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Energy Price Shocks and Economic Fluctuations in Nigeria: From Granger Causality Modelling.

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ABSTRACT

Energy prices play a critical role in shaping economic activity by influencing production costs, household expenditure, transportation, and overall macroeconomic stability. In Nigeria, fluctuations in the prices of diesel, kerosene, charcoal, coal, and cooking gas pose challenges to economic growth because the country relies heavily on both modern and traditional energy sources. These short-run price shifts can quickly affect inflation, production costs, and consumer welfare, underscoring the need to understand their immediate effects on economic output. This paper, therefore, examines the short-run causal relationship between domestic energy price shocks and economic growth using Granger causality modeling. The data were sourced from CBN, NBS and other reputable sources spanning from 1990 - 2026. The methodology determines whether past movements in premium motor spirit, diesel, charcoal, cooking gas, and coal prices predict short-term changes in real GDP growth. The results show no statistically significant short-run causal impact of energy prices on economic growth in Nigeria. These findings suggest that Nigeria's economy is relatively resilient to immediate energy price shocks, possibly due to subsidies, price interventions, and the influence of broader macroeconomic factors. Hence, stabilizing short-run economic fluctuations requires more than energy price management. Key recommendations include adopting an integrated macroeconomic energy policy approach, promoting economic diversification, improving energy market monitoring, strengthening long-term energy planning, and supporting further research on sector-specific and long-term energy impacts.

Keywords: Granger Causality, Augmented Dickey-Fuller, Error Variance Decomposition

INTRODUCTION

Energy prices are a key determinant of economic activity, influencing production costs, household consumption, transportation, and overall macroeconomic stability. In Nigeria, fluctuations in energy prices pose significant challenges to economic growth and stability. As a country heavily reliant on both modern and traditional energy sources, Nigeria's economy is highly sensitive to domestic energy price shocks, which can propagate quickly through production sectors, household expenditures, and government fiscal operations. Short-term fluctuations in energy prices are particularly significant because they can have an immediate impact on inflation, production costs, and consumer purchasing power. For example, sudden increases in diesel or kerosene prices can raise transportation and industrial costs. In contrast, higher charcoal or coal prices can disproportionately affect low-income households and small-scale enterprises that depend on these traditional fuels. Similarly, the fluctuation of cooking gas prices can alter household consumption patterns and impact service-oriented sectors. These immediate effects underscore the need to understand the short-run causal relationships between energy prices and economic performance in Nigeria.

Empirical evidence on the short-run impacts of energy price shocks in Nigeria remains limited, and most studies have focused on crude oil prices or electricity consumption, neglecting domestic energy sources that directly affect households and informal sectors (Adenikinju, 2012). Furthermore, while macroeconomic theory suggests that changes in energy prices can cause short-run fluctuations in GDP, inflation, and investment, few studies have rigorously examined the direction and magnitude of these effects in the Nigerian context. This paper addresses this gap by employing Granger causality modeling to examine the short-run relationships between domestic energy price shocks, specifically diesel, kerosene, charcoal, coal, and cooking gas, and economic growth in Nigeria. Granger causality analysis allows for the assessment of predictive causality, determining whether past changes in energy prices can statistically explain variations in economic growth in the short run. By focusing exclusively on short-run dynamics, the study provides insights into the immediate transmission mechanisms of energy price shocks, offering valuable guidance for policymakers tasked with managing energy markets and mitigating macroeconomic volatility.

LITERATURE REVIEW

Energy price shocks have long been recognized as critical determinants of macroeconomic performance in resource-dependent economies like Nigeria. The fluctuation of energy prices influences production costs, household consumption, transportation, and overall economic stability, making it a central concern for policymakers and researchers alike. Empirical studies examining the Nigerian context reveal diverse findings, reflecting variations in data, methodologies, energy sources, and time periods. Ahmad *et al*. (2024) employed Granger causality and the Toda Yamamoto approach to investigate the relationship between domestic petroleum product prices and inflation in Nigeria. Using data from 1990-2023, they found a unidirectional causal link from diesel (automotive gas oil) prices to inflation, while the prices of premium motor spirit and kerosene did not significantly affect inflation. This study highlights the heterogeneity in the macroeconomic impact of different energy products and underscores that not all fuel price fluctuations transmit equally to the economy. Similarly, Zamafara *et al.* (2025) explored the link between domestic and international oil prices and food inflation using Johansen cointegration, VECM, and Granger causality on monthly data from 2012 to 2025. Their findings demonstrated a significant long-run positive relationship, with rising domestic oil prices leading to higher food prices. This illustrates the broader transmission mechanism through which energy price shocks affect consumption and welfare in Nigeria.

Other studies have focused on the macroeconomic implications of oil price volatility using structural models. Adesete & Bankole (2020) applied a structural vector autoregressive model to assess the effect of oil price shocks on Nigeria's macroeconomic aggregates. Their results confirmed that fluctuations in oil prices have significant implications for macroeconomic stability and economic planning. Alenoghena (2020) similarly employed the SVAR approach to study oil price shocks from 1980-2018 and found negative effects on economic growth and industrial output, indicating that price volatility undermines Nigeria's macroeconomic performance. Ologbenla (2020) provided a complementary perspective, showing that oil price shocks influence GDP indirectly through intermediate variables such as the exchange rate, emphasizing the mediating role of macroeconomic factors in transmitting energy price shocks to output.

The sensitivity of the Nigerian economy to oil price volatility was further examined by Okoli *et al,* (2020), who used a vector autoregressive approach, and their findings confirmed that macroeconomic variables such as growth and inflation respond strongly to oil price fluctuations, highlighting that volatility, rather than average price levels, can have substantial short-term effects. Nteegah & Kalu (2024) extended this literature by applying the ARDL approach to petroleum product prices, including petrol, diesel, kerosene, and compressed natural gas, to analyze their impact on economic growth. They found that in the long run, energy prices generally hurt growth, while short-run effects vary by product, suggesting the complexity and heterogeneity of energy price transmission mechanisms in Nigeria. Further empirical studies reinforce these observations. A VAR-based study covering 1990–2021 showed that oil price shocks have both positive and negative impacts on real GDP, depending on price movements, and highlighted the importance of exchange rates and balance-of-payments channels in transmitting these shocks (IJDEE, 2024). Chuku *et al,* (2010) examined both linear and asymmetric effects of oil price shocks using VECM and Granger causality and found that while oil price shocks could influence supply-side variables, their effects on macroeconomic activity varied across periods. Finally, Chunku *et al.* (2022) investigated energy price fluctuations (oil and gas) and inflation using Granger causality and found that, in some cases, energy price changes did not Granger cause inflation, highlighting the sensitivity of results to model specification, energy proxies, and mediating macroeconomic factors. Overall, these studies provide strong evidence that energy price shocks significantly affect Nigeria's macroeconomic outcomes, including inflation, GDP growth, industrial output, and exchange rate dynamics. However, several gaps persist; most studies focus narrowly on crude oil, petrol, or diesel, leaving other domestic energy sources such as kerosene,

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coal, charcoal, and cooking gas underexplored. Additionally, while many studies examine either short-run or long-run effects in isolation, few provide a comprehensive short-run causality analysis across a broader basket of energy sources. There is also limited consideration of recent structural changes in Nigeria's energy policies, subsidy reforms, and exchange rate adjustments, which may alter the transmission mechanisms of energy price shocks. These gaps highlight the need for updated empirical analyses that integrate a wider range of energy sources and focus explicitly on short-run causal dynamics. Investigating the Granger causality relationships between domestic energy prices, including kerosene, coal, charcoal, diesel, and cooking gas, and economic growth can provide valuable insights into how these shocks propagate in the short run, informing policy measures to stabilize the economy and promote sustainable growth.

MATERIALS AND METHODS

This study relies entirely on secondary data obtained from official and reliable sources to examine the short-run causal effects of energy price shocks on economic growth in Nigeria. Data on economic performance, measured by real gross domestic product, was sourced from the National Bureau of Statistics (NBS), NNPC, and Central Bank of Nigeria, covering the period of 1990 to 2024. It provides consistent and standardized information on Nigeria's macroeconomic output over the study period. Prices of domestic energy sources, diesel, kerosene, coal, charcoal, and cooking gas were collected from authoritative agencies.

Model Specification and Hypotheses

This study employs time series data covering the period 1990 to 2024 in Nigeria. The choice of 1990 as the starting point is motivated by improved data consistency in energy price reporting and macroeconomic statistics, while 2024 represents the most recent available observations. The analysis is conducted using annual data (1990–2024), yielding T= 35 annual observations. Thus, t= 1990, 1991-2024. All variables and economic fluctuations $[Y_t]$ diesel price $[DSP_t]$ kerosine price $[KER_t]$ coal price $[COAL_t]$ charcoal price $[CHAR_t]$ and cooking gas price $[GAS_t]$ are measured at an annual frequency

Definition of Variables

Let:

Y_t=InY_t, dsp= In DSP_t, ker_t=In KER_t, $Coal_t$= In $COAL_t$, $Char_t$= In $CHAR_t$, gas.

The 6×1

$$\begin{bmatrix} Y_t \\ dsp_t \\ ker_t \\ coal_t \\ char_t \\ gas_t \end{bmatrix}$$

Y_t = Economic fluctuations (e.g., real GDP growth or output gap)

dsp_t= Diesel price

ker_t = Kerosene price

$coal_t$= Coal price

$char_t$=Charcoal price

gas_t=Gas price

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Cointegration Structure

The key matrix is:

$\Pi = \alpha\beta'$

Where:

β = matrix of long-run cointegrating vectors

α = adjustment coefficient matrix

Rank Π = r (number of cointegrating relationships)

If:

r=0 → No cointegration

0<r<6 → Cointegration exists

r= 6 → All variables stationary

Johansen Test Statistics

Johansen proposes two likelihood ratio tests:

Trace statistics λ trace (r)= -T $\sum_{i=+1}^{n} In\left[In\ I - \lambda i^{i}\right]$ λmax$[v_r\, r+1]$= -T In $[1-\lambda_{r+1}]$

Where:

λi^{i} = estimated eigenvalues

T = sample size (1990–2024)

The model for the study will become:

$\Delta X_t = \alpha\beta X_{t-1} + \sum_{i=1}^{p-1} ri\Delta X_{t-1} + \mathcal{E}_t$

Data Analysis and Presentation

To examine the short-run causal relationships between domestic energy prices and economic growth, the study adopts a Granger causality framework. The general model is expressed as:

$$RGDP_{t=\alpha_0} + \sum_{t=1}^{p} \alpha RGDP_{t-1} + \sum_{j=1}^{q} \beta_j\ ENERGY_{t-1} + \varepsilon_j$$

Where:

RGDPt = Real GDP at time t

ENERGYt−j = Price of an energy source (diesel, kerosene, coal, charcoal, cooking gas) lagged j periods

βj = Coefficients

q = Optimal lags determined by AIC/SBC

ε_t = Error term

Data Analysis and Presentation

Table 1: Descriptive Statistics

Statistic	GDP	RGDP_GROWTH	PMS	DIESEL	CHARCOAL	GAS	COAL
Minimum	8.1	-1.80	0.70	0.6	50.0	45.0	45.0
1st Quartile	32.6	2.70	27.50	23.5	97.5	87.5	87.5
Median	154.1	3.46	65.00	60.0	220.0	200.0	200.0
Mean	189.4	3.91	98.84	148.1	390.3	323.6	323.6
3rd Quartile	375.6	5.40	121.00	200.0	525.0	425.0	425.0
Maximum	568.5	10.60	617.00	1200.0	1800.0	1400.0	1400.0

Descriptive properties indicate that GDP shows considerable variation, reflecting significant growth over time. In contrast, RGDP growth is more stable, exhibiting a narrower range. Energy prices demonstrate much higher volatility, especially for diesel, charcoal, gas, and coal, which exhibit substantial differences between their minimum and maximum values. This higher volatility in energy markets compared to macroeconomic growth indicators may have an impact on GDP dynamics.

Table 2: Stationarity Test Using Augmented Dickey-Fuller Test

Variables	Test Statistics	P-Values	Conclusion
RGDP	-6.942	0.000	1(1)
PMS Price	-7.245	0.000	1(1)
Diesel Price	-7.010	0.000	1(1)
Charcoal Price	-3.669	0.009	1(1)
Cooking Gas Price	-4.356	0.002	1(1)
Coal Price	-4.359	0.002	1(1)

The ADF test results indicate that all variables are non-stationary at levels but become stationary after first differencing, classifying them as integrated of order one, I(1). Specifically, the RGDP series had a test statistic of -6.942 and a p-value of 0.000, confirming its non-stationarity at levels. This aligns with findings from previous studies (Hamilton, 2003) that GDP often follows a stochastic trend. Similarly, petrol and diesel prices showed I(1) integration with test statistics of -7.245 and -7.010, both significant at the 1% level, reflecting the persistent trends and volatility in energy markets. Charcoal prices exhibited I(1) integration with a test statistic of -3.669 and a p-value of 0.009, suggesting less volatility compared to petroleum products. Cooking gas and coal prices, with test statistics of -4.356 and -4.359, respectively, were also non-stationary at levels but stationary after first differencing, confirming I(1). These findings support the use of analysis to explore long-run equilibrium relationships between fuel prices and economic growth in Nigeria

Table 3: Johansen Cointegration Test Results (Trace and Max-Eigen)

Null Hypothesis	Eigenvalue	Trace Statistic	Critical Value (5%)	p-value	Decision ($\alpha = 0.05$)
Non	0.8421	140.15	95.75	0.0000	Reject H_0
At most 1	0.6286	81.08	69.82	0.0048	Reject H_0
At most 2	0.4093	49.39	47.86	0.0356	Reject H_0
At most 3	0.3909	32.54	29.80	0.0236	Reject H_0
At most 4	0.3020	16.67	15.49	0.0331	Reject H_0
At most 5	0.1492	5.17	3.84	0.0230	Reject H_0

Table 4: Granger Causality Test

Dependent Variable	Independent Variable	Res.Df Model 1	Res.Df Model 2	F-statistic	p-value	Conclusion (α=0.05)
RGDP Growth	PMS_Price	27	29	0.1612	0.852	No causality
RGDP Growth	Diesel Price	27	29	0.0155	0.9846	No causality
RGDP Growth	Charcoal	27	29	1.4245	0.2581	No causality
RGDP Growth	Cooking Gas	27	29	0.9948	0.3829	No causality
RGDP Growth	Coal Price	27	29	0.0104	0.9896	No causality

Table 4 presents the results of the Granger causality test conducted to examine the short-run relationship between energy price shocks and economic growth in Nigeria, measured by real gross domestic product growth. The test investigates whether past changes in various energy prices, including premium motor spirit, diesel, charcoal, cooking gas, and coal, can predict short-term fluctuations in economic output. The results reveal that none of the energy price variables Granger-cause RGDP growth at the 5% significance level. Specifically, the p-values for petrol (0.852), diesel (0.9846), charcoal (0.2581), cooking gas (0.3829), and coal (0.9896) are all well above the threshold of 0.05, indicating that past variations in these energy prices do not provide statistically significant information for forecasting short run economic growth in Nigeria.

These findings suggest that, in the short term, fluctuations in energy prices, whether in petroleum products or domestic fuels, do not exert a measurable influence on the country's economic performance. This outcome highlights the resilience of the Nigerian economy to immediate energy price shocks, implying that other macroeconomic factors, such as fiscal policies, exchange rate movements, or structural economic dynamics, may play a more dominant role in driving short term economic fluctuations.

Table 5. Impulse Response Functions

Response of RGDP GROWTH						
Period	RGDP GROWTH	LPMS PRICE	LDIESEL PRICE	LOOKINGGLASS	LCHARCAOL PRICE	COAL PRICE
1	2.547249	0.000000	0.000000	0.000000	0.000000	0.000000
2	0.796575	0.556830	-0.669701	0.408761	0.363990	0.031906
3	0.027245	0.618202	-0.448520	0.183979	0.079138	0.095201
4	-0.193113	0.372101	-0.275129	-0.021825	-0.164076	0.072685
5	-0.159478	0.259783	-0.246903	-0.157332	-0.232976	0.040878
6	-0.113418	0.205689	-0.190514	-0.137911	-0.193271	0.051166
7	-0.079532	0.149507	-0.133672	-0.118433	-0.109551	0.060426
8	-0.056902	0.083060	-0.048978	-0.099526	-0.054771	0.054859
9	-0.033308	0.024060	0.016152	-0.091207	-0.019902	0.032844
10	-0.010084	-0.014876	0.057975	-0.079268	9.62E-06	0.010282
Response of LPMS_PRICE:						
Period	RGDP_GROWTH	LPMS PRICE	LDIESEL PRICE	LOOKINGGLASS	LCHARCAOL PRICE	COAL PRICE
1	-0.057227	0.224974	0.000000	0.000000	0.000000	0.000000
2	-0.032738	0.120772	0.041557	0.124279	0.031037	0.012096
3	0.000250	0.103045	-0.016217	0.059374	0.049384	-0.005474
4	-0.006912	0.082211	0.004548	0.079695	0.013626	-0.002540
5	-0.005852	0.074124	-0.033259	0.054181	0.008612	-0.006810
6	-0.010559	0.073405	-0.037888	0.053653	-0.006903	5.54E-05
7	-0.014105	0.069799	-0.050016	0.044886	-0.009054	0.004506
8	-0.016957	0.067096	-0.048697	0.041577	-0.012117	0.008647

9	-0.017986	0.063595	-0.045751	0.039426	-0.010852	0.009941
10	-0.017354	0.061353	-0.040144	0.040264	-0.008392	0.009833
Response of LDIESEL_PRICE:						
Period	RGDPGROWTH____	LPMS_PRICE	LDIESEL_PRICE	LOOKINGGLASS	LCHARCAOL_PRICE	COAL PRICE
1	-0.031651	0.171578	0.143945	0.000000	0.000000	0.000000
2	0.018776	0.080563	0.081481	0.141408	0.064247	-0.003112
3	0.033684	0.092804	0.002290	0.093255	0.079515	-0.018228
4	0.006571	0.082434	0.010284	0.110267	0.034294	-0.011297
5	-0.001408	0.078321	-0.036980	0.076278	0.015600	-0.012245
6	-0.010573	0.081197	-0.050344	0.069132	-0.008750	-0.002611
7	-0.016944	0.081719	-0.067227	0.057139	-0.014674	0.004834
8	-0.021710	0.081733	-0.066698	0.052852	-0.018035	0.011388
9	-0.023625	0.079514	-0.061862	0.050800	-0.015528	0.013825
10	-0.022978	0.077821	-0.053309	0.052606	-0.011334	0.013700
Response of LCOOKING_GAS:						
Period	RGDP GROWTH____	LPMS_PRICE	LDIESEL PRICE	LCOOKING GAS	LCHARCAOL PRICE	COAL PRICE
1	-0.022548	0.034401	-0.007978	0.037123	0.000000	0.000000
2	-0.009931	0.034382	-0.009183	0.042044	0.010199	0.000285
3	-0.004953	0.035972	-0.009547	0.045448	0.009925	0.001257
4	-0.004289	0.037258	-0.015403	0.045649	0.007960	0.000796
5	-0.005443	0.040820	-0.020548	0.045284	0.004452	0.001011
6	-0.007184	0.044319	-0.025148	0.045269	0.001803	0.002008
7	-0.008761	0.047357	-0.028632	0.045185	8.95E-05	0.003298
8	-0.010100	0.049709	-0.030622	0.045397	-0.000923	0.004430
9	-0.011042	0.051621	-0.031558	0.045923	-0.001297	0.005155
10	-0.011603	0.053315	-0.031814	0.046936	-0.001202	0.005527
Response of LCHARCAOL_PRICE:						
Period	RGDP GROWTH	LPMS PRICE	LDIESEL RICE	LCOOKING GAS	LCHARCAOL PRICE	COAL PRICE
1	-0.009109	0.031667	0.003415	0.046985	0.018126	0.000000
2	-0.003579	0.032715	0.007447	0.053186	0.027248	-0.000785
3	-0.000316	0.031460	0.004413	0.054750	0.020973	-0.002544
4	-9.77E-06	0.034499	-0.008083	0.052084	0.013558	-0.004173
5	-0.002441	0.040708	-0.019203	0.050775	0.006401	-0.002666
6	-0.005815	0.045981	-0.028458	0.049052	0.001708	0.000322
7	-0.009004	0.049692	-0.033790	0.047326	-0.001566	0.003291
8	-0.011371	0.052154	-0.035943	0.046208	-0.003302	0.005310
9	-0.012687	0.054090	-0.035953	0.046264	-0.003618	0.006355
10	-0.013149	0.055789	-0.034966	0.047485	-0.002848	0.006694
Response of COAL_PRICE:						
Period	RGDP GROWTH	LPMS_PRICE	LDIESEL PRICE	LCOOKING GAS	LCHARCAOL PRICE	COAL PRICE
1	0.166940	-0.299925	-0.134902	0.072421	0.088457	0.680057
2	0.089300	-0.881302	-0.231389	-0.286578	0.094663	0.363866
3	-0.016799	-0.606726	0.193721	-0.374472	-0.099378	0.065267
4	0.016898	-0.376920	0.351646	-0.078901	0.007552	-0.053718

5	0.107926	-0.192379	0.285945	0.099590	0.178331	-0.073314
6	0.118415	-0.115757	0.238772	0.207353	0.218269	-0.058131
7	0.096419	-0.079219	0.149299	0.194717	0.177960	-0.059957
8	0.064400	-0.037082	0.069380	0.166774	0.097969	-0.056413
9	0.035380	0.010603	-0.014451	0.137205	0.038141	-0.042385
10	0.009018	0.053120	-0.073049	0.117450	0.000110	-0.019003
Cholesky Ordering: RGDP_GROWTH LPMS_PRICE LDIESEL PRICE LOOKINGGLASS LCHARCAOL_PRICE COAL PRICE						
Source: Author's Computation, E-views version 12						

Table 5. present the annual frequency of the data spanning 1990–2024, which provides 35 observations for Nigeria, it is essential to adopt a parsimonious lag structure in order to preserve degrees of freedom and avoid over-parameterization. In small samples, excessive lag lengths can substantially reduce estimation efficiency and compromise the reliability of statistical inference. The optimal lag length was therefore determined using standard information criteria, with particular emphasis on the Schwarz Bayesian Information Criterion (SBIC). Because the SBIC imposes a stronger penalty for model complexity, it is generally more suitable for small-sample studies. The SBIC selected a lag length of one (p = 1), indicating that a single lag adequately captures the dynamic interactions among the variables.

Although the Akaike Information Criterion (AIC) may occasionally recommend a higher lag order due to its relatively weaker penalty term, the SBIC-based selection is preferred in this study for several reasons. First, the limited sample size (T = 35) necessitates a cautious approach to model specification. Second, including additional lags could lead to overfitting and reduced estimation precision. Third, diagnostic tests confirmed the absence of residual serial correlation at the chosen lag length, suggesting that the model sufficiently captures the underlying dynamics. Finally, the stability condition was satisfied, as all inverse roots of the characteristic polynomial lie within the unit circle.

Accordingly, a lag length of one was adopted for the VAR and Granger causality estimations. This specification effectively captures short-run dynamics while maintaining model parsimony, stability, and statistical robustness.

Table 6: Forecast Error Variance Decomposition of GDP

Horizon	GDP	PMS	DIESEL	CHARCOAL	GAS
1	1	0	0	0	0
5	0.8232	0.012	0.0491	0.0269	0.0888
10	0.683	0.0097	0.0703	0.1483	0.0887

Table 4 indicates that GDP variations are primarily influenced by its own shocks, particularly in the short term. At the first horizon, GDP accounts for 100% of its forecast error variance. As time progresses, the impact of energy variables becomes more significant. By the tenth horizon, charcoal, diesel, and gas together explain a substantial portion of GDP fluctuations, with charcoal having the largest contribution among them. This suggests that there are increasingly long-term linkages between energy and economic growth.

Table 7: Model Diagnostic Test Results

Test Category	Test Statistic	Degrees of Freedom	p-value	Interpretation
Serial Correlation				
Portmanteau Test	$\chi^2 = 301.61$	df = 288	0.2789	No significant autocorrelation
Heteroskedasticity				
ARCH Test (multivariate)	$\chi^2 = 567$	df = 2205	1	No evidence of heteroskedasticity
Normality				
Jarque-Bera (multivariate)	$\chi^2 = 20.138$	df = 12	0.0645	Residuals are normally distributed
Skewness Test	$\chi^2 = 9.534$	df = 6	0.1457	No significant skewness
Kurtosis Test	$\chi^2 = 10.603$	df = 6	0.1014	No excess kurtosis

The diagnostic estimation tests indicate that the model satisfies the key classical assumptions, confirming its reliability for inference and policy interpretation. The Portmanteau test for serial correlation reports a chi-square statistic of 301.61 with a p-value of 0.2789, suggesting the absence of significant autocorrelation in the residuals. This implies that the model adequately captures the dynamic structure of the data and that the lag length chosen is appropriate. More so, the multivariate ARCH test for heteroskedasticity yields a chi-square statistic of 567 with a p-value of 1.00, indicating no evidence of conditional heteroskedasticity. This confirms that the variance of the residuals is stable over time, strengthening the robustness of the estimated coefficients

DISCUSSION OF FINDINGS

The Granger causality analysis was employed to examine the short-run relationship between energy price shocks and economic growth in Nigeria. This approach is consistent with earlier empirical studies emphasizing the short-run dynamics between fuel prices and macroeconomic performance (Adenikinju, 2012; Iwayemi & Fowowe, 2011). The study focuses on major domestic energy sources premium motor spirit (petrol), diesel, charcoal, cooking gas, and coal to determine whether price fluctuations in these fuels possess predictive power over short-term changes in real gross domestic product (RGDP) growth.

The results provide useful insights into the interaction between energy price shocks and economic fluctuations. The findings indicate that none of the energy price variables Granger-cause RGDP growth in the short run. Specifically, petrol prices yielded an F-statistic of 0.1612 ($p = 0.8520$), diesel prices recorded an F-statistic of 0.0155 ($p = 0.9846$), charcoal prices produced an F-statistic of 1.4245 ($p = 0.2581$), cooking gas prices generated an F-statistic of 0.9948 ($p = 0.3829$), and coal prices showed an F-statistic of 0.0104 ($p = 0.9896$). In all cases, the p-values exceed the 5 percent significance level, confirming the absence of statistically significant short-run causality from energy prices to economic growth.

This outcome is broadly consistent with existing evidence suggesting that fuel price shocks in Nigeria may transmit through longer-term adjustment mechanisms rather than immediate output responses (Akinlo, 2009; Obadiaru & Olofin, 2018). Institutional factors such as administered pricing, subsidy regimes, consumption smoothing behavior, and structural rigidities may dampen the short-run pass-through of energy price changes to aggregate output. To provide a more comprehensive dynamic assessment, future analysis could incorporate impulse response functions (IRFs) alongside forecast error variance decomposition. While variance decomposition quantifies the relative contribution of energy price shocks to fluctuations in economic growth, impulse response functions would trace the time path and persistence of RGDP responses to one-standard-deviation shocks in each energy price variable. The joint interpretation of these tools would offer deeper insights into the magnitude, direction, and duration of transmission effects.

Nevertheless, the findings should be interpreted with caution. The absence of short-run causality does not necessarily imply the absence of economic relevance. Potential limitations include omitted macroeconomic variables (such as exchange rates, inflation, monetary policy stance, and global oil prices), possible structural breaks arising from policy shifts and economic crises, and distortions induced by long-standing fuel subsidy interventions in Nigeria's energy market. These factors may attenuate or obscure short-run statistical relationships, thereby affecting inference. Overall, the evidence suggests that energy price shocks do not exert immediate predictive effects on economic growth within the sample period, although longer-run dynamics and broader structural considerations remain important channels of transmission.

CONCLUSION

This paper analyzes the short-run impact of energy price shocks on Nigeria's economic fluctuations using Granger causality modeling. It investigates key energy sources premium motor spirit, diesel, charcoal, cooking gas, and coal to see if price changes predict short term economic growth. The findings indicate that none of these energy prices Granger-cause real GDP growth in the short run, as all p-values exceed the 5% significance level. This suggests that the Nigerian economy is resilient to short-term energy price fluctuations. Factors such as government interventions, subsidies, and other macroeconomic influences may stabilize economic performance. The results indicate that managing short run economic stability requires a broader approach beyond energy price control, including fiscal and monetary policies. In summary, energy price shocks in Nigeria do not significantly impact short-run economic growth, underscoring the need for a more comprehensive understanding of economic variables.

Policy Implications and Recommendations

From a policy perspective, these results indicate that short run stabilization of energy prices alone is unlikely to substantially mitigate economic volatility, and a broader set of economic instruments may be necessary to influence short-term growth outcomes. In summary, the Granger causality analysis provides clear evidence that energy price shocks in Nigeria have no significant short-run causal effect on economic growth, underscoring the need for policymakers and researchers to consider additional factors beyond energy prices when addressing short-term economic fluctuations.

Key recommendations include:

i. Integrated policy approach by combining energy pricing with broader economic interventions.

ii. Economic diversification through strengthening non energy sectors to reduce vulnerability to energy price shocks.

iii. Enhanced Monitoring by improving data collection and tracking of energy markets for evidence-based policy.

iv. Long term energy planning by considering the long-term effects of energy prices on investment and industrial growth.

v. Encourage studies on long-term and sector-specific impacts of energy price shocks to inform policy

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