Oil Price Shocks, Monetary Policy Transmission and Exchange Rate Stability in Nigeria

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Abstract
This study investigates the empirical effects of global oil price shocks on core monetary policy transmission channels and exchange rate stability in Nigeria, utilizing selected net oil-importing and net oil-exporting African economies as a comparative baseline. Grounded in the theoretical framework of the Real Business Cycle (RBC) model, the study employs an Autoregressive Distributed Lag (ARDL) framework and accounts for potential structural non-linearities using the Asymmetric or Nonlinear ARDL (NARDL) approach. The empirical analysis utilizes three core operational targets of monetary policy as dependent variables: The Monetary Policy Rate (MPR), Broad Money Supply (MS), and the Prime Lending Rate (PLR). The results reveal significant structural asymmetries based on net energy trade profiles. In net oil-exporting nations like Nigeria, the Error Correction Term (ECT) is negative and statistically significant, indicating a stable long-run equilibrium adjustment rate of approximately 15.3%. Furthermore, global oil price innovations exert a positive and statistically significant impact on the MPR in both the short and long run within exporting economies, highlighting systematic policy tightening by monetary authorities to sterilize windfall-induced domestic liquidity. Conversely, in net oil-importing nations, changes in oil prices show a negative long-run relationship with the policy rate, which reverses to a positive impact in the short run to combat imported cost-push inflation. The study concludes that global energy shocks heavily dictate Nigeria's internal monetary transmission paths and exchange rate dynamics. Consequently, it is recommended that the Central Bank of Nigeria (CBN) explicitly integrate international crude oil partial sums into its macroeconomic forecasting models and optimize liquidity sterilization mechanisms alongside fiscal stabilization buffers to buffer the domestic economy against exogenous energy market volatility.

Keywords: *Oil Price Shocks, Monetary Policy Transmission, Exchange Rate Stability, ARDL, Nigeria.*

1.0 Introduction

In many African nations, oil prices play a critical role in shaping the economic landscape, given the continent's substantial reliance on crude oil either as a major export commodity or as an essential industrial import. For an oil-exporting economy like Nigeria, crude oil constitutes the primary source of foreign exchange earnings and fiscal revenue, meaning global shocks directly dictate domestic economic stability (Iwayemi & Fowowe, 2011). Empirical evidence shows that fluctuations in global oil prices have far-reaching consequences for Nigeria's internal macroeconomic variables, including inflation, exchange rates, output growth, fiscal balances, and

external accounts. In contrast, net oil-importing African economies—including Kenya, South Africa, and Rwanda—experience escalating structural production costs and severe external trade vulnerabilities when global energy prices rise (Bacon & Kojima, 2008).

Despite the centrality of oil in the Nigerian economy, the specific transmission mechanisms through which oil price shocks propagate into domestic macroeconomic outcomes remain highly complex and deeply asymmetrical. Structural weaknesses, institutional rigidities, and persistent fiscal dominance frequently undermine the capacity of Central Bank of Nigeria (CBN) monetary policy to stabilize oil-induced domestic fluctuations. The country often struggles to respond optimally to global oil volatility due to credit market frictions, shallow financial markets, and fragile interest rate transmission channels (Bleaney & Hall, 2001). Consequently, the ability of monetary authorities to cushion the domestic economy against external energy disturbances while maintaining price and exchange rate stability remains constrained.

While monetary policy is theoretically positioned to mitigate the adverse domestic distortions of external price shocks, the empirical literature presents conflicting evidence. Some studies indicate that symmetric oil price movements influence monetary policy choices uniformly (Akpan, 2009; Bekhet & Yusuff, 2013), while others argue that the structural transmission path is fundamentally asymmetric, varying heavily by an economy's net resource endowment (Oyelami, 2017). Furthermore, a significant portion of historic regional literature has focused narrowly on broad output fluctuations while ignoring key operating targets of the central bank—such as the Monetary Policy Rate (MPR), money supply, and prime lending rates. Even where monetary variables were considered, they were frequently misaligned with actual institutional policy settings. This study addresses these analytical gaps by analyzing the exact effects of world oil price variations on core monetary policy variables and exchange rate stability in Nigeria, utilizing selected oil-importing nations as a comparative baseline.

2.0 Literature Review

2.1 Conceptual Framework

2.1.1 Oil Price and Oil Price Fluctuations

Oil prices refer to the global market valuation of crude oil, typically benchmarked against international indicators such as Brent crude, West Texas Intermediate (WTI), and the OPEC reference basket. These prices are determined by a dynamic combination of supply and demand fundamentals, geopolitical tensions, OPEC production quotas, and speculative financial activities (Hamilton, 2009; Kilian & Murphy, 2014). In the African context, oil price fluctuations exert a disproportionate influence due to the continent's dual position as both a major supplier and a heavy consumer of petroleum products.

For oil-exporting countries, international oil prices directly determine export revenues, fiscal balances, and foreign exchange reserves (International Monetary Fund, 2022). Sharp increases in oil prices generate massive fiscal windfalls, enabling governments to expand public spending and accumulate reserves. However, the inherent volatility of global oil markets exposes these economies to the structural risks of the "resource curse" and "Dutch disease," where commodity booms create temporary prosperity while undermining long-term economic diversification (Corden & Neary, 1982). Conversely, sharp price declines trigger fiscal crises, severe currency depreciation, and domestic inflationary pressures.

For oil-importing African countries, petroleum is a critical input for transportation, electricity, and industrial manufacturing. Rising oil prices inflate import bills, widen current account deficits, and drive cost-push inflation through higher fuel and energy costs (Mwase & Kumah, 2015). Thus, for

African importers, global oil price hikes represent an exogenous negative supply shock, constraining real economic growth and macroeconomic stability.

It is vital to distinguish between oil price shocks and broader oil price volatility. According to Baumeister and Kilian (2016), an oil price shock represents the unexpected element of a significant shift in crude markets, quantified precisely as the difference between the expected and actual price. Expanding on this, Kilian (2009) defines these shocks as structural, exogenous disturbances that generate distinct dynamic movements in global oil markets, which subsequently influence endogenously determined macroeconomic variables. While shocks represent sudden, un-forecasted innovations, oil price volatility describes the broader cause-and-effect processes governing the severity, persistence, and variance of long-term price movements.

Early academics such as Hamilton (1986) and Kilian (2008) established that crude oil prices are shaped by a combination of OPEC production decisions, geopolitical events, weather disruptions, and global supply–demand dynamics. Expectations on the supply side are influenced by the physical availability of crude oil and uncertainty surrounding future production capacity (Fattouh, 2007; Hamilton, 2009; Kilian, 2008). On the demand side, economic growth plays a central role: expanding economies require more energy, and petroleum products account for approximately one-third of total global energy use according to the International Energy Agency (IEA). Seasonal variations further influence supply–demand balances, contributing to fluctuations in crude oil market prices. Because the energy sectors of both oil-exporting and oil-importing countries are exposed to uncertainty in global markets, expectations shift in response to fluctuations in the global business cycle (aggregate demand shocks) and the uncertainty associated with unexpected shortfalls in available supply relative to anticipated petroleum demand (precautionary demand shocks; Hamilton, 2013a; Kilian, 2009).

2.1.2 Oil Price Volatility

Since 1970, the global energy sector has been characterized by unpredictable fluctuations and structural volatility, wherein significant and abrupt shifts in nominal crude prices are traditionally measured by standard deviation over specific timeframes (Elder & Serletis, 2010). Historical data tracked by the U.S. Energy Information Administration (EIA) vividly illustrates this volatility: in the first quarter of 1997, the global nominal oil price stood at $21.02 per barrel, plummeted to a structural low of $10.86 by the first quarter of 1999, and sharply reversed to peak at $29.10 by the third quarter of 2000.

Following the post-1986 rise in oil price volatility, Hooker (1996) contended that the traditional link between oil prices and economic growth had evolved and could no longer be explained by a simple linear relationship or by the traditional asymmetric parameters proposed by Mork (1989). Hooker's investigation was unable to verify that only increases in oil prices have a detrimental impact on economic growth while drops had no macroeconomic impact. Subsequent research expanded these findings. Hamilton (1996) discovered that most oil price increases since 1986 were immediately followed by even more significant declines. To control for this, he introduced the "net oil price increase" (NOPI), comparing the current price of oil with the peak price level of the previous year rather than just the preceding quarter. When applied to data after 1986, it demonstrated that individual price increases were often corrections to previous decreases.

Volatility is statistically measured as the expected change in the price of a given variable in a positive or negative direction. For example, if oil volatility is 15% and current oil prices are $100, it means that within the next year traders expect oil prices to fluctuate between $85 and $115. Prices of basic energy (natural gas, electricity, heating oil) are generally more volatile than prices

of other commodities. One major reason energy prices are so volatile is that many consumers are extremely limited in their ability to substitute alternative fuels in the short run when energy prices fluctuate. This lack of instant substitution impacts businesses and consumers alike, making it difficult to predict financial outlays for oil-related products. Higher uncertainty can prompt households to save more as a precautionary measure against future fluctuations in labor income, building up buffer stocks of savings (Carroll, 1990). As noted by Romer (1990), the flip side of increased precautionary saving for the future is an immediate reduction in household consumption today. For instance, Benito (2004) observed that a one-standard-deviation rise in employment risk, particularly in developing countries, leads to a noticeable reduction in aggregate consumption. While the effect on savings and spending is often temporary and dissipates once target buffer stocks are achieved, it creates significant short-run contractionary pressures.

2.1.3 Monetary Policy

Monetary policy encompasses the collection of instruments and measures used by central banks to control the money supply, interest rates, and lending conditions to attain macroeconomic stability. Stabilizing exchange rates, guaranteeing sustainable economic growth, and preserving price stability constitute the core objectives of monetary policy (Mishkin, 2019). Central banks traditionally employ conventional instruments such as open market operations, reserve requirements, and policy interest rates, alongside unconventional measures during structural crises. In Africa, monetary policy effectiveness is frequently constrained by structural challenges, including shallow financial markets, limited capital mobility, weak central bank independence, and fiscal dominance (Nguyen et al., 2021). Many African economies operate hybrid monetary regimes that combine inflation-targeting objectives with aggressive exchange rate stabilization to manage external shocks. Oil price volatility further complicates policy by creating conflicting policy objectives: central banks in oil-importing countries face pressure to tighten monetary policy to contain imported inflation—often at the expense of growth—while those in oil-exporting countries experience severe liquidity surges during price booms that fuel demand-pull inflationary pressures. The transmission mechanisms of monetary policy in Africa are generally weaker than in advanced economies. Credit and interest rate channels are constrained by underdeveloped banking systems, while the exchange rate pass-through channel tends to be stronger due to high import dependence (Mishra et al., 2014). Consequently, oil price shocks place considerable pressure on African monetary authorities, highlighting the vital importance of credible, well-coordinated, and proactive policy frameworks.

3.0 Methodology

3.1 Model Specification

To investigate the empirical effect of global oil price shocks on domestic monetary policy instruments, this study builds upon the theoretical foundations of the Real Business Cycle (RBC) framework adapted for resource-dependent economies (Kydland & Prescott, 1982; Okon, 2021). The study captured the dynamic interactions using analytical tools with focus on global oil price shocks and its effect on domestic monetary policy in Nigeria, the baseline empirical model is specified as follows:

MPV_it = alpha_i + sum(beta_j * MPV_{i,t-j}) + sum(gamma_q * OIP_{i,t-q}) + delta * Z_{it} + mu_i + epsilon_{it}

Where:

* MPV_it is the vector of domestic monetary policy variables for country i at time t, estimated individually across three separate models using:
1. Monetary Policy Rate (MPR)
2. Broad Money Supply (MS)
3. Prime Lending Rate (PLR)
* OIP_it denotes the global benchmark oil price (World Oil Price).
* Z_{it} represents a vector of macroeconomic control variables (such as domestic inflation and real GDP output growth parameters).
* alpha_i represents country-specific fixed effects; mu_i accounts for unobserved time effects, and epsilon_{it} is the stochastic error term.

3.2 Estimation Techniques

The study's estimation methods are guided directly by its comparative objectives. To capture both the dynamic interactions and long-run adjustments, the model is estimated using the Autoregressive Distributed Lag (ARDL) framework, isolating the net-exporting category to draw explicit structural inferences for the Nigerian economy.

3.3 Asymmetric Autoregressive Distributed Lag (NARDL)

To account for nonlinearities, the study incorporates the Asymmetric or Nonlinear ARDL (NARDL) approach developed by Shin et al. (2014). Traditional linear ARDL models assume a symmetric relationship, implying that positive and negative shocks of the same magnitude exert identical impacts on the target parameters. The NARDL model relaxes this assumption, permitting the examination of long-run and short-run asymmetries by decomposing the independent variable (OIP) into its positive (OIP+) and negative (OIP-) partial sums.

A major advantage of the panel NARDL model, as noted by Pesaran and Pesaran (1997) and Ibrahim (2015), is its econometric flexibility: it does not require uniform I(1) integration among variables, remaining valid for mixed integrations of I(0) and I(1), provided no variable exhibits I(2) broken trend. This framework effectively extracts hidden co-integration, unmasks relationships invisible within traditional linear models, and maintains robust statistical properties within cross-country samples.

4.0 Results and Discussion

4.1 ARDL Estimates: Oil Prices and the Monetary Policy Rate (MPR)

To address the primary objective, empirical tests were run to evaluate how global oil price innovations impact key monetary instruments. Tables 4.1a and 4.1b present the results of the ARDL model tracking the Monetary Policy Rate (MPR), contrasting net oil-exporters (representing Nigeria's structural cohort) against net-importing economies. Likewise, the empirical results reveal that the Error Correction Term (ECT) coefficients are appropriately negative for both country groups, confirming a systemic pull toward long-run equilibrium. However, the ECT is statistically significant only within the net oil-exporting cohort, showing that long-run equilibrium adjustments occur at a stable rate of approximately 15.3% per period. Conversely, the ECT coefficient for net oil-importing countries is statistically insignificant, indicating weaker long-run error correction dynamics within that group.

The impact of oil price fluctuations on the MPR differs sharply across the two groups. In net oil-exporting nations like Nigeria, variations in global oil prices exert a positive and significant influence on the MPR in both the long and short run, reflecting policy tightening during oil

windfalls to curb excess domestic liquidity. In contrast, for net oil-importing countries, changes in oil prices show a negative and significant relationship with the policy rate in the long run, which reverses to a positive and significant impact within short-run dynamics, pointing to immediate policy tightening to combat imported cost-push inflation.

Furthermore, the estimated long-run and short-run effects of oil price fluctuations on the broad money supply. The results show that the error correction terms (ECT) are negative but lack statistical significance across both exporting and importing cohorts, signaling weak long-run causal relationships between global oil prices and money supply lines. Specifically, for Nigeria, oil prices exert a positive but statistically insignificant influence on money supply in the long run ($p = 0.1282$), while demonstrating a positive and significant effect in the short run as windfall cash hits regional commercial banks.

5.0 Conclusion and Recommendations

5.1 Conclusion

This study investigated the empirical effects of global oil price variations on core monetary policy instruments and exchange rate stability in Nigeria, drawing comparative baselines from cross-border African data. The findings confirm that global oil price shifts exert varied, complex, and highly asymmetric effects on domestic monetary variables depending directly on a nation's net energy trade profile.

For Nigeria, as a leading net oil-exporter, rising global oil prices lead to policy interest rate tightening in both the long and short run to sterilize windfall liquidity injections and ease pressure on the Naira. Conversely, the expansionary pressures observed in oil-importing countries highlight the structural counter-strains facing trade partners. The overall evidence validates that external energy shocks dictate Nigeria's internal monetary transmission paths, demanding proactive, non-linear policy stances from the Central Bank of Nigeria.

5.2 Recommendations

Based on these empirical findings, the study offers the following recommendations:

1. Tailor CBN Forecasting to Energy Volatility: The Central Bank of Nigeria must explicitly incorporate international crude oil price behaviors and structural partial sums into its macroeconomic forecasting models when setting annual monetary policy guidelines, as domestic policy rates and operational target liquidity are highly sensitive to external oil shifts.
2. Optimize Liquidity Sterilization and Stabilization Buffers: Nigerian monetary authorities should optimize liquidity sterilization tools and foster tighter coordination with fiscal buffers (such as the Excess Crude Account and Sovereign Wealth Fund) to smooth out short-run structural cash surges during oil booms.
3. Support Structural Import Substitution: To mitigate long-run exchange rate depreciation and monetary transmission vulnerabilities, policy makers should aggressively incentivize domestic refining capacity and alternative energy investments, reducing the domestic economy's dependency on volatile global petroleum product imports.

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