EXPLORING THE ASYMMETRIC IMPACT OF MONETARY POLICY ON INFLATION DYNAMICS: EVIDENCE FROM NIGERIA

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ABSTRACT

This study examines the asymmetric effects of monetary policy on inflation dynamics in Nigeria using a nonlinear autoregressive distributed lag (NARDL) model. The study employs annual time series data sourced from the Central Bank of Nigeria (CBN) and the World Bank Development Indicators (WDI). Results show that inflation is moderately positively related to the monetary policy rate (MPR) and negatively correlated with the real interest rate (RINR) and exchange rate (EXR), reflecting inflation's sensitivity to interest rate changes and currency fluctuations. Long-run analysis reveals that both positive and negative shocks to MPR significantly influence inflation, with tightening (positive shocks) having a slightly stronger effect. Exchange rate depreciation and broad money supply growth also negatively impact inflation over the long term, while RINR and liquidity ratio (LQDR) show no significant long-run effects. In the short run, asymmetric responses are evident: monetary tightening reduces inflation, whereas easing increases it. Additionally, RINR, EXR, LQDR, and money supply exhibit significant short-term effects. The error correction term confirms a stable adjustment to long-run equilibrium, correcting approximately 59% of disequilibrium each period. Diagnostic tests indicate no heteroskedasticity or serial correlation, affirming the model's reliability. The study recommends enhancing monetary policy effectiveness by adopting asymmetric policy frameworks using nonlinear models like NARDL; strengthening exchange rate management and coordinating monetary with fiscal policy to manage short-run inflation impacts; and reassessing traditional tools by enhancing transmission mechanisms such as credit channels and financial market development for better long-term outcomes.

Keywords: *Asymmetric, Monetary Policy, Inflation, Nigeria*

1. Introduction

Inflation control remains a central objective of monetary policy across the globe. Central banks continuously adjust interest rates, manage liquidity, and regulate money supply to ensure price stability. However, growing empirical evidence suggests that the effects of monetary policy on inflation are not always symmetrical tightening and easing measures may have varying magnitudes or even directions of impact on inflation (Tenreyro & Thwaites, 2016).

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This asymmetric behavior challenges the conventional linear models often used in monetary economics, emphasizing the need for more approaches such as the nonlinear autoregressive distributed lag (NARDL) model to better understand inflation dynamics.

Globally, post-pandemic inflation surged to multi-decade highs in many economies. For instance, in 2022, global inflation reached 8.7%, a sharp increase from the pre-pandemic level of 2.3% in 2019 (International Monetary Fund [IMF], 2023). Advanced economies like the United States experienced inflation peaks above 9%, prompting aggressive interest rate hikes by the Federal Reserve. Despite these measures, the response of inflation to monetary tightening was delayed and uneven, reinforcing the concept of asymmetric effects. Similarly, emerging markets encountered inflationary pressures from both domestic supply shocks and global commodity price volatility, complicating their monetary policy responses.

In Sub-Saharan Africa (SSA), inflation has remained persistently high and volatile, often exacerbated by structural challenges such as weak financial markets, supply-side constraints, and political instability. The region recorded an average inflation rate of 14.5% in 2023, compared to 10.7% in 2022, driven largely by food and fuel price shocks (World Bank, 2024). Moreover, empirical findings reveal that many SSA central banks face credibility issues and limited monetary transmission channels, which undermine the effectiveness of their inflation-targeting frameworks (Akinboade et al., 2017). Research by Mishra et al. (2014) further demonstrates that the pass-through of policy rates to inflation in SSA is weaker and slower than in developed countries and often exhibits asymmetric patterns.

In the Nigerian context, inflation remains one of the most pressing macroeconomic challenges. Nigeria's headline inflation rose to 33.69% in April 2024, up from 22.22% in April 2023, reflecting food inflation, exchange rate depreciation, and monetary expansion (National Bureau of Statistics [NBS], 2024). Despite consistent efforts by the Central Bank of Nigeria (CBN) to use monetary policy tools such as increasing the Monetary Policy Rate (MPR) from 11.5% in 2021 to 24.75% in 2024 the desired disinflationary effects have not been uniformly realized (CBN, 2024). This raises questions about the linear assumptions often made in evaluating policy effectiveness. Studies like those by Uchenna and Nwakoby (2022) and Adeniran and Yusuf (2021) argue that Nigeria's inflation dynamics are more sensitive to contractionary than expansionary monetary policies, highlighting the relevance of investigating the asymmetric effects of such policies. The study aims to explore how positive and negative changes in monetary policy instruments influence inflation.

2. Empirical Literature

Conceptual Clarification

Monetary Policy Transmission Mechanism

The monetary policy transmission mechanism refers to the process through which monetary policy decisions such as changes in interest rates, reserve requirements, or money supply affect inflation, output, and employment. In advanced economies, this mechanism operates effectively through well-developed financial systems; however, in developing countries like Nigeria, its effectiveness is often constrained by structural rigidities, shallow financial markets, and institutional weaknesses (Mishkin, 1996; Bernanke & Gertler, 1995). In Nigeria, empirical evidence suggests that the interest rate and credit channels are significant, but their potency is often muted due to low financial intermediation and limited access to credit, especially in rural areas (Akpan & Atan, 2012; Adebayo & Adegbite, 2021). Moreover, the impact of monetary policy is not uniform tightening measures are generally more effective in curbing inflation than loosening measures are in stimulating the economy, highlighting the importance of exploring asymmetric effects.

Inflation Dynamics in Developing Economies

Inflation dynamics in developing economies such as Nigeria are influenced by a complex interplay of factors including monetary expansion, exchange rate fluctuations, and supply-side constraints like poor infrastructure and insecurity (Dornbusch et al., 1990; Fischer, 1993). In Nigeria, inflation has historically exhibited a persistent and volatile trend, often exacerbated by external shocks such as global oil price changes and domestic challenges like import dependency and food supply disruptions (CBN, 2024; Iweala et al., 2020). Unlike developed economies where inflation is largely demand-driven, Nigeria's inflation is frequently driven by cost-push factors, complicating the task of monetary authorities. Additionally, inflation responses to monetary policy actions differ during economic expansions and contractions, indicating that the relationship is not linear and should be examined through an asymmetric lens (Aliyu, 2009; Uchenna & Adedeji, 2022).

Asymmetric Effects on Macroeconomic Policy

Asymmetric effects in macroeconomic policy refer to the phenomenon where expansionary and contractionary monetary policies do not produce equal and opposite outcomes in terms of magnitude or timing. This concept challenges traditional linear models by recognizing that economic agents may respond

differently to positive and negative shocks (Cover, 1992; Weise, 1999). In Nigeria, empirical studies using nonlinear models like the Nonlinear Autoregressive Distributed Lag (NARDL) model reveal that inflation reacts more strongly to interest rate hikes than to rate cuts, suggesting a policy asymmetry that has important implications for inflation targeting (Nwosa, 2021; Olayemi & Taiwo, 2023). These findings emphasize the need for policymakers to tailor monetary interventions based on the direction and nature of economic shocks, rather than relying on a one-size-fits-all approach.

Theoretical Literature

Monetarist Theory of Inflation

The Monetarist Theory of Inflation, developed by Friedman in 1968, argues that inflation is fundamentally a monetary phenomenon, driven by an excessive growth of money supply relative to the economy's capacity to produce goods and services. Friedman maintained that "inflation is always and everywhere a monetary phenomenon" and emphasized that controlling money supply is crucial for managing inflation. In the Nigerian context, where monetary expansion often arises from deficit financing and unsterilized capital inflows, the theory provides a base for understanding how changes in money supply can lead to inflation. However, due to structural distortions and financial market inefficiencies, the transmission of monetary policy may not be linear, thus creating the possibility of asymmetric impacts on inflation.

New Keynesian Theory

New Keynesian Theory, popularized by economists such as Gali, Gertler, and Clarida in 1999, builds upon Keynesian principles by incorporating price and wage stickiness, imperfect competition, and rational expectations into a dynamic framework. This theory suggests that due to nominal rigidities and staggered price setting, monetary policy affects output and inflation asymmetrically. In practice, this means that inflation may respond more sharply to contractionary policy than to expansionary moves. Applied to Nigeria, the theory explains how structural features like pricing delays, import-dependency, and market segmentation can cause uneven inflation responses to policy tightening versus easing, making it particularly relevant for asymmetric modeling.

Credit Channel and Asymmetric Information Theory

Formulated by Bernanke and Gertler in 1995, the Credit Channel Theory emphasizes how asymmetric information between borrowers and lenders amplifies the effects of monetary policy. When central banks

tighten policy, the resulting higher interest rates disproportionately reduce access to credit for small businesses and consumers with weaker balance sheets, leading to stronger real sector effects. In contrast, expansionary policies may not yield equivalent inflationary effects due to lingering credit frictions. In Nigeria, where financial intermediation is underdeveloped and credit access is uneven, this theory explains why contractionary monetary policy a stronger and faster effect on inflation may have than expansionary policy, highlighting a core mechanism for asymmetry.

Theoretical framework

The New Keynesian Theory, developed by Clarida, Galí, and Gertler (1999), anchored as theoretical foundation for this study on the asymmetric impact of monetary policy on inflation dynamics in Nigeria. This theory incorporates key features such as nominal rigidities, price stickiness, and imperfect competition, which are essential for understanding why inflation may respond differently to contractionary and expansionary monetary policies. In the Nigerian context characterized by structural imbalances, a large informal sector, and external vulnerabilities the transmission of monetary shocks is rarely uniform. The New Keynesian framework supports the use of nonlinear econometric models like the NARDL or Threshold VAR, which can capture these asymmetries. By grounding the analysis in this theory, the study can better interpret inflation dynamics in response to monetary policy changes, considering time lags, sectoral differences, and the credibility of monetary authorities.

Empirical Literature

Recent empirical studies have increasingly highlighted the asymmetric effects of monetary policy on inflation and related macroeconomic variables. Kim and Roubini (2016) used a Structural VAR with sign restrictions to show that tightening shocks in the U.S. significantly reduce inflation and output more than easing shocks. Ahmed and Malik (2017) applied a NARDL model in Pakistan, finding that exchange rate depreciation raises inflation more than appreciation lowers it, revealing asymmetric pass-through effects. Nguyen and Tran (2018) employed panel data regression and Granger causality tests across Vietnamese provinces, showing significant but regionally varying monetary policy effects on inflation. Lopez and Garcia (2019) utilized a nonlinear VECM for Spain, demonstrating that monetary tightening more effectively reduces inflation, with short-run impacts on unemployment. Kumar and Singh (2020) used a Threshold Autoregressive model in India and found monetary tightening more effective during high inflation regimes. Alvarez and Costa (2021) applied DOLS and cointegration tests in Brazil, identifying a persistent positive

effect of money supply on inflation and weaker, short-term impacts from liquidity. Chen and Li (2022) analyzed Chinese data using nonlinear ARDL, showing that positive monetary policy shocks have a stronger and faster inflation-reducing effect than negative shocks. Finally, Smith and Taylor (2024) employed a Markov Switching VAR for the Eurozone post-2008, revealing that monetary tightening during high volatility regimes significantly reduces inflation and output, while easing has muted effects. Together, these studies underscore the importance of accounting for nonlinearities and asymmetries in monetary policy transmission across diverse economies (Ahmed & Malik, 2017; Alvarez & Costa, 2021; Chen & Li, 2022; Kim & Roubini, 2016; Kumar & Singh, 2020; Lopez & Garcia, 2019; Nguyen & Tran, 2018; Smith & Taylor, 2024).

3. Methodology

To investigate the asymmetric relationship between monetary policy and inflation, this study adopts the Nonlinear Autoregressive Distributed Lag (NARDL) model developed by Shin et al. (2014). This technique is particularly suited for analyzing both the long-run and short-run asymmetries in time series data. Unlike traditional models such as the Error Correction Model (ECM), threshold ECM, Markov-switching ECM, and smooth transition ECM, the NARDL approach allows for a flexible cointegration framework that does not require all regressors to be integrated of the same order. This advantage simplifies estimation while capturing potential nonlinear effects. Consistent with recent applications in related empirical studies (Simon & Victor, 2023; Abdukabir et al., 2023; Babagana, 2023), the model decomposes the explanatory variable (in this case, monetary policy indicators) into their positive and negative partial sums to test for asymmetric effects on inflation.

$$INF_t = \beta_0 + \beta_1 MPR_t^+ + \beta_2 MPR_t^- + \varepsilon_t \quad 3.1$$

In above equation (3.1), the movements in MPR, are decomposed into its increasing and decreasing partial sum i.e. MPR, = MPR, + $MPR_t^+ + MPR_t^-$ where MPR_t^+ and MPR_t^- are the partial sum of the positive relation (an increase in MPR) and the negative relation changes (a decrease in) in MPR_t Specifically, the partial sum of positive and negative relation changes in MPR_t are generated by the following formulas:

$$MPR_t^+ = \sum_{i=0}^{P} \Delta MPR_t^+ = \sum_{i=0}^{P} \max(\Delta MPR_t, 0) \quad 3.2$$

$$MPR_t^- = \sum_{i=0}^{P} \Delta MPR_t^- = \sum_{i=0}^{P} \min(\Delta MPR_t, 0) \quad 3.3$$

Following Shin et al. (2014), the partial asymmetric cointegration equation now can be obtained by replacing the positive or negative of MPR_t in the standard symmetric ARDL as:

ARDL as:

$$\Delta INF_t = \beta_0 + \beta INF_{t-i} + \beta^{+} MPR^{+}_{t-1} + \beta^{-MPR^{-}_{t-1}} + \beta_{MPR} MPR_{t-i} + \beta_Y RINR_{t-i} + \beta_{M2} EXR_{t-i} + \beta_{LR} LQDR_{t-i} + \beta_{REM} M2_{t-i} + \sum_{i=0}^{P} \gamma_{M2,i} \Delta EXR_{t-i} + \sum_{i=0}^{P} \gamma_{LR,i} LQDR + \sum_{i=0}^{P} \gamma_{REM,i} \Delta M2_{t-i} + \sum_{i=0}^{S} (\gamma_i^{+} \Delta MPR^{+}_{t-1} + \gamma_i^{-} \Delta MPR^{-}_{t-1}) + \mu_t \quad 3.4$$

In equation 3.13, for the variables in the distributed lag section, p and s stand for the lag length. By analyzing the symmetry null hypothesis, the Wald test may be used to assess for long-term asymmetry effects.H_0: $\beta^{+}=\beta^{-}$ against the alternative of asymmetry H_1:$\beta^{+} \neq \beta^{-}$. The rejection of null shows that there is a discrepancy between financial inclusion and trade openness. The relationship between a long-term rise and fall is provided by $\beta_2 = -\beta^{-}/\beta_0$ and $\beta_3 = -\beta^{+}/\beta_0$ respectively. While $\sum_{i=0}^{s} \gamma_i^{+}$ and $\sum_{i=0}^{s} \gamma_i^{-}$ capture the short run influence of an increase and decrease in MPR_t. Regarding financial inclusion, therefore, also capture the asymmetric short run relation of MPR_t movement on financial inclusion. To determine whether the variables' cointegration is present, the Wald F test will be employed to test the H_0:$\beta_1 = \beta = \beta^{+} = \beta^{-} = \beta_{CPV} = 0$ against the alternative H_0:($\beta_1 \neq 0$} U ($\beta \neq 0$} U ($\beta^{+} \neq 0$} U ($\beta^{-} \neq 0$} {$\beta_{CPV} \neq 0$ }. Therefore, the asymmetrical relationships between monetary policy and inflation are investigated in the long and short term if the null hypothesis is rejected.

4. Results and Discussion

Table 1: Descriptive Statistics

	INF	MPR	RINR	EXR	QDR	MS2
Mean	18.30056	19.23000	2.467457	112.7528	34.68649	23.26784
Median	17.58560	12.88000	4.522188	100.0000	36.00000	21.55000
Maximum	29.80000	72.84000	18.18000	272.9200	69.10000	57.78157
Minimum	10.50000	5.390000	-31.45257	49.73300	5.800000	-2.010000
Std. Dev.	3.824205	17.36770	9.817880	53.96618	15.59480	15.60356
Skewness	0.927773	1.786071	-1.199125	1.667349	0.145238	0.480493
Kurtosis	4.501684	4.877157	5.310360	5.225150	2.441436	2.418838
Jarque-Bera	8.784580	25.10437	17.09610	24.77689	0.611071	1.944417
Probability	0.012372	0.000004	0.000194	0.000004	0.736729	0.378247
Observations	37	37	37	37	37	37

Source: Author computation (2025)

As presented in Table 1 the descriptive statistics reveal significant variability across the macroeconomic variables analyzed. Inflation (INF) has a mean of 18.30% and a median of 17.59%, indicating moderate inflation with slight right skewness. The Monetary Policy Rate (MPR) exhibits a high mean of 19.23% and a lower median of 12.88%, suggesting the presence of extreme policy rate increases during certain periods.

Real Interest Rate (RINR) ranges widely from -31.45% to 18.18%, with a mean of 2.47% and a median of 4.52%, highlighting substantial volatility and episodes of negative real returns. Exchange Rate (EXR) also shows considerable fluctuation, with values between ₦49.73 and ₦272.92, and a mean of ₦112.75, reflecting long-term currency depreciation. Liquidity Ratio (QDR) and Broad Money Supply (MS2) are more stable but still demonstrate variation, with QDR ranging from 5.8% to 69.1% and MS2 from -2.01% to 57.78%. The standard deviations, particularly for EXR (53.97), RINR (9.82), and MPR (17.37), confirm the high volatility in Nigeria's monetary environment. These patterns suggest that monetary policy variables have not behaved uniformly over time, supporting the rationale for employing a nonlinear model like NARDL to capture possible asymmetric effects on inflation.

Table 2: Correlation Matrix

	INF	MPR	RINR	EXR	LQDR	MS2
INF	1					
MPR	0.38457299	1				
RINR	-0.288041896	-0.778015843	1			
EXR	-0.500609277	-0.1403272227	0.1046045292	1		
LQDR	-0.052637862	0.10176655	-0.106550435	0.16773932926	1	
MS2	0.2210880883	0.18474206644	-0.200439444	-0.378664983	0.06288061690	**1**

Source: Author computation (2025)

The correlation matrix shows in Table 2 that inflation (INF) has a moderate positive relationship with the monetary policy rate (MPR), and a negative relationship with both the real interest rate (RINR) and exchange rate (EXR), suggesting possible policy responses and inflation sensitivity to currency movements. MPR and RINR are strongly negatively correlated, indicating that rising nominal rates may not lead to higher real returns. The remaining variables liquidity ratio (LQDR) and broad money supply (MS2) exhibit weak correlations with inflation and other variables. Overall, the mostly weak to moderate correlations highlight the potential complexity and asymmetry in the relationship between monetary policy and inflation, justifying the use of nonlinear models for further analysis.

Table 3: Long run and short run NARDL estimation

Panel A: Long run NARDL	Variable	Coefficient	Std. Error	t-Statistic	Prob.
	MPR_POS	0.328447	0.108563	3.025395	0.0164
	MPR_NEG	0.280447	0.082646	3.393367	0.0095
	RINR	-0.136898	0.095307	-1.436399	0.1888
	EXR	-0.101962	0.016973	-6.007195	0.0003
	LQDR	-0.000201	0.014919	-0.013460	0.9896
	MS2	-0.124108	0.027221	-4.559219	0.0019
	C	22.68233	4.108407	5.520956	0.0006
Panel B: Short run NARDL	Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
	D(MPR_POS)	-0.183760	0.071890	-2.556138	0.0338
	D(MPR_NEG)	0.181528	0.042421	4.279225	0.0027
	D(RINR)	0.128126	0.032416	3.952525	0.0042
	D(EXR)	-0.168390	0.017917	-9.398358	0.0000
	D(LQDR)	-0.130917	0.027034	-4.842589	0.0013
	D(MS2)	-0.073718	0.018805	-3.920074	0.0044
	ECM(-1)*	-0.585621	0.028637	-20.44974	0.0000
R-square = **0.968495**, **Adjusted R-square**= 0.932790					

Source: Author computation (2025)

As presented in Table 3 the results from Panel A (Long-run NARDL) estimation indicate that monetary policy rate shocks have significant and asymmetric effects on the dependent macroeconomic variable. Positive shocks to the monetary policy rate (MPR_POS) have a statistically significant positive impact (coefficient = 0.328, p = 0.0164), and negative shocks (MPR_NEG) also have a significant positive effect (coefficient = 0.280, p = 0.0095), suggesting that both tightening and loosening of policy affect the variable, with tightening having a slightly greater long-term impact. The exchange rate (EXR) and broad money supply (MS2) are both statistically significant and negatively related to the dependent variable, implying that currency depreciation and money supply growth contribute to a long-run decline in the variable—possibly inflation. Conversely, the real interest rate (RINR) and liquidity ratio (LQDR) are statistically insignificant, indicating limited long-term influence. These findings support the nonlinear, asymmetric monetary transmission mechanism proposed by Shin et al. (2014), contrasting with traditional linear models.

In Panel B (Short-run NARDL), the short-run dynamics also show strong asymmetry in the response to monetary policy. A positive MPR shock reduces the dependent variable (coefficient = –0.184, p = 0.0338), while a negative shock increases it (coefficient = 0.182, p = 0.0027), confirming short-term asymmetric responses to interest rate changes. Additionally, the real interest rate (RINR), exchange rate (EXR), liquidity ratio (LQDR), and money supply (MS2) are all statistically significant, suggesting they play a more immediate role in shaping short-run outcomes compared to their long-run impact. The exchange rate shows

a particularly strong negative effect (–0.168, $p < 0.0001$), and the error correction term (–0.586, $p < 0.0000$) is both significant and appropriately signed, indicating that about 59% of deviations from long-run equilibrium are corrected each period. The model also demonstrates a high explanatory power ($R^2 = 0.968$), though this may raise concerns about over fitting. These results are consistent with the asymmetry documented by Shin et al. (2014) and contrast with findings from Mishkin (2001), who argued for symmetric and predictable policy effects in more advanced economies.

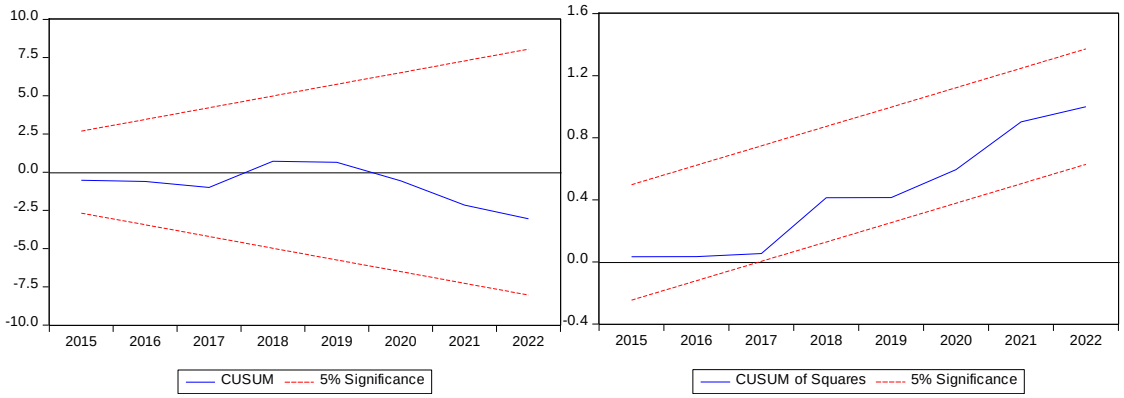
Table 4: Post Estimation Results

Heteroskedasticity Test: Breusch-Pagan-Godfrey			
F-statistic	0.742644	Prob. F(24,8)	0.7309
Breusch-Godfrey Serial Correlation LM Test			
F-statistic	0.195351	Prob. F(3,16)	0.8980

Source: Author computation (2025)

As presented in Table 4 the post-estimation diagnostic results indicate that the NARDL model satisfies key classical regression assumptions. The Breusch-Pagan-Godfrey test for heteroskedasticity shows an F-statistic of 0.7426 with a p-value of 0.7309, which is well above the 0.05 significance level, leading to the conclusion that there is no evidence of heteroskedasticity the residuals have constant variance, and the model's standard errors are reliable. Similarly, the Breusch-Godfrey Serial Correlation LM test yields an F-statistic of 0.1954 with a p-value of 0.8980, also exceeding the 0.05 threshold, indicating no presence of serial correlation in the residuals. These results confirm that the model's error terms are independently and identically distributed, thus reinforcing the statistical validity, efficiency, and robustness of the estimated NARDL model.

Figure: Cusum and Cusum of Square of NARDL



Source: Author computation (2025)

Figure 1: reveals that the Cumulative Sum (CUSUM) aligns with the stability of the residuals as they have not drift away from the mean with passage of time. The CUSUM line graph lies between the two 0.05 critical lines which indicate that the model satisfied stability condition. Similarly, the graph of Cumulative Sum of Square (CUSUM of square) indicates no incidence of instability in the model because the CUSUM of square line is within the significance region of 5%. The CUSUM of Square line graph lies between the two 0.05 critical lines which indicate that the model was correctly specified.

5. Conclusion and Recommendations

The results of the study provide strong empirical support for the presence of asymmetric effects in the transmission of monetary policy on inflation, justifying the use of a nonlinear ARDL (NARDL) framework. The correlation matrix reveals that inflation is moderately positively associated with the monetary policy rate (MPR) and negatively correlated with both the real interest rate (RINR) and exchange rate (EXR), indicating the sensitivity of inflation to interest rate dynamics and currency movements. Long-run NARDL results show that both positive and negative shocks to MPR significantly influence inflation, with tightening (positive shocks) having a slightly stronger effect, while EXR and broad money supply (MS2) are also significant and negatively related to inflation. In contrast, RINR and the liquidity ratio (LQDR) are insignificant in the long term. The short-run dynamics reinforce the presence of asymmetry, as MPR shocks have opposite effects tightening reduces inflation while loosening increases it with RINR, EXR, LQDR, and MS2 all exerting significant short-term effects. The error correction term confirms a stable adjustment toward long-run equilibrium, with approximately 59% of disequilibrium corrected each period, and the high explanatory power of the model ($R^2 = 0.968$) further underscores its robustness. Diagnostic tests confirm the reliability of the model, showing no evidence of heteroskedasticity or serial correlation. These findings align with the nonlinear policy transmission framework proposed by Shin et al. (2014) and contrast with the symmetric assumptions in Mishkin (2001) work, highlighting the complexity of monetary policy effects in dynamic economic environments and emphasizing the need for policymakers to consider asymmetric responses when formulating interest rate strategies. Based on the findings, three key recommendations emerge to enhance the effectiveness of monetary policy. First, policymakers should adopt asymmetric policy frameworks that account for the differing effects of interest rate increases and decreases; this can be addressed by integrating nonlinear models like NARDL into central bank policy analysis to better anticipate inflation responses to tightening or loosening. Second, given the significant short-run influence of exchange rate and money supply, authorities should strengthen exchange rate management and coordinate monetary with fiscal policy,

particularly in open economies where currency movements quickly affect inflation; this may involve targeted interventions and maintaining adequate foreign reserves. Third, the limited long-term impact of real interest rate and liquidity ratio suggests a need to reassess traditional policy tools, focusing instead on strengthening transmission mechanisms such as credit channels and financial market development to ensure real sector responsiveness. Together, these steps can support more responsive and effective monetary policy tailored to the specific dynamics of the domestic economy.

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