

Exchange rate volatility and monetary policy measures on Nigeria's trade patterns

Ajibola Fatima Oladejo

ajibolaoladejo95@gmail.com

Covenant University <https://orcid.org/0000-0001-5111-8410>

Dorcas Tolulope Ayanwola

Covenant University <https://orcid.org/0009-0006-9833-4034>

Nwoke Ejike M

K. O. Mbadiwe University (KOMU), Ideato, Nigeria <https://orcid.org/0009-0007-5083-2293>

Makinde Kazeem Olajide

Accounting department, Federal University of Agriculture, Abeokuta <https://orcid.org/0000-0002-1244-5870>

Abiola Lydia Aina

Department of Economics, Ajayi Crowther University, Oyo <https://orcid.org/0000-0002-8385-281X>

Research Article

Keywords: Exchange rate volatility, Monetary policy, Bilateral trade balance, EGARCH, Nigeria

Posted Date: October 15th, 2026

DOI: <https://doi.org/10.21203/rs.3.rs-11367866/v1>

License:   This work is licensed under a Creative Commons Attribution 4.0 International License. [Read Full License](#)

Additional Declarations: The authors declare no competing interests.

Abstract

This paper examines whether monetary policy conditions the effect of exchange rate volatility on Nigeria's bilateral trade balance with its major trading partners over 1986–2025. Naira volatility was measured by the conditional standard deviation from an EGARCH(1,1) model and entered, alongside the monetary policy rate (MPR) and broad money (M2) growth, into a partner-quarter panel regression with interaction terms. Higher volatility was associated with a significantly weaker trade balance. The volatility-M2 interaction was positive and significant, so the adverse effect narrowed as money growth rose, whereas the volatility-MPR interaction was insignificant. A higher MPR was associated with a stronger balance, consistent with import compression. Log-linear and instrumental-variable estimates broadly supported the direction of the volatility effect. The evidence indicates that direct foreign exchange stabilisation, rather than interest rate adjustment alone, offers the more reliable protection for Nigeria's trade.

Introduction

For an oil-dependent economy that settles the bulk of its external trade in US dollars, an unstable naira is not an abstract macroeconomic nuisance; it acts as a tax on every cross-border contract. Between 1986 and 2025 Nigeria passed through several foreign exchange arrangements: the Second-tier Foreign Exchange Market introduced under the Structural Adjustment Programme, the Dutch Auction System and its retail and wholesale variants (the Retail and Wholesale Dutch Auction Systems, RDAS and WDAS), the multiple-window regime of 2016–2022, and the unification of the official windows in 2023. Each transition reset both the level and the volatility of the naira. Yet the trade balance did not respond in the way that price-competitiveness arguments predict. Repeated depreciations did little to lift non-oil exports, while episodes of high volatility coincided with import compression and strain in trade finance.

The policy problem is therefore twofold. First, it is not clear how far exchange rate volatility, as distinct from the level of the exchange rate, shapes Nigeria's trade with its principal partners. Second, the Central Bank of Nigeria (CBN) has relied on two broad instruments, the policy rate and liquidity management, without firm evidence on whether either softens or sharpens the trade cost of volatility. If tight money raises the cost of the trade credit that importers and exporters need to bridge currency risk, an interest rate response to volatility could deepen the damage it is intended to contain. If, instead, liquidity eases working capital constraints, monetary accommodation could cushion it. Which of these mechanisms dominates is an empirical question with direct consequences for how the CBN sequences its instruments during foreign exchange stress.

Theory offers no unambiguous answer. Models of risk-averse traders predict that higher volatility reduces trade (Clark, 1973; Ethier, 1973; Hooper & Kohlhagen, 1978), and real options reasoning implies that firms postpone irreversible trade commitments when uncertainty rises (Bloom, 2009; Dixit & Pindyck, 1994). Where hedging is available, or where income effects dominate substitution effects, the impact may be small or even positive (De Grauwe, 1988). Unsurprisingly, the empirical literature remains divided (Bahmani-Oskooee & Hegerty, 2007). Nigerian studies have mostly relied on aggregate time series and have treated monetary policy as a separate regressor rather than as a factor that may moderate the volatility effect (Olubiyi & Dauda, 2024; Umaru & Mohammed, 2022). Limited studies on Nigeria have examined bilateral trade balances with individual partners while allowing the effect of volatility to vary with the monetary policy stance.

This paper addresses that gap with two objectives: (i) to estimate the association between exchange rate volatility and Nigeria's bilateral trade balance with its major partners; and (ii) to test whether the MPR and broad money growth moderate that association. The study makes three contributions. First, it measures volatility with an exponential GARCH (EGARCH) model, which allows depreciation and appreciation shocks of equal size to have different effects on conditional variance, a feature of the naira that symmetric measures overlook. Second, it models the moderating role of

monetary policy through explicit interaction terms and reports the conditional marginal effect of volatility across policy settings, rather than interpreting interaction coefficients in isolation. Third, it is explicit about what the research design can and cannot identify. Because the volatility, policy rate and money growth series vary only over time, the analysis distinguishes the associations it can estimate from causal claims that would require partner-specific variation.

The analysis used quarterly data from 1986Q1 to 2025Q4 for a panel of Nigeria's largest trading partners. The remainder of the paper is organised as follows. Section 1 reviews the theoretical and empirical literature and states the hypotheses. Section 2 describes the data, the volatility measure, the model and the estimation strategy. Section 3 presents and discusses the results. The final section concludes, sets out policy implications and acknowledges the limitations of the study.

1. Literature review

1.1. Exchange rate volatility and trade

The classical argument runs from uncertainty to reduced trade. When export receipts or import costs are denominated in foreign currency and forward cover is incomplete, a risk-averse firm reduces the volume it is willing to commit (Clark, 1973; Ethier, 1973). Hooper and Kohlhagen (1978) showed that the incidence of this risk depends on which side of the transaction bears it, so volatility can affect prices as well as quantities. Later work emphasised irreversibility: when entry into a foreign market involves sunk costs, uncertainty raises the value of waiting, and trade contracts even if the expected exchange rate is unchanged (Bloom, 2009; Dixit & Pindyck, 1994). Against this, De Grauwe (1988) demonstrated that a sufficiently strong income effect can make exporters raise volumes to protect expected revenue, so the sign is not determined by theory alone.

The empirical record mirrors this ambiguity. In their review, Bahmani-Oskooee and Hegerty (2007) concluded that results depend heavily on the sample, the volatility measure and the level of aggregation. Evidence for developing economies has more often been negative: Arize et al. (2000) found significant adverse long-run effects of volatility on exports in thirteen less developed countries, and Bahmani-Oskooee and Gelan (2018) reported that volatility affected trade flows in a number of African economies, with heterogeneous signs. In contrast, studies applying gravity models to large panels have frequently found small effects once trade costs and multilateral resistance are properly controlled for. Tenreyro (2007), using Poisson pseudo-maximum likelihood (PPML) and instrumenting volatility, found no significant impact of nominal volatility on trade, and Clark et al. (2004) found the negative association to be fragile across specifications. The lesson for a single-country study is that the estimation design, not just the data, drives the conclusion.

1.2. Monetary policy, trade finance and the cost of volatility

Monetary policy enters the problem through financing. The credit channel implies that a policy tightening raises the external finance premium faced by firms, particularly those with weak balance sheets (Bernanke & Gertler, 1995). International trade is unusually finance-intensive because of the time lag between production, shipment and payment. Amiti and Weinstein (2011) showed that shocks to bank health reduced exports beyond their effect on domestic sales, and Manova (2013) showed that credit constraints restrict both entry into exporting and export volumes. If volatility raises the cost of hedging and the collateral that banks demand on trade lines, then a tight monetary stance could amplify the trade cost of volatility. Liquidity provision, conversely, could cushion it.

Invoicing practices sharpen this point for Nigeria. Under the dominant currency paradigm, most emerging market trade is priced and settled in US dollars irrespective of the partner, so volatility against the dollar matters more than bilateral volatility against the partner's currency (Amiti et al., 2022; Gopinath et al., 2020). Monetary authorities in such

economies also face strong incentives to limit exchange rate movements, the ‘fear of floating’ documented by Calvo and Reinhart (2002), and their room for independent policy depends on the exchange rate regime and capital mobility (Obstfeld et al., 2019). Together these strands suggest that the interaction between monetary instruments and volatility, rather than either in isolation, is the relevant object for a dollar-dependent commodity exporter.

1.3. Nigerian evidence and research gap

Research on Nigeria has documented the persistence of naira volatility and its links to dollarisation and portfolio choice (Yinusa, 2008), its adverse association with manufactured exports (Umaru & Mohammed, 2022), and the role of bilateral real exchange rate volatility in trade with selected partners (Olubiyi & Dauda, 2024). Reviews of exchange rate management over four decades stress the frequency of regime changes and the limited success of depreciation in promoting non-oil exports (Omotosho & Egbuna, 2024). However, most of this work used aggregate trade measures or single bilateral relationships, and monetary policy, where included, entered additively. Limited studies on Nigeria have combined an asymmetric volatility measure, a panel of major partners and explicit volatility-policy interactions. This study takes that step.

1.4. Hypotheses

Two null hypotheses were tested. H01: exchange rate volatility has no significant association with Nigeria’s bilateral trade balance with its major partners. H02: the association between volatility and the trade balance does not vary with the monetary policy stance, measured by the MPR (H02a) and by broad money growth (H02b). The credit channel predicts that tighter policy amplifies the drag of volatility on financed trade flows. Because both exports and imports are affected, however, the implied sign of the interaction for the trade balance is ambiguous ex ante and was treated as an empirical question rather than imposed.

2. Data, model and estimation strategy

2.1. Theoretical framework

The empirical model is motivated by the structural gravity framework of Anderson and van Wincoop (2003), in which bilateral trade depends on the economic size of the two partners and on bilateral trade costs relative to the costs each partner faces with all other markets (multilateral resistance):

$$X_{ij} = \frac{Y_i E_j}{Y_W} \left(\frac{t_{ij}}{\Pi_i P_j} \right)^{1-\sigma}$$

1

where X_{ij} denotes exports from country i to country j , Y_i is the exporter’s output, E_j is the importer’s expenditure, Y_W is world output, t_{ij} represents bilateral trade costs, Π_i and P_j are the outward and inward multilateral resistance terms, and σ is the elasticity of substitution between varieties (Head & Mayer, 2014; Yotov et al., 2016). Exchange rate volatility enters as a component of t_{ij} : by raising hedging costs, the risk premium on trade credit and the option value of waiting, it raises the effective cost of trading. Monetary conditions affect how large that premium is, because they determine the cost and availability of the finance that traders use to absorb currency risk. The interaction between volatility and the monetary stance is therefore a natural extension of the trade cost function.

2.2. Data and sample

The study used quarterly data from 1986Q1 to 2025Q4 (160 quarters). The bilateral panel was defined at the level of Nigeria’s four main partner groups: China, the European Union, the United States and ECOWAS. Two criteria guided the

selection: (i) each group was a major destination or source of Nigeria’s goods trade, and together the four accounted for just over 70% of Nigeria’s bilateral trade in 2024; and (ii) consistent quarterly bilateral flow data were available from UN Comtrade and the IMF Direction of Trade Statistics for the full sample. Grouping the European and West African partners into blocs avoided gaps in individual country series while preserving the main differences in invoicing currency and trade composition. Table 1 lists the partner groups and their trade shares.

Table 1
Partner groups in the bilateral panel

Partner group	Share of Nigeria’s trade, 2024 (%)	Selection rationale
China	35	Largest single partner; share rose from 12% in 2005; imports dominate the bilateral balance
European Union	18	Main destination for oil and non-oil exports; share fell from 38% in 2005
United States	12	Long-standing partner; share fell from 24% in 2005; trade invoiced in US dollars
ECOWAS	6–7	Main regional bloc; relevant to ECOWAS and AfCFTA integration

Source: Researchers Concept (2026).

After the construction of growth rates and the volatility series, 158 usable quarters remained for the Nigeria-wide variables. The baseline estimation panel contained 632 partner-quarter observations, and the instrumental-variable sample contained 474 observations because of instrument lags and incomplete partner series. The baseline panel comprised four partner series with complete data, China, the European Union, the United States and ECOWAS, each observed for 158 quarters. Missing observations were handled by listwise deletion; bilateral trade flows were not interpolated. Table 2 defines the variables and their sources.

Table 2
Variable definitions and data sources

Variable	Definition and unit	Source
TB	Nigeria's exports to partner j minus imports from partner j, US\$ million, constant prices	UN Comtrade; IMF Direction of Trade Statistics
VOL	Annualised EGARCH(1,1) conditional standard deviation of monthly naira-US dollar returns, %	Researchers computation (2026) from the official NGN/USD rate (CBN; Deutsche Bundesbank)
MPR	Monetary policy rate, quarterly average, % per annum; Minimum Rediscount Rate before December 2006	CBN
M2	Broad money growth, year on year, %	CBN Statistical Bulletin
GDP	Real GDP growth, year on year, %	NBS; World Bank WDI
OIL	Brent crude oil price, US\$ per barrel	US Energy Information Administration
RES	Natural logarithm of gross external reserves, US\$ million	CBN
INF	Headline consumer price inflation, year on year, %	NBS; IMF International Financial Statistics
FFR	Effective US federal funds rate, % (instrument)	Board of Governors of the Federal Reserve System
Note: the MPR was introduced in December 2006; for earlier quarters, the Minimum Rediscount Rate, its predecessor policy rate, was used. Quarterly values are averages of the monthly MPR.		

Source: Researchers survey (2026).

2.3. Measuring exchange rate volatility

Volatility was measured by an EGARCH(1,1) model (Nelson, 1991) estimated on monthly log returns of the official naira-US dollar rate. The naira-dollar rate was used for all partners because, under dominant currency pricing, the dollar is the settlement currency for most of Nigeria's trade, including with European and regional partners (Gopinath et al., 2020). The return and mean equations were:

$$r_t = 100\Delta \ln e_t, \quad r_t = \mu + \varphi r_{t-1} + \epsilon_t, \quad \epsilon_t = \sigma_t z_t$$

2

where e_t is the naira price of one US dollar and z_t is a standardised innovation. The conditional variance followed:

$$\ln \sigma_t^2 = \omega + \alpha |z_{t-1}| + \gamma z_{t-1} + \beta \ln \sigma_{t-1}^2$$

3

The parameter γ captures asymmetry: a positive γ means that depreciation shocks (positive returns) raise volatility more than appreciation shocks of equal size. Because the variance equation is specified in logarithms, no non-negativity restrictions are required. The quarterly volatility measure VOL_t was the average of the three monthly conditional standard deviations, annualised.

2.4. Model specification

The baseline model related the bilateral trade balance to volatility, the two monetary policy measures, their interactions and a vector of macroeconomic controls:

$$TB_{jt} = \alpha_j + \beta_1 VOL_t + \beta_2 MPR_t + \beta_3 M2_t + \beta_4 (VOL_t \times MPR_t) + \beta_5 (VOL_t \times M2_t) + \gamma' X_t + \epsilon_{jt}$$

4

where TB_{jt} is Nigeria's trade balance with partner j in quarter t , α_j is a partner fixed effect, and X_t contains real GDP growth, the oil price, log external reserves and inflation. Because of the interaction terms, β_1 is the effect of volatility only when both MPR and M2 growth equal zero, a point outside the sample. The economically relevant quantity is the conditional marginal effect:

$$\frac{\partial TB_{jt}}{\partial VOL_t} = \beta_1 + \beta_4 MPR_t + \beta_5 M2_t$$

5

The design determines what can be identified. The partner fixed effects absorb distance, common language, colonial ties and other time-invariant bilateral costs, so these gravity variables were not estimated separately. Because VOL_t , MPR_t , $M2_t$ and the controls are common to all partners, full time fixed effects (or exporter-time and importer-time effects) could not be included without absorbing the very variables of interest. Their coefficients are therefore identified from time-series variation shared across partners, and the effective information for them is closer to 158 quarters than to 632 observations. Cross-sectional dependence in the errors is likely, and standard errors should be robust to it (Driscoll & Kraay, 1998).

PPML is the preferred estimator for gravity equations in levels because it handles zero flows and heteroskedasticity consistently (Santos Silva & Tenreyro, 2006). It requires a non-negative dependent variable, however, and the trade balance is signed: its sample mean was -US\$1,037.9 million. The baseline was therefore estimated by linear regression with partner fixed effects. Estimating exports and imports separately by PPML is the natural extension and is discussed among the limitations.

2.5. Pre-estimation tests and robustness

Stationarity was examined with the augmented Dickey-Fuller (ADF) test (Dickey & Fuller, 1979), and pairwise correlations were inspected for collinearity. Two robustness checks were carried out. The first re-estimated the model in log-linear form by ordinary least squares. The second addressed the possible endogeneity of the policy rate and volatility by two-stage least squares (2SLS), using the lagged US federal funds rate and the lagged oil price as external instruments:

$$MPR_t = \pi_0 + \pi_1 FFR_{t-1} + \pi_2 OIL_{t-1} + \delta' X_t + \nu_t$$

6

with an analogous first stage for VOL_t , and fitted values replacing the endogenous regressors and their interaction in Eq. (4). The exclusion restriction requires that, conditional on the controls, the instruments affect the bilateral trade balance only through the policy rate and volatility. This is plausible for the US federal funds rate, which acts on Nigeria mainly through portfolio flows and the CBN's policy response. It is weaker for the oil price, which can affect export receipts directly. The 2SLS estimates were therefore treated as a robustness check rather than as the preferred causal estimates.

3. Results and discussion

3.1. Descriptive statistics and pre-estimation tests

Table 3 summarises the data. Trade openness averaged 56.2% of GDP and ranged from 28.5% to 89.7%. Annualised exchange rate volatility averaged 20.1%, with a standard deviation of 13.2 and a range of 5.3% to 58.7%. The maximum was almost three times the mean, which points to a right-skewed series in which calm periods alternate with short, intense episodes. The policy rate averaged 14.6% (range 6.0% to 27.25%), broad money growth 21.3% (7.5% to 71.2%), real GDP growth 4.8% (-6.2% to 10.8%) and inflation 24.7% (8.5% to 70.6%). The mean log oil price of 3.67 corresponds to a geometric mean of about US\$39 per barrel. Nigeria's bilateral trade balance with the sample partners was negative on average (-US\$1,037.9 million per quarter), with a standard deviation of US\$870.3 million.

Table 3
Descriptive statistics

Variable	Obs.	Mean	Std. dev.	Min.	Max.
TO (% of GDP)	158	56.244	13.048	28.450	89.670
VOL (%)	158	20.054	13.172	5.300	58.700
MPR (%)	158	14.587	4.569	6.000	27.250
M2 growth (%)	158	21.304	14.873	7.500	71.200
GDP growth (%)	158	4.849	2.428	-6.200	10.800
ln OIL	158	3.672	0.713	2.234	4.817
INF (%)	158	24.666	13.750	8.500	70.600
TB (US\$ million)	632	-1,037.855	870.337	-2,789.050	59.500
Note: TO denotes trade openness (exports plus imports as a share of GDP). TB statistics refer to the partner-quarter panel.					

Source: Researchers computation (2026) using Stata 19.

Table 4 reports pairwise correlations. The strongest were between log reserves and the oil price (0.774), trade openness and the oil price (0.715), money growth and inflation (0.665), and trade openness and reserves (0.655). None exceeded 0.8, so pairwise collinearity among the regressors was moderate. The interaction terms are, by construction, correlated with their components; this inflates the standard errors of individual coefficients but does not affect the conditional marginal effects reported below.

Table 4
Pairwise correlations

Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)
(1) TO	1.000						
(2) RES	0.655 (0.000)	1.000					
(3) MPR	-0.035 (0.665)	0.015 (0.853)	1.000				
(4) M2	-0.019 (0.817)	-0.523 (0.000)	0.243 (0.002)	1.000			
(5) GDP	0.605 (0.000)	0.223 (0.005)	0.354 (0.000)	0.310 (0.000)	1.000		
(6) OIL	0.715 (0.000)	0.774 (0.000)	-0.292 (0.000)	-0.500 (0.000)	0.326 (0.000)	1.000	
(7) INF	0.234 (0.003)	0.128 (0.108)	0.404 (0.000)	0.665 (0.000)	0.382 (0.000)	-0.129 (0.105)	1.000

Note: p-values in parentheses.

Source: Researchers computation (2026) using Stata 19.

The ADF results in Table 5 failed to reject the null hypothesis of a unit root at the 5% level for each series tested. This does not prove that the series are integrated, since the ADF test has low power in samples of this length, but it does indicate that they are highly persistent. Regressions in levels on persistent series risk being spurious unless the series are cointegrated, so the baseline coefficients should be read as conditional long-run associations, and the stationarity of the residuals is a necessary check.

Table 5
Augmented Dickey-Fuller unit root tests (levels)

Variable	Obs.	Lags	Test statistic	1% CV	5% CV	10% CV	p-value
TO	156	1	-2.303	-4.021	-3.443	-3.143	0.433
ln TO	156	1	-2.497	-4.021	-3.443	-3.143	0.329
RES	156	1	-2.300	-4.021	-3.443	-3.143	0.434
MPR	156	1	-0.879	-4.021	-3.443	-3.143	0.958
M2 growth	156	1	-2.429	-4.021	-3.443	-3.143	0.364
GDP growth	156	1	-2.395	-4.021	-3.443	-3.143	0.382

Note: CV denotes critical value. The null hypothesis is that the series contains a unit root.

Source: Researchers computation (2026) using Stata 19.

3.2. Baseline results

Table 6 presents the baseline estimates of Eq. (4). The coefficient on volatility was negative and significant ($\beta_1 = -20.003$, $p = 0.006$). As noted above, this coefficient measures the effect of volatility when MPR and money growth are both zero and should not be read as the average effect. The volatility-M2 interaction was positive and significant ($\beta_5 =$

0.605, $p < 0.001$), whereas the volatility-MPR interaction was small and statistically insignificant ($\beta_4 = 0.159$, $p = 0.641$). H02b was therefore rejected, but H02a was not: the data offered no evidence that the policy rate altered the sensitivity of the trade balance to volatility.

Table 6
Baseline estimates: bilateral trade balance

Variable	Coef.	Std. err.	p-value	95% confidence interval
VOL	-20.003***	7.193	0.006	[-34.210, -5.796]
MPR	22.349***	8.154	0.007	[6.243, 38.456]
M2 growth	-36.428***	7.117	0.000	[-50.486, -22.371]
GDP growth	8.968	13.931	0.521	[-18.549, 36.484]
OIL	-5.843***	1.559	0.000	[-8.922, -2.765]
RES	-551.392***	36.719	0.000	[-623.919, -478.865]
INF	5.688	5.984	0.343	[-6.131, 17.507]
VOL × MPR	0.159	0.340	0.641	[-0.512, 0.829]
VOL × M2	0.605***	0.148	0.000	[0.313, 0.898]
Constant	12,690.896***	803.142	0.000	[11,104.539, 14,277.250]
Observations	632			
R-squared	0.946			
F-statistic (p-value)	387.969 (0.000)			
AIC / BIC	8,521.134 / 8,565.623			
Note: dependent variable TB (US\$ million), the quarterly average of Nigeria's trade balance with the four partner groups, stacked across partners (632 = 4 × 158). *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. OIL enters in levels (US\$ per barrel). No partner fixed effects were included. Standard errors are robust and clustered by quarter (158 clusters).				

Source: Researchers computation (2026) using Stata 19.

Table 7 evaluates Eq. (5) at representative values of the two policy variables, using the sample mean and one standard deviation either side for the MPR, and the sample minimum, mean and mean plus one standard deviation for money growth (the mean minus one standard deviation lies below the observed minimum). At average policy settings, a one-percentage-point rise in annualised volatility was associated with a deterioration of about US\$4.8 million in the quarterly bilateral balance. At the lowest observed money growth the deterioration was close to US\$13 million, whereas at high money growth the point estimate turned positive. At the mean MPR, the estimated effect crossed zero at money growth of about 29%. Moving across MPR values changed the effect by little more than US\$1.5 million, which is the quantitative counterpart of the insignificant VOL × MPR coefficient.

Table 7
Conditional marginal effect of volatility on the trade balance (US\$ million)

MPR (%)	M2 growth = 7.5% (min.)	M2 growth = 21.3% (mean)	M2 growth = 36.2% (mean + 1 SD)
10.0 (mean – 1 SD)	-13.88 [-24.50, -3.25]	-5.52 [-18.38, 7.34]	3.50 [-12.58, 19.59]
14.6 (mean)	-13.15 [-23.03, -3.26]	-4.79 [-17.23, 7.65]	4.23 [-11.66, 20.13]
19.2 (mean + 1 SD)	-12.42 [-22.50, -2.33]	-4.06 [-16.82, 8.70]	4.96 [-11.34, 21.26]
Note: marginal effects computed from Table 6 as $\beta_1 + \beta_7 \times \text{MPR} + \beta_8 \times \text{M2}$, with 95% confidence intervals in brackets based on the cluster-robust covariance matrix of the Table 6 estimates.			

Source: Researchers computation (2026).

Two cautions apply to these magnitudes. First, the positive values at high money growth should not be taken as evidence that volatility improves the balance: their confidence intervals include zero, and only the effects at the lowest money growth were significantly negative. In addition, quarters of very rapid money growth were also quarters of high inflation (the M2-INF correlation was 0.665), so the interaction may partly reflect inflationary episodes rather than liquidity as such. Second, the main effects of MPR and M2 also need conditional reading. Evaluated at mean volatility, a one-point rise in the MPR was associated with an improvement of about US\$25.5 million in the quarterly balance, consistent with import compression, while a one-point rise in money growth was associated with a deterioration of about US\$24.3 million, consistent with liquidity-fuelled import demand.

Among the controls, the oil price and external reserves carried negative and significant coefficients. These are associations rather than established mechanisms: periods of high oil receipts and large reserve buffers relax the foreign exchange constraint on imports, which would weaken balances with partners that are net suppliers to Nigeria, but the specification does not isolate this channel. GDP growth and inflation were not significant. The high R-squared (0.946) largely reflects the partner fixed effects, which capture persistent differences in the level of the balance across partners; it says nothing about how well the model explains variation over time within partners.

3.3. Robustness

Table 8 reports the log-linear OLS and 2SLS estimates. The two columns differ in the dependent variable, the controls and the sample (632 and 474 observations), so their coefficients are not directly comparable with each other or with Table 6, and only the direction of the effects can be compared. In both, the direct coefficient on volatility was negative and significant (-0.172 and -23.92, both $p < 0.01$). In the log-linear model both interactions were positive and significant. Evaluated at the sample means of the MPR and money growth, however, the implied semi-elasticity of the trade balance with respect to volatility was about +0.06 ($-0.172 + 0.0116 \times 14.59 + 0.00286 \times 21.30$), and it was negative only at below-average policy rates and money growth. The negative volatility effect in Table 6 is therefore not robust in magnitude across functional forms, and conclusions about the policy interactions differ between specifications. In the 2SLS column the MPR coefficient was insignificant.

Table 8
Robustness estimates

Variable	(1) OLS, log-linear	(2) 2SLS, levels
VOL	-0.172*** (0.0149)	-23.92*** (4.225)
MPR	-0.220*** (0.0165)	-2.166 (5.241)
M2 growth	-0.187*** (0.0162)	-
GDP growth	-	-4.183 (12.01)
OIL	-	-21.41*** (0.993)
INF	-	-11.62*** (3.890)
VOL × MPR	0.0116*** (0.000850)	24.36*** (2.414)
VOL × M2	0.00286*** (0.000316)	-
Constant	11.53*** (0.283)	327.6*** (96.67)
Observations	632	474
R-squared	0.319	0.816
Note: standard errors in parentheses. ** $p < 0.01$, $p < 0.05$, $p < 0.1$. - denotes a variable not included.		

Source: Researchers computation (2026) using Stata 19.

3.4. Discussion

Three findings stand out. First, at typical policy settings, higher naira volatility was associated with a weaker bilateral trade balance. This is consistent with the evidence for developing economies that volatility imposes a net cost on trade (Arize et al., 2000; Bahmani-Oskooee & Gelan, 2018), and with the view that, for a dollar-invoicing economy, the relevant risk is volatility against the dollar (Gopinath et al., 2020). Because the outcome is a balance, the result means that volatility weighed on exports more than on imports, or raised imports relative to exports. It does not show that the volume of trade or trade openness fell; that would require separate models for exports, imports or openness.

Second, the moderating role of monetary policy ran through liquidity rather than through the interest rate. The positive VOL × M2 interaction fits the trade-finance channel: where liquidity is ample, traders can more easily fund the working capital and hedging costs that volatility imposes (Amiti & Weinstein, 2011; Manova, 2013). The absence of a significant VOL × MPR interaction is consistent with weak pass-through from the policy rate to lending conditions in Nigeria and with the CBN's historical preference for quantity and administrative tools during episodes of foreign exchange pressure, a pattern associated with fear of floating (Calvo & Reinhart, 2002). An insignificant interaction does not, however, establish that the interest rate channel is neutral; it means only that this sample could not detect a moderating effect.

Third, the policy rate had a direct association with the balance. A higher MPR was associated with a stronger balance, most plausibly through import compression. This is a level effect, distinct from any moderation of volatility. The results therefore support a division of labour: the policy rate influences the level of the balance through absorption, while the sensitivity of trade to currency swings is better addressed by instruments that act directly on foreign exchange market conditions and on the availability of trade finance. These conclusions refer to the pooled partner panel. Whether the effects differ between, for example, European and ECOWAS partners was not tested and would require partner-specific interactions.

Conclusions

This paper examined whether monetary policy conditions the association between exchange rate volatility and Nigeria's bilateral trade balance with its major partners over 1986–2025. Volatility was measured with an EGARCH(1,1) model and its interaction with the policy rate and broad money growth was estimated in a partner-quarter panel. At typical policy settings, higher volatility was associated with a weaker trade balance. The adverse association narrowed as money growth increased, whereas the policy rate did not significantly alter it. A higher policy rate was, independently, associated with a stronger balance. The direction of the direct volatility effect was confirmed in log-linear and instrumental-variable estimates, but its magnitude, and the implied role of the policy interactions, varied across specifications.

Three policy implications follow, each limited to what the evidence supports. First, because the sensitivity of the trade balance to volatility was not reduced by changes in the policy rate, the CBN should not rely on interest rate increases to protect trade during foreign exchange stress. Direct stabilisation measures are better suited to the task: transparent, rules-based intervention, the timely publication of market data, and a deeper market for forwards and other hedging instruments that traders can access at reasonable cost. Second, the positive volatility-money growth interaction suggests that liquidity matters for traders during volatile periods. Because rapid money growth was also associated with weaker balances and with higher inflation, such support is better targeted at trade finance, for example through refinancing windows for letters of credit, than delivered through broad monetary expansion. Third, the policy rate remains a lever on the level of the balance through domestic absorption, and its use for that purpose should be coordinated with fiscal policy and with the non-oil export agenda of the Federal Ministry of Industry, Trade and Investment.

The study has several limitations. The dependent variable was the trade balance, so the results do not speak directly to trade volumes or openness; separate PPML gravity models for exports and imports would address this and would allow zero flows to be handled. The volatility and policy variables were common to all partners, so their coefficients rest on time-series variation, and full time fixed effects could not be used to control for common shocks. The key series were highly persistent, and the cointegration properties of the baseline model require formal confirmation. The instrumental-variable estimates depend on exclusion restrictions that are not fully testable, particularly for the oil price. Finally, partner-specific effects and differences across exchange rate regimes were not estimated.

Future research could build on this study in three directions: by estimating bilateral exports and imports separately with PPML and partner-specific volatility measures; by allowing the volatility effect to differ across exchange rate regimes, including the period since the 2023 unification; and by using firm- or transaction-level customs data to trace the trade-finance channel that the aggregate results suggest.

Declarations

Declaration of Generative AI Use

The authors have used generative AI (Claude Anthropic). It was used to edit the manuscript text language. The authors reviewed and verified all content, estimates and references, and take full responsibility for the published article.

References

1. Amiti M, Itskhoki O, Konings J (2022) Dominant currencies: How firms choose currency invoicing and why it matters. *Q J Econ* 137(3):1435–1493. <https://doi.org/10.1093/qje/qjac004>

2. Amiti M, Weinstein DE (2011) Exports and financial shocks. *Q J Econ* 126(4):1841–1877.
<https://doi.org/10.1093/qje/qjr033>
3. Anderson JE, van Wincoop E (2003) Gravity with gravitas: A solution to the border puzzle. *Am Econ Rev* 93(1):170–192. <https://doi.org/10.1257/000282803321455214>
4. Arize AC, Osang T, Slottje DJ (2000) Exchange-rate volatility and foreign trade: Evidence from thirteen LDC's. *J Bus Economic Stat* 18(1):10–17. <https://doi.org/10.1080/07350015.2000.10524843>
5. Bahmani-Oskooee M, Gelan A (2018) Exchange-rate volatility and international trade performance: Evidence from 12 African countries. *Econ Anal Policy* 58:14–21
6. Bahmani-Oskooee M, Hegerty SW (2007) Exchange rate volatility and trade flows: A review article. *J Economic Stud* 34(3):211–255. <https://doi.org/10.1108/01443580710772777>
7. Bernanke BS, Gertler M (1995) Inside the black box: The credit channel of monetary policy transmission. *J Economic Perspect* 9(4):27–48. <https://doi.org/10.1257/jep.9.4.27>
8. Bloom N (2009) The impact of uncertainty shocks. *Econometrica* 77(3):623–685.
<https://doi.org/10.3982/ECTA6248>
9. Calvo GA, Reinhart CM (2002) Fear of floating. *Q J Econ* 117(2):379–408.
<https://doi.org/10.1162/003355302753650274>
10. Clark PB (1973) Uncertainty, exchange risk, and the level of international trade. *West Econ J* 11(3):302–313
11. Clark P, Tamirisa N, Wei S-J (2004) *A new look at exchange rate volatility and trade flows* (IMF Occasional Paper No. 235). International Monetary Fund
12. De Grauwe P (1988) Exchange rate variability and the slowdown in growth of international trade. *IMF Staff Pap* 35(1):63–84
13. Dickey DA, Fuller WA (1979) Distribution of the estimators for autoregressive time series with a unit root. *J Am Stat Assoc* 74(366a):427–431. <https://doi.org/10.1080/01621459.1979.10482531>
14. Dixit AK, Pindyck RS (1994) *Investment under uncertainty*. Princeton University Press
15. Driscoll JC, Kraay AC (1998) Consistent covariance matrix estimation with spatially dependent panel data. *Rev Econ Stat* 80(4):549–560. <https://doi.org/10.1162/003465398557825>
16. Ethier W (1973) International trade and the forward exchange market. *Am Econ Rev* 63(3):494–503
17. Gopinath G, Boz E, Casas C, Díez FJ, Gourinchas P-O, Plagborg-Møller M (2020) Dominant currency paradigm. *Am Econ Rev* 110(3):677–719. <https://doi.org/10.1257/aer.20171201>
18. Head K, Mayer T (2014) Gravity equations: Workhorse, toolkit, and cookbook. In G. Gopinath, E. Helpman, & K. Rogoff (Eds.), *Handbook of international economics* (Vol. 4, pp. 131–195). Elsevier. <https://doi.org/10.1016/B978-0-444-54314-1.00003-3>
19. Hooper P, Kohlhagen SW (1978) The effect of exchange rate uncertainty on the prices and volume of international trade. *J Int Econ* 8(4):483–511
20. Manova K (2013) Credit constraints, heterogeneous firms, and international trade. *Rev Econ Stud* 80(2):711–744.
<https://doi.org/10.1093/restud/rds036>
21. Nelson DB (1991) Conditional heteroskedasticity in asset returns: A new approach. *Econometrica* 59(2):347–370.
<https://doi.org/10.2307/2938260>
22. Obstfeld M, Ostry JD, Qureshi MS (2019) A tie that binds: Revisiting the trilemma in emerging market economies. *Rev Econ Stat* 101(2):279–293. https://doi.org/10.1162/rest_a_00740
23. Olubiyi EA, Dauda M (2024) Bilateral real exchange rate volatility and trade: The Nigerian case. *Iran Economic Rev* 28(3):991–1021

24. Omotosho BS, Egbuna EN (2024) Four decades of exchange rate management in Nigeria: Lessons and prospects. *J Afr Econ* 33(2):145–178
25. Santos Silva JMC, Tenreiro S (2006) The log of gravity. *Rev Econ Stat* 88(4):641–658.
<https://doi.org/10.1162/rest.88.4.641>
26. Stock JH, Yogo M (2005) Testing for weak instruments in linear IV regression. In: Andrews DWK, Stock JH (eds) *Identification and inference for econometric models: Essays in honor of Thomas Rothenberg*. Cambridge University Press, pp 80–108
27. Tenreiro S (2007) On the trade impact of nominal exchange rate volatility. *J Dev Econ* 82(2):485–508.
<https://doi.org/10.1016/j.jdeveco.2006.03.007>
28. Umaru MA, Mohammed H (2022) Real exchange rate volatility and manufacturing sector exports in Nigeria. *Asian Economic Financial Rev* 12(1):1–17
29. Yinusa DO (2008) Between dollarization and exchange rate volatility: Nigeria's portfolio diversification option. *J Policy Model* 30(5):811–826
30. Yotov YV, Piermartini R, Monteiro J-A, Larch M (2016) *An advanced guide to trade policy analysis: The structural gravity model*. World Trade Organization

Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- [Appendix.docx](#)