Assessing the Effect of International Lending Interest Rate Volatility on Government Infrastructural Expenditure

EFUNTADE, Olubunmi Omotayo, PhD
Federal University Oye-Ekiti, Ekiti State, Nigeria.
Email: bunmiefuntade@yahoo.com

EFUNTADE, Alani Olusegun, FCIB, ACA.
Federal University Oye-Ekiti, Ekiti State, Nigeria.
Email: alaniefuntadee@yahoo.com

SOLANKE, Taiwo Festus, ACA
Federal University Oye-Ekiti, Ekiti State, Nigeria

OLUGBAMIYE, Dominic Olorunleke
Federal University Oye-Ekiti, Ekiti State, Nigeria

DOI: 10.56201/ijefm.v8.no1.2023.pg87.103

Abstract

Spending on government infrastructure in Nigeria is faced with several economic challenges among which international lending rate volatility is significant. This study focuses on determining the effect of interest rate fluctuation on government infrastructural expenditure between 1993 and 2022. Its theoretical footing is the loanable fund theory, as it employs the Vector Error Correction framework to analyse the various data sourced from the World Development Indicators. The stationarity test confirmed that all the data were stationary at levels. Empirical results confirmed that international lending rate fluctuation has insignificant positive impact on public infrastructural spending (government infrastructural expenditure) in Nigeria. It was also observed that a long run relationship exists between international lending interest rate fluctuation and infrastructural development in Nigeria. It was therefore recommended that the regulatory authorities should strive to maximize this opportunity to design appropriate long term policies that can enhance infrastructural expansion through the appropriate modelling of international interest rate regime rather than putting in place short term measures that are not sustainable to infrastructural development. This paper proposes an innovative bond, the floating-interest infrastructure bond, which could attract private finance in infrastructure projects. This paper explains how private finance can be channelized into infrastructure investment by the sharing of spillover tax revenues between the government and the investors using a floating-interest-rate infrastructure bond. The private sector, such as banks and postal banks, will develop long-term deposits to provide loans for infrastructure development. Unlike the usual government bond, which provides a fixed interest rate, the proposed floating-interest-rate infrastructure bond pays a floating interest. Spillover effect

depends on a number of factors, such as quality of infrastructure, inter-connectivity with other infrastructure, type of infrastructure (i.e., water supply, roads, railways, etc.), income, and access to finance, education. Thus, governments can increase the spillover effect of international lending interest rate fluctuation and government infrastructure expenditure

Keywords: International lending rate volatility, government infrastructural expenditure

JEL Classification Codes: D51, E43, F34, H50

1.0 Introduction

Dawood (2018) posits that globalization has made funds to flow in and out relatively freely to and from countries. Due to this development, foreign interest rates may influence economic conditions in developing countries and this serves as a challenge for monetary financial stability (Dawood, 2018). The interest rate has linkages to the volatility of other macroeconomic variables. The good news of macroeconomic variables would encourage the public's expectation of the interest rate increase. Kim and Jeffrey (2000) examine the effect of macroeconomic news on interest rate volatility in the US and Australia. They find that monetary policy announcement has a significant effect on interest rate both in the short-run and long-run. The conditional volatility of the Australian interest rate changes was also significantly influenced by lagged US interest rate shocks, as well as by surprises in US macroeconomic announcements.

The basic function of interest rate in an economy in which individual economic agents decision as to whether they should borrow, invest, save and/or consume are summarized by the I.M.F (2022) under three broad aspects. Interest rate is regarded as return on financial assets serves as incentives to savers, making them differ present consumption to a future date. Interest rate perform various important functions in the sense that they influence a broad range of economic decisions and outcomes. In this way, the level of interest (lending) rate influence growth in financial instrument; output and employment. In other words, as a cost of capital, interest rates influences the demand for loanable funds by different types of borrowers, including, private economic agents. The domestic interest rate in conjunction with the rate of return on foreign financial assets, expected change in exchange rate and expected inflation rate determine the allocation of accumulated savings among domestic financial assets, foreign, assets and goods that are hedged against inflation. The speculative movement of funds into/out of domestic/international assets depends on the relative levels of interest rates and whichever is appropriate among exchange rate, inflation rate and foreign interest rates.

Foreign borrowing is usually contracted to achieve two major macroeconomic objectives. These include increase in investment or consumption as well as financing temporary balance of payment deficit (Akinwunmi & Adekoya, 2018). As a result economy indulges in external borrowing to accelerate economic development and bridge the gap between national revenue and expenditure. However, financing economic development through foreign borrowing imposes an instantaneous obligation of interest rates payments which has to be made in foreign exchange (Onikosi-Alliyu, 2022). To meet this contractual foreign debt service

responsibility or obligation, external loans must be capable of generating additional foreign exchange through investment. Government spending on infrastructures is considered as a catalyst for economic growth and development. Many countries today place more emphasis on the development of key areas of the economy such as; education, health, transports, communication to mention a few that will help to boost the economic performance.

Interest rate dynamics has been a major policy focus in almost all countries in the globe. The developed and emerging economies carefully maintain an interest rate policy that improve the performance of the real sector. This is why, sometimes in the United States, the interest rate is reduced to as low as 1 percent in order to boost the performances of the real sector and create jobs (Ozigbo, 2020).

According to Babatunde (2018) infrastructure is a strategic economic growth driver. Its potentials are numerous; it serves as a catalyst for public development in the entire government agenda, such as healthcare delivery, transportation, education and food security. Infrastructure level affects the developmental ratings of a nation. Infrastructure contributes to the score of Nigeria's economic growth.

Infrastructure is understood to represent capital goods in the form of transportation, education, and health facilities, equipment of energy and water provision, facilities for sewage, garbage disposal, and air purification, building and housing stock, facilities for administrative purposes and for the conservation of natural resources (Rillo & Ali, 2018). Due to its public provision often given in reality, in the literature material infrastructure is also referred to as social overhead capital, social amenities, or public facilities.

Generally accepted are (1) the distinction between capital equipment and capital services, on the one hand, and operation of a facility or production of output, on the other hand, (2) the spatial representation of material infrastructure (Rillo & Ali, 2018): In a horizontal approach we may distinguish point systems (for example, airports, hospitals), point-network systems (for example, telephone services, electricity supply), and network systems (for example, roads)(Nedozi *et al.*, 2017). From a vertical viewpoint we may refer to the continent, the nation, the area, the region, the county, the lot (for example, international highways, interstate highways, expressways, motorways and country roads, through roads and main streets, local streets).

Most developed nations such as Britain, United State of America and France have been classified as developed nation because of the level of infrastructural development in their contribute to the growth of the economy whereas spending on consumption by the government retard growth. It is argued that the country will benefit socially and economically from government investment (spending) in health, roads, education, communication etc. Nigeria economy is challenged with poor infrastructural facilities, ranging from poor roads networks, lack of educational facilities and healthcare facilities, unstable power supply to mention a few (Jibir & Aluthge, 2019). These complex problems affected the economic growth of the nation. The few basic government infrastructures available in the country are depreciated especially with regards to the road networks.

1.1 Statements of Problems

International lending interest rates have fluctuated significantly over the past decades and these fluctuations have continued to be of truly vast importance. One of the most challenging questions in this regard is to be able to distinguish between short-and long-term effects of some influences on government infrastructural expenditure For example, if the real interest rate plays an important role in government infrastructural expenditure expansion, it is crucial to know if it has a short-run or a long-run effect, or both. In the same way, in cases where there is evidence of possible impacts, it is important to be able to compare volatility in interest rate with appreciation/depreciation effects on government infrastructural spending. Given these considerations this paper intends to contribute to the existing literature on the determinants of growth in infrastructural development in two important ways.

Interest rate is always difficult to forecast. Interest rates will probably rise with the removal of public sector funds from the industry. The interest rate (MPR) is the rate at which banks borrow from Central Bank to cover their immediate cash shortfall. The higher the cost of such borrowing, the higher also will be the rate banks will advance credit to the real sector. The lending rate remained high and discouraging to intended investors, as cost of funds continue to rise. This has a grave implications for the global competitiveness of the real sector. The unemployment and poverty level was still high in the country in spite of the implementation of NEEDS (National Empowerment Economic Development Strategy) agenda and the tremendous growth in the telecommunication sector, has provided jobs for a good number of Nigerians. The last few years have witnessed reductions in public-sector credit. There is need to pursue to a logical end in order to boost and encourage private sector confidence that will show that Nigerian economy is indeed pursuing private sector-led economic policies by reducing the interest rate (MPR) to a single digit.

In recent times, debt owed by countries worldwide has been in the news due to the increasing rate at which countries borrow from external and domestic sources. Arguably, borrowing is not a bad idea if the borrowed fund is channeled into capital projects such as railway construction, road construction, human capital development and electricity generation. However, when borrowed funds are not used for investment purposes, the concept of debt financing will lead to an economic setback. As Ijirshar, Joseph, and Godoo (2016) note, a country will be less prosperous if the loans obtained for investment projects are not adequately managed. It is noted that only when the investment project's gains exceed the interest paid on the loans that the economy will be better off.

It is clear evidence that debt servicing obligation constitutes a major setback for the Nigeria economy in the last two decades of democratic rule. In the past 14 years, external debt rose by 616% as its servicing commitments continues to hit deep on the economy growth path. is an urgent need for the redirection of public spending from huge recurrent expenditures to productive investment expenditures possible via fiscal adjustments.

1.2 Objectives of the study

The broad objective of the study is to investigate the effect of international lending interest rate volatility on government infrastructural expenditure of the Federal Government of Nigeria, while the specific objectives are to:

i. investigate the effect of nominal interest rate volatility on government infrastructural expenditure of Federal Government in Nigeria;

ii. examine the relationship between real interest rate volatility on government infrastructural expenditure of Federal Government in Nigeria;;
iii. evaluate the effect of fixed interest rate volatility on government infrastructural expenditure of Federal Government in Nigeria;; and
iv. assess the influence of floating interest rate volatility on government infrastructural expenditure of Federal Government in Nigeria;.

1.3 Research Hypotheses

This study is designed to test the following null hypotheses:

H_{01}- Nominal interest rate volatility has no significant effect on volatility on government infrastructural expenditure of Federal Government in Nigeria;

H_{02}- Real interest rate volatility has no significant causal relationship with volatility on government infrastructural expenditure of Federal Government in Nigeria;

H_{03}- Fixed interest rate volatility has no significant effect on volatility on government infrastructural expenditure of Federal Government in Nigeria;

H_{04}-Floating interest rate volatility has no significant influence on volatility on government infrastructural expenditure of Federal Government in Nigeria.

2.1 Theoretical Review

2.11 The Loan-able Funds Theory of Interest Rate

The neo-classical or the loan-able fund theory owns its origin to the Swedish economist, Knut-Wicksell. It examines interest rate in terms of demand and supply of loan-able funds or credit. According to this theory, the rate of interest is the price of credit is determined by the demand and supply for loan-able funds. In other words, it is the price which equates the supply of credit, or saving plus the net increase in the amount of money in a period, to the demand for credit, or investment plus net hoarding in the period (Afolabi, 1999). The demand for loan-able fund has primarily three sources: government, businessmen and consumers who need them for purpose of investment, hoarding and consumption. The government borrows funds for provision of public goods or security. The businessmen borrow for capital goods and investment projects. Such borrowings are interest elastic and depend mostly on the expected rate of profit as compared with the interest rates. The demand of loan-able fund on the part of consumers is for the purchase of durable consumer goods, individuals' borrowings and they are also interest elastic. The tendency to borrow is more at a lower rate of interest than at a higher rate (Afolabi, 1999; Chigbu, 2006).

2.12 Pareto Optimality Theory of Lending Credit Market

Since the days of the pioneering economist Adam Smith, it is a widespread belief that under an economic system with free markets , effective resource allocation will occur . This is called the Pareto optimal situation, where any change in the distribution of resources would have to be detrimental to at least one economic actor. In a perfectly competitive market, unfettered competition would protect consumers from the political influence of lobbies, and forces producers to deliver products and services at cost. Competition is rarely perfect, markets fail and market power – a firm's ability to raise prices substantially above cost or to offer low quality – must be kept in check (Tirole, 2015). Indeed, it is now well

recognised that there are many aspects of market failure in developed economies where this situation does not arise (Stiglitz, 1989).

Indeed, the core principle underlying the rationale for government intervention in a vast array of areas of public policy rests the notion of "market failure" (Stiglitz, 1989). Market failures arise when the competitive outcome of markets does not result in an efficient allocation of resources. As is known from the basic theory of welfare economics, under such market failures a competitive market system does not yield socially efficient outcomes (Pack and Saggi, 2006). In other words, credit market failures result in a suboptimal allocation of resources and prevent Pareto optimality.

The existence of credit market failures is the key rationale behind intervention in financial markets, and the use of financial instruments generally. Jaffee and Russell (1976) sets out the classic theoretical logic behind the allocation of capital. In a perfectly functioning credit market, there will be a market for loans with the interest rate determined through processes of supply and demand. As those who will make best use of the loans will be able to pay the highest rates, the market will allocate finance to the best investments. This market would be Pareto efficient as it would not be possible to improve the allocation without making someone worse off. Yet, in practice, there are a set of related market failures which prevent this situation from occurring.

A market failure exists because it is hard for the lender to distinguish the risk level of a firm, entrepreneur or innovation without paying a significant cost. Lenders deal with this in two ways. In markets for debt, where lenders are primarily interested in ensuring a repayment stream, they will require either a significant financial track record or some form of collateral. In doing so, they exclude certain types of firms which can provide neither – young firms, or those seeking to attempt new, innovative business models. Providing finance to these firms would have been optimal for the economy overall, but the screening cost prevents it being provided. In this way, asymmetric information can provide an economic rationale for interventions in debt markets for certain firms.

Mckinnon and Shaw (1973) argued in favour of financial liberalization as medium of promoting

saving, investment, and growth. Their argument was based on the fact that real interest rates are

frequently negative in developing countries due to administrative controls on the nominal interest

rates and heavy regulation in the financial market. This is supported by Udude (2015) and

Fatoumata (2017). They contended that in those countries where self-financing is very important

and interest rate is negative or very low, an upward increase in real deposit rates encourages savings (the substitution effect dominates the income effect) and the substitution from goods to bank deposits. Both have positive effects on private investment because self - financing investment rises and because there is a rise in the availability of funds to finance any profitable investment project. However, at higher rates, economic agents would prefer to hold deposits that yield a higher return than investment in physical capital. Therefore, at high rates, investment and real bank rates are expected to be negatively related. Hence, Mckinnon's

arguments imply a nonlinear relationship between real interest rates and private (real sector) investments (Mckinnon & Shaw, 1973).

2.13 Theory rate gap theory

According with the theory, interest rate gap (the difference between bid interest rate paid for deposits and ask interest rate collected for granted loans) could be influenced by the following factors: Monetary expansion: Commercial banks encounter liquidity problems by lending money with higher maturity than deposits' maturity. This liquidity risk is multiplied by fractional reserves mechanism that allows commercial banks to lend money from demand deposits. Because of this facility, the interest rate paid by banks to private deponents significantly decrease, the credit interest rate conditions remaining the same.

So, the theory reveals that this facility increases the interest rate gap by diminishing the bid interest rate. On the other hand, this facility significantly increases the broad money by providing zero cost liquidity for commercial banks. The development and sophistication of financial sector: As in the case of any market, the banking sector is sensitive to competition and market sophistication and development. When the financial sector is highly competitive with many banks providing loans to various beneficiaries, the ask interest rate is put under pressure to decrease. The high competition between banks to attract deposits increases the bid interest rate.

The influence of the government / state: State is one of the most important actor for global financial markets today. State is acting as issuer of financial instruments such as treasury bills (short term maturity) and treasury bonds and notes (medium and long term maturity), competing for capital with private sector. Bigger state means higher public expenditure and public debt to GDP. This competition of the state to sell financial securities is submitted to increase the ask interest rate for credit operations. In the absence of monetary intervention, this securities issued by governments are largely sold on the market to private investors increasing the interest rate gap (a positive relationship between state dimension and interest rate gap is expected).

Government expenditures on healthcare and social security have increased substantially in the last three decades. Financing infrastructure development using public funds has become more constrained due to the financial crisis and recession. Yet, attracting funds for the development of infrastructure projects, such as water supply, roads, and railways, is particularly important for developing countries where infrastructure needs are very high. Public funds are not sufficient for meeting infrastructure needs especially during the recent recession, and thus attracting private funds in infrastructure development is important.

However, bankable infrastructure projects are scarce because revenue flow is generated mainly from infrastructure user charges, which are usually low in developing countries. The proposed floating-interest-rate infrastructure bond will allow for more bankable projects in infrastructure and attract more private funds. Infrastructure, such as water supply, electricity, roads, railways,

etc., is an essential part of economic growth.

2.14 Financing Gap Theory

Generally, the idea of financing gap has infested the developing countries which significantly encouraged the so called foreign borrowings. Financing gap is essentially the difference between the funds that are available from domestic sources and the total investment requirement; and one way of closing this gap is by borrowing from abroad. Easterly (1999) informed that the idea originated when Domar (1946) in a publication entitled "Capital Expansion, Rate of Growth, and Employment" where it was postulated that there would be a proportionate relationship between investment spending and the total growth of gross domestic product (GDP).

The financing gap idea resurfaced in the work of Rostow (1960); "The Stages of Economic Growth" postulating that for any country to move from being a less developed to a developed economy, it needs to pass through a sequence of stages. There exists a proportionate association between such investment and economic growth and development. Rostow (1960) deduced that the necessary condition for takeoff is that investment increases from 5% to 10% of profits which means that if a developing country does not have enough domestic resources for investment it must fill the gap with foreign aid or external debt. Chenery and Strout (1966) augmented the Harrod-Domar financing gap model with an understanding of the need to have savings funded internally. National saving, in the event of an existing temporary shortfall between investment ability and saving ability can be supplemented by foreign aid. Self-refinancing occurs if a particular country has a high enough marginal saving rate; only then will a country be able to finance its investment out of its own saving. Some scholars observed that the model has proved to be amongst those generally employed theories in explaining growth phenomenon in economics and equally used in reaching at all financing requirements decisions by International Finance Institutions (IFIs) (Easterly, 1999).

2.2 Conceptual Review

2.21 Nominal Interest Rate

It is defined as the rate paid for the use of money or credit before taking into consideration the inflation rate over the rental period. In other words it embeds both the effects of inflation and uncertainty. That is, the interest rates were not adjusted for changes in purchasing power caused by changes in the price level. In fact, inflation can reduce the purchasing power of returns on any investment. In addition, inflation causes the purchasing power of the principal to decline. For example, if inflation is 5.0 per cent per year, the purchasing power of the ₦1,000 principal falls by ₦50 each year.

Black (2002) defined interest rate as the price that a borrower has to pay in order to have access to the use of cash, which he or she does not own, and the return that a lender enjoys for foregoing consumption or liquidity in the current period. This definition connotes interest rate as both a cost and a reward. Interest rate is a cost of capital, which influences the demand for loanable funds by borrowers in need of such. When conceived in this way, interest rates are seen as lending rates on different forms of loans and advances in the financial market.

2.22 Real Interest Rate

This is the nominal interest rate adjusted for expected inflation. To encourage savings, real interest rate is expected to be positive. Lenders and borrowers know that inflation reduces

the purchasing power of interest income, so they base their investment decisions on interest rates adjusted for changes in purchasing power. Such adjusted interest rates are called real interest rates. Lending and borrowing parties are actually not sure of what the real interest rate will be over the tenor of the loan, they have to base their decisions concerning savings and investments on their expectations about the real interest rate. Savers and borrowers must decide what they expect the inflation rate to be in order to estimate the expected real interest rate. The expected real interest rate, equals the nominal interest rate, minus the expected rate of inflation

2.3 Empirical Review

Horgan (2014) investigated the impact of interest rate and foreign exchange rates on manufacturing sub sector in Nigeria during the period 1980 -2012. The study adopted the OLS and the cointegration techniques on data on index of manufacturing sector output, rate, and FDI and government capital expenditure. The study reveals that interest rate in the long run does not impact on manufacturing output while government capital expenditure does. Udoka and Anyingang (2012) investigated the effect of interest rate fluctuation on the economic growth of Nigeria before and after interest rate deregulation regime in Nigeria. Data collected were analyzed using the ordinary least square (OLS) analytical technique. The result of the findings reveal that, there existed an inverse relationship between interest rate and economic growth in Nigeria. Hence, they concluded that increase in interest rate decreases GDP growth in Nigeria, thus retarding growth of the real sector.

Amadi and Amadi (2020) see government expenditure on infrastructure as enormous because it is capital-intensive. Many countries give infrastructure expenditure an utmost priority because of its role in the country's economic development. Infrastructure can bring about even development. Its potentials are numerous; Infrastructure such as road, communication, transportation and education are amongst the basic requirement for economic development. Infrastructure level affects the developmental ratings of a nation. Infrastructure contributes to the score of Nigeria's economic growth.

Ozigbo (2020) empirically investigated the impact of interest rate dynamics on performance of manufacturing- sub sector in Nigeria. The research covers the period between 1980 and 2019.This period is important since it includes the pre-structural adjustment programme (SAP) era where interest rate was not liberalized and the structural adjustment programme period where interest rate is liberalized. The cointegration technique with its implied error correction mechanism was used for the study. The result shows that the high interest rate in Nigeria has hindered the performance of the manufacturing sub -sector. The GARCH and ARCH results indicates that interest rate dynamics has influenced the performance of the manufacturing sub-sector. The result also confirms a long run relationship among the variables. It was therefore recommended amongst others, that there should be a drastic reduction in the interest rate coupled with the adoption of liberalized interest rate regime with some caution; this will increase the performance of the manufacturing sub- sector in Nigeria.

Olubanjo, Atobatele and Akinwumi (2010) simulated the inter-relationships among interest rates, savings and investment in Nigeria between 1993 and 2010 using two stages least square method. Their result suggests that a marked decrease in the real lending rate would not result automatically into increased domestic investment.

2.4 Gap Identification

From the past literature, we see that numerous studies have been done on the effect of fluctuation in international lending rate on the government infrastructural expenditure. We scanned throughout the literature, and we reported all the studies which we were able to find on the basis of covering period, country specification, method used, and mixed empirical results. At a glance, what one sees from is that the empirical findings of the studies are highly controversial. Some empirical studies reveal that the effects of international lending interest rate fluctuation on government infrastructural expenditure (Amadi J. & Amadi, 2020; Babatunde, 2018; Fatoumata, 2017; Nedozi *et al.*, 2017) is negative while the others bring into light positive (Abiad *et al.*, 2020); Dawood, 2018; Ikubor *et al.*, 2021), or insignificant results (Mann, 2018; Ozigbo, 2020; Yoshino *et al.*, 2020) depending mainly on a number of factors such as models implemented, study period, country specification, term length, components of government infrastructural spending considered.

3.0 Methodology

This section discusses the econometric techniques that will be used to achieve the objectives of the study. This chapter comprises the research design, sources and methods of data collection, estimating techniques, model specification, variable description and measurement and expected contribution to knowledge.

3.1 Research Design

The research design for the study will be *ex post facto* and cross-sectional research analysis of annual multivariate time series data due to the nature of proposed data. The study will examine the historical data in order to understand the current state of government infrastructural expenditure in Nigeria and causal connections with international lending rate volatility.

3.2 Sources and Methods of Data Collection

All the data that will be used in this research will come from secondary sources. Annual time series data for Nigeria will be used from 1993 to 2022. The time series data will be sourced from statistical bulletins from Nigerian Bureau of Statistics (NBS) and Budget Office of the Federation.

3.3 Estimating Techniques

This section comprises the descriptive and inferential statistics that the study shall employ to achieve its objectives.

3.3.1 Descriptive Statistics and Normality Tests Multivariate Time Series Data

The following descriptive statistics, mean, median, percentage, variance, standard deviation, standard error and coefficient of variation, will be used to summarize the data. Normality of the data will be tested by skewness, kurtosis, Shapiro-Wilk test, Kolmogorov-Smirnov test and Jarque-Bera (JB) test.

3.3.2 Inferential Statistics for Multivariate Time Series Data

The particular statistics that shall be employed to test the study's hypotheses and various diagnostic tests are discussed here.

3.3.2.1 Diagnostic Tests

The study will use the following diagnostic test to resolve the following econometric time series problems: Non-stationarity (Unit root)-Dickey Fuller(DF), Augmented-Dickey-Fuller(ADF), Phillips-Perron(PP) and Kwiatkowski–Phillips–Schmidt–Shin (KPSS) tests; Heteroscedasticity-Breusch-Pagan test, white test and Ramsey-Reset test; Autocorrelation-Durbin-Watson test; Multicollinearity-Variance Inflation Factors (VIF).

3.3.2.2 Method of Data Analysis

The following regression, cointegration and causality tests will be conducted on the time series data: Regression: ARDL Bound test, Johansen approach and Error-Correction Mechanism(ECM) models. Causality: Toda-Yamamoto Causality, Engle-Granger causality, Sims-Granger causality and modified WALD test. Time series regression (estimating standard error of regression(S), R-squared, adjusted R-squared and predicted R-squared) using heteroscedasticity models for prediction applying Generalised Auto-Regressive Conditional Heteroscedasticity (GARCH).

Table 1. Description of the Variables, Sources and Expected Signs

Variables	**Symbol**	**Measurement**	**Sign**	**Source**
Dependent variable				
Government Infrastructural Expenditure	GIE	Summation of federal government expenditure on infrastructural development	+/-	Amadi & Amadi (2020); Babatunde, S. A. (2018); Ikubor et al. (2021)
Independent Variable				
Nominal interest rate volatility	NIR	Annualised average nominal interest rate	+/-	Dawood (2018)
Real interest rate volatility	RIR	Annualised average real interest rate	+/-	Fatoumata (2017)

Fixed interest rate volatility	FIR	Annualised average fixed interest rate	+/-	Ozigbo (2020)
Floating interest rate volatility	FLIR	Annualised average floating interest rate	+/-	Yoshino et al., (2020)

Source: The authors' compilation, 2023.

3.4 Model Specification

The study proposed examination of the causal relationship between international lending interest rate volatility and government infrastructural expenditure;
international lending interest rate should be segregated into nominal interest rate volatility, real interest rate volatility, fixed interest rate volatility and floating interest rate volatility.
GIE=*f*(NIR,RIR,FIR,FLIR) ……(1)

The proposed model is adapted from work of Dawood (2018).

$$GIE=\beta_0+\beta_1 NIR+\beta_2 RIR+\beta_3 FIR+\beta_4 FLIR+\varepsilon \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots(2)$$

Where;

GIE represents Government Infrastructural Expenditure (Dependent variable),

NIR represents nominal interest rate volatility (Independent variable)
RIR represents real interest rate volatility (Independent variable)
FIR represents fixed interest rate volatility (Independent variable)
FLIR represents floating interest rate volatility (Independent variable)
β_0, β_1, β_2, β_3, and β_4 are regression coefficients to be estimated.
ε is Error term.

A-priori Expectation

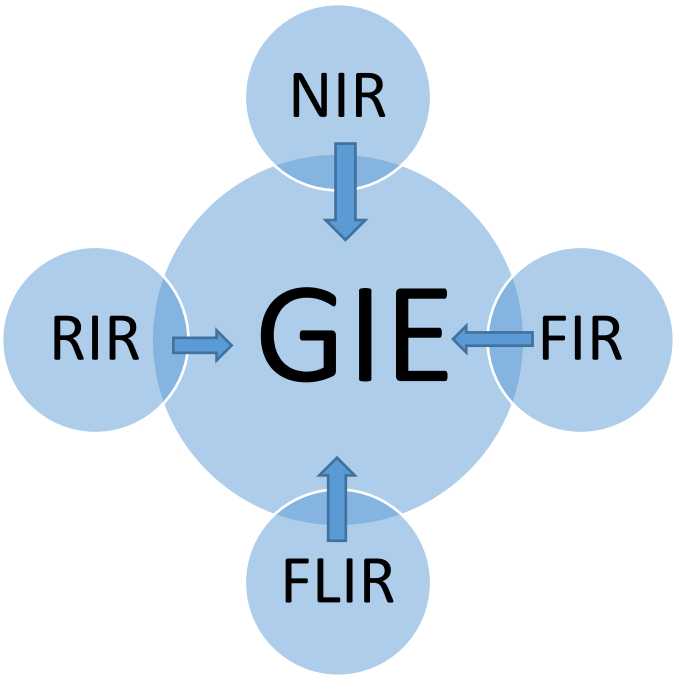
$\frac{dNIR}{d\text{GIE}} > 0$:connote that nominal interest rate volatility is expected to exert positive or negative relationship with Government Infrastructural Expenditure.

$\frac{dRIR}{d\text{GIE}} > 0$: connote that real interest rate volatility is expected to exert positive or negative relationship with Government Infrastructural Expenditure.

$\frac{dFIR}{d\text{GIE}} > 0$:connote that fixed interest rate volatility is expected to exert positive or negative relationship with Government Infrastructural Expenditure.

$\frac{dFLIR}{d\text{GIE}} > 0$:connote that floating interest rate volatility is expected to exert positive or negative relationship with Government Infrastructural Expenditure.

Figure 1: Framework Development



Source: Author's conceptualisation 2023

4.0 Data Analysis

Table 2. Result of Bound Test (cointegration of the variables)

Bound Test				Bound Test
Test Statistic	Value	K	Lower Bound	Upper Bound
F-Statistic	136.2672	6	2.62	3.79

Source:The authors.
Note:

Null hypothesis: No long-run relationship exists.

The result of bound test presented in Table 2 shows that the value of F-statistic lies above the upper bound value of Pesaran test statistic, an indication that the null hypothesis, that there is no long-run relationship among the variables, is to be rejected. This guarantees the conduct of error correction needed for the estimation of long-run dynamics.

4.1 Tests for Stationarity (Using Augmented Dickey-Fuller)

The ADF test result reveals that data for dependent variable: government infrastructural expenditure and that of independent variables: Nominal interest rate volatility; Real interest rate volatility; Fixed interest rate volatility and Floating interest rate volatility are stationary at 1st difference. Therefore, we conclude that the data used for the variables of the study are stationary and the findings of their analysis are considered valid and reliable for decision-making.

4.2 Model Analysis and Test of hypotheses

Table 3:

Variable	Coefficient	Std. Error	T-Statistic
C	117670.4	139317.0	0.84462
D(GIE)	0.530717	0.27557	1.92588
D(NIR)	5995.190	38109.3	0.15732
D(RIR)	138.1383	7593.56	0.01819
D(FIR)	-5403.436	9899.89	-0.54581
D(FLIR)	1384.819	7498.74	0.18467
R-squared	0.641820	Log likelihood	-387.9315
Adj. R-squared	0.452195	Akaike AIC	29.47640
Sum Sq. resid	4.77770	Schwarz SC	29.95634
S.E. equation	529773.5	Mean dependent	465541.0
F-statistic	3.384680	S.D. dependent	715776.0

Source: From E-views result

The result of the model analysis is as indicated on table 3. The results show that the Adjusted R-Square value = 0.64 (i.e. 64%). This shows that the explanatory or independent variables included in the model (Nominal interest rate volatility; Real interest rate volatility; Fixed interest rate volatility and Floating interest rate volatility) accounted for 64% variation in the

dependent variable (government infrastructural expenditure). The remaining unexplained is taken care of by U, the error term.

The four independent variables (Nominal interest rate volatility; Real interest rate volatility; Fixed interest rate volatility and Floating interest rate volatility) jointly influence the dependent variable significantly. This was consolidated with the result of the joint signified by the F-statistics (Prob) falling within the significance region of 0.00 to 0.05 and the t-stat (prob) of the constant (C) which falls within the significance region 0.00 – 0.05; indicating a case of joint significant impact of the explanatory variables on null hypotheses of the study.

However, taking the explanatory (independent) variables singly, the above result shows that the first explanatory variable (Nominal interest rate volatility; Real interest rate volatility; Fixed interest rate volatility and Floating interest rate volatility) has a positive but insignificant relationship (impact) with (on) the dependent variable (government infrastructural expenditure). This is signified by the value of t-statistic (prob) which falls outside the significance region of 0.00 –0.05 or 0% to 5%. It thus indicates that the null hypotheses of the study are accepted with the conclusion that volatility of international lending rate has no significant relationship with government infrastructural expenditure.

4.3 Discussion of findings

From the test conducted on the hypotheses of this study, which measures the joint effect of the four components of international lending interest rate volatility (Nominal interest rate volatility; Real interest rate volatility; Fixed interest rate volatility and Floating interest rate volatility) on infrastructural development (government infrastructural), it reveals that they have insignificant effect on government infrastructural expenditure in consonance with Amadi J. & Amadi, H. (2020); Babatunde, S. A. (2018); Fatoumata, K. M. (2017); Nedozi, F.O., Obasanmi, J.O. & Ighata, J.A. (2017).

The error correction model above shows that the error correction term has the expected negative sign and it is significant at 5.0 per cent level. This result affirms the earlier result of co-integration between international lending interest rate volatility represented by (Nominal interest rate volatility; Real interest rate volatility; Fixed interest rate volatility and Floating interest rate volatility) and government infrastructural expenditure. The coefficient of the error correction term represents the speed of adjustment. The R2 of 0.64 indicates that about 64.0 per cent of the variations in the growth of government infrastructural expenditure is explained by the variables Nominal interest rate volatility; Real interest rate volatility; Fixed interest rate volatility and Floating interest rate volatility that enter the model. The coefficient of the ECM is -0.02. The negative sign is an indication of the existence of a long-run equilibrium relationship between government infrastructural expenditure and the independent variables (Nominal interest rate volatility; Real interest rate volatility; Fixed interest rate volatility and Floating interest rate volatility) that influence its short-run dynamics of the model. In fact, the result shows very low speed of adjustment of 2.0 per cent between the short-run and long-run equilibrium behaviours of government infrastructural expenditure and its explanatory variables. The F-statistics of 3.38 measuring the joint significance of all the regressors shows that the overall model is significant at 5.0 per cent level.

5.0 Conclusion and Recommendation

Spending on government infrastructure in Nigeria is faced with several economic challenges among which international lending rate volatility is significant. This study focuses on determining the effect of interest rate fluctuation on government infrastructural expenditure between 1993 and 2022. Its theoretical footing is the loanable fund theory, as it employs the Vector Error Correction framework to analyse the various data sourced from the World Development Indicators. The stationarity test confirmed that all the data were stationary at levels. Empirical results confirmed that international lending rate fluctuation has negative impact on public infrastructural spending in Nigeria. It was also observed that a long run relationship exists between international lending interest rate fluctuation and infrastructural development in Nigeria. It was therefore recommended that the regulatory authorities should strive to maximize this opportunity to design appropriate long term policies that can enhance infrastructural expansion through the appropriate modelling of international interest rate regime rather than putting in place short term measures that are not sustainable to infrastructural development. This study helps to examine the impact of interest rate on government infrastructure expenditure. It was discovered that interest rate will automatically assist in the mobilization and utilization process of financial resources in order to achieve a desired growth and development of public infrastructure.

References

Amadi J. & Amadi, H. (2020). Government expenditure on infrastructure as a driver for economic growth in Nigeria. *Journal of International Business Research and Marketing, 5* (2), 1-12.

Abiad, A., Rana-Hasan, R., Jiang, Y. & Patalinghug, E. (2020). The past and future role of infrastructure in Asia's development. In: Susantono B, Park D and Tian S (Eds.), Infrastructure Finance in Asia. 1-25.

Afolabi, L. (1999), Monetary Economics, Ibadan, H.L Bhatia (978), History of Economic Though (4th revised edition), New Delhi.

Babatunde, S. A. (2018). Government spending on infrastructure and economic growth in Nigeria. *Economic Research-Ekonomska Istraživanja, 31*(1),997-1014

Chenery, H. B. & Strout, A. M. (1966). Foreign assistance and economic development. *American Economic Review, 56*(4), 679-733.

Chigbu, E. E (2006). Evaluation of the determinants of commercial bank's interest rates spread In a liberalized, consolidating developing financial system. *Nigeria Journal of Economic and Financial Research, 1*(2), 34-45.

Dawood, T. (2018). Foreign interest rate, monetary policy and bank credit. *Jurnal Ekonomi Pembangunan: Kajian Masalah Ekonomi dan Pembangunan,19*(2),138-155.

Dickey, D. A., & Fuller, W. A. (1979). Distribution of the estimators for autoregressive time series with a unit root. *Journal of the American Statistical Association, 74*(366),427-431.

Domar, H. (1946). Impact of foreign private investment on the development of Nigerian capital market. *International Journal of Economics, Business and Management Research, 1*(2), 120-132.

Easterly, W. (1999). Growth implosions, debt explosions, and my Aunt Marilyn: Do growth slowdowns cause public debt crises? The World Bank.

Fatoumata, K. M. (2017). Impact of interest rate on economic growth in Nigeria. *Pyrex Journal of Business and Finance Management Research, 3*(3),23-43.

Johansen, S. (1988). Statistical analysis of cointegration vectors. *Journal of Economic Dynamics and Control, 12*(2-3),231-254.

Horgan, A. A. (2014). Interest rate and agricultural sector output in Nigeria. *International Journal of Social Sciences,12*(3),12-23.

Ikubor, J. O., Osadume, R. C., Jibir, A., & Hassan, A. A. (2021). Impact of government infrastructural expenditure on economic growth: Evidence from Nigeria. *International Journal of Economics and Development Policy (IJEDP),4*(1),26 -39.

Jaffee, D. M., & Russell, T. (1976). Imperfect information, uncertainty, and credit rationing. *The Quarterly Journal of Economics, 90*(4), 651-666.

Kim, S. J., & Jeffrey, S. (2000). International linkages and macroeconomic news effects on interest rate volatility- Australia and the US. *Pacific-Basin Finance Journal, 8*(1), 85-113.

Mann, K. (2018). The effect of public expenditure on the economic growth in Nigeria (1980-2013). *IISTE, 19* (4), 20-41.

Mckinnon, R. & Shaw, A. (1973). Money and Capital in Internal Development. Washington D.C: The Brookings Institution.

Nedozi, F.O., Obasanmi, J.O. & Ighata, J.A. (2017). Infrastructural development and economic growth in Nigeria: Using simultaneous equation. *Journal of Economics 5* (3),325–332.

Onikosi-Alliyu, S. O., Mustapha, R. A., Yusuf, Y. M. & Shuaib, H. R. (2022). Impact of COVID-19 on external debt in Nigeria. *Lapai Journal of Economics, 5*(2),45-57.

Ozigbo, S. A. (2020). Interest rate dynamics and its impact on the performance of the manufacturing sub-sector in Nigeria. *International Journal of Development and Economic Sustainability, 8*(5),21-36.

Pack, H. & Saggi, K. (2006). Is there a case for industrial policy? A critical survey. *World Bank Research Observer, 21*(2), 267-296.

Phillips, P. C. B. & Perron, P. (1998). Testing for a unit root in time series regression. *Biometrika, 75*(2),335-346.

Rillo, A. D. & Ali, Z. (2018). Toward an innovative approach of financing infrastructure in Asia. *Journal of Infrastructure, Policy and Development, 2*(1),87-96.

Rostow, A. (1960). IMF and economic growth: The effects of programs, loans, and compliance with conditionality. *World Development, 34*(5), 769-788.

Stiglitz, J. E. (1989). Markets, market failures, and development. *The American Economic Review, 79*(2),197-203.

Tirole, J. (2015). Market failures and public policy. *American Economic Review,105*(6),1665-1682.

Udude, C. C. (2015). Impact of interest rate on savings in the Nigerian Economy. *Journal of Policy and Development Studies 9*(3),45-64.

Yoshino, N., Azhgaliyeva, D. &Mishra, R. (2020). Financing infrastructure using floating-interest-rate infrastructure bond. *Journal of Infrastructure, Policy and Development,4*(2),306-315.