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Corridor-specific exchange rate dynamics in Bangladesh: An ARDL analysis during Covid-19 and political transition

This study investigates the macroeconomic determinants of the Bangladeshi Taka, quoted as BDT per foreign currency unit, against the US Dollar, Indian Rupee, and Euro using 78 monthly observations from January 2019 to June 2025, a period encompassing the COVID-19 pandemic and a major political transition. Employing a corridor-specific ARDL bounds testing approach with explicit structural break dummies, the analysis estimates short- and long-run relationships for remittances, foreign exchange reserves, consumer prices, trade balance, and domestic equity performance. Results reveal pronounced heterogeneity across corridors. Cointegration is confirmed for USD/BDT, where inflation emerges as the dominant long-run driver of depreciation, consistent with dominant currency pricing channels. In contrast, the long-run relationships for INR/BDT and EUR/BDT prove less stable over the turbulent sample period, suggesting these corridors are more susceptible to short-run shocks and regime changes that disrupted long-run equilibrium. In the INR corridor, remittances are associated with modest depreciation while reserve accumulation exerts stabilizing pressure. For EUR/BDT, inflation drives long-run depreciation, though structural instability limits the strength of the long-run evidence. The COVID-19 and transition dummies enter significantly across specifications, confirming that uncertainty amplifies exchange rate dynamics. The findings underscore the need for corridor-aware policy responses that prioritize inflation control, targeted reserve management, and remittance channel quality rather than uniform stabilization measures.

1. Introduction

Bangladesh's bilateral exchange rates have experienced pronounced volatility since 2019, reflecting the compounding effects of the COVID-19 pandemic and a major political transition beginning in August 2024. These shocks have strained the external sector, intensified inflationary pressures, and tested the resilience of macroeconomic policy frameworks (Bhattacharya et al., 2020; Hassaan et al., 2024). Understanding the determinants of exchange rate movements during such turbulent periods is essential for designing effective stabilization strategies, yet existing research remains fragmented. The literature has largely focused on how exchange rates affect other macroeconomic variables rather than the reverse channels that determine currency

value, while bilateral pairs of strategic importance, most notably INR/BDT, remain understudied despite deepening trade integration between Bangladesh and India (Rizve, 2025; Baijou & Zaraba, 2022).

This paper addresses these gaps through a corridor-specific analysis of USD/BDT, INR/BDT, and EUR/BDT using monthly data from January 2019 to June 2025. It integrates remittances, foreign exchange reserves, consumer prices, trade balance, and domestic equity performance within a unified ARDL bounds testing framework that explicitly incorporates COVID-19 and political transition dummies to account for structural breaks (Pesaran et al., 2001). The results reveal pronounced heterogeneity across corridors. Cointegration is confirmed for USD/BDT, with inflation emerging as the dominant long-run driver of depreciation, consistent with dominant currency pricing channels (Gopinath et al., 2020). In the INR corridor, remittances are associated with modest depreciation while reserve accumulation exerts stabilizing pressure. For EUR/BDT, persistent inflation drives long-run depreciation. The COVID-19 and transition dummies enter significantly in several specifications, confirming that uncertainty amplifies exchange rate adjustments and underscoring the need for corridor-aware policy responses.

2. Literature review

2.1 Rationale for study period and currency choice

The study adopts the period from January 2019 to June 2025 to capture two major events with significant economic and social implications: the COVID-19 pandemic and the government's collapse in 2024. The pandemic exerted pressure on Bangladesh's economy through global and domestic shocks, adversely affecting key macroeconomic indicators (Bhattacharya et al., 2020; Sayed et al., 2025). Beyond macroeconomic disruption, evidence shows that COVID-19 also altered exchange rate dynamics. Iyke (2020) finds that pandemic indicators such as infections per million had statistically significant predictive power for exchange rates in emerging markets, explaining short-term volatility and influencing longer-horizon predictability, thereby supporting a disease outbreak channel of exchange rate behavior. Similarly, Narayan (2020) demonstrates that COVID-19 changed the behavior of the Japanese yen versus the US dollar by reducing shock persistence, with the exchange rate shifting from non-stationary before the pandemic to mostly stationary during it, implying more transitory effects of shocks. These findings suggest that the pandemic not only destabilized macroeconomic fundamentals but also altered exchange rate resistance to shocks. The government's fall in August 2024 further introduced political uncertainty and potential policy disruptions likely to affect economic outcomes (Hassaan et al., 2024).

Three exchange rates are examined: USD/BDT, INR/BDT, and EUR/BDT, selected for their distinct economic relevance. The US dollar is central to Bangladesh's foreign reserves and dominates exchange-rate research, motivating inclusion of USD/BDT (M. N. M. Chowdhury et al., 2014; Biswas et al., 2023; Alam, 2012). The United States is also a major export destination, with bilateral trade reaching USD 12.4 billion in 2024 (Office of the United States Trade Representative, n.d.). Europe similarly represents a key export market and FDI source, with exports rising to US$23.2 billion in 2022–23 and net EU FDI totaling $3.5 billion between 2017–2021 (RAPID, 2023; Mahmud et al., 2024), supporting analysis of EUR/BDT and related forecasting work. Although trade with India is substantial, with exports reaching USD 1.76 billion in FY 2024–25 and imports USD 9 billion in FY 2023–24, academic research on INR/BDT remains limited, justifying its inclusion to address this gap (Rizve, 2025).

2.2 Remittance

Remittance flows have become a substantial and stable source of external income for developing countries, often exceeding official aid and forming a notable share of GDP, with global remittances surpassing $430 billion in 2011 and projected to reach $540 billion by 2016 (Meyer & Shera, 2016). While prior research links remittances to economic growth and financial development (Meyer & Shera, 2016; Azizi, 2020; Chowdhury et al., 2022), their effects on exchange rate dynamics remain comparatively underexplored. Empirical studies suggest remittances influence real and bilateral exchange rates through foreign exchange supply, domestic demand, and price adjustments, though findings are mixed. For Nigeria, Dynamic OLS estimates show remittances significantly increase the real exchange rate, implying real depreciation pressure (Adejumo & Ikhide, 2018). In contrast, evidence for Bangladesh using cointegration and VECM indicates remittances appreciate the real exchange rate and may weaken trade competitiveness, though trade openness and productive investment can mitigate these effects (Chowdhury & Rabbi, 2013). ARDL results for Bangladesh also find appreciation without conclusive Dutch Disease effects (Amin & Murshed, 2017). Broader cross-country work highlights the complex transmission from remittances to exchange rates, shaped by macroeconomic structure and price dynamics (Hassan & Holmes, 2012; Osigwe & Obi, 2016).

For Bangladesh's regional context, informal cross-border flows add another layer to exchange rate transmission. Pohit and Taneja (2003) show that informal India-Bangladesh trade is large and persistent due to institutional inefficiencies in formal systems, with traders relying on alternative mechanisms that reduce transaction costs, allowing such flows to endure despite liberalization. Consequently, in the INR corridor, substantial trade and financial flows may occur outside formal channels (Pohit & Taneja, 2003), potentially affecting foreign exchange supply and bilateral exchange rate dynamics beyond officially recorded remittance data. Given the mixed evidence and informal cross-border flows in the India-Bangladesh corridor, we hypothesize that remittance effects are corridor-specific. In the INR corridor, remittances may depreciate the BDT (positive coefficient) if they finance Indian imports or bypass official reserves. For USD and EUR corridors, the expected sign is ambiguous, as forex supply effects may be offset by import demand or other adjustments.

2.3 Consumer price index

The Consumer Price Index (CPI) is the principal instrument for measuring inflation and changes in the cost of living, constructed as a fixed-weight index that tracks a representative basket of goods and services over time and thereby informs monetary policy, economic analysis, and assessments of purchasing power (Bryan & Cecchetti, 1993). Considerable literature has examined how exchange-rate fluctuations transmit to domestic price levels: depreciation can raise import prices directly and, through relative price effects, stimulate demand for domestic tradables, strain productive capacity, increase input costs, and permit firms to raise mark-ups, generating both direct and indirect inflationary pressures as demonstrated in New Zealand (Orr et al., 1998). Country-specific studies extend these mechanisms to developing settings, with investigations in Nigeria, Iran, and Turkey highlighting similar exchange-rate inflation channels (Nuhu, 2021; Njoku & Emmanuel, 2019; Monfared & Akin, 2017; Abdurehman & Hacilar, 2016). The reverse direction, whether inflation feeds back to determine exchange-rate movements, has attracted less robust empirical support; for example, an unpublished Kenyan study found inflation to be an insignificant determinant relative to interest rates and monetary policy (Okoth, 2013). Empirical evidence for Bangladesh reveals a nuanced, sometimes bidirectional relation-

ship: high-frequency analysis indicates that exchange-rate volatility raises the CPI and that import volumes and taxes amplify price pressures amid weak domestic supply capacity (Islam et al., 2022); long-run ARDL estimates identify GDP, money supply, and interest rates as principal inflation drivers and show mixed effects for contemporary and lagged real exchange rates (Uddin et al., 2014); and more recent bounds testing suggests a stable long-run nexus in which higher interest rates appreciate the currency while inflation's effect on the nominal exchange rate is positive but statistically insignificant (Chowdhury, 2022). The paper hypothesizes that higher domestic inflation leads to BDT depreciation across all corridors, with stronger effects in the USD corridor due to dollar-denominated trade invoicing and in the EUR corridor due to Bangladesh's higher-value imports from the Eurozone (EU Trade Relations with Bangladesh, n.d.).

2.4 Foreign currency reserves

Foreign currency reserves constitute a central pillar of macroeconomic stability, representing the stock of foreign currencies that a central bank holds to meet international obligations, support monetary policy, and buffer against external shocks (Rana, 2024). For emerging and developing economies such as Bangladesh, adequate reserves are crucial to ensure payment capacity, underwrite import needs, and maintain exchange-rate credibility, thereby reducing vulnerability to balance-of-payments disruptions and preserving investor confidence (Naima et al., 2024). Empirical investigations across diverse country settings, employing a range of time-series techniques, yield mixed evidence on the reserves–exchange rate nexus. In Nigeria, ARDL analysis and correlation matrices indicate a positively significant association between the real exchange rate and reserves, while the nominal rate's link is positive but statistically insignificant (Kalu et al., 2019). Monthly data cointegration analysis for China identifies a single long-run relationship in which the real exchange rate exerts a significant positive effect on reserves, whereas real interest-rate differentials appear positively signed but insignificant (Narayan & Smyth, 2006). By contrast, VAR-based causality and cointegration tests for India reveal no robust short- or long-run association between exchange-rate movements and reserves (Raju & Gokhale, 2013). In Bangladesh, the literature has predominantly concentrated on the determinants of foreign exchange reserves rather than on how reserves influence exchange-rate behavior, with studies characterizing reserve dynamics and their macroeconomic drivers (Chowdhury et al., 2014; Islam, 2021). Accordingly, increases in foreign exchange reserves are hypothesized to strengthen the taka, reflected in a negative coefficient, with the strongest effect expected in the INR corridor given the policy emphasis on reserve management to maintain regional stability.

2.5 Dhaka Stock Exchange

The Dhaka Stock Exchange (DSE), as one of Bangladesh's two principal exchanges, performs essential functions, facilitating listings, providing an automated trading platform, settling transactions, issuing periodic reviews, monitoring listed firms, and protecting investor funds through regulatory frameworks, and its price series serves as a sensitive indicator of investors' wealth and expectations (Sani et al., 2025). Despite the DSE's systemic importance, empirical inquiry into the effects of exchange-rate movements on its performance is relatively sparse; extant literature from other jurisdictions yields mixed evidence regarding the exchange-rate-stock nexus. For example, volatility analysis for South Africa using a GARCH(1,1) model finds only a weak linkage between currency volatility and stock-market performance, implying limited exposure to exchange-rate shocks (Mlambo et al., 2013), while cross-country bounds-testing work across twelve emerging markets documents that exchange-rate uncertainty significantly influences

stock-market development in most cases, with heterogeneity in magnitude and sign driven by structural characteristics (Hajilee & Nasser, 2014). More recent high-frequency analysis of the seven E7 economies identifies cointegration between exchange rates and stock returns, a generally positive long-run relationship (except for Indonesia), and modest effects of exchange-rate inclusion on return volatility in GARCH specifications (El-Diftar, 2023). Within Bangladesh, research has predominantly treated the stock market as a dependent variable influenced by macroeconomic forces: studies demonstrate that foreign exchange reserves, exchange rates, and oil prices materially shape DSE movements (Golder et al., 2020), and earlier daily-data analysis reports that roughly 73.18% of DSE return variation is attributable to BDT/USD exchange-rate movements (Alam, 2013). The relationship between stock market performance and exchange rates is hypothesized to be theoretically ambiguous. A positive coefficient would imply that stronger equity performance reflects capital inflows exerting depreciating pressure on the currency, whereas a negative coefficient would suggest that domestic market confidence outweighs portfolio flow effects and supports the exchange rate.

2.6 Balance of trade

The balance of trade (BoT), defined as the difference between a country's exports and imports of goods and services, constitutes the largest component of the balance of payments and serves as a principal indicator of external economic transactions, with exports and imports identified as its primary determinants (Ektiarnanti et al., 2021). Gross Domestic Product (GDP) also shapes trade dynamics since expansions in domestic output and income tend to raise import demand, thereby exerting downward pressure on the trade balance (Ektiarnanti et al., 2021; Rahmawati, 2014). Empirical research on the exchange-rate-trade nexus produces nuanced and sometimes divergent findings: sectoral and temporal heterogeneity characterize the adjustment process, with some studies documenting partial support for the J-curve; an initial deterioration in the trade balance following depreciation, followed by subsequent improvement, while others observe long-run improvements absent a clear short-run J-curve (illustrative cases include Vural, 2016; Baharumshah, 2001). While numerous investigations focus on how exchange-rate movements influence trade performance (Rinaldi et al., 2019; Rahman et al., 2023), far fewer examine the reverse causation from trade outcomes to exchange-rate dynamics. Where this reverse linkage has been studied, results indicate that trade components may enter long-run cointegrating relationships with exchange rates but frequently exert indirect or weaker short-run effects relative to broader macro fundamentals: for example, annual analysis for Morocco finds cointegration among exports, imports, GDP, and exchange rate with GDP and inflation Granger-causing exchange- rate movements, whereas trade-balance components display only indirect long-run associations (Baijou & Zaraba, 2022). In Bangladesh, the literature has predominantly concentrated on exchange-rate effects on trade, yielding mixed evidence for J-curve dynamics (Aziz, 2012; Khatoon et al., 2021), with a small subset of studies linking trade fundamentals to exchange- rate behavior and identifying factors such as trade liberalization, debt burdens, capital inflows, and terms-of-trade shifts as important drivers of real exchange-rate adjustment (Rahman & Basher, 2001). A smaller trade deficit is hypothesized to appreciate the taka, reflected in a negative coefficient, with the strongest effect expected in the USD corridor due to the predominance of dollar-denominated trade. This expectation reflects the greater sensitivity of the exchange rate to trade outcomes in corridors where invoicing currency aligns with major import and export transactions.

2.7 Political uncertainty, crises, and exchange rates

Political uncertainty and large-scale crises significantly influence exchange rates through risk premia, volatility, and capital flows. Pástor and Veronesi (2013) show that heightened political uncertainty reduces the credibility of government policies, prompting risk-averse behavior that raises asset risk premia and increases market volatility. Similarly, Ahir et al. (2022) demonstrate that global uncertainty, including pandemic-related shocks, depresses output and disrupts financial markets, with emerging economies experiencing larger and more persistent effects due to weaker institutions and financial constraints.

These dynamics help explain why different currency corridors respond differently to crises. Kumar and Prabheesh (2023) find that reserve currencies such as the USD often act as safe havens during periods of uncertainty, while regional currencies are more vulnerable to shocks. This provides a theoretical justification for including COVID-19 and political transition dummies in our analysis, as they capture periods of elevated uncertainty that affect exchange rate behavior. This theoretical lens also implies that the relative stability of long-run relationships across corridors may depend on both crisis intensity and the specific role each currency plays in global and regional financial systems.

2.8 Research gap, hypotheses summary, and methodological positioning

Despite advances, the literature remains fragmented with salient gaps: recent work has elucidated how remittances, inflation, reserves, and exchange-rate volatility affect macroeconomic outcomes in Bangladesh and comparable economies (Azizi, 2020; Chowdhury et al., 2022; Islam et al., 2022; El-Diftar, 2023), yet empirical attention remains largely unidirectional, privileging exchange-rate impacts on prices, trade, or equity returns rather than reciprocal causation. Evidence for reverse linkages is sparse and context-bound, reducing external validity (Baijou & Zaraba, 2022). Bilateral pairs of policy relevance, most notably INR/BDT, are understudied despite expanding India–Bangladesh trade (Rizve, 2025), and recent calls emphasize integrated analyses of reserves and macro-financial stability (Naima et al., 2024; Rana, 2024). Methodologically, few recent high-frequency, multivariate studies jointly model remittances, reserves, CPI, trade balance, and stock markets across USD/BDT, EUR/BDT, and INR/BDT to capture post-COVID structural breaks and volatility transmission (Biswas et al., 2023; Mahmud et al., 2024; Golder et al., 2020). These conceptual and methodological limitations also extend to how political uncertainty and crisis dynamics are incorporated into exchange rate analysis.

In this broader context, the literature on political uncertainty, crises, and exchange rate dynamics has grown substantially, including studies that apply asymmetric methods such as the nonlinear autoregressive distributed lag (NARDL) model. Shin et al. (2014) developed the NARDL framework to capture asymmetric responses to positive versus negative shocks, a methodological advance widely adopted in subsequent research. Bahmani-Oskooee et al. (2016) applied asymmetry analysis to Pakistan–US trade at the industry level, finding that exchange rate volatility affects approximately half of all industries in the short run, with long-run effects concentrated in key sectors such as textiles. While valuable, these studies focus primarily on asymmetric trade responses rather than on the determinants of exchange rates themselves, and they do not compare multiple bilateral corridors for a single country.

Our study addresses this gap by examining corridor-specific effects across Bangladesh's three principal exchange rates: USD/BDT, INR/BDT, and EUR/BDT. Unlike prior work on asymmetry, we employ linear ARDL models to test whether the same

macroeconomic determinants, namely remittances, foreign reserves, CPI, trade balance, and the DSEX index, exert different effects across corridors. This approach captures corridor heterogeneity rather than nonlinear asymmetry. Understanding such heterogeneity is crucial for policymakers because interventions effective in one corridor may not translate to others, even under similar macroeconomic conditions.

Based on the reviewed literature and our corridor-specific focus, we formulate the following testable hypotheses (summarized with expected signs in Table 1):

- H1 (Remittances): Remittance inflows exert corridor-specific pressure on the exchange rate. In the INR corridor, remittance-driven demand for Indian imports may lead to BDT depreciation (positive coefficient); effects in other corridors are ambiguous a priori.
- H2 (Foreign reserves): Increases in foreign exchange reserves stabilize and appreciate the taka (negative coefficient), with the effect most pronounced in the INR corridor where regional reserve management is active.
- H3 (CPI): Rising domestic inflation depreciates the currency (positive coefficient) across all corridors via purchasing power parity channels, with the strongest effects anticipated in the USD/BDT corridor (due to dollar trade invoicing) and the EUR/BDT corridor (due to high value import content from the Eurozone).
- H4 (Trade balance): Improvements in the trade balance (smaller deficit) appreciate the taka (negative coefficient), with effects likely strongest in the USD corridor where trade is predominantly dollar-invoiced.
- H5 (DSEX): The relationship between stock market performance and exchange rates is theoretically ambiguous, reflecting opposing forces of capital inflows and domestic confidence.
- H6 (COVID-19 and transition dummies): Pandemic shocks and political transitions temporarily disrupt exchange rate dynamics, with the direction and magnitude varying by corridor.

Table-1 Expected signs by corridor

Variable	USD/BDT	INR/BDT	EUR/BDT	Rationale
Remittances (REM)	?	+	?	INR corridor: remittance-driven demand for Indian imports (healthcare, education, tourism) may depreciate BDT; other corridors ambiguous due to mixed evidence in literature
Foreign Reserves (FER)	?	–	?	Reserve accumulation stabilizes and appreciates the taka (negative coefficient), strongest in the INR corridor; effects in USD and EUR corridors are uncertain due to less targeted reserve management.
Consumer Price Index (CPI)	+	?	+	Purchasing power parity channel: higher inflation depreciates currency; strongest in USD/EUR corridors due to trade invoicing and import content
Balance of Trade (BOT)	–	?	?	Improvement in trade balance (smaller deficit) reduces demand for foreign currency, appreciating the taka; effect likely strongest in USD corridor where trade is dollar-invoiced

DSEX Index	?	?	?	Theoretically ambiguous: positive if stock market strength reflects capital inflows (depreciating pressure); negative if it reflects domestic confidence (appreciating pressure)
COVID-19 Dummy	?	?	?	Pandemic disruptions expected to affect exchange rates, but direction uncertain a *priori*; may vary by corridor depending on trade and remittance exposure
Transition Dummy	?	?	?	Political uncertainty typically weakens currency (depreciation), but magnitude may differ across corridors

Note:(+) indicates expected BDT depreciation (increase in exchange rate); (–) indicates expected BDT appreciation (decrease in exchange rate); (?) indicates uncertain or context-dependent expectation based on existing literature.

3. Data and methodology

3.1 Introduction

This study adopts an exploratory stance to identify the key macroeconomic determinants of Bangladesh's bilateral exchange rates and to assess the direction and magnitude of their relationships. Rather than aiming to model the precise dynamics of equilibrium adjustment, we focus on corridor specific short and long run elasticities. The empirical framework is the Autoregressive Distributed Lag (ARDL) bounds testing approach of Pesaran et al. (2001), applied to monthly data from January 2019 to June 2025. This period captures the COVID 19 pandemic and the subsequent political transition in Bangladesh, events that may have induced structural breaks in the relationships.

The analysis proceeds in several steps: (i) unit root tests to verify that no variable is I(2); (ii) structural break tests to motivate the inclusion of regime dummies; (iii) ARDL model selection using the Akaike Information Criterion (AIC), including dummy variables for the pandemic and political transition; (iv) bounds testing for cointegration, both with and without dummies; (v) estimation of long run multipliers with standard errors obtained via the delta method; and (vi) a battery of diagnostic tests to validate the chosen specifications. All computations are performed in Python using the Google Colab environment.

3.2 Data description

Monthly data for all variables were obtained from the Bangladesh Bank's "Monthly Economic Trends" bulletins, covering January 2019 through June 2025. The choice of this sample period is deliberate: it spans the COVID 19 crisis (from March 2020) and the political transition that began in August 2024. All series are actual, not forecasted.

Table 2 lists the variables together with their abbreviations and the transformations applied. Exchange rates, remittance inflows, foreign exchange reserves, and the Dhaka Stock Exchange index (DSEX) are taken in natural logarithms so that their coefficients can be interpreted as elasticities. The Consumer Price Index (CPI) is used in its raw point to point form (percentage change), because logging a rate would distort its interpretation; the coefficient on CPI therefore measures the semi elasticity – the percentage change in the exchange rate for a one percentage point change in inflation. The balance of trade (BoT) is expressed in millions of US dollars and is kept at levels because it contains negative values throughout the sample; logging is not feasible, and the coefficient is interpreted as the percentage change in the exchange rate per USD 1 - million change in the trade balance.

Table-2 Variable description

Variable	Description	Abbreviation
Dependent Variables	Dependent Variables	
USD/BDT Exchange Rate	Log of monthly average spot rate	USD
INR/BDT Exchange Rate	Log of monthly average spot rate	INR
EUR/BDT Exchange Rate	Log of monthly average spot rate	EUR
Independent Variables	Independent Variables	
Remittance Inflows	Log of monthly remittance (USD)	REM
Balance of Trade	Export - Import, USD	BOT
Foreign Exchange Reserves	Log of gross foreign reserves (USD)	FER
Consumer Price Index	CPI (Point-to-Point)	CPI
Dhaka Stock Exchange Index	Log of DSEX index value	DSEX

Note: All data covering exchange rates, remittances, reserves, trade balance, consumer prices, and the DSEX index are obtained from Bangladesh Bank's "Monthly Economic Trends" publication (Bangladesh Bank, 2024).

Table 3 presents descriptive statistics for the raw (non logged) variables to provide an intuitive overview of the data.

Table-3 Descriptive statistics of all variables

	USD	INR	EUR	DSEX	REM	BOT	FER	CPI
Mean	96.824	1.238	107.023	5653.80	1907.57	-19035.00	34248.75	7.52
Standard Deviation	14.179	0.103	13.947	808.19	408.92	6436.76	7275.56	2.04
Minimum	83.940	1.120	91.990	3989.08	1092.96	-31488.40	24197.19	5.02
Maximum	122.872	1.437	141.105	7329.03	3295.63	-5702.51	48059.99	11.66
Count	78	78	78	78	78	78	78	78

Source: Authors' calculation

The summary statistics reveal notable macroeconomic patterns over the sample period. The Bangladeshi Taka experienced substantial depreciation against all three currencies, as reflected in the relatively high mean values and wide dispersion of USD/BDT, INR/BDT, and EUR/BDT rates. Remittance inflows and foreign exchange reserves display large magnitudes and considerable variability, underscoring their central role in external sector stability. The consistently negative mean of the balance of trade (BOT) confirms a persistent trade deficit, while the CPI series indicates a period of elevated inflationary pressure.

3.3 Unit Root tests

Prior to model estimation, the stationarity properties of the variables were examined using the Augmented Dickey Fuller (ADF) test. Establishing the order of integration is a critical prerequisite for the ARDL bounds testing approach, which is valid only when none of the variables are integrated of order I(2) or higher. The results, presented in Table 3.3, confirm that the variables are a mix of I(0) and I(1) processes, validating the use of the ARDL methodology.

- Remittances (REM) and Foreign Exchange Reserves (FER) are stationary at level [I(0)], with ADF statistics of -3.05 (p=0.03) and -4.25 (p=0.001) respectively.
- The exchange rates (USD, INR, EUR), along with the Balance of Trade (BOT), Consumer Price Index (CPI), and the DSEX index, are non stationary at the level but become stationary after first differencing, i.e., I(1).

Table-4 Results of augmented Dickey Fuller Unit Root tests

Variable	Level ADF Statistic (p-value)	First Difference ADF Statistic (p-value)	Order of Integration
USD	0.685 (0.990)	-5.367 (0.000)	I(1)
INR	0.353 (0.980)	-8.010 (0.000)	I(1)
EUR	0.518 (0.985)	-6.592 (0.000)	I(1)
REM	-3.052 (0.030)	-	I(0)
BOT	-2.200 (0.206)	-13.415 (0.000)	I(1)
FER	-4.252 (0.001)	-	I(0)
CPI	-1.024 (0.744)	-11.125 (0.000)	I(1)
DSEX	-1.126 (0.704)	-6.527 (0.000)	I(1)

Source: Authors' calculation

3.4 Structural Break tests

Because the sample includes the COVID 19 pandemic and the 2024 political transition, we test for structural breaks in each exchange rate series using the Zivot–Andrews test, which allows for a single break of unknown timing in the intercept, trend, or both. For none of the three exchange rates is the break significant at the 5% level. However, given the relatively small sample size (78 monthly observations) and because unit root and structural break tests can exhibit low power in finite samples, we introduce two dummy variables to control for these major exogenous shocks (Sathyanarayana & Mohanasundaram, 2025).

Such dummy variables are commonly used in ARDL models to account for major exogenous shocks or regime shifts, complementing structural break tests by capturing known events that may influence the system; for example, they can be included to control for shocks such as financial crises (Omar et al., 2022) or pandemics that are expected to affect variable relationships over time.

- COVID dummy: The COVID-19 dummy variable equals 1 from March 2020 to December 2021 (the period of the most severe pandemic-related disruptions) and 0 otherwise. Major infection waves in Bangladesh, particularly the Delta surge in 2021, subsided by early November 2021, and conditions began stabilizing toward the end of the year (Hasan, 2021); therefore, December 2021 is used as the end of the COVID-19 dummy period.
- Transition dummy = 1 from August 2024 onward (the start of the political transition), 0 otherwise.

These dummies are included in the ARDL models as additional exogenous regressors; their optimal lag structure is determined jointly with the other variables during model selection.

3.5 ARDL model specification

For each exchange rate corridor, we estimate an ARDL model of the general form

$$\Delta Y_t = \alpha + \sum_{i=1}^{p-1} \gamma \Delta Y_{t-i} + \sum_{j=1}^{k} \sum_{l=0}^{q_j} \beta_{j,l} \Delta X_{j,t-l} + \theta_1 Y_{t-1} + \sum_{j=1}^{k} \theta_{j+1} X_{j,t-1} + \sum_{m} \delta_m D_{m,t} + \varepsilon_t$$

where Y_t is the log exchange rate, $x_{j,t}$ are the explanatory variables (REM, BOT, FER, CPI, DSEX), $D_{m,t}$ are the dummy variables, and ε_t is a white noise error term. Lag orders are selected by minimizing the AIC using the *ardl_select_order* function in stats models, with maximum lags set to 2 for the dependent variable and 3 for the regressors (including the dummies). The selection is performed on a common set of candidate variables, but the final specifications differ across corridors because the

AIC may exclude variables that do not improve model fit.

The corridor specific specifications selected by the AIC are:

- USD/BDT: ARDL(2,0,1) with BOT and CPI (dummies not retained).
- INR/BDT: ARDL(1,1,0,0,3) with REM, FER, DSEX, and the COVID dummy (lagged up to three periods).
- EUR/BDT: ARDL(1,2,3,0,1) with REM, CPI, DSEX, and the transition dummy (lagged one period).

3.6 Bounds testing for cointegration

The existence of a long run (cointegrating) relationship is tested by an F-test on the level lag coefficients in the error correction representation above. Because the asymptotic distribution of this test statistic is non standard, we compare the computed F-statistic with the critical value bounds tabulated by Pesaran et al. (2001) for the case of a restricted intercept and no trend. The null hypothesis of no cointegration is rejected if the F-statistic exceeds the upper bound I (1); it cannot be rejected if it lies below the lower bound I (0); and the result is inconclusive if it falls between the two bounds.

We perform the bounds test twice for each corridor: first with only the core economic variables, then including the dummy variables that entered the final ARDL model. This allows us to assess whether the regime dummies help to establish cointegration.

3.7 Long run multipliers

Where cointegration is confirmed, the long run multiplier (or elasticity) for a variable is calculated as:

$$\lambda_j = \frac{\sum_{l=0}^{q_j} \beta_{j,l}}{1 - \sum_{i=1}^{p} \gamma_i}$$

Standard errors for these multipliers are obtained via the delta method, which takes into account the covariance structure of the estimated short run coefficients. The gradient vector with respect to the underlying ARDL parameters is constructed, and the variance of λ_j is computed as $\nabla \lambda_j' \, COV(\hat{\beta}, \hat{\gamma}) \nabla \lambda_j$. The corresponding *z*-statistic and *p*-value are then derived under the assumption of asymptotic normality.

For models where the bounds test is inconclusive, the long run multipliers are reported only as suggestive and are interpreted with caution.

3.8 Diagnostic tests

To validate the estimated ARDL models, we perform a series of diagnostic checks on the residuals:

- *Serial correlation:* Ljung Box test (lags 2,4,6) and Durbin Watson statistic.
- *Heteroskedasticity:* White's test (regressing squared residuals on fitted values and their squares).
- *Normality:* Jarque Bera test.
- *Stability:* Cumulative sum (CUSUM) and cumulative sum of squares (CUSUMSQ) tests based on recursive residuals. Because the standard statsmodels implementation of recursive residuals is not directly compatible with ARDL objects, we compute them manually by sequentially estimating the model on expanding windows and plotting the resulting statistics together with the 5% significance bounds.

All diagnostic results are summarized in Section 4 and confirm that the models are adequately specified (no serial correlation or heteroskedasticity, but some non normality, which is common in financial time series). The stability plots are presented in Appendix Figures A1–A3.

4. Empirical findings

This section presents the estimated short- and long-run dynamics of Bangladesh's bilateral exchange rates using the ARDL framework for USD/BDT, INR/BDT, and EUR/BDT. Model specification and lag

selection followed the Akaike Information Criterion (AIC) via the ardl_select_order() function in stats models, ensuring statistically robust and parsimonious models. For each corridor, we first report the bounds test for cointegration both with and without the regime dummies introduced in Section 3, and then present both the short-run coefficients and, where cointegration is confirmed or at least suggestive, the long-run multipliers with their standard errors and p values. Diagnostic checks (serial correlation, heteroskedasticity, normality, and parameter stability) are summarized to validate the estimated relationships. Visual representations of the raw data series are provided in Appendix Figures B1–B9. All variables are transformed as described in Table 3.1: exchange rates, remittances, reserves, and DSEX enter in natural logs (coefficients are elasticities); CPI is the raw point-to-point inflation rate (coefficients are semi-elasticities); and the balance of trade (BOT) is in millions of US dollars (coefficient is the percentage change in the exchange rate per USD 1 million change in BOT).

4.1 USD/BDT results

The AIC selected specification for the US dollar corridor is an ARDL (2,0,1) model that includes the balance of trade (BOT) and consumer price index (CPI). Neither the COVID dummy nor the transition dummy was retained by the information criterion, suggesting that for the USD/BDT relationship, the core macroeconomic variables alone provide the best fit over the sample period.

4.1.1 Short run dynamics

Table 5 presents the short run estimation results. The exchange rate exhibits strong persistence, with the first lag of USD significant and positive (1.2309, $p<0.01$) and the second lag negative and significant (−0.2936, $p<0.01$), indicating a pattern of partial correction following initial movements. Improvements in the trade balance are associated with immediate BDT appreciation, as the contemporaneous BOT coefficient is negative and marginally significant at the 10% level (−1.326e 07, $p=0.059$). The effect of inflation is delayed: while the contemporaneous CPI coefficient is insignificant, the one month lag (0.0021, $p=0.023$) shows that higher inflationary pressure exerts depreciating pressure on the taka with a short lag.

Table-5 Short run estimation results – USD/BDT (ARDL (2,0,1))

Variable	Coefficient	Std. Error	z-statistic	p-value
const	0.1078	0.035	3.076	0.003
USD.L1	1.2309	0.114	10.845	0
USD.L2	−0.2936	0.108	−2.720	0.008
BOT.L0	−1.326e-07	6.9e-08	−1.922	0.059
CPI.L0	−3.966e-05	0.001	−0.048	0.962
CPI.L1	0.0021	0.001	2.32	0.023

Source: Authors' calculation

4.1.2 Cointegration and long run multipliers

Bounds tests for cointegration are reported in Table 6. Both the model with only the core variables and the model that additionally includes the two dummies yield F-statistics well above the upper critical bound at the 5% level, providing strong evidence of a stable long run equilibrium relationship for USD/BDT.

Table-6 Bounds test results – USD/BDT

Model	F-statistic	5% I(0) bound	5% I(1) bound	Conclusion
Core variables only	4.38	2.39	3.38	Cointegration confirmed
Including dummies	3.73	2.39	3.38	Cointegration confirmed

Source: Authors' calculation

Because cointegration is confirmed, we can interpret the long run multipliers in Table 7 as reliable elasticities. The estimated long run effect of CPI is positive and highly significant: a one percentage point increase in the point to point inflation rate is associated with a 3.25% depreciation of the taka against the US dollar (0.0325×100). The balance of trade has a negative coefficient, as expected (an improvement in the trade balance appreciates the currency), but the effect is very small and only marginally significant at the 10% level.

Table-7 Long Run Multipliers – USD/BDT

Variable	Long-run multiplier	Std. Error	z-statistic	p-value
BOT	-0.000002	0.000001	-1.693	0.09
CPI	0.0325	0.0038	8.481	0

Source: Authors' calculation

4.1.3 Diagnostic tests

Diagnostic tests on the USD/BDT residuals indicate no serial correlation (Ljung Box $p > 0.05$ at all lags, Durbin Watson=1.88) and homoskedasticity (White test p=0.338). The Jarque Bera test, however, rejects normality ($p<0.001$), a common finding in financial time series. Parameter stability, assessed by the manual CUSUM and CUSUMSQ tests (Appendix Figure A1), shows that the CUSUM statistic remains within the 5% critical bounds throughout the sample, while the CUSUMSQ exhibits a brief excursion near the end, possibly reflecting the volatility associated with the political transition. The Zivot Andrews test detected no significant structural break in the USD/BDT series itself (p=0.407).

4.2 INR/BDT results

For the Indian rupee corridor, AIC selected an ARDL (1,1,0,0,3) specification that includes remittances (REM), foreign exchange reserves (FER), the DSEX index, and the COVID dummy with lags up to three periods. The transition dummy was not retained.

4.2.1 Short run dynamics

Table 8 presents the short run results. The exchange rate shows strong persistence, with the lagged dependent variable coefficient large and highly significant (INR.L1 = 0.8017, $p<0.01$). Remittance inflows and foreign exchange reserves exert opposing contemporaneous effects. A 1% increase in remittances is associated with a 0.027% rise in INR/BDT (depreciation) at time t, while a 1% rise in reserves corresponds to a 0.058% fall in INR/BDT (appreciation). The DSEX index enters positively and significantly (0.0316, $p<0.01$), indicating that stronger domestic equity performance is contemporaneously associated with rupee appreciation or slight taka depreciation. The COVID dummy is significant at various lags, with the contemporaneous effect negative (–0.0104, $p<0.01$) and the lagged effects alternating in sign, capturing the complex pandemic period dynamics.

Table-8 Short run estimation results – INR/BDT (ARDL (1,1,0,0,3)

Variable	Coefficient	Std. Error	z-statistic	p-value
const	0.0076	0.077	0.099	0.921
INR.L1	0.8017	0.047	16.883	0
REM.L0	0.0268	0.01	2.748	0.008
REM.L1	0.0205	0.011	1.942	0.056
FER.L0	−0.0577	0.019	−3.076	0.003
DSEX.L0	0.0316	0.011	2.919	0.005
COVID.L0	−0.0104	0.004	−2.846	0.006
COVID.L1	0.0092	0.005	1.946	0.056
COVID.L2	0.0074	0.005	1.567	0.122
COVID.L3	−0.0083	0.004	−2.147	0.035

Source: Authors' calculation

4.2.2 Cointegration and long run multipliers

Bounds tests (Table 9) give a mixed picture. With only the core variables, the F-statistic (2.74) falls between the lower and upper bounds, making the test inconclusive. When the COVID dummy is added, the statistic drops slightly to 2.33, which lies below the I(0) bound, suggesting no cointegration. Given the inconclusive nature of these results, the long run multipliers reported below should be interpreted with caution; they are suggestive rather than definitive.

Table-9 Bounds test results – INR/BDT

Model	F-statistic	5% I(0) bound	5% I(1) bound	Conclusion
Core variables only	2.74	2.39	3.38	Inconclusive
Including dummies	2.33	2.39	3.38	No cointegration

Source: Authors' calculation

With this caveat in mind, the estimated long run multipliers (Table 10) are statistically significant and economically meaningful. A 1% increase in remittance inflows is associated with a 0.24% depreciation of the taka against the rupee. Foreign exchange reserves exert a stabilizing influence: a 1% rise in reserves leads to a 0.29% appreciation (negative coefficient). The DSEX index also shows a positive long run association with INR/BDT (0.16% depreciation for a 1% increase in equity prices).

Table-10 Long run multipliers – INR/BDT

Variable	Long-run multiplier	Std. Error	z-statistic	p-value
REM	0.2388	0.0452	5.285	0
FER	-0.2912	0.0563	-5.17	0
DSEX	0.1593	0.0555	2.869	0.004

Source: Authors' calculation

4.2.3 Diagnostic tests

Diagnostic checks confirm no serial correlation (Ljung Box p>0.05, Durbin Watson=1.92) and homoskedasticity (White p=0.418). The residuals are non normal (Jarque Bera p=0.017). The CUSUM statistic stays within the 5% bounds, but the CUSUMSQ again shows some instability (Appendix Figure A2), consistent with the sample's exceptional events. The Zivot Andrews test for the INR/BDT series itself found no significant break (p=0.838).

4.3 EUR/BDT results

For the euro corridor, AIC selected an ARDL (1, 2, 3, 0, 1) model that includes remittances (REM), CPI, DSEX, and the transition dummy (lagged one period). The COVID dummy was not retained.

4.3.1 Short run dynamics

Table 11 presents the short run results. The lag structure shows strong persistence (EUR.L1 = 0.8686, p<0.01). Remittance inflows affect EUR/BDT in alternating directions across lags: positive at lag 0 (0.0294, p=0.044) and lag 1 (0.0563, p=0.001), but negative at lag 2 (−0.0351, p=0.024). This oscillating pattern suggests short term adjustments in response to remittance inflows, possibly reflecting liquidity effects followed by currency rebalancing. The contemporaneous CPI coefficient is negative (−0.0036, p=0.039), indicating that inflationary pressure may initially coincide with a mild BDT appreciation, though the positive lagged effects (CPI.L2 = 0.0043, p=0.042) eventually dominate. The transition dummy is significant at lag 1 (−0.0224, p = 0.008), capturing the post August 2024 regime shift.

Table-11 Short run estimation results – EUR/BDT (ARDL (1,2,3,0,1)

Variable	Coefficient	Std. Error	z-statistic	p-value
const	0.1514	0.079	1.923	0.059
EUR.L1	0.8686	0.042	20.916	0
REM.L0	0.0294	0.014	2.055	0.044
REM.L1	0.0563	0.017	3.399	0.001
REM.L2	−0.0351	0.015	−2.318	0.024
CPI.L0	−0.0036	0.002	−2.103	0.039
CPI.L1	−0.0002	0.002	−0.077	0.939
CPI.L2	0.0043	0.002	2.073	0.042
CPI.L3	0.0029	0.002	1.643	0.105
DSEX.L0	−0.0197	0.014	−1.453	0.151
TRANS.L0	0.0143	0.008	1.787	0.079
TRANS.L1	−0.0224	0.008	−2.743	0.008

Source: Authors' calculation

4.3.2 Cointegration and long run multipliers

Bounds tests (Table 12) are inconclusive for both the core variables model (F = 2.99) and the model including the transition dummy (F = 2.73), as both statistics lie between the 5% bounds. Long run multipliers are therefore reported as suggestive only.

Table-12 Bounds test results – EUR/BDT

Model	F-statistic	5% I(0) bound	5% I(1) bound	Conclusion
Core variables only	2.99	2.39	3.38	Inconclusive
Including dummies	2.73	2.39	3.38	Inconclusive

Source: Authors' calculation

With this caution, the estimated long run relationships (Table 13) point to a strong positive effect of remittances: a 1% increase in remittances is associated with a 0.39% depreciation of the taka against the euro. CPI also has a positive and significant semi elasticity: a one percentage point rise in inflation leads to a 2.6% depreciation. The DSEX coefficient is negative but not statistically significant.

Table-13 Long run multipliers – EUR/BDT

Variable	Long-run multiplier	Std. Error	z-statistic	p-value
REM	0.3857	0.1199	3.217	0.001
CPI	0.0263	0.0051	5.17	0
DSEX	-0.1498	0.112	-1.338	0.181

Source: Authors' calculation

4.3.3 Diagnostic tests

Diagnostic tests for the EUR model show no serial correlation (Ljung Box p>0.05, Durbin Watson=1.79) and homoskedasticity (White p=0.289). Residuals are again non normal (Jarque Bera p=0.001). The CUSUM plot indicates parameter stability, while the CUSUMSQ shows some instability (Appendix Figure A3), as observed for the other corridors. The Zivot Andrews test found no significant break in the EUR/BDT series (p=0.878).

4.4 Summary of cross corridor findings

Table 14 summarizes the key results across the three exchange rate corridors. Cointegration is firmly established only for USD/BDT; for INR/BDT and EUR/BDT, the evidence is inconclusive or points to the absence of a stable long run relationship. Despite this, the estimated long run effects for INR and EUR are broadly consistent with economic theory and with the findings for the US dollar, where comparable variables appear. Remittances consistently show a depreciating effect on the taka (positive coefficient), while foreign exchange reserves (significant only for INR) exert a stabilizing (negative) influence. Inflation (CPI) is a robust driver of depreciation in both the USD and EUR corridors. The trade balance and stock market index have less consistent effects across the three currency pairs.

Table-14 Summary of long run effects across corridors

Variable	USD/BDT	INR/BDT	EUR/BDT
Cointegration	Confirmed	Inconclusive / No	Inconclusive
REM		+0.24***	+0.39***
FER		–0.29***	
CPI	+0.03***		+0.03***
BOT	NS		
DSEX		+0.16**	NS
COVID dummy		Significant lags	
Transition dummy			L1 significant

Source: Authors' calculation

*Note:***p<0.01, **p<0.05, *p<0.1. 'NS' denotes not significant at the 5% level (e.g., USD/BDT BOT is significant only at the 10% level, p=0.09). '--' indicates variable not retained in final model.*

5. Discussion and policy implications

5.1 Corridor-specific heterogeneity in exchange rate determination

This study's central contribution is to demonstrate that Bangladesh's exchange rate dynamics are corridor-specific rather than uniform across currencies. The same macroeconomic variables do not behave in the same way in USD/BDT, INR/BDT, and EUR/BDT, and the strength of the evidence differs by corridor. The USD corridor exhibits confirmed cointegration and a stable long-run relationship, while the INR and EUR corridors show economically meaningful short-run dynamics but weaker long-run stability. These differences are not weaknesses. They are substantive findings that support the argument that bilateral exchange rate behavior depends on trade invoicing structure, remittance usage patterns, reserve management practices, and crisis transmission mechanisms. This confirms the gap identified in the literature, where empirical attention has remained largely unidirectional and insufficiently bilateral, particularly for INR/BDT despite deep trade integration between Bangladesh and India.

The persistence observed in all three corridors is consistent with broader emerging market evidence. Colak et al. (2024) show that exchange rate pass-through in emerging economies is typically stronger and more volatile than in advanced economies, reflecting weaker monetary credibility and higher macroeconomic instability. Bangladesh's exchange rate behavior during overlapping pandemic and political shocks fits this pattern well. The presence of lagged dependent variables with large coefficients across all specifications indicates inertia and gradual adjustment rather than immediate equilibrium restoration, a feature that reinforces the case for corridor-aware rather than uniform policy responses. Importantly, this study does not attempt to model nonlinear asymmetry in the sense of Shin et al. (2014) or the industry-level asymmetric trade responses examined by Bahmani-Oskooee et al. (2016). Instead, it identifies cross-corridor heterogeneity under a linear ARDL framework. The results show that heterogeneity across bilateral exchange rates alone is sufficient to generate materially different dynamics, without invoking nonlinear decomposition of positive and negative shocks. This is a methodologically distinct and policy-relevant contribution in its own right.

5.2 USD corridor dynamics, inflation pass-through, and dominant currency pricing

The USD/BDT corridor provides the strongest empirical evidence in the paper. It is the only corridor for which the bounds test confirms cointegration under both baseline and dummy-augmented specifications, allowing the long-run estimates to be interpreted with substantially greater confidence than those in the INR and EUR corridors. In the short-run, the exchange rate exhibits strong persistence, with the two-lag AR structure indicating a pattern of initial overadjustment followed by partial correction rather than immediate equilibrium restoration.

Inflation emerges as the dominant long-run driver of depreciation, directly supporting Hypothesis H3 and extending the existing literature by demonstrating that this effect is strongest and most stable in the USD corridor rather than uniformly across currencies. This is consistent with the dominant currency paradigm developed by Gopinath et al. (2020), which argues that the US dollar shapes global trade prices and financing conditions disproportionately. Bangladesh's heavy reliance on dollar-denominated imports, including fuel and intermediate inputs, implies that USD/BDT movements have a direct impact on production costs and consumer prices.

Under dominant currency pricing, exchange rate pass-through into domestic prices is more powerful in the dollar corridor, which helps explain why CPI is the most robust long-run determinant in that specification. Carriere-Swallow et al. (2024) further argue that pass-through intensifies during periods of high inflation and uncertainty, when firms adjust prices more frequently and absorb fewer cost shocks in margins. The sample period includes both pandemic disruption and political transition, which likely amplified the inflation-exchange rate feedback loop. Notably, the contemporaneous CPI coefficient is insignificant while the one-month lag is significant, suggesting that inflationary pressure takes approximately one month to transmit into exchange rate movements, consistent with the delayed price adjustment mechanisms documented in the pass-through literature. The trade balance enters the USD corridor with the expected negative sign, indicating that improvements in the trade balance are associated with appreciation of the taka. However, the magnitude is small and only marginally significant. Bangladesh's aggregate trade balance captures diverse goods and sectors, which likely attenuates the measured effect relative to the more direct inflation channel. Overall, the USD corridor results imply that sustained exchange rate pressure over this period is more closely tied to domestic price dynamics than to aggregate trade balance movements.

5.3 INR corridor dynamics, remittances, reserves, and regional linkages

The INR/BDT corridor presents economically meaningful signals, though long-run inference is weaker due to inconclusive bounds test results. The remittance result is consistent with the corridor-specific hypothesis developed for the INR corridor. While remittances increase foreign exchange supply, their impact on bilateral exchange rates depends on usage patterns, and the literature shows mixed outcomes across country contexts. In the India corridor specifically, remittances may be linked to import-intensive spending on healthcare, education, travel, and cross-border settlements. This can increase demand for INR transactions, offsetting the simple supply effect of foreign currency inflows. Pohit and Taneja (2003) highlight the importance of informal India-Bangladesh trade flows driven by institutional frictions and transaction

cost considerations, which reinforces why the positive remittance coefficient in this corridor is consistent with corridor-specific absorption mechanisms rather than contradictory to theory. The negative reserve coefficient aligns with the macro-stabilizing role of reserves and supports Hypothesis H2. In the India corridor, reserve accumulation appears to exert a stabilizing influence, indicating that reserve policy may be particularly relevant in the regional corridor. Even though long-run cointegration is not confirmed, the estimated coefficients provide suggestive directional evidence consistent with the hypothesized reserve stabilization mechanism.

The positive and significant DSEX coefficient in both the short- and long-run suggests that stronger domestic equity performance is associated with taka depreciation against the rupee. While a positive equity-exchange rate relationship may reflect capital flow dynamics, a domestic demand channel appears more plausible in the India-Bangladesh corridor. Periods of rising equity valuations may coincide with stronger domestic spending and wealth effects, stimulating import-intensive household and corporate expenditures, particularly on Indian goods and services such as healthcare, education, travel, and consumer products. This raises demand for INR transactions and places depreciation pressure on the taka. Such a mechanism may be more relevant than portfolio flow explanations, given the limited financial integration between Bangladeshi and Indian equity markets. The significance of the COVID dummy reinforces the uncertainty channel. The oscillating short-run COVID effects in the INR corridor reflect shock-sensitive regional adjustment rather than stable equilibrium behavior, consistent with evidence that global uncertainty shocks have stronger and more persistent effects in emerging markets. Because bounds tests are inconclusive or reject cointegration when dummies are included, the long-run multipliers in this corridor should be interpreted as suggestive directional relationships rather than stable elasticities.

5.4 EUR corridor dynamics, inflation transmission, and import composition

The EUR/BDT corridor exhibits meaningful short-run dynamics but inconclusive long-run stability. The lag structure of CPI is economically plausible, as inflation and exchange rate relationships can be bidirectional and delayed. Temporary negative contemporaneous effects may reflect short-run rigidities or policy smoothing, while positive lagged effects indicate eventual depreciation as relative prices adjust. Campa and Goldberg (2005) emphasize that pass-through depends on import composition and industry structure. Bangladesh's economic links with Europe are closely tied to export manufacturing and imported inputs, meaning adjustment in this corridor may occur through slower trade contract renegotiation and sector-specific cost transmission rather than immediate spot market movements. This helps explain why cointegration is weaker than in the USD corridor despite a similarly positive CPI association. Remittance inflows also influence EUR/BDT. Short-run effects oscillate across lags before converging on a positive long-run association. Unlike the INR corridor, where remittance-linked spending on Indian goods provides a direct bilateral demand channel, the EUR corridor mechanism appears distinct. The depreciation effect here likely reflects broader foreign exchange demand dynamics and import-financing patterns rather than direct trade linkages with Europe. This distinction reinforces the corridor-specific nature of remittance transmission documented in this study.

The DSEX coefficients are negative but statistically insignificant in both the short- and long-run, indicating that domestic equity performance does not exert a stable influence on the taka-euro exchange rate. Unlike the India corridor, where rising equity valuations may stimulate demand for regionally traded goods and services, Bangladesh's economic linkages with Europe are primarily export-oriented and concentrated in manufacturing supply chains (Rahman & Rahman, 2000), making DSE movements less likely to generate direct demand for euro-denominated transactions. This structural difference reinforces the corridor-specific nature of exchange rate dynamics documented in this study. The significance of the transition dummy illustrates corridor heterogeneity in crisis transmission. Political uncertainty affected EUR/BDT but not USD/BDT, consistent with the argument that transitions alter investor sentiment and trade expectations differently across bilateral relationships (Pastor & Veronesi, 2013; Ahir et al., 2022). Given the inconclusive bounds test results and the relatively short post-transition window in the sample, the long-run multipliers for EUR/BDT carry additional uncertainty beyond estimation error alone and should be interpreted accordingly.

5.5 Policy implications for Bangladesh

The corridor-specific heterogeneity documented in this study implies that Bangladesh requires a differentiated exchange rate management strategy rather than a uniform stabilization approach. The same policy instrument does not carry equal weight across the three bilateral corridors, and this has direct operational consequences.

Inflation control emerges as the most broadly applicable lever, particularly for managing USD and EUR exposure. Because the transmission from domestic prices to the exchange rate is strongest and most stable in these corridors, monetary policy, fiscal coordination, and supply chain management should be treated as integral components of foreign exchange strategy rather than separate domains. Price stability and exchange rate stability are not separable objectives in this context.

Reserve management is most consequential in the INR corridor, where the stabilizing role of reserves is empirically supported. Deployment and liquidity signaling should be prioritized during periods of regional settlement pressure, as illustrated by Bangladesh Bank's $500 million intervention fund established in 2025 (Byron & Habib, 2025). That said, given the absence of confirmed cointegration in this corridor, reserve decisions should be guided by directional judgment rather than mechanical rules derived from estimated coefficients.

Remittance policy should shift its focus from volume targets to channel quality and usage patterns. The depreciation association in the INR corridor suggests that remittance inflows linked to import-intensive spending or informal cross-border flows do not automatically strengthen the taka. Policies that incentivize formal channel use, productive domestic investment, and financial retention of remittance earnings are more likely to generate stabilizing effects.

Beyond these three corridor-specific priorities, two broader institutional measures deserve attention. First, the significance of the crisis dummies across specifications confirms that exchange rate dynamics are sensitive to political and macroeconomic uncertainty. Institutionalizing clear communication protocols, pre-defined intervention triggers, and coordinated fiscal-monetary responses would reduce the amplification of shocks during turbulent periods. Second, the mixed and corridor-specific role of equity

market performance suggests that DSEX movements are better treated as a macro-financial sentiment indicator than as a policy target. More fundamentally, the precision of corridor-level management would be enhanced by better data infrastructure: disaggregated remittance statistics by destination corridor, currency-of-invoicing trade data, and transparent reporting of reserve operations would allow policymakers to monitor and respond to bilateral pressures more accurately.

5.6 Contribution of the study

The contribution of this study lies in empirically identifying corridor-specific heterogeneity in Bangladesh's exchange rate determination during a period of overlapping macroeconomic and political shocks. By integrating remittances, reserves, inflation, trade balance, equity performance, and crisis dummy into separate bilateral ARDL models, the analysis provides a more policy-relevant mapping of exchange rate dynamics than an aggregate model would allow. The results do not claim structural causality. They provide corridor-specific empirical regularities under stress conditions. However, the evidence shows that exchange rate determinants, adjustment speeds, and long-run stability differ materially across USD, INR, and EUR exposures. That insight has direct implications for macroeconomic management in an open emerging economy context.

6. Conclusion

This study provides an exploratory assessment of the macroeconomic determinants of Bangladesh's bilateral exchange rates against the USD, INR, and EUR from January 2019 to June 2025. Using an ARDL bounds testing framework with COVID-19 and political transition dummies, we document pronounced corridor-specific heterogeneity. Cointegration is confirmed for USD/BDT, where inflation emerges as the dominant long-run driver of depreciation, while the long-run relationships for INR/BDT and EUR/BDT were found to be less stable over the turbulent sample period, suggesting that these corridors are more susceptible to short-run shocks and regime changes that disrupted long-run equilibrium. In the INR corridor, remittances are associated with modest depreciation while reserve accumulation exerts stabilizing pressure. For EUR/BDT, inflation is associated with depreciation in the estimated long-run coefficients, though the relationship is weakened by structural instability over the sample period.

The findings carry three policy implications. First, inflation control should be treated as central to exchange rate management, particularly for USD and EUR exposure. Second, reserve policy matters most in the INR corridor, where stabilizing effects are evident. Third, remittance monitoring should focus on usage patterns and channel quality rather than volume alone. As an exploratory study, causality is not claimed, and future research could extend this analysis by incorporating interest rate differentials, testing for nonlinear asymmetries, or applying identification strategies to clarify causal mechanisms. Nonetheless, the corridor-specific patterns documented here offer empirically grounded insights for macroeconomic management in an open emerging economy context.

Authors' contribution statement

Tahsin Shabab Rajee, Ali Altamish Chowdhury, and Priotosh Kumar Sarkar jointly contributed to the conceptualization and design of the study. Tahsin Shabab Rajee developed the methodology, conducted the econometric and statistical analyses, and wrote the methodology, results, and discussion sections. Ali Altamish Chowdhury drafted the introduction and literature review and revised these sections in response to feedback. Priotosh Kumar

Sarkar was responsible for data collection and prepared the abstract and conclusion, and also handled reference formatting and final proofreading. All authors contributed to the intellectual development of the manuscript and approved the final version for publication.

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Appendices

Figure A1: Stability plot of USD/BDT

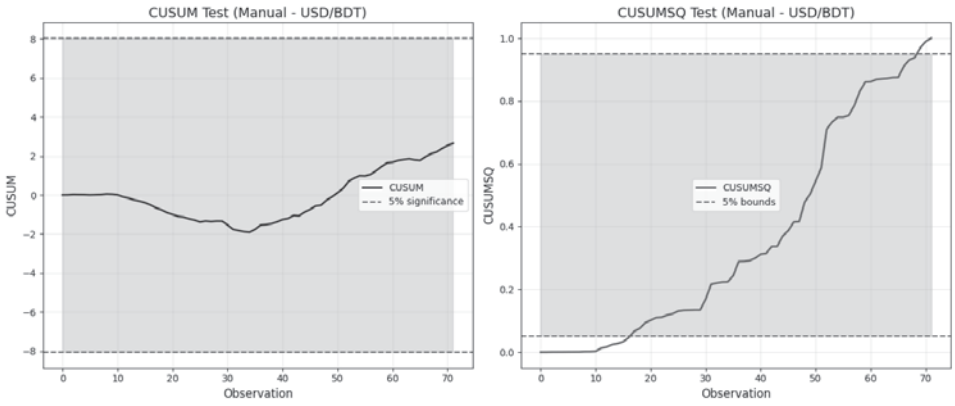

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Figure A2: Stability plot of INR/BDT

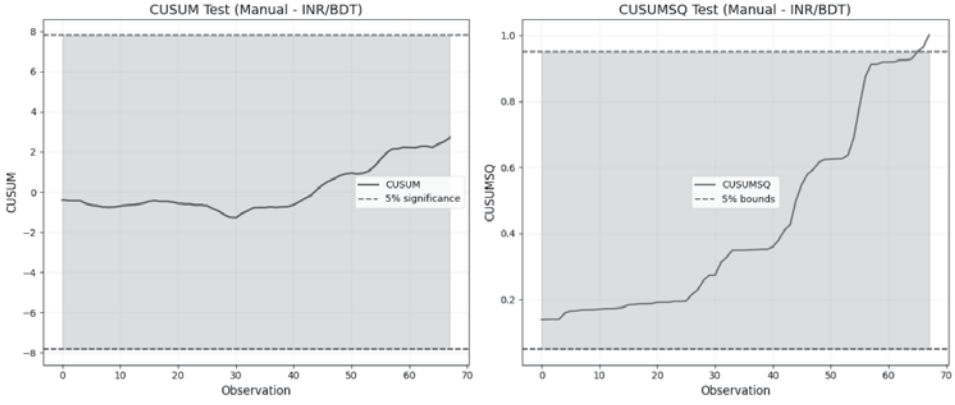

Figure A3: Stability plot of EUR/BDT

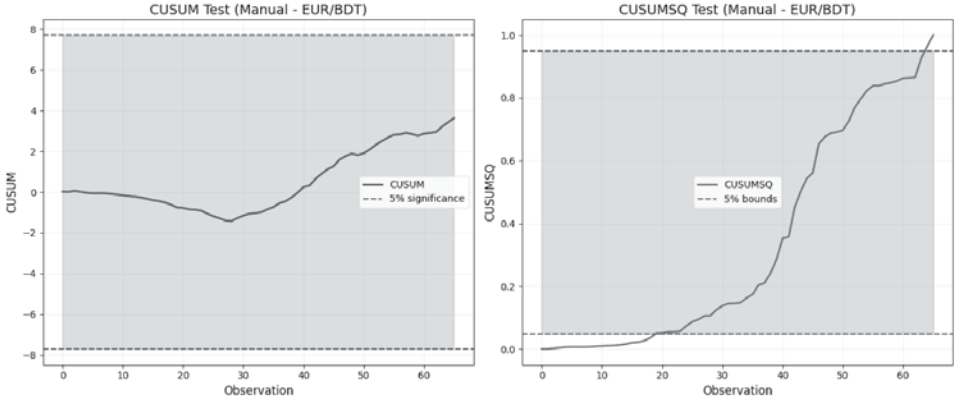

Figure (1-9) Data series of dependent and independent variables


9. Consumer Price Index (CPI)
14.00
12.00
10.00
8.00
6.00
4.00
2.00
0.00
Jan-19
May-19
Sep-19
Jan-20
May-20
Sep-20
Jan-21
May-21
Sep-21
Jan-22
May-22
Sep-22
Jan-23
May-23
Sep-23
Jan-24
May-24
Sep-24
Jan-25
May-25