynes, will occasion changes in output and income through the multiplier effect. However, the Keynesian output model will be expanded to allow for inclusion of other relevant variables that have been found to exert significant impact on infrastructural growth. Examples of such variables include real interest rate, federal government

capital expenditure, inflation rate, net official development assistance and official aid received. Also, infrastructural growth will be proxied by gross fixed capital formation.

Model Specification

Based on the theoretical framework and relevant literature reviewed above, the following theoretical model will be estimated in this study;

$$GFCF_t = f(RINTR_t, INFL_t, GCE_t, ODA_t) \dots \dots \dots (1)$$

In addition, the parameterised model is presented below;

$$GFCF_t = \beta_0 + \eta_i RINTR_t + \psi_i INFL_t + \gamma_i GCE_t + \omega_i ODA_t + \xi_t \dots \dots \dots (2)$$

Where, GFCF = Gross Fixed Capital Formation (proxy for infrastructural growth), RINTR = real interest rate, INFL = inflation rate, GCE = federal government capital expenditure, ODA = net official development assistance and official aid received, subscript 't' indicates time period. β_0 is the intercept, η_i , ψ_i , γ_i , ω_i are the coefficients of the respective variables, ξ_t is the error term. f implies functional dependent.

Estimation Techniques

In order to achieve the broad objective of this study, the Fully Modified Ordinary Least Squares (FMOLS) will be utilized. One of the numerous advantages of the FMOLS is that, it has the ability to employ the variables in a regression model both at levels and at first differences. Thus, it permits the incorporation of both levels and differenced variables. Also, the study presented the diagnostic tests used to ascertain if the underlying assumptions of the analytical procedures are satisfied.

The Data

Gross fixed capital formation, Real interest rate, Inflation rate and Net official development assistance and official aid received were obtained from the World Bank, while Federal Government Capital Expenditure was collected from the Central Bank of Nigeria (2018) Statistical Bulletin. Furthermore, the data set employed in this study covered a period of 38 years. In other words, this study will cover a period 1981 to 2018.

Apriori Expectation

Essentially, real interest rate and inflation rate are expected to have negative impacts on infrastructural growth, while federal government capital expenditure and net official development assistance and official aid received are expected to have positive impacts on infrastructural growth.

DATA PRESENTATION AND ANALYSIS

This chapter reports the various findings from the empirical assessment of the impact of monetary policy on infrastructural growth in the context of Nigeria.

Graphical Analysis

Figure I shows the trend of federal government capital expenditure (₦'billion), gross fixed capital formation (₦'billion), inflation rate (annual %), net official development assistance and official aid

received (₦'billion) and real interest rate (%) in Nigeria. As shown in the graph, federal government capital expenditure has been on the increase generally. Though, there were minor fluctuations in the course of investigation. For instance, federal government capital expenditure stood at N6.57 billion in 1981. The figure rose progressively to about N498.03billion in 1999 after which it declined to N351.25 billion in 2004. It further rose progressively to about N1,152.80billion in 2009 after which it declined to N874.70billion in 2012. Federal government capital expenditure however attained a peak of N1, 682.10 billion in 2018.

Gross Fixed Capital Formation has been on the increase generally and has been relatively stable over the years, though there was a progressive decline in the trend from 1981 to 1987. For instance, Gross Fixed Capital Formation stood at N15,789.67billion in 1981, the highest figure ever recorded. It however decreased progressively to about N5,668.87billion in 1987, after which it rose from N6,047.75billion in 1988 to about N10,557.89billion in 2006. As of 2015, Gross Fixed Capital Formation in Nigeria has further increased further to about N10,636.22billion. Though, it decreased slightly to about N10,569.60billion in 2018. From the graph also, inflation rate fluctuated significantly between 1981 and 2001 but became relatively stable from 2001 to 2004, having attained 72.84% in 1995. There were instabilities in the rate of inflation from 2005 to 2008. It has however maintained stability in recent times from 2008 to 2018. The graph of real interest rate reveals that the figure has substantially oscillated between negative and positive from 1981 to 2010. It has however been relatively stable since 2011.

The graphs further revealed that, net official development assistance and official aid received in Nigeria was very low from 1981 up to 2004. However, the year 2006 witness a significant upsurge in net official development assistance and official aid received in Nigeria which attained its peak of about N1,450.94billion in that same year (2006). The figure however fell to N230.27billion in 2007 after which it rose progressively to N1050.25billion in 2018. Figure I shows the trend of federal government capital expenditure (₦'billion), gross fixed capital formation (₦'billion), inflation rate (annual %), net official development assistance and official aid received (₦'billion) and real interest rate (%) in Nigeria from 1981 to 2018 below.

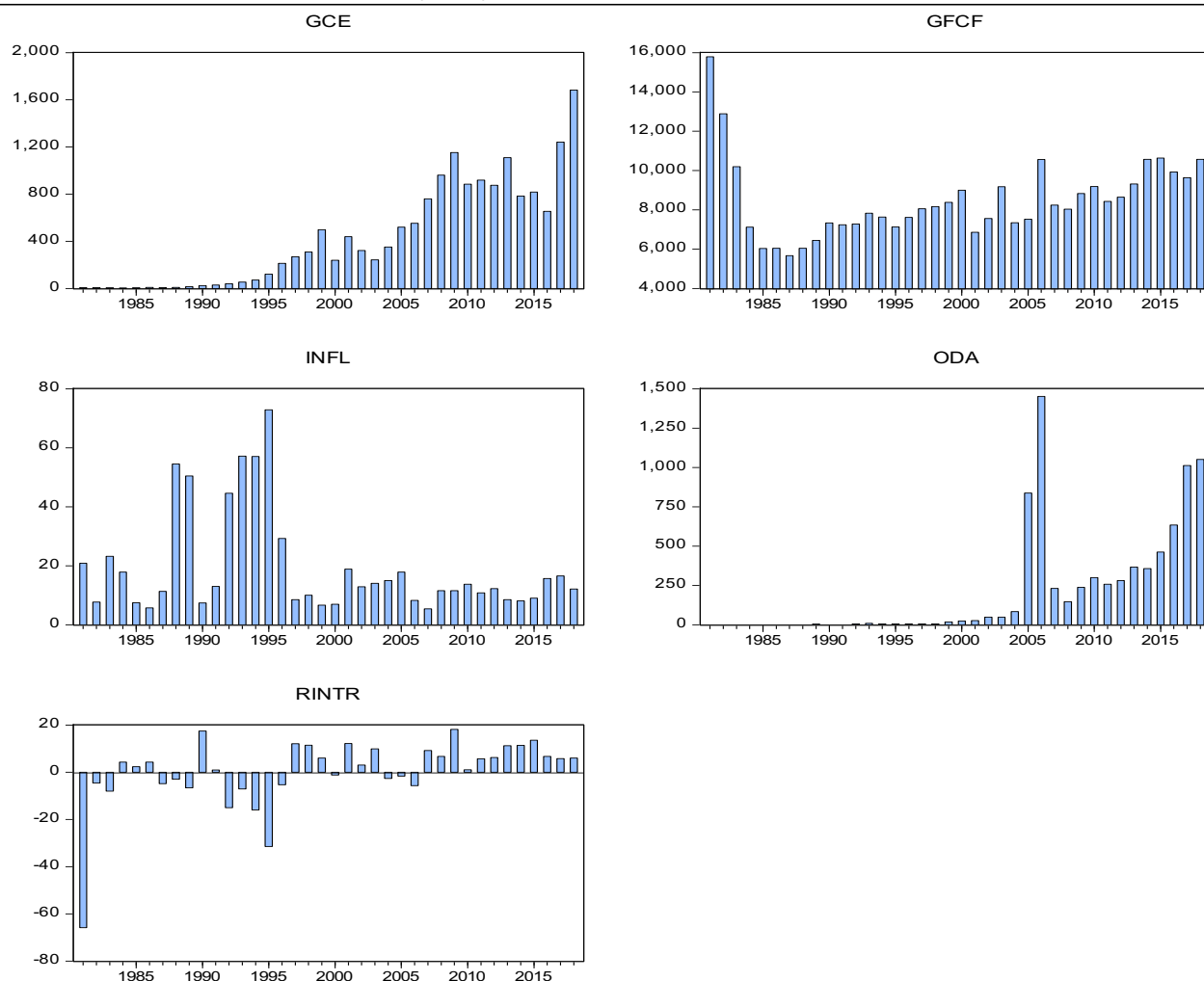


Figure I: Trend in Federal Government Capital Expenditure (₦'billion), Gross Fixed Capital Formation (₦'billion), Inflation Rate (annual %), Net Official Development Assistance and Official Aid Received (₦'billion) and Real Interest Rate (%) in Nigeria from 1981 to 2018.
Source: Authors' Computation using E-views 11, 2020

Descriptive Statistics

The results reported in Table I indicate that, the average values of federal government capital expenditure (₦'billion), gross fixed capital formation (₦'billion), inflation rate (annual %), net official development assistance and official aid received (₦'billion) and real interest rate (%) were reported as 426.22, 8498.09, 19.32, 208.42 and 0.2 respectively, while their standard deviation values were reported as 441.89, 1980.14, 17.26, 350.15 and 14.79 respectively in the period under examination. Similarly, all the variables (except real interest rate) were found to have positive skewness implying that, they have sequences that are tailed to the right. It was further established that gross fixed capital formation, inflation rate, net official development assistance and official aid received and real interest rate had excess kurtosis values of 6.33, 4.84, 6.52 and 11.9, respectively in the period under examination, suggestive of leptokurtic distribution (indication of many outliers), while federal government capital expenditure was platykurtic in its behaviour.

The Jarque Bera statistics show that only federal government capital expenditure was normally distributed. The test has the null hypothesis that the series under consideration have normal distribution. Thus, given the benchmarked probability of the Jarque Berra statistic of 0.05, it can be concluded that only federal government capital expenditure with a corresponding Jarque Bera probability value of 0.08 followed normal distribution in the course of assessment. It therefore follows that, for the rest of the variables, the null hypothesis is rejected since their p-values are less than 0.05 respectively. Table I reports the summary statistics of the variables used in this study from 1981 to 2018.

Table I: Descriptive Statistics of the Variables used in this study

statistics	Federal Government Capital Expenditure	Gross fixed capital formation	Inflation rate	Net official development assistance	Real interest rate
Mean	426.22	8498.09	19.32	208.42	0.2
Maximum	1682.1	15789.7	72.84	1450.94	18.18
Minimum	4.1	5668.87	5.38	0.06	-65.86
Std. Dev.	441.89	1980.14	17.26	350.15	14.79
Skewness	0.9	1.49	1.74	2.04	-2.59
Kurtosis	2.99	6.33	4.84	6.52	11.91
Jarque-Bera	5.15	31.74	24.57	46	168.12
Probability	0.08	0.00	0.00	0.00	0.00
Obs	38	38	38	38	38

Source: Authors' Computation using E-views 11, 2020

Analysis of Pair-wise Correlation Statistics

The correlation matrix is shown in Table II. The result discloses the pair-wise association among the time series variables utilised in the study. From the result, a positive association exists between federal government capital expenditure and gross fixed capital formation, federal government capital expenditure and net official development assistance and official aid received as well as federal government capital expenditure and real interest rate. From the result also, a positive association exists between gross fixed capital formation and net official development assistance and official aid received, as well as net official development assistance and official aid received and real interest rate. Conversely, the result revealed the existence of a negative correlation between federal government capital expenditure and inflation rate, gross fixed capital formation and inflation rate, gross fixed capital formation, and real interest rate, inflation rate and net official development assistance and official aid received, as well as inflation rate and real interest rate during the period under investigation.

The key inference that can be drawn from these results is that, gross fixed capital formation maintained a direct link with both federal government capital expenditure and net official development assistance and official aid received, while its relationship with inflation rate and real interest rate returned negative. This is clearly in line with apriori expectation. The result is reported in Table II.

Table II: Correlation Statistics of all Variables Employed (1981-2018)

	Federal Government Capital Expenditure	Gross fixed capital formation	Inflation rate	Net official development assistance and official aid received	Real interest rate
GCE	1.00	0.28	-0.38	0.66	0.43
GFCF	0.28	1.00	-0.26	0.33	-0.35
INFL	-0.38	-0.26	1.00	-0.25	-0.51
ODA	0.66	0.33	-0.25	1.00	0.16
RINTR	0.43	-0.35	-0.51	0.16	1.00

Source: Authors' Computation using E-views 11, 2020

Pre-Estimation Tests**Testing for Stationarity**

The Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) tests were employed with a view to evaluating the stationarity properties of the variables used in the study. Interestingly, the results showed that all the variables under consideration were all stationary at first difference from both the Augmented Dickey Fuller and Phillip-Perron test results. Nevertheless, from the stationarity test results in Table II inflation rate was significant at 5 % test level in the Augmented Dickey-Fuller (ADF) test (at Level) and 10% test level in the Phillips-Perron (PP) test (at Level). Likewise, gross fixed capital formation was significant at 1 % test level in the Phillips-Perron test (at Level). Furthermore, real interest rate was significant at 1 % test level in both the Augmented Dickey-Fuller (ADF) test (at Level) and Phillips-Perron (PP) test (at Level). From the stationarity test results in Table III, all the series were eventually found to be stationary at 1% significance level (at first differences) in both the Augmented Dickey Fuller and Phillip-Perron test results. The stationarity test results for all the variables (1981-2018) are summarized in Table III.

Table III: Unit Root Tests-Augmented Dickey Fuller and Philips Perron Approaches (1981-2018)

Series	t-Stat	Test critical values:			t-Stat	Test critical values:			Remark
		1%	5%	10%		1%	5%	10%	
ADF test at Level					ADF test at 1st Difference				
GCE	0.45	-3.62	-2.94	-2.61	-5.70***	-3.63	-2.95	-2.61	I(1)
GFCF	-1.97	-3.64	-2.95	-2.61	-5.09***	-3.64	-2.95	-2.61	I(1)
INFL	-3.47**	-3.63	-2.95	-2.61	-6.25***	-3.63	-2.95	-2.61	I(0/1)
ODA	-1.00	-3.63	-2.95	-2.61	-6.24***	-3.63	-2.95	-2.61	I(1)
RINTR	-7.16***	-3.62	-2.94	-2.61	-9.69***	-3.63	-2.95	-2.61	I(0/1)
PP test at Level					PP test at 1st Difference				
GCE	2.34	-3.62	-2.94	-2.61	-5.67***	-3.63	-2.95	-2.61	I(1)
GFCF	-4.24***	-3.62	-2.94	-2.61	-5.32***	-3.63	-2.95	-2.61	I(0/1)
INFL	-2.76*	-3.62	-2.94	-2.61	-9.45***	-3.63	-2.95	-2.61	I(0/1)
ODA	-1.74	-3.62	-2.94	-2.61	-8.89***	-3.63	-2.95	-2.61	I(1)
RINTR	-6.94***	-3.62	-2.94	-2.61	-28.5***	-3.63	-2.95	-2.61	I(0/1)

NB: *Significant at 10%, **Significant at 5%, and ***Significant at 1%.

Source: Authors' Computation using E-views 11, 2020

Testing for Cointegration

Predominantly, cointegration test is essential for establishing the presence (or otherwise) of a long-run interaction among the variables in a regression model. This study therefore considered the single equation cointegration technique offered by Engle and Granger (1987) and Phillips and Ouliaris (1990) given the null hypothesis that there is no cointegration among the variables used. Fundamentally, Engle and Granger (1987) accounts for serial correlations by applying the parametric ADF methodology, while Phillips and Ouliaris (1990) utilised the nonparametric PP technique. From the results in Table IV, the Engle-Granger and the Phillips-Ouliaris tau-statistic (t-statistic) and the normalized coefficient of autocorrelation (z-statistic) at the same time validated the null hypothesis of no cointegration in the case of the GFCF model which forms the bedrock of this study. Precisely, both the tau-statistic and z-statistic from both test methods revealed evidence of no cointegration from the GFCF model. Arising from the foregoing cointegration results, the only applicable and the most efficient analytical technique in this regard, is the Fully Modified Least Squares (FMOLS).

Table IV: Cointegration Test Results: Eagle-Granger and Philip-Ouliaris Approach

Dependent	Eagle-Granger Approach				Philip-Ouliaris Approach			
	tau-stat	Prob.*	z-stat	Prob.*	tau-stat	Prob.*	z-stat	Prob.*
GCE	-3.54	0.36	-20.61	0.27	-3.65	0.32	-21.56	0.23
GFCF	-3.84	0.25	-21.09	0.25	-3.78	0.27	-18.71	0.37
INFL	-4.09	0.17	-22.17	0.21	-4.13	0.16	-21.85	0.22
ODA	-4.36	0.11	-41.25	0.00	-3.72	0.29	-19.11	0.35
RINTR	-7.16	0.00***	-37.91	0.00***	-7.21	0.00***	-38.66	0.00***

NB: ***Significant at 1%.

Source: Authors' Computation using E-views 11, 2020

Fully Modified Least Squares (FMOLS)

Having recognized that variables are stationary but exhibit no evidence of co-integrating association, the study progressed to estimate the specified Model using the Fully Modified Least Squares method. The study evaluated how each of the selected explanatory variables impacts on the level of infrastructural growth in the context of the Nigerian economy. The dependents variable is gross fixed capital formation (GFCF, proxy for infrastructural growth) while the explanatory variables include federal government capital expenditure (GCE), inflation rate (INFL), net official development assistance and official aid received (ODA) and real interest rate (RINTR).

Specifically, Table V presents the estimates of the FMOLS. From the result, the coefficient representing real interest rate is negative and statistically significant at 1% test level. Specifically, the result depicts that, 1% increase in real interest rate will bring about a corresponding decline in the level of infrastructure in the economy by 119.57 units. Similarly, the impact of inflation rate on infrastructural growth was found to be negative and statistically significant at 99% confidence level. Explicitly, the result shows that, 1% rise in inflation rate will lead to a corresponding reduction in the level of infrastructural growth in by 56.77 units. From the FMOLS result also, the coefficient of federal government capital expenditure was found to be positive and statistically significant at 1% test level. Clearly, the result implies that, about 2.44 units increase in the level of infrastructural growth in Nigeria is triggered by a corresponding increase in federal government capital expenditure by 1 unit.

The result further established that, net official development assistance and official aid received exert a positive though, statistically insignificant effect on the level of infrastructural growth in the period of assessment. Explicitly, the result indicates that, about 0.49 unit rise in the level of infrastructural growth is attributed to 1 unit increase in net official development assistance and official aid received in the country. The coefficient of determination (R-squared) value of 0.82 depicts that about 82% of the systematic changes in the level of infrastructural growth in Nigeria is accounted for, by the joint influence of the regressors (federal government capital expenditure, inflation rate, net official development assistance and official aid received and real interest rate) captured in this study, while the remaining 18% of the variations in the level of infrastructural growth is absorbed by the error term. Thus, the model is adjudged to have a high predictive power.

Table V: Fully Modified Least Squares (FMOLS)

Dependent Variable: GFCF				
Method: Fully Modified Least Squares (FMOLS)				
Long-run covariance estimate (Bartlett kernel, Newey-West fixed bandwidth= 4.0000)				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	8355.59	598.99	13.95	0.00***
RINTR	-119.57	41.78	-2.86	0.01***
INFL	-56.77	22.03	-2.58	0.01***
GCE	2.44	0.86	2.83	0.01***
ODA	0.49	0.99	0.49	0.63
R-squared	0.82	Adjusted R-squared		0.72

NB: ***Significant at 1%.

Source: Authors' Computation using E-views 11, 2020

Discussion of Findings

The general outcome of the FMOLS estimation reported in Table V is in line with theoretical apriori expectations. Specifically, the empirical outcome of this study revealed a significant inverse relationship between real interest rate, which is a key monetary policy variable and gross fixed capital formation (GFCF, proxy for infrastructural growth). The implication of this finding is that, when the monetary authority raises the rate of interest, many investors will find it difficult to borrow investable funds and this will in turn affect the level of investment in the economy. It therefore, implies that, a reduction in the level of investment will lead to a fall in the level of infrastructural formation in the economy. Similarly, the significant inverse relationship between inflation rate and infrastructural growth implies that, when there is an increase in the general price level in an economy, the cost of basic factor inputs will also rise and this will affect general productivity as the real value and purchasing power of the domestic currency will be adversely affected, thus, leading to a fall in real investments in infrastructures and by extension, a decline in infrastructural growth.

Nevertheless, a positive link was established between federal government capital expenditure and infrastructural growth. This suggests that, when the government increases its size by way of increasing budgetary allocation to critical infrastructures, there will be an increase in capital projects, which are infrastructures driven. Thus, the more the government invests in capital projects, the higher the level of infrastructural formation and growth in an economy. Similar result

was found establishing a direct link between net official development assistance and official aid received and level of infrastructural growth. This implies that, when there is an increase in the inflows of official development assistance and official aids in a country, that country will be better positioned financially to pursue development goals in the areas of infrastructural formation. Thus, a significant rise in the volume of official development assistance and official aids received by a country, the level of infrastructural growth in that country will be bolstered.

Multicollinearity Test: Variance Inflation Factor (VIF)

From the table VI below, it can be seen that the Centered VIF for federal government capital expenditure, inflation rate, net official development assistance and official aid received and real interest rate are less than 10 (i.e. $VIF < 10$). This means, there is absence of multicollinearity among the variables in the FMOLS model estimated.

Table VI: Variance Inflation Factors

Variable	Coefficient Variance	Uncentered VIF	Centered VIF
C	358784.40	6.12	NA
RINTR	1745.54	3.02	2.90
INFL	485.47	5.55	2.47
GCE	0.75	4.87	2.43
ODA	0.98	2.79	2.03

Source: Authors' Computation using E-views 11, 2020.

Residuals and Stability Diagnostics

As part of robustness checks, the authors further carried out autocorrelation reported in Table VII and parameter instability tests, using the Hansen approach reported in Table VIII, while the normality test was conducted with the aid of the Jarque-Bera statistic reported in Figure I. From all tests results, the associated probability values were greater than the 5% critical values. This indicates that, autocorrelation is not present in the estimated model. The parameter instability test shows that the P-value = $0.2 > 0.05$. Thus, we fail to reject the null hypothesis and conclude that the FMOLS parameters estimated are stable. The residuals are normally distributed, since the P-value 0.08 is greater than 0.05 level of significance. This implies that the estimated FMOLS Model is robust.

Table VII Autocorrelation

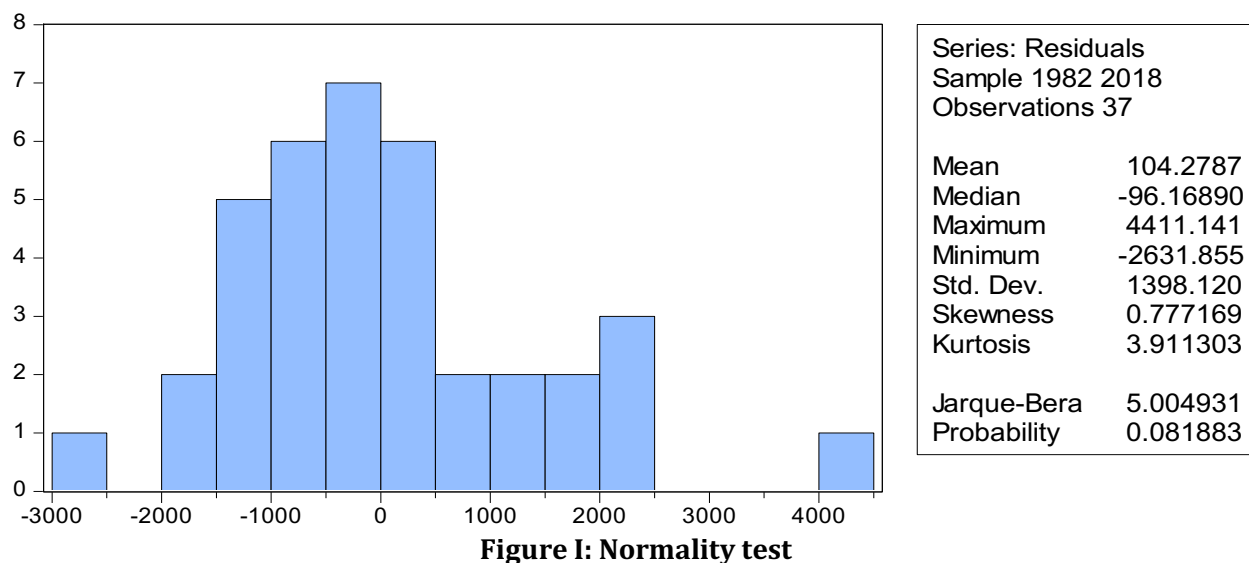
Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob*
. * .	. * .	1	0.15	0.15	0.93	0.34
. .	. * .	2	-0.06	-0.09	1.08	0.58
. .	. .	3	0.03	0.05	1.11	0.77
. .	. .	4	0.05	0.03	1.21	0.88
*Probabilities may not be valid for this equation specification.						

Source: Authors' Computation using E-views 11, 2020

Table VIII: Hansen Parameter Instability

Table VIII: Hansen Parameter Probability				
Equation: FMOLS				
Series: GFCF RINTR INFL GCE ODA				
	Stochastic	Deterministic	Excluded	
Lc statistic	Trends (m)	Trends (k)	Trends (p2)	Prob.*
0.37	4	0	0	> 0.2
*Hansen (1992b) Lc(m2=4, k=0) p-values, where m2=m-p2 is the number of stochastic trends in the asymptotic distribution				

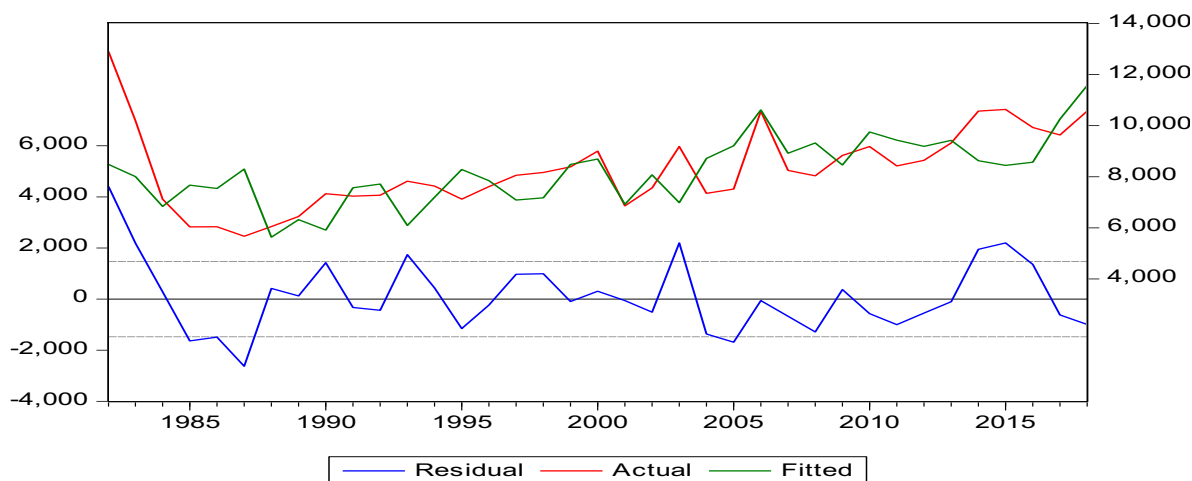
Source: Authors' Computation using E-views 11, 2020



Source: Author's Computation using E-views 11, 2020

Graph of the Residual, Actual and Fitted Observations

The graphs in Figure II show that, the actual and the fitted observations from the model are almost close to each other. Thus, the estimated models are robust.



Source: Authors' Computation using E-views 11, 2020

Forecast of Gross fixed capital formation for Nigeria

In order to further validate the above empirical findings, it becomes beneficial to simulate the actual behaviour of gross fixed capital formation with changes in federal government capital expenditure, inflation rate, net official development assistance and official aid received and real interest rate. This is actualized by utilising forecasting procedures with the E-views application and the result is reported in Figure III. Explicitly, the result indicates that, the forecasted Gross fixed capital formation (GFCFF) for Nigeria remained inside the 2 standard error critical lines, thus validating the strength and accuracy of the forecast. Also, judging from relevant econometric theories, the forecast result is accurate given the fact that the Theil inequality index of 0.079 is closer to zero.

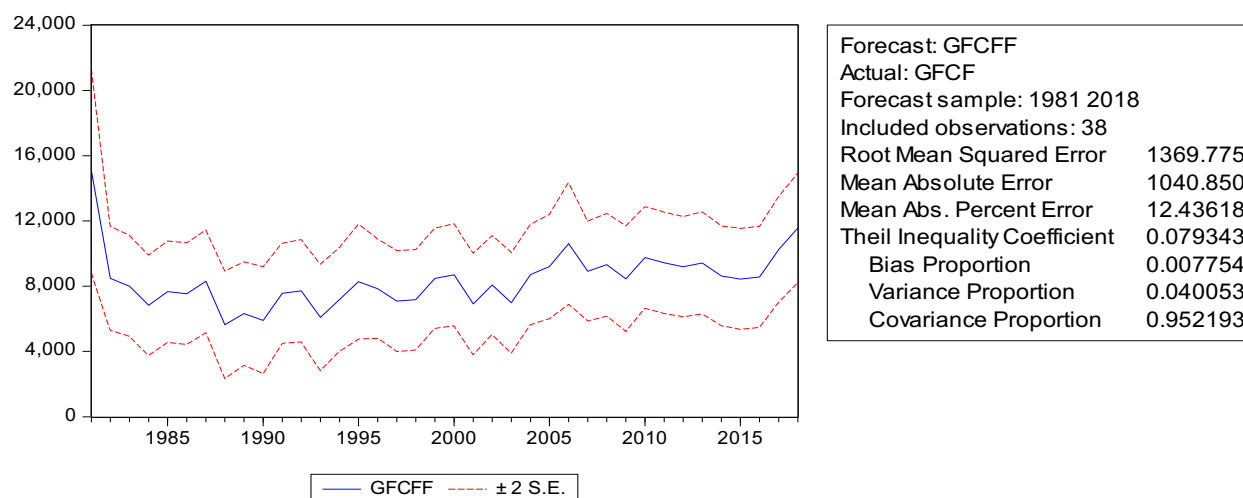


Figure III: Forecasting Infrastructural Growth in Nigeria

Source: Authors' Computation using E-views 11, 2020

Policy Implications of Findings

From the FMOLS results, federal government capital expenditure, inflation rate, and real interest rate were found to be of huge relevance in the period under review. The inference that can be drawn is that, for a desirable level of infrastructural growth to be achieved in Nigeria, policy makers need to give significant attention to these variables in the process of macroeconomic policy conception, formulation and implementation in the country. Thus, federal government capital expenditure, inflation rate, and real interest rate are very instrumental for driving infrastructural growth in the country.

CONCLUSION AND RECOMMENDATION

Earlier research efforts have recognized Monetary Policy as a significant factor inducing infrastructural growth via improvement in transportation and communication networks, among others. The empirical outcomes of this study have further validated the above submission, thus, dispelling the hypothesis that, monetary policy has insignificant impact on infrastructural growth in an economy. This study has thus revealed that interest rate plays a key role in the determination of appropriate policy package aimed at enhancing the level of infrastructural growth in Nigeria. Thus, it is hoped that if proper measures are put in place to promote investments through a workable monetary policy, there will be a significant improvement in the area economic infrastructure such as power and telecommunications, energy, education, transportation among others. In the light of the foregoing, this study however concludes that, federal government capital

expenditure, inflation rate and real interest rate significantly impact on infrastructural growth, while the impacts of net official development assistance and official aid received have been insignificant in the determination of infrastructural growth.

In the light of the study's findings and conclusion above, the following policy actions are hereby recommended that, the monetary authority should carefully review existing lending interest rate to a minimum figure that will be investment driven particularly in the face of global economic uncertainties occasioned by the COVID-19 pandemic that have led to the collapse of many economies across the world. A lower interest rate will drive more investments particularly in the area of economic infrastructure. It is also recommended that some sectors that promote critical infrastructure such as power, telecommunications, energy, education, transportation among others should be given interest-free loans within this period of economic and financial difficulties pending the significant fading away of the ravaging impact of the COVID-19 pandemic. This initiative can be championed by the central Bank of Nigeria and supported by the various financial institutions in the country.

Given the significant positive impact of government capital expenditure on infrastructural growth, it is recommended that the government both at the local, state and federal levels should pay more attention to infrastructural growth by improving budgetary allocations to critical infrastructure sectors that will boost the implementation of capital projects across the country. Similarly, the impact of inflation rate on infrastructural growth was found to be negative and statistically significant. Thus, to achieve a desired level of infrastructural growth in Nigeria, it becomes expedient that the government should pay close attention to the dynamics in inflation in the country. One of the principal consequences of the COVID-19 pandemic is the fall in global outputs, which implies a decline in the supply of goods and services. Thus, the fall in supply of most essential goods and services will trigger unbalanced demand and this will trigger a general price hike. It therefore becomes important for the government and other stakeholders in the private sector to devise means to enhance the massive production of these essential commodities so as to cushion the deleterious effects of uncontrolled price increase in the country.

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