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The Macroeconomic Impact of Crude Oil Price Fluctuations in Nigeria

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Abstract: The main objective of the study was to determine the way fluctuations in the price of crude oil affected macroeconomic variables in Nigeria from 2000 Q1 to 2022 Q4. The data was analysed in the paper using Structural Vector Autoregressive (SVAR) models. According to the findings, Nigeria's current economic growth has been significantly impacted by lag GDP values. This indicates that economic growth in Nigeria was significantly impacted by one-period lag GDP by 3,791.7 units in the short-run and 7,430.4 units in the long-run. Also in the short-run, the current broad money supply was significantly impacted by both the one-period lag general price level (0.445 units) and the one-quarter lag broad money supply (757.7 units). According to the crude oil price fluctuation model, current crude oil price variations in Nigeria are significantly influenced by

one-period lags in general price level (-64.9 units), crude oil price fluctuation (1,114.6 units), and fiscal budget deficits (0.65 units). All of the one-period lagged coefficients of macroeconomic variables, including real GDP, broad money supply, interest rates, general price level, inflation rates, and fiscal budget deficits, had a significant impact on current economic growth and broad money supply, respectively, as demonstrated by the long-run economic growth and broad money supply models. The real GDP's impulse response to fluctuations in crude oil prices fell during the first period, peaked during the second, and then increased to show a positive trend during the third. This study came to the conclusion that shocks or fluctuations in the price of crude oil are the main cause of macroeconomic policy instability in Nigeria. The study recommended that the government should control foreign exchange rate regimes, pursue expansionary monetary policy, general price level control and stabilisation measures.

Keywords: Crude Oil Price Fluctuation, Macroeconomic Policy impact, Structural Vector Autoregression, Nigeria.

Introduction

Nigeria, a leading oil producer globally and the foremost oil-producing nation in Africa, significantly relies on oil exports for much of its revenue and economic management. About 90% of Nigeria's export earnings and 90% of its foreign exchange earnings in 2003 and 2004, respectively, came from the country's export of crude oil (Lyke, 2019). The oil is Nigeria's principal source of foreign exchange earnings, despite the fact that its share of GDP has recently decreased due to an increase in non-oil revenues. Although crude oil exports and sales generate revenue, it seems that global fluctuations in oil prices have diminished the advantages Nigerians gain from this resource. Recent macroeconomic instability has been attributed to a number of factors, including fluctuations in crude oil prices, theft of crude oil, production quota restrictions, economic downturns, the COVID-19 outbreak, insurgencies, terrorism, and inadequate administrative abilities in government management. The country's economic development and the direction of macroeconomic policy can be affected by fluctuations in the price of crude oil in a number of ways. A number of theoretical transmission mechanisms can be used to analyse the way fluctuations in the price of crude oil affect macroeconomic policy. According to the supply-side effect, the crude oil is a necessary component in the manufacture of goods and services. As a result, rising crude oil prices may raise the cost of manufacturing and distribution. Increased production expenses often deter investment, leading to a rise in the overall cost of goods and services within the economy. Reduced consumption during periods of high oil prices results in the demand effects of crude oil price fluctuations. A decrease in investment and national output or income follows a decrease in consumption. Akinleye and Ekpo (2013) claim that fluctuations in the price of the crude oil have an impact on the foreign currency market, which in turn generates shocks to the stock market, interest rates, inflation, and ultimately macroeconomic instability. According to Castro and Jimenez-Rodriguez (2020), fluctuations to the price of the crude oil may cause national currencies to weaken in the short-run for any duration; however, long-run responses for the US effective exchange rate exhibit a variety of patterns over

time, with the US currency appreciating in value between the two periods. According to Baffes et al. (2015), fluctuations in the price of the crude oil have a direct as well as an indirect effect on macroeconomic policy. While trade and other commodity markets, monetary and fiscal policy reactions, and investment uncertainty are the indirect consequences, the direct effects occur in exporters' and importers' prices and operations.

Macroeconomic policy can be influenced by fluctuations in the price of crude oil, particularly in economies that are monocultural like Nigeria. Crude price fluctuations have the potential to impact the government income and impede the effective distribution of resources within the economy. The foreign market's volatility in the crude oil prices exposes Nigeria's economy to shocks, unstable macroeconomic policies, and instability. A set of governmental objectives and targets known as macroeconomic policy is intended to achieve, regulate, and stimulate specific aggregate economic variables over a given time period. These variables include the money supply, interest rates, inflation, exchange rates, budget deficits, taxation, external reserves, employment, investments, and income policies. According to Agri et al. (2016), Nigeria, being a net importer of refined petroleum products, is heavily impacted by the fluctuations in global oil prices and has minimal control over the price of the crude oil it exports to the international market. Researchers carried out empirical studies on the correlation between Nigerian macroeconomic policy variables and fluctuations in crude oil prices since the oil glut of the 1980s. For example, Ushie et al. (2012) found that policymakers in oil-producing countries like Nigeria face major challenges as a result of fluctuations in the price of crude oil. They contended that fluctuations in the price of oil have contributed to inflation, reduced the growth of output, and reduced the value of the real exchange rate. Furthermore, Akinleye and Ekpo (2013) continued to demonstrate that fluctuations in the price of crude oil have an impact on actual expenditures by governments in Nigeria over the long-run. However, Adi et al. (2022) demonstrated that historical fluctuations in crude oil prices and shocks are part of the reason for the present volatility in Nigeria's foreign exchange rate and crude oil price markets.

The impact of shocks or fluctuations in the price of crude oil on macroeconomic policy does not appear to be stable across time. According to Castro and Jimerez-Rodriguez (2020) and Agboola et al. (2024), there are times when both variables move in the same direction and times when they are moving in different directions. Changes in the price of the crude oil have had positive and negative effects in Nigeria. Several empirical research, including those by Adi et al. (2022), Ahmad et al. (2022), Bello and Sa'ad (2021), Castro and Jimerez-Rodriguez (2020), Gbatu et al. (2017), and Ushie et al. (2012), have shown a positive correlation between the volatility of oil prices and the instability of foreign exchange rates. However, it has been discovered by Akinleye and Ekpo (2013), Ifeonyemetalu et al. (2020), and Agri et al. (2016) that there is a positive correlation between fluctuations in crude oil prices and economic growth. Conversely, Guo and Kliesen (2005) discovered that the future GDP (gross domestic product) in the USA was significantly and negatively impacted by the crude oil futures prices. According to lyke (2019) and Alawadhi and Longe (2024), there is a negative correlation between positive oil price volatility or uncertainty and output, however there is a positive correlation between negative oil uncertainties and output growth in Nigeria.

Krichene (2006) investigated the relationship between monetary policy and oil price shocks within the context of the global oil demand and supply model. He demonstrated that stable oil prices and prudent monetary policy are essential for achieving both price stability and economic growth. According to investigations by Aremo et al. (2012) and Lawrence (2020), shocks to the price of the crude oil have a significant impact on how Nigeria manages its fiscal policy.

Research Problem

Even though the crude oil exports and sales generated significant revenues, it seems that recent international fluctuations in crude oil prices have diminished the benefits that Nigerians receive from the resource. The most recent macroeconomic instability has been attributed to a number of factors, including fluctuations in crude oil prices, petroleum subsidy removal, exchange rate unification policy, production quota or restrictions, economic downturns, the COVID-19 outbreak, insurgencies, terrorism, corruption and inadequate administrative abilities in government management of monetary and fiscal policies. The country's economic development and the direction of macroeconomic policy can be affected by fluctuations in the prices of oil in a number of ways. For example, the world economic recession of 2016 and 2020 lowered the international price of crude oil and exerted pressure on government fiscal operations due to reduced revenue for Nigeria. Also, the removal of fuel or petroleum subsidy and exchange rate unification policy has have resulted in hyperinflationary pressures in Nigeria, thereby threatening macroeconomic stability. The general price level is becoming so uncontrollable that it appears that the current government has lost the capacity for effective macroeconomic stabilisation in Nigeria. According to Abdulkareem and Abdulkareem (2016), the Nigerian economy's reliance on oil earnings as its primary source of revenue raises questions regarding how the volatile oil prices can affect the nation's macroeconomic conditions. It is important to analyse the impact of crude oil price fluctuations because it has implications for macroeconomic policy stabilisation in Nigeria. It will enhance understanding of the short-run structural problems confronting the Nigerian economy with potential long-run structural adjustments that can engender growth and development.

Research Focus

The primary objective of this research was to systematically examine the influence of fluctuations in Nigeria's crude oil prices on key macroeconomic policy variables. These include general price levels, fiscal budget deficits, economic growth, inflation rates, and the aggregate money supply within the economy. By employing empirical analysis, this study aimed to elucidate the dynamic relationships between crude oil price volatility and these critical economic indicators. This article conducted a comprehensive analysis of the effects of fluctuations in crude oil prices on macroeconomic policy in Nigeria between 2000 and 2022.

Research Aim and Questions

The objective of this paper was to examine the effects of fluctuations in crude oil prices on Nigeria's macroeconomic conditions. The study specifically looked at the structural impact of fluctuations in crude oil prices, both short- and long-term, on macroeconomic variables in Nigeria.

Is there a causal relationship between fluctuations in the price of crude oil and macroeconomic variables? What structural impacts do fluctuations in crude oil prices have, both short- and long-term, on Nigeria's macroeconomic variables? What innovations are causing Nigeria's macroeconomic instability?

Literature Review

The aim of effective macroeconomic policy management is to foster a stable environment that encourages consistent and sustainable economic growth. However, managing macroeconomic policy becomes difficult and demanding in an environment with significant volatility, risks, and uncertainties, particularly when political instability (like insurgency) coexists. Macroeconomic policy management is the effective combination of monetary, fiscal, and exchange rate policies to accomplish predefined aggregate goals (such employment growth, poverty reduction, exchange rate stability, and sustained economic growth, among others). The Central Bank, the Ministries, Departments, and Agencies (MDAs) of government, the Executive, Legislature, and Judiciary at the Federal, State, and Local Government levels, and other intergovernmental relations are necessary for its success. The management of macroeconomic policies can be severely constrained by fluctuations in the price of crude oil in the global market, as this can have a positive or negative impact on the allocation of resources. Crude oil price fluctuation is described by Hamilton (2005) and Gbatu et al. (2017) as a statistical measure of the average crude oil price's growth or fall over a given period of time, or the difference or change.

Theoretical Underpinnings

The effects of an increase or reduction in the price of crude oil on the quantity of crude oil demanded and supplied over time have been explained by the theories of supply and demand. There is an abundance of evidence in the literature about the supply-side and demand-side impacts of fluctuations in the price of crude oil on macroeconomic indices like employment, exchange rates, economic growth, etc. According to the supply-side effect, crude oil is a crucial component of production. As a result, rising crude oil prices may raise the cost of manufacturing and distribution. Long-run production costs are ultimately increased by the price increase, even though crude oil suppliers initially profit from it. High costs of production often deter investment, leading to a rise in the general price of products and services within the economy. Expensive prices for products and services raise costs of living, which in turn raise the country's rates of poverty. Decreased consumption is one way that high oil prices cause the demand-side effects of fluctuations in crude oil prices. Because of a decreasing standard of living, a reduction in consumption also causes a decrease in investment. Low savings and investment result in low output or national income as well as low employment. Baffes et al. (2015) assert that changes in oil prices exert both direct and indirect influences on inflation and economic growth. While the trade and other commodity markets, monetary and fiscal policy reactions, and investment uncertainty are the indirect effects, the direct effects can be seen in the exporters' and importers' prices and operations.

The impact of supply and demand shocks to the explanation for fluctuations in the price of crude oil has been assessed empirically. In order to break down oil price shocks into three

categories—oil supply shocks, global demand shocks for all industrial commodities, and oil-specific demand shocks that represent a precautionary demand related to potential future supply or market concerns—Killian (2008) employed a structural vector autoregressive model. The study challenged the conventional wisdom that oil supply shocks are the primary cause of historical variations in oil prices, demonstrating instead that precautionary demand shocks and global aggregate demand shocks are working together to drive price fluctuations. The authors went on to assert that fluctuations in crude oil prices are caused by demand shocks particular to the oil industry, implying that precautionary demand shocks can be a reflection of quick changes in the market's perception of the uncertainty surrounding future shortages in oil supply. Furthermore, Kilian and Murphy (2014) extended the investigation by utilising data on oil inventories to incorporate speculative demand for oil. They stated that while increases in global oil consumption brought on by the global business cycle explained the causes for a rise in oil prices over time, speculative demand movements for oil play a significant impact during oil shock periods. Oil inventories virtually remain unchanged upon impact of a positive flow demand shock, but then temporarily decline. A sustained rise in oil reserves was linked to a positive speculative demand shock. On the other hand, a protracted decline in oil production and a decline in real world economic activity were linked to a negative demand shock. A sustained improvement in real global economic activity was also linked to a positive shock to the demand for the crude oil.

Similar to this, Güntner and Linsbauer (2018) investigated the impact of oil supply and demand shocks on American households' perceptions of their own financial status and their predictions for the future of the economy. They discovered that a positive shock to aggregate demand leads to a period of optimism among American consumers, which is followed by a statistically significant decline in the consumer sentiment index over the next two years. However, because of increased income and employment, households gain from a rise in the demand for industrial commodities around the world that is fuelled by global real economic activity. Future increases in consumer and energy prices may reduce the anticipated rise in nominal household income. Hamilton (2010) claims that a rise in oil prices reduces the amount of money that consumers may spend on goods and services other than oil, as well as the overall income of an oil-importing country. Researchers have elucidated the impact of macroeconomic policy expansion on fluctuations in oil prices, which might potentially pave the way for supply and demand shocks in the global oil markets. Research has demonstrated that there is a nonlinear relationship between fluctuations in oil prices and GDP (Hamilton, 2010; Kilian, 2008). As noted by Hamilton (2010), the nonlinearity can stem from several factors, including variations in data sets, methods of measuring oil prices, differences in price adjustment techniques, potential model specification errors, the presence of multiple delays, and the varying degrees of influence from each variable. According to Joo and Park's (2021) empirical findings, stock returns are asymmetrically affected by oil price uncertainty. Furthermore, the asymmetric behaviours are contingent upon both the oil market conditions and the amount of stock returns. The findings indicate that when both oil price volatility and stock returns are low, rising oil price volatility has a negative impact on stock returns. On the other hand, increased oil price volatility increases stock returns when stock returns are high and oil price volatility is low. A negative shock to oil prices, according to Yildirim and Arifli (2021), affects trade balance, depreciates currency, raises

inflation, and reduces economic activity. Moreover, our results suggest that the devaluation driven by the oil price influences the shock's inflationary and recessionary outcomes.

The Neoclassical Theory of Trade

The comparative cost advantage theory and the differences in factor productivity between nations were the main concerns of traditional economic theory when it came to the international oil market and trade (Wangwe 1993). The Neoclassical economic perspectives on trade, which prioritised natural resources (such crude oil) over factor productivity, gave rise to a clearer understanding of the benefits of global trade. The mercantilist economists maintained that exports of goods (ICT) and services to other countries should rise over time, while imports should fall, in order to guarantee a steady supply of gold for goods or services in which a country has a comparative cost advantage. The Hechsher-Ohlin model placed emphasis on the importance of natural or resource endowment in export performance and international trade, based on this underlying principle. The theory is a general equilibrium model that permits simultaneous interactions between national markets, product markets, and factor markets. The model made the assumption that capital, labour, and technological inputs are fixed factors. There are two countries, two products, and two factor inputs. Through the oil factor market, the supply and demand of crude oil in one market can interact, and as a result of global trade, the domestic market can have an impact on both the domestic and foreign product and factor markets. The trade can increase economic efficiency and result in a redistribution of wealth or national revenue across the many production elements and countries, with a positive net effect (gain minus loss from trade) for both. However, in the real world, there are many countries and trade in the global economy is driven by labour mobility and continuous advancements in technology. In today's global trade, there are benefits and losses as well. Because of this, the crude oil market is the one where specialization and the concept of comparative cost advantage are most applicable. Romer's endogenous growth theory placed more emphasis on the importance that ideas, knowledge, investments in human capital, technological spillovers, and R&D activities have in spurring economic growth and innovation than did the Hechsher-Ohlin theory of trade. Investments in human capital and advancements in technology were considered essential for prosperity. The hunt for alternative energy sources has started to disrupt the laws governing the energy industry and poses a danger to the long-run viability of crude oil prices and the world oil market as a whole.

Empirical Studies

There is a substantial body of empirical research examining the effects of crude oil price volatility on macroeconomic indicators. Adi et al. (2022) used daily data from October 23, 2009, to November 30, 2020, to investigate the transmission mechanisms between shocks to the crude oil price and the foreign exchange rate. The study found that current exchange rate instability and West Texas Intermediate oil price fluctuations in the global market are significantly influenced by past crude oil price volatilities. This was determined using vector autoregressive model (VAR) and generalized autoregressive conditional heteroskedascity (GARCH) models. They also demonstrated the existence of bidirectional volatility spillovers between shocks to the price of West Texas

intermediate crude oil and volatilities in exchange rate regimes. Nonetheless, a two-way transmission mechanism between the volatility of the Naira exchange rate and Brent crude oil shocks in Nigeria was demonstrated. On the other hand, there was a one-way transmission mechanism between shocks to the price of Brent crude oil and the volatility of the Naira exchange rate in Nigeria. Exchange rates and West Texas oil prices were found to be affected by asymmetric shocks, whereas the price of Brent oil was found to be affected by symmetric shocks. Ifeonyemetalu et al. (2020) employed the GARCH technique to examine the impact of fluctuations in oil prices on Nigeria's economic growth from 1984 to 2017. According to the study, Nigeria's economic growth was positively and significantly impacted by the price of crude oil and the exchange rate. However, crude oil price fluctuations had positive but insignificant effects on growth. The macroeconomic effects of oil revenue shocks and institutions were examined by Ushie et al. (2012) using VAR techniques, and the findings showed that fluctuations in oil revenue contributed to low output growth, inflation, and appreciation of the real exchange rate in Nigeria. The impact of output was observed to decline and to remain in that downward trend for approximately three years before a steady state growth path was reached. The impact of the real exchange rate was observed to appreciate with a temporary muted effect in years three and four, and then to resume from the fifth and tenth year. The impact of inflation was observed to increase in year three and then flatten out for the remainder of the period. They also disclosed that the economy's inflationary pressure seems to have decreased as a result of the institutional quality improvement. The paper came to the conclusion that Nigeria needed a mix of political and economic strategies to reduce instability and wasteful expenditure while directing oil revenues toward investments and productive endeavours on the one hand, and a political culture that promotes accountability, transparency, and a shared national identity on the other.

Bello and Sa'ad (2021) examined the impact of fluctuations in crude oil prices on a few macroeconomic variables in Nigeria between 1970 and 2016 using a structural VAR model. The study found that an oil price shock has a major short- and long-run impact on the rate of inflation, exchange rates, and economic growth. For the period, the exchange rate has an insignificant impact, raising the possibility of a currency crisis in the event of a shock to the global oil market. Similar to this, Agri et al. (2016) investigated how Nigeria's sustainable development and macroeconomic factors were affected by fluctuations in oil prices between 1990 and 2015 using the VAR technique. They discovered that fluctuations in oil prices had an impact on Nigeria's real GDP, interest rates, unemployment, and balance of payments. In order to determine the conditional standard deviations of the world oil price uncertainty in the UK, Texas, and Dubai markets between January 1980 and May 2010, Kuncoro (2011) used the GARCH technique. In all three markets, the analysis discovered evidence of asymmetric leverage effects. Compared to the negative shocks, the positive shocks are more prevalent. But only in the Dubai market does the volatility process return to its mean. Using the GARCH approach, lyke (2019) evaluates the impact of oil price uncertainty on Nigeria's real output from the 1980Q1 to the 2019Q1. According to the study, a rise in output is caused by negative crude oil price uncertainty, whereas a fall in output is influenced by positive oil price uncertainty. The study also showed that output had a robust and uneven response to fluctuations in the price of crude oil. From January 1974 to July 2019, Castro and Jimenez-Rodriguez (2020) examined the dynamic relationships between the oil price and the US effective exchange rate. By using the Time Varying

Parameter (TVP)-VAR methodology, they discovered that the rises in oil prices that have been occurring during the 2000s have forced a trade balance adjustment, which has resulted in the depreciation of the US effective exchange rate, and have also caused a wealth transfer from the USA to oil-exporting countries. Although they were only significant in the 1990s, the long-run responses of the US effective exchange rate to shocks in oil prices were positive until the mid-2000s. After that, however, there are negative reactions. Oil prices in non-US dollar economies increase when the US effective exchange rate appreciates, potentially causing a drop in oil demand or consumption.

Gbatu et al. (2017) examined the effects of exchange rate volatility and shocks to the oil price on real GDP in ECOWAS member countries between 1980 and 2015 using the fixed effect panel technique. The study showed that, for both net oil importers and the entire ECOWAS, there is evidence of both asymmetric and linear correlation effects between oil price shocks and real GDP. Shocks to the oil price have a negative correlation with real GDP. Shocks to the oil price have a negative correlation with real GDP. Shocks to oil prices did, however, have an insignificant negative effect on the real GDP of ECOWAS net oil exporters. The study further indicates that, regardless of whether ECOWAS members are net oil importers or exporters, trade has a significant and positive correlation with real GDP in these countries. Moreover, they illustrated that fluctuations in exchange rates adversely and significantly affect the real GDP of all ECOWAS member states, along with net oil importers in West Africa. Nigeria's macroeconomic variables was the subject of an empirical investigation by Ekong and Effiong (2015) using a structural vector autoregressive (SVAR) method to examine the effects of supply and demand shocks in the crude oil market from 1986 to 2011. The study discovered that the real exchange rate in Nigeria is solely caused by aggregate demand shocks. However, there was no correlation found between macroeconomic variables like real GDP, the consumer price index, and the real exchange rate, and crude oil price shocks like aggregate demand shocks, oil supply shocks, and oil-specific demand shocks. They also showed that, during the first two quarters, an oil supply shock results in a positive response from the real exchange rate and a negative response from the real GDP and consumers' price index. Real GDP and real exchange rates react negatively to aggregate demand shocks, although the consumer price index exhibited a positive reaction over the course of the time frames. Demand shocks related to oil produced a brief increase in real GDP, but during the first two quarters, the consumer price index and real exchange rates showed no change. In addition, shocks to the oil supply, aggregate demand, and oil-specific demand each accounted for roughly 6%, 14%, and 4% of the variations in real GDP, respectively. The differences were explained by 10%, 9%, and 2% in the case of the consumer price index and by 6%, 10%, and 2% in the case of the real exchange rate, respectively.

Using the VAR approach, Okoli et al. (2017) reported empirical evidence showing that, over the long-run in Nigeria, real GDP, interest rates, expenditures by government, and exchange rate regimes all positively correlated with the volatility of crude oil prices. In Nigeria, however, imports and inflation were constant in the short-run, reacted adversely to fluctuations in the price of crude oil, and turned positive in the long run. Over a range of time horizons, the interest rate's response to the volatility of crude oil was positive but occasionally negative. Additionally, the study discovered a bidirectional causal relationship between the volatility of oil prices and real GDP, as well as a

unidirectional relationship between the volatility of oil prices and the money supply, exchange rate, government expenditures, and oil price volatility. Aremo et al. (2012) found that in Nigeria, government revenue and GDP are impacted by shocks to the crude oil prices before government fiscal expenditure is affected. They did this using the SVAR approach with data spanning from 1980 to 2009. They argued that while increases in crude oil prices or price shocks may result in higher government revenue, the increase in revenue from oil did not necessarily translate into higher government spending because some of the funds are likely being misappropriated rather than allocated to worthwhile projects that will spur economic growth. Krichene (2006) investigated the impact of monetary policy on oil prices by employing the VAR approach within the framework of the global oil demand and supply model. The study concluded that producer market power and high oil price volatility were caused by low price and high income elasticity of demand and stiff supply in the global oil market. While a two-way relationship between interest rates and oil prices was established, it was found that exchange and interest rates had no effect on the equilibrium of the oil market prices. This relationship was contingent on the sort of oil shocks experienced. According to the report, rising oil prices may lead to an increase in interest rates during supply shocks, whereas falling interest rates may lead to an increase in oil prices during demand shocks. The source of the extreme volatility of oil prices was low interest rates. The analysis came to the conclusion that tight supply and poor price elasticity of demand in the global oil market were the root causes of producer market power and excessive volatility in oil prices. It was discovered that although there was a two-way relationship between interest rates and oil prices, exchange rates and interest rates had no bearing on the equilibrium price of the oil market. The kind of oil shocks encountered determined the nature of this relationship. The report states that during supply shocks, rising oil prices may cause interest rates to rise, whereas during demand shocks, dropping interest rates may cause oil prices to rise. Low interest rates were the cause of the excessive volatility in oil prices. Abere and Akinbobola (2020) used SVAR approaches to study exogenous shocks, institutional quality, and macroeconomic performance in Nigeria. The outcome demonstrated how the price of oil impacted the GDP and inflation rate projection error variance across the timeframe, indicating a strong impact of external shocks on macroeconomic indicators in Nigeria. Also, the forecast error variance of the aggregated domestic macroeconomic performance was influenced by or explained by institutional quality as well as exogenous shocks. The study came to the conclusion that Nigeria's macroeconomic performance is influenced by both external shocks and institutional quality. In a similar vein, Ologbenla (2020) examined the macroeconomic effects of fluctuations in the price of crude oil on the Nigerian economy between 1980 and 2019. The study reported, using VAR methodologies, that Nigeria's exchange rate is controlled by crude oil prices but not GDP. According to Lawrence (2020), who used the SVAR approach, Nigerian government income and GDP were initially impacted by crude oil prices before government expenditure was affected. The study also demonstrated how Nigeria's budgetary strategy is significantly impacted by the crude oil prices.

Employing the SVAR methodology, Taghizadeh-Hesary and Yoshino (2015) examined the impact of fluctuations in crude oil prices on macroeconomic indicators in China, Japan, and the United States. According to the study, the effects of shocks to the price of crude oil on GDP growth rates in the USA and Japan are far less severe than in China. They argued that there are several

reasons why the impacts of China, Japan, and the USA differ from one another. These include high fuel substitution (such as the use of gas, renewable energy, and nuclear power), a declining population in Japan, the shale gas revolution in the USA, more frequent strategic crude oil shocks, and government-mandated energy efficiency targets. They also discovered that, in comparison to Japan and the USA, China experiences less inflation or the consumer price index impact from crude oil prices. This is due to the fact that China's larger real GDP led to a greater forward shift in aggregate supply, which stopped inflation during increases in oil prices. Quero-Viria (2016) investigated the macroeconomic implications of fluctuations in oil prices in Columbia using SVAR. According to the article, Columbia will see increases in GDP of 0.04 per cent, decreases in unemployment of 0.12 per cent, and decreases in inflation of 0.09 per cent for every one per cent increase in oil prices. Holm-Hadulla and Hubrich (2017) used a regime-switching framework (VAR) for the European countries to study how changes in oil prices affected macroeconomic indicators. According to the study, under normal circumstances, there are very little adjustments made to inflation and economic activity in response to fluctuations in oil prices. The economy enters a negative regime when the impact of shocks to the oil price signals significant and long-lasting macroeconomic swings, with inflation and economic activity following suit. The second round impacts of crude oil price shocks on inflation and economic growth are consistent with the detrimental regime effects, with the wage-price spiral serving as an important means for the positive co-movement between these variables. By combining elements of the oil supply (such as depletion, endogenous oil exploration and extraction), as well as elements of the oil demand (such as rising demand from emerging markets, usage efficiency, and endogenous demand responses), Arezki et al. (2017) investigated a macroeconomic framework of the oil market. The study demonstrated how small fluctuations in the supply and demand of oil can eventually lead to significant shifts in the price of oil. Future cycles in oil prices may be caused by the delays between fluctuations in the price of oil and how supply and demand for it react to those changes. Over the next ten years, there will be a one per cent difference in oil prices depending on how efficient oil usage is. Positive oil supply shocks were positive and insufficient to lower oil prices, but exogenous oil price shocks were negatively correlated with negative oil supply shocks. A negative shock to the oil supply reduced global GDP by 0.1 per cent annually. Investments in oil exploration, extraction technology, and efficient oil usage were positively correlated with changes in oil prices.

According to studies conducted by De Michelis et al. (2020), low crude oil prices increase consumption in countries that import oil while decreasing it in countries that export it. They also showed that a 10% drop in oil prices increases GDP and consumption by roughly 0.2% in the euro-area while decreasing GDP and consumption in countries that export oil like Canada by comparable amounts. The results were not all that positive for the United States of America. While a decrease in oil industry investment may cause the U.S. GDP to briefly shrink in the short-run, an increase in domestic consumption may cause the GDP to gradually increase. A decrease in oil prices drives the global economy more than an increase in oil prices of a same magnitude. Crespo and Zambrano (2018) employed the bivariate VAR technique in Venezuela to assess the impact of shocks to the oil price on macroeconomic variables. According to the study, between 1921–1970 and 1999–2015, real output in the non-oil sector increased positively and significantly as a result of a positive shock

to the price of oil. But from 1984 to 1998, the association was insignificant. They discovered that the mechanism via which fluctuations in oil prices impacted macroeconomic variables had evolved over time in Venezuela. Shocks to the price of crude oil seemed to have an independent impact on macroeconomic variables between 1920 and 1970, but between 1999 and 2015, expenditures by the government had an impact on how they affected the business cycle. From 1984 to 2015, there was an uneven response between real investment and real output in the oil sector to shocks in oil prices. Shocks to the price of oil had a positive correlation with macroeconomic indicators, and they were a significant contributor to Venezuela's business cycle swings. Hamilton (2005) examined into the reasons for and effects of the US oil shocks that occurred in 2007–2008. According to the study, past oil price shocks were brought on by actual disruptions to the oil supply, while the oil price shocks of 2007–2008 were brought on by strong demand meeting slow global oil production, which sent the United States into yet another recession.

Although several studies have examined the causal relationship between macroeconomic variables, a review of the literature indicates a dearth of research on the structural impacts of short-run and long-term fluctuations in the crude oil prices on macroeconomic variables in Nigeria. This paper aims to address this gap."

Research Methodology

Research Design

The Hechsher-Ohlin theory of trade which placed emphasis on the importance of natural or resource endowment in growth process form the theoretical foundations of this paper. The approach was the deployment of Structural Vector Autoregression (SVAR technique. This paper's methodology modelled the macroeconomic impact of crude oil price fluctuations in Nigeria between 2000:Q1 and 2022:Q4. In an economy that depends on revenue from petroleum exports, macroeconomic factors including the money supply, interest rates, inflation, exchange rates, fiscal deficits, and fluctuations in oil prices always affect real GDP growth. Real GDP as well as fluctuations in petroleum prices are negatively correlated, according to economic theories (Iyke 2019). The fluctuations in crude oil prices were calculated in this study by multiplying the deviations of crude oil prices from the mean price by one hundred (100) (Güntner & Linsbauer 2018). The crude oil price fluctuations = (crude oil price - mean) × 100. Macroeconomic variables (including real GDP, money supply, interest rates, exchange rates, inflation, and fiscal deficits) also have an impact on the volatility of crude oil prices. Variations in the price of crude oil have varying effects on macroeconomic variables, and the degree and size of these effects might vary depending on the variable under study.

Data Collection

The paper used a sample of 92 secondary quarterly data. The data were collected from the National Bureau of Statistics (NBS) and the Central Bank of Nigeria (CBN). The sample size was sufficient because it might accurately reflect the study's true population. The participants were the macroeconomic variables shown in Table 1 of the study. Also, equations 5 through 12 of this paper's

models indicated that data will be collected on crucial macroeconomic variables in Nigeria. Table 1 highlights the variables' descriptions and the types of data sources.

Table 1

Sources and Description of Data

Variables	Description	Source
Economic growth	Real GDP at current market price (₦ billion)	CBN/NBS
Money supply	Broad money supply	CBN
The crude oil price fluctuations	The deviation of crude oil price from the mean price multiplied by 100	CBN/NBS
General price level	Consumer price index	CBN/NBS
Inflation	Change in consumer price index (%)	CBN/NBS
Foreign exchange rate	Official exchange rates (₦/\$)	CBN
Interest rates	Maximum lending rates (%)	CBN
Fiscal deficits	Budget deficits (i.e., Government revenues minus expenditures)	CBN

Model Specification

The paper used econometric techniques to analyse the impact of crude oil price fluctuations on macroeconomic variables in Nigeria. The procedure follows the simplified form of the k-dimensional SVAR (1) process which is given in equation 1; and the paper assumed that the coefficients of the standard VAR (1) process are invertible;

$$Y_{it} = \alpha_0 + \alpha_1 Y_{it-1} + \sum_{i=1}^n \beta_i Z_{it-1} + \varepsilon_{it} \quad (1)$$

Assuming the SVAR model has an n-system of simultaneous equations so that equation 1 can be rewritten as in equation 2;

$$\begin{bmatrix} Y_{1t} \\ \vdots \\ Y_{nt} \end{bmatrix} = \begin{bmatrix} 1 & Y_{1t-1} & Z_{1t-1} \\ \vdots & \vdots & \vdots \\ 1 & Y_{nt-1} & Z_{nt-1} \end{bmatrix} \begin{bmatrix} \alpha_1 \\ \vdots \\ \beta_k \end{bmatrix} + \begin{bmatrix} \varepsilon_{1t} \\ \vdots \\ \varepsilon_{nt} \end{bmatrix} \quad (2)$$

Where; $Y_{it} = (Y_{1t}, Y_{2t}, \dots, Y_{nt})$ is a $n \times 1$ column vector of endogenous variable, Y_{it-1} is a $n \times 1$ column matrix of one-period lag endogenous variables, $\sum_{i=1}^n$ = Summation sign, $Z_{it} = (Z_{1t-1}, Z_{2t-1}, \dots, Z_{kt-1})$ is an $n \times (k-1)$ vectors of lagged exogenous variables giving n observations on k-1 variables with $i = 1, 2, \dots, k$, α_0 is a $k \times 1$ matrices of structural intercept terms (the 1s in equation 2 is representing the intercept terms), α_1 is a $k \times 1$ matrices of lag structural coefficients of endogenous variable, β_i is a $k \times 1$ column matrix of structural lagged exogenous variables coefficients to be estimated and $\varepsilon_{it} = (\varepsilon_{1t}, \varepsilon_{2t}, \dots, \varepsilon_{nt})$ is a $n \times 1$ unobserved white noise column structural innovations process of n disturbances. In compact form, equation 2 can be written as in equation 3.

$$Y = \beta Z + \varepsilon \quad (3)$$

Where; $Y = (Y_1, Y_2, \dots, Y_n)$ and $\epsilon = (\epsilon_1, \epsilon_2, \dots, \epsilon_n)$ are each $n \times 1$ matrices of endogenous variables and innovations for observations with $i = 1, 2, \dots, n$, $\beta = (\alpha_0, \alpha_1 \& \beta_i)$ are each $k \times 1$ matrices of coefficients and $Z = (Z_1, Z_2, \dots, Z_n)$ are $n \times k$ matrix of regressors giving n observations on $k-1$ variables.

This paper's model is an adopted model based on the study conducted by Aremo et al. (2012). This model presented a functional description of the macroeconomic impact of fluctuations in the price of crude oil, shown in equation 4;

$$Y_t = F(Y_{t-1}, MS_t, CPF_t, INT_t, CPI_t, INF_t, EXR_t, FD_t) \quad (4)$$

In econometric form, equation 4 is transformed into equation 5 using the SVAR (1) process as follows;

$$Y_t = \alpha_0 + \alpha_1 Y_{t-1} + \alpha_2 MS_{t-1} + \alpha_3 CPF_{t-1} + \alpha_4 INT_{t-1} + \alpha_5 CPI_{t-1} + \alpha_6 INF_{t-1} + \alpha_7 EXR_{t-1} + \alpha_8 FD_t + \epsilon_{1t} \dots \dots \dots (5)$$

Therefore, following the SVAR (1) system of modelling, the exogenous variables in equation 4 are then specified as endogenous variable as shown in equations 6 to 12.

$$MS_t = \phi_0 + \phi_1 Y_{t-1} + \phi_2 MS_{t-1} + \phi_3 CPF_{t-1} + \phi_4 INT_{t-1} + \phi_5 CPI_{t-1} + \phi_6 INF_{t-1} + \phi_7 EXR_{t-1} + \phi_8 FD_{t-1} + \epsilon_{3t} \dots \dots \dots (6)$$

$$CPF_t = \beta_0 + \beta_1 Y_{t-1} + \beta_2 MS_{t-1} + \beta_3 CPF_{t-1} + \beta_4 INT_{t-1} + \beta_5 CPI_{t-1} + \beta_6 INF_{t-1} + \beta_7 EXR_{t-1} + \beta_8 FD_{t-1} + \epsilon_{2t} \dots \dots \dots (7)$$

$$INT_t = \pi_0 + \pi_1 Y_{t-1} + \pi_2 MS_{t-1} + \pi_3 CPF_{t-1} + \pi_4 INT_{t-1} + \pi_5 CPI_{t-1} + \pi_6 INF_{t-1} + \pi_7 EXR_{t-1} + \pi_8 FD_{t-1} + \epsilon_{7t} \dots \dots \dots (8)$$

$$CPI_t = \gamma_0 + \gamma_1 Y_{t-1} + \gamma_2 MS_{t-1} + \gamma_3 CPF_{t-1} + \gamma_4 INT_{t-1} + \gamma_5 CPI_{t-1} + \gamma_6 INF_{t-1} + \gamma_7 EXR_{t-1} + \gamma_8 FD_{t-1} + \epsilon_{4t} \dots \dots \dots (9)$$

$$INF_t = \rho_0 + \rho_1 Y_{t-1} + \rho_2 MS_{t-1} + \rho_3 CPF_{t-1} + \rho_4 INT_{t-1} + \rho_5 CPI_{t-1} + \rho_6 INF_{t-1} + \rho_7 EXR_{t-1} + \rho_8 FD_{t-1} + \epsilon_{5t} \dots \dots \dots (10)$$

$$EXR_t = \delta_0 + \delta_1 Y_{t-1} + \delta_2 MS_{t-1} + \delta_3 CPF_{t-1} + \delta_4 INT_{t-1} + \delta_5 CPI_{t-1} + \delta_6 INF_{t-1} + \delta_7 EXR_{t-1} + \delta_8 FD_{t-1} + \epsilon_{6t} \dots \dots \dots (11)$$

$$FD_t = \theta_0 + \theta_1 Y_{t-1} + \theta_2 MS_{t-1} + \theta_3 CPF_{t-1} + \theta_4 INT_{t-1} + \theta_5 CPI_{t-1} + \theta_6 INF_{t-1} + \theta_7 EXR_{t-1} + \theta_8 FD_{t-1} + \epsilon_{8t} \dots \dots \dots (12)$$

Where; Y_t = real GDP at time t and $t-1$, CPF_t = crude oil price fluctuations (measured as the crude oil price minus mean price multiplied by 100) at time t and $t-1$, MS_t = Broad money supply at time t and $t-1$, CPI_t = consumer price index (proxied as the general price level at time t and $t-1$, INF_t = inflation rates at time t and $t-1$, EXR_t = official exchange rates at time t and $t-1$, IR_t = maximum interest rates at time t and $t-1$, FD_t = fiscal deficits (government revenue-government expenditures) at time t and $t-1$, $\alpha_0, \beta_0, \phi_0, \gamma_0, \rho_0, \delta_0, \pi_0 \& \theta_0$ = constant or intercept terms in equations 5 to 12 respectively, and $\alpha_i, \beta_i, \phi_i, \gamma_i, \rho_i, \delta_i, \pi_i \& \theta_i$ = slopes or coefficients of exogenous variables in equations 5 to 12 respectively with $i = 1, 2, \dots, 8$ and $\epsilon_{1t}, \epsilon_{2t}, \dots, \epsilon_{8t}$ = respective white noise innovations process or error terms in equations 5 to 12 at time t .

Data Analysis and Analytical Techniques

This paper used Econometric Views (EViews 10) for the estimation of data. First, the descriptive statistics of the variables were examined. In order to prevent erroneous regression results, the unit root properties of the gathered data were analysed in the article. The order of variable integration was ascertained by the author using the Philip-Perron (PP) and Augmented Dickey-Fuller (ADF) tests. It might be necessary to estimate equation 13 in order to do the unit roots tests at constant.

$$\Delta Y_t = \alpha_0 + \alpha_1 Y_{t-1} + \sum_{i=1}^n \Delta \beta_i Y_{t-i} + \varepsilon_t \dots \dots \dots (13)$$

Where; ΔY_t = first difference operator of the variable being examined, Y_{t-1} = the lagged value of the variable being examined, β_i = coefficient of the variable being examined, $\sum_{i=1}^n Y_{t-i}$ = sum of lagged variables being examined from $i = 1, 2, \dots, n$ and ε_t = white noise error term.

The Johansen co-integration test was performed immediately following the unit root tests in order to ascertain whether equilibrium or long-run relationships existed between the variables under investigation. If the trace statistics are higher than the 5 per cent crucial values, the null hypothesis that there is no co-integration is rejected. It was determined which equations co-integrated. This made it possible for the study to assess the pairwise Granger causality of an endogenous variable to see if it might be considered an exogenous variable. In order to ascertain the direction and importance of causation between each lagged endogenous variable in the SVAR systems, the study employed chi-square statistics. The amount of lags to be included in the reduced form VAR was then determined using the lag length selection test. The reduced form VAR and SVAR (1) systems were then estimated in the paper by converting the VAR error terms into uncorrelated structural innovations utilising additional identification limitations of a structural equation. In order to estimate the model's coefficients, the SVAR systems were subject to both short- and long-term constraints. The effects of periodic fluctuations in the price of crude oil to one of the innovations in the current and future values of the endogenous variable were still examined by the paper using the impulse-response function. The impulse response of the residuals or error terms was designed to disregard correlations in the VAR residuals when a one-standard-deviation shock was applied. To highlight the relative impact of each random innovation or error term on the variables within the SVAR system, the paper ultimately employed variance decomposition analysis.

Results

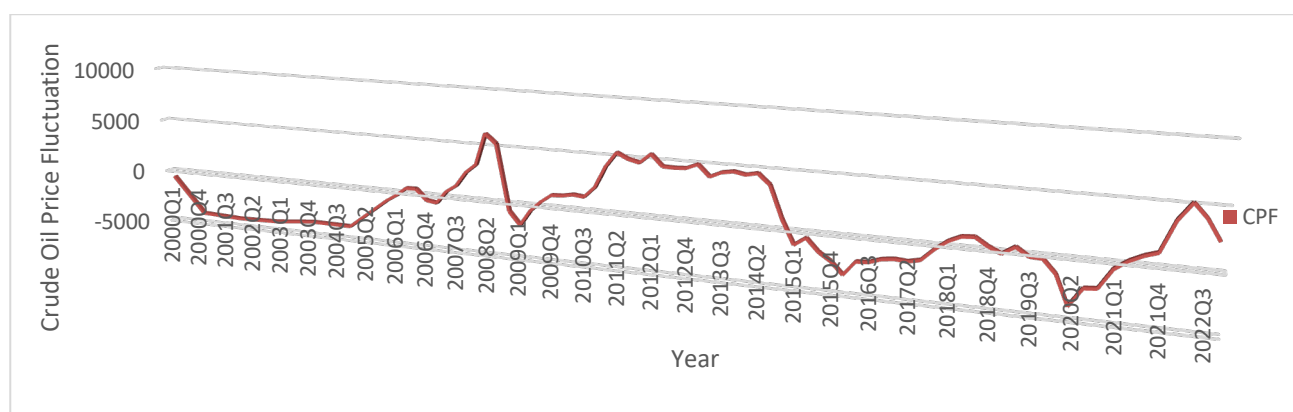
Table 2 displays the descriptive statistics of the variables or instruments that are being studied. The table revealed the mean (average), maximum values, minimum values, the standard deviation and other descriptive statistics of macroeconomic variables in Nigeria.

Table 2*Descriptive Statistics of Macroeconomic Variables*

Variable	CPF	CPI	FD	INF	INT	MS	EXR	Y
Mean	-0.163	157.46	-569.59	12.65	25.09	16,659.1	199.13	25,503.3
Median	-357.5	120.48	-240.46	12.20	25.76	12,737.1	153.85	23,485.1
Maximum	6,088.7	491.49	150.68	26.20	31.95	51,490.5	445.71	57,780.6
Minimum	-4,196.0	29.72	-2,237.1	3.793	18.00	795.530	99.88	5,877.5
Std. Dev.	3,047.8	116.91	631.83	4.244	4.171	14,072.6	99.27	12,250.2
Skewness	0.324	1.084	-1.3323	0.447	-0.169	0.646	1.078	0.364
Kurtosis	1.979	3.295	3.4693	3.523	1.873	2.333	2.719	2.347
Jarque-Bera	5.602	18.359	28.063	4.106	5.307	8.103	18.118	3.668
Probability	0.061	0.0001	0.000	0.128	0.070	0.017	0.0001	0.159
Sum	-14.99	14,486.1	-52,403.1	1,163.5	2,308.8	1.53×106.	18,319.5	2.35×106
Sum Sq. Dev.	8.45×108	1.244×106	36,327,633	1,638.9	1,583.1	1.8×1010	8.968×105	1.37×1010
Observations	92	92	92	92	92	92	92	92

Source: Author's computation.

The models listed in section 3 are analysed in this section. The first section of the paper used the Güntner and Linsbauer (2018) measure of crude oil price fluctuations, which is the crude oil price deviations from its mean price multiplied by 100. Nigeria's crude price fluctuations are shown in Figure 1. The figure showed that, from 2000Q1 to 2007Q2, most fluctuations in crude oil prices were negative, with the exception of 2006Q2 and 2006Q3, which showed positive price fluctuations. From 2007Q3 to 2014Q4, Nigeria had positive price changes in crude oil prices. From 2015Q1 to 2017Q4, however, negative fluctuations in crude oil prices were observed, signalling the start of the recession in 2019 and 2020. Due to the economic downturn and the COVID-19 epidemic, the positive variations in crude oil prices persisted in 2018Q1 and reduced to negative again in 2019Q3. This remained negative until 2021Q2, at which point they continued to rise until 2022Q4.

Figure 1*Crude Oil Price Fluctuations*

Source: Author's computation.

Table 3 of this research presents the results of the macroeconomic variables' unit root tests. Table 3 showed that both the Philip-Perron (PP) and the Augmented Dickey-Fuller (ADF) tests indicate that the general price level, as measured by the consumer price index (CPI), is integrated of order two (2). This shows that the CPI is a stationary state after second difference. However, using the identical ADF and PP tests, inflation (INF) was stationary at levels. Using both the ADF and the PP tests, other macroeconomic variables like real GDP (Y), the broad money supply (MS), maximum lending or interest rates (INT), fiscal deficits (FD), and fluctuations in the price of crude oil (CPF) were all integrated of order one. At the first difference, the variables were stationary. Therefore, a stationary process supposed to emerge from the linear combination of non-stationary macroeconomic variables. Because the study's linear combination was stationary, the models were estimated at first difference.

Table 3

Unit Root Tests of Macroeconomic Variables

Variable	Augmented Dickey-Fuller Test			Philip-Perron (PP) Test		
	ADF Stat.	5% critical value	Order of integration	PP Stat.	5% critical value	Order of integration
Real GDP (Y)	-9.2826**	-2.8939	I (1)	-9.2906**	-2.8939	I (1)
Money supply (MS)	-4.5557**	-2.8943	I (1)	-8.5932**	-2.8939	I (1)
Inflation (INF)	-7.7883**	-2.8951	I (0)	-7.2629**	-2.8939	I (0)
Interest rate (INT)	-7.4476**	-2.8939	I (1)	-7.5900**	-2.8939	I (1)
Consumer price index (CPI)	-10.817**	-2.8951	I (2)	-12.642**	-2.8943	I (2)
Fiscal deficits (FD)	-11.292**	-2.8943	I (1)	-20.259**	-2.8939	I (1)
Crude oil price (COP)	-7.1107**	-2.8943	I (1)	-6.4673**	-2.8939	I (1)
Crude oil price fluctuations (CPF)	-7.1107**	-2.8943	I (1)	-6.4673**	-2.8939	I (1)
Official exchange rate (EXR)	-7.7374**	-2.8939	I (1)	-7.6523**	-2.8939	I (1)

Note. ** & *** = significant at 5% and 10% level respectively.

Source: Author's computation.

The Johansen Co-integration Test for each of the macroeconomic variables under examination was shown in Table 4. Six (6) co-integrating equations at lag interval in first difference, one to one period, were found by the test. As a result, the null hypothesis of no co-integration was rejected. Thus, the co-integration tests imply that there are long-term correlations between the variables. We will estimate the structural VAR equations on both a short- and long-run basis.

Table 4

Johansen Co-integration Test of Macroeconomic Variables

Series: D(Y) D(MS) D(CPF) D(INT) D(CPI) D(INF) D(EXR) D(FD)				
Hypothesis of no co-integrating equations	Eigen value	Trace statistics	5% critical value	probability

None *	0.629	289.65	159.53	0.000
At most 1 *	0.443	202.23	125.62	0.000
At most 2 *	0.432	150.75	95.75	0.000
At most 3 *	0.354	100.93	69.82	0.000
At most 4 *	0.250	62.54	47.86	0.001
At most 5 *	0.202	37.17	29.79	0.006
At most 6	0.162	17.28	15.49	0.027
At most 7	0.019	1.742	3.84	0.187

Note. Trace test indicates 6 cointegrating eqn(s) at the 0.05 level, * denotes rejection of the hypothesis at the 0.05 level and **MacKinnon-Haug-Michelis (1999) p-values.

Source: Author's computation.

The Granger causality tests' justification was provided by the co-integration tests. The Granger Causality tests of Nigeria's macroeconomic variables were shown in Table 5. To find out if the endogenous variables can be considered exogenous variables, the Granger causality tests were performed. Its significance was verified using the probability and chi-square statistics. The Table demonstrated the causal relationship in both directions between the broad money supply and real GDP, the general price level (CPI) and real GDP, official exchange rates and real GDP, real GDP and fiscal budget deficits, and the relationship between the broad money supply and crude oil price fluctuations, broad money supply and lending rates, broad money supply and interest or lending rates, broad money supply and fiscal budget deficits, and the general price level and inflation rate in Nigeria. This indicates that real GDP is caused by a large money supply, not the other way around. In Nigeria, interest rates, official exchange rates, and fiscal budget deficits are also caused by the wide money supply variable, according to Grant. In Nigeria, the general price level granger is the source of real GDP, inflation, official exchange rates, and interest rates. Changes in the price of crude oil have a granger effect on the money supply, interest rates, and general level of prices in Nigeria. Nonetheless, real GDP in Nigeria is impacted by official exchange rates granger. Bidirectional or two-way causality between various macroeconomic variables is also present in Table 5. For example, while the broad money supply also contributes to the general price level, the general price level also contributes to the broad money supply.

Table 5

Granger Causality Tests of Macroeconomic Variables

Granger causality tests	F-Stat.	Prob.	Granger causality tests	F-Stat.	Prob.
CPF does not granger cause Y	0.0369	0.9638	INF does not granger cause MS	0.0985	0.9062
Y does not granger cause CPF	0.6197	0.5405	MS does not granger cause INF	0.8721	0.4218
Y does not granger cause MS	2.1142	0.1270	EXR does not granger cause MS	1.5849	0.2110
MS does not granger cause Y	2.8437***	0.0638	MS does not granger cause EXR	2.6816***	0.0742
CPI does not granger cause Y	3.9484**	0.0229	INT does not granger cause MS	1.3368	0.2682
Y does not granger cause CPI	0.0706	0.9319	MS does not granger cause INT	2.8344***	0.0643
INF does not granger cause Y	0.4316	0.6509	FD does not granger cause MS	0.1787	0.8367

Y does not granger cause INF	0.3507	0.9211	MS does not granger cause FD	6.9219**	0.0016
EXR does not granger cause Y	3.4521**	0.0362	INF does not granger cause CPI	0.5283	0.5916
Y does not granger cause EXR	0.2475	0.7813	CPI does not granger cause INF	6.5237**	0.0023
INT does not granger cause Y	0.1155	0.8911	EXR does not granger cause CPI	1.1289	0.3282
Y does not granger cause INT	1.3072	0.2760	CPI does not granger cause EXR	6.9022**	0.0017
FD does not granger cause Y	2.0418	0.1361	INT does not granger cause CPI	0.6894	0.3971
Y does not granger cause FD	4.6431**	0.0122	CPI does not granger cause INT	0.6894	0.5046
MS does not granger cause CPF	1.5963	0.2087	FD does not granger cause CPI	2.6189***	0.0788
CPF does not granger cause MS	3.8679**	0.0247	CPI does not granger cause FD	10.6055**	0.0000
CPI does not granger cause CPF	1.7659	0.1772	EXR does not granger cause INF	1.8125	0.1695
CPF does not granger cause CPI	2.5297***	0.0857	INF does not granger cause EXR	1.5456	0.2191
INF does not granger cause CPF	0.3686	0.6928	INT does not granger cause INF	0.7713	0.4656
CPF does not granger cause INF	1.7506	0.1799	INF does not granger cause INT	0.9675	0.3842
EXR does not granger cause CPF	0.4909	0.6138	FD does not granger cause INF	2.3548	0.1011
CPF does not granger cause EXR	2.1938	0.1178	INF does not granger cause FD	0.3071	0.7364
INT does not granger cause CPF	1.3027	0.2771	INT does not granger cause EXR	0.2128	0.8088
CPF does not granger cause INT	2.6334***	0.0777	EXR does not granger cause INT	0.7982	0.4562
FD does not granger cause CPF	0.1424	0.8675	FD does not granger cause EXR	2.6135***	0.0792
CPF does not granger cause FD	0.9685	0.3838	EXR does not granger cause FD	24.014**	0.0000
CPI does not granger cause MS	4.0767**	0.0204	FD does not granger cause INT	0.2708	0.7634
MS does not granger cause CPI	2.6718***	0.0749	INT does not granger cause FD	1.9197	0.1530

Note. ** & *** = significant at 5% and 10% level respectively.

Source: Author's computation.

This indicates that there is a reciprocal relationship between the overall money supply and the general level of prices. In Nigeria, general pricing levels also contribute to fiscal budget deficits, but deficits in the fiscal budget themselves are caused by the general price levels. Table 5 additionally demonstrated a two-way causal relationship between Nigeria's official currency rates and fiscal budget deficits. This indicates that, in Nigeria, official exchange rates are a cause of fiscal budget deficits, but fiscal budget deficits are a result of official exchange rates. As a result, the Granger causality tests indicate that the endogenous variables in the model may be handled as exogenous variables. When the causation results don't hold true, macroeconomic variable rigidities or structural issues are to blame. Table 6 displayed the selection of the VAR lag order. A lag time of one (1) is recommended as the most appropriate for VAR estimations by the Hannan-Quinn (HQ) information criterion. The sequential modified L-R test statistics of lag length four (4), lag length five (5), zero lag length Schwarz information criterion (SIC), and lag length eight (8) Akaike information criterion (AIC) are all recommended over this.

Table 6

VAR Lag Order Selection

Lag	LogL	L-R	FPE	AIC	SIC	HQ
0	-3659.3	NA	3.30×1028	88.37	88.60*	88.46
1	-3533.7	224.06	7.52×1027	86.88	88.98	87.73*

2	-3482.8	80.96	1.07×1028	87.19	91.16	88.79
3	-3431.7	71.38	1.63×1028	87.51	93.34	89.85
4	-3326.4	126.92*	7.48×1027	86.51	94.21	89.61
5	-3244.2	83.12	$7.11 \times 1027^*$	86.08	95.64	89.92
6	-3183.5	49.72	1.47×1028	86.16	97.58	90.75
7	-3088.4	59.59	2.04×1028	85.41	98.69	90.75
8	-2971.9	50.49	3.65×1028	84.14*	99.29	90.23

Note. * indicates lag order selected by the criterion, LR: sequential modified LR test statistic (each test at 5% level), FPE: Final prediction error, AIC: Akaike information criterion, SIC: Schwarz information criterion, and HQ: Hannan-Quinn information criterion.

Source: Author's computation.

Macroeconomic Impact of Crude Oil Price Fluctuations

Table 7 presents the findings of the reduced form VAR estimation used to begin the SVAR estimation in this investigation. To prevent regression or erroneous results, the VAR models were estimated at first difference with a single lag period. The economic growth model's broad money supply coefficient fell short of the a-priori prediction. The findings indicated that Nigeria's current economic growth (real GDP) was adversely affected by a one-period lag in broad money supply. Similar to this, Nigeria's present economic growth has been significantly impacted positively by both the general level of prices and fiscal budget deficits. One-period lags in real GDP, one-period lags in the broad money supply, one-period lags in fluctuations in the price of crude oil, one-period lags the general price level, and one-period lags official exchange rates were all significant at the 10% and 5% levels, respectively, in the broad money supply model. This demonstrated that current broad money supply in Nigeria was significantly influenced by one-quarter lagged values of real GDP, broad money supply, fluctuations in the price of crude oil, general price level, and official exchange rates. However, the one-quarter lag crude oil price fluctuation in the crude oil price fluctuation model significantly increased the current volatility in the crude oil price in Nigeria. Additionally, in the interest rates model, current interest or lending rates in Nigeria were significantly impacted by one-quarter lag values of the broad money supply, fluctuations in the price of crude oil, and interest rates. According to the general price level model, Nigeria's current general price level was significantly impacted by inflation rates and the coefficient of one-quarter lag general price level.

Table 7

VAR Estimates in Reduced Form

Variable	D (Yt)	D (MSt)	D (CPFt)	D (INTt)	D (CPIt)	D (INFt)	D (EXRt)	D (FDt)
Constant	53.864	193.8***	37.320	-0.0889	0.3043	-0.173	0.052	7.1572
©	[0.093]	[1.668]	[0.218]	[-0.630]	[0.851]	[-0.422]	[0.029]	[0.166]
D (Yt-1)	0.035	0.033***	-0.021	0.000027	-0.000046	0.000015	-0.00019	-0.019**
	[0.318]	[1.531]	[-0.643]	[1.014]	[-0.690]	[0.188]	[-0.588]	[-2.427]
D (MSt-1)	-1.212**	-0.182***	0.229	0.00025***	0.00045	0.00013	-0.000613	-0.032
	[-2.259]	[-1.701]	[1.454]	[1.907]	[1.355]	[0.347]	[-0.379]	[-0.795]

D (CPFt-1)	0.086 [0.228]	0.165** [2.186]	0.324** [2.921]	-0.00014*** [-1.511]	-0.00016 [-0.696]	-0.00002 [-0.081]	-0.002649** [-2.329]	0.036 [1.279]
D (INTt-1)	-69.573 [-0.159]	5.544 [0.064]	96.524 [0.751]	0.232** [2.189]	-0.249 [-0.925]	-0.144 [-0.467]	-0.854 [-0.649]	-46.37 [-1.429]
D (CPIt-1)	209.8** [2.213]	80.44** [4.241]	-33.123 [-1.187]	-0.0072 [-0.312]	0.947** [16.227]	0.0445 [0.665]	0.816** [2.854]	-2.189 [-0.311]
D (INFt-1)	-153.54 [-0.985]	-34.145 [-1.096]	-35.365 [-0.771]	0.0417 [1.102]	-0.259** [-2.705]	0.2448** [2.225]	0.432 [0.920]	5.096 [0.440]
D (EXRt-1)	51.015 [1.435]	14.22** [1.999]	12.917 [1.234]	-0.0029 [-0.343]	-0.0058 [-0.265]	-0.003 [-0.124]	0.077 [0.723]	-0.0198 [-0.007]
D (FDt-1)	2.19*** [1.662]	0.005 [0.018]	-0.042 [-0.107]	-0.000077 [-0.239]	-0.0011 [-1.413]	-0.000018 [-0.019]	0.0005 [0.138]	-0.447** [-4.563]
R2	0.1356	0.3181	0.1457	0.1456	0.8181	0.0848	0.1839	0.2877
Adj. R2	0.0503	0.2507	0.0613	0.0612	0.8001	-0.0056	0.1033	0.2174
F-stat.	1.5888***	4.7229**	1.7269***	1.7250***	45.523**	0.9384	2.2819***	4.0897**

Note. ** & *** = significant at 5% and 10% level respectively.

Source: Author's computation.

According to the inflation rate model, Nigeria's current inflation rates are significantly higher than those of one period lag. Nonetheless, the official exchange rate model showed that the general level of prices and the one-period lag values of crude oil price fluctuation had a major influence on current official exchange rates in Nigeria. The coefficients of one-period lag economic growth and one-period lag fiscal budget deficits in the fiscal budget deficit model have a significant effect on Nigeria's current level of fiscal budget deficits. Most of the estimated models in the reduction VAR have low coefficients of determination, indicating that they have a poor goodness of fit. Only for the general price level model was the R-square useful. The remaining models had low goodness of fit and minimal impact across the majority of variables. The Nigerian economy's structural shocks, bottlenecks, and rigidities are the reasons for this. The major causes of the shocks or bottlenecks are fluctuations in the price of crude oil, shocks to foreign exchange rates, shocks to the broad money supply, shocks to inflation, shocks to interest rates, and shocks to other macroeconomic variables in Nigeria. As presented in Table 6, the estimates may not be suitable for use in policy decisions. Based on this premise, the study estimated the SVAR estimations in order to further examine the estimates.

Short-run and Long-run Impacts of Macroeconomic Variables

Recursive long-run (F-triangular) and short-run (S-triangular) limitations with a conventional normal distribution were applied to the reduced form VAR estimates in order to perform the SVAR estimation. The study's Table 8 displays the findings of the SVAR estimates. One-period lag economic growth was significant in the short-run at the 5% level, whereas other exogenous variables were not significant. This indicates that the short-run economic growth in Nigeria was significantly impacted by real GDP estimates that were one period lag by 3,791.7 units. Furthermore, in the short-run, current broad money supply was significantly positively impacted by the coefficient of the one-quarter lagged broad money supply. This suggests that in the short-run, Nigeria's one-period lag broad money supply significantly increased the country's current broad money supply by 757.7

units. Although it did not fulfil the a-priori anticipation, the coefficient of one-period lag general price level (CPI) had a short-run significant impact on Nigeria's current broad money supply. In the short-run, Nigeria's current broad money supply was significantly positively impacted by a one-period lag general price level by 0.445 units. The one-period lag crude oil price fluctuation coefficient in the crude oil price fluctuation model fulfilled the a-priori expectation, although it was still significant at 5%. This indicates that current crude oil price fluctuations in Nigeria were significantly positively impacted by 1,114.6 units from one-period lag fluctuations in crude oil prices. Furthermore, the general price level and fiscal budget deficits' coefficient of one-quarter lag values had significant short-run positive and negative effects on the current fluctuations in the price of crude oil, respectively. This suggested that the current fluctuations in Nigeria's crude oil prices were significantly impacted by the general price level, which was one period lag, as well as the fiscal budget deficits, that were one period lag, by -64.9 and 0.65 units, respectively.

Table 8

SVAR Estimates of Macroeconomic Variables

Matrices	Short-run SVAR Estimates		Long-run SVAR Estimates	
	Coefficients	Probability	Coefficients	Probability
C(1)	3791.7**	0.000	7430.4**	0.000
C(2)	32.33	0.686	3673.9**	0.000
C(3)	-1.048	0.993	-67.06	0.679
C(4)	-0.083	0.389	0.953**	0.000
C(5)	-0.191	0.437	44.41**	0.000
C(6)	-0.209	0.459	2.455**	0.000
C(7)	0.222	0.854	35.46**	0.000
C(8)	-39.826	0.178	-285.03**	0.000
C(9)	757.68**	0.000	2194.0**	0.000
C(10)	59.673	0.612	293.05***	0.068
C(11)	-0.025	0.795	0.544**	0.000
C(12)	0.445***	0.067	24.19**	0.000
C(13)	0.253	0.367	1.963**	0.000
C(14)	1.603	0.181	19.55**	0.000
C(15)	34.859	0.234	-79.44**	0.000
C(16)	1114.6**	0.000	1506.8**	0.000
C(17)	-0.143	0.137	-0.3161**	0.013
C(18)	0.649**	0.006	-2.795**	0.001
C(19)	-0.144	0.606	-0.535	0.145
C(20)	-1.226	0.302	-5.338**	0.000
C(21)	-64.914**	0.024	17.164	0.400
C(22)	0.906**	0.000	1.185**	0.000
C(23)	0.182	0.4296	-0.023	0.977
C(24)	-0.069	0.803	0.129	0.723
C(25)	0.569	0.631	-0.398	0.747
C(26)	25.01	0.377	-18.84	0.354
C(27)	2.182**	0.000	7.539**	0.000
C(28)	0.863**	0.002	0.569	0.117
C(29)	-0.265	0.823	2.059***	0.093
C(30)	14.89	0.598	-45.68**	0.022
C(31)	2.507**	0.000	3.416**	0.000

C(32)	0.577	0.626	2.423**	0.044
C(33)	-17.101	0.544	2.402	0.903
C(34)	11.214**	0.000	11.28**	0.000
C(35)	44.388	0.112	31.12	0.112
C(36)	263.22**	0.000	184.19**	0.000
Log likelihood	-3854.6		-3854.6	

Note. ** & *** = significant at 5% and 10% level respectively.

Source: Author's computation.

In the short-run, the coefficient of one-period lag interest rates was significant, but it did not meet the model's a-priori expectation. In Nigeria, current interest rates rise or fall by 0.906 units if one-period lag interest rates fluctuate by 1%. In the price level model, the one-period lag general price level and one-period lag inflation rates had significant coefficients, both at 5%. In Nigeria, the current general price level will alter or increase by 2.18 units and 0.86 units, respectively, if the one-period general price level and inflation rates change by one unit each in the short-run. One-period lag inflation had a significant positive impact of 2.51 units on current inflation rates in Nigeria, according to the coefficient of one-period lag inflation rates, which was significant at the 5% threshold. Similarly, current official exchange rates in Nigeria were significantly positively impacted by the coefficients of the one-period lag official exchange rate by 11.21 units. Furthermore, Nigeria's current fiscal budget deficits were significantly impacted by a one-period lag fiscal deficit. In general, the short-run results of the SVAR models indicate that macroeconomic variables that are lag one period and have significant associations with their current levels in Nigeria.

Most of the VAR system's coefficients became significant according to the SVAR model's long-run estimates. For instance, in the economic growth model, practically all of the macroeconomic variables with one-period lags, including real GDP, the broad money supply, interest rates, general price level, inflation rates, official exchange rates, and fiscal deficits, had long-run effects on current economic growth. The coefficient of one-period lag fluctuations in crude oil prices was the only macroeconomic variable that was not significant over the long-run. In the long run, all macroeconomic variables in Nigeria had significant impacts, as demonstrated by the broad money supply model. The findings imply that macroeconomic variables with one-period lags (real GDP, broad money supply, fluctuations in the price of crude oil, interest rates, general price level, inflation rates, and fiscal deficits) have long-run significant impacts on the broad money supply. Furthermore, in the long-run, the coefficient of one-period lag fiscal budget deficits in the crude oil price fluctuation model was not significant. In the long-run, Nigeria's current crude oil price fluctuations were also significantly influenced by other one-period lag macroeconomic variables, such as real GDP, the broad money supply, fluctuations in the price of crude oil, interest rates, the general level of prices, inflation rates, and official exchange rates. In the interest rates model, Nigeria's current interest rates were significantly impacted over the long-run by one-period lag interest rates. Interest rates in Nigeria were not significantly impacted by other macroeconomic factors. On the contrary, the long-run significance of the coefficient of one-quarter lagged inflation rates was demonstrated by the general pricing model. In the long run, Nigeria's present general price level was significantly impacted by other macroeconomic variables that lag one period, such as official exchange rates,

fiscal budget deficits, and general price level. According to the inflation rate model, official exchange rates and inflation rates that are one period lag, have a significant long-term impact on Nigeria's current inflation rates. The long-run significance of other macroeconomic variables, such as fiscal budget deficits with a one-period lag, was not found. Furthermore, in the long run, official exchange rates in Nigeria that were one period lag had a significant positive influence on current exchange rates. In the long-run, the one-period lag fiscal deficits coefficient was not significant. Likewise, Nigeria's current fiscal budget deficit was significantly positively impacted by one-period lag fiscal budget deficits.

Impulse Response of Macroeconomic Variables in Nigeria

The study further investigated the impulse-response function to analyse how one-period shocks or fluctuations in crude oil prices affect the current and future values of macroeconomic variables in response to specific innovations. The impulse-response function of Figure 2 was plotted by setting the residuals options of each macroeconomic model to one standard deviation in order to ignore the likely correlations in the error terms of the SVAR models. Figure 2 showed that the response of real GDP to broad money supply rose initially and reached a maximum level in period one and then declined to negative values in period two. It becomes positive in period three and then turns to negative in the fourth period. The response of money supply on real GDP became positive afterwards. However, crude oil price fluctuations response to real GDP declined negatively in the first period and reached its minimum point in the second period and then rose to become positive in the third period. Interest rates, the general price level and inflation rates were positive in their response to real GDP all through the time horizons.

Figure 2*Impulse Response Function of Macroeconomic Variables*

Source: Author's computation.

For every period, there was a negative impact of the official exchange rate on real GDP. Fiscal budget deficits had a positive response on real GDP until the fourth period, at which point they started to have negative. In a similar vein, real GDP's response to the broad money supply revealed that it was negative during the first period, peaked during the second, and then became positive during the third. For the remaining periods, real GDP's reaction to the broad money supply was positive. Nonetheless, the broad money supply model's response to fluctuations in the price of crude oil was positive over the course of every period. The first and second periods of interest rate response to broad money were positive, but the third period through the tenth period saw a negative response. Starting with the third period, the general price level responded positively and remained relatively stable in the economy. In the first two periods, the inflation rate responded

positively; but, in the third quarter and for the duration of the remaining period, it turned negative. During the whole period, the official exchange rates had a negative response to the broad money supply in the economy. On the other the same direction, the response of the fiscal budget deficit to broad money was positive and peaked in the second period; it turned negative in the third and subsequent periods.

Furthermore, as Figure 2 indicates, real GDP, interest rates, general price level, inflation, and official exchange rate all responded negatively to the crude oil price fluctuation model throughout the course of the periods. During the periods, however, the broad money supply and fiscal budget deficits responded positively to fluctuations in the price of crude oil. According to the interest rate model, real GDP as well as fluctuations in the price of crude oil reacted positively to interest rates during the first two periods before going negative during the fourth. During the fifth period, real GDP increased, but fluctuations in the price of crude oil remained negative. However, throughout the periods, changes in interest rates had a negative response on the broad money supply, general price level, inflation rate, official exchange rates, and fiscal budget deficits. According to the general price level model, fluctuations in the general price level were positively responded to changes in real GDP, the total money supply, and the price of crude oil over all time periods. The official exchange rate showed a positive response, peaking in the second quarter before becoming negative in the third. However, in the first period, changes in the general price level were accompanied by negative responses from interest rates and fiscal budget deficits, which turned positive in the third period. In the inflation rate model, variations in Nigeria's inflation rates have a negative response on real GDP, the broad money supply, fluctuations in the price of crude oil, the general level of prices, official exchange rates, and fiscal budget deficits. Interest rates responded positively to inflation rates at first, peaking in the second period; however, this responses turned negative in the fifth and subsequent periods. Real GDP, fluctuations in the price of crude oil, interest rates, general price level, and inflation rates all showed negative responses to official exchange rates over every point in time, according to the official exchange rate model. On the contrary, the fiscal budget deficit and the total money supply were positive during the first and second periods before turning negative over the remaining periods. For the majority of the periods in the fiscal budget deficits model, changes in the general level of prices, the money supply, inflation rates, and the price of crude oil all responded positively to changes in the fiscal budget deficits. Nonetheless, for most of the periods, changes in the government's fiscal budget deficit had a negative impact on real GDP, interest rates, and official exchange rates.

Structural Decomposition of Macroeconomic Variables

The models' structural decomposition yields details regarding the relative significance of each random innovation in influencing Nigeria's macroeconomic variables. The variances in the endogenous macroeconomic variables are divided into components that are impacted by the VAR model. Table 9 of this study presents the structural decomposition of the macroeconomic variables. Only the most significant innovations or shocks that have an effect on Nigeria's macroeconomic indicators were displayed in the table. According to the structural breakdown of real GDP in period 2, approximately 90.27% of Nigeria's shocks resulting from macroeconomic variables were

attributable to real GDP shocks. A 3.06% shock to the broad money supply during the second period also had a significant impact on the real GDP shocks. In the same period of time, changes in the official exchange rate (2.81%), fiscal deficits (2.08%), inflation rate (0.97%), general price level (0.74%), interest rate (0.03%), as well as fluctuations in the price of the crude oil (0.02%) all contributed to variations in real GDP shock. In the tenth period, shocks attributable to fluctuations in the price of crude oil were greater than shocks caused by changes in interest rates. This showed that the general price level, inflation rate, official exchange rates, fiscal budget deficits, and changes in the broad money supply all had a greater influence on real GDP than did fluctuations in the price of the crude oil. The broad money supply shocks accounted for almost 80.12% of the shocks in macroeconomic variables during the third period, according to the structural decomposition of the broad money supply. Subsequently, there were shocks to the crude oil price of 6.88%, shocks to the general price level of 5.27%, shocks to the official exchange rate of 3.56%, shocks to real GDP of 2.49%, shocks to inflation of 1.45%, shocks to interest rates of 0.13%, and shocks to the fiscal budget deficit of 0.0043%. Approximately 92.63% of the shock or innovations in Nigeria's macroeconomic variables during period 10 were caused by fluctuations in the price of the crude oil. Broad money supply shocks (2.79%), shocks to the official exchange rate (1.95%), shocks to the general price level (1.06%), shocks to interest rates (0.80%), shocks to inflation (0.49%), shocks to real GDP (0.27%), and shocks to the fiscal deficit (0.01%) come next. The 86.99% structural breakdown of interest rate shocks in period four (4) was mainly supported by 5.81% of shocks to the price of crude oil fluctuation, 3.15% of shocks to the broad money supply, 1.90% of shocks to real GDP, 1.19% of shocks to the inflation rate, 0.65% of shocks to the general price level, 0.21% of shocks to the official exchange rate, and 0.09% of shocks to the fiscal budget deficit. The general price level model in period two had 80.11% structural decomposition which also included 7.62% of shocks to the fluctuations in the price of crude oil, 6.04% of shocks to the broad money supply, 3.98% of shocks to the inflation rate, 0.89% of shocks to the fiscal deficit, 0.85% of shocks to real GDP, 0.37% of shocks to interest rates, and 0.13% of shocks to the official exchange rate. The structural decomposition of the 86.19% inflation shocks for the third period of the inflation rates model was likewise complemented by 11.26% general price level shocks, 1.24% broad money supply shocks, 0.56% real GDP shocks, 0.37% interest rate shocks, 0.36% crude oil price fluctuation shocks, 0.019% official exchange rate shocks, and 0.0003% fiscal budget deficit shocks.

Table 9

Structural Decomposition of Macroeconomic Variables

Period	Percentages (%)							
	D (Yt)	D (MSt)	D (CPFt)	D (INTt)	D (CPIt)	D (INFt)	D (EXRt)	D (FDt)
1	100.0000	99.81825	99.71409	96.70333	87.33952	87.73502	96.28820	87.24991
2	90.27387	83.27760	93.81299	88.25407	80.10737	86.63627	87.46107	77.88408
3	89.05327	80.21687	92.85910	87.25106	76.70805	86.18637	84.87059	76.75455
4	88.59815	77.67769	92.72101	86.99117	74.56093	85.94147	83.22664	76.36144
5	88.19277	75.48734	92.69373	86.78019	73.22325	85.76396	81.71768	76.22773
6	87.85702	73.54476	92.67687	86.58325	72.32579	85.61378	80.40522	76.13724

7	87.55237	71.88576	92.66290	86.40088	71.68739	85.47919	79.25182	76.05807
8	87.27832	70.43064	92.65053	86.23549	71.21222	85.35723	78.23276	75.98692
9	87.02917	69.15954	92.63925	86.08543	70.84650	85.24624	77.32567	75.92219
10	86.80303	68.04041	92.62894	85.94897	70.55719	85.14516	76.51555	75.86323

Source: Author's computation.

This indicates that the overall level of prices in Nigeria has a significant impact on inflation rates. Within the official exchange rate decomposition, the second period's 87.46% structural decomposition of exchange rate shocks is further explained by shocks to the crude oil price fluctuation, general price level, 1.77% broad money supply, 1.09% inflation rate, 0.63% real GDP, 0.47% interest rate, and 0.014% fiscal budget deficit. The structural breakdown further demonstrated that fluctuations in the price of crude oil, general price levels, and the size of the money supply, inflation rates, real GDP, interest rates, and fiscal budget deficits all have a significant impact on official exchange rate variations. According to the fiscal budget deficit model, approximately 77.88% of the shocks in macroeconomic variables in Nigeria's second period might be attributed to fiscal deficit shocks. 9.01% of shocks to the fluctuations in the price of crude oil, 4.30% of shocks to real GDP, 3.31% of shocks to interest rates, 2.35% of shocks to the broad money supply, 2.22% of shocks to the official exchange rate, 0.66% of shocks to the inflation rate, and 0.25% of shocks to the general price level followed the fluctuations in fiscal deficit shocks.

Discussion

Until the findings of this paper, most empirical studies have not delve in details into the short-run and long-run structural impact of crude oil price fluctuations on macroeconomic variables in Nigeria. In order to analyse the data collected from the National Bureau of Statistics (NBS) and Central Bank of Nigeria, the study used structural vector autoregressive (SVAR) models. The Johansen co-integration tests revealed that the variables are co-integrated and demonstrate long-run associations. Also, the Granger causality test demonstrated a unidirectional or bi-directional causality between macroeconomic variables in Nigeria. The studies by Adi et al. (2022), Krichene (2006), and Miamo and Achuo (2021) have documented similar findings. According to the short-run findings, Nigeria's current economic growth has been significantly impacted by real gross domestic product values that are lagging one period. The results are consistent with Alhamran et al. (2022) who found that oil prices, political stability, and globalisation have a positive impact on the real economic growth. In the short-run, the current broad money supply was significantly impacted by both the one-period lag general price level and the one-quarter lag broad money supply. According to the crude oil price fluctuation model, current crude oil fluctuations in prices are significantly influenced by one-period lags in general price level, one-period lags in crude oil price fluctuation, and one-period lags in fiscal budget deficits. This result differs from Tala and Hlongwane (2023) who linked exchange rates to crude oil price fluctuations. In Nigeria, the current interest rate was significantly influenced by the coefficient of one-period lag interest rates. In the general price level model, the coefficients of the one-period lag general price level and one-period lag inflation rates were significant. The significant coefficient of one-period lag inflation rates indicates that, in the short-run one-period lag inflation significantly increased current inflation rates in Nigeria. This was contrary to

the findings of Sharma and Dahiya (2023) who reported that inflation and exchange rate are significantly related in the short-run. In the short-run, Nigerian official exchange rates and fiscal deficits were significantly positively impacted by the coefficients of one-period lag official exchange rates and one-period lag fiscal deficits, respectively. The short-run results align with Ologbenla's (2020) findings, which indicate that while crude oil price fluctuations affect the real exchange rate in the economy, they have no impact on economic growth. However, the broad money supply and economic growth models demonstrated that almost all the coefficients of macroeconomic variables, including real GDP, the broad money supply, fluctuations in the price of crude oil, interest rates, the general level of prices, rates of inflation, official exchange rates, and fiscal budget deficits, had long-run significant impacts on current economic growth. The coefficient of one-period lag crude oil price fluctuations in the economic growth model was the only macroeconomic variable that was not significant over the long-run. The finding is contrary to Shao and Hua (2022) results which showed a long-run relationship between crude oil futures prices and spot prices. The findings are in agreement with those of Ologbenla (2020), who claimed that while crude oil prices have an impact on the real exchange rate in the economy, they do not affect economic growth. The results, however, stand in contrasts with those of Agri et al. (2016), Okoli et al. (2017), and Bello and Sa'ad (2021), who discovered that fluctuations in the price of crude oil had a significant effect on the determination of shocks to inflation, the exchange rate, and economic growth.

The real GDP's impulse response to fluctuations in the crude oil prices declined during the first period, peaked during the second, and then increased to show a positive trend during the third. Nonetheless, the broad money supply model's response to fluctuations in the price of the crude oil was positive over the periods. Real GDP, interest rates, general price level, inflation, and official exchange rate all showed negative responses to the crude oil price fluctuation model throughout the periods. In the first and second periods, real GDP as well as fluctuations in the price of crude oil responded positively to interest rates; in the fourth quarter, however, this response turned negative. The general price level model showed that over the period, real GDP, the broad money supply, and fluctuations in the price of crude oil all responded positively to changes in the general price level. However, changes in Nigeria's inflation rates responded negatively to real GDP, the broad money supply, changes in the price of crude oil, general price levels, official exchange rates, and fiscal budget deficits. Real GDP, fluctuations in the price of crude oil, interest rates, the general price level, and rates of inflation all showed negative responses to official exchange rates over the period of the study, according to the official exchange rate model. Also, for almost all the periods, changes in fiscal deficits were positively responding to the broad money supply, changes in the price of the crude oil, the general level of prices, and inflation rates. The shocks in crude oil prices were the primary factor driving innovations in the broad money supply, interest rates, official exchange rates, and fiscal budget deficits, according to the structural decomposition of the shocks in macroeconomic variables. This finding is consistent with Aremo et al. (2012) who found that Nigeria's government revenue and GDP are impacted by shocks to crude oil prices before government fiscal expenditure is affected. The general price level, the size of the broad money supply, and real GDP shocks are the main causes of inflation, whereas the broad money supply, fluctuations in the price of crude oil, and inflation shocks in Nigeria are the main causes of shocks to the official exchange rate. As a result, the

primary cause of shocks in Nigeria's macroeconomic policy instability is fluctuations in the price of crude oil. Crude oil price fluctuations affect official exchange rates, inflation rates, general price level, broad money supply, and real GDP growth. The implications are partly due to trade and other commodity markets, monetary (broad money supply) and fiscal (fiscal deficits) policy responses, and investment uncertainty. They also partly affect general prices and the activities of both exporters and importers. Variations in the price of the crude oil on the global market can lead to macroeconomic shocks that affect government policy. These shocks can affect a country's real GDP growth, official exchange rates, lending rates, general price level, inflation rates, and government budget deficits. To solve the structural issues the Nigerian economy is experiencing, further study is needed. The macroeconomic stabilisation process that unifies Nigeria's monetary and fiscal policy could be the focus of future research. Nigeria's macroeconomic instability is currently caused by both internal and external factors, necessitating the implementation of effective macroeconomic stabilization measures.

Conclusions and Implications

The evidence suggests that the crude oil price fluctuations are impacting macroeconomic variables in Nigeria. Crude oil price fluctuations impacts official exchange rates, inflation rates, the general price level, broad money supply, and real GDP growth. The implications can be attributed to trade and other commodity markets, investment uncertainty, and monetary (broad money supply) and fiscal policies (fiscal deficits) responses, as well as general prices and the activities of importers and exporters. Given Nigeria's heavy reliance on oil as its main source of income, the macroeconomic implications of fluctuations in the price of crude oil are important. The Nigerian economy may be impacted in a number of ways by these fluctuations since the majority of Nigeria's government revenue comes from crude oil. Fluctuations in oil prices directly affect government revenue, resulting to budgetary instability. The crude oil pricing fluctuations can lead to budgetary deficits, pushing the government to borrow more, increasing the national debt. Additionally, fluctuations in the price of the crude oil could have an impact on public spending on infrastructure, health care, education, and other vital services, which would lower government revenue. Fluctuations in the price of the crude oil can cause a decline in the value of the Nigerian currency since they reduce foreign exchange revenues. A prolonged period of the crude oil prices fluctuations can result in current account deficits, which can affect the country's international financial position. Crude oil price fluctuations can deter both foreign and domestic investment due to economic uncertainty and reduced profitability in the oil sector. The depreciation of the Naira can worsen the trade balance by reducing export earnings while import costs may rise. The depreciation of the Naira can cause imported inflation, which can raise general prices of goods and services.

In Nigeria, the oil industry employs a large number of people. Fluctuations in the price of crude oil have the potential to cause job losses and raise unemployment rates. Fluctuations in crude oil prices can lead to economic instability, exacerbating issues such as poverty and income inequality. This volatility also affects the sustainability and financial viability of Nigerian oil and gas companies. The need for economic diversification to lessen reliance on oil earnings is made apparent by the paper. The financial Strategy to control inflation and maintain currency stability, the Central Bank of

Nigeria might alter interest rates and employ other monetary instruments. The government may face greater pressure to implement effective structural changes that promote sustainable growth and economic diversification. As a result, fluctuations in crude oil prices have a substantial impact on the country's macroeconomic stability and growth prospects, calling for comprehensive and flexible policy measures to mitigate these effects. In order to improve Nigeria's macroeconomic performance, the study recommended the following measures.

- The Central Bank of Nigeria should take strong action in implementing general price control and stabilisation measures. Though evidence from the study suggests that there are high rates of inflation and low domestic production, increases in real GDP, the broad money supply, exchange rate appreciation, and the price of crude oil are all expected to continue to increase productivity and production.
- The CBN should undertake expansionary monetary policy as well. The CBN's credit expansion is still insufficient to satisfy the real sectors of Nigeria.
- The government should promote the growth of external reserves from oil windfalls. Increasing the government's ability to generate revenue. To decrease the informal sectors' share of the economy, the government must integrate them.
- The government should subsidise agricultural inputs in order to increase domestic production. The elimination of agricultural subsidies has reduced the sector's productivity and placed pressure on Nigeria's general price level as well as the local currency.
- It is important to prevent a further depreciation of the Naira in relation to the US dollar. In Nigeria, the broad money supply and real GDP are having a negative impact on exchange rates.
- The government should implement prudent macroeconomic management strategies aimed at mitigating instability stemming from fluctuations in crude oil prices in Nigeria.

Suggestions for Future Research

In order to achieve macroeconomic stabilisation, Nigeria could resolve a number of urgent economic problems by unifying its fiscal and monetary policies. The following are some potential subjects and research issues that could direct future studies: How might fiscal and monetary policy coordination help in reducing inflation and promoting economic growth? In what ways might policy unification help in the management of Nigeria's exchange rate to maintain stability and competitiveness? How might coordinated policies encourage economic diversification that goes beyond reliance on crude oil? How might these laws be crafted to guarantee growth that is inclusive while lowering inequality and poverty? Such studies could greatly support Nigeria's economic growth and stability and offer insightful information to policymakers.

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