

# **The Effect of Global Oil and Gas Prices and Production Fluctuations on the Economy of Nigeria**

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*Once a cornerstone of the U.S. economy, crude oil production now experiences a paradigm shift, abundant for domestic consumption and export, signaling a lasting global oil price transformation. Despite a surge in U.S. hydrocarbon production and weakening oil prices, imports from Nigeria dramatically dropped from 1.5 million barrels per day in 2006 to 0.2 million in 2013, ceasing entirely by early 2014. Consequently, Nigeria faced a sudden depletion of trade surpluses and reduced foreign reserves. This study delves into the immediate and long-term challenges confronting Nigeria, particularly examining the impact of recent oil and gas price fluctuations on key macroeconomic factors. Findings highlight the balance of payments' high elasticity to oil price shifts and low elasticity to money supply changes with a coefficient of determination of 78.69%. Additionally, the exchange rate shows low elasticity to oil price changes and moderate elasticity to money supply variations with a coefficient of determination of 82.80%.*

*Keywords: macroeconomics, oil price, variation, exchange rates, the balance of payments*

## **INTRODUCTION**

Over the past few years, the world has experienced a continuous sharp and significant drop in oil prices. More importantly, the gas price has asymptotically approached zero cents in the global oil and gas market. This is due in part to several emerging factors. Chief among them is hydraulic fracturing technology, commonly called 'fracking': a well-stimulation technique that uses liquefied material to produce and establish thinning fractures around reservoir well formations that spark production and increase productivity from new and existing oil and gas formations. It also permits the recovery of hydrocarbons from figures that petroleum production economists once believed were unmanageable production processes, such as tight shale formations. Furthermore, the United States, the largest importer and consumer of global crude oil, has been reducing its overreliance on foreign crude oil, partly due to its Strategic Petroleum Reserve (SPR) policy. Specifically, only in the past four years, U.S. hydrocarbon production has almost quadrupled, especially in states like Texas and North Dakota, where fracking has become an evolutionary phenomenon.

Crude oil, once the most critical and scarce commodity in the U.S. and the fuel driving its economic engine, is now abundant for local consumption and available for export, creating a new paradigm. This paradigm created a new global oil price order, which is here to stay. To explain this recent price

phenomenon, the classical economic theory of the law of one price implies that the price of a commodity remains relatively the same globally while the transaction cost creates the differences. Therefore, as the U.S. continues to increase production, the excess crude oil is dumped into the world market, increasing the world supply and exerting a continuous downward pressure on the global oil price. Assuming the global oil and gas demand remains relatively the same, this downward pressure on global oil prices poses a significant problem for oil-revenue-dependent countries like Nigeria. Between 2014 and 2015 alone, the oil price fell by about 50 percent, and the question was: has the oil price now reached the bottom?

As the global oil price plummeted again in 2020 to its lowest in over five years, another oil-revenue-dependent country, Saudi Arabia, began a dual strategy of increased production and crude oil export. This approach drastically cut the price of its crude oil in the U.S., a straightforward process seen by many in the market aimed to choke off the U.S. shale boom, with the hope of frustrating oil producers in the U.S. and creating a condition that could lead to a decline in hydrocarbon production within its states. Also, the Organization of Petroleum Exporting Countries (OPEC) strongly believes that U.S. hydrocarbon production will collapse by driving down oil prices.

Moreover, in the past few months, U.S. crude or West Texas International shares have begun to fall gradually as profit from fracking slowly declined, and fear now percolates the global oil market. Overall, the full effect of this strategy is yet to be seen and is still debatable. In light of these dynamic changes in the global oil market, the Saudis, the largest and most powerful producer among the OPEC members, and others within OPEC have been repositioning and restructuring their economies to absorb and withstand external shocks like the tumbling oil price. The Nigerian government presumed an increase in oil price for its 2015-2017 budget years, knowing that one of the significant problems in its oil revenue is the increased oil production in the U.S. By most standards, the proposed budget should have been dead on arrival, but was not the case in Nigeria.

Nigeria's oil supply to the U.S. was the bulk of its export revenue. In the past decade, while oil prices averaged about \$100/b, Nigeria greatly benefited from this oil windfall, and oil accounted for over 90-95 percent of its exports while at the same time contributing about 90 percent of its annual budget revenue. However, as the oil price weakened and the hydrocarbon production in the U.S. increased, U.S. hydrocarbon import from Nigeria significantly reduced from about 1.5 mb/d in 2006 to about 0.2 mb/d in 2013, and by early 2014, the U. S. completely stopped oil import from Nigeria. The result is the sudden erosion of the nation's trade surpluses and depletion of foreign reserves. Hence, this research study will attempt to elicit some significant frontline challenges in the country in the short and long term. Specifically, this research will examine the effects of recent crude oil price fluctuations on critical macroeconomic variables in Nigeria.

## **THE ECONOMY**

Before the 1970s economic prosperity from the hydrocarbon upsurge, agricultural export production was the mainstay of the economy. Cocoa and livestock, specifically, credited a substantial stake in total exports and well-developed domestic and export markets (Osho, 2006). Even with this rigorous overlook for growth, combined with the Nigeria oil boom, the Nigerian economy- the world's sixth largest oil-producing country- has suffered a drastic decline in agricultural production. One of the noticeable features during the era of the oil boom was the crippling 'Dutch Disease,' where crude oil accounted for over 95 percent of its local and export revenues. This classic 'Dutch Disease' was exacerbated by every Nigerian administration, as they failed to develop other sectors of the economy. Incidentally, this failure to intelligently integrate over 40 years of the windfall from the oil and gas exports into other domestic sectors of the economy is now evident as the unemployment rate and inflation rate are astronomically near the roof. This negligence was a colossal mistake which continues to plague the country. Paradoxically, today, as the oil price slides and the oil boom begins to fade, the challenges now confronting the Nigerian economy are diverse.

To better understand the current state of the Nigerian economy, its gross domestic product was rebased with 1990 as the base year, culminating in about a 90 percent increase in the overall economy. As a result,

the Nigerian economy instantly became the largest economy in Africa, with approximately \$550 billion in gross domestic product eclipsing that of South Africa. However, in the past few years, according to several economic reports, especially the Financial Times, data continue to show that there has been a steady decline in Foreign Direct Investment (FDI) in Nigeria. Specifically, in the past two years, data from the Central Bank of Nigeria revealed that Nigeria's FDI has crumbled to its lowest in decades.

In classical macroeconomic theory, FDI is regarded as a significant catalyst for economic development and an essential medium of technology transfer from developed to developing countries. In the world today, the most stable economies strongly rely on FDI to spur job creation, price stability, sustainable economic growth, and a favorable balance of trade payments because it is seen as an imperative source of non-debt inflows that combines external resources and technology transfer for domestic investment, improvements in human capital, and increases the level of domestic capital formation of a nation. Moreover, several studies have shown that the decline in Nigeria's FDI is attributed to many economic freedom factors such as bad governance, mismanagement, corruption, and so on, resulting in a low index of financial freedom and a lack of stable electricity needed for industrial and business growth. Successive Nigerian governments appropriated trillions of Naira for electricity power generation required to develop other sectors of its economy to no avail. Consequently, foreign investors now perceive Nigeria as a high-risk market for investment.

## **LITERATURE**

In recent years, oil prices have fluctuated, and the effect is widespread on many aggregate measures, such as unemployment and currency depreciation in Nigeria's economy. This is partly due to the lack of diversity in Nigeria's economy and its dependency on oil revenue for its survival, economic development, and growth. Hence, as the global oil price fluctuates, this downward market pressure generates a great concern for the Nigerian economy and the leaders. This concern requires a robust, holistic perspective, looking into the Nigerian economy and ways to explore how to decrease its reliance on oil revenue and begin to expand its non-oil revenue to revitalize its overall non-oil export outlook (Olomola, 2006).

Any price variation comes with attended risk. Regnier (2007) reported that oil price fluctuations outdid several hydrocarbon commodities price variations during the 1980s, and the trend remains. Sauter and Awerbuch (2003) examined the risk in oil investments. They reported that impending oil price streams signify a highly risky duty for hydrocarbon consumers. Whenever oil prices upsurge, economic activities are affected, resulting in income and asset value either declining or appreciating by some measure. Barsky and Kilian (2004) explain that a period of oil price escalation is associated with recessions, high inflation, low productivity, and low economic performance. However, this study does not give oil shocks a significant role in explaining macroeconomic fluctuations by challenging the notion that oil price fluctuation is exogenous in the performance of the US economy and the fact that none of the recent shocks has been associated with stagflation in the US economy as in the 1970s.

Over these periods, several oil price fluctuations reveal the divergent response of the foreign exchange market and other macroeconomic performance indicators to the oil shocks. Prominent among these are the recessions of 1973, 1981, 1990, and 2001, which all occurred around major oil shocks. At the same time, Cologni and Manera (2005) analyzed fluctuations in hydrocarbon prices, price levels, and interest rates within G-7 countries with a structural cointegrated vector autoregression to measure the impacts of hydrocarbon price fluctuations on gross domestic products. For the selected countries, unexpected hydrocarbon price fluctuations affect interest rates, followed by tight money policy tools deployed to combat inflation resulting from the oil price shock. This impact is then transmitted to reduced output growth.

## **THEORY AND EMPIRICAL MODEL**

Sarno and Taylor (2002) explain that the early studies on exchange rate determination focused on the malleability of demand for and supply of exports, imports, and foreign currency and the conditions under

which devaluation may enhance the trade balance. The model for this paper will be built on the assumption that crude oil is a critical part of aggregate consumption and production in the US. The price of oil will then be a crucial part of the Gross Domestic Product (GDP); if its price rises, the cost of output rises. The price of oil affects the balance of trade.

$$y = C(y) + I(y) + G + BGS(P, Q) \quad (1)$$

$$BOP = 0 = BGS(P, Q) = X - M = P_x Q_x - P^*_m Q^*_m \quad (2)$$

where  $y$  is GDP is total output,  $C$  is consumption and assumed to be a function of GDP,  $G$  is government expenditure, and  $BGS$  is the balance of goods and services and is presumed to be a function of price and quantity.  $BOP$  is the balance of payment and is assumed to be equal to  $BGS$  and equal to the difference between export,  $X$ , and import,  $M$ .  $P_x$  and  $Q_x$  are domestic prices and domestic quantity of export while  $P^*_m$  and  $Q^*_m$  are foreign prices and foreign volumes of imports respectively.

If the prices of other imports are assumed constant, and that of oil is allowed to fluctuate to isolate the effect of its shocks, the law of one price (LOOP) is considered for oil because it has a universal world price. The purchasing power parity, PPP, can also be assumed to hold the LOOP assumption.

$$P = eP^* \quad (3)$$

$$e = P/P^* = \$/fc \quad (4)$$

where  $fc$  is the foreign country currencies, and  $e$  is the trade-weighted exchange rate of Nigeria and major trading partners.

The model for this paper is built on the ‘investment saving’ (IS), ‘liquidity preference-money supply’ (LM), and the ‘balance of payment,’ ISLM-BP, model where the interest rate is assumed to be fixed. The BP curve is a function of the economy’s oil price and money supply. The future price of oil is used because the future price is anticipated and considers that the Central bank in the country would have taken all necessary measures to prepare for the effect as compared to the spot price, which is an unexpected price. The price of oil, money supply, and Gross Domestic Product (GDP) are all real values, deflated with the consumer price index. Marion and Svensson (1984) explain that how an economy adjusts to an expected change in oil price differs from how it will adjust to an unexpected change in oil price.

Furthermore, to establish the impacts of oil price shock on aggregate measures, three equations explain the various movements in the ISLM-BP curves. The equations will show how the economy could be destabilized and move to another equilibrium state. This was shown through its effects on the balance of payment ( $BGS$ ), National income( $y$ ), and exchange rate ( $Er$ ). The following models will be estimated:

$$BGS = \alpha_0 + \alpha_1 P_{oil} + \alpha_2 MS + \alpha_3 BGS_{t-1} + \varepsilon \quad (5)$$

$$Er = \beta_0 + \beta_1 P_{oil} + \beta_2 MS + \beta_3 e_{t-1} + \varepsilon \quad (6)$$

$$y = \gamma_0 + \gamma_1 P_{oil} + \gamma_2 MS + \gamma_3 y_{t-1} + \varepsilon \quad (7)$$

Data on the annual time series balance of payment and exchange rate are acquired from the Central Bank of Nigeria data portal from 2008 to 2018. While interest rate data were garnered from the Nigeria Stock Market portal from 2008 to 2018. Crude Oil Prices, 1970-2007 were gathered from the Earth Policy Institute of the U.S. Department of Energy and the United States Energy Information Administration, EIA.

## RESULTS

A multivariate regression analysis was conducted to examine the response of balance payment to changing macroeconomic variables such as oil price, money supply, and lag  $BP_{t-1}$ . The coefficients of oil price, money supply, and lag  $BP_{t-1}$  are shown in Table 1. The result indicated that the oil price is 7.6311, the money supply is 0.0001, and the lagged balance of payment is 0.8987, which are all significant at the 10% level.

**TABLE 1**  
**MODEL 1-ESTIMATED COEFFICIENTS**

Parameters	Balance of Payment $BP_t$
Oil Price	7.6311** (0.0038)
Money Supply	0.0001** (0.0258)
$BP_{t-1}$	0.8783** (0.0000)
$R^2$	0.9496

Estimates shown in Table 1 indicate that a unit increase in oil price results in a 7.6311 increase in the balance of payment, while a unit increase in the money supply results in a 0.0001 increase in the balance of payment. The coefficient of determination  $R^2$  specifies that predictive variables describe 94.97% of the total predicted balance of payment in the multiple regression equation. Also, the  $F$ -value was conducted to test the hypothesis that the predictive variables expound a significant percentage of the difference in the predicted balance of payment.

**TABLE 2**  
**MODEL 2-LOG ESTIMATED COEFFICIENTS**

Parameters	Ln Balance of Payment $BP_t$
Ln (Oil Price)	1.4697** (0.0002)
Ln (Money Supply)	-0.2269** (0.0000)
Ln ( $BP_{t-1}$ )	0.1682 (0.2411)
$R^2$	0.7869

Table 2 used a double log model to measure macroeconomic variables' relative responsiveness and sensitivity. The logarithm parameter estimate coefficients are presented in Table 2. The result indicated that a percent change in oil price translated to a 1.46 percent increase in the balance of payment. While a percent change in money supply led to a 0.227 percent decrease in the balance of payment. Hence, this suggests that the balance of payment is very elastic relative to changes in oil price and very inelastic to changes in the money supply. The coefficient of determination  $R^2$  specifies that predictive variables describe 78.69% of the total predicted log of the balance of payment in the multiple regression equation. Also, the  $F$ -value was conducted to test the hypothesis that the predictive variables expound a significant percentage of the difference in the predicted balance of payment.

**TABLE 3**  
**MODEL 1-ESTIMATED COEFFICIENTS**

Parameters	Exchange Rate $Er_t$
Oil Price	-0.26792** (0.0000)
Money Supply	0.0001** (0.0000)
$Er_{t-1}$	0.3296** (0.0000)
$R^2$	0.8813

Estimates shown in Table 3 indicate that a unit increase in the oil price results in a 0.2679 unit decrease in the exchange rate, while a unit increase in the money supply results in a 0.0001 unit increase in the exchange rate. The coefficient of determination  $R^2$  specifies that predictive variables describe 88.13 % of the total predicted variable (exchange rate) in the multiple regression equation. Also, the  $F$ -value was conducted to test the hypothesis that the predictive variables expound a significant percentage of the difference in the predicted exchange rate.

**TABLE 4**  
**MODEL 2-LOG ESTIMATED COEFFICIENTS**

Parameters	Ln (Exchange Rate $Er_t$ )
Ln (Oil Price)	-0.2002** (0.0000)
Ln (Money Supply)	0.3852** (0.0000)
Ln ( $ER_{t-1}$ )	0.0137 (0.3296)
$R^2$	0.8280

Table 4 used a double log model to measure macroeconomic variables' relative responsiveness and sensitivity. The logarithm parameter estimate coefficients are presented in Table 4. The result indicated that a percent change in oil price translates to a 0.20 percent decrease in the exchange rate. While a percent change in money supply to a 0.385 percent increase in the exchange rate. Therefore, the results suggest that the exchange rate is inelastic relative to changes in oil prices and slightly elastic to changes in the money supply. The coefficient of determination  $R^2$  specifies that predictive variables describe 82.80% of the total dependent variable in the log of the balance of payment in the multiple regression equation. Also, the  $F$ -value was conducted to test the hypothesis that the predictive variables expound a significant percentage of the difference in the predicted balance of payment.

## CONCLUSIONS

The present research has identified a complex and crucial relationship between global oil and gas prices, production fluctuations, and the Nigerian economy. The study noted that macroeconomic variables such as the balance of payment and exchange measures are relatively responsive to instability in oil prices and interest rate volatility. First, that increase in oil price caused a rise in the balance of payment, therefore signifying that the balance of payment is very elastic relative to the change in oil price. Second, that increase in the money supply caused little or no change in the balance of payment and demonstrated that the balance of payment is highly inelastic to change in the money supply. Third, to measure the relative responsiveness and sensitivity of the exchange rate, the research suggested the exchange rate is inelastic relative to changes in oil price and slightly elastic to changes in the money supply. Furthermore, this research has explored the multifaceted dynamics of this relationship and has drawn several key conclusions. Also, Nigeria's economy is undeniably intertwined with its oil and gas sector. The country's heavy reliance on oil exports has made it highly susceptible to the volatile nature of global energy markets. Consequently, global oil and gas price fluctuations profoundly and directly impact Nigeria's economic performance and stability.

The revenue volatility stemming from these price fluctuations poses significant challenges for Nigeria. The nation's ability to fund crucial public services, infrastructure projects, and social welfare programs is contingent upon the health of its oil and gas sector. This vulnerability calls for fundamentally reevaluating Nigeria's economic structure and a concerted effort to diversify revenue sources. The research also highlights the importance of addressing internal production challenges. Nigeria's oil production has been consistently disrupted by militant activities, pipeline vandalism, and operational inefficiencies. These disruptions hamper the country's capacity to meet production targets and contribute to economic instability. Therefore, addressing these internal issues is paramount. Nevertheless, the findings emphasize the need for prudent fiscal policies that can mitigate the impact of global oil price fluctuations. The Nigerian government should consider establishing mechanisms to save excess revenues during periods of high oil prices and to build buffers for periods of low prices. Simultaneously, infrastructure, human capital, and technology investment in non-oil sectors must be prioritized to foster economic diversification and reduce the nation's overreliance on oil and gas revenues.

In conclusion, the research underscores the urgency of redefining Nigeria's economic landscape. While the challenges posed by global oil and gas prices and production fluctuations are significant, they are manageable. Nigeria can chart a more resilient and sustainable economy by implementing sound policies, addressing internal production challenges, and actively pursuing diversification. Additionally, engaging in international diplomacy and collaborations can help Nigeria navigate the complex global factors influencing its economic fortunes. The path to financial stability and prosperity may be arduous, but it is a path that Nigeria must undertake with determination and strategic foresight. By taking these steps, Nigeria's economy can move beyond its historical reliance on oil and gas and open fresh opportunities for growth and progress.

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