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# GAS PRICE VOLATILITY, INFLATIONARY PRESSURE, AND ECONOMIC GROWTH IN NIGERIA

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## ABSTRACT

The study examined how gas price volatility and inflationary pressure impact economic growth in Nigeria from 2000 to 2023. Specifically, it investigated the effects of these factors on economic growth during this period. Time series data were collected from the Central Bank of Nigeria Statistical Bulletin, the National Bureau of Statistics Bulletin, and the International Energy Agency gazette. The GARCH regression technique was used to analyze the data. The study found that gas price volatility had a positive but non-significant effect on Nigeria's economic growth. Similarly, inflationary pressure had a positive but non-significant effect. However, the empirical results for carbon dioxide emissions showed a significant negative effect on economic growth in Nigeria. Overall, the F-statistics indicated that gas price volatility, inflationary pressure, and carbon dioxide emissions significantly affect Nigeria's economic growth. It is recommended that the government implement monetary and fiscal policies to control inflation, stabilize gas prices, and promote economic growth.

**Keywords:** inflationary pressure, oil price, gas flaring, Liquefied Natural Gas (LNG)
**JEL**: C22, E31, O47, Q43

## INTRODUCTION

Natural gas is a commodity that relies on modern energy sources and offers advantages, including being cleaner, easier to store, and easier to transport worldwide. See, for example, Beyca et al. (2019). In recent years, every country has increasingly focused on sustainable development, particularly regarding natural gas (Zhang & Wen, 2008). Burning natural gas releases far less harmful particulate matter and greenhouse gases than crude oil and other fossil fuels, making it attractive to environmentalists as a clean energy source (Delborne et al., 2020; Obama, 2017). As a key strategic commodity, gas price volatility significantly influences the energy market, economic growth, and even national security (Weber, 2012). In Nigeria, where the economy relies heavily on oil exports, gas price fluctuations are closely linked to crude oil prices, which significantly affect the country's revenue and foreign exchange earnings. Changes in gas prices can also lead to shifts in inflation rates, impacting the overall macroeconomic stability and growth of the Nigerian economy (Maugeri, 2016).

According to Premium Times, gas prices have consistently been a concern for Nigerians because they significantly affect the economy, especially for low-income households that rely heavily on gas. As observed by Ogboru et al. (2017), a sudden increase in gas prices can raise household expenses, making them difficult to absorb. Additionally, since gas is used as fuel for cooking, when prices rise, the cost of food preparation also increases. This can lead to higher food inflation, potentially causing a ripple effect on the overall economy. Yusuf (2015) argued that gas plays a

crucial role in Nigeria's economic policies, as it accounts for an average of 80% of government revenue, 90-95% of foreign exchange earnings, and 12% of real gross domestic product. Despite these windfalls, Nigeria continues to have a growing proportion of impoverished people and has experienced ongoing economic stagnation (Okonjo-Iweala & Osafo-Kwaako, 2007).

Since the oil discovery and the oil boom of the 1970s, most of Nigeria's macroeconomic indicators have become unstable and concerning, with a steady decline in GDP and the value of the naira over the years, along with neglect of the agricultural sector (Ugah, 2021; Obaka, 2022). For example, the GDP growth rate, which was 25% in 1970 when the naira was N0.7 to a dollar, declined to 5% when the currency depreciated to N101.7 in 2000, and further dropped to 2% in 2018 when the naira plummeted to N363.5 per dollar. The ongoing decline in GDP also correlates with rises in crude oil and gasoline prices, unemployment rates, and oil rents from 1970 to the present. As of the second quarter of 2020, Nigeria's unemployment rate was 27.1%, meaning about 21,764,614 (21.7 million) Nigerians remained unemployed. Nigeria's dependence on oil revenue has raised concerns, especially since oil is a globally traded commodity whose price is highly unpredictable (Obaka, 2022). Oil price volatility has significant implications for both oil-importing and exporting countries; however, countries that rely heavily on oil exports are more vulnerable to these fluctuations, particularly during periods of negative volatility. Nigeria's economy is highly dependent on crude oil export revenue, so changes in oil prices directly affect Nigeria's macroeconomy (Akinlo & Apanisile, 2015). As previously mentioned, Nigeria is a major oil producer in Africa, and its economy heavily depends on crude oil exports. This makes Nigeria more susceptible to price fluctuations, meaning that when global oil prices rise, Nigerian gas prices tend to increase as well.

The anecdotal link between gas price volatility, inflation, and output in oil-exporting African nations has drawn the attention of stakeholders, governments, and the general public (Sina et al., 2020). Gas price fluctuations are widely regarded as the main drivers of significant economic issues, including trade deficits, low investment, capital outflows, and inflation (Hathaway, 2009). As a non-renewable energy source, gas has a substantial impact, and changes in gas prices influence a country's economic performance. When gas prices rise or fall, the likelihood of inflation rising or falling also changes (Hussain et al., 2016). Due to their heavy reliance on oil revenues, the economies of OPEC oil-exporting countries in Africa have been greatly affected by oil price volatility (Omojolaibi, 2013). Countries heavily dependent on imported oil may experience significant economic effects from fluctuations in oil prices. Consequently, oil price volatility can be linked to changes in inflation (Kose & Unal, 2021).

Given the crucial role of the oil and gas sector in Nigeria's economy and its influence on various macroeconomic indicators and industries, it is important to examine the complex connections between gas price changes, inflationary pressures, and economic growth. This study aims to fill existing knowledge gaps, provide detailed insights, and offer practical guidance for policymakers, economists, and stakeholders to enhance the resilience and sustainability of Nigeria's economy amid fluctuating gas prices and inflation.

## LITERATURE REVIEW

### Theoretical framework

### Supply and Demand theory

The supply and demand theory explains how prices are set in a market. It states that the intersection of the supply and demand curves determines a commodity's price. The theory was first introduced by Adam Smith, a Scottish philosopher and economist, in his book "The Wealth of Nations" (1776). However, it was later expanded and refined by other economists such as Leon Walras, Carl Menger, and Alfred Marshall. Ogbuiwe (2018) pointed out that the supply and demand theory can also be used to analyze how changes in price influence economic growth. In Nigeria, for example, if an increase in gas prices leads to higher supply, it can contribute to economic growth as producers have more incentives to produce. Conversely, if an increase in gas prices reduces demand, it may slow economic growth as consumers are less motivated to buy. Donwa, Mgbame, and Aigboduwa (2015) argued that the supply and demand theory is not always realistic, especially in developing economies like Nigeria, where policies are converging.

### Expectations-Augmented Phillips Curve Theory

The Expectations-Augmented Phillips Curve (EAPC) Theory is an updated version of the original Phillips Curve, first introduced by Alban William Phillips in 1958. The original Phillips Curve showed a negative relationship between inflation and unemployment, but subsequent research revealed that this relationship was unstable and influenced by expectations of future inflation (Awogbemi & Ajoa, 2011). The Expectations-Augmented Phillips Curve (EAPC) theory explains the link between inflation, unemployment, and economic growth (Awogbemi & Taiwo, 2012). It can be used to analyze how fluctuations in gas prices influence inflationary pressures and economic growth in Nigeria. For instance, if rising gas price volatility increases expectations of future inflation, it can lead to higher current inflation and slower economic growth. This is because it reduces consumer purchasing power and decreases aggregate demand (Kilindo, 1997).

### Empirical review

Earlier studies on this topic include Hamilton (1983, 1996, 2005), which provide evidence of a strong link between increases in gas prices and subsequent economic downturns in the United States (US), especially after World War II. In Nigeria, Aliyu (2009) found an asymmetric effect of gas price shocks on real GDP, with positive shocks having a larger impact than negative shocks. Alhassan and Kilishi (2016) also showed that oil price shocks caused macroeconomic fluctuations in Nigeria. Focusing on inflation, Hooker (2002) found that fluctuations in oil prices contributed to rising US core inflation before 1981 and to declining inflation afterward. Since then, many studies have examined the relationship between oil prices and inflation in both developed and developing countries using different methods.

Studies such as Brown, Oppedahl, and Yucel (1995); Dias (2013); Lu et al. (2013); Zhao et al. (2016); Conflitti and Luciani (2017); and Zivkov et al. (2019) report a significant positive effect of oil prices on inflation in developed countries. Using a vector autoregression (VAR) model and U.S. data, Brown et al. (1995) showed that oil price shocks influence output and the price level; however, the country’s monetary policy can offset the inflationary pressure caused by these shocks. Similarly, Dias (2013) estimated the effects of oil price shocks on economic variables such as GDP, employment, and inflation using a structural VAR model for Portugal from 1984 to 2012.

Results from impulse response functions (IRFs) indicated that, among other findings, a roughly 13 percent increase in oil prices caused inflation to rise by 0.25 and 0.05 percentage points in the first and second periods, respectively. Nonetheless, this impact gradually diminishes starting from the third period, with virtually no long-term effect on the price level.

Lu et al. (2013) examined the impact of oil price shocks on inflation in Taiwan using a bivariate GARCH approach and data from 1986 to 2008. They found that oil prices strongly Granger-caused inflation in Taiwan and identified a lasting volatility spillover from oil prices to inflation during this period. Zhao et al. (2016) created a dynamic stochastic general equilibrium (DSGE) model for the Chinese economy to analyze how oil price shocks affect output and inflation. The study identified four types of oil price shocks: supply shocks caused by political events in OPEC countries, other oil supply shocks, demand shocks to industrial commodities, and demand shocks specific to the crude oil market. They showed that the first shock mainly drives short-term fluctuations in China's output and inflation, while the other three shocks tend to have longer-lasting effects. Demand shocks specific to the crude oil market contribute the most to the variations in China's output and inflation.

Conflitti and Luciani (2017) examined the pass-through of oil prices to inflation in the US and the Euro area using dynamic factor models and VAR. After distinguishing between the common and idiosyncratic effects of oil price shocks on inflation, the study showed that oil prices mainly impact inflation through the common effect. The pass-through was small but significant and long-lasting. Zivkov et al. (2019) also found that the pass-through of oil prices to inflation was relatively slow in eleven Central and Eastern European countries (the Czech Republic, Poland, Hungary, Slovakia, Lithuania, Latvia, Estonia, Romania, Bulgaria, Slovenia, and Croatia) during 1996-2018. A rise followed a 100 percent increase in oil prices, resulting in inflation of 1-6 percentage points. Two countries (Slovakia and Bulgaria), which had the highest oil import/GDP ratios, tended to have the highest and most consistent pass-through effects in the analysis.

Niyimbanira (2013) found a cointegrating relationship between oil prices and inflation in South Africa, with unidirectional causality from oil prices to inflation. Shafique (2016), however, was unable to find any effect of crude oil price shocks on the producer price index in Pakistan, an oil-importing economy. Using a VAR framework, Ito (2010) showed that Russia is vulnerable to oil price shocks, as they cause mild inflation in the short run and affect the exchange rate and national output. Similarly, Abounoori, Nazarian, and Amiri (2014) examined the nature and causes of oil price pass-through into inflation in Iran. Their analysis revealed a positive, incomplete pass-through in both the short and long terms, indicating that oil price hikes lead to inflation in Iran. In comparative studies, Sek, Teo, and Wong (2015) and Sek and Lim (2016) distinguished between high- and low-oil-dependent countries and examined the impact of oil price shocks on inflation in these groups. Using a panel ARDL framework, Sek, Teo, and Wong (2015) found that the impact was more severe for high-oil-dependency countries, which are mainly oil producers, than for low-oil-dependency countries. Sek and Lim (2016) also noted that CPI inflation in oil-exporting countries does not respond to oil supply and demand shocks, while supply shocks can significantly influence inflation in oil-importing countries.

In Nigeria, Olusegun (2008) demonstrated that oil price shocks significantly contribute to fluctuations in oil revenues and national output. However, he suggested that oil price shocks might

not necessarily cause inflation, but recommended to use fiscal policy measures to restore stability in the domestic economy after an oil shock. Similarly, Odionye et al. (2019) showed that the response of inflation to oil price shocks was initially negative, then turned positive after two periods. Meanwhile, the exchange rate's response to oil price shocks was negative and persistent. Omotosho and Doguwa (2012) found that major factors driving high inflation volatility in Nigeria included the announcement of fuel price hikes, food crises, exchange rate instability, and upward wage reviews for public sector employees. Therefore, the subsequent removal of fuel subsidies in Nigeria and increases in international crude oil prices are likely to lead to higher domestic fuel prices and inflationary pressures in the country.

Ibrahim (2015), Abdlaziz et al. (2016), and Lacheheb and Sirag (2019) applied the NARDL approach to examine the oil price-inflation nexus in Malaysia, Indonesia, and Algeria. Ibrahim (2015) found that food prices, oil prices, and real GDP are cointegrated with asymmetries in food price behavior in Malaysia. The study established a significant relationship between oil price hikes and increases in food prices in both the long and short run, but found no significant influence of oil price declines on food prices in either the long or short term. Abdlaziz, Rahim, and Adamu (2016) provided evidence of a strong positive relationship between food and oil price increases in both the long and short runs. Their results indicated that a 10 percent increase in oil prices led to a 3.6 percent rise in food prices in the long run. Lacheheb and Sirag (2019) also identified a nonlinear effect of oil prices on inflation: increases in oil prices significantly affect inflation. In contrast, declines in oil prices do not.

Kelikume (2017) investigated the asymmetric effects of exchange rate and oil price shocks on inflation using a vector error correction model (VECM). The study found, among other results, that increases in oil prices caused a 43 percent rise in inflation over a year, whereas a fall in oil prices led to a 29 percent increase in inflation. Bala and Chin (2018) estimated the asymmetric impacts of oil price shocks on inflation in four African oil-producing countries—Algeria, Angola, Libya, and Nigeria—using the ARDL dynamic panels framework. They discovered that both positive and negative oil price shocks positively affected inflation during the period, with a more significant impact observed during oil price declines. Similarly, Omolade et al. (2019) used a panel structural VAR framework. They found that a sharp decline in oil prices was accompanied by an increase in inflation across eight African oil-producing countries, including Nigeria. The study revealed that the inflation increases following these declines were more structural than monetary in nature.

Using a New-Keynesian DSGE model to analyze the macroeconomic effects of oil price shocks and the fuel subsidy regime in Nigeria, Omotosho (2019) found that oil price shocks affected headline inflation. However, their impact was minimal because international oil prices were not fully passed through to domestic fuel prices. The study showed that a negative oil price shock led to lower marginal costs and reduced domestic inflation. However, depreciation of the domestic currency following a drop in oil prices led to increases in import prices, raising both headline and core inflation measures.

Cunado and de Gracia (2005) have shown that oil price shocks affected both consumer prices and economic activity in six Asian countries – Japan, Singapore, South Korea, Malaysia, Thailand, and the Philippines, even though the impact was limited to the short run and more pronounced

when oil price shocks are defined in local currencies. Additionally, they found evidence of asymmetries in the relationship between oil price shocks and inflation in four countries. Using an unbalanced panel of 72 developed and developing economies, Choi et al. (2018) demonstrated that a 10 percent increase in global oil inflation would, on average, raise domestic inflation by about 0.4 percentage points, with the effect disappearing after two years. They also revealed that the effect is asymmetric, with positive oil price shocks having a larger impact on inflation than negative ones. Regarding the transmission channels for the shocks, their results indicated that the share of transportation in the CPI basket and energy subsidies are the most significant factors explaining cross-country differences in the impact of oil price shocks.

Likewise, Mai-Lafia et al. (2016) assessed the impact of oil price volatility on macroeconomic variables and sustainable development in Nigeria. They used secondary time series data in a Vector Autoregression (VAR) analysis. They found that fluctuations in oil prices significantly affect real GDP, exchange rates, unemployment, balance of payments, and interest rates in Nigeria, and that negative volatility in the international oil market has a notable impact on price fluctuations. However, Orlu (2017) investigated the effect of Premium Motor Spirit (PMS) prices on Nigeria's economic growth, as well as the influence of gross domestic investment (GDI), labor employment (LEMP), and lending interest rate (LIR) on Nigeria's economy from 1970 to 2013. The study revealed that an increase in PMS price has a significant negative impact on Nigeria's real GDP at the 5% significance level. This suggests that a 1% rise in PMS price, lagged by one year, leads to a 0.7% decrease in real GDP. Similarly, Yakubu and Akanegbu (2019) empirically examined the effect of oil price volatility on economic growth in Nigeria, using annual time-series data from 1985 to 2016. Their findings indicated that oil price volatility has a negative but insignificant effect on economic growth in Nigeria. It was also found that the variables used in the study share a long-run relationship, and no evidence of causality was observed between oil price volatility and Nigeria's economic growth.

Osuala et al. (2013) examined the impact of inflation on Nigeria's economic growth from 1970 to 2011 using the Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) tests, as well as Granger causality analysis. The study used variables such as real gross domestic product (GDP) and inflation rate. Results showed a bidirectional relationship between inflation and economic growth in Nigeria. Additionally, Umaru and Zubairu (2012) investigated how inflation affects economic growth and development in Nigeria between 1970 and 2010, using the Augmented Dickey-Fuller (ADF) test and the Granger causality test. Their empirical findings indicated that all variables were stationary in first differences, and the causality results showed that GDP Granger-causes inflation. Inyiama (2013) analyzed the relationship between inflation rate and economic growth in Nigeria from 1979 to 2010, using the Johansen-Juselius cointegration technique, ordinary least squares (OLS), and Granger causality. The results revealed that the inflation rate is negatively related to real GDP, while exchange rates and interest rates exhibit positive but insignificant relationships with inflation. Granger causality results indicated no causality between the inflation rate and real GDP, though there is unidirectional causality from the exchange rate to real GDP.

Aminu et al. (2013) examined the impact of unemployment and inflation on Nigeria's economic growth from 1986 to 2010 using the Augmented Dickey-Fuller (ADF) approach, Johansen cointegration test, and Granger causality test. The Granger causality results showed that unemployment and inflation influence RGDP. Aminu and Anono (2012) studied how inflation

affects economic growth and development in Nigeria from 1986 to 2011, employing the ADF test, Ordinary Least Squares (OLS) method, and Granger causality test. The results indicated that the inflation coefficient was not statistically significant but was consistent with theoretical expectations. Ozurumba (2012) investigated the causal relationship between inflation and fiscal deficits in Nigeria from 1970 to 2009, using the autoregressive distributed lag (ARDL) model and the Granger causality test. The Granger causality findings revealed that fiscal deficit/GDP causes inflation. The ARDL results showed that the fiscal deficit/GDP ratio is significantly negatively related to inflation.

Muhammad et al. (2014) studied the relationships among economic growth, savings, and inflation and estimated the inflation threshold for the Pakistani economy. The 2SLS results showed that inflation and the real interest rate negatively and significantly affect economic growth. In contrast, economic growth, unemployment, and the real interest rate negatively influence the inflation rate. Additionally, indirect taxes have a positive effect on inflation. The findings also indicated that economic growth, the dependency ratio, and foreign direct investment increase a country's savings, whereas the depreciation rate reduces them. Najid and Uma-Tul (2012) examined the relationship between inflation and gross domestic product in Pakistan from 1971 to 2011. They used the Granger Causality test and the Ordinary Least Squares (OLS) method in their analysis. The variables included gross domestic product (GDP) as the dependent variable and the inflation rate (INFR) as the independent variable. The empirical results of the Granger causality test showed that GDP causes inflation. The OLS results revealed a positive relationship between inflation and economic growth in Pakistan.

Muhammad et al. (2011) examined the effect of inflation on GDP in Pakistan from 1972 to 2010 using ordinary least squares (OLS). The study includes gross domestic product (GDP) growth rate as the dependent variable, with consumer price index (CPI) as a proxy for inflation, trade openness (OPNS), and investment growth rate (INVG) as independent variables. The results showed that inflation has a negative and significant effect on the growth of the Pakistani economy. Ezeanyeji and Ugochukwu (2015) analyzed the impact of inflation on economic growth in Nigeria from 1991 to 2013 using the OLS method of a simple regression model. In their study, gross domestic product (GDP) served as the dependent variable, while inflation rate (INF) was the independent variable. Their findings indicated that inflation negatively influences Nigeria’s economic growth. From this literature review, it is clear that the debate on gas/oil price volatility and its relationship with economic growth remains largely unresolved, with three main perspectives emerging. One view argues that changes in crude oil prices positively affect economic growth; another suggests the impact is negative; and a third sees no significant link between the two. These differing opinions raise many questions rather than provide clear answers, emphasizing the need for this study.

## METHODOLOGY

The research design for this study will combine descriptive and analytical methods. The study will use an ex post facto design, collecting data over time. It will gather information on gas price volatility, inflationary pressure, and economic growth in Nigeria from 2000 to 2023 from reputable sources, including the Central Bank of Nigeria, the National Bureau of Statistics, and the International Energy Agency.

Based on the research questions and hypotheses, the study will use the Generalized Autoregressive Conditional Heteroskedasticity (GARCH) statistical model to analyze the volatility of gas prices and inflationary pressure in Nigeria. The model is specified in the following functional form:

GDPPC = f (GPV, IFP) ……i

where GDPPC is the dependent variable (economic growth measured by gross domestic product per capita), GPV (gas price volatility), and IFP (inflationary pressure). To examine the relationship between the dependent and independent variables, equation (i) is specified in its econometric form with the cost of carbon dioxide emissions included as an explanatory variable.

$GDPPC = \beta_0 + \beta_1 GPV + \beta_2 IFP + \beta_3 CCADIOE + \mu$…….ii

where CCADIOE is the cost of carbon dioxide emissions, β0 is the constant term, β1 – β3 are the coefficients of explanatory variables, and μ is the error term. However, the Autoregressive Integrated Moving Average (ARIMA) model examines the relationship between gas price volatility and inflationary pressure, and the study is specified as:

$y_t = c + \beta y_{\{t-1\}} + \delta I_t + \varepsilon_t$……..iii

where yt is the dependent variable (inflationary pressure), c is a constant, β is the autoregressive coefficient, δ is the gas price volatility coefficient (It), and εt is the error term. To control for outliers and avoid spurious results, CCADIOE was converted to its natural logarithm.

**DATA ANALYSIS, RESULTS, AND DISCUSSIONS**

The statistical behavior of the variables, as shown in Table 1, indicates that economic growth, measured by gross domestic product, has an average of 2.3443 over the period. The median value was 2.7917, and since this value is greater than the mean, it implies that economic growth is positively skewed to the right, with a skewness of 0.4745. This positive skewness suggests a leptokurtic distribution, with a kurtosis of 4.4911, above the normal threshold of 3.0, and a heavier tail than a normal distribution. The maximum value observed was 12.2761, while the minimum was -4.1620, with a standard deviation of 3.4514 for economic growth.

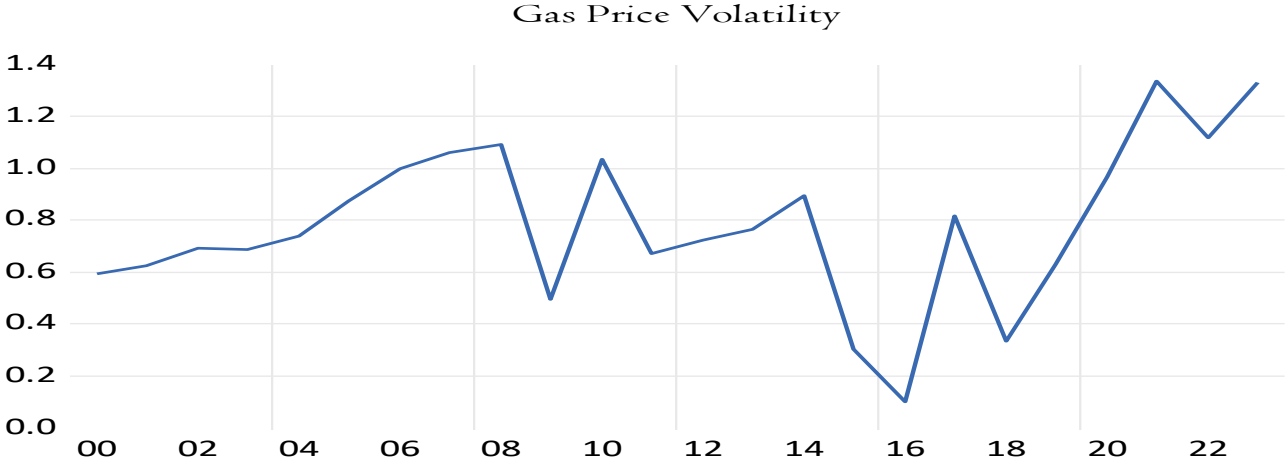
Table 1: Result of descriptive statistics

| | GDPPC | GPV | IFP | CCADIOE |
|---|---|---|---|---|
| Mean | 2.344388 | 0.786897 | 12.94262 | 105194.3 |
| Median | 2.791716 | 0.752950 | 12.70720 | 101470.1 |
| Maximum | 12.27614 | 1.334482 | 20.23454 | 190865.8 |
| Minimum | -4.162059 | 0.100218 | 5.388008 | 76947.40 |
| Std. Dev. | 3.451497 | 0.306455 | 4.036141 | 21806.08 |
| Skewness | 0.474586 | -0.201910 | 0.017819 | 90.62194 |
| Kurtosis | 4.491180 | 2.784219 | 2.163339 | 11.09746 |
| Jarque-Bera | 3.124544 | 0.209633 | 0.701272 | 90.62104 |
| Observations | 24 | 24 | 24 | 24 |

Source: E-views 12.0 statistical software

For the independent variables, the mean values of gas price volatility, inflationary pressure, and carbon emissions were 0.7868, 12.9426, and 105194, respectively, with median values of 0.7529, 12.7072, and 101470. From these results (mean and median), all values were left-skewed at -0.2019, 0.0178, and 2.5026, with their means exceeding their medians. Regarding kurtosis, only the carbon dioxide emission had a high kurtosis value of 11.0974, while gas price volatility {2.7842} and inflationary pressure {2.1633} were platykurtic, i.e., below the 3.0 threshold. The standard deviation results indicated that the variables in the series were not widely dispersed from the center. Lastly, the Jarque-Bera values for all variables except carbon emissions failed to pass the normality test, as their corresponding p-values were greater than 0.05.

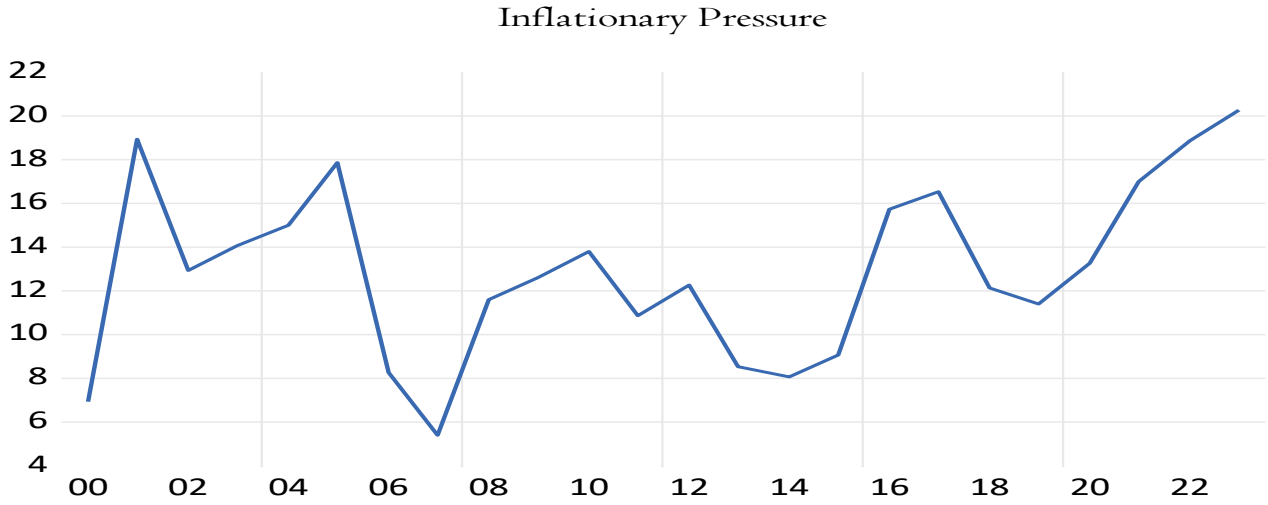
Trend behavior of Gas Price Volatilty in Nigeria




The trend analysis in figure 1 above reveals an increased level of gas price volatility in Nigeria, evidenced by a series of fluctuations in gas prices. The volatile behavior of gas prices in Nigeria can be attributed to a complex interplay of economic, supply and demand, external, structural policy, seasonal, and demographic factors. Economic changes, such as monetary policy and

exchange rates, and external shocks, such as global trends and oil prices, significantly affect gas prices. Empirically, periods of high gas price volatility have coincided with low economic growth rates, while stable gas prices have been associated with faster economic growth. However, the analysis shows that gas price volatility exhibits a cyclical pattern, with prices tending to increase during economic booms and decrease during recessions, as in 2016. This could result from citizens' lack of interest in patronizing gas use and seeking alternative means to enhance sustainability. Gas price increases lead to higher production and transportation costs and, ultimately, higher prices for goods and services, with adverse consequences for economic growth.

Trend behavior of Inflationary pressure in Nigeria




The fluctuating inflationary pressure in Nigeria is significantly influenced by gas price volatility, which has a ripple effect on the overall economy. Gas price increases lead to higher production and transportation costs, and ultimately to higher prices for goods and services, exacerbating inflationary pressures. Conversely, economic growth is hindered by gas price volatility, which disrupts investment decisions, reduces consumer spending, and lowers economic output. The Nigerian economy, heavily reliant on oil and gas, is particularly vulnerable to gas price fluctuations, which can either stimulate or stifle economic growth, depending on the direction of the price movement.

Correlation analysis

Correlation tests are crucial in econometric analysis; if the independent variables are highly correlated, multicollinearity is present in the data.

Table 2: Correlation results

| | GDPPC | GPV | IFP | CCADIOE |
|---|---|---|---|---|
| **GDPPC** | 1.0000 | | | |
| **GPV** | 0.14152073 | 1.0000 | | |
| **IFP** | -0.1649392 | 0.21265654 | 1.0000 | |
| **CCADIOE** | -0.4046814 | 0.28510245 | 0.47193856 | 1.0000 |

Source: E-views 12.0 statistical software

The correlation analysis in Table 2 highlights significant connections between economic growth (GDPPC), gas price volatility, inflationary pressure (IFP), and carbon dioxide emissions (CCADIOE). First, the positive correlation of 0.1415 between economic growth (GDPPC) and gas price volatility suggests that when economic growth increases, gas price fluctuations tend to rise as well. This indicates that a strong economy is associated with more gas price changes. Conversely, inflationary pressure (IFP) and carbon dioxide emissions (CCADIOE) show negative correlations with economic growth, with coefficients of -0.1649 and -0.4046, respectively. This implies that as the economy expands, inflation and emissions generally decline. This is a positive sign, as it suggests economic growth can help lower inflation and reduce environmental impacts. Further analysis shows that inflationary pressure (IFP) and carbon dioxide emissions (CCADIOE) are positively linked to gas price volatility, meaning higher fluctuations in gas prices are associated with increased inflation and emissions. Lastly, the correlation coefficients among the independent variables are all below 0.80, indicating that multicollinearity is not a major concern for the model. This means each variable provides unique information, allowing for separate understanding of their effects.

Regression results

As part of the robustness analysis, we also examine the conditional volatilities of gas prices and inflationary pressures on economic growth using a GARCH (1,1) model. The results of the estimated GARCH regression are presented in Table 3. The estimated coefficients for gas price volatility indicate that a percentage change in GPV leads to a 1.1758 percentage point increase in economic growth in Nigeria, but this effect is statistically insignificant at the 5% level.

Table 3: GARCH regression result
Dependent Variable: GDPPC
Method: ML ARCH- Student's t distribution (BFGS/ Marquardt steps)
Pres ample variance: backcast (parameter=0.7)
GARCH = C(5) +C(6)*ARCH(-1^)2 + C (7)*GARCH (-1)

| Variable | Coefficient | Std. Error | z-Statistic | Prob. |
|---|---|---|---|---|
| C | 94.62209 | 38.34079 | 2.467922 | 0.0136 |
| GPV | 1.175826 | 1.635315 | 0.719021 | 0.4721 |
| IFP | 0.103972 | 0.149688 | 0.694591 | 0.4873 |
| LOG(CCADIOE) | -8.164355 | 3.359432 | -2430278 | 0.0151 |
| Variance Equation | | | | |
| C | 747.445 | 14077157 | 0.000531 | 0.9996 |
| RESID (-1)^2 | -36.90025 | 69625.17 | -0.000530 | 0.9996 |
| GARCH (-1) | 1.102662 | 0.150714 | 7.316273 | 0.0000 |
| T.DIST. DOF | 2.000024 | 0.045244 | 44.20546 | 0.0000 |
| R-squared | 0.231622 | Mean dependent var | | 2.344388 |
| Adjusted R-squared | 0.116365 | S.D. dependent var | | 3.451497 |
| S.E. of regression | 3.344472 | Akaike info criterion | | 5.315907 |
| Sum squared resid | 210.5319 | Schwarz criterion | | 5.708591 |
| Log likelihood | -55.79088 | Hannan-Quinn criterion | | 5.420086 |
| Durbin-Watson stat | 1.273533 | | | |

Source: E-views 12.0 statistical software

The estimated GARCH results in Table 3 showed that the coefficient of gas price volatility was positive but not statistically significant. This indicates that increases in gas prices could raise the economy by a proportional amount. Specifically, a 1% rise in GPV results in a 1.1758% increase in Nigeria's economic growth. This suggests that a stronger economy is linked to greater fluctuations in gas prices. These findings contradict Smith (2020), who conducted a systematic review and found a significant negative relationship between gas price volatility and economic growth.

Additionally, the results showed a negligible positive effect of inflationary pressure on Nigeria's economic growth. Specifically, a 1% increase in inflationary pressure corresponds to a 0.1039% rise in economic growth, although this is statistically insignificant (p-value = 0.4873). This supports the findings of Johnson (2019), who also found that inflation had an insignificant impact on economic growth. However, the observed positive relationship conflicts with the expected outcome of the study.

Furthermore, the estimated coefficient for carbon dioxide emission (CCADIOE) indicates a negative and significant relationship with economic growth, meaning that a one-unit increase in CCADIOE results in about an 8.1643-unit decrease in economic growth. This is a positive outcome, as it implies that economic growth can contribute to lowering environmental impact. This finding aligns with Lee (2022), who reported a significant negative relationship between carbon dioxide emissions and economic growth. Lastly, the ARCH regression output shows a

negative ARCH effect, suggesting that the appropriate model is GARCH(1). The GARCH model parameters are statistically significant at the 5% level, rejecting the null hypothesis and confirming the presence of gas price volatility and inflationary pressures in the model. This supports the study by Brownless (2018), which found that GARCH models are suitable for capturing volatility in the Nigerian economy and responding to changing market conditions.

## CONCLUSION AND RECOMMENDATIONS

This study investigates the impact of gas price volatility, inflationary pressures, and economic growth in Nigeria. It seeks to determine how gas price volatility, inflation, and the cost of carbon dioxide emissions influence Nigeria's economic growth. Secondary time series data were collected and analyzed using the GARCH regression technique. The study concludes that gas price volatility has a positive but statistically insignificant effect on Nigeria's economic growth. Similarly, inflationary pressures were found to have an insignificant positive impact on economic growth in Nigeria. However, the empirical results for carbon dioxide emission costs reveal a negative and significant effect on Nigeria's economic growth, which aligns with the correlation findings. Overall, the study concludes that gas price volatility, inflationary pressures, and carbon dioxide emissions have significant impacts on economic growth in Nigeria.

From the findings, the study makes the following recommendations for policy and practice:

1. The government should diversify the economy to reduce dependence on gas prices, invest in renewable energy sources, and implement policies to stabilize gas prices.

2. Economic policies that enhance price stability should be put in place through monetary and fiscal measures to control inflation, raise interest rates to reduce consumption, and invest in productive sectors to boost economic output. And

3. Policy guidelines should be established by the Central Bank of Nigeria to decrease carbon dioxide emissions, promote renewable energy adoption, improve energy efficiency, and encourage sustainable practices.

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