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OIL PRICE VOLATILITY AND PUBLIC SECTOR FINANCING IN NIGERIA

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Abstract

The paper has explored the influence that oil price volatility has on financing in the public sector in Nigeria. The fluctuation of oil prices in the world market has posed great fiscal pressures on the economies of the world that are major consumers of oil, with Nigeria being the most notable example, as oil revenue and government spending largely depend on the petroleum industry. The study was conducted to test the connexion between the volatility of the oil prices, the volatility of the exchange rate, the volatility of the inflation rate and the financing proxied by the public sector advances by government expenditure. The paper was based on the theory of fiscal theory of revenue instability, Dutch disease theory and Keynesian theory of public expenditure. The research design chosen was ex post facto research design and the positivist philosophy was used to guide the empirical analysis. The study population included macroeconomic statistics of the public sector financing of Nigeria and the macroeconomic volatility level of the country between the period of 1986 and 2024 making up a total of 39 cases in time-series data. The secondary sources were the Central Bank of Nigeria Statistical Bulletin and World Development Indicators where the data were found. The analysis also used descriptive statistics, Augmented Dickey-Fuller unit root test as well as ARCH-GARCH models to study volatility at 5 percent level of significance. It was found that oil price volatility affects negatively and significantly the financing of the public sector, whereas the exchange rate volatility affects positively and significantly the government expenditure. The volatility of the inflation rate was negatively and non-significantly related to the public sector financing. The paper concluded that fiscal sustainability in Nigeria is a major issue caused by the instability in oil prices. The research suggests such fiscal stabilisation measures, exchange rate policies and economic diversification to mitigate fiscal weakness. The research would be an addition to the body of knowledge that gives empirical results on the volatility relationship between the movements of oil prices and the finance of the public sector in Nigeria.

Keywords: *Oil prices volatility, government finances, exchange rate volatility, inflation volatility, government expenditure and Nigeria.*

Introduction

The oil price volatility is a critical contributor to Macroeconomic instability in Nigeria since the structure of the fiscal set up in the country had been relying substantially on the crude oil receipts hitherto. Nigeria being an oil-exporting economy means that oil determines a large percentage of its governmental endeavours using oil revenue thus any changes in the global price of oil frequently become uncertainty about revenues, budgetary disturbances and unreliable funding of the public sector. The volatility of oil prices, the volatility of the exchange rates and the volatility of the inflation rate are studied as well as the public sector financing is proxied by the government expenditure. This is significant, given the fact that government spending is the primary avenue in which the government invests in infrastructure, government services, security, education, and health services. The ability of the government to plan and maintain spending is undermined when oil prices vary drastically particularly within an economy where fiscal buffers tend to be small (Aregbeyen & Fasanya, 2017;

Central Bank of Nigeria [CBN], 2024). As empirical examples of Nigeria demonstrate, the dynamics of oil prices have a strong influence on the fiscal performance and spending patterns over a period of time, which supports the idea that the financial policies of the country continue to be strongly vulnerable to the fluctuation in the global oil market (Aregbeyen & Fasanya, 2017; Abubakar et al., 2023).

In addition to the direct oil price fluctuations, exchange rate volatility also takes centre stage in explaining the public sector financing in Nigeria. Because crude oil is the largest earner of foreign exchange, the decrease in oil prices often decreases foreign exchange earnings and puts strains on the naira. The depreciation of the exchange rates increases the domestic price of imported capital goods, debt servicing and the domestic government procurement and as such it influences the amount and efficiency of the public spending. According to Igbinovia and Ogiemudia (2021), the volatility of the exchange rates among countries in Nigeria is somehow associated with volatility in oil prices, showing that oil shocks can spread instability, which is not limited to the petroleum industry, into the general macroeconomy. Similarly, the volatility of inflation rates makes fiscal control difficult since inflation will decrease the real value of government spending and raise the nominal price of implementing state projects. Nigeria-based research has confirmed that the oil price fluctuation can nourish the inflationary pressure, particularly, energy prices, exchange rate pass-through, and production expenses (Abdulkareem, 2016; Aregbeyen & Fasanya, 2017). Therefore, the relationship between the volatility of oil prices, fluctuations in exchange rates, and volatility of inflation is significant in explaining the changes in government expenditure in Nigeria. The combination of these variables offers a more holistic foundation of explaining the behaviour of oil-dependent economy financing in Nigeria like the public sector financing (Abubakar et al., 2023; Igbinovia & Ogiemudia, 2021).

The available literature on oil price volatility in Nigeria has given significant findings, but a number of gaps still exist. In the first place, the impact of oil price volatility on economic growth, exchange rate behaviour, inflation, or the external balances have been the focus of several studies, but little has been explicitly done regarding the effect of such volatility on the financing of the public sector as measured by government spending. As an example, Aregbeyen and Fasanya (2017) have studied fiscal behaviour in reaction on oil price volatility, whereas Igbinovia and Ogiemudia (2021) have concentrated more on exchange rate volatility. Equally, Abdulkareem (2016) examined oil price and macroeconomic volatility generally, but not the government expenditure as the key indicator of the public sector funding. Second, too much of the literature has considered these variables individually, studying the volatility in oil prices, the volatility in exchange rates, or the volatility in inflation rather than combining all these factors into a single model. But in Nigeria, these variables are related to each other and their two factorial effects may stand better explanations to changes in government expenditure. Third, more current fiscal research like the study by Abubakar et al. (2023) puts more focus on fiscal effort and government balance and allows the incorporation of research that specifically models the operationalization of financing the public sector with government expenditure. Hence, the current literature presents an empirical and conceptual gap on the interplay of the volatility of oil prices, exchange rate volatility, and inflation rate volatility on government expenditure in Nigeria. This research study is meant to fill the gap.

Literature Review

Conceptual Framework

Oil Price Volatility

The volatility of oil prices can be described as the level of fluctuation or unrest in the prices of crude oil in a specified duration of time. It represents unpredictability and intensity of fluctuations in the global oil prices due to shifts in the supply, demand, geopolitical factors, as well as macroeconomic factors. Volatility is a term used in economic literature to refer to the variation of prices around an average quantity and is commonly quantified as a standard deviation, variance, ARCH, GARCH models (Hamilton, 2009; Kilian, 2008). The fluctuation of oil prices has been a big issue in both the economies of oil exporters and oil importers due to its overwhelming impact on the macroeconomic stability, fiscal performance and financial market.

Oil market across the world is very sensitive to geopolitical disharmony, decision among key oil producers on production, technological developments in energy production and the global economic growth. As an example, the actions of the Organisation of Petroleum Exporting Countries (OPEC), some unforeseen changes in oil-producing areas, or changes in the world demand can also cause unexpected changes in oil prices. According to Hamilton (2009), the economic cycles in the past have been greatly influenced by the oil price shocks, particularly in the economies that are largely dependent on petroleum revenues. On the same note, Kilian (2008) observes that supply shocks, aggregate demand shocks as well as oil-specific demand shocks have the potential of causing oil price volatility. Oil variability is a significant fiscal and macroeconomic implication in oil-dependent economies like Nigeria.

Nigeria largely depends on the export of crude oil as a source of government revenue, thus, variations in the price of oil tend to cause instability in the fiscal revenues, the exchange rates, and inflation (Aregbeyen and Fasanya, 2017). As the oil prices attempt to soar up, the government is receiving more revenue, which means that the fiscal policies adopted by the government will be expansionary and the amount of money that the government spends will also increase. On the other hand, reduction in the prices of oil leads to revenue loss, fiscal deficit and pressure on borrowings. The volatility of oil prices also impact on the movements in the exchange rates and the inflation rates since any fluctuation of oil earnings has impacts on the foreign exchange supply and the domestic production cost. Therefore, the knowledge of the volatility of oil prices is vital in assessing fiscal sustainability, macroeconomic stability, and planning of the economy of the economies being dependent on oil.

Public Sector Financing

Public sector financing can be defined as the means, whereby governments raise, distribute, and control funds in order to deliver social welfare, economic growth, along with provision of social services and goods. It entails both the creation of revenue and the expenditure of funds by the government institutions in order to finance the national development objective. Some sources of funds in the public sector financing include taxations, oil revenues, external borrowings, grants and other sources of government income (Musgrave and Musgrave, 1989). These financial resources should be well managed in order to uphold fiscal stability and contribute to long-term economic growth. Government spending is a big part of a public sector financing owing to the fact that it embodies use of a given financial allocation in fulfilling societal demands. The government expenditure is usually to develop infrastructure, education, healthcare, security, public administration and social welfare programmes. Musgrave and Musgrave (1989) define government spending to have three major functions in an economy; distribution

of resources, income redistribution and stabilisation of economic operations. These functions have the benefit of making the public sector financing to result in economic growth and better standards of living.

The nature of government revenue structure also plays a major role in the distribution of funds to the public sector in developing economies of the world like Nigeria. The government of Nigeria relies on oil incomes highly, and thus they constitute a huge percentage of the budget. Consequently, a fluctuation in oil prices tends to have an impact on the amount of funds that can be used by governments to spend and do development programmes (Aregbeyen & Fasanya, 2017). In case of low oil revenues, governments run the risk of budget deficits and they will engage in borrowing or cutting down on expenditures. On the other hand, when the price of oil is high, consumers tend to increase their government expenditure and the growth of governmental projects in the sectors. Financing through the public sector is also very important in the management of the macroeconomy. During downturns, governments rely on fiscal policies especially conducting public expenditure as a way of boosting economic growth, lower unemployment as well as stabilising the economy. As such, to ensure viable financing of the government public sector and effective management of fiscal policies, it is imperative to comprehend the determinants of government expenditure especially the macroeconomic factor of oil price volatility, exchange rate volatility, and inflation volatility.

Theoretical Framework

Fiscal Theory of Government Revenue instability

The Fiscal Theory of Government Revenue Instability is one of the most important theories that the current study is based on. This theory impacts on the changes in the government revenue sources on the public expenditure and fiscal stability. According to the theory, governments that get much of their revenues based on fluctuating commodities have high chances of having unstable fiscal results. When the nation earns much of its social income through some naturally produced commodities like crude oil, fluctuations in commodity prices have a direct impact on the taxation of the amount of spending and financial sustainability in the government. This point of view can be theoretically explained by the research undertaken by the authors of studies of fiscal behaviour in the economies reliant on resources. Gelb, (1988) asserts that resource-endowed economies tend to have a major fiscal instability in that government income depends on international commodity prices. As the prices of commodities rise, government income grows very fast prompting increased state spending. However, in situations where prices fall, governments experience shortages in revenues which can cause fiscal deficit, higher borrowing or cutting on government expenditure.

The Nigerians have a fiscal system that is highly reliant on the revenue of crude oil. The government and foreign exchange they earn are a significant percentage of oil exports. As a result, the changes in the prices of the oil impact greatly on the provision of resources to fund the government spending. It has been experimentally demonstrated that the volatility of oil prices has significant impacts on the governmental revenues and expenditure trends of oil-reliant economies (Aregbeyen & Fasanya, 2017). It means that unstable fiscal performance and uncertain funding of the public sector may take place as a result of oscillating oil prices. The applicability of this theory in the current study is its explanation of the influences of the volatility of oil prices on the government expenditure. When oil prices are volatile, the government revenue also varies thus affecting the ability of the government to fund the

activities in the public sector. Hence, the fiscal theory of revenue instability can be an effective model to obtain an insight into the connexion between oil price probability and government revenues in Nigeria.

Dutch Disease Theory

The other significant theory that serves to be a platform of this study is the Dutch Disease Theory. The Dutch disease came by when the Netherlands realised that it experienced this phenomenon after discovering natural gas resources in 1960s. The theory presents how the boom in the natural resource sectors in the country can result in negative macroeconomic impacts in other macroeconomic sectors. As Corden and Neary (1982) explain, Dutch disease arises when a rise in export of natural resources causes boost of domestic currency causing other industries to lose competitiveness like manufacturing and agriculture. The rise in the foreign exchange earnings of the exports of natural resource contribute towards the increase in the national income and demand of the domestic goods and this may cause the inflationary pressure and appreciation of the exchange rates.

In oil-exporting nations like Nigeria, there is a tendency when the oil price rises and exchange rates are appreciated and government spending is also high. Nonetheless, the depreciation of the exchange rate, fiscal deficits, and macroeconomic instability could be witnessed when the oil prices fall. These ups and downs may have a great influence on financing the public sector as government expenditures are directly associated with oil incomes. Dutch disease theory also puts an emphasis on the transmission channels in which the oil price volatility impacts on macroeconomic factors like the exchange rate and inflation. On an increase on oil prices, the foreign exchange inflows are increased and the currency is appreciating as well as the government spending. On the other hand, as the oil prices decrease, the rate of inflow of the foreign exchange dwindles resulting in the depreciation of the exchange rate and fiscal limitation. These macroeconomic manoeuvres ultimately impact on the government in terms of financing the activities in the public sector. The Dutch disease theory is therefore able to explain the correlation between volatility in oil prices, exchange rate instability, and financing of the public sector in Nigeria. It gives a clue to the extent to which the oil industry changes can impact on the greater macroeconomic and fiscal outcomes.

Keynesian Public Expenditure Theory

Another significant theoretical contribution towards this study is the Keynesian theory of the public expenditure. The theory has its origin in the efforts of John Maynard Keynes who highlighted the importance of government expenditure in the stabilisation of economic fluctuations and economic growth. According to Keynes (1936), the state spending might be implemented as an economic policy to manipulate the aggregate demand, especially when an economy is in a recession or unstable situation. Government expenditure, according to the Keynesian economic school of thought, is very relevant in boosting economic activity and resolving market failures. In cases where the level of demand in the private sector is low, the governments can inject public spending in to boost production, job creation and economic recovery rate. On the other hand, when the economy is booming governments can cut down on expenditure so as to avoid inflationary strains. The government spending is mostly subject to changes in the oil income in the context of the economies that are based on oil. Rising oil prices are accompanied by the governments usually spending more on infrastructural development, social infrastructure and developmental projects. But once the cost of oil goes down fiscal constraints can push

governments to cut down on expenditure or even borrow.

It is also important that the Keynesian theory focuses on fiscal policies as one of the stabilising factors in the management of macroeconomic shocks. Fiscal policy instruments like public expenditure can be used by governments to counter the adverse impact of economic shocks such as changes in oil prices, exchange rates and inflation. As such, to find out the effects of oil price volatility on government expenditure is crucial to the construction of effective fiscal policies. The Keynesian frame is especially conducive to Nigeria since the government spending is still one of the main methods of stimulating the growth of the economy and its stabilisation. The analysis of the connexion between volatility of the oil price and government expenditure makes this study relevant in appreciating the way in which fiscal policy is responsive to macroeconomic changes in the economies that are resource-dependent.

Empirical Review

Using the framework of Differences-in-Differences, Lawal et al. (2025) evaluated the effectiveness of the fiscal policy of Nigeria in dealing with the oil price shocks with a special focus on health expenditure and the sustainability of external debt over 43 years. Their results indicated that downturns of the economy related to unfavourable oil prices shocks frequently led to higher health expenditure and higher borrowing whereas oil-price handling intervals did not involve adequate financial wise, social capital and debt decrease. The authors concluded that fiscal policy reactions were not fully successful in Nigeria, and advised more effective counter-cyclical regulations. Even though their dependent variable addressed health expenditure, the research is very relevant since the study shows how oil price shocks pervert the priorities of government spending and deter debt-funded government sector financing. It thus favours the overall assertion that the volatility of oil is negating expenditure stability in Nigeria.

Ihugba and Adefabi (2025) examined how oil prices and inflation in Nigeria relate to each other at nonlinear rate between 1981 and 2024 to determine the relationship. Their findings indicated that the inflationary effect of the rise in oil prices was stronger compared with the deflationary effect of fall of the oil prices. The positive oil price shocks applied to inflation at some lags considerably but the negatives shocks did not necessarily give significant impact. This study is of significance to the current research since it supports the fact of asymmetry in the oil price-inflation nexus. The paper suggests that inflation volatility can also distort the financing of the public sector not only because of revenue shocks, but also because the inflation channel, in particular where an increase in oil prices leads to a stronger price pressure than deflation alleviates it.

Sale (2025) examined the dynamic relationship between crude oil price, exchange rate and inflation in Nigeria using annual information between the years 1980 and 2024. The analysis showed that there was a positive correlation between crude oil price and exchange rate and negative correlation between inflation and and exchange rate as well as oil price. It also did not find any long-run relationship between the variables indicating that the significant impacts were short-run and dynamic as opposed to long-run flexible equilibria. Although the results are slightly different with other studies, the article is still relevant as it points out that the behaviour of the exchange rates are influenced by the oil price fluctuations and the final effect on the inflation performance. In the case of the study of the public sector financing, this is important as even where the relationship between long-run equilibrium and the short-run macroeconomic variability is not

strong, budget execution, project costs and expenditure planning may still get derailed.

Using monthly data 2015-2021, Okwuchukwu and Onyele (2025) assessed whether the relationship between government spending in Nigeria and the volatility of oil prices is affected by some dynamics of governance. Having modelled and estimated the oil price volatility using GARCH(1,1), it was discovered that the oil price was perpetually volatile and that the government revenues had positive and significant impacts on government expenditure, but the oil price volatility and the government governance had a negative and significant impact on government expenditure. This stands out as one of the most closely related recent researches on the current work since it structures oil price volatility with governance and government expenditure in one empirical framework. The most significant addition it makes is the fact that it is volatility rather than price level that suppresses government spending in bad governance conditions, which supports the argument in favour of institutional changes in the management of government finance that is based on oil.

Agboola et al. (2024) expanded the body of knowledge by examining the output and government spending reaction of oil-exporting emerging economies towards oil price shocks. Applying the objective empirical approach, the authors discovered remarkable numbers of asymmetries of responses in both output and government expenditure, as well as pointed out that the cyclicality of expenditures is related to the significant changes in oil prices. Though, it was not Nigeria specific study, it is very relevant since Nigeria falls in the category of oil exporting emerging economies discussed conceptually. The paper sustains the assertion that the oil government spending in such economies gives an unequal reaction to positive and negative oil shocks, which reinforces the theoretical and empirical arguments in the model of the oil price volatility as a key consideration in determining the public sector financing in Nigeria.

It has been proved that Omotosho and Yang (2024) explored the macroeconomic dynamics and oil price shocks in a resource-abundant emerging economy based on a case study of Nigeria. Using a regime switching dynamic stochastic general equilibrium model estimated using Bayesian techniques, they discovered the strong evidence of regime switching behaviour and indicated that macroeconomic effects of oil price shocks depend on the kind of shock, the monetary policy reaction, and the fuel subsidy regime. The research is useful since it presents a better structural basis of propagation of an oil shock in a resource-dependent economy. In the present research, its significance is that, as a conditioned factor, oil-price changes are shown to cause fiscal factors and macroeconomic stability of the country; in addition, the policy regime in which the latter change takes place is also a conditioned factor to the eventual outcome.

Oyadeyi et al. (2024) have investigated exchange rate pass-through to prices in Nigeria by using quarterly data between the years 2000 and 2023 and threshold autoregression and self-exciting smooth threshold regression. They found that the impact of exchange rate depreciation on prices is not linear and there is a depreciation threshold of approximately 5 percent which is crossed after which the depreciation has a much stronger inflationary impact. To the downside of that, pass-through to prices is less intense; to its upside, inflationary pressures become more severe and start damaging consumer demand and producer supply. The paper is the key issue of the given topic as one of the explanatory variables in the model is the exchange rate volatility. The results imply that the foreign exchange shocks caused by oil can easily be passed onto inflation and thus the real value and

effectiveness of the government spending in Nigeria can be eroded.

Muhammad et al. (2023) also examined the asymmetric impact that oil prices would exert on government spending in Nigeria by relying on 1981 to 2019 annual data and NARDL. Their results suggested that government expenditure in Nigeria was responsive to positive and negative shifts in oil prices in a positive and statistically significant way, which bodes to the fact that fiscal spending in Nigeria is a very sensitive issue in response to the oil market movements. Nevertheless, this research claimed that the total government expenditure was not predictable statistically by exchange rate, inflation and real GDP in their specification. The significance of the study to the current study is in the fact that it supports the hypothesis that oil price shocks have a direct influence on the behaviour of the masses regarding expenditure in Nigeria and that the response to such shocks is not linear but has an asymmetric nature. It can also be used to argue that management of expenditures is still at the mercy of the commodity-price cycle.

The article by Abubakar et al. (2023) analysed how the fiscal effort in Nigeria responded to oil price fluctuations with the help of both linear and non-linear ARDL models. They discovered that the long-term reaction of government balance to dynamic price of oil is symmetrical, whereas the short-term reaction is asymmetrical. In particular, an increase in oil prices enhanced the fiscal status in the long term but positive oil price changes deteriorated the fiscal status of the government in the short term, whereas the opposite was the case with negative changes. It was also found that fiscal rules deteriorated short-run fiscal position but improved the long-run fiscal position. The study is especially timely in that it transcends the aggregate expenditure to present the effect of oil price volatility on the quality of fiscal adjustment in itself. It implies that not only the revenue sensitivity of Nigeria public sector financing but also the timing and the form of fiscal policy reaction influences the public sector financing.

Abu et al. (2022) made one of the most direct empirical statements on the topic by investigating whether the correlation between oil price and the amount of expenditure of people in Nigeria is conditional on the degree of corruption. Based on the non-linear autoregressive distributed lag (NARDL) wizard and quarterly data of 1996-2019, the authors developed a long-run connexion between the variables, and evidence of long-run asymmetry was revealed. They found that good and bad oil price shocks had a significant effect on increasing both public expenditure in the long run but again the magnitude of such effect was based on the existing degree of corruption. The research also recognised debt service, and internal security expenditure as the significant long-run causes of public expenditure. This is a very relevant review, as it demonstrates that oil price changes have no effect on the public expenditure on their own, institutional quality may strengthen or weaken picture of fiscal transmission in Nigeria.

Methodology

The type of research used in this study is the ex-post facto research. The ex-post facto design would be suitable to investigate studies based on past events in which the researcher is not controlling the variables but analysing the existing relationships between the variables. Ex-post facto designs can also be used in macroeconomic and financial research due to the impossibility of experimentally influencing the variables of interest, which include oil prices, exchange rates, inflation rates, and government expenditure, which have already been determined by economic forces. Gujarati and Porter (2009) state that ex-post facto type of research is especially relevant when conducting time-series study of the economy

since it enables the investigator to examine cause-effect relationships with reference to the historic data. On the same note, Kothari (2004) outlines that ex-post facto research investigates the potential factors of an already existing phenomenon through an analysis of the past and their consequences. Regarding this study, the design will allow testing the effect of variations in the prices of oil, exchange rate and inflation volatility upon the funding of the public sector in Nigeria over a period. This work is based on the secondary macroeconomic statistics of the 1986-2024 period, thanks to which it is possible to systematically and objectively assess the trends in the long-run economic processes and fiscal policy.

This study is based on positivism philosophically. Positivism is based on the notion that social and economic phenomena are objectively measurable and can be described by the use of empirical observations and statistical methods. The values of the approach focus on measurable information, testing hypotheses, and the objective study. As Saunders, Lewis and Thornhill (2019) state, positivism is very common in quantitative studies since it is more inclined toward observable facts and statistical relationship but not subjective interpretation. In the positivist paradigm, scholars use the test of theories on the basis of the numerical data and econometric methods. This paper is consistent with the positive philosophy of philosophy since it uses quantitative time- series and econometric models, including ARCH and GARCH to analyse volatility patterns of the macroeconomic variables. The positivist approach will thus offer scientific grounds as to the identification of the relationship between oil price volatility and variables of public sector financing.

The paper uses the secondary time-series data that is generated out of the reliable national and international databases. In particular, the information about oil prices was retrieved in the international energy databases, whereas the information about the exchange rates, inflation rates and the government spending were received in the publications of the Central Bank of Nigeria (CBN) and World Development Indicators of the World Bank (WDI). In macroeconomic research, secondary data best suit the study as they give good historical data of the economic variables that have been collectively compiled by the known bodies of knowledge. Wooldridge (2019) argues that secondary macroeconomic data are typically utilised in econometric studies since they allow them to examine economic relationships over a long time. The dataset employed in this paper covers 1986 to 2024 and this is adequate amount of volatility and modelling of the economies through the use of these data. The character of the data is annual time-series data, which is suitable to the analysis of long-term macroeconomic trends and effects of policy.

The results of the analysis start with descriptive statistics which provide the summary of the essential features of the variables with the help of which the study is conducted. Mean, standard deviation, skewness and kurtosis are some of the descriptive statistics that are used to shed more light on the distribution and variability of the data (Gujarati and Porter, 2009). Such statistics are also used to identify the existence of volatility pattern in the variables. The second step is that of the unit root test which is carried out to observe the properties of the variables of time-series in terms of stationarity. Another significance of stationarity in the time-series analysis is that non-stationary variables may create spurious regression patterns. Augmented Dickey-Fuller (ADF) test is usually applied to test the presence of a unit root of a variable (Dickey and Fuller, 1981). Having stationarity guarantees the econometric analysis comes up with sound and valid findings. In order to analyse dynamical volatility, the paper uses an

Autoregressive Conditional Heteroskedasticity (ARCH) model as proposed by Engle (1982). ARCH model also records how different periods of activities in our financial and macroeconomic systems are volatile by the virtue that the error term variance is subject to previous squared errors. This renders the model to be applicable in examining volatility trends in the oil prices and other macroeconomic variables. Nevertheless, owing to the fact that the volatility could continue to rise, this paper also uses the Generalised Autoregressive Conditional Heteroskedasticity (GARCH) model proposed by Bollerslev (1986). The GARCH model is based on one more generalisation of the ARCH model: in the version of model, the conditional volatility is modelled using the past error terms, and also using the past conditional variances. Brooks (2019) states that GARCH model is a popular tool in financial and economic studies since it is effective in modelling volatility clustering and persistence of time-series data. The ARCH and GARCH models applied to the present study therefore allow a sound analysis of the volatility in the prices of oil products, exchange rate and inflation, and their consequences to the finances of the public sector in Nigeria.

Results and Discussion

4.1 Results

Table 4.1: Descriptive Statistics Result

	PSF	OPV	EXV	IFV
Mean	3512.219	314.0905	161.5562	16.11908
Median	1504.200	319.0810	128.6516	16.54839
Maximum	19808.44	550.2128	798.0400	24.85000
Minimum	13.04110	75.22695	2.020575	11.48313
Std. Dev.	4578.954	96.35232	176.2052	2.982647
Skewness	1.808216	-0.028425	1.840604	0.559964
Kurtosis	6.097031	3.005728	6.616263	3.232129
Jarque-Bera	36.83905	0.005305	43.27156	2.125701
Probability	0.000000	0.997351	0.000000	0.345470
Sum	136976.5	12249.53	6300.692	628.6441
Sum Sq. Dev.	7.97E+08	352783.3	1179835.	338.0549
Observations	39	39	39	39

Source: E-views 10 Output

The average public sector financing (PSF) is equal to 3512.219 and it is an average level of the government spending in the period of the research. The mean is significantly higher than the median of 1504.200, which shows that the distribution of financing of the citizens of the public sector is concentrated on the higher values at some point in the years. This imbalance implies that there were certain years in which the level of the government spending rose considerably, which may have been caused by the inflationary monetary policy, or even an oil boom, or a growth in the amount spent on infrastructure and social services. PSF has the highest and lowest values of 19,808.44 and 13.04110 respectively, which implies that there are significant changes in the expenditure of the government during the research time. There are also large variations of filming in the public sector in Nigeria, which are further affirmed by the high standard deviation of 4578.954.

The same variation can be explained by the instability of the macroeconomy of Nigeria, the oil price shocks, and the fiscal

policy changes that define the Nigerian economy. In the case of oil price volatility (OPV), the mean value is equal to 314.0905 and median equals 319.0810. The distance separating the mean and the median is close, which suggests that the distribution of the oil price volatility was relatively symmetric during the course of the study. The highest and the lowest values lie in 550.2128 and 75.22695 respectively which means that there were strong fluctuations in the oil prices within the period of analysis. Oil price volatility variability is moderate, as it is portrayed by the standard deviation of 96.35232. Because Nigeria is a very oil-oriented country changes in the price of oil have a great impact on the fiscal stability and financing of the government. The volatility of the oil prices may influence the capacity of the government to fund the government spending especially where the oil cheques form a significant portion of the national revenue.

The mean and the median of exchange rate volatility (EXV) is 161.5562 and 128.6516 respectively. The highest of 798.0400 and the lowest of 2.020575 represents large variations in the exchange rate volatility during the period of the study. The standard deviation of 176.2052 indicates that there are high variability of the exchange rate. This high volatility discloses the fragile nature of the Nigerian foreign exchange market and particularly when oil price shocks, economic crises and policy changes like opening up the exchange rate occur. The implications of exchange rate volatility on government spending include that it influences the prices of imports, debt servicing overseas and macroeconomic stability. The volatility of the inflation rate (IFV) has a mean figure of 16.11908 and a median of 16.54839. The highest one has a value of 24.850000 whereas the lowest is 11.48313. Inflation volatility has relatively less changes compared to other variables as is denoted by standard deviation of 2.982647. This is an indication that inflation volatility has been rather stable than oil price and exchange rate volatility. Nevertheless, inflation remains a significant factor in finding out the true worth of the government expenditures and state of fiscal policy.

The values of the skewness suggest that both PSF and EXV have a positive skew, that is, both distributions are skewed to the right with a larger number of observations that are concentrated at lower value and a low number of values at extreme frequencies. On the contrary, the skewness of OPV is a negative value, showing a rather balanced distribution. The skewness of IFV is moderately positive. The value of kurtosis indicates that PSF and EXV are leptokurtic as they have extreme values or outliers and that OPV and IFV are leptokurtic with nearly three values of kurtosis which implies the existence of an approximately normal meanings distribution. The Jarque Berra test affirms that the distribution of PSF and EXV is not normal as the test has its probability values that are less than 0.05, whereas the distribution of OPV and IFV is normal as the test has probability values that are greater than 0.05.

Table 4.2: Result of Unit Root Test (Using ADF)

Variables	ADF T-Stat @ Level	T-Critical @ level	P-value @ level	ADF T-Stat @ 1st Diff.	T-Critical @ 1st Diff.	P-value @ 1st Diff.	Order of Integration
PSF	-2.083787	-2.910019	0.1734	-9.647422	-2.943427	0.0000	I(1)
EXV	-1.278053	-2.909206	0.6346	-4.761082	-2.943427	0.0002	I(1)
OPV	-2.611142	-2.908420	0.0762	-8.574585	-2.943427	0.0000	I(1)
IFV	-1.716903	-2.908420	0.4180	-7.764759	-2.943427	0.0000	I(1)

Source: E-views 10 Output

The findings indicate that the non-stationarities of all the variables, including PSF, EXV, OPV, and IFV, are at level since they all have test statistics of ADF values that are less than the critical values of level 5% and probability values greater than 0.05. An example can be given on PSF ADF statistic -2.083787 p-value 0.1734 which shows that the null hypothesis of unit root is not rejected at level. Equally, non-level stationarity is also exhibited by EXV, OPV and IFV. This means that the variables are stochastic and can have enduring movements in due course. Nonetheless, the first difference made all the variables stationary since their ADF statistics are larger in absolute value than the critical values, as well as, their probability values are smaller than 0.05. As an example, the ADF statistic of PSF is -9.647422 and probability value at first difference is 0.0000, which states that there is strong evidence of stationarity present. Likewise, EXV, OPV and IFV similarly turn stationary at which point they have been first differenced. This implies that all the variables are integrated of one order or I(1).

Table 4.3: ARCH Result

Dependent Variable: PSF
Method: ML ARCH - Normal distribution (BFGS / Marquardt steps)
GARCH = C(5) + C(6)*RESID(-1)^2

Variable	Coefficient	Std. Error	z-Statistic	Prob.
OILP	-0.121504	0.606687	-0.200274	0.8413
EXR	24.46546	0.320209	76.40476	0.0000
INF	12.66921	20.02602	0.632637	0.5270
C	-626.8079	442.5955	-1.416209	0.1567
	Variance Equation			
C	8171.282	10862.45	0.752250	0.4519
RESID(-1)^2	2.155061	0.960826	2.242926	0.0249

R-squared	0.955337	Mean dependent var	3512.219
Adjusted R-squared	0.951508	S.D. dependent var	4578.954
S.E. of regression	1008.324	Akaike info criterion	16.31662
Sum squared resid	35585136	Schwarz criterion	16.57255
Log likelihood	-312.1741	Hannan-Quinn criter.	16.40845
Durbin-Watson stat	0.589068		

Source: E-views 10 Output

The findings indicate that oil price volatility (OILP) has a negative coefficient -0.121504 whose probability value (0.8413) is relatively insignificant and shows that oil price volatility has a negative though not significantly important effect on the financing of the public through the underwriting of the sector. This implies that changes in the oil prices might not have a profound impact on the government outlay in the short term. The coefficient of exchange rate volatility (EXR) stands at a positive value of 24.46546 and the probability value of the statistic value at 1% level is 0.0000 which is significant. This implies that the volatility of the exchange rates has a strong effect of raising financing of the public sector. The positive relationship can mean higher expenditure by the governments related to the exchange rate instability, which could be as a result of the fiscal inclinations to stabilise the economy in terms of fiscal intervention. The volatility in inflation rate has a positive coefficient of 12.66921 but it is not significant with

probability of 0.5270. This means that the volatility of inflation does not have a strong impact on financing at the public sector when using ARCH model in Nigeria. According to the equation of variance, the coefficient of the ARCH term (RESID-1 -2) is 2.155061 and statistically significant at the 5% level. This shows that there are ARCH effects, i.e. volatility of the financing of the public sector is dependent on the previous shocks. The fact that the value of R -squared is high (0.955337) implies that the explanatory variables explain a substantial percentage of the variation in the financing of the public sector.

Table 4.4: GARCH Result

Dependent Variable: PSF
Method: ML ARCH - Normal distribution (BFGS / Marquardt steps)
Presample variance: backcast (parameter = 0.7)
GARCH = C(5) + C(6)*RESID(-1)^2 + C(7)*GARCH(-1)

Variable	Coefficient	Std. Error	z-Statistic	Prob.
OILP	-1.133548	0.324750	-3.490520	0.0005
EXR	22.58382	0.607029	37.20387	0.0000
INF	-9.243645	7.519987	-1.229210	0.2190
C	240.9229	184.4863	1.305912	0.1916
	Variance Equation			
C	-940.1536	9138.842	-0.102874	0.9181
RESID(-1)^2	2.460689	1.102490	2.231939	0.0256
GARCH(-1)	-0.103685	0.197488	-0.525020	0.5996
R-squared	0.948380	Mean dependent var		3512.219
Adjusted R-squared	0.943955	S.D. dependent var		4578.954
S.E. of regression	1084.012	Akaike info criterion		16.27970
Sum squared resid	41127872	Schwarz criterion		16.57829
Log likelihood	-310.4542	Hannan-Quinn criter.		16.38683
Durbin-Watson stat	0.459738			

Source: E-views 10 Output

The findings also point the negative and statistically significant impact of the oil price volatility on the financing of the public sector with -1.133548 and probability value of 0.0005. This implies that when the price of oil volatility increases, government spending decreases in Nigeria, maybe because of uncertainty in the revenues and financial constraint. The coefficient of exchange rate volatility is positive and statistically significant with 22.58382 and probability weight of 0.0000 implying that exchange rate volatility has serious impacts on the financing of the public sector. This observation implies that fluctuations in the exchange rate can result in more government expenditures which could be in the form of increasing the price of imports and fiscal changes. The coefficient of -9.243645 is negative but has no significant value, which means that the inflation volatility is not an important factor in influencing the public sector financing as between the GARCH framework. The equation of variance shows that the ARCH term is significant, which proves the volatility clustering in the equation. But, GARCH term is not found to be significant, indicating the volatility perspective may not be profound with time. The overall model statistics indicate that it has a high explanatory power as it has the value of R-squared at 0.948380.

Discussion of Findings

ARCH result reports that oil price volatility is not significantly related with the system of public sector financing (negative) and on the other hand GARCH result is significantly related with a negative relationship. It would mean that long-run financing in the public sector would tend to decrease in Nigeria when the volatility of oil prices increases. The outcome shows how sensitive the fiscal system of Nigeria is to changes in the global oil prices since crude oil is one of the primary sources of revenues to the government. Once the oil prices are volatile, the government revenue becomes volatile and frequently results into uncertainty during fiscal as well as problems in the reduction of the government expenditure. The finding is in line with fiscal theory of revenue instability that stipulates that the economy that depends extensively on natural resource revenues that are volatile, tend to have unstable public finances and unpredictable governmental expenditure (Gelb, 1988).

The observation is also in line with the empirical evidence available in the literature. As an example, Aregbeyen and Fasanya (2017) discovered that the volatility of oil prices has a high impact on the fiscal behaviour and government spending in Nigeria. On the same note, Abu et al. (2022) found that the dynamics of oil prices can change the dynamics of public expenditure in Nigeria especially when they are accompanied by institutional constraints. They found out that positive and negative oil price shocks have a great impact on government expenditure in the long-run. The negative correlation observed in this paper indicates that as the volatility of oil prices increases, the government might have to take up conservative fiscal policies or cut back on the expenditure because of the uncertainty regards the flow of oil revenue. This finding is another indication that the thesis of Corden and Neary (1982) as applied to the Dutch disease theory is accurate and economies that rely heavily on resource industries are vulnerable to macroeconomic volatility in case commodity prices are volatile. Instability of oil prices consequently hubs revenue flow and compromises the ability of the government to fund the activities of the public sector.

These findings also indicate that the exchange rate volatility posits a positive and statistically significant influence on the funding of the public sector under both ARCH and GARCH estimates. This implies that the volatility in the exchange rate will more likely result in expenditure in Nigeria government. A possible reason is that depreciation of the exchange rate will raise the price of imports, interest payments on foreign debts, and the cost of the government to purchase capital goods hence an increase in the demand of the public. This observation falls in line with the empirical study of Igbinovia and Ogiemudia (2021), who stated that the volatility of the exchange rates has a major impact on the macroeconomic stability and the fiscal performance of Nigeria. The positive relation can also signify the government interventions to stabilise the economy in such times when there is exchange rate instability. Theoretically, this outcome can be explained by the fact that the Keynesian theory of the state expenditure implies that during periods of macroeconomic instability, governments will raise their level of public spending to stabilise the economic activity and keep the aggregate demand (Keynes, 1936).

In addition, it indicates that the ARCH and GARCH models operating on the volatility of inflation rates itself have an insignificant impact on the public sector financing. The volatility of inflation can certainly affect the real value of the government expenditure, but the statistical significance of the volatility indicates that the volatility of inflation cannot directly ascertain the decision of government spending in Nigeria. Such a result can be explained by the

fact that the priorities of the fiscal policy and revenue levels in the health sector influence the government spending much more significantly than inflation trends do. The negative coefficient in the GARCH model however indicates that an increase in the volatility of inflation may decrease the real effectiveness of government spending in the long run. This observation partly follows the conclusion of Ihugba and Adefabi (2025), who determined that oil price shocks may incur inflationary impacts in Nigeria hence influencing the macroeconomic stability.

Conclusion and Recommendations

Conclusion

This paper has analysed how oil price volatility impacts on public sector financing in Nigeria between 1986 and 2024. The study applied the ARCH and GARCH models, the results showed that variable oil prices effectively reduce the funding of the public sector negatively and significantly and, therefore, the instability of global oil prices undermined the ability of the government to continue spending. The volatility of the exchange rate was observed to have a positive and significant value on the funding of the public sector implying that fluctuations of the exchange rate have the effect of rising the government spending commitments. The public sector financing had a negative but insignificant relationship to inflation volatility. It can therefore be inferred that the macroeconomic instabilities especially oil price volatilities are very vital to the determination of the fiscal stability and the government spending in Nigeria.

Limitations of the Study

Although this study made a contribution, it has some limitations. Firstly, the paper mainly reported the volatility of oil prices, exchange rate volatility and inflation volatility as several determinants of the financing of the public sector whereas other macroeconomic elements including interest rates, debt level and fiscal policy reforms were not considered. Second, the review was based on annual secondary data; this might be inaccurate in monitoring short term changes in macroeconomic variables. Third, the research focused on Nigeria and this factor can be constraining to the generalisation of findings to other economies that rely on oil. Future studies can involve other macroeconomic variables as well as use cross country comparative studies in order to give wider information.

Recommendations

Some policy suggestions were given on how to improve the stability of financing to the public sector in Nigeria based on the results of this study.

First, the Nigerian government should enhance fiscal stabilisation initiatives in order to mitigate the adverse impacts of fluctuation of oil prices on financing the public sector. One of such strategies is amplification and proper management of sovereign wealth funds and stabilisation funds. These reserves can be used as fiscal buffers whereby they save the surplus oil revenue during oil price high periods and spend it during the low period. Such counter-cyclical fiscal measures enable the government to expose the exposure of the public expenditure to oil price dynamics in the international market as well as to guarantee sustainable funding of the public sector.

Second, the Central Bank of Nigeria should attempt to use measures that are directed at stabilising the exchange rate and enhancing the foreign exchange market. Given that exchange rate volatility is a major factor in financing the sector of the economy, having a stable exchange rate setting will aid in curbing fiscal uncertainty and cost of government spending. This can be done through implementation of cautious monetary and exchange rate policies such as the enhanced management of foreign exchange

and non-oil foreign exchange values diversification.

Third, the Nigerian government should speed up the process of diversifying the economy so as to avoid over reliance on oil income. The diversification of the economy by investing in agriculture, manufacturing and technological initiatives will expansion of the revenues base and less fiscal exposure to fluctuations in the prices of oil. The diversification will increase the stability state of the government revenues and will increase the long-term financing experience of the sector of the population.

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