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Original Research Article

Evaluating the Effect of Oil Price Volatility on Capital Expenditure of Federal Government in Nigeria

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Abstract

This study examined the effect of oil price volatility on federal government capital expenditure in Nigeria for the period 1993 to 2022 using secondary data from relevant government agencies. The study specifically examine the impact of Brent UK crude oil price volatility, OPEC spot rate crude oil volatility and West Texas Intermediate crude oil price volatility controlling the disruptions of oil subsidy, corruption and inflation on capital expenditure. The research employed an ex-post facto research design to produce results via Bounds test and Autoregressive Distributed Lag regression test. The long run estimate of the model report that Brent UK crude oil price volatility, OPEC spot rate crude oil volatility and West Texas Intermediate crude oil price volatility failed to report significant effect on the federal government capital expenditure in Nigeria. This shows that the oil price volatility is a short run phenomenon, that will fade out in short period, hence the reason for the high speed of adjustment of the error correction term. There is need for federal government in Nigeria to continually monitor crude oil international price and negotiate with OPEC on production output and quota. There is also need to monitor federal government's capital expenditure pattern and revenues in critical revenue generating agencies. Federal Government should remain committed to sustaining fiscal adjustments by creating fiscal space for capital and infrastructural development.

Keywords: Federal Government capital expenditure, oil price volatility, Brent oil price volatility, OPEC oil price volatility, West Texas Intermediate oil price volatility and oil subsidy cost, corruption perceptions index and inflation rate variation.

INTRODUCTION

Background to the Study

Many world economies are characterized by low capital accumulation and a lack of resources to meet rising government spending (Saheed *et al.*, 2018). Most governments are forced to resort to domestic and international borrowing to plug budget deficits and fund growth as public spending continues to increase and budget deficits widen. In the modern world, external borrowing has become indispensable (Soludo, 2018), because it complements domestic savings and helps countries to conduct productive activities. The determinants of government expenditure are important factors that are relevant for managing fiscal imbalances in developing countries, Nigeria inclusive (Raza *et al.*, 2019). This becomes more pungent when development challenges such as poor infrastructure, high level of unemployment, insecurity of life and properties are blooming. These developmental challenges persist in Nigeria, despite the huge government expenditure that are budgeted annually to solve them. Based on this, diverse fiscal policies measures are being adopted by the Nigerian government with the aim of managing national capital budget expenditures (Orji, 2019). Ramadhan (2019) opined that driving road infrastructure and education infrastructure had a significant impact on GDP per capita; and concluded that, it is necessary to strengthen capital budget planning for the development of public infrastructure to improve economic welfare. A notable characteristic of public finance in these countries is the strong pro-cyclicality of government expenditures and the non-oil operational balance in relation to oil price fluctuations (El Anshasy & Bradley, 2020; Villafuerte & Lopez-Murphy, 2019). Government spending usually acts as a

key transmission mechanism of oil price shocks to the macroeconomy (Husain *et al*, 2018; Sturm *et al.*, 2019).

In Nigeria, oil revenue is the dominant source of government accounting for 80% of total government revenue. Brent Crude Oil Price is the leading global price benchmark for Atlantic basin crude oils for Europe Sales. It is used to set the price of two-thirds of the world's international traded crude oil supplies. It is one of the two main benchmark prices for purchases of oil worldwide, the others being West Texas intermediate (WTI) for America crude sales and OPEC spot prices for Asia and African Sales. Oil revenue and oil prices stimulates all kinds of activities in the economy. Nigeria is spending about 118% of its revenue on debt servicing meaning it is also borrowing to service debt at interest rate. Foreign debt servicing is denominated in foreign exchange rate in dollars and pound sterling from Paris Club and London Club (Olayungbo, 2021). It has also suggested that uncertainty about future oil revenues and variability of such revenues arising from changes in oil price can influence the level of public expenditure in oil-dependent countries as governments reassess their expected income streams (Abdel-Latif *et al.*, 2018; Mourad & Hadadah, 2019).

In fact, most times, revenues have fallen short due to low oil prices Nigerian government was compelled to adjust its expenditure downward, the same way high oil prices have led to an upward adjustment in public expenditure (Orhewere, Ogbeide-Osaretin, 2020). Public expenditure tends to fluctuate in response to changes in oil prices (Adedokun, 2018). Available statistics from the Organization of Petroleum Exporting Countries (OPEC) illustrates that oil prices fluctuated during the 1996-2019 (Orhewere & Ogbeide-Osaretin, 2020). Evidence from the world and Nigeria shows that the nexus among government expenditure and oil price fluctuation is documented and have mixed results (positive and negative results) as shown in literature. This research will give in depth, holistic and examination of the nexus among these major determinants of capital expenditure with certain innovative contributions.

Statement of the Problem

Nigeria's Federal Government budget has been on an increase over the last thirty (30) years and the performance of the capital budget has been a subject of hot debate (Dikeogu, 2018). Developmental challenges persist in Nigeria, despite the huge government capital expenditure that are budgeted annually to solve them. Dikeogu (2018) noted that the level of capital expenditure is insufficient and inadequate to foster and achieve desired sustainable development goals in Nigeria. From a budget size of about ₦200 billion in 1990 to ₦3.93 trillion in 2010 and ₦10 trillion in 2020, available statistics suggest that the annual capital budget has not been able to improve the lives of Nigerians over the past several years because of observed low level of capital budget performance which is insufficient to foster rapid economic development and reduce poverty (Olaoye & Akinola, 2019). Davies *et al.* (2019) identify barriers causing the poor implementations of Sustainable Development Goals in Nigeria namely inadequate allocation to capital expenditure, poverty, poor accountability, inadequate domestic water supply, poor energy supply, poor human capital development initiatives, poor transportation and telecommunication networks, illiteracy level, and environmental degradation. This becomes more pungent when development challenges such as poor infrastructure, high level of unemployment, insecurity of life and properties are blooming.

Despite consistent improvement in government budgetary allocation on health, education, transport, road construction and defense sectors in Nigeria, the country is still bedeviled with problems of poor health infrastructure, low educational facilities in area of primary education, research and development, bad roads with attendant accidents and inaccessibility to farm settlements and incessant insecurity (Richardson & Chigozie, 2019). Implications of problem of government capital expenditure are infrastructural deficits, the loss of many lives and properties due to road accidents caused by bad roads. If the budget is well implemented, and the roads are fixed it would prevent accidents. Relocations of many companies from Nigeria to other countries as a result of non-implementation of budget on electricity. The relocation of those companies has created unemployment for their workers and their contributions to GDP is gone (Adah & Akogu, A., 2019; Raza *et al.*, 2019). The national capital budget is always at risk and not exempted from exposures like accounting exposure, forecasting exposure, transaction exposure, and macroeconomic exposure. Oil forecast, tax forecast and other uncertainties in budget projections are major practical and academic issues in public sector accounting (Effiom & Edet, 2019; Gurdal *et al.*, 2021).

Since the 1990s, oil price cycles have been highly unpredictable. Fiscal policy in oil-exporting economies plays a significant role in managing the highly volatile and uncertain oil revenues (Adewale, 2021; Olayungbo, 2021). Though, in the quest to reduce the effect of this shock, the authorities was forced to lower its oil revenue projection to ₦820 billion from oil exports in 2016 based on a benchmark price of $38/barrel from a projected oil earnings of ₦3.9 trillion predicated on a price assumption of $53/b in 2015 (Ebi & Aladejare, 2022). In the light of the above, it is most appropriate to embark on academic investigation into the relationship between oil price variation and capital government expenditure with a view to proffering solutions to ensure fiscal balance and identify problems that militate against balanced implementation of

national annual capital expenditure of Federal Government of Nigeria.

Objectives of the Study

The broad objective of the study is to investigate the effect of oil price volatility on capital expenditure of the Federal Government of Nigeria, while the specific objectives are to:

1. investigate the effect of Brent oil price volatility on capital expenditure of Federal Government in Nigeria;
2. examine the relationship between OPEC oil price volatility and expenditure of Federal Government in Nigeria;
3. evaluate the effect of West Texas Intermediate oil price volatility on capital expenditure of Federal Government in Nigeria.

Research Hypotheses

This study is designed to test the following null hypotheses:

H_{01}- Brent oil price volatility has no significant effect on capital expenditure of Federal Government in Nigeria;

H_{02}- OPEC oil price volatility has no significant relationship with capital expenditure of Federal Government in Nigeria;

H_{03}- West Texas Intermediate oil price volatility has no significant effect on capital expenditure of Federal Government in Nigeria.

Scope of the Study

The time scope of the study on assessing the effect of oil price volatility and capital expenditure of Federal Government of Nigeria is based on the national annual budgets of the fiscal years 1993 to 2022. The period is regarded as a time of natural resources (oil) crisis, public infrastructure failure, industrial collapse, price instability, illicit economic activities and terrorist attacks.

LITERATURE REVIEW

Capital expenditure

Capital expenditure is the government capital spending on capital projects, provision of infrastructures as well as major repairs, restructuring and overhauling of the existing ones to match with the present needs of the citizens (Pantamee *et al.*, 2020). According to Gitonga et al. (2022) capital budget expenditure involves spending on infrastructural projects such as highways, ports, fiber optic, standard gauge railway, agriculture mechanization, improving public health infrastructure, massive investment in road management and maintenance, defense and education development spending. In all developing nations, public investment serves a very important purpose and is very paramount for a sustainable economic development. Governments spend on capital projects like roads construction, airports, building of new schools, health care centers, electricity generation, telecommunications and buying of new software, specialist hospitals, to be able to adequately develop an economy (Olaoye & Akinola, 2019). These categories of expenditures are referred to as capital investments and are made on capital projects which help to maintain or improve government properties, usually called infrastructures (Ogbonna & Appah, 2018).

The capital budget therefore is the aspect of the overall national budget that determines the allocation of funds to finance capital projects and critical infrastructure, such as the construction of roads, bridges, hospitals, schools, prisons, public administrative buildings, highways, dams, and irrigation systems; the purchase of machinery and equipment; and the supply of water, electricity, and transport, health, and educational facilities (Orisanaiye *et al.*, 2020) The capital budget, unlike the recurrent budget, is intended to provide funds to finance capital expenditures, such as the construction of durable assets. Capital expenditures may be on short or long term capital projects. For instance in Portland, a capital project has to satisfy certain conditions such as: it must be a new construction, expansion, renovation, or replacement project for an existing facility or facilities before it could be classified as capital expenditure (Gurdal *et al.*, 2021). They have a productive life of several decades and help to provide a more efficient economy (Delavallade, 2019).

Oil price volatility

Oil production is centralized by the world organization OPEC, whose members control about 73% of the total production of oil. Ramyar and Kainfar (2019) speak about the necessity and importance of oil and mention entities for which the information about oil prices is particularly important-especially enterprises, governments, and policy-makers. According to Aamir *et al.* (2018), future oil prices are highly dependent on historical prices. The authors also state that in recent years, the future oil prices are considered very uncertain. For this reason, great attention is currently paid to their prediction, including the methods of measurement, especially from the side of investors, economists, academics, government agencies, etc. Crude oil prices always seem to be fluctuating over time, showing different degrees of ups and downs. The degree of the responsiveness of different countries to the volatility of oil prices typically varies according to economic conditions worldwide. However, for both oil-importing and oil-exporting nations, oil continues to play a key position, because it is a critical energy source and one of the most exchanged product. In case of oil-consuming countries, the rise in oil prices is bad news as it affects production, investment decision and economic growth. Arise in oil prices will cause an increase in the cost of producing domestic products and this will affect production and output negatively (Alekhina & Yoshino, 2018; Charfeddine & Barkat, 2020).

Brent crude oil price volatility

The price of crude oil depends heavily on its different classifications, and these classifications depend on several factors. The most important of which are origin (Brent, West Texas) and its density (light, medium density, heavy) as well as its sulphur content (Alvarez-Diaz, 2020). Brent crude derives its name from a Shell oil exploration title on an oil field it has verified in the North Sea region on behalf of Exxon Mobile and Royal Dots Shell. Shell has named all the oil fields by the names of birds. In this case, the area was named after "goose Brent". The Brent blend is an oil ore used as a benchmark to price two-thirds of global oil production, especially in European and African markets. Brent consists of an oil mix of 15 different fields in the Brent and Tienen regions (some in the United Kingdom and others in Norway) which produce about 500,000 barrels per day (Uzo-Peters *et al.*, 2018).

West texas intermediate (WTI) crude oil price volatility

The West Texas Intermediate (WTI) crude oil is a sweet and light oiland has a specific weight of 396 degrees and contains 0.24% of the sulphur only, which makes it superior to OPEC oil and Brent crude (Caporin *et al.*, 2019). On average WTI is sold for about $2 more than the OPEC basket, and is about $1 higher than Brent because of its quality and is the main source of gasoline in the United States (Klein, 2018). As his name implies, most of it is produced in West Texas. It is one of the global measurement materials used in pricing other materials, especially in North America. The city of Cushing, Oklahoma, is the world's largest oil market and the pricing point as the centre of intersection of a wide range of oil pipelines that enable the transfer of oil to various parts of the United States including US ports and then anywhere in the world (Caporin *et al.*, 2019). Crude oil is an essential commodity and dominates many aspects of global economics and politics. There are two major benchmarks for world oil prices, West Texas Intermediate (WTI henceforth) crude oil and Brent crude oil, which are both light and sweet. WTI refers to oil extracted from wells in the US and sent via pipeline to Cushing, Oklahoma (Caro *et al.*, 2020). The supplies are land-locked, and it is relatively expensive to ship to certain parts of the globe. Brent refers to oil from fields in the North Sea. Because the supply is water-borne, it is easier to transport to distant locations.

OPEC reference basket price

Nigeria being among the members of the Organization of the Petroleum Exporting Countries (OPEC)does abide by the benchmark of prices of crude oil set by OPEC for all the oil producing countries on four classifications according to their grades; (i) West Texas Intermediate (WTI)–Texas Light Sweet with grade of crude oil used as a benchmark in oil pricing. It was also described as light because of its relatively low density and because of its low sulphur content. (ii) Market Average (MA)–price of crude oil U.S. dollars per barrel based on average in the market. (iii) Bonny Light (BL)–a high-grade crude oil with high API gravity (low specific gravity).(iv) Brent (BP)-trading classification of sweet light crude oil that serves as a major benchmark price for purchases of oil worldwide(Ayoola & Olanrewaju, 2018). According to OPEC (2022), ORB is currently made up of the following type of crude oils: Saharan Blend, Girassol, Djeno, Zafiro, Rabi Light, Iran Heavy, Basra Medium, Kuwait Export, Es Sider, Boony Light, Arab Light, Murban and Merey. The OPEC oil market is highly volatile with a pronounced cyclicality. Oil has been transformed into a financial asset because trading in financial derivatives (futures) greatly exceeds physical oil's global production and consumption. Islamic Republic of Iran, Venezuela, Kuwait, Saudi Arabia and Iraq founded the Organization of the Petroleum Exporting Countries (OPEC) in 1960 (OPEC, 2020). Later Qatar, Indonesia, Libya, the United Arab Emirates, Algeria, Nigeria, Gabon, Angola, Equatorial Guinea and Congo joined the cartel (OPEC, 2020). OPEC produces approximately 44% of the total crude oil production. OPEC tries to control the oil price by manipulating the supply and demand of the oil.

Control variables of the study

Oil subsidy, corruption and inflation are employed as control variables of the study. The control variables will enhance the internal validity of the study by limiting the influence of confounding and extraneous variables namely distortions of huge oil subsidy payment, hydra-headed corruption and hydra inflationary trends on capital expenditure. The three control variables will be held constant in the study models and will help to validly establish whether there is correlational or causal relationship between the variables of interest in this study and avoid research bias.

Oil subsidy

Namovsky (2018) defined subsidy as any government intervention, in cash or kind, to private sector producers or consumers for which the government receives no equivalent compensation in return. Fuel subsidy has been a growing liability to Nigeria's budgets, in a systematic fashion for almost four decades, hence creating vested interest. The exponential growth of Cost of fuel subsidy is due to the rising cost of Crude oil in the international market, exchange rate volatility and the population growth of Nigeria which resulted in increased petroleum consumption,' the combination of these three variables therefore made the Cost of the fuel subsidy unsustainable. Understanding the Current fuel subsidies magnitude is critical for advancing reform because it underscores the potential socio-economic benefits to be realized (Kyle, 2018). In addition to the burden that fuel subsidy is placing on the national budget, keeping petroleum below the market Value has discouraged

additional investment in Nigeria's oil sector, because the visibility of recovering the investment under the artificially low price structure is uncertain. With 5.1 trillion cubic meters of proven natural gas reserves and 26.8 billion cubic meters of export in 2014, Nigeria is not only Africa's biggest natural gas country, but also the world's 3rd largest producer. It is also 4th biggest crude oil exporting nation, having produced 2.1 million barrels per day in 2014, and the 8th in proven crude oil reserves (Namovsky, 2018).

Corruption

There is no generally accepted and precise definition of the word corruption. One short version is 'the abuse of public power for private benefit, which focuses particularly on the public sector (Delavallade, 2019). Transparency International uses the broader definition 'abuse of entrusted power for private gain'. The latter also includes various forms of corruption that takes place in the private sector and elsewhere. The current state of corruption in Nigeria has been categorised as endemic; corruption has been identified as one major obstacle to economic growth and development of the Nigerian economy (Okafor *et al.*, 2020). Several incomes generated from the oil industry in Nigeria are diverted to the pockets of some individuals, whose responsibility is to manage the resources on behalf of the nation. Donwa *et al*. (2019) viewed corruption as diverting the resources that should have been used for the developmental purpose of the society to private or personal use. Ngwakwe (2019) defined corruption as the illicit activities done with purposes of making prosperity unlawfully either alone, in collectively thereby disrespecting standing laws put in place guild the business actions of government. Salisu (2020) defined corruption as the misapplication of public resources to private ends. For instance, government actors ask for inducement for carrying out their official duties. Corruption Perceptions Index (CPI) by Transparency International (TI) ranks 180 countries and territories around the world by their perceived levels of public sector corruption. The result are given on a scale of 0(highly corrupt) to 100(very clean). The CPI aggregates data from a number of different sources that provide perceptions among business-people and country experts of the level of corruption in the public sector.

Inflation

Almahdi and Faroug (2018) describes inflation as a persistent tendency for price and money wages to increase. Inflation is measured by the proportional changes over time in some appropriate price index, commonly a consumer price index or a GDP deflator. Consumer price index measure of inflation, shows the yearly percentage change in the cost to the average consumer of purchasing a basket of goods and services that may be fixed or changed at particular intervals, such as annually. For instance, petroleum oil price explosion in the world market and excess crude oil can trigger off inflation in the economy if the increased income is not properly managed. Mukhtarov *et al.* (2019) further stated that demand-pull inflation can be caused by too much aggregate demand. According to Almahdi and Faroug (2018) the neo-classical economists defined inflation as a galloping rise in prices as a result of the excessive increase in the quantity of money. The Nigerian economy has been struggling with tackling inflationary pressure for decades. In the 1980s and 1990s, the annual consumer price index inflation rate stood at an average of about 22.1% and 30.63% respectively (World Development Indicator WDI,2020). There was an easing in inflationary pressure in the 2000s with the annual consumer price index inflation rate falling to about 11.53% on the average between the year 2000 and last the quarter of the year 2015 (WDI, 2018). However; more recent statistics have shown that the nation is yet to achieve desired success in stemming inflation to a sustainable single-digit rate as 2018 and 2019 statistics show annual inflation rates of 15.67% and 16.52% respectively (WDI, 2020).

Theoretical Review

Peacock and Wiseman theory of public expenditure

Allan Peacock and Jack Wisemen theory, otherwise known as PWT, was based on the political theory of public expenditure determination which states that government likes to spend more money, that citizens do not like to pay more taxes, and that government needs to pay some attention to the aspiration and wishes of their people. PWT attempted to explain the circular trend or time pattern of change in government expenditure in response to development in the political economy while the taxable capacity of the electorate acts as a constraint. Their theory is known as Displacement Hypothesis and is based on the experience of Great Britain. The Displacement hypothesis states that government expenditure grows in step wise fashion (Peacock & Scott, 2000). Peacock and Wiseman (1979) in a study of public expenditure from 1891 to 1955 in U.K. asserted that Wagner's Law is valid as they made the following conclusions: that increase in government spending depends on income generated by the government as economic development brings in considerable proceeds to the governments; which make it possible to increase her spending; there is a difference between the hope of the people about public expenditure and the tolerance level of taxation in the economy.

Empirical Review

Effect of oil price volatility on capital expenditure

Raouf (2021) employed the vector autoregressive model (VAR), impulse response function and variance decomposition to study the impact of oil price shocks on components of government spending on both oil-exporting and oil importing countries over the period from 1980 to 2018. While the vast majority of previous studies focused on the impact of oil price shocks on government spending, this study emphasized

the impact of these shocks on the current and capital government expenditure. It was found that oil price shocks affect government current expenditure positively in the two groups of countries. While it affects government capital expenditure positively in oil-exporting countries and negatively in oil-importing countries. Raouf (2021) asserts that Oil revenue has played an important role in the annual government budgets of many countries around the globe. There is no doubt that government decisions to spend on consumption or investment is highly affected by changes in oil prices. The results indicate that in oil exporting countries, revenues generated from increasing oil prices helps to increase countries' growth rate and enhance current and capital expenditure or in another words the government will use this revenue to spend and invest more.

While in case of oil importing countries, the increase in oil prices will affect growth rate in two different ways as it affects the fund available to import the materials needed for the production process and at the same time restricted the funds necessary to invest. Qwader (2018) studied the effect of fluctuations in oil prices on a number of factors of the Jordanian budget using ordinary least squares using annual data over the period from 1992 to 2015. The main results indicate that oil price shocks have statistically significant positive impact on government and tax receipts, foreign grants and government spending. While with respect to the effect on budget deficits, oil price shocks have statistically significant negative impact.

Koh (2017) examined the macroeconomic implications of the downward oil price shock in 40 crude-exporting countries under various exchange rate systems and fiscal policy structures over the period from 1973 to 2010 using VAR techniques. The findings indicate that government output and demand declined because of the fall in oil prices. Nevertheless, in countries with flexible currency regimes, the production reaction is considerably smaller and simpler due to a larger, instant reduction of real exchange rates. Contractionary fiscal policy is also less required as depreciation of the currency plays an effective damping function. Upstream oil price variation is omitted. Only West Texas Intermediate (WTI) Oil Price Volatility is used and the proposed study will use WTI, OPEC spot rate and Brent Crude oil price volatility. Johansen Co-integration for pre-test; while Vector Error Correction Model (VECM) is not employed as estimation techniques.

Erdogan *et al.* (2020) examined the relationship between volatility in oil prices and military expenditures in GCC countries (United Arab Emirates, Bahrain, Qatar, Kuwait, Saudi Arabia and Oman) using ARDL Model. According to the Bound test results, there is a cointegration relationship between the variables in all countries in all countries. Besides, the long-term results showed that the volatility in oil prices in all countries, except for Bahrain, positively affects military expenditures. The error correction model indicated that there is a reverse relationship between oil price volatility and military expenditure. These findings indicated that despite the volatility in oil prices, military expenditures in GCC countries are not reduced. Only military expenditure is captured as against total government expenditure on budget implementation. Also, OPEC spot price is the only oil price variant used in the study. Adedokun (2018) investigated the effects of oil shocks (price) on the dynamic relationship between government revenues and government expenditure in Nigeria using structural VAR (SVAR) on data from 1981-2014. The results of SVAR show that oil price shocks could not predict the variation in government expenditure in the short run, while the predictive power of oil revenue is very strong both in the short run and in the long-run on government expenditure. The structural VAR (SVAR) deployed in this study did not indicate the direction of the causation and effect among the variables. This makes the estimation result incomplete. Hence, the proposed study will us ECM and VECM analysis in addition to cointegration tests.

Gap Identified in the Literature

From the analysis of previous researches, the causal relationship between oil price volatility and capital expenditure is inconsistent; mixed results is evident with some results indicating that oil price volatility have a positive influence on government capital expenditure (Abu *et al.*, 2022; Erdogan *et al.*, 2020; Jibir & Aluthge, 2019), others find that oil price volatility has no significant influence on capital expenditure (Adedokun, 2018; Anis, 2020; Mohammed & Sani, 2020).But, oil price volatility had a negative effect on capital expenditure (Betour, 2020; Ebi & Aladejare, 2022; Orhewere & Ogbeide-Osaretin, 2020). None of the accessible previous studies examined the effect of volatilities of Brent crude oil price, West Texas Intermediate oil price and OPEC spot crude oil price on capital expenditure which this study seek to evaluate. A number of studies have link a rise or fall in capital expenditure of federal government to several factors including oil price volatility (Abdel-Latif *et al.* , 2018; Abu *et al.*, 2022; Adedokun, 2018; Ebi & Aladejare, 2022; Erdogan *et al.*, 2020; Mohammed & Sani, 2020; Qwader, 2018; Raouf, 2021), corruption (Anfofum & Olure-Bank, 2018; Donwa *et al.*, 2019; Delavallade, 2019; Serife & Gulbahar, 2017), oil subsidy (Namovsky, 2018), inflation rate uncertainty (Almahdi &Faroug, 2018; Dikeogu, 2018; Mukhtarov *et al.*, 2019), amongst others. Whether these or any other factors could rightly be held responsible for the long-term increase or decrease in capital budget expenditure remains unresolved empirical questions. These mixed results and inconclusive arguments, is as a result of differences in their study periods, test statistics used, sources of their data, study jurisdictions among

others, which necessitated this study to close these gaps by providing further empirical evidence on the impacts of revenue and budget risk factors on capital expenditure in Nigeria.

METHODOLOGY

Research Design

The research design for the study is *ex post facto* research analysis of annual multivariate time series data due to the nature of proposed data. The study examined the historical data in order to understand the historical state of capital expenditure and oil price volatility in Nigeria.

Sources and Methods of Data Collection

All the data used in this research come from secondary sources. Annual time series data for Nigeria will be used from 1993 to 2022. The time series data is sourced from statistical bulletins from Office of the Accountant General of the Federation (OAGF), Budget Office of the Federation, OPEC and Energy International Agency (EIA).

Description and Measurement of Variables

The description and measurements of variables of the study are shown in table 1

Table 1: Description and Measurement of Variables

Variable	Proxy/Symbol	Measurement	Sources
Capital Expenditure (Dependent Variable)	Federal Government Capital Expenditure (FGCE)	Summation of all federal government expenditure in a fiscal year	Zakaria & Shamsuddin (2017); Yinusa *et al.* (2017); Oliver *et al.* (2017)
Oil Price Volatility (Budget Risk factor) Independent variable	OPEC spot rate Crude Oil Price (OP); Brent Crude Oil Price (BP): West Texas Intermediate (WTI)	Average OPEC spot rate Crude Oil Price(OP) per fiscal year; Average Brent Crude Oil Price (BP) per fiscal year; Average West Texas Intermediate (WTI) per fiscal year	Erdogan et al. (2020); Zakaria & Shamsuddin (2017); Adedokun (2018)
Oil Subsidy (Control Variable)	Oil Subsidy payment to major petroleum marketers (OS)	Total Petroleum Products subsidy payments to Downstream Marketers in a fiscal year	Deh & Edeh (2020)
Corruption (Control Variable)	Corruption Perceptions Index (CPI).	Average scale of Corruption Perceptions Index (CPI) per fiscal year.	Salisu (2020); Ben *et al.* (2018)
Inflation Rate (Control Variable)	Consumer Price Index	Average Changes in general price level per fiscal year (an average of the consumer price level (cpi)	Serife & Gulbahar (2017)

Source: Author's Compilation, 2022

Model Specification and Variable Measurement

The following multiple linear regression analysis models are used as guide to study the four specific research objectives:

Objective: to evaluate the effect of oil price volatility on capital expenditure of Federal Government in Nigeria; the model (1) below is adapted from work of Erdogan et al. (2020) i.e. Government Spending=f(Oil Price Variation); oil price volatility is segregated into Brent oil volatility, OPEC price volatility and West Texas Intermediate volatility.

$FGCE=f(BP,OP,WTI,OS,CPI,IRV)$…… (1)

$FGCE=\beta_0+\beta_1 BP+\beta_2 OP+\beta_3 WTI+ \beta_4 OS + \beta_5 CPI + \beta_6 IRV + \varepsilon$ ……..…(2)

Where: FGCE represents Federal Government Capital Expenditure (Proxy for Capital Expenditure) (Dependent variable); BP represents Brent Oil Price Volatility (Independent variable); OP represents OPEC Oil Price Volatility (Independent variable); WTI represents West Texas Intermediate Oil Price Volatility (Independent variable); OS represents Oil Subsidy (Control variable); CPI represent Corruption Perceptions Index (Control variable); IRV represent Inflation Rate Variation (Control variable); β_0, β_1, β_2, β_3, β_4, β_5 and β_6 are regression coefficients to be estimated and ε is Error term.

Data Analysis and Interpretation of Results

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

Descriptive Statistics

The result of the descriptive statistics of the variables used in the model estimation was captured in this section. Table 4.1 report the outcome of the descriptive statistics. The variable of Federal Government Capital Expenditure (FGCE) report an average of 808.586 billion naira, which implies that in average during the sample period the country FG spent about 808.586 billion naira on the capital projects. The maximum amount spent on capital projects was 3079.87 billions naira between 1993 and 2022, indicating the highest recorded capital expenditure by the federal

government. The minimum FGCE is 54.5 billion naira, representing the lowest recorded capital expenditure. The standard deviation of FGCE is 682.239 billion naira, suggesting a relatively high variability in capital expenditure. The skewness of 1.549 indicates a positively skewed distribution, indicating that there may be some extreme values or outliers on the higher end. The kurtosis of 5.512 implies a leptokurtic distribution, indicating the presence of heavy tails and potential outliers. The Jarque-Bera statistic of 19.894 suggests a departure from normality, as indicated by the low probability value of 0.000.

The Brent UK Crude Oil Price Volatility (BP) report the mean of 54.19167 US Dollars, representing the average volatility of Brent UK crude oil prices. The maximum BP is 111.63 US Dollars, indicating the highest recorded volatility of Brent UK crude oil prices. The minimum BP is 12.8 US Dollars, representing the lowest recorded volatility. The standard deviation of BP is 32.43162 US Dollars, suggesting moderate variability in Brent UK crude oil price volatility. The skewness of 0.40381 suggests a nearly symmetrical distribution with a slight positive skew. The kurtosis of 1.898424 indicates a platykurtic distribution with lighter tails compared to a normal distribution. The Jarque-Bera statistic of 2.332148 indicates no significant departure from normality, as evidenced by the relatively high p-value of 0.311. The OPEC Spot Rate Crude Oil Volatility (OP) report the mean of 52.139 US Dollars, representing the average volatility of OPEC spot rate crude oil prices. The maximum OP is 109.08 US Dollars, indicating the highest recorded volatility of OPEC spot rate crude oil prices. The minimum OP is 12.3 US Dollars, representing the lowest recorded volatility. The standard deviation of OP is 32.00669 US Dollars, suggesting moderate variability in OPEC spot rate crude oil price volatility. The skewness of 0.413408 suggests a nearly symmetrical distribution with a slight positive skew. The kurtosis of 1.87622 indicates a platykurtic distribution with lighter tails compared to a normal distribution. The Jarque-Bera statistic of 2.433133 indicates no significant departure from normality, as evidenced by the relatively high p-value of 0.296.

West Texas Intermediate Crude Oil Price Volatility (WTI): The mean WTI is 52.23867 US Dollars, indicating the average volatility of the West Texas Intermediate crude oil price in Nigeria. The median WTI is 49.77000 US Dollars, representing the middle value of the data. This suggests that the distribution of WTI volatility is relatively symmetrical. The maximum WTI is 99.06000 US Dollars, indicating the highest recorded volatility of the crude oil price during the given period. The minimum WTI is 14.39000 US Dollars, representing the lowest recorded volatility. This suggests that there have been periods of relative stability in the crude oil price. The standard deviation of WTI is 28.67264 US Dollars, indicating significant variability in crude oil price volatility. The skewness of 0.303091 suggests a slightly positively skewed distribution. The kurtosis of 1.74627 indicates a platykurtic distribution with lighter tails compared to a normal distribution. The Jarque-Bera statistic of 2.424119 indicates no significant departure from normality, as evidenced by the relatively high p-value of 0.297584.

Table 2: Descriptive Statistics

Variable	Mean	Median	Max.	Mini.	Std. Dev.	Skewness	Kurtosis	Jarque-Bera	Prob	Obs
BP	54.191	53.285	111.63	12.8	32.431	0.403	1.898	2.332	0.311	30
CPI	20.6	24	28	7	6.677	-0.83	2.448	3.827	0.147	30
FGCE	808.586	697.06	3079.87	54.5	682.239	1.549	5.512	19.894	0	30
IRV	12.483	12.37	21.95	5.42	4.426	0.377	2.355	1.23	0.54	30
OP	52.139	48.99	109.08	12.3	32.006	0.413	1.876	2.433	0.296	30
OS	453.322	133.01	3400	5.46	706.1	2.783	11.421	127.382	0	30
WTI	52.238	49.77	99.06	14.39	28.672	0.303	1.746	2.424	0.297	30

Source: Researcher's Compilation, 2023, from E view 9.0

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Correlation analysis

The correlation matrix shows the pairwise correlations between the variables used in the study. - FGCE (Federal Government Capital Expenditure): FGCE has a strong positive correlation with BP (0.595), OP (0.618), and WTI (0.587), indicating that there is a positive relationship between FGCE and these variables. FGCE has a strong positive correlation with OS (0.801) and CPI (0.607), suggesting a positive relationship between FGCE and these variables. FGCE has a weak positive correlation with IRV (0.344), indicating a relatively weaker positive relationship between FGCE and IRV. BP (BP Stock Price): BP has a moderate positive correlation with FGCE (0.595), OP (0.499), and WTI (0.492), indicating positive relationships between these variables. OP (Oil Price): OP has a moderate positive correlation with FGCE (0.618), BP (0.499), and WTI (0.490), suggesting positive relationships between these variables. WTI (WTI Crude Oil Price): WTI has a moderate positive correlation with FGCE (0.587), BP (0.492), and OP (0.490), indicating positive relationships between these variables.

OS (Oil Subsidy Cost): OS has a very moderate positive correlation with FGCE (0.801), indicating a significant positive relationship between these variables. OS has a moderate positive correlation with BP (0.456), OP (0.470), and WTI (0.441), suggesting positive relationships with these variables. OS has a weak positive correlation with CPI (0.395), indicating a relatively weaker positive relationship. CPI (Nigeria Corruption Index): CPI has a moderate positive correlation with FGCE (0.607), suggesting a positive relationship between these variables. CPI has a strong positive correlation with BP (0.447), OP (0.455), WTI (0.447), and OS (0.395), indicating positive relationships with these variables. CPI has a weak positive correlation with IRV (0.010), indicating a relatively weaker positive relationship. IRV (Inflation Rate Variation): IRV has a weak positive correlation with FGCE (0.344), indicating a relatively weaker positive relationship between these variables. IRV has a very weak positive correlation with CPI (0.010), suggesting a negligible positive relationship.

Table 3: Correlation Analysis

Correlation							
Probability	**FGCE**	**BP**	**OP**	**WTI**	**OS**	**CPI**	**IRV**
FGCE	1						
BP	0.59545	1					
	0.0005	-----					
OP	0.61817	0.49872	1				
	0.0003	0	-----				
WTI	0.58656	0.49232	0.48975	1			
	0.0007	0	0	-----			
OS	0.80103	0.45598	0.47022	0.44086	1		
	0	0.0001	0.0001	0.0001	-----		
CPI	0.60673	0.44747	0.45497	0.44651	0.3954	1	
	0.0004	0	0	0	0.0306	-----	
IRV	0.34378	-0.0182	-0.0133	-0.0119	0.34332	0.01034	1
	0.0629	0.924	0.9442	0.9501	0.0633	0.9568	-----

Source: Researcher's Compilation, 2023, from E view 9.0

ARDL model interpretation

Having obtained the result of the diagnostic test and it was discovered that the model is robust, therefore the study can interpret the model estimate of the effect of the oil price volatility on the federal government capital expenditure in Nigeria. From the result in Table 4.3, in the short run, the first period change in FGCE report the coefficient of -0.011575, the t-value of -0.125277, and the p-value of 0.9052, which shows that change in the lagged FGCE variable has insignificant effect on the current change in FGCE. The variable of D(FGCE(-2)) with the coefficient of 0.677445, the t-value of 6.270135, and the p-value of 0.0015 shows that a one-unit change in the FGCE two periods ago has a significant positive effect on the current FGCE. The coefficient of D(BP) is -8.970828, the t-value is -0.611159, and the p-value is 0.5678. The coefficient suggests that a one-unit change in Brent UK Crude Oil Price Volatility has a negative effect on FGCE, but it is not statistically significant. This implies that current or immediate change in brent oil price does not leads to immediate change in the capital expenditure in the country. The coefficient of D(BP(-1)) is -96.55132, the t-value is -5.221979, and the p-value is 0.0034. The coefficient indicates that a one-unit change in the lagged Brent UK Crude Oil Price Volatility has a significant negative effect on FGCE. The result shows that rise in the previous Brent UK Crude Oil Price will bring about the fall in the capital expenditure of the country.

The variable of OP (OPEC Spot Rate Crude Oil Volatility) at the current change failed to report significant effect on the federal government capital expenditure, but one lagged change in the OPEC Spot Rate Crude Oil Volatility, exhibit significant positive effect on the federal government capital expenditure in Nigeria with the coefficient of 72.38945, the t-value of 4.314808, and the p-value of 0.0076. The result implies that in the short run, the country capital expenditure increases as the price of the OPEC Spot Rate Crude Oil Volatility increases. The variable of WTI shows that in the short run, the coefficient of WTI report a value of 27.02967, the t-value of 3.989530, and the p-value of 0.0104. The coefficient suggests that a one-unit change in West Texas Intermediate Crude Oil Price Volatility has a significant positive effect on FGCE. The coefficient D(WTI(-1)) is 36.20320, the t-value is 5.658459, and the p-value is 0.0024. The coefficient indicates that a one-unit change in the lagged West Texas Intermediate Crude Oil Price Volatility has a significant positive effect on FGCE. The coefficient of D(OS(-1)) is 0.804435, the t-value is 8.839136, and the p-value is 0.0003. The coefficient indicates that a one-unit change in the lagged Oil Subsidy Cost has a significant positive effect on FGCE. The coefficient of D(CPI) is 35.24096, the t-value is 4.351390, and the p-value is 0.0073. The coefficient suggests that a one-unit change in the Nigeria Corruption Index has a significant positive effect on FGCE. The coefficient of D(CPI(-1)) is -21.49602, the t-value is -2.646242, and the p-value is 0.0456.

The coefficient indicates that a one-unit change in the lagged Nigeria Corruption Index has a significant negative effect on FGCE. The coefficient of D(IRV) is 20.91952, the t-value is 4.057116, and the p-value is 0.0098. The coefficient suggests that a one-unit change in Inflation Rate Variation has a significant positive effect on FGCE. The coefficient of D(IRV(-1)) is 28.48946, the t-value is 6.099298, and the p-value is 0.0017. The coefficient indicates that a one-unit change in the lagged Inflation Rate Variation has a significant positive effect on FGCE. Moreover, the error correction term report a coefficient of -0.634741 and t-value of -9.540022. The result shows that error correction term is statistically significant and negatively signed, which implies that the model will converge to equilibrium in the long run. The coefficient shows that about 63.4% of the errors will be corrected annually. More so, the long run estimate of the model report that Brent UK Crude Oil Price Volatility (BP), OPEC Spot Rate Crude Oil Volatility (OP) and West Texas Intermediate Crude Oil Price Volatility (WTI) failed to report significant effect on the federal government capital expenditure in Nigeria. This shows that the volatility is a short run phenomenon, that will fade out in short period, hence the reason for the high speed of adjustment of the error correction term. The R-squared value is 0.961915, indicating that the independent variables explain approximately 96.19% of the variance in FGCE in the long run. The adjusted R-squared value is 0.917482, which takes into account the degrees of freedom.

Table 4: ARDL Model Estimate of Effect of oil price volatility on Federal Government Capital Expenditure in Nigeria

	Short Run Estimate		
	Coefficient	**t-value**	**p-value**
D(FGCE(-1))	-0.011575	-0.1253	0.9052
D(FGCE(-2))	0.677445	6.27014	0.0015
D(BP)	-8.970828	-0.6112	0.5678
D(BP(-1))	-96.55132	-5.222	0.0034
D(OP)	-20.27386	-1.2003	0.2838
D(OP(-1))	72.38945	4.31481	0.0076
D(WTI)	27.02967	3.98953	0.0104
D(WTI(-1))	36.2032	5.65846	0.0024
D(OS)	0.149582	1.92054	0.1129
D(OS(-1))	0.804435	8.83914	0.0003
D(CPI)	35.24096	4.35139	0.0073
D(CPI(-1))	-21.49602	-2.6462	0.0456
D(IRV)	20.91952	4.05712	0.0098
D(IRV(-1))	28.48946	6.0993	0.0017
CointEq(-1)*	-0.634741	-9.54	0.0002
	Long Run Estimate		
	Coefficient	t-value	p-value
BP	157.1117	1.15115	0.3017
OP	-126.3603	-1.2929	0.2526
WTI	-57.41133	-1.0043	0.3613
OS	0.506112	0.57663	0.5892
CPI	139.9466	2.27681	0.0718
IRV	8.129842	0.20926	0.8425
C	-1481.006	-1.7026	0.1494
R-squared	0.961915		
Adjusted R-squared	0.917482		

Source: Researcher's Compilation, 2023, from E view 9.0

DISCUSSION AND FINDINGS

The long run estimate of the model report that Brent UK crude oil price volatility, OPEC spot rate crude oil volatility and West Texas Intermediate crude oil price volatility failed to report significant effect on the federal government capital expenditure in Nigeria. This shows that the oil price volatility is a short run phenomenon, that will fade out in short period, hence the reason for the high speed of adjustment of the error correction term. The model's R-squared value of 0.988520 indicates that the independent variables collectively explain a large proportion of the variation in FGCE in the long run. The adjusted R-squared value of 0.979335 accounts for the degrees of freedom in the model. The F-value of 159.9104 is statistically significant at the 1% level (p-value: 0.000000), indicating that the model is overall significant in explaining the variation in FGCE. The results of the study were found to be in conflict with those of (Abu *et al.*, 2022; Erdogan *et al.*, 2020; Jibir & Aluthge, 2019), others find that oil price volatility has no significant influence on capital expenditure (Adedokun, 2018; Anis, 2020; Mohammed & Sani, 2020).But, oil price volatility had a negative effect on capital expenditure (Betour, 2020; Ebi & Aladejare, 2022; Orhewere &

Ogbeide-Osaretin, 2020). The result of the study shows evidences that federal government capital expenditure in Nigeria responds largely to fiscal sychronisation theory. Thus, the behaviour of Federal government capital expenditure in Nigeria cannot be fully understood from the orthodoxy of the Wagner's theory and Peacock-Wiseman theories. There is need to monitor federal government's capital expenditure pattern and revenues in critical revenue generating agencies.

SUMMARY, CONCLUSION AND RECOMMENDATIONS

The study investigate the impact of oil price fluctuation (Brent oil price volatility, OPEC oil price volatility, West Texas Intermediate price volatility) on federal government capital expenditure in Nigeria. The long run estimate of the model report that Brent UK crude oil price volatility, OPEC spot rate crude oil volatility and West Texas Intermediate crude oil price volatility failed to report significant effect on the federal government capital expenditure in Nigeria. This shows that the oil price volatility is a short run phenomenon, that will fade out in short period, hence the reason for the high speed of adjustment of the error correction term. The key research findings on oil price volatility effects on capital expenditure of federal government considering the three major global crude oil prices (Brent UK oil price, West Texas Intermediate (WTI)and OPEC spot oil price) suggest that the crude oil price fluctuation has little or minor influence on federal government capital expenditure in Nigeria. Outcome of study revealed that non-oil revenue and oil revenue were statistically significant and have positive effects on federal government capital expenditure at 5% level of significance.

This study made the following recommendations: the Federal Government should reconsider and renegotiate relationship with OPEC to avoid being capped to a limit when and if the output exceeds the production quota, given the country need for urgent upstream oil revenues for capital expenditure on infrastructural development. In line with the findings on the effect of oil price volatility on capital expenditure of Federal Government in Nigeria; There is a need to diversify the income resources to minimize the dependency on oil price volatility and hedging the budget deficit from the volatility of oil price volatility. The appropriate policies towards the shifting from oil economy to non-oil economy are the shield to face and save the economy from the negative impact of the oil price volatility in Nigeria. In view of the findings, the study recommend that government should save more when oil price rises above its benchmark.

Contribution to Knowledge

This study contributed to knowledge by adding up to the available literature on the subject of oil price volatility and capital expenditure. Oil subsidy, corruption perception index and inflation rate are used as control variables, the study segregated all independent variables as follow oil price volatility (OPEC spot price, Brent oil price, West Texas Intermediate price) which is very rare in any literature in Nigeria.

Suggestions for Further Studies

It is suggested that further study should factor in transmission effect or pass-through of crude oil shocks at different stages on capital expenditure in Nigeria. The degree of oil price pass-through to entire budgetary expenditure framework should be explored. Comprehensive analysis and management of budget risks can help ensure sound fiscal public finances and budgetary stability. Federal Government need a more complete understanding of these potential threats to their fiscal position.

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