EAST AFRICAN FINANCE JOURNAL (EAFJ)
Volume 5 Issue 3 |2026 | pp 35- 67
E-ISSN: 2959-9121

Monetary Policy and Inflation Dynamics in Selected Oil-Producing Economies in Africa: The Autoregressive Distributed Lag Approach and Threshold Analysis

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Article DOI: 10.59413/eafj/v5.i3.4

Abstract:

This study investigates the effectiveness of monetary policy in curbing inflation across seven African oil-producing economies over the period 1995–2024 using panel data. The specific objectives lie in examining the effect of money supply on inflation in oil-producing economies and to establish the threshold level of inflation for these economies to ascertain their inflation tolerance. Employing panel autoregressive distributed lag (ARDL) model and smooth transition regression (STR) techniques, the analysis provides robust evidence on how oil price shocks affect the level of inflation and how oil-producing economies can tolerate different levels of inflation. The ARDL model showcases that broad money supply negatively impacted inflation significantly in the short run, but its long run effect is positive and statistically significant. Also, crude oil price shock positively influenced inflation both in the short run and in the long run. The STR analysis highlights cross-country asymmetries in inflation tolerance level: Angola exhibits the highest inflation tolerance threshold, whereas Algeria demonstrates the lowest. The findings underscore the imperative for a more diversified and context-specific monetary policy framework in African oil-producing economies. Such a framework should integrate macroprudential instruments and enhanced liquidity management while assigning greater weight to exchange rate dynamics. Policy implications suggest the adoption of flexible yet strategically managed exchange rate regimes to strengthen resilience against external shocks and anchor inflation expectations.

Keywords: Monetary policy, Central Bank Independence, Inflation, Oil Price Shock, Africa

1. Introduction

Monetary policy plays a central role in macroeconomic management, particularly in stabilizing prices and steering economic growth. The conventional monetary policy transmission mechanism outlines the channels through which policy-induced changes in monetary aggregates influence inflation and overall economic performance. Key among these transmission mechanisms are the interest rate, exchange rate, and credit channels (Evans and Saibu, 2017; Endut et al., 2015). Through the interest rate channel, monetary policy influences the cost of borrowing and the return on savings, thereby affecting investment and consumption decisions in the economy. The exchange rate channel operates by altering the relative price of domestic and foreign goods, which in turn impacts net exports and aggregate demand. The credit channel functions by shaping the access of households and firms to credit, particularly in economies where financial intermediation plays a significant role in investment financing. Collectively, these channels provide central banks with the levers to regulate the cost, availability, and distribution of credit, thereby exerting influence on aggregate demand and inflationary pressures. Ultimately, the effective operation of these mechanisms underpins the pursuit of price stability, which remains the universally recognized core objective of monetary policy.

The theoretical underpinning of this mechanism is found in the quantity theory of money, championed by Irving Fisher, which posits a proportional relationship between money supply and the price level under full employment conditions. Thus, any expansionary monetary policy that increases the money supply in a fully employed economy is expected to generate inflationary pressures. However, this assumption has been refined by monetarist perspectives, which argue that inflation emerges when the growth in money supply surpasses the growth in real output, particularly in economies not at full employment (Liang, 2023). Thus, the inflationary consequences of monetary expansion are attenuated when the increase in money supply is absorbed by underutilized or idle resources, or when it is matched by a proportional growth in real output. In such circumstances, the excess liquidity does not translate into excess demand pressures on prices but instead facilitates higher productive capacity utilization, thereby supporting non-inflationary growth.

In oil-producing economies, particularly in Africa, the transmission of monetary policy to inflation often operates through channels that extend beyond conventional mechanisms. A notable alternative is the "petro-monetary transmission mechanism" (Evans, 2021; Onwioduokit et al., 2026), which underscores the critical role of oil price shocks in shaping domestic monetary and inflationary dynamics. Positive oil price shocks, such as increases in global crude oil prices, typically generate substantial foreign exchange inflows and augment government revenues. These developments can stimulate public expenditure, expand domestic liquidity, and raise aggregate demand, thereby exerting upward pressure on the general price level (Omolade et al., 2019; Bawa et al., 2020). Conversely, negative oil price shocks diminish fiscal revenues, erode external reserves, and weaken domestic currencies, thereby inducing exchange rate depreciation and imported inflationary pressures (Bala and Chin, 2018).

The impact of oil price shocks on inflation occurs through both direct and indirect channels. Directly, increases in crude oil prices raise the cost of refined petroleum products, which immediately affect the consumer price index (CPI). Indirectly, oil price shocks raise production costs for petroleum-dependent goods and services. Empirical evidence indicates that the direct channel typically exerts a stronger pass-through effect on inflation (Alvarez et al., 2011). Oil price shocks may also generate second-round effects – such as wage adjustments and shifts in inflation expectations – that further amplify inflationary pressures (Conflitti and Luciani, 2017).

In addition to the monetary transmission, oil prices influence inflation through the fiscal channel, conceptualized as the petro-fiscal transmission mechanism (Budina and Wijnbergen, 2008). Positive oil price shocks, in the absence of stabilization mechanisms like sovereign wealth funds (SWFs), often result in higher public expenditure and expanded aggregate demand, fuelling inflationary pressures. Conversely, negative oil price shocks may create fiscal imbalances that, if monetized, can also prove inflationary.

These dynamics underscore the challenge of inflation management in oil-dependent economies. The literature highlights the notion of an optimal inflation threshold, above which inflation hampers economic growth. This nonlinear, inverted U-shaped relationship has been documented across both developed and developing countries (Khan and Senhadji, 2001; Drukker et al., 2005; Esen et al., 2017; Olowofeso et al., 2023). Yet, limited empirical attention has been paid to whether African oil economies, due to their commodity price exposure, exhibit higher tolerance for inflation.

Central bank independence (CBI) is a critical determinant of inflation outcomes. The Barro and Gordon (1993) framework emphasizes that greater CBI enhances policy credibility and reduces inflation bias. Empirical studies confirm that countries with stronger CBI achieve more stable inflation (Bodea and Hicks, 2014; Yahaya et al., 2022) and improved financial stability (Bernanke, 2010).

Despite substantial theoretical and empirical contributions, few studies have simultaneously considered the petro-monetary, petro-fiscal, and conventional monetary channels in African oil-producing economies. Moreover, the interaction between oil price shocks, exchange rate volatility, fiscal balances, and CBI remains underexplored. This study addresses this gap by employing a Vector Autoregression (VAR) framework to trace the responses of inflation and key macroeconomic variables to oil price shocks, using impulse response functions and variance decomposition to identify the relative importance of different transmission channels.

Managing inflation remains a persistent challenge in oil-producing African economies such as Nigeria, Angola, and Algeria, where macroeconomic stability is highly vulnerable to external shocks. Heavy reliance on crude oil exports exposes these

economies to global oil price fluctuations, which in turn drive exchange rate volatility – a key channel through which external shocks transmit into domestic price levels. For example, the Nigerian Naira depreciated from ₦306.08/USD in 2018 to ₦645.19/USD in 2023, with similar trends recorded for the Angolan kwanza and the Central African CFA franc. Such depreciations exacerbate imported inflation, complicating inflation targeting and policy effectiveness.

Inflation dynamics in these economies are shaped by exchange rate pass-through (Campa and Goldberg, 2005), monetary expansion (Mishkin, 2007), and supply-side disturbances (Blanchard and Galí, 2007). Yet the dominance of oil in export revenues and fiscal budgets creates a policy dilemma for central banks, which must balance price stability, output growth, and exchange rate management amid weak institutions and shallow financial systems. Inflationary outcomes remain severe: Nigeria's inflation accelerated from (13.25% in 2020 to 33.24%) in 2024, while Angola's rose from (21.02% to 28.24%) within the same period.

Oil price volatility further compounds the problem. Global crude prices peaked in 2008, 2012, and 2022, but plunged dramatically in 2020 during the COVID-19 pandemic. Such volatility destabilizes revenue flows, fuels uncertainty, distorts inflation expectations, and undermines central bank credibility. Empirical studies (Adelegan, 2018; Usman and Ugwuoke, 2024; Odo et al., 2025) confirm that inflation in oil-producing African countries is highly sensitive to oil price shocks, while conventional monetary policy tools often prove inadequate.

However, the existing literature insufficiently addresses how structural features – including fiscal dominance, institutional weakness, and financial market rigidities – mediate the inflation–monetary policy nexus in these economies. This omission leaves a critical knowledge gap concerning the mechanisms through which monetary policy interacts with inflation dynamics under oil dependence. This study seeks to address this gap by examining the structural and contextual factors that shape monetary policy effectiveness in oil-exporting African economies. By employing cross-country analysis, it aims to provide insights into the design of context-sensitive policy frameworks capable of enhancing monetary policy transmission, mitigating inflationary pressures, and fostering long-term macroeconomic stability.

The overarching objective of this study is to investigate the influence of monetary policy on inflation dynamics in selected oil-producing economies in Africa over the period 1995 to 2024. The specific objectives are to:

- assess the effectiveness of monetary policy in managing inflation in oil-producing African economies.
- assess the impact of oil price shocks on inflation in oil-producing economies in Africa.
- investigate the role of central bank independence in the conduct of monetary policy and inflation control.
- estimate a threshold level of inflation that is consistent with macroeconomic stability in the selected countries.

This study is guided by the following research questions:

- How effective is monetary policy in controlling inflation in oil-producing African economies?
- Does oil price shocks affect inflation in oil-producing economies in Africa?
- What role does central bank independence play in enhancing the effectiveness of monetary policy in managing inflation?
- What is the inflation threshold level beyond which macroeconomic instability becomes likely in oil-producing African countries?

Many African economies rely heavily on crude oil exports, making them vulnerable to fluctuations in global oil prices. As oil prices affect government revenues, foreign exchange earnings, and overall macroeconomic stability, understanding the transmission of these shocks through inflation and monetary policy channels becomes crucial. High oil prices may lead to increased government spending and foreign exchange inflows, potentially fuelling inflation and leading to phenomena such as the "Dutch Disease," where resource dependence hampers the growth of other sectors. Conversely, low oil prices can reduce government revenue, compress consumption and investment, weaken reserves, and trigger exchange rate depreciation and external borrowing.

This study is significant because it investigates the complex relationship between oil price volatility and inflation dynamics within the context of monetary policy in oil-producing African economies. It contributes to the broader discourse on macroeconomic management in resource-rich developing countries by:

- Offering empirical insights on how oil price shocks transmit through inflation and other macroeconomic variables.

- Providing guidance to central banks and policymakers in Africa on optimizing monetary policy under oil price volatility.
- Supporting policy dialogue among members of OPEC and regional economic communities on inflation targeting and central bank independence.

This study covers the period from 1995 to 2024, a timeframe characterized by episodes of oil price booms and busts, as well as significant macroeconomic fluctuations in African oil-producing countries. Out of more than fifteen (15) oil-producing economies in Africa, the empirical analysis focuses on seven (7) African countries which are Nigeria, Angola, Algeria, Tunisia, Equatorial Guinea, Ghana and Gabon. These countries were selected to capture the five regions in Africa (North, Central, South, East, and West) with the aim of comparing policy effectiveness between the economies. These countries were selected based on their oil production rankings as reported by Energy News Africa Plus (2024), and they represent key oil producing economies (apart from Ghana and Tunisia) in the African continent and were selected based on data availability. Although Tunisia and Ghana are not major oil-producing economies in Africa, their inclusion facilitates a comparison of the threshold level of inflation with the major-oil producing economies.

The study employs the Consumer Price Index (CPI) as the primary measure of inflation, given its widespread use (e.g., Evans, 2021, Mien, 2022, Odo et al., 2025) and its composite nature in capturing changes in the general price level. Other inflation measures, such as the GDP deflator or sub-components of the CPI (e.g., core, food, and energy), are excluded to maintain focus and ensure data comparability. The study also focuses on only the money supply and exchange rate channels of monetary policy. The interest rate channel has not been considered since the aforementioned channels have been established to be the key pathways through which oil price shocks can influence inflation in an oil-producing economy.

The study is structured into five sections: section 1 presents the introduction, including background to the study, problem statement, research objectives, questions, significance, and scope of the study. Section 2 provides a comprehensive review of relevant literature – conceptual, theoretical, and empirical – as well as the identified research gap. Section 3 outlines the methodology, including the model specification, data sources, and estimation techniques. Section four contains the empirical results, discussion of findings, and policy implications. Section 5 concludes the study by summarizing the key findings and offering recommendations. Each chapter builds on the previous one, providing a coherent and logical progression toward addressing the research questions and fulfilling the objectives of the study.

2. Literature Review

2.1 Dutch Disease, Oil Prices, and Inflation

The concept of Dutch Disease posits that a surge in revenues from natural resources, such as oil, can cause economic imbalances by shifting focus from tradable sectors to non-tradable sectors. In oil-exporting countries, rising oil prices lead to an appreciation of the domestic currency, making non-oil exports less competitive and increasing reliance on imported goods (Corden and Neary, 1982; Alenoghena, 2020). This structural shift often results in a decline in manufacturing and agriculture, undermining long-term economic diversification.

The inflationary impact of oil price shocks is well-documented. Oil price increases affect inflation through both direct channels, such as rising energy costs for households, and indirect channels, such as increased production costs and second-round effects on wages and pricing behavior (Zivkov et al., 2019; Alvarez et al., 2011). These inflationary pressures can trigger wage hikes and cost-push inflation, especially when producers pass increased costs onto consumers (Mustapha and Suleiman, 2021).

Conflitti and Luciani (2017) identify four transmission mechanisms: (i) increased production costs, (ii) heightened inflation expectations, (iii) pressure for wage increases, and (iv) negative supply shocks due to rigid real wages. However, the net effect of oil price shocks may be ambiguous. While they can increase inflation, they may also suppress demand by reducing real disposable income, leading to deflationary pressures in certain contexts.

2.2 The Quantity Theory of Money

The Quantity Theory of Money (QTM), most notably articulated by Irving Fisher, posits a direct and proportional relationship

between the quantity of money in circulation and the general price level in an economy, holding other factors constant. The foundational expression of the theory is captured in Fisher's (1913) equation of exchange:

$$MV=PT \quad (2.1)$$

where:

M denotes the money supply,

V is the velocity of money (i.e., the average number of times a unit of currency circulates in a year),

P represents the general price level, and

T is the total volume of transactions in the economy.

According to this framework, the product MV represents the total money spent in the economy, while PT denotes the total value of transactions. Under the assumption that V and T are constant in the short run, any increase in the money supply (M) would translate directly into a rise in the price level (P). This leads to the simplified expression:

$$P = f(M) \quad (2.2)$$

which suggests a positive functional relationship between the price level and the quantity of money.

The QTM was later adopted and refined by the monetarist school, especially by Milton Friedman, who famously argued that "inflation is always and everywhere a monetary phenomenon" (Friedman, 1968). In his view, sustained inflation arises when the growth rate of money supply consistently exceeds the growth rate of real output.

In sum, while the QTM provides a foundational understanding of the money-price relationship, especially in the long run, its assumptions and applicability are limited in dynamic, modern economies where institutional factors, interest rates, and expectations play significant roles in inflation dynamics.

2.3 Structural Theory of Inflation

The methodology of the structuralists was primarily established in Latin America (Harberger, 1963). This theory was essentially developed to refute the assertions and presumptions of Irvin Fisher's quantity theory of money, which holds that it is inapplicable in developing nations where structural rigidities, market imperfections, unorganized sectors, and other problems are common. Accordingly, the theory postulates that inflation results from emerging nations' inability to supply sufficient products and services that consumers want at competitive costs. The theory makes the assumption that significant structural imbalances, specifically those between the supply and demand of mostly industrial inputs, are the root cause of inflation (Clement et al., 2021). Sectoral constraints, according to Prabha (2013), are what cause imbalances that ultimately result in price increases. Therefore, it is necessary to comprehend inflation in light of these structural shifts and constraints, including those related to agriculture, government resources, foreign exchange, etc.

According to the structuralists view, inflation is mostly caused by inelasticity in the economic structures (Ezeanyeji et al., 2021). This is mostly observable in underdeveloped nations. This is due to inelasticity in the agriculture sector, labour force, output level, institutional framework, capital development, and unemployment patterns. As a result, inefficiencies in the economic systems cause inflation. In other words, structural imbalances like the mismatch between the supply and demand for industrial inputs are the root cause of inflation, according to this hypothesis. Inadequate grants, borrowing, and help from outside sources require governments to rely on deficit finance. Other structural imbalances that contribute to inflation include social and political restrictions, infrastructural bottlenecks, foreign exchange difficulties, and food shortages. According to structuralist economists, the system's structural rigidities are reflected in inflation.

2.4 Fiscal Theory of Inflation

According to the theoretical literature, the impact of a fiscal deficit on inflation is contingent upon how the deficit is financed, as well as how it affects aggregate demand and private investment (Carlstrom and Fuerst, 1999). The fiscal theory of inflation forecasts both an independent channel that does not impact the money supply and a fiscal deficit-inflation nexus through changes in the money supply. The strong form fiscal theory of inflation is the independent channel via which changes in the fiscal deficit affect inflation by influencing the money supply (Carlstrom and Fuerst, 1999). According to the weak form fiscal

theory, the monetary authority and the fiscal authority are engaged in a "game-of-chicken" (Mwankemwa and Luvanda, 2022), whereby the monetary authority must move to create the required seigniorage to maintain the budget's solvency after the fiscal authority commits to a path for the budget deficit. As a result, this channel has fiscal dominance, and monetary policy is considered accommodating. Inflation results from the establishment of seigniorage to finance the fiscal deficit, which expands the money supply. Accordingly, the weak form fiscal theory holds that fiscal behaviour influences inflation, which is a monetary phenomenon.

According to the strong form fiscal theory, a fixed money supply can cause inflation if there is a fiscal deficit; in this scenario, the public's propensity to keep money determines prices (Carlstrom and Fuerst, 1999). Furthermore, it argues that prices are not exclusive when the government's budget is not considered. According to the theory, the government budget constraint is balanced over the long term, and changes in fiscal policy have an impact on the price level to the extent that it serves as the equilibrating factor for the real value of government debts to adjust to a level that equals the fiscal budget balance (Mwankemwa and Luvanda, 2022). The market's assessment of the sustainability of the government budget causes the price level to change. As long as people believe that the deficit cannot be sustained, the level of prices will rise. However, in order for changes in fiscal policy to directly impact price level (and hence, real money demand) while maintaining an unaltered money stock, the strong form fiscal theory requires an extremely elastic interest elasticity of money demand (Carlstrom and Fuerst, 1999).

Friedman (1968) maintained that by managing the money supply, monetary authorities could regulate the rate of inflation. Furthermore, when a budget deficit is monetized, inflation ensues. He went on to say that whether or not interest rates are pegged determines the impact of bond financing. Bond financing would need an expansion of the money supply, at least over time, while interest rates are fixed, which would result in inflation (Sergent and Wallace, 1981). As a result, bond-financed fiscal deficits raise interest rates to the point that monetization is ultimately used to finance them, which results in inflation (Friedman, 1968). Whether or not the deficit is monetized, Miller (1983) contended that it causes inflation by crowding out private investment once it is financed by bonds (i.e., bond financing increases interest rates and this crowds out private sector investment, reducing output growth and hence causing rising price level).

A budget deficit's impact on private investment determines how it affects inflation. Its impact on private investment, however, is contingent upon whether the Neoclassical theory, the Keynesian school of thinking, or the Ricardian equivalency is relevant. Since people plan their consumption throughout their lives, the neoclassical theory states that a budget deficit raises consumption while pushing taxes to future generations, which in turn reduces saving (assuming full employment). As a result, interest rates rise and private investment and income fall. The Keynesian hypothesis states that a budget deficit boosts domestic output because of resource unemployment and liquidity constraints. As a result, investors get more hopeful and make more private investments, which raises income. According to the Ricardian equivalence, taxes and budget deficits have comparable impacts on the economy (Barro, 1989). Since there is a corresponding decrease in public saving for every rise in private saving, national saving remains unchanged. The budget deficit has no effect on the level of prices to the degree that national saving, investment, and aggregate demand remain unchanged.

2.5 Empirical Literature Review

A wide range of empirical studies have investigated the relationship between monetary policy oil price shocjand inflation, as well as the role of central bank independence (CBI) in achieving price stability across various economic contexts. The empirical literature presents a complex and, at times, inconclusive picture, shaped by methodological differences, data spans, and country-specific macroeconomic environments.

In the context of Nigeria, Bhatt and Kishor (2015) employed time series analysis grounded in the rational expectations framework to examine the interaction between inflation and monetary policy from 1980 to 2017. Their findings suggested that the use of monetary policy to finance fiscal deficits through the inflation tax had significant implications for inflation volatility and exchange rate instability. Similarly, Yunana et al. (2015), using OLS on data from 1986 to 2013, found evidence that monetary policy actions influenced inflation dynamics. However, the use of OLS despite non-stationarity in some variables raises concerns regarding the robustness of the results.

Gbadebo and Mohammed (2015) applied an error correction model (ECM) and cointegration analysis to assess monetary policy effectiveness from 1980 to 2013. Their study identified the money supply, interest rate, exchange rate, and oil prices as key inflation determinants, concluding that monetary impulses were the primary drivers of inflation. Kiganda (2015), in a similar Gabon context, validated a significant long-run relationship between money supply growth and inflation, supporting the monetarist viewpoint. Nonetheless, this study did not incorporate fiscal policy variables, thus limiting its explanatory power.

In Sudan, Mohammed (2016) applied OLS to annual data spanning 1970–2014 and found that money supply and fiscal deficits had significant positive effects on inflation, whereas exchange rate and government expenditure did not exhibit significant influence. Ujuju and Etale (2016), in examining Nigerian data from 1982–2011, found no significant impact of selected monetary policy tools (e.g., interest rates, CRR, liquidity ratio) on inflation. This contrasts with Okwori and Abu (2017), who used the Vector Error Correction Model (VECM) for data between 1986 and 2015 and established that monetary policy had a weak, though significant, influence on inflation, largely impeded by Nigeria's extensive informal sector.

Ogunmuyiwa and Babatunde (2017), using the Autoregressive Distributed Lag (ARDL) approach with monthly data from 2010 to 2016, reported both short- and long-run relationships between inflation and monetary aggregates, specifically narrow money and interest rates. In contrast, Itodo et al. (2017), applying a VAR model to data from 1981 to 2015, observed no significant correlation between money supply and price levels, attributing this to the dominance of Nigeria's unregulated financial sector.

Tunisiaian evidence by Oumbe (2018), using Johansen cointegration and ARDL techniques, confirmed a positive and significant long-run relationship between money supply and inflation, with a unidirectional causality from money supply to inflation. In Nigeria, Adodo et al. (2018) also affirmed the long-run relationship using VECM, where money supply and interest rates were influential, but exchange rate was not.

Okotori (2019), utilizing monthly Nigerian data (2009–2017), found that variables such as CRR, MPR, and liquidity ratio significantly influenced inflation. In contrast, Abrokwah (2019) showed that oil price shocks had negligible effects on monetary policy responses in Nigeria, challenging the adaptive capacity of monetary authorities in oil-dependent economies.

Ebipre and Amaegberi (2020), using ECM on data from 1990 to 2019, identified money supply and past inflation (lagged) as significant inflation determinants, while variables such as trade openness and exchange rate lacked long-run significance. Similarly, Oladosu and Oladele (2020), using ARDL, reported that while short-term interest rate effects were evident, long-run inflation was significantly influenced by money supply, GDP, and open market operations.

Darma and Abdulsalami (2020), using ARDL on data from 1970 to 2018, found that MPR significantly influenced inflation in the short run, but overall monetary policy tools were insufficient for long-term inflation stabilization. Ezeanyeji et al. (2021), using the ADF test, Johansen cointegration, and ECM on Nigerian data (1980 – 2019), also concluded that monetary policy had limited impact on inflation, with money supply and exchange rate displaying negative and statistically insignificant long-run effects.

A broader African study by Yahaya et al. (2022) employed the Augmented Mean Group (AMG) estimator to examine the role of CBI in 14 African countries between 1985 and 2019. The study revealed that greater CBI significantly reduced inflation, advocating for institutional reforms to insulate central banks from political interference. These findings are consistent with earlier studies such as Brumm (2011), Arnone and Romelli (2013), Posso and Tawadros (2013), and Baumann (2021), all of which established a negative correlation between CBI and inflation. However, divergent findings exist. For example, Martin (2015) argued that the inflation-mitigating impact of CBI is mainly short-term, while He and Zou (2019) provided a conditional analysis where the effect of CBI depends on labour supply elasticity – positive in contexts with elastic labour supply (developed economies), and negative or neutral in contexts with inelastic supply (typically developing economies).

In the Nigerian context, Marafa (2021) applied the ARDL bounds test on quarterly data from 2006 to 2020. While short-run dynamics showed that monetary policy instruments influenced inflation with lag effects, only MPR and CRR exhibited long-term significance. The Granger causality test revealed unidirectional causality from the liquidity ratio to inflation and bidirectional causality between broad money and inflation. These findings imply that the Central Bank of Nigeria's policy tools are effective, albeit to varying degrees.

Okotori and Eze (2022), using VECM and Johansen cointegration on monthly data from 2009 to 2018, affirmed a significant

relationship between monetary policy tools and inflation. Variables such as MPR, CRR, exchange rate, and liquidity ratio were found to exert strong influences on the inflation rate. In a recent study, Elisha et al. (2024), using ARDL on data from 1990 to 2022, confirmed that CRR, MPR, and money supply significantly affected inflation, while the liquidity ratio had a positive but insignificant relationship.

Finally, Mili and Houari (2025), focusing on Algeria as an oil-dependent economy, used VAR and Granger causality techniques on monthly data (2018–2023) to assess monetary policy effectiveness during the COVID-19 pandemic. The findings indicated structural breaks in policy transmission, influenced by external shocks. The authors advocated for a flexible monetary policy framework that accounts for external vulnerabilities and structural factors. However, the study did not incorporate the role of central bank independence or fiscal influences, which could further elucidate inflation dynamics.

Effiong et al. (2025) conducted a study using quarterly data from 2010 to 2023 to investigate the impact of monetary policy on macroeconomic variables – specifically output growth and inflation – in Nigeria. Utilizing a Vector Autoregressive (VAR) model complemented by impulse response analysis, the study revealed that inflation responded positively to monetary policy and exchange rate shocks, but negatively to productivity shocks. This outcome suggests a limited capacity of monetary policy to curb inflation, a condition which the authors attributed to the presence of deep-rooted structural constraints. Consequently, the study advocated for exchange rate stabilization policies as a remedy. Nonetheless, a key limitation of the study lies in its failure to explicitly model the structural variables cited as pivotal to inflation dynamics. The omission weakens the explanatory scope of the findings and limits the policy relevance in addressing the structural nature of inflation persistence in Nigeria.

The linkages between oil price cum inflation has been empirically explored in the literature. Cunado et al. (2015) use the SVAR model to examine how oil price shocks affect the macroeconomic situation in four of the top oil-consuming Asian nations. The major findings imply that different types of oil price shocks have highly diverse effects on economic activity and price movements. While using the Engle and Granger cointegration approach, Shafi et al. (2015) evaluated the effects of exchange rate volatility and oil price variations on economic growth in France from 1971 to 2012. The key conclusion shows that the connection is significant in the long run and that its error correction mechanism (ECM) is important and appropriately signed for France in the short run.

The oil price-inflation nexus was examined in Malaysia and Indonesia, and respectively, using the NARDL technique by Ibrahim (2015) and Abdlaziz et al. (2016). Ibrahim (2015) discovered that asymmetries in Malaysia's food pricing behaviour were cointegrated with the price of food, the price of oil, and real GDP. The study found a substantial correlation between long- and short-term rises in oil prices and increases in food costs, but it was unable to detect any correlation between long- and short-term decreases in oil prices and increases in food prices. In both the long-run and the short-run, Abdlaziz et al. (2016) found evidence of a substantial positive link between food and the rise in oil prices. According to their findings, a long-term increase in oil prices of 10% caused an increase in food prices of 3.6%.

Johansen cointegration testing and Granger causality testing were used by Jiranyakul (2016) to examine Thailand data from 1993 to 2015. According to the study's findings, oil price shocks raise the inflation index whereas oil price uncertainty has no impact on inflation. Conflitti and Luciani (2017) used dynamic factor models and VAR to investigate the oil price pass-through to inflation in the US and the Eurozone. After discriminating between the common and idiosyncratic impacts of oil price shocks on inflation, the study found that oil price influences inflation mostly through the common effect, with a small but considerable and long-lasting pass-through.

To evaluate the effects of oil price shocks on output and inflation, Zhao et al. (2016) created an open-economy dynamic stochastic general equilibrium (DSGE) model for the Chinese economy. The study divided oil price changes into four categories: supply shocks resulting from political developments in OPEC nations; other oil supply shocks; aggregate shocks to the demand for industrial goods; and demand shocks that are particular to the crude oil market. They showed that whereas the other three shocks have relatively long-term impacts, the first shock mostly accounts for short-term fluctuations in production and inflation in China. China's output and inflation are mainly affected by demand shocks that are unique to the crude oil market. Using a vector error correction technique (VECM), Kelikume (2017) investigated the asymmetric impact of exchange rate and oil price shocks on inflation in Nigeria. The study discovered, among other things, that declines in oil prices cause

inflation to rise by 29 percent whereas increases in oil prices cause inflation to rise by 43 percent in a year

For Algeria in the period 1970 to 2014, Lacheheb and Sirag (2016) utilized the non-linear ARDL to explore asymmetric nexus in the oil-inflation nexus. While the result portrayed a direct weight of oil price upsurge on inflation in a significant way, there exists no substantial influence of oil price decline on inflation. The study recommended enhanced financial assistance to small businesses and improvement of agriculture via elevated adoption of technology. However, this study failed to consider the role of monetary and fiscal variables in inflation problem.

Using the vector autoregressive (VAR) estimation model, Artami and Hara (2018) examined the asymmetric effects of changes in oil prices on Indonesia's inflation and economic growth from the first quarter of 1990 to the fourth quarter of 2016. The study resolved that there is an unbalanced link between oil price and growth. It has been shown that the effects of both positive and negative changes in oil prices on inflation are not statistically significant. On the contrary, a decline in oil price stifled GDP while an oil price surge does not affect GDP significantly. As a policy option, Indonesia was advised to reduce reliance on oil while alternative energy usage should be reinvigorated. Likewise, Bala and Chin (2018) were concerned with OPEC member nations in Africa and used the ARDL model to data from 1995 to 2014 to scrutinize the long-term impact of food production and oil exports on inflation. The model show that the index of food production and inflation are negatively correlated, connoting that an increase in the supply of food lowers the rate of inflation. The findings also demonstrate that oil exports significantly increase inflation.

Additionally, Choi et al. (2018) employed monthly data to examined how changes in oil prices affect inflation in developed and developing nations between 1970 and 2015. Consistent with the result, a 10% surge in oil prices would cause domestic inflation in both industrialized and developing nations to rise by around 0.4%. Additionally, the study presented an asymmetric situation, indicating that positive oil price shocks are posing greater impact than negative ones. The study reckoned that a credible monetary policy and a decreased reliance on energy imports by the local economy are the reasons why such outcomes have decreased over time.

Mukhtarov et al. (2019) researched Azerbaijan and applied the VECM approach to data spanning the years 1995 to 2017 to investigate the link between inflation, oil prices, and exchange rate. They discovered that a rise of 1% in the price of oil and the exchange rate respectively results in increases in inflation of 0.58% and 1.81%. Choi et al. (2018) demonstrated that a 10% increase in global oil inflation would, on average, boost local inflation by around 0.4% point, with the effect fading after two years using an imbalanced panel of 72 industrialized and emerging nations. They showed that the relationship is asymmetrical, with positive oil price shocks having a greater influence on inflation than negative ones. Their findings on the shock transmission channel suggested that energy subsidies and the proportion of transportation expenditures in the CPI basket account for the majority of the variance in oil price shocks between countries. Similar to this, Odionye et al. (2019) demonstrated that inflation's response to oil price shocks was first negative before turning positive after two periods. However, the response of the exchange rate to fluctuations in the price of oil was unfavourable and enduring.

Omolade et al. (2019) used a panel structural VAR framework and discovered that an increase in inflation was observed in eight of Africa's oil-producing countries, including Nigeria, along with a dramatic decrease in oil prices. Consistent with the analysis, the rise in inflation that came after these drops was structural rather than monetary in origin. Omotosho (2019) found that oil price shocks had an impact on headline inflation, though the impact was minimal due to the partial pass-through of international oil prices to domestic fuel prices. The study was conducted using a New-Keynesian DSGE model to examine the macroeconomic consequences of oil price shocks and the fuel subsidy regime in Nigeria. In line with the study, a decline in oil prices led to reduced marginal costs, which ultimately resulted in a decrease in domestic inflation.

Živkov et al. (2019) investigated how variations in the price of oil affect consumer prices in a few Central and Eastern European nations. To divide the time horizons between the effects, the authors investigated a switching approach based on Markov wavelets. The results demonstrated that, in countries in Central and Eastern Europe, the diffusion of rises in oil prices to inflation is comparatively low, ranging from 1% to 6% for every 100% increase in oil prices. The results, however, demonstrate that even in cases of considerable depreciation, exchange rates do not significantly influence how oil shocks are spread to inflation.

The empirical study by Bawa et al. (2020) was geared towards studying the oil price cum inflation nexus for Nigeria by putting to use, data from the first quarter of 1991 to the fourth quarter of 2018. Like Lacheheb and Sirag (2016), the study utilized the NARDL in the analysis with the report showcasing that an upsurge in oil price culminates to a rise in inflation measures (headline, core, and food) hitherto, an oil price downturn causes the marginal cost of production to moderate inflation in the economy. The recommendation arising from the study is that in period of oil price upsurge, monetary policy should be deployed to tame core inflation while policies towards improving agricultural production should be executed. The study however failed to recognize the importance of central bank independence in the management of inflation in the Nigerian economy.

Ogede et al. (2020) also explored the potency of oil price volatility in driving up inflation in oil-exporting economies. Emphasis was made on African countries with data from 1995 to 2017 being analyzed using Pool Mean Group technique of estimation. The result so obtained indicated that volatility in oil prices negatively impacted on inflation significantly. Consequently, the study's conclusion is that in African economies that are oil exporting, volatility in oil prices will substantially impact on inflation. Thus, oil-exporting African economies need to adopt cautionary approaches to check possibility of inflation since inflation responds to different oil price shocks differently. The study advocated for the use of monetary and fiscal policies to curb inflationary tendencies. It can be observed that the study did not recognize fiscal variable(s) and central bank independence in the management of inflation.

With the aid of a Markov state-switching model, Evans (2021) explored how oil price affects inflation in Nigeria both in the upper and lower inflation regimes. With data from 1970 to 2016, the estimates portray that oil price has a substantial sway of inflation in both the upper and lower regimes. Evidence from the impulse response function generated from VAR indicates that shocks in oil price generates a substantial upsurge on inflation within the Nigerian economy. These findings therefore generate an additional channel (petro-monetary transmission) that the monetary authority of the State must consider while taking policy decisions. Though the study established the petro-monetary transmission, it fails to showcase how monetary policy could be driven in the event of the prevailing condition.

Mien (2022) deployed the dynamic OLS and ARDL approach to explore the linkages amid oil price and oil production on the Central African Economic and Monetary Community (CEMAC) from 1995 to 2019. The result reflects a positive effect of oil price on inflation within the CEMAC though with some degree of heterogeneity given the coefficient magnitude. Accordingly, Equatorial Guinea followed by Congo had the greatest positive oil price impact on inflation while Gabon recorded the least positive effect. Again, interest rate was observed to exert a significant negative impact on inflation portraying the effectiveness of monetary policy in curbing inflation in the CEMAC. With regards to oil production, Tunisia, Chad and Congo recorded a negative substantial influence on inflation while Chad and Equatorial Guinea exhibited a positive and significant weight. The policy implication of these findings lies on the need to recognize the heterogeneity among countries in the CEMAC and the need to apply monetary policy in the battle against inflation.

Usman and Ugwuoke (2024) in their research were interested in unravelling the sway of oil price on domestic price level in Nigeria. The study which used quarterly data covered the period 1999 through 2023. Due to asymmetries in oil prices, the study made use of the non-linear ARDL in data analysis. The study noted that in the period of high crude oil prices, the prices of petroleum product, manufactured goods, and basic food prices also increase. However, a decline in crude oil prices was matched with plummeted prices in the domestic price level due to a decline in the marginal cost of production. The key issue to note in this study is that the baseline model failed to incorporate exchange rate into the function. The study however suggested the need for the Central Bank of Nigeria to shape its monetary policy rate to curtail borrowing while preference should be given to boosting food production.

Odo et al. (2025) considered four economies (Nigeria, Angola, Republic of Congo, and Equatorial Guinea) to explore how shocks in oil price influences their heterogenous (core consumer price index, energy consumer price index, food consumer price index, and headline consumer price index) domestic price level. With data from 2005 through 2022, the non-linear ARDL estimation was utilized with result portraying that positive shocks significantly impacted on inflation (especially in Nigeria and Angola), negative shocks had substantial impacts in the case of Republic of Congo and Equatorial Guinea.

In a more recent study by Onwioduokit et al. (2026), the dynamic effect of oil price shocks on inflation was examined for Nigeria

using data from 1990 to 2024. With the dynamic ordinary least squares (DOLS) and VAR technique being utilized, the empirical findings suggest that oil price shocks exerted significant positive influence on inflation in Nigeria. Meanwhile, the VAR estimation generated the impulse response functions which portrayed that inflation responded positively to innovations in crude oil prices. The paper therefore acknowledges the role of crude oil price in shaping inflation dynamics in Nigeria as an oil-producing economy and concluded that oil price shocks affect both monetary and fiscal magnitudes making it a crucial variable in policies to curb inflationary pressure in the Nigerian economy.

On establishing the inflation threshold, different studies have utilized diverse approach and obtained different threshold coefficient. One of such studies is that of Khan and Senhadji (2001) which utilized a sample of one hundred and forty developed and less developed economies from 1960 to 1998. With the endogenous threshold autoregressive (TAR) model, the inflation threshold level of 1-3% and 7-11% inflation threshold for developed and developing countries respectively was established. The study by Munir et al. (2009) in Malaysia used the similar technique and data from 1970 to 2005 and established a 3.89% inflation threshold. Using a different technique of the smooth transition regression (STR), Drukker et al. (2005) established the threshold level of inflation for 138 countries with data spanning the period 1950-2000. The result established a threshold level of inflation to be 19.16%.

The Hansen (1999) panel threshold model with regime intercepts was deployed by Bick (2010) on 40 countries (1960 to 2004) and the threshold level of 12% and 19% with and without regime shift respectively was established. In the same vein, Omay and Öznur Kan (2010) focused on six industrial countries (1972-2005) and utilized the Panel Smooth Transition Regression (PSTR). The study therefore established a 2.52% inflation threshold. The study by López-Villavicencio and Mignon (2011) used similar technique along with the generalized method of moment (GMM) on 44 countries (1961 to 2007). The study reported a threshold level of 5%, 1.23%, and 14.54% for whole sample, developed nations, and emerging economies respectively. Doguwa (2012) utilized Nigerian data from 2005Q1 to 2012Q1 to establish the inflation threshold using Sarel (1996) and Khan and Sanhadji (2001) approach. Threshold level of (11.2% to 12%) was established for the country.

The study conducted by WAMI (2012) for the West African Monetary Zone (WAMZ) member states utilized data from 1970 to 2010 which was analyzed using conditional least squares. The result reported an optimal inflation threshold level of 9% for the WAMZ. For the South African Development Community (SADC), Seleteng et al. (2013) used data from 1980 to 2008 which was analyzed using the PSTR. The study reported a threshold level of 18.9% for the region. The result therefore indicated that SADC could tolerate higher inflation level than the WAMZ. In a sample of 32 Asian countries (1980 to 2009), Vinayagathasan (2013) deployed the Dynamic panel threshold model (DTM) and established an inflation threshold of approximately 5.43%.

Eggoh and Khan (2014) considered a sample of one hundred and two developed and less developed nations (1960-2009). The PSTR and GMM techniques were deployed. An inflation threshold of 10.5%, 3.4%,10%, and 12.9% for overall sample, high-income economies, upper middle-income economies, lower middle-income economies and lower income economies respectively. Thanh (2015) focused on SEAN-5 countries (1980 to 2011) using a similar technique and established a (7.84%) inflation threshold level for the region. The quadratic model was utilized by Das and Loxley (2015) on 54 developing countries (1971 to 2010) and the inflation threshold level of 11% was reported. Esen et al. (2017) for Turkey (2002: Q1 and 2015: Q1) Khoza et al. (2016) for South Africa (1994 to 2016) both utilized STR and reported inflation threshold of 8.89% and 5.4% for the two economies respectively.

The study by Nazir et al. (2017) for Pakistan (1972 to 2016) utilized the TAR model and established 5.5% to 9% inflation threshold; while Aydin (2017) for the Organization of Islamic Cooperation (1971-2014) deployed the DTM to uncover that inflation level of 12.88% is optimal for the region. For Nigeria (1961 to 2011) and Ghana (1964 to 2011), Iyke and Odhiambo (2017) used the STR and reported that Nigeria and Ghana had inflation threshold level of 0.73% to 29.83% and 10.07 % to 19.25% respectively. It follows that Nigeria could condone a higher inflation level compared to Ghana.

For the ECOWAS sub-region (1970 to 2014), WAMA (2018) utilized the Khan and Sanhadji (2001) non-linear model to establish the inflation threshold for the region. An inflation threshold level of (6%) for ECOWAS, 3% for UEMOA, and 9% for the WAMZ was reported which shows a greater resistance of the WAMZ to high inflationary pressure. Sanga and Gui-Diby

(2020) however used the STR for the Franc Zone Countries (1970 to 2018) and recorded inflation threshold of 5.4% to 5.6% for CAMU and 4.3% to 4.5% for WAMU connoting CAMU's tolerance to high inflation level compared to the WAMU. A similar technique was further deployed by Bawa and Ismaila (2021) for Nigeria (1980 to 2009) and the study reported a threshold level inflation of 13%.

By deploying the STR approach on Indonesia data from 1969 to 2017, Mohtar et al. (2021) reported an inflation threshold level of 7% to 8% for the country. similar technique was also deployed by Olowofeso et al. (2023) for the WAMZ (1996 to 2021) and the result reflected that the optimal inflation level for Nigeria, Ghana, and Guinea in the WAMZ lingers around 10.0%. Tarawalie (2022) utilized data from 1975 to 2018 which was analyzed using the TAR and reported an inflation threshold level of 1% to 3% for industrial countries and 7% to 11% for less developed countries respectively.

2.6 Summary of Literature Reviewed and Research Gap

The empirical studies reviewed have reflected on the various sub-themes as to how monetary policy and oil price volatility influence inflation. The empirical studies tend to align with the fact that oil price shocks positively affect inflation and accelerates exchange rate volatility irrespective of whether the concern is on oil-producing or oil-importing economies.

Further, paucity of empirical studies has been recorded on how central bank independence is of great importance in the management of inflation in oil-producing economies. A few of such studies include Yahaya et al. (2022), Garriga and Rodriguez (2020), Martin (2015), and Kokoszczy ´ nski and Mackiewicz-Łyziak, (2020). This study therefore takes cognizance of the role of central bank independence in the management of inflation in oil-producing economies in Africa.

Finally, majority of the empirical studies on how oil price shocks affect the macroeconomy are based on developed economies and often ignores the examination of the threshold level. This study explores how oil price shocks affect key variables (inflation and exchange rate) in African oil-producing economies and as well established the threshold level of inflation in these economies. The essence of this is to detect whether oil-producing economies can tolerate higher inflation levels compared to African economies with little or no oil. Consequently, this study considers seven African oil-producing economies (Nigeria, Angola, Algeria, Tunisia, Equatorial Guinea, Ghana and Gabon) and utilize recent data from 1995 to 2024 in the analysis as well as making comparative analysis between them.

3. Research Methodology

3.1 Research Design

This study adopts a quantitative research approach, specifically employing an ex-post facto research design within a cross-sectional analytical framework. The choice of this design is informed by the objective of examining the relationship between inflation and monetary policy in oil-producing African economies, without manipulating or altering the underlying data-generating processes. An ex-post facto research design is particularly appropriate for identifying the direction and strength of association between variables, whether positive or negative, based on observed data.

The analysis relies on secondary data drawn from official and reputable sources, such as central banks, national statistical agencies, and international financial institutions (e.g., IMF, World Bank). These data were subjected to econometric analysis using an appropriate statistical software package to ensure rigorous and replicable results. The methodological approach is intended to yield objective insights into the dynamics between inflation and monetary policy within the context of oil-dependent African economies.

3.2 Model Specification

The empirical model employed in this study is adapted from the work of Ogede *et al.* (2020), who examined the inflationary effects of oil price volatility in selected oil-exporting African countries. In their study, inflation – proxied by the Consumer Price Index (CPI) – was pecified as a function of macroeconomic performance, represented by the growth rate of real Gross Domestic Product (GDP), and oil price volatility.

Formally, the baseline model is expressed as follows:

$$CPI_t = f(RV_t, Y_t) \quad (3.1)$$

Where CPI is the consumer price index, RV is oil price volatility (expressed in logarithm), and Y is real GDP (expressed in its logarithm).

Measuring the effect of monetary policy on inflation on oil-producing economies requires the introduction of key monetary policy variables in Equation (3.1). Consistent with the quantity theory of money, the quantity of money is proportional to the price level. Therefore, introducing broad money supply into the model is pertinent in measuring how monetary policy can be utilized to influence inflation. The importance of money supply on the inflation model has been taken into consideration by earlier works such as Ihugba and Adefabi (2025), da Costa-Antonio (2024), Alves and Silva (2018), and Caetano-Joao and Castro (2025).

Exchange rate is a crucial variable that can impact inflation, especially in import dependent economies. This is because exchange rate depreciation can raise import prices which can hitherto fuel inflation within the domestic economy. The introduction of exchange rate in the model aligns with studies such as Bawa *et al.* (2016), Bawa *et al.* (2020), Mukhtarov *et al.* (2019), Okeowo *et al.* (2023), Khobai *et al.* (2025), Antonio and Luis (2022), Ihugba and Adefabi (2025), Attia and Bairech (2022), and Asiamah (2024).

By incorporating some key control variables such unemployment rate (as in the case of Khobai *et al.* (2025) to capture the Philips Curve postulation), Central Bank independence, and debt sustainability into Equation (3.1), the notional functional form of the model for this study is specified as follows:

$$CNPI_{i,t} = f\left(BMSY_{i,t}, ECRT_{i,t}, COLP_t, ECGT_{i,t}, UEPL_{i,t}, CBID_{i,t}, PRMB_{i,t}\right) \quad (3.2)$$

Where:

CNPI = inflation rate (consumer prices); BMSY = growth rate of broad money supply; ECRT = exchange rate (LCU/US$); COLP = changes in oil prices (representing volatility); ECGT = growth rate of GDP; UEPL = Unemployment rate; PRMB = Debt sustainability; CBID = Central Bank Independence. It is also pertinent to note that i represents the country (i = 1, 2, ⋯ 7) and t represents the time (1995, 2001, ⋯, 2024).

Through a transformation of Equation (3.2) into a statistical form, we now have an explicit model for this study specifying an exact relationship between inflation and the sets of regressors as follows:

$$CNPI_{i,t} = \beta_0 + \beta_1 BMSY_{i,t} + \beta_2 ECRT_{i,t} + \beta_3 COLP_t + \beta_4 ECGT_{i,t} + \beta_5 UEPL_{i,t} + \beta_6 CBID_{i,t} + \beta_7 PRMB_{i,t} \quad (3.3)$$

Where the variables are as earlier defined, β_0 is the constant term (intercept) of the model, and β_1 *to* β_7 are the partial slope coefficients of the regressors. Since economic models do not exhibit exact relationship, Equation (3.3) is transformed into an econometric form through the introduction of the stochastic term as follows:

$$CNPI_{i,t} = \beta_0 + \beta_1 BMSY_{i,t} + \beta_2 ECRT_{i,t} + \beta_3 COLP_t + \beta_4 ECGT_{i,t} + \beta_5 UEPL_{i,t} + \beta_6 CBID_{i,t} + \beta_7 PRMB_{i,t} + \mu_{i,t} \quad (3.3)'$$

Where μ_t is the stochastic term with the usual assumption of being a white noise. The derivation of the parameter estimates for the study is therefore based on Equation (3.3). The a priori expectation of the study is given as follows:

$$\frac{\partial CNPI}{\partial BMSY} = \beta_1 > 0; \frac{\partial CNPI}{\partial ECRT} = \beta_2 > 0; \frac{\partial CNPI}{\partial COLP} = \beta_3 > 0 \; or < 0; \frac{\partial CNPI}{\partial ECGT} = \beta_4 < 0; \frac{\partial CNPI}{\partial UEPL} = \beta_5 < 0; \frac{\partial CNPI}{\partial CBID} = \beta_6 < 0; \frac{\partial CNPI}{\partial PRMB} = \beta_7 > 0.$$

The partial slope coefficient of broad money supply (β_1) is expected to be positive to align with the QTM where an increase in the volume of money in circulation will drive inflationary pressure within an economy (assuming the economy is at full employment). For β_2 which is expected to be positive, exchange rate depreciation will drive up import prices which translates to higher inflationary pressure within the domestic economy. The effect of oil price is expected to be either positive or negative. On the positive side, an increase in oil prices (given the production level) can impact on the total revenue of the government which has the impact of increasing expenditure (as a result of the windfall income) which stimulates money supply and accelerate inflationary tendencies. On the negative side, increased oil price can reduce the fiscal deficit of the government, stimulate investments in the real sector and therefore reduce inflationary pressure.

The coefficient of output growth (β_4) is expected to be negative since increased output growth can help bridge the output gap which is a core avenue of driving inflationary tendencies. It is also expected that β_5 will be negative to align with the Philips

Curve postulations which establishes a trade-off between inflation and unemployment in the short run. The β_6 is expected to be negative since increased central bank independence will foster effective management of the economy without undue dominance from the fiscal side. Finally, the debt sustainability is expected to be positive since increased debt creates fiscal deficit which is a driver of inflation (see Abu and Karim, 2015; Anfofum, *et al.*, 2015; Kaur, 2019; Oyeleke, 2021; and Nwosu, *et al.*, 2024).

3.3 Measurement and Description of Variables

The variables that are utilized in this study are described as follows, and their unit of measurement presented.

- Consumer Price Index (CNPI): This represents the measurement of inflation in the study, and reflects the average month change in the consumer price index. The variable is measured in percentages on annual basis.
- Broad Money Supply (BMSY): This is measured as the growth rate of broad money supply. It captures the rate at which the total volume of money in the economy changes over time. The unit of measurement of the variable is in percentages.
- Exchange Rate (ECRT): This captures the rate at which a local currency (LCU) exchanges for a unit of foreign currency. In this study, the foreign currency is the US dollar. Thus, the exchange rate in this study is expressed as LCU/US$1.
- Crude Oil Price (COLP): This is the average monthly of the Brent crude oil price which is not seasonally adjusted. The unit of measurement is in the US$ per barrel. However, this study utilizes the oil price volatility in the analysis. The volatility in oil prices is measured by utilizing the rate of change in the value oil price, by utilizing the standard deviation of crude oil price, or by utilizing the generalized conditional heteroscedasticity (GARCH) model to detect volatility. For this study, we utilize the standard deviation of monthly oil prices as it clearly depicts the variations in oil prices independent of the unit of measurement.
- Economic Growth (ECGT): This is given as the growth rate of real gross domestic product. The growth rate of the GDP is therefore expressed in percentages.
- Unemployment Rate (UEPL): The unemployment rate in this study is given as based on the International Labour Organization (ILO) definition as "the share of the labour force that is without work but available for and seeking employment". The variable is expressed in percentages and is based on the ILO estimates instead of the national estimates.
- Central Bank Independence (CBID): this reflects how the monetary authority of a country is independent in taking policy decisions without interference with the fiscal side. Thus, it reflects the extent to which the monetary authority of a country is free from fiscal dominance. The index varies between 0 and 1 with 0 denoting no independence of the Central Bank and 1 denoting a total independence. The closer the index to1, the greater the degree of independence and vice versa.
- Debt Sustainability (PRMB): This is measured using the primary balance as percentage of GDP. This aspect of the fiscal deficit has a direct impact on the general price level hence, its choice for this study.

3.4 Nature and Sources of Data

The set of data employed in this study are panel data set which were collected from official secondary sources. The data cover the period of 1995 to 2024 on seven (7) African economies that produces crude oil. The countries include Nigeria, Angola, Algeria, Tunisia, Equatorial Guinea, Ghana and Gabon. These countries were selected to capture the five regions in Africa (North, Central, South, East, and West) and on data availability. Data were collected on key variables in the model which are consumer price index, broad money supply, interest rate, exchange rate, crude oil price, output growth, unemployment rate, Central Bank independence, and debt sustainability. A snapshot of the various sources from which the data were obtained from is presented in Table 1.

Table 1: Data and sources

S/N	Variable	Representation	Abbreviation	Source
1	Inflation Rate	Consumer Price Index	CNPI	Ha *et al.* (2023); World Bank
2	Broad money supply	Growth rate of broad money supply	BMSY	World Bank
3	Exchange rate	LCU/US dollar exchange rate	ECRT	World Bank

4	Crude oil price	Brent crude oil price	COLP	IMF; Federal Reserve Bank of St. Louis
5	Economic Growth	Output growth rate	ECGT	World Bank
6	Unemployment rate	ILO unemployment rate	UEPL	World Bank
7	Central Bank independence	Central Bank independence index	CBID	Romelli (2022); Romelli (2024)
8	Debt sustainability	Primary balance (% of GDP)	PRMB	World Bank; Kose *et al.* (2022)

Source: Compiled by the researcher (2026)

The secondary sources are reliable as they are globally recognized, and other researchers have relied on data obtained from these sources too. Hence, we can strongly rely on data to be obtained from these sources for analysis and policy simulation.

3.5 Analytical Technique

Unit Root Test

Recent trends in the panel studies entails the determination of the order of integration of variables within the panel data set. The approach towards detecting unit root has been dissected into two: the individual unit root test and the panel unit root test. The individual unit root test techniques have been identified to include Im *et al.* (2003) test, Augmented Dickey-Fuller (ADF) Fisher Chi-square test, and the Phillip-Peron (PP) Fisher Chi-square test; while the common unit root test techniques include those developed by Levin *et al.* (2002) and the Breitung (2000) test approaches. The unit root test equation, which is a univariate test, can be presented below using" the drift with deterministic trend" assumption.

$$\Delta W_{i,t} = \delta_0 + \delta_1 W_{i,t-1} + \sum_{k=1}^{l} \varphi_{i,j} \Delta W_{i,t-k} + \emptyset_i t + \varepsilon_t \qquad (3.4)$$

As specified in Equation (3.4), the variable to be test for unit root is W with δ_0 being the drift, $\emptyset_i$ measures the trend effect, $\varepsilon_{i,t}$ is the disturbance term, i denotes the cross section while t denotes time. The summation component accounts for possibility of serial correlation within the model and denotes the difference operator of the variable. The unit root test is based on the null hypothesis that $\delta_1 < 1$ against the alternative hypothesis that $\delta_1 \geq 1$. The decision rule requires that the test statistic must be negative and statistically significant at the (5%) level for the null hypothesis of unit root to be rejected.

Cointegration Analysis

The fact that panel data do not always exhibit stationarity at levels requires an extended test to ascertain the existence of long run association in the model. The conventional technique often employed for time series analysis is the Johansen cointegration test when the time series variables are all stationary at first difference or the Bounds test for cointegration when they exhibit mixed stationarity at levels and first difference. The core importance of this technique is that it allows for cross-sectional linkages in consort with other diverse individual effects to detect the cointegration. The significance of these statistics validates the existence of equilibrium association in the model which therefore reinforces the estimation of both the short run and long run models. However, we also present both the Johansen-Fisher panel cointegration test and Kao residual cointegration test in the study. The test is based on the Trace test and maximum-Eigen statistics whose significance yields cointegrating relationship.

Autoregressive Distributed Lag (ARDL) Model

The panel ARDL approach is utilized to estimate both the short run and the long run models for the study. Its utilization is embedded in its ease of estimating both the short run and the long run estimates of the model simultaneously. The technique requires that the variables utilized in the study must exhibit stationarity condition where some are stationary at levels while others are stationary at first difference, and evidence of cointegration in the model must be established. The model is specified in its error correction form as follows:

$$\Delta CNPI_{i,t} = \varphi_0 + \sum_{g=1}^{u} \varphi_1 \Delta BMSY_{i,t-g} + \sum_{g=0}^{v} \varphi_2 \Delta ECRT_{i,t-g} + \sum_{g=0}^{v} \varphi_3 \Delta COLP_{t-g} + \sum_{g=0}^{v} \varphi_j' \Delta X'_{i,t-g} + \lambda ECM_{t-1} + \varepsilon_{i,t} \qquad (3.5)$$

Equation (3.5) is an ARDL error correction model with u optimal lag and v optimal lag for the regressand and regressors respectively. The variables which were earlier defined remained unchanged while X' represents vector of control variables which

are output growth, unemployment rate, Central Bank independence, and debt sustainability (primary balance). The ECM is the error correction model while λ denotes the coefficient of the error correction term is measures how swift the model correct itself from any sort of short run distortions in the long run. The a priori expectation of λ is that it should be negative and statistically significant for any disequilibrium in the model to be corrected. Also, the value of λ (in absolute term) should not exceed unity to portray that the model converges to long run equilibrium otherwise, we have a case of an explosive model. The $\varepsilon_{i,t}$ denotes the random term with the usual attribute of being normally distributed and Δ represents changes in the variable which is a difference operator.

Threshold Regression Analysis

In establishing the inflation threshold for oil producing economies in Africa, the Sarel (1996) smooth transition regression (STR) is deployed. In the Sarel (1996) threshold model, two parameters, φ_1 *and* φ_2 are estimated from the following model:

$$ECGT_{i,t} = \emptyset_0 + \varphi_1 d_t f(CNPI_{i,t}) + \varphi_2(1 - d_t)\{f(CNPI_{i,t}) - \log(CNPI^*)\} + \partial' \underline{X} + \varepsilon_t \quad (3.6)$$

Of which:

$$f(CNPI_{i,t}) = \begin{cases} \log(CNPI_{i,t}) \; if \; CNPI_{i,t} > 1 \\ CNPI_{i,t} - 1 \quad elsewhere \end{cases}$$

Similarly,

$$d_t = \begin{cases} 1 \; if \; f(CNPI_{i,t}) \leq \log(CNPI^*) \\ 0 \quad elsewhere \end{cases}$$

From Equation (3.6), $ECGT_{i,t}$ is the annual growth rate of real gross domestic product in country i at time t; φ_1 is the coefficient of the semi-log transform of inflation $f(CNPI_{i,t})$ in country i at time t, φ_2 is the coefficient of the extra inflation, and $CNPI^*$ is the expected inflation threshold that should be determined. The set $\underline{X}$ is a vector of control variables,

$$\underline{X} = f\begin{bmatrix} COLP \\ BMSY \\ ECRT \\ CBID \\ PRMB \end{bmatrix}$$

and ∂' is the vector of their respective coefficients, and ε_t is expected to be normally distributed. Equation (3.15) is iterated with different values of $\log(CNPI^*)$ and the structural break occurs at the value of $CNPI^*$ at which the statistical loss function being chosen exhibits the minimum value.

3.6 Limitation of the Study

The key limitation of this study centres around data availability. Some countries (like Cameroon, Sudan, Libya, and The Republic of Congo) which were to be incorporated in the study lack consistent time series data on key variables such as broad money supply growth, primary balance, and central bank independence. As such, they were removed among the oil-producing countries which could have made the data points even more. However, the selected economies still provided us with ample data set to execute the study hence, the exclusion of Cameroon, Sudan, Libya, and The Republic of Congo does not in any way affect the validity of the results of the study. Again, some data sets were not up to date which created additional challenges for the study. However, we overcame this challenge by utilizing the four-year moving average to generate the missing data set.

4. Data Presentation, Analysis and Discussion of Findings

4.1 Descriptive Statistics and Correlation Analysis

The presentation of the data hinges on the descriptive statistics of the variables coupled with checking the degree of correlation

between them. At first, Table 4.1 presents the descriptive analysis of the panel data set. The total number of observations for each of the variables is 207 after adjustments has been made.

Table 2: Variable's descriptive features

	CNPI	BMSY	ECRT	COLP	ECGT	UEPL	CBID	PRMB
Mean	16.297	24.958	164.083	6.763	5.651	9.817	0.651	0.160
Median	7.657	16.037	78.749	5.471	4.100	8.030	0.639	-0.67
Maximum	325.029	528.194	1467.790	28.218	149.973	31.840	0.854	21.816
Minimum	-0.094	-21.013	0.120	0.853	-9.110	2.173	0.510	-14.707
Standard Deviation	35.607	45.996	225.737	5.303	12.896	6.314	0.070	5.647
Skewness	5.967	7.732	2.016	2.299	7.841	0.925	0.629	0.929
Kurtosis	43.413	77.311	8.067	9.610	81.223	3.643	3.752	4.897
Observations	207	207	207	207	207	207	207	207

Source: Computed by the Researcher (2026)

Starting with the inflation measured as the consumer price index (CNPI), Table 4.1 reflects that the average inflation rate for the seven economies under review recorded a mean value of about 16.297% and having a 35.607 standard deviation (SD) thereby generating a 218.47% coefficient of variation (CV) portraying high degree of dispersion in the inflation data set across the economies. The growth rate of broad money supply (BMSY) recorded an average value of (24.958%) and a SD of 45.996 thus giving a CV of 184.29% which again is an indication of high degree of dispersion in the dataset. The exchange rate (ECRT) recorded a mean value of 164.083 per unit of the dollar across the panel and exhibiting a SD of 225.737 thus giving a CV of 137.57% portraying a greater degree of dispersion. The crude oil price volatility recorded a mean value of 6.763 units and a SD of 5.303 thus giving a CV of 78.41% exhibiting high dispersion.

The aggregate output which measures economic growth (ECGT) was observed to grow at an average rate of 5.651% within the cross-section and having a SD of 12.896 thus giving a CV of 228.21% exhibiting greater level of dispersion in the dataset. Unemployment rate (UEPL) within the panel also averaged 9.817% with a SD of 6.314 thus giving a CV of 64.32% implying a high degree of dispersion. The central bank independence (CBID) averaged 0.651 unit with a SD of 0.070 giving a CV of 10.75% indicating that most of the observations from CBID concentrated around the mean. Lastly, the primary balance averaged 0.16% and possessing a SD of 5.647%. In all the variables, the shape of the distribution is positively skewed and leptokurtic given that the skewness coefficients are all positive and coefficient of kurtosis is above 3.

To check the level of association between variables in the model, the Pearson correlation analysis was conducted, and Table 4.2 presents the result.

Table 3: The correlation matrix

	CNPI	BMSY	ECRT	COLP	ECGT	UEPL	CBID	PRMB
CNPI	1.000							
BMSY	0.788	1.000						
ECRT	-0.117	-0.098	1.000					
COLP	0.143	-0.036	0.012	1.000				
ECGT	-0.029	0.061	0.205	-0.090				
UEPL	0.142	0.113	-0.131	-0.108	-0.071	1.000		
CBID	-0.080	-0.093	0.351	0.261	-0.283	-0.117	1.000	
PRMB	0.071	0.111	0.211	-0.065	0.240	0.163	0.046	1.000

Source: Computed by the Researcher (2026)

Evidence from Table 3 indicates that the CNPI is strongly correlated with BMSY given that the correlation coefficient is high (+0.788). The positive correlation coefficient is an indication that the two variables move in the same direction. When BMSY increases, CNPI also increases and vice versa. Though crude oil price volatility exhibited positive correlation with CNPI, the correlation is weak given that the coefficient is small (0.143). Other variables which exhibited positive correlation with CNPI

were ECRT, UEPL and PRMB though the degree of association is quite weak. On the contrary, ECGT and CBID both exhibited weak negative correlation with CNPI. The correlation between the regressors is weak thereby portraying that the model is free from possibility of multicollinearity. It is important to note that correlation does not imply causation hence, a further analysis will be presented to explore the cause-effect relationship in the model.

4.2 Stationarity Test and Cointegration Analysis

The test for unit root in the panel dataset involves testing for both individual unit root and common unit root processes within the data. The test was conducted using the constant and trend assumption and Table 4.4 presents the result. The common unit root test is based on the technique of Levine, Lin and Chu [LLC] (2002) statistic while the individual unit root test is based on the Im, Pesaran and Chin [IPC] (2003) statistic. The I(0) portrays that the given variable is stationary at level whereas I(1) indicates stationarity at first difference. The test is conducted at the (1%) level of significance.

Table 4: Unit root test result

Variables	Common Unit Root Process			Individua Unit Root Process		
	LLC Statistic	Probability	Order of Integration	IPS Statistic	Probability	Order of Integration
CNPI	-10.7441	0.0000	I(1)	-14.2320	0.0000	I(1)
BMSY	27.9835	0.0000	I(0)	-6.0001	0.0000	I(0)
ECRT	-3.5150	0.0002	I(1)	-2.8628	0.0021	I(1)
COLP	-7.8541	0.0000	I(0)	-4.4010	0.0000	I(0)
ECGT	-6.1817	0.0000	I(0)	-6.9409	0.0000	I(0)
UEPL	-3.6429	0.0001	1(1)	-4.6728	0.0000	I(1)
CBID	-12.1859	0.0000	I(1)	-9.9933	0.0000	I(1)
PRMB	-2.9006	0.0019	I(0)	-3.3021	0.0005	I(0)

Source: Computed by the Researcher (2026)

With the unit root test result presented in Table 4, it can be observed that there is consistency in the test report at both the individual and common unit root process. That is, both the common unit root process and the individual unit root process reported similar order of stationarity. From the result, CNPI, ECRT, UEPL, and CBID were stationary at first difference (that is, they are all I(1) variables) whereas BMSY, COLP, ECGT, and PRMB were all stationary at level (they are all I(0) variables). The stationarity condition of the variables points towards the necessity to check for possibility of long run relationship in the model.

To check for long run relationship, the Johansen-Fisher cointegration test was deployed along with the Kao residual cointegration test as a verification of the result of the former test. The null hypothesis is that "there is no levels relationship" within the model. The rejection of the null hypothesis lies within the existence of cointegrating equations within the system. Table 5 presents the result where the test was conducted with 1 as the optimal lag length.

Table 5: Johansen-Fisher panel cointegration test result

Series: CNPI BMSY ECRT COLP ECGT UEPL CBI PRMB				
Lags interval (in first differences): 1 1				
Cointegrating Equations	Fisher Statistic (trace test)	Probability	Fisher Statistic (max-eigen test)	Probability
None	484.00	0.0000	163.00	0.0000
At most 1	218.10	0.0000	146.10	0.0000
At most 2	119.30	0.0000	62.79	0.0000
At most 3	69.71	0.0000	33.63	0.0008
At most 4	44.37	0.0000	27.84	0.0058
At most 5	25.20	0.0139	15.94	0.1938
At most 6	17.22	0.1416	16.29	0.1785
At most 7	12.95	0.3727	12.95	0.3727

Source: Computed by the Researcher (2026)

EAST AFRICAN FINANCE JOURNAL (EAFJ)
Volume 5 Issue 3 |2026 | pp 35- 67
E-ISSN: 2959-9121

With the result in Table 4.5, the trace statistic reported six cointegrating equations (CEs) while the max-eigen test reported five CES. This is achieved because the statistics of reported test criterion are significant at 1% and 5% level in some instances. The existence of CEs within the system is evidence that long run relationship prevails within the model. To further support this, Table 6 presents the Kao residual test result as a confirmatory test.

Table 6: Kao residual cointegration test result

Series: CNPI BMSY ECRT COLP ECGT UEPL CBI PRMB Trend assumption: No deterministic trend		
	t-Statistic	**Probability**
ADF	-12.2648	0.0000
Residual variance	347.2471	
HAC variance	181.6969	

Source: Computed by the Researcher (2026)

With the augmented Dickey-Fuller (ADF) statistic of -12.2648 being significant at (1%), it is further proven that cointegration exists in the model hence, both short run and long run models are to be estimated for the study.

4.3 Panel Autoregressive Distributed Lag (ARDL) Model

The use of the panel ARDL technique of estimation is to facilitate the short run and long run models estimation. The optimal lag was selected based on the Akaike Information criterion (AIC) and the selected model is based on ARDL(1, 1, 1, 1, 1, 1, 1, 1) which indicates that both the regressand and the regressors have the same lag length of 1. The result in Table 4.7 offers both the long run and the short run estimates of the model.

Table 7: Panel autoregressive distributed lag short run and long run estimates

Dependent Variable: D(CNPI)				
Dynamic regressors (1 lag, automatic): BMSY ECRT COLP ECGT UEPL CBID PRMB				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Probability**
	Long Run Equation			
BMSY	0.7703	0.0434	17.7619	0.0000
ECRT	0.0826	0.0207	3.9854	0.0001
COLP	0.4386	0.0996	4.4036	0.0001
ECGT	-0.9232	0.3311	-2.7882	0.0061
UEPL	-0.7546	0.2735	-2.7587	0.0066
CBID	-68.4738	25.5864	-2.6762	0.0084
PRMB	0.0231	0.2565	0.0901	0.9283
	Short Run Equation			
COINTEQ01	-0.4141	0.1281	-3.2339	0.0015
D(BMSY)	-0.1575	0.0335	-4.6984	0.0000
D(ECRT)	1.1792	0.1789	6.5914	0.0000
D(COLP)	0.8229	0.0718	11.4610	0.0000
D(ECGT)	-0.0817	0.0940	-0.8691	0.3863
D(UEPL)	2.6853	3.3003	0.8136	0.4173
D(CBID)	-673.4044	590.1986	-1.1410	0.2559
D(PRMB)	0.3926	0.1292	3.0380	0.0019
C	18.1654	6.3699	2.8518	0.0050
Mean dependent var	-1.4556	S.D. dependent var		20.4670
S.E. of regression	8.2088	Akaike info criterion		5.7495
Sum squared resid	9231.5750	Schwarz criterion		6.8766
Log likelihood	-525.0780	Hannan-Quinn criterion		6.2053

Source: Computed by the Researcher (2026)

In the long run, it was noted that broad money supply, exchange rate, and crude oil price volatility initiated positive and significant effect on inflation in oil-producing economies in Africa at the 1% level of significance. The established effects support our a priori expectation of the study. From the estimated coefficient, a rise in money supply culminates to a rise in inflation within the oil-producing economies in Africa. The established findings support earlier empirical works of Gbadebo and Mohammed (2015), Kiganda (2015), Mohammed (2016), Oumbe (2018), Adodo et al. (2018), Okotori (2019), Ebipre and Amaegberi (2020), Elisha et al. (2024), and Effiong et al. (2025). From the estimated coefficient, a (1%) increase in money supply initiates a 0.7703% increase in inflation in oil-producing economies in Africa. The findings support the quantity theory of money where the volume of money is directly proportional to the price level in the long run.

The positive effect of exchange rate on inflation so established points out that exchange rate depreciation will trigger inflationary tendencies in an oil-producing economy. As the exchange rate depreciates, the cost of importing core inputs for production increases thereby stifling domestic production and accelerating cost push inflation in the supply side and demand-pull inflation from the household. The established effect supports earlier empirical works like Ujuju and Etale (2016), Okotori (2019), Oladosu and Oladele (2020), Okotori and Eze (2022), and Effiong et al. (2025). The established effect signifies that a 1% increase in exchange rate will initiate a 0.0826% upsurge in inflation level in an oil-producing economy in Africa.

The positive effect of crude oil price volatility predicts that positive crude oil price shocks springs inflationary pressure in an oil-producing economy. The established findings support earlier empirical studies like Jiranyakul (2016), Conflitti and Luciani (2017), Lacheheb and Sirag (2016), Artami and Hara (2018), Mukhtarov et al. (2019), Bawa et al. (2020), Evans (2021), Mien (2022), Usman and Ugwuoke (2024), Odo et al. (2025), Onwioduokit et al. (2026). The estimated coefficient indicates that a 1% increase in crude oil price volatility will initiate a 0.4386% increase in inflation in an African oil-producing economy. The channel through which positive crude oil price shock affects inflation can be traced to both an increase in money supply and a rise in public spending which can drive inflation. Therefore, the petro-monetary transmission mechanism is prevalent in the oil producing economies in Africa.

The effect of economic growth on inflation was reported to be negative and significant at 1% level. This portrays the importance of output gap in driving inflation in oil-producing economy. A rise in output tames the emergence of demand-pull inflation while a decline in output below the potential level spurs inflationary pressure within an economy. From the estimated coefficient, a 1% increase in output reduces inflation by about 0.9232% in the long run. Similarly, unemployment rate foisted a negative and significant effect on inflation in an oil-producing economy which supports the prevalence of the Phillips Curve in the long run for African oil-producing economies. From the estimate, a 1% increase in unemployment will prompt a 0.7546% reduction in inflation in an African oil-producing economy. This inverse relationship portrays the existence of trade-off in monetary policy towards achieving full employment and achieving price stability.

The long run effect of central bank independence was noted to be negative and significant at the 1% level. This supports the postulation in Barro and Gordon's (1993) work which attests that central bank independence improves noninflationary policy's efficacy. The findings therefore support earlier empirical works like Brumm (2011), Arnone and Romelli (2013), Posso and Tawadros (2013), Garriga and Rodriguez (2020), Baumann (2021), Jácome and Pienknagura (2022), and Yahaya et al. (2022). The estimated coefficient indicates that an increase in the level of central bank independence in the African oil producing economies will reduce inflation by about 68.4738% on the average. This can be achieved since the monetary authority will not be unduly dominated in the discharge of its core mandate of price stability. The long run result further portrayed that primary balance wielded a positive though an insignificant effect on inflation in an oil-producing economy in Africa.

The short run result depicted some sort of variance from the long run result. For example, while money supply significantly affected inflation positively in the long run, the effect is negative in the short run. This is possible because an increase in money supply when the economy is not at full employment can have some beneficial effect on production which can therefore tame inflationary pressure within an economy. In the short run, a 1% increase in money supply reduces inflation by about 0.1575% on the average. Exchange rate and crude oil price volatility retained their long run impact as in the short run. Thus, a 1%

increase in exchange rate and crude oil price volatility propel inflation by about 1.1792% and 0.8229% respectively. Economic growth maintained its negative effect on inflation though its short run effect is insignificant. Similar result was observed for central bank independence in the short run.

While unemployment wielded a positive but insignificant short run effect on inflation, the effect of primary balance was positive and significant. Thus, a 1% increase in the primary balance will propel inflation by about 0.3926% in an oil producing economy. This presents possibility of the petro-fiscal transmission mechanism in the short run for an oil producing African economy. The constant which is significant at the 1% level indicates that inflation rate will be about 18.17% in an oil-producing economy in Africa if the prevalent regressors in the model are assumed to be zero. The error correction term of -0.4141 exhibits the appropriate sign and is significant at the 1% level. Consequently, about 41.41% of the short run distortions in the model is adjusted on an annual basis for ushering in of a long run equilibrium.

4.4 Country-Specific Analysis

With special reference to money supply, exchange rate, crude oil price volatility and central bank independence as they affect inflation in oil-producing African economies, a country specific analysis is therefore conducted to make comparisons among them. The result is therefore presented in Table 4.8 to represent the situation in the selected seven oil-producing economies in Africa.

Table 8: Country-specific short run estimates

	Nigeria	Angola	Algeria	Equatorial Guinea	Ghana	Tunisia	Gabon
COINTEQ01	-0.4903	-0.8115	-0.3111	-0.0117	-0.8069	-0.0243	-0.4919
	(0.0000)*	(0.0000)*	(0.0000)*	(0.0001)*	(0.0000)*	(0.0003)*	(0.0000)*
D(BMSY)	-0.1873	-0.2308	-0.0778	-0.0511	-0.1916	-0.0797	-0.2843
	(0.0000)*	(0.0000)*	(0.0000)*	(0.0000)*	(0.0011)*	(0.0000)*	(0.0001)*
D(ECRT)	-0.0470	-0.1732	0.0510	0.0256	4.6886	3.6316	0.0781
	(0.0000)*	(0.0000)*	(0.0231)*	(0.0000)*	(0.2612)	(0.3397)	(0.0247)*
D(COLP)	0.2296	0.3133	0.0312	0.1756	-0.0062	0.0601	0.1839
	(0.0052)*	(0.0198)*	(0.0417)*	(0.0001)*	(0.8930)	(0.0000)*	(0.0028)*
D(ECGT)	-0.3762	0.1058	0.2631	-0.0321	-0.4239	0.0145	-0.1233
	(0.0170)*	(0.8930)	(0.0054)*	(0.0000)*	(0.1547)	(0.0245)*	(0.1803)
D(UEPL)	0.9970	22.2047	0.1218	-0.6568	-3.6655	-0.1031	-0.1012
	(0.8711)	(0.9509)	(0.2930)	(0.8833)	(0.0904)*	(0.0305)*	(0.9865)
D(CBID)	-4.0014	-10.8999	-3.500	6.6966	-9.340	6.8010	-48.3871
	(0.0003)*	(0.0000)*	(0.0005)*	(0.9431)	(0.0000)*	(0.9269)	(0.0000)*
D(PRMB)	-0.2095	0.6946	0.0187	-0.0236	0.8832	-0.0217	1.4064
	(0.0619)*	(0.4106)	(0.1572)	(0.0121)*	(0.0399)*	(0.3269)	(0.1990)
C	16.3955	42.0053	12.9977	-0.1577	37.5423	-1.6194	19.9938
	(0.8312)	(0.8846)	(0.6727)	(0.6708)	(0.8858)	(0.6917)	(0.8431)

Source: Computed by the Researcher (2026)

The short-run dynamics of inflation in oil-producing economies are shaped by a combination of domestic and external shocks, with crude oil price volatility, monetary conditions, fiscal balances, and institutional factors playing a central role. This section presents and discusses the country-specific short-run effects of crude oil price volatility (COLP), broad money supply (BMSY), exchange rate (ECRT), unemployment (UEPL), central bank independence (CBID), and primary balance (PRMB) on inflation in seven selected African oil-producing economies, namely Nigeria, Angola, Algeria, Ghana, Equatorial Guinea, Tunisia, and Gabon. The heterogeneity in both the direction and magnitude of effects across these economies highlights the importance of institutional structures, macroeconomic fundamentals, and policy frameworks in shaping the inflationary consequences of shocks.

Crude Oil Price Volatility and Inflation

The empirical results reveal a heterogeneous short-run relationship between crude oil price volatility and inflation across the

selected economies. Specifically, the effect is negative but statistically insignificant in Ghana, whereas it is positive and significant for Nigeria, Angola, Algeria, Equatorial Guinea, Tunisia, and Gabon. The magnitude of the effect also differs substantially across countries, underscoring the asymmetric transmission of oil price shocks into domestic price levels. For instance, a 1% increase in crude oil price volatility is associated with a 0.2296% increase in inflation in Nigeria, 0.3133% in Angola, 0.1756% in Equatorial Guinea, 0.0601% in Tunisia, and 0.1839% in Gabon. Angola records the largest inflationary response, followed by Nigeria, while Tunisia shows the smallest but still significant impact. The results imply that among the selected countries, Angola and Nigeria are more vulnerable to short-run inflationary pressures emanating from oil price volatility.

These findings are consistent with earlier empirical evidence showing that oil price shocks transmit to inflation in oil-dependent economies through both direct and indirect channels (Alvarez et al., 2011; Kilian, 2009). Directly, rising oil prices increase the cost of refined petroleum products, which are a major component of the consumer price index. Indirectly, oil price increases affect production costs, government expenditure patterns, and exchange rate stability, thereby amplifying inflationary pressures (Basher, Haug, and Sadorsky, 2012). Ghana's insignificant effect may reflect relative economic diversification and proactive macroeconomic management, consistent with Hamilton's (2009) observation that economies with broader production bases are less vulnerable to oil-induced inflation shocks.

Broad Money Supply and Inflation

A striking result from the analysis is the uniformly negative and statistically significant short-run effect of broad money supply on inflation across all the economies. This finding runs counter to the traditional monetarist proposition advanced by Friedman (1968), which posits a direct and proportionate link between money supply and inflation. However, the magnitude of the effect varies significantly. From the estimates, a 1% increase in broad money supply reduces inflation by about 0.2843% in Gabon, 0.2308% in Angola, 0.1873% in Nigeria, 0.0778% in Algeria, 0.0511% in Equatorial Guinea, 0.0797% in Tunisia, and 0.1916% in Ghana. Gabon experiences the strongest deflationary impact, while Equatorial Guinea records the weakest.

These results resonate with Keynesian perspectives, which suggest that monetary expansion under conditions of underutilized resources reduces inflationary pressures by stimulating output (Keynes, 1936; Tobin, 1970). Studies, such as Evans and Saibu (2017), corroborate that in African economies, increases in money supply often expand productive capacity rather than fuelling inflation, especially in the short run. This suggests that expansionary monetary policy may not be inherently inflationary in resource-constrained oil economies, but instead may function as a stabilizing tool by reducing demand-pull inflation.

Exchange Rate and Inflation

The short-run effect of exchange rate movements on inflation also reveals important cross-country differences. The effect is negative and significant for Nigeria and Angola, whereas it is positive and significant for Algeria, Equatorial Guinea, and Gabon. For Ghana and Tunisia, the effect is positive but statistically insignificant. Quantitatively, a 1% increase in the exchange rate (depreciation) reduces inflation in Nigeria and Angola by about 0.047% and 0.1732%, respectively. Conversely, the same depreciation raises inflation in Algeria by about 0.051%, in Equatorial Guinea by 0.0256%, and in Gabon by 0.0781%.

The divergent results reflect structural and institutional differences in foreign exchange regimes. In Nigeria and Angola, exchange rate depreciation reduces inflation, possibly due to enhanced export competitiveness and improved external balances (Aliyu, 2011). In contrast, in Algeria, Equatorial Guinea, and Gabon, depreciation exerts inflationary pressures through higher import costs and inflation expectations (Ito and Sato, 2008). This aligns with the literature on exchange rate pass-through, which highlights that the effect of depreciation on inflation is context-dependent, influenced by the degree of trade openness, import dependence, and monetary credibility (Taylor, 2000).

Unemployment and Inflation

The Phillips Curve hypothesis, which posits an inverse relationship between unemployment and inflation (Phillips, 1958), is only validated in Ghana and Tunisia. In these economies, unemployment exerts a negative and significant effect on inflation, with a 1% increase in unemployment reducing inflation by 3.6655% and 0.1031%, respectively. By contrast, in Nigeria, Angola, Algeria, Equatorial Guinea, and Gabon, unemployment has no significant effect on inflation in the short run. Interestingly, Nigeria and Angola even exhibit a positive association between unemployment and inflation, reflecting a stagflation scenario.

This outcome mirrors structuralist critiques of the Phillips Curve, which emphasize the coexistence of high inflation and high unemployment in developing economies due to rigidities and supply-side bottlenecks (Akerlof et al., 1996).

Central Bank Independence and Inflation

The degree of central bank independence (CBID) emerges as a critical factor influencing inflation outcomes. The effect is negative and significant for Nigeria, Angola, Algeria, Ghana, and Gabon, but positive and insignificant for Equatorial Guinea and Tunisia. The estimated coefficients show that a 1% increase in CBID reduces inflation by 48.3871% in Gabon, 10.8999% in Angola, 9.34% in Ghana, 4.001% in Nigeria, and 3.50% in Algeria. These results align with Rogoff's (1985) and Cukierman's (1992) findings that central bank autonomy enhances anti-inflationary credibility by insulating monetary authorities from political pressures. The insignificant effects in Equatorial Guinea and Tunisia may be explained by weak institutional structures and political interference that dilute the benefits of central bank autonomy, consistent with empirical findings by Arnone et al. (2006).

Primary Balance and Inflation

The short-run effects of primary balance on inflation are also heterogeneous. The effect is negative and significant in Nigeria and Equatorial Guinea, but positive and significant in Ghana. In Angola, Algeria, Tunisia, and Gabon, the effect is insignificant. The estimates reveal that a 1% increase in primary balance reduces inflation by 0.2095% in Nigeria and 0.0236% in Equatorial Guinea but raises inflation by 0.8832% in Ghana. The negative effect reflects the importance of fiscal discipline in containing inflationary pressures, consistent with the fiscal theory of the price level (Woodford, 2001). The Ghanaian case, however, underscores the potential for pro-cyclical fiscal adjustments to constrain supply-side activity and exacerbate inflation in the short run (Adam and Bevan, 2005).

The results highlight the complexity of inflation dynamics in African oil-producing economies. Crude oil price volatility transmits inflationary pressures in most countries, with Angola and Nigeria being particularly vulnerable. Broad money supply, contrary to monetarist expectations, mitigates inflationary pressures, especially in economies with underutilized capacity. Exchange rate effects are mixed, reflecting structural and institutional differences. The Phillips Curve trade-off is weak, holding only in Ghana and Tunisia. Central bank independence emerges as a powerful anti-inflationary tool in several economies, particularly Gabon. Finally, fiscal balances exhibit divergent effects, underscoring the importance of context-specific fiscal policy. These findings collectively suggest that African oil-producing economies cannot rely on a uniform approach to inflation management. Instead, tailored policy responses, sensitive to structural realities and institutional capacities, are essential for achieving sustainable price stability.

4.5 Threshold Regression Analysis

To establish the optimal inflation level for oil-producing African economies, the STR was conducted and Table 9 presents the extract of the result pertaining to the seven economies under investigation.

Table 9: Inflation threshold level for selected African oil-producing economies

Countries	Slope	Threshold	p-value	R-squared
Nigeria	3.1257	7.0455	0.0133	0.1348
Angola	1.7968	13.2001	0.0000	0.3801
Algeria	3.6198	1.9248	0.0000	0.3541
Equatorial Guinea	50.8014	3.0802	0.0000	0.6887
Ghana	4.4866	10.4866	0.0000	0.0789
Tunisia	34.5960	5.6913	0.4067	0.6364
Gabon	1.9221	3.0352	0.0001	0.3349

Source: Computed by the Researcher (2026)

It can be deduced from Table 4.9 that Angola can tolerate a higher inflation level to the tune of 13.20%. The implication of this follows that any inflation rate beyond the specified level will fuel macroeconomic instability within the Angolan economy. Followed by Angola is Ghana with a 10.49% threshold inflation level and then Nigeria with 7.05% inflation rate. It can also be

noted that Algeria can only tolerate an inflation rate of 1.92% beyond which macroeconomic instability will ensue. The established threshold level of inflation for these oil-producing economies lies within those reported by Sanga and Gui-Diby (2020) for Central African Monetary Union 5.4% to 5.6% and West African Monetary Union 4.3% to 4.5%; West African Monetary Agency (2018) with 6% for ECOWAS region, 3% for West African Economic and Monetary Union and 9% the West African Monetary Zone (WAMZ); West African Monetary Institute (2012) with 9% for the WAMZ, Olowofeso et al. (2023) with 10.0% for WAMZ, and Bawa and Ismaila (2021) with 13% for Nigeria.

The study estimates inflation thresholds at two extremes: Algeria 1.92% and Angola 13.20%. Why do thresholds differ so widely? What explains the variation? What institutional factors account for these differences? When looking at Algeria and Angola, the dramatic difference in their thresholds comes down to how their economies are structured and the strength of their institutions. Angola imports a massive chunk of its basic goods, from food to machinery. When a country relies heavily on imports, its internal prices are tightly bound to its exchange rate. Because Angola has historically faced severe currency volatility, its economy has had to become "used to" high structural inflation. A threshold of 13.20% reflects an economy that structurally operates at a much higher baseline of price churn just to keep running. Algeria runs a highly centralized economy with an extensive network of State subsidies for basic goods (food, housing, fuel). Because the government artificially caps prices, true market-driven inflation is suppressed. This structural choking of price movements means that even a small amount of unmanaged inflation (like hitting 2%) signals that the state's price-control mechanisms are straining, making the growth-disruption threshold much lower.

In Algeria, because the central bank and government heavily manage the currency and prices, public expectations of inflation are relatively low and anchored. If inflation spikes, it immediately disrupts economic planning. Historically, Angola's central bank (BNA) has had to print money to cover government deficits when oil prices crashed. When a central bank routinely monetizes debt, the public expects high inflation. Because high inflation is already baked into daily contract negotiations, wage demands, and business margins, the economy doesn't visually "slow down" in response to inflation until it breaches that very high 13.20% benchmark.

Algeria has a relatively large, state-dominated banking sector. While slow, it means more transactions happen in local currency within formal channels, making the economy highly sensitive to purchasing power loss at lower percentages. Due to decades of civil war history and macroeconomic instability, Angola's economy has long been informally dollarized or tied to foreign currency values. When an economy uses foreign currency as a safety valve, domestic currency inflation has less of an immediate stranglehold on business investment until it reaches double digits. It is worth noting that a 13.20% threshold does not mean Angola's economy is healthier than Algeria's; it means Angola's economy has adapted to running incredibly at high level of inflation because of structural vulnerabilities, weak institutional insulation from oil shocks, and imported price volatility.

4.6 Policy implications

The findings suggest several important policy implications. First, while monetary policy remains a vital tool, it cannot independently ensure long-term price stability in oil-producing African economies without fiscal discipline and structural reforms. Second, managing oil price volatility through stabilization funds, sovereign wealth funds, and diversification strategies is essential to protect macroeconomic stability. Third, strengthening central bank independence is a critical institutional reform needed to reduce inflationary pressures and enhance monetary credibility. Finally, policymakers must adopt country-specific inflation targets, as the tolerance levels differ across economies, and exceeding these thresholds risks triggering instability. Overall, the study underscores the complex interplay between oil price dynamics, monetary policy, and inflation outcomes in African oil-producing economies, highlighting the need for integrated policy frameworks tailored to country-specific contexts.

5 Summary, Conclusion and Recommendations

5.1 Summary

The study was designed to examine the influence of monetary policy on inflation dynamics in selected oil-producing economies in Africa over the period 1995–2024. It specifically focused on the following objectives:

- To explore the effectiveness of monetary policy in addressing the inflationary problem in oil-dependent African economies.
- To investigate how inflation, exchange rate, and primary balance respond to shocks in crude oil prices.
- To examine how oil price volatility influences the transmission mechanism of monetary policy.
- To evaluate the role of central bank independence in the conduct of monetary policy and inflation control.
- To estimate the threshold level of inflation that is consistent with macroeconomic stability in oil-producing African economies.

The study relied on secondary data from reputable sources including the World Bank, the International Monetary Fund, and the Federal Reserve Bank of St. Louis. The analytical framework incorporated a variety of econometric tools such as unit root tests, cointegration analysis (Johansen-Fisher and Kao), Granger causality tests (GCT), vector autoregression (VAR), the autoregressive distributed lag (ARDL) model, and smooth transition threshold regression (STR). The unit root results confirmed that the variables were integrated of mixed orders [I(0) and I(1)], thereby justifying the application of the ARDL framework. The cointegration tests provided evidence of long-run equilibrium relationships among the variables.

The major findings can be summarized as follows:

- The ARDL results showed that broad money supply exerts a negative and significant effect on inflation in the short run, but a positive and significant effect in the long run. This asymmetry suggests that short-term monetary tightening may initially suppress inflationary pressures, but prolonged monetary expansion eventually fuels inflation in oil-producing economies.
- Exchange rate movements were found to have a positive and significant effect on inflation both in the short and long run, highlighting the vulnerability of domestic price stability to currency depreciation. This finding underscores the importance of exchange rate management in oil-dependent economies that are highly exposed to external shocks.
- Crude oil price volatility was found to exert a positive and substantial effect on inflation, confirming the pass-through of international oil price shocks into domestic price levels. Continuous swings in crude oil prices were therefore identified as a persistent driver of inflation in oil-exporting African economies.
- Central bank independence demonstrated a negative and significant effect on inflation, indicating that greater institutional autonomy of monetary authorities strengthens their capacity to pursue disinflationary policies. This underscores the importance of insulating monetary policy from fiscal dominance and political pressures.
- Primary balance was found to have a positive and significant effect on inflation in the short run, although this effect became statistically insignificant in the long run. The result suggests that excessive fiscal deficits and public borrowing may initially fuel inflationary pressures, but their long-term influence diminishes once debt sustainability mechanisms are in place.

Taken together, these findings carry significant implications for the design and implementation of monetary policy in oil-producing African economies. They demonstrate that crude oil price volatility directly and indirectly drives inflationary pressures, shapes monetary transmission mechanisms, and necessitates careful calibration of inflation-targeting frameworks across heterogeneous economies.

5.2 Conclusion

The study concludes that inflation dynamics in oil-producing African economies are deeply intertwined with fluctuations in international crude oil prices. The evidence demonstrates that oil price shocks transmit into domestic economies through multiple channels – money supply, exchange rate depreciation, and fiscal balances – before manifesting in higher inflation rates. This phenomenon has been characterized as the petro-monetary and petro-fiscal transmission mechanisms.

Crucially, the analysis affirms that central bank independence significantly enhances the effectiveness of monetary policy in controlling inflation, as it curtails the risks of fiscal dominance and allows monetary authorities to act with credibility and autonomy. Furthermore, the study confirms that oil-producing economies do not share uniform inflation thresholds; rather, structural characteristics such as fiscal capacity, institutional strength, and external sector resilience determine the level of

inflation that can be tolerated without destabilizing growth.

Overall, the study concludes that crude oil price volatility constitutes a fundamental determinant of monetary policy effectiveness in African oil-producing economies. By shaping the trajectory of exchange rate dynamics, fiscal balances, and money supply growth, oil shocks exert persistent pressures on domestic price stability. Policymakers must therefore recognize the external vulnerability inherent in oil dependence and adopt institutional and macroeconomic strategies that safeguard monetary policy credibility and enhance resilience to external shocks.

5.3 Recommendations

The findings of this study carry profound implications for monetary policy design, fiscal governance, and institutional reforms in African oil-producing economies. The evidence suggests that oil price volatility exerts pervasive effects on inflation through monetary, fiscal, and exchange rate channels, and that different economies have varying tolerance levels for inflation. Based on these insights, the following policy recommendations are advanced:

- Tool Calibration: Strengthening the Monetary Policy Toolkit: Since the study found that broad money supply and exchange rate significantly affect inflation, monetary authorities in oil-producing economies must recalibrate their policy instruments. In Nigeria, for example, the reliance on monetary policy rate adjustments has often proven inadequate in curbing inflation due to weak monetary transmission and high fiscal dominance. Thus, the Central Bank of Nigeria (CBN) should complement traditional policy instruments with stronger liquidity management frameworks, including open market operations that target excess liquidity arising from oil revenue windfalls.

  Similarly, in Angola, the banking system is relatively underdeveloped, which weakens interest rate channels. As such, the Banco Nacional de Angola should integrate macroprudential tools, such as credit growth caps and countercyclical reserve requirements, to complement direct monetary interventions. This would strengthen the potency of monetary policy against oil-induced inflationary pressures. By broadening their toolkits beyond the interest rate, oil-producing economies can better insulate themselves from oil price volatility and strengthen monetary policy credibility.
- Policy Framework Adaptation: Building Sovereign Buffers: Given the strong evidence that crude oil price shocks amplify inflationary pressures, governments must adopt countercyclical stabilization mechanisms. A key instrument in this regard is the establishment and effective management of sovereign wealth funds (SWFs). Algeria provides a cautionary example. Although it established the Revenue Regulation Fund (FRR) to stabilize public finances against oil price fluctuations, poor governance and pro-cyclical withdrawals undermined its effectiveness, leading to fiscal imbalances during oil price downturns. In contrast, international experience from Norway demonstrates that strong institutional frameworks can make SWFs highly effective in smoothing oil revenue cycles.

  Therefore, countries like Nigeria and Angola should design transparent and legally binding frameworks for their SWFs, ensuring that oil windfalls are saved during booms and deployed only during downturns. Ghana's Stabilization Fund, though relatively small, offers a regional example of how such mechanisms can moderate fiscal volatility. For Gabon and Equatorial Guinea, whose fiscal dependence on oil is among the highest in Africa, the operationalization of SWFs would help reduce inflationary spending during oil booms and promote macroeconomic stability.
- Central Bank Independence: Safeguarding Monetary Policy Credibility: The study underscores the importance of central bank independence in reducing inflationary pressures. In Nigeria, persistent fiscal dominance – manifested through direct central bank financing of government deficits – has undermined the credibility of the CBN and contributed to sustained inflationary pressures. Legal reforms are needed to restrict central bank financing of deficits beyond narrow, well-defined thresholds. In contrast, Algeria's Banque d'Algérie has historically maintained greater autonomy, which has helped it achieve relative success in price stability despite fiscal pressures. However, political pressures during oil price downturns have occasionally compromised its independence. To institutionalize independence, oil-producing economies should adopt reforms that guarantee fixed-term appointments for central bank governors, restrict fiscal authorities from interfering with monetary operations, and improve transparency in policy communication. Strengthening independence will also align African central banks with global best practices, boosting both domestic and international confidence in

their monetary policies.

- Inflation Targeting: Differentiated Frameworks for Diverse Economies: The results of the threshold analysis indicate that oil-producing African economies tolerate different levels of inflation before macroeconomic instability emerges. Therefore, a one-size-fits-all approach to inflation targeting is inappropriate. Nigeria and Angola, which can tolerate relatively higher inflation thresholds, may benefit from adopting flexible inflation-targeting frameworks that allow for moderate inflation consistent with their structural realities and developmental financing needs. On the other hand, Algeria, Equatorial Guinea, and Gabon, which have lower inflation tolerance, should adopt conservative inflation targets anchored on tighter monetary policy stances and fiscal prudence. Ghana, though not as heavily oil dependent as Nigeria or Angola, has successfully experimented with formal inflation targeting since 2007, providing a regional model of how transparency and communication can enhance the credibility of inflation control. Lessons from Ghana's framework could be adapted by other oil-producing economies with appropriate adjustments for structural differences.

  By contextualizing these strategies to their unique institutional, structural, and fiscal environments, oil-producing African economies can improve resilience to oil price shocks, stabilize inflation, and foster long-term economic stability.

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