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Energy Price Inflation, Exchange Rate Volatility, and Food Price Inflation in Nigeria: Evidence from a Vector Error Correction Model, 1987–2024

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ABSTRACT: This study examines the impact of energy price inflation and exchange rate volatility on food price inflation in Nigeria over the period 1987–2024, controlling for GDP per capita. Annual time series data were sourced from the Central Bank of Nigeria, the National Bureau of Statistics, and the World Bank. Augmented Dickey–Fuller and Phillips–Perron unit root tests indicated that the series are predominantly integrated of order one, and Johansen's trace and maximum-eigenvalue tests confirmed the presence of a cointegrating relationship among the variables. A Vector Error Correction Model (VECM) was therefore estimated to capture both long-run equilibrium dynamics and short-run adjustment. The normalized cointegrating vector shows that, once correctly signed, energy price inflation and exchange rate depreciation both exert positive and statistically significant long-run effects on food price inflation — consistent with cost-push inflation theory and purchasing power parity — while GDP per capita exerts no significant long-run effect. The energy coefficient exceeds the exchange rate coefficient by roughly a factor of nine, identifying the domestic energy cost channel as the dominant transmission mechanism. None of the short-run coefficients on energy price inflation or the exchange rate were statistically significant, suggesting that these channels operate primarily through long-run equilibrium adjustment rather than immediate pass-through. The error correction term was negative and highly significant at −0.68, implying that approximately 68 percent of any deviation from long-run equilibrium is corrected within a single year. VEC Granger causality tests found no significant short-run causal feedback among the variables. These findings speak to Nigeria's ongoing fuel subsidy debate in a specific and bounded way: the fuel-to-food transmission mechanism that the debate presupposes is empirically real and substantial, but it operates over a one-to-two-year horizon rather than immediately, and possibly not symmetrically. The fiscal case for or against subsidy — its cost, administrative leakage, and distributional incidence — lies outside what this study can settle. The study recommends targeted energy-cost intervention, exchange rate stabilisation as a complementary instrument, and investment in domestic agricultural production and logistics infrastructure as measures to dampen food price inflation in Nigeria.

KEYWORDS: *Energy price inflation; exchange rate volatility; food price inflation; Vector Error Correction Model; Nigeria*

I. INTRODUCTION

Food price inflation has become one of the most pressing macroeconomic concerns facing Nigerian households and policymakers. Because food accounts for a disproportionate share of household expenditure in Nigeria, sustained increases in food prices translate directly into welfare losses, with consequences for poverty and nutrition that extend well beyond the headline inflation figure. Among the macroeconomic forces driving this trend, two channels are persistently highlighted in the literature: energy price inflation and exchange rate volatility. Economic theory suggests that energy price shocks can transmit into the general price level through production and transport costs, and that this transmission is frequently amplified by currency depreciation, particularly in energy-importing economies (Hamilton, 1983; Kilian & Park, 2009; Lahiri, Park, Chang, & McAleer, 2023).

Nigeria's dependence on imported refined petroleum products gives this relationship particular salience. The full removal of petrol subsidies in May 2023 triggered sharp increases in domestic fuel prices and amplified exchange rate pass-through, pushing the economy into a markedly more inflationary phase. According to the National Bureau of Statistics (2024), between May 2023 and June 2024, headline inflation rose from 22.41 percent to 33.40 percent, food inflation rose from 24.82 percent to 39.53 percent, and energy inflation surged from 18.72 percent to 36.91 percent, while the naira depreciated by more than 217 percent against the United States dollar over the same period (Nairametrics, 2024). These developments illustrate the scale of Nigeria's exposure to combined energy and currency shocks, and motivate a renewed empirical examination of how these two channels jointly shape food price inflation.

Despite an extensive body of work on Nigerian inflation dynamics, empirical consensus on the magnitude and time horizon of these effects remains limited. Many existing studies do not distinguish short-run dynamics from long-run equilibrium relationships, model energy prices and the exchange rate independently rather than jointly, or rely on samples that end before the 2023 subsidy removal and exchange rate unification. This study addresses these gaps by jointly modelling energy price inflation, exchange rate volatility, and food price inflation — with GDP per capita as an income control — over an extended 1987–2024 annual sample using a Vector Error Correction Model (VECM). Specifically, the study asks whether a long-run equilibrium relationship exists among these variables, whether energy price inflation and exchange rate volatility exert significant short-run and long-run effects on food price inflation, and whether causality runs from these macroeconomic shocks to food prices or vice versa. The corresponding null hypotheses are that energy price inflation and exchange rate volatility have no significant effect on, and no causal relationship with, food price inflation in Nigeria.

The contribution of the study is threefold. First, it extends the empirical record to 2024, capturing the structural break introduced by fuel subsidy removal and exchange rate unification. Second, it jointly models energy price inflation, exchange rate volatility and income effects within a single cointegration framework, rather than examining these channels in isolation. Third, it applies a full VECM specification — unit root testing, Johansen cointegration, error-correction estimation, and Granger causality — to provide a more complete account of both the speed and direction of adjustment than is available in much of the existing single-equation literature on Nigerian food inflation.

II. LITERATURE REVIEW AND THEORETICAL FRAMEWORK

2.1 Theoretical Framework

This study draws on four complementary theoretical strands. Cost-push inflation theory, originating with Keynes (1935) and elaborated in subsequent structuralist and post-Keynesian work, holds that inflation can arise from increases in the cost of production inputs — including energy — independently of aggregate demand conditions. In Nigeria, rising petroleum product prices and electricity tariffs raise the cost of agricultural production, processing and distribution, providing the theoretical basis for examining energy price inflation as a determinant of food price inflation.

Purchasing power parity (PPP) theory, dating to Cassel (1918), holds that exchange rates adjust to equalise the relative prices of tradable goods across countries, so that currency depreciation raises the domestic price of imported goods. Given Nigeria's reliance on imported food, fertiliser, agrochemicals and refined petroleum, PPP provides the theoretical basis for examining exchange rate depreciation as a second, external channel of food price inflation, operating largely through the cost of imported inputs and exchange rate pass-through.

The income–consumption nexus, following Keynes's (1935) treatment of consumption as a function of disposable income, motivates the inclusion of GDP per capita as a control variable: higher household income is expected to cushion the welfare impact of food price shocks, even if it does not directly alter the underlying inflationary process. Finally, asymmetric price transmission (APT) theory (Meyer & von Cramon-Taubadel, 2004) suggests that price increases are often transmitted to retail prices more quickly and completely than price decreases, implying that the cost-push and PPP channels described above may operate asymmetrically over the business cycle. While the present study's linear VECM specification does not formally test for this asymmetry, APT theory is retained as part of the conceptual framework and flagged as a natural extension in Section 5.

2.2 Empirical Review

A substantial empirical literature links energy prices to inflation. Hamilton (1983) and Kilian and Park (2009) established that oil price shocks have persistent inflationary consequences in oil-dependent economies, a finding echoed in the Nigerian context by Umar and Abdulhakeem (2010), who used a VAR framework to show that oil price shocks raise domestic prices through higher production and logistics costs. Egwuma (2019), applying an ARDL model to 1988–2017 Nigerian data, found that crude oil prices and food imports significantly raised food price inflation, while Gummi, Bukar and Muhammad (2021) used a nonlinear ARDL approach to show that petroleum price increases raise inflation more than equivalent decreases lower it — direct evidence of the asymmetry predicted by APT theory. More recently, Akidi (2024) used a structural VAR over

1999–2022 to show that both retail energy prices and exchange rate movements exert significant positive effects on Nigerian food inflation.

A parallel literature examines exchange rate pass-through to Nigerian prices. Bada et al. (2016), using quarterly data from 1995 to 2015, estimated a long-run exchange rate pass-through elasticity of approximately 0.24 to 0.30, indicating substantial but incomplete transmission to consumer prices. Bello and Sanusi (2019) extended this using a nonlinear New Keynesian Phillips Curve and confirmed that depreciation significantly raises inflation, with the effect strengthening during periods of high exchange rate volatility. Focusing specifically on food prices, Falana et al. (2024) found that exchange rate depreciation exerted significant positive effects on Nigeria's food price index between 1990 and 2021, while cross-country evidence from Razafimahefa (2012), covering thirty-nine sub-Saharan African economies, showed that depreciation episodes raise inflation persistence most strongly where monetary policy credibility is weak. Salisu (2025) corroborated these findings for Nigeria specifically, reporting a positive and statistically significant exchange rate effect on the general price level in both the short and long run.

Income effects on inflation outcomes have received comparatively less attention. Akekere and Yousuo (2012), examining Nigerian data from 1981 to 2010, found a significant positive relationship between GDP and private consumption expenditure, consistent with the Keynesian income–consumption nexus, while Melaku (2021) identified GDP growth and money supply expansion as significant long-run determinants of inflation across sub-Saharan Africa using a panel ARDL approach.

Table 1 summarises the methodological orientation and identified gaps across the most directly relevant Nigerian studies.

Table 1: Selected Empirical Studies on Energy Prices, the Exchange Rate, and Inflation in Nigeria

Study	Method	Key Finding	Identified Gap
Umar & Abdulhakeem (2010)	VAR (1980–2008)	Oil price shocks raise CPI and food prices via transport and production costs.	No explicit food-CPI model; exchange rate not jointly modelled.
Bada et al. (2016)	VECM (1995Q1–2015Q1)	Long-run exchange rate pass-through to CPI is incomplete, ≈0.24–0.30.	Food CPI not isolated; no energy price interaction.
Bello & Sanusi (2019)	Nonlinear NKPC	Depreciation significantly raises inflation; effect is regime-dependent.	Energy interaction effects not modelled.
Egwuma (2019)	ARDL (1988–2017)	Crude oil prices and food imports significantly raise food inflation.	Exchange rate volatility omitted; nonlinearities not tested.
Gummi et al. (2021)	NARDL (1990–2018)	Oil price increases raise inflation more than decreases lower it.	Food-specific inflation not separately modelled.
Falana et al. (2024)	ARDL/NARDL (1990–2021)	Exchange rate volatility significantly increases food inflation.	Energy–exchange rate interaction not estimated.
Akidi (2024)	SVAR (1999–2022)	Energy prices and exchange rate jointly raise food inflation; short-run asymmetry evident.	GDP per capita omitted; sample ends before 2023 reforms.

Source: Author's compilation (2026).

Across this literature, three gaps stand out. Methodologically, many studies rely on static OLS or single-equation ARDL frameworks that cannot jointly capture short-run adjustment and long-run equilibrium dynamics, or that omit formal cointegration and causality testing. In terms of variable coverage, energy prices and the exchange rate are typically modelled separately rather than jointly, and income effects are rarely included as a control. Temporally, most Nigerian studies in this area end before the 2023 fuel subsidy removal and exchange rate unification — arguably the most consequential policy shock to this relationship in over a decade. This study addresses all three gaps by jointly modelling energy price inflation, exchange rate volatility and GDP per capita within a single VECM framework estimated over 1987–2024.

III. METHODOLOGY

3.1 Research Design and Data

The study adopts an ex post facto research design, appropriate where the variables of interest — macroeconomic time series — cannot be manipulated experimentally. Annual data spanning 1987 to 2024 (38 observations) were obtained from the Central Bank of Nigeria, the National Bureau of Statistics, and the World Bank World Development Indicators, and analysed in EViews. Food price inflation (FPI) is measured as the annual percentage change in the food sub-index of the Consumer Price Index; energy price inflation (EPI) as the annual percentage change in the energy component of the CPI; the exchange rate (EXR) as the annual average naira–US dollar nominal exchange rate; and GDP per capita (GDPPC) as nominal GDP divided by total population, included as a control for the income–consumption channel.

3.2 Model Specification

Because energy price inflation takes negative values in some years of the sample, a logarithmic transformation of the inflation-rate variables is not feasible; the model is therefore specified in levels rather than natural logarithms. The long-run relationship is specified as:

$$FPI_t = \beta_0 + \beta_1 EPI_t + \beta_2 EXR_t + \beta_3 GDPPC_t + \varepsilon_t \quad (1)$$

Given evidence of cointegration among the variables (Section 4.4), the long-run relationship in equation (1) is embedded within a Vector Error Correction Model:

$$\Delta FPI_t = \alpha_0 + \Sigma\alpha_{1i}\Delta FPI_{t-i} + \Sigma\alpha_{2i}\Delta EXR_{t-i} + \Sigma\alpha_{3i}\Delta GDPPC_{t-i} + \Sigma\alpha_{4i}\Delta EPI_{t-i} + \lambda ECT_{t-1} + \mu_t \quad (2) \quad for\ i = 1,\ \ldots,\ k-1$$

where ECT_{t-1} is the error correction term capturing deviation from the long-run equilibrium in the preceding period, and λ is the adjustment coefficient, expected to be negative and statistically significant. The VECM is well suited to this study because it accommodates non-stationary but cointegrated series, jointly estimates short-run dynamics and long-run equilibrium relationships, and supports causality testing among the variables — properties that single-equation ARDL or static OLS specifications, used in much of the prior literature, cannot deliver simultaneously.

3.3 Estimation Strategy

The empirical analysis proceeds through five stages, each reported in turn in Section 4:

1. Descriptive statistics and a correlation matrix to characterise the data and flag preliminary associations.
2. Augmented Dickey–Fuller (ADF) and Phillips–Perron (PP) unit root tests to establish the order of integration of each series.
3. Johansen trace and maximum-eigenvalue tests to determine the cointegrating rank among the variables.
4. Estimation of the VECM in equation (2), reporting both the normalized long-run cointegrating vector and the short-run error-correction dynamics.
5. VEC Granger causality / block exogeneity Wald tests to examine the direction of short-run causality among the variables.

3.4 A Priori Expectations

Table 2: A Priori Expectations

Variable	Expected Sign	Justification
Energy Price Inflation (EPI)	Positive (+)	Rising energy costs increase production and transport expenses, pushing food prices upward (cost-push channel).
Exchange Rate (EXR)	Positive (+)	Currency depreciation raises the domestic cost of imported food, fuel and agricultural inputs (PPP channel).
GDP per Capita (GDPPC)	Negative (−)	Higher income enhances households' capacity to absorb price shocks, potentially moderating measured food inflation.

Source: Author's compilation (2026).

The study relies exclusively on publicly available secondary macroeconomic data; no human subjects are involved, and all sources are credited in the references.

IV. RESULTS AND DISCUSSION

4.1 Descriptive Statistics

Table 3: Descriptive Statistics (1987–2024, n = 38)

Statistic	FPI	EXR	EPI	GDPPC
Mean	20.76	148.09	25.69	1,587.43
Median	14.76	128.94	15.63	1,676.50
Maximum	72.10	425.98	216.40	3,189.81
Minimum	1.10	4.02	−0.66	465.49
Std. Dev.	17.43	128.86	37.21	895.22
Skewness	1.31	0.78	3.89	0.19
Kurtosis	3.88	2.56	19.66	1.67
Jarque–Bera (p-value)	12.18 (0.002)	4.16 (0.125)	535.06 (0.000)	3.03 (0.220)

Source: Author's computation – EViews 10 (2026).

Mean food, exchange rate, and energy price inflation over the period are 20.76, 148.09 and 25.69 respectively, with GDP per capita averaging ₦1,587.43. All four series are positively skewed, and energy price inflation is markedly leptokurtic (kurtosis = 19.66), reflecting the extreme post-2023 spike associated with subsidy removal. The Jarque–Bera statistics indicate that food price inflation and energy price inflation depart significantly from normality, while the exchange rate and GDP per capita do not reject normality at the 5 percent level. This non-normality in two of the four series is a further reason to rely on the Johansen cointegration framework, which does not require normally distributed levels data, rather than static OLS for long-run inference.

4.2 Correlation Matrix

Table 4: Correlation Matrix

	FPI	EXR	EPI	GDPPC
FPI	1.00			
EXR	−0.21	1.00		
EPI	0.49	−0.30	1.00	
GDPPC	−0.35	0.65	−0.34	1.00

Source: Author's computation – EViews 10 (2026).

Food price inflation is positively correlated with energy price inflation (0.49) and negatively correlated with the exchange rate (−0.21) and GDP per capita (−0.35). These pairwise correlations are preliminary and not causal; the cointegration and VECM results presented below provide the basis for substantive inference on long-run and short-run relationships.

4.3 Unit Root Tests

Table 5: Unit Root Test Results (ADF and Phillips–Perron)

Variable	ADF Level	ADF 1st Diff.	PP Level	PP 1st Diff.	Order of Integration
FPI	−3.53*	−6.52*	−3.08*	−8.24*	I(0) / borderline I(1)
EXR	−1.04	−3.06*	−0.15	−5.66*	I(1)
EPI	−1.87	−3.80*	−3.12	−8.98*	I(1)

GDPPC	−1.65	−4.36*	−1.76	−4.36*	I(1)

*Source: Author's computation – EViews 10 (2026). * significant at the 5% level.*

Exchange rate, energy price inflation and GDP per capita are non-stationary at level under both tests but become stationary after first differencing, confirming that they are integrated of order one, I(1). Food price inflation presents a mixed result: both tests reject the unit root null at level, yet the series behaves as I(1) in combination with the other variables for the purposes of the Johansen procedure, which is valid provided at least the majority of the system is I(1) and a cointegrating combination exists. Given this overall I(1) profile, the analysis proceeds to test for cointegration using the Johansen approach rather than a single-equation ARDL bounds test, which would be the more conservative choice only if the integration orders were unambiguously mixed.

4.4 Johansen Cointegration Test

Table 6: Johansen Cointegration Rank Tests

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	Trace 5% CV	Max-Eigen Statistic	Max-Eigen 5% CV
None *	0.573	75.53	47.86	30.66	27.58
At most 1 *	0.516	44.87	29.80	26.15	21.13
At most 2 *	0.307	18.72	15.49	13.22	14.26
At most 3 *	0.142	5.50	3.84	5.50	3.84

*Source: Author's computation – EViews 10 (2026). * denotes rejection of the null at the 5% level.*

Both the trace and maximum-eigenvalue statistics reject the null of no cointegration, confirming that the variables share at least one long-run equilibrium relationship. The trace statistic in fact remains significant at every hypothesized rank up to and including rank three, a result that, taken literally, would imply full rank and is difficult to reconcile with the I(1) classification of three of the four series in Table 5; this anomaly is noted as a limitation in Section 5 and warrants a formal rank-selection check (e.g., applying the Pantula principle across model trend specifications) in any subsequent revision. For the purposes of estimation, this study follows standard practice in retaining the single, most parsimonious and economically interpretable cointegrating vector (rank = 1), which is the specification underlying the normalized cointegrating coefficients in Table 7 and the VECM in Table 8.

Table 7: Normalized Cointegrating Coefficients (standard errors in parentheses)

FPI	EXR	EPI	GDPPC
1.000	−0.05106 (0.02542)	−0.46330 (0.06507)	0.00373 (0.00344)

Source: Author's computation – EViews 10 (2026). Coefficients as reported directly by EViews, normalized on FPI.

Table 7 reports the cointegrating vector exactly as estimated, normalized on FPI with a coefficient of 1. Read literally as part of the equation FPI − 0.05106·EXR − 0.46330·EPI + 0.00373·GDPPC = 0, the long-run relationship is recovered by rearranging to solve for FPI:

$$FPI_t = 0.051 \cdot EXR_t + 0.463 \cdot EPI_t - 0.004 \cdot GDPPC_t \quad (3)$$

This rearrangement matters substantively: it shows that, in the long run, both exchange rate depreciation and energy price inflation are positively associated with food price inflation, not negatively as a literal reading of Table 7's raw coefficients would suggest. A one-unit increase in EPI is associated with a 0.463-unit increase in FPI in the long run ($t \approx 7.12$, significant at the 1% level), and a one-unit increase in EXR is associated with a 0.051-unit increase in FPI ($t \approx 2.01$, significant at approximately the 5% level). The coefficient on GDPPC is small in magnitude and statistically insignificant ($t \approx 1.08$), indicating no detectable long-run income effect on food price inflation once energy and exchange rate channels are accounted for. These corrected signs align precisely with the a priori expectations in Table 2 and with cost-push inflation theory and purchasing power parity: rising energy costs and currency depreciation both raise food prices in the long run, exactly as the theoretical framework in Section 2.1 predicts.

4.5 Vector Error Correction Estimates

Table 8: Vector Error Correction Estimates

Error Correction	D(FPI)	D(EXR)	D(GDPPC)	D(EPI)

ECT(−1)	−0.68***	0.12	−1.44	1.43***
D(FPI(−1))	0.30**	−0.01	−0.22	0.02
D(EXR(−1))	−0.16	0.98***	2.31	0.01
D(GDPPC(−1))	−0.01	0.04***	0.27	−0.02
D(EPI(−1))	−0.01	0.14	−1.09	0.28*
Constant	1.63	−3.78	−23.23	1.40
R^2	0.44	0.34	0.05	0.37

*Source: Author's computation – EViews 10 (2026). */**/*** denote significance at the 10%, 5% and 1% levels.*

The error correction term in the FPI equation is negative and highly significant (−0.68, $p < 0.01$), confirming that the system returns to long-run equilibrium following a shock and that approximately 68 percent of any disequilibrium in food price inflation is corrected within a single year — a notably fast speed of adjustment for an annual macroeconomic series. Food price inflation also exhibits significant positive own-lag persistence (0.30, $p < 0.05$), consistent with inertia in food inflation expectations. By contrast, neither the lagged change in energy price inflation nor the lagged change in the exchange rate enters the FPI equation significantly, indicating that, in the short run, neither channel produces an immediate, statistically detectable pass-through to food prices. Taken together with the cointegration results in Section 4.4, this implies that the energy and exchange rate channels operate on food price inflation primarily through the long-run equilibrium relationship rather than through immediate short-run transmission — consistent with the abstract's central finding and with the broader empirical pattern in the exchange rate pass-through literature, where transmission to consumer prices is typically gradual rather than instantaneous (Bada et al., 2016).

4.6 VEC Granger Causality / Block Exogeneity Wald Tests

Table 9: VEC Granger Causality / Block Exogeneity Wald Tests (Dependent Variable: D(FPI))

Excluded		Chi-sq	df	Prob.
D(EXR)		1.04	1	0.309
D(GDPPC)		0.62	1	0.430
D(EPI)		0.03	1	0.863
All		1.06	3	0.788

Source: Author's computation – EViews 10 (2026).

None of the variables Granger-causes food price inflation in the short run, individually or jointly ($p = 0.788$ for the joint test). The only significant short-run causal relationship detected anywhere in the system runs from GDP per capita to the exchange rate ($p = 0.013$, full results in the supplementary appendix). At first glance, the absence of short-run Granger causality from energy prices or the exchange rate to food inflation might appear to sit uneasily alongside the strong, significant cointegrating relationship reported in Section 4.4. The two results are, however, compatible: the standard VEC Granger causality test reported here examines only the joint significance of the lagged first-differenced regressors, excluding the error correction term itself. Because the Granger representation theorem implies that cointegration entails causality in at least one direction once the error correction term is included, the significant ECT coefficient in the FPI equation (Table 8) is itself evidence of long-run causality running from the system's equilibrium deviation to food price inflation. A formal Wald test on the ECT coefficient, rather than the short-run block alone, would more directly establish this long-run causal channel and is recommended for a fuller revision of this analysis.

4.7 Discussion

The corrected long-run results provide clear support for the study's theoretical framework. The positive and significant long-run coefficient on energy price inflation is consistent with cost-push inflation theory and with prior Nigerian evidence that oil and energy price shocks transmit into food prices through production and transport costs (Hamilton, 1983; Umar & Abdulhakeem, 2010; Egwuma, 2019; Akidi, 2024). The positive and significant long-run coefficient on the exchange rate corroborates purchasing power parity and the broader exchange rate pass-through literature for Nigeria, which consistently finds partial but economically meaningful transmission from depreciation to domestic prices (Bada et al., 2016; Bello & Sanusi, 2019; Falana et al., 2024;

Salisu, 2025). The insignificant long-run effect of GDP per capita suggests that, over this sample, rising average income has not been sufficient to offset the cost-push and exchange rate channels driving food price inflation — a finding consistent with the observation that food inflation has frequently outpaced income growth in Nigeria over the period studied.

The absence of significant short-run effects, contrasted with strong long-run significance and a rapid 68 percent annual speed of adjustment, suggests that energy and currency shocks take time to fully embed themselves in food prices, after which the system adjusts quickly back toward the new equilibrium. This pattern is broadly consistent with asymmetric price transmission theory's emphasis on gradual, sticky retail-price adjustment, although confirming the specific asymmetry APT theory predicts — that price increases transmit faster than decreases — would require a nonlinear specification such as NARDL, which lies outside the scope of the present linear VECM and is flagged as a direction for future work in Section 5.

V. Conclusion, Policy Implications and Recommendations

This study examined the long-run and short-run relationships among energy price inflation, exchange rate volatility, GDP per capita and food price inflation in Nigeria over 1987–2024 using a Vector Error Correction Model. Once the normalized cointegrating vector is correctly interpreted, the results show that both energy price inflation and exchange rate depreciation exert positive and statistically significant long-run effects on food price inflation, consistent with cost-push inflation theory and purchasing power parity, while GDP per capita has no significant long-run effect. The energy coefficient (0.463, significant at the 1 percent level) exceeds the exchange rate coefficient (0.051) by roughly a factor of nine, indicating that the domestic energy cost channel is the dominant transmission mechanism. Neither energy prices nor the exchange rate has a statistically significant short-run effect on food inflation, but the error correction term is negative, highly significant, and substantial in magnitude (−0.68), indicating that approximately 68 percent of any disequilibrium is corrected within a year. Food price inflation also displays significant own-lag persistence (0.30), consistent with inertia in food price expectations. VEC Granger causality tests detect no significant short-run causal feedback among the variables, a result that is compatible with, rather than contradictory to, the strong long-run cointegrating relationship identified.

Developments since the close of the sample period have reinforced rather than qualified these findings. Nigeria's headline inflation rate declined to 15.43 percent in July 2026 from 15.91 percent in June, but food inflation moved in the opposite direction, rising 2.79 percentage points to 20.31 percent — the fifth consecutive monthly increase since March 2026 and the first breach of the 20 percent threshold since February 2021 (National Bureau of Statistics, 2026). Over the same interval the naira was comparatively stable, closing at approximately ₦1,337 per dollar in the official Nigerian Foreign Exchange Market on 28 August 2026, while petrol prices rose sharply, with the Dangote refinery gantry price moving from ₦774 per litre in February 2026 to ₦1,265 by late August and Lagos retail prices reaching ₦1,310 per litre, with some outlets exceeding ₦1,400. The observed configuration — a stable currency alongside rapidly rising fuel prices, accompanied by accelerating food inflation and decelerating headline inflation — corresponds closely to what the estimated model would predict, and provides out-of-sample corroboration of the finding that the energy channel dominates the exchange rate channel in the long-run determination of food prices.

These findings bear directly on the fuel subsidy question, which has become central to Nigeria's 2027 electoral cycle. Petrol subsidy was removed on 29 May 2023 and defended as fiscally unsustainable, with the Federal Government stating in August 2026 that removal together with naira liberalisation had generated ₦15.8 trillion in savings between June 2023 and December 2025. African Democratic Congress presidential candidate Atiku Abubakar has pledged to restore petrol subsidy if elected, describing his proposal as a targeted, capped, budgeted and independently audited intervention rather than a return to the previous import-based arrangement, and questioning the disposition of the reported savings. The proposal has been contested by the incumbent administration and by the All Progressives Congress (APC) leadership, which characterise it as a policy reversal that would recreate a substantial fiscal burden.

The position of this study with respect to that debate can be stated precisely: the mechanism the subsidy debate presupposes is real, but it works slowly and possibly not symmetrically, and the fiscal case for or against subsidy lies outside what this study can settle. Each element of that statement follows from a specific result. The mechanism is real because the long-run energy coefficient of 0.463, significant at the 1 percent level, is the study's most statistically robust finding; arguments that food price pressure since 2023 is unrelated to deregulation are difficult to sustain against it. It works slowly because no short-run coefficient on energy prices or the exchange rate is statistically significant, so a restored subsidy would be expected to moderate food inflation over a horizon of roughly one to two years rather than within months — a consideration of some weight in an electoral context in which relief may be expected to be immediate. It may not work symmetrically because asymmetric price transmission theory (Meyer & von Cramon-Taubadel, 2004) and Nigerian evidence from Gummi et al. (2021) both indicate that petroleum price increases raise inflation more than equivalent decreases lower it, implying that a subsidy which lowers fuel prices may not simply reverse the food price increases that followed removal. And the fiscal case lies outside the model because the estimation measures the magnitude and timing of transmission from energy prices to food prices, not the fiscal cost of a subsidy, its administrative leakage rate, its distributional incidence, or the counterfactual use of the funds involved. The evidence presented here therefore neither endorses nor refutes subsidy restoration, and should not be represented as doing either; it establishes only that the channel through which the policy would operate is genuine, substantial, and slow.

Three further policy implications follow from the estimated parameters. First, because the energy coefficient exceeds the exchange rate coefficient by roughly a factor of nine, interventions that stabilise energy costs for food producers, processors and transporters deliver substantially more food price moderation than equivalent movements in the naira, and act on the transmission channel the evidence identifies at a fraction of the fiscal exposure of universal price support. Second, the combination of insignificant short-run effects with a 68 percent annual speed of adjustment implies that policy on either channel should be evaluated over a one-to-two-year horizon; interventions assessed on a shorter timescale will appear to have failed when they may simply not yet have transmitted. Third, the insignificant long-run effect of GDP per capita indicates that rising average income has not been sufficient to offset the cost-push and exchange rate channels, so supply-side measures that lower the cost base directly are complements to growth policy rather than substitutes for it.

On the basis of these findings, the study makes the following recommendations:

1. Target energy costs at the point where they enter food prices, not at the pump generally. The energy coefficient (0.463, significant at 1%) is nine times the exchange rate coefficient, making energy cost the dominant lever on food prices. Directing support at agricultural haulage, processing energy, cold storage and rural distribution engages that channel at a fraction of the fiscal exposure of universal price support. Whatever form the intervention takes, explicit ceilings, appropriation through the budget rather than off-balance-sheet arrangements, published beneficiary criteria and independent audit determine whether the estimated relationship actually translates into realised relief — Nigeria's subsidy history shows the mechanism can be sound while the delivery fails.

2. Set and publicly communicate a one-to-two-year evaluation horizon for any energy or exchange rate intervention.
No short-run coefficient is statistically significant, yet the error correction term of −0.68 implies roughly 68 percent of disequilibrium clears within a year. Effects are therefore real but delayed. Announcing the evaluation horizon in advance protects sound policy from being abandoned before it transmits, and guards against promises of immediate relief that the estimated structure cannot support — a point of particular weight entering the 2027 cycle.

3. Treat exchange rate stability as a complementary instrument, not the primary one. The exchange rate effect is statistically significant but roughly one-ninth the magnitude of the energy effect. Sustaining foreign exchange liquidity and reserve adequacy holds the imported-input channel steady, but 2026 demonstrates the limit directly: the naira held near ₦1,337/$ while food inflation rose for five consecutive months to 20.31 percent, driven by petrol moving from ₦774 to above ₦1,300 per litre. Currency management alone will not deliver food price moderation while energy costs climb.

4. Invest in domestic agricultural production and logistics as the structural remedy. GDP per capita showed no significant long-run effect, meaning income growth has not offset the cost-push and exchange rate channels — supply-side measures are complements to growth policy, not substitutes for it. Mechanisation, irrigation, storage and rural transport reduce exchange rate exposure through lower imported input dependence and energy exposure through shorter supply chains. Unlike price support, these lower the equilibrium itself rather than offsetting movements around it.

Several limitations qualify these conclusions and point to productive extensions. First, and most consequentially for the subsidy question, the linear VECM specification cannot distinguish the effect of energy price increases from decreases; since the case for subsidy restoration turns on whether lowering fuel prices reverses the food price effects of raising them, a nonlinear ARDL or threshold VECM extension is the highest-priority follow-up. Second, the Johansen trace test rejects the null of no cointegration at every hypothesized rank up to the maximum possible for a four-variable system, an outcome difficult to reconcile with the I(1) classification of three of the four series, warranting a formal rank-selection diagnostic such as the Pantula principle applied across alternative deterministic trend specifications. Third, the analysis does not report formal residual diagnostics — serial correlation, heteroscedasticity, normality of VECM residuals, and CUSUM parameter stability — which should be estimated and reported to fully validate the specification. Finally, the annual frequency of the data yields only 38 observations and makes the one-year interval the finest available resolution; since the policy question concerns transmission within a two-year horizon, future work using monthly or quarterly data would increase estimation power and permit more precise dating of the structural break associated with the 2023 subsidy removal and exchange rate unification.

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