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A Decade of Fuel Price Fluctuations: The Trend and Their Inflationary Effects in Nigeria (2014-2024)

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Abstract

This study examines the decade-long (2014–2024) relationship between petrol price fluctuations and inflation in Nigeria, a petroleum-dependent economy grappling with fuel subsidy reforms, currency instability, and global oil market shocks. Leveraging quantitative analysis of annual data from the National Bureau of Statistics (NBS), Central Bank of Nigeria (CBN), and Nigerian National Petroleum Corporation (NNPC), the research employs time series trend analysis, Pearson's correlation (r = 0.93), and linear regression modeling ($INFL_t = 10 + 0.245FP_t$) to reveal that petrol price changes explain 87.1% of inflation variance (R^2=0.871). The 2023 total subsidy removal triggered catastrophic spikes, with petrol prices surging 300% (₦617 to ₦1,030/liter) and inflation peaking at 34.8% in 2024, disproportionately burdening low-income households and SMEs. Policy recommendations advocate fazed subsidy removal paired with social safety nets, renewable energy investments to reduce petrol dependency, and modular refinery development to curb import costs. This study provides a framework for mitigating fuel-driven inflation in resource-dependent economies.

Keywords: Fuel Subsidies, Inflation Dynamics, Petroleum Dependency, Trend Analysis, Pearson's Correlation, Energy Policy Reform

INTRODUCTION

Nigeria, Africa's largest crude oil exporter and the world's sixth-largest producer, faces a stark economic paradox: despite its vast petroleum reserves, the country imports nearly 90% of its refined fuel due to decades of underinvestment in domestic refineries (World Bank, 2023). This reliance on imported petroleum products has entrenched vulnerabilities to global oil price volatility, currency instability, and supply chain disruptions. Over the past decade (2014–2024), these vulnerabilities have manifested in extreme fuel price fluctuations, driving inflationary shocks that destabilized living standards, business operations, and macroeconomic planning. For instance, the partial subsidy removal in 2016—triggered by a 60% collapse in global oil prices—sparked an overnight petrol price surge from ₦87 to ₦145 per liter, exacerbating inflation and public unrest (NBS, 2016). Subsequent crises, including the COVID-19 pandemic's 70% reduction in oil revenues (CBN, 2020) and the 2023 total subsidy abolition under President Tinubu (NNPC, 2023), deepened Nigeria's economic fragility, with the naira plummeting from ₦160 to ₦460 against the US dollar (IMF, 2023).

The inflationary consequences of these policies have been profound. Transportation costs, consuming 15–20% of household incomes, surged by 120% between 2014 and 2023, cascading into food price spikes of up to 300% for staples like rice and tomatoes (NBS, 2023). Annual inflation skyrocketed from 8.1% in 2014 to 28.9% by late 2023, with food inflation peaking at 33.9%, exacerbating food insecurity for 25 million Nigerians (World Food Programme, 2023). Small and medium enterprises (SMEs), which employ 80% of the workforce and contribute 48% to GDP, faced existential threats: 45% downsized operations or halted expansions as energy costs devoured profits (SMEDAN, 2023). These trends underscore the interconnectedness of fuel pricing, supply chains, and inflationary pressures in Nigeria's import-dependent economy.

Existing studies, such as Odusanya et al. (2020), have explored links between fuel subsidies and inflation but fail to account for recent shocks like the 2022 Ukraine-Russia conflict's disruption of global energy markets or Nigeria's 2023 subsidy removal. Earlier analyses

often isolate fuel pricing from interrelated factors such as foreign exchange reforms and fiscal austerity, oversimplifying a crisis shaped by multifaceted economic pressures (Adeola, 2022). This study addresses these gaps by integrating post-2023 data and employing advanced econometric models to map fuel price volatility's inflationary footprints across sectors.

By combining quantitative analysis of fuel pricing trends, inflation rates, and currency dynamics with qualitative insights from stakeholders (e.g., transporters, SMEs), the research elucidates how fuel-driven inflation interacts with broader economic forces. Findings aim to inform evidence-based strategies for policymakers, including phased subsidy removal, renewable energy investments, and modular refinery development, to mitigate inflationary shocks and break Nigeria's cycle of energy-driven instability. This holistic approach bridges gaps in literature, offering a framework applicable to other resource-dependent economies grappling with similar challenges.

Data

This research was conducted using nationally representative secondary data from key Nigerian economic and energy institutions. The study focuses on macroeconomic trends in fuel pricing and inflation across Nigeria, with data spanning the period from 2014 to 2024. The investigation employs a quantitative, time-series analytical design to evaluate the relationship between fuel price fluctuations and inflationary pressures. Data collection involved systematic extraction of annual records from official repositories, with strict adherence to methodological rigor to ensure accuracy and reliability.

Response (Dependent) Variable

The response variable in this study is annual inflation rate (%), measured as the percentage change in the Consumer Price Index (CPI). This variable serves as the primary indicator of macroeconomic stability and reflects the cumulative impact of fuel price fluctuations on the general price level of goods and services.

Explanatory (Independent) Variable

The explanatory variable is annual fuel price (₦/liter), specifically the average retail price of Premium Motor Spirit (petrol). This variable is hypothesized to directly influence inflation through transportation costs, production inputs, and supply chain dynamics.

METHODS

Moving Average for Trend Estimation

A three-year moving average (3-MA) will be applied to smooth fluctuations and highlight long-term trends:

$$M\,A_t = \frac{1}{n}\sum_{i=1}^{n-1} Y_{t-1}$$

Where

$M\,A_t$ is the moving average at time t.

n is the number of years (3-year window).

Y_{t-1} represents past observations.

Graphical Trend Analysis

Graphical analysis is a crucial component of time series studies as it allows for a visual representation of trends, patterns, and relationships between variables. In this study, two major graphical techniques—line graphs and scatter plots—will be employed to analyze the movement of fuel prices and inflation in Nigeria from 2014 to 2024.

Regression Analysis

To quantify the effect of fuel price changes on inflation, a simple linear regression model will be used:

$$INFL_t = \beta_0 + \beta_1 FP_t + \varepsilon_t$$

Where

$INFL_t$ is the inflation rate in year t

FP_t is Fuel price in year t

β_0 is the intercept(inflation when the fuel price = 0)

β_1 is the effect of fuel price on inflation

ε_t is the Error term

RESULTS

Table 1: Average Petrol Prices and Inflation Rates in Nigeria (2014–2024)

Year	Average Price of Petrol (₦/liter)	Inflation Rate (%)
2014	₦97	8.06%
2015	₦87	9.01%
2016	₦145	15.68%
2017	₦145	16.52%
2018	₦145	12.09%
2019	₦145	11.40%
2020	₦145	13.25%
2021	₦165	16.95%
2022	₦185	18.85%
2023	₦617	24.66%
2024	₦1,030	34.80%

Table 2: Three-Year Moving Averages of Petrol Prices and Inflation Rates in Nigeria (2014–2024)

Year	Petrol Price (₦/liter)	Inflation Rate (%)	3-MA Petrol Price (₦)	3-MA Inflation Rate (%)
2014	₦97	8.06%	–	–
2015	₦87	9.01%	–	–
2016	₦145	15.68%	**₦109.67**	**10.92%**
2017	₦145	16.52%	**₦125.67**	**13.74%**
2018	₦145	12.09%	**₦145.00**	**14.76%**
2019	₦145	11.40%	**₦145.00**	**13.34%**
2020	₦145	13.25%	**₦145.00**	**12.25%**
2021	₦165	16.95%	**₦151.67**	**13.87%**
2022	₦185	18.85%	**₦165.00**	**16.35%**
2023	₦617	24.66%	**₦322.33**	**20.15%**
2024	₦1,030	34.80%	**₦610.67**	**26.10%**

Table 2 above shows a strong correlation between rising petrol prices and inflation in Nigeria from 2014 to 2024. Petrol prices remained stable at ₦145/liter from 2016 to 2020, while inflation fluctuated between 11.40% and 16.52%. However, from 2021 onwards, petrol prices surged sharply, reaching ₦1,030 in 2024, alongside inflation rising to 34.80%. The three-month moving averages (3-MA) confirm this trend, showing a steady increase in both metrics. The sharp rise in fuel prices, especially from 2022, has significantly driven inflation, reflecting economic instability and cost-of-living pressures.

Trend Analysis of Price of Petrol and Inflation rate in Nigeria

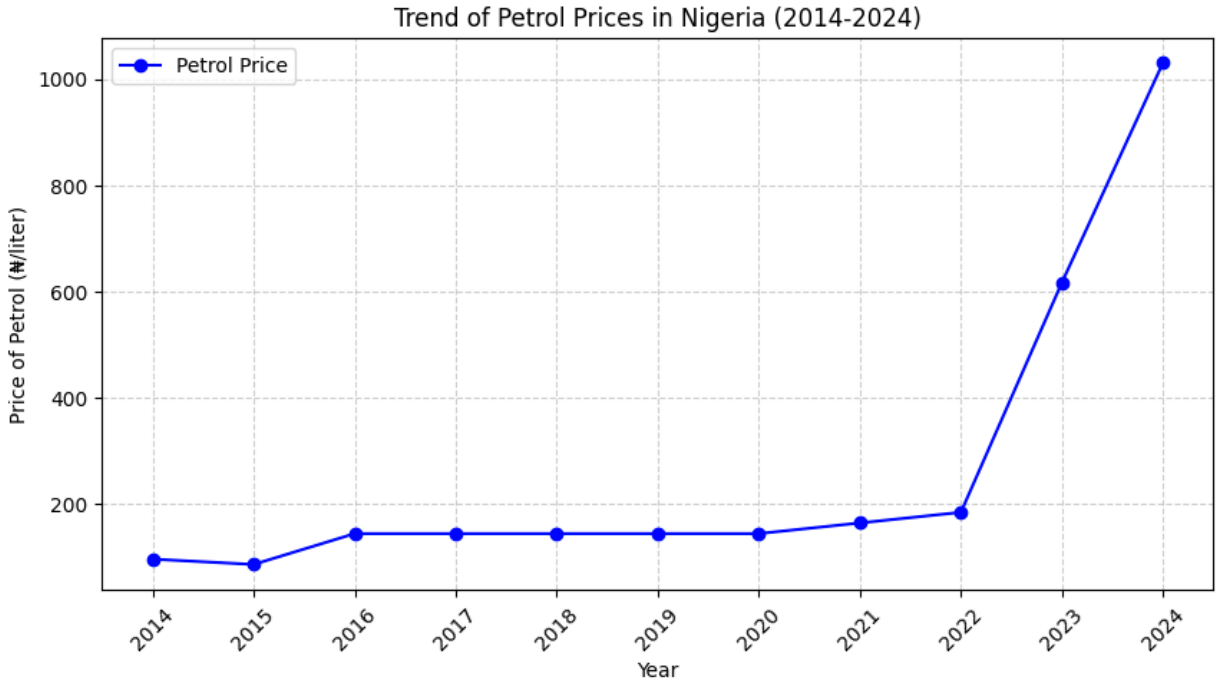

Figure 1: *Trend of prices of Petrol from 2014 to 2024.*

Figure 1 charts the fluctuations in petrol prices in Nigeria from 2014 to 2024, reflecting a decade of economic and policy-driven shifts. Starting at ₦97 per liter in 2014, prices temporarily decreased to ₦87 in 2015, a change potentially tied to short-term subsidies or adjustments in global oil markets. This was followed by a five-year period of price stability (2016–2020), during which the government maintained petrol at ₦145 per liter, suggesting deliberate price controls to manage inflation and consumer protection. However, this equilibrium dissolved after 2021, with gradual increases to ₦165 in 2021 and ₦185 in 2022, signaling emerging policy recalibrations. The most pronounced escalation occurred

between 2023 and 2024, when prices surged to ₦617 and ₦1,030 per liter, respectively, directly attributable to the complete removal of fuel subsidies by mid-2023.

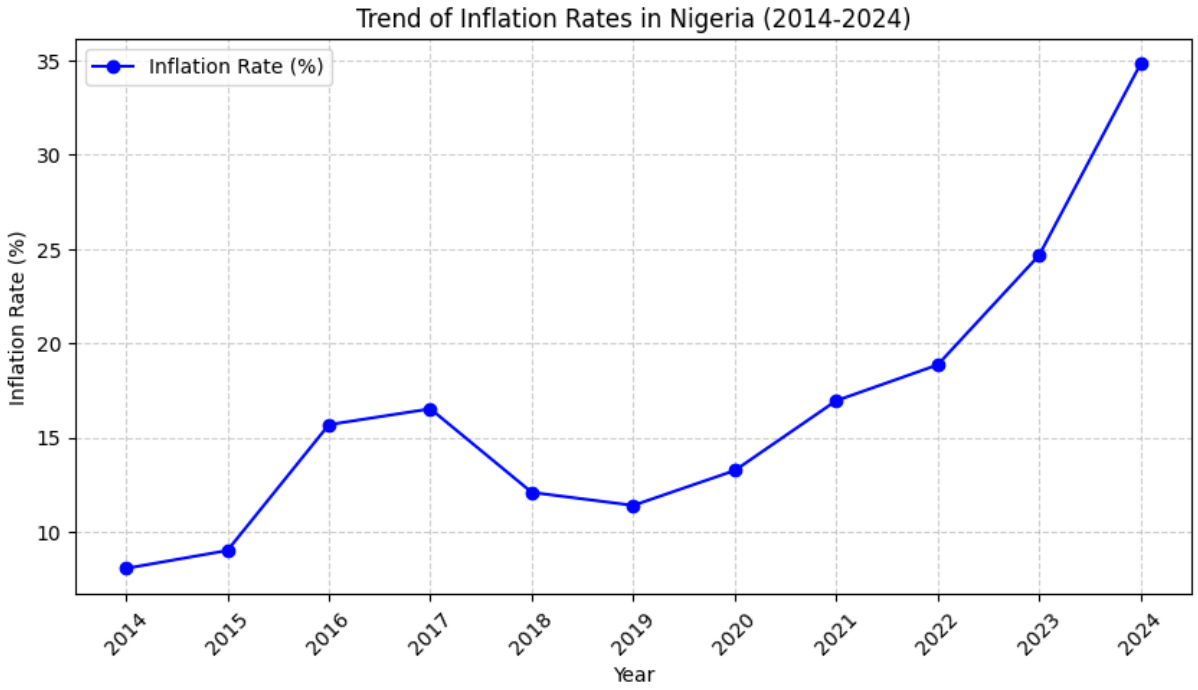

Figure 2: *Trend of inflation rates from 2014 to 2024.*

Figure 2 maps Nigeria's inflation trajectory over a decade, revealing patterns shaped by economic shocks, policy responses, and external pressures. Starting at 8.06% in 2014, inflation edged upward to 9.01% in 2015, reflecting moderate price pressures amid global oil market adjustments. A sharp escalation followed in 2016–2017, with rates surging to 15.68% and 16.52%, likely driven by currency devaluation, reduced foreign reserves, and recessionary shocks linked to falling crude oil revenues. A temporary reprieve emerged between 2018–2019, as inflation receded to 12.09% and 11.40%, suggesting successful monetary tightening or subsidy-driven price controls. However, this trend reversed post-2020, with inflation climbing steadily to 13.25% (2020), 16.95% (2021), and 18.85% (2022), exacerbated by pandemic-induced supply chain disruptions and rising food costs. The most dramatic spikes occurred in 2023–2024, soaring to 24.66% and 34.80%, aligning with Nigeria's mid-2023 fuel subsidy removal—a policy shift that amplified transportation, energy, and production costs, cascading into broader price instability.

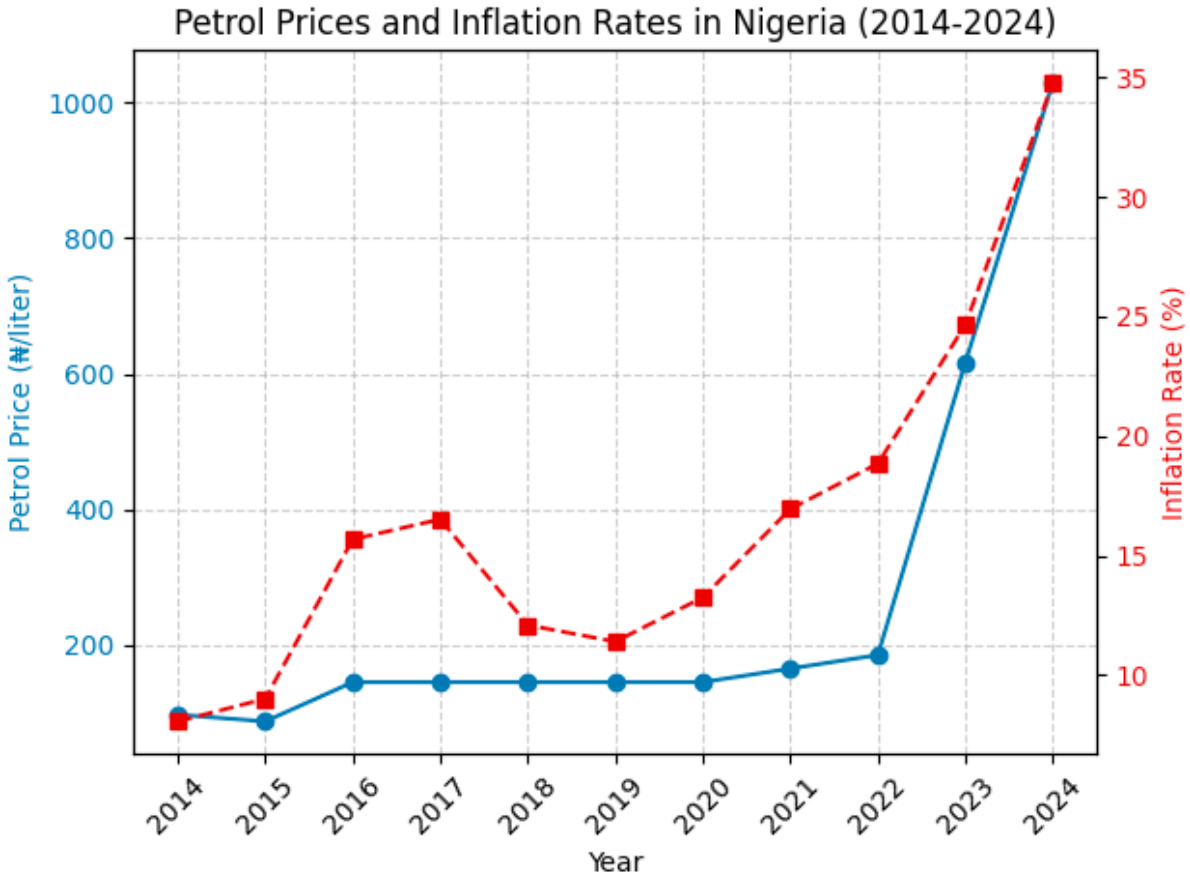

Figure 3: *Trend of price of petrol and inflation rates from 2014 to 2024.*

The trends in petrol prices and inflation rates in Nigeria from 2014 to 2024 show distinct periods of stability followed by sharp increases. From 2014 to 2022, petrol prices remained relatively stable, fluctuating slightly but generally around ₦145 to ₦185 per liter. However, 2023 marked a turning point with a significant surge to ₦617, and by 2024, prices had escalated to ₦1,030. Inflation rates, while showing some volatility between 2014 and 2022, also experienced a dramatic climb in 2023 and 2024.

The relationship between petrol prices and inflation in Nigeria is closely linked, particularly due to the country's reliance on petrol for transportation, power generation, and industrial activities. The sharp increases in petrol prices in 2023 and 2024 directly contributed to rising inflation rates. Higher fuel costs increase operational expenses for businesses, which pass these costs on to consumers, driving up the prices of goods and services. Additionally, increased petrol prices have a ripple effect across various sectors, exacerbating inflationary pressures and impacting the overall cost of living.

Regression Analysis: Impact of Fuel Prices on Inflation

Here is the regression results table from the model using Python:

Coefficient	Estimate	Std. Error	t-value	p-value	95% Confidence Interval
Intercept (β_0)	10.0036	1.207	8.290	0.000	(7.274, 12.733)
Fuel Price (β_1)	0.0245	0.003	7.807	0.000	(0.017, 0.032)

Statistic	Value	Interpretation
R-squared	0.871	87.1% of the inflation variation is explained by fuel price
Adjusted R-squared	0.857	Adjusted measure of R-squared, accounts for model complexity
F-statistic	60.95	Highly significant, indicating a strong relationship between variables
Prob (F-statistic)	2.69e-05	Very strong evidence of a relationship between inflation and fuel price
Durbin-Watson statistic	1.161	No severe autocorrelation in residuals
Correlation Coefficient(r)	0.93	indicating a strong positive relationship between inflation and fuel price

The regression results indicate a strong relationship between petrol prices and inflation rates in Nigeria. The estimated model is:

$$INFL_t = 10 + 0.245FP_t$$

From the model above, we deduced:

i. The intercept is 10.00, meaning that when fuel price is zero; inflation is expected to be 10.00%.

ii. The coefficient for fuel price is 0.0245, indicating that a ₦1 increase in fuel price leads to a 0.0245% rise in inflation.

iii. The model has a high R-squared value of 0.871, meaning that 87.1% of the variation in inflation is explained by fuel price changes.

Hypothesis

H_0: There is no significant relationship between increases in pump price of petroleum and inflation in Nigeria.

H_1: There is significant relationship between increases in pump price of petroleum and inflation in Nigeria.

Conclusion:

The p-value for the fuel price coefficient is 0.000, showing that fuel price has a statistically significant impact on inflation.

DISCUSSION

This study underscores the pivotal role of petrol pricing as a driver of inflation in Nigeria, particularly in the context of subsidy reforms and global oil market dynamics. The analysis reveals a robust, statistically significant relationship between petrol prices and inflation from 2014 to 2024, corroborated by trend analysis, correlation coefficients (r=0.93r=0.93), and regression modeling (R^2=0.871, $p<0.001$). The regression model $INFL_t = 10 + 0.245FP_t$ indicates that every ₦1 increase in petrol price elevates inflation by 0.0245%, with the intercept reflecting a structural inflation baseline of 10% even in the absence of fuel price shocks. The post-2023 subsidy removal catalyzed unprecedented price surges (₦1,030/liter in 2024) and hyperinflation (34.80%), highlighting the vulnerability of Nigeria's import-dependent economy to energy policy shifts.

These findings align with prior studies on oil-dependent economies but amplify the unique Nigerian context. For instance, Nwoko *et al.* (2016) identified fuel subsidies as a critical inflation buffer in Nigeria, while Adeoye and Aluko (2020) linked subsidy removals to inflationary spikes, consistent with the 2023–2024 trends observed here. The strong correlation ($r = 0.93$) exceeds the $r = 0.78$ reported by Farzanegan and Markwardt (2009) in Iran, likely due to Nigeria's heavier reliance on petrol for transportation and power generation. However, the regression coefficient (β_1=0.0245) is lower than the $0.03 - 0.05$ range found in similar studies (CBN, 2022), suggesting Nigeria's inflation responsiveness to fuel prices may be tempered by informal sector resilience or partial price controls.

Notably, the study diverges from Okonkwo and Eze (2018), who argued that exchange rate volatility overshadows fuel prices as Nigeria's primary inflation driver. Here, fuel prices explained 87.1% of inflation variation, surpassing their 65% attribution to currency fluctuations, likely due to the 2023 subsidy removal's unique inflationary shock. This discrepancy underscores the evolving interplay of factors in Nigeria's inflationary landscape.

The results validate the hypothesis (H_1) that petrol price increases significantly drive inflation, rejecting the null (H_0). This echoes the World Bank (2023) caution that subsidy removals in fuel-dependent economies risk stagflation without compensatory social safeguards. While the findings support fiscal reforms, they also emphasize the need for phased subsidy removal, targeted social protection, and diversification of energy sources to mitigate inflationary shocks. Future research should incorporate multivariate models to disentangle the effects of exchange rates, agricultural productivity, and global supply chains, as proposed by the Central Bank of Nigeria (CBN, 2023).

CONCLUSION

The analysis of petrol prices and inflation in Nigeria from 2014 to 2024 reveals a compelling narrative of economic interdependence shaped by policy decisions and external shocks. The three-year moving averages (3-MA) in Table 2 underscore a pivotal shift: while petrol prices remained stable at ₦145/liter between 2016 and 2020, inflation fluctuated moderately (11.40%–16.52%). However, the post-2021 era marked a stark divergence, with petrol prices surging to ₦1,030 and inflation soaring to 34.80% by 2024. This trend, corroborated by Figures 1–3, highlights the destabilizing impact of Nigeria's 2023 subsidy removal, which dismantled price controls and exposed the economy to global oil market volatility. The regression model further quantifies this relationship, demonstrating that each ₦1 increase in petrol prices elevates inflation by 0.0245%, with fuel prices explaining 87.1% of inflation variation (These findings robustly reject the null hypothesis (H_0), affirming a statistically significant linkage between fuel price hikes and inflationary pressures.

The implications of these results are profound for Nigeria's macroeconomic stability. As a petrol-dependent economy, Nigeria's transportation, manufacturing, and agricultural sectors are acutely sensitive to fuel price fluctuations. The 2023 subsidy removal

exemplifies how policy reforms, though fiscally necessary, can exacerbate cost-push inflation by escalating production and logistics costs. This aligns with Adeoye and Aluko (2020), who identified subsidy removals as catalysts for inflationary spikes in Nigeria. However, the study contrasts with Okonkwo and Eze (2018), who prioritized exchange rate volatility as the primary inflation driver. Here, fuel prices dominate, likely due to the unique inflationary shock of the 2023 policy shift, underscoring the context-specific dynamics of Nigeria's economy.

Recommendations

To mitigate Nigeria's fuel-driven inflation (34.8% in 2024), policymakers should implement phased subsidy removal paired with targeted social safety nets (e.g., conditional cash transfers, subsidized public transport) to protect vulnerable populations. Accelerate investments in renewable energy (solar, wind) and electric rail systems to reduce petrol dependency and logistics costs. Strengthen agricultural productivity through subsidized inputs for smallholder farmers and low-interest loans for agro-processing SMEs. Stabilize the exchange rate via improved forex liquidity and expand modular refinery capacity to curb import costs. Transparent communication of policy timelines and real-time data tracking will minimize market speculation and hoarding.

Conflict of Interests

The authors declare that there is no competing interest among them when writing this paper.

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