Bangladesh Journal of Political Economy

Vol. 39, No. 1, June 2023, pp. 131-148
Bangladesh Economic Association
ISSN 2227-3182
DOI: http:/doi.org/10.56138/bjpe.v39n1.08

Exchange Rate Depreciation and Its Connection to Falling Reserves in Bangladesh: Evaluating the Domino Effect

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Abstract

This study examines the relationship between exchange rate depreciation and foreign exchange reserves in Bangladesh, with particular attention to whether declining reserves exert systematic pressure on the exchange rate—often described as a "domino effect." Using annual data from 1973 to 2022 and applying the Autoregressive Distributed Lag (ARDL) bounds testing approach, the analysis evaluates both short- and long-run dynamics among the exchange rate, inflation, per capita GDP, and foreign exchange reserves. The results indicate strong short-run persistence in exchange rate movements, while the effects of inflation and reserves on exchange rate depreciation are statistically weak. Per capita GDP exhibits short-run significance, though this relationship does not persist in the long run. The bounds test confirms the existence of a long-run equilibrium relationship among the variables; however, the estimated long-run coefficients are not statistically significant, suggesting that reserves have limited explanatory power for sustained exchange rate depreciation. The findings do not provide strong empirical support for a reserve-driven "domino effect" in the Bangladeshi context. Instead, the results suggest that exchange rate dynamics are influenced more by internal persistence than by reserve depletion alone. The study contributes to the literature by offering evidence from a long-horizon time-series analysis and highlights the importance of cautious interpretation when linking reserve movements directly to exchange rate depreciation in emerging economies.

Keywords: *Exchange rate depreciation · reserves · ARDL model · Economic stability · Domino effect · Bangladesh*

1.0 Introduction

Exchange rate depreciation and the management of foreign exchange reserves are central issues for macroeconomic stability in emerging economies (Aizenman & Marion, 2003; Cheung & Ito, 2009). For countries operating under managed

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or semi-flexible exchange rate regimes, foreign exchange reserves serve as an important buffer against external shocks, facilitate international trade payments, and help stabilize market expectations (Lee & Yoon, 2020). A widely held assumption in both policy discussions and academic debates is that declining reserves may exert pressure on the exchange rate, potentially triggering further depreciation through a self-reinforcing mechanism often described as a "domino effect" (Bação et al., 2012).

In Bangladesh, heightened exchange rate volatility in recent years has coincided with a notable decline in foreign exchange reserves (Bangladesh Bank, 2023). These developments have renewed interest in understanding whether reserve depletion systematically contributes to exchange rate depreciation or whether exchange rate movements are primarily driven by other macroeconomic forces. While descriptive accounts frequently associate falling reserves with currency depreciation, such associations do not necessarily establish a stable or causal relationship, particularly over the long run (Narayan & Smyth, 2006; Lee & Yoon, 2020). This highlights the need for rigorous empirical investigation rather than relying solely on crisis narratives.

The fiscal year ending in June 2023 marked a period of heightened external vulnerability for Bangladesh, characterized by significant pressure on the domestic currency and a decline in foreign exchange reserves. The global commodity and energy price shocks following the Russia–Ukraine conflict increased import costs for import-dependent economies such as Bangladesh, thereby intensifying demand for foreign currency and placing sustained pressure on reserve holdings. During this period, Bangladesh Bank experienced a notable contraction in foreign exchange reserves, which declined by approximately USD 10.52 billion (25.39 percent) between June 2022 and June 2023 (Bangladesh Bank, 2023). At the same time, the nominal exchange rate of the Taka against the US dollar depreciated sharply, rising by Tk 23, representing a cumulative depreciation of 26.75 percent since March 2022 (Bangladesh Bank, 2023). These developments underscore the importance of empirically examining whether reserve depletion systematically contributes to exchange rate depreciation or whether both variables respond jointly to broader macroeconomic shocks.

From a theoretical perspective, the reserve–exchange rate linkage is commonly framed around a central bank's capacity to intervene in the foreign exchange market and maintain confidence (Heller, 1976; Aizenman & Marion, 2003). A decline in reserves may weaken this capacity, potentially increasing vulnerability to speculative pressures and exchange rate depreciation. This intuition underpins the so-called "domino effect," in which reserve depletion initiates a chain reaction that leads to sustained currency weakness (Bação et al., 2012). However,

whether this mechanism operates in practice is ultimately an empirical question and may depend on country-specific characteristics, including exchange rate arrangements, macroeconomic fundamentals, and the persistence of exchange rate dynamics (Cheung & Ito, 2009).

Empirical evidence on the relationship between foreign exchange reserves and exchange rates remains mixed. Some studies find that reserve adequacy plays a stabilizing role, while others report weak or insignificant effects once broader macroeconomic conditions are taken into account (Narayan & Smyth, 2006; Cheung & Ito, 2009). In the case of Bangladesh, existing research has largely focused on reserve accumulation, remittance inflows, trade performance, or monetary variables, with relatively limited attention given to directly testing whether reserve depletion exerts systematic pressure on exchange rate depreciation over a long time horizon (Chowdhury et al., 2014; Khan & Amin, 2021).

Against this backdrop, the present study investigates the relationship between exchange rate depreciation and foreign exchange reserves in Bangladesh using annual data from 1973 to 2022. Rather than offering a broad assessment of crisis consequences or policy effectiveness, the study adopts a focused empirical approach. Using the Autoregressive Distributed Lag (ARDL) bounds testing framework (Pesaran et al., 2001), the analysis examines both short-run dynamics and long-run relationships among the nominal exchange rate, inflation, per capita GDP, and foreign exchange reserves. This approach is well-suited for exploring long-run equilibrium relationships in small samples with variables integrated of mixed orders.

The contribution of this study is twofold. First, it provides long-horizon empirical evidence on the reserve–exchange rate relationship in Bangladesh using an econometric framework appropriate for time-series data with mixed integration properties. Second, it offers a direct empirical test of the reserve-driven "domino effect" hypothesis within a country-specific context. By doing so, the study clarifies whether declining reserves alone can explain exchange rate depreciation or whether exchange rate movements are better characterized by internal persistence and broader macroeconomic conditions.

The remainder of the paper is organized as follows. Section 2 reviews the relevant theoretical and empirical literature. Section 3 describes the data sources and econometric methodology. Section 4 presents and discusses the empirical results. Section 5 concludes with a summary of findings, limitations of the analysis, and cautiously derived policy implications.

2.0 Literature Review

2.1 Theoretical Perspectives on Exchange Rates and Foreign Exchange Reserves

Foreign exchange reserves play a critical role in the macroeconomic management of open economies, particularly in stabilizing exchange rates and mitigating external shocks. Traditional theories emphasize the precautionary motive for reserve accumulation, whereby countries hold reserves to smooth external imbalances, stabilize exchange rates, and maintain market confidence (Heller, 1976; Aizenman & Marion, 2003). Within this framework, declining reserves may weaken a central bank's capacity to intervene in foreign exchange markets, thereby increasing vulnerability to exchange rate depreciation.

The conceptual idea often described as a "domino effect" builds on this intuition. In this context, reserve depletion may initiate a sequence of adverse outcomes: reduced intervention capacity, deteriorating market confidence, speculative pressures, and ultimately sustained exchange rate depreciation (Bação et al., 2012). While this mechanism is frequently invoked in policy discussions, it is not automatic and depends on country-specific factors such as exchange rate regimes, capital mobility, and macroeconomic fundamentals. As such, the relevance of the domino effect remains an empirical question rather than a theoretical certainty.

Inflation and real economic activity are also closely linked to exchange rate dynamics. The quantity theory of money suggests that reserve accumulation, if not sterilized, may expand the money supply and generate inflationary pressures, indirectly influencing exchange rates (Heller, 1976). Conversely, under floating or managed exchange rate regimes, the relationship between reserves, inflation, and exchange rates may be weak or unstable, particularly when central banks pursue inflation-targeting or discretionary monetary policies (Steiner, 2017).

2.2 Empirical Evidence on Reserves, Exchange Rates and Inflation

Empirical studies examining the relationship between foreign exchange reserves and exchange rates have produced mixed results. Cross-country analyses often find that higher reserve levels are associated with greater exchange rate stability, particularly in emerging economies (Cheung & Ito, 2009). However, other studies report that once macroeconomic fundamentals are accounted for, the direct effect of reserves on exchange rate movements becomes statistically insignificant (Lee & Yoon, 2020).

Research using time-series techniques such as cointegration and ARDL models has further highlighted the complexity of this relationship. Narayan and Smyth (2006), for example, identify a long-run relationship between exchange rates

and reserves in China, while emphasizing that short-run dynamics may differ substantially from long-run equilibrium behavior. Similar findings are reported for several developing economies, where reserves influence exchange rates only under specific conditions or during periods of heightened external stress.

The relationship between inflation and reserves has also attracted considerable attention. Studies focusing on developing economies such as Pakistan, Nigeria, Vietnam, and Sri Lanka suggest that reserve accumulation can have inflationary consequences if not accompanied by effective monetary sterilization (Chaudhry et al., 2011; Akpan, 2016; Phung Nguyen et al., 2019). However, other empirical evidence indicates that the inflationary impact of reserves is weak or context-dependent, particularly in economies with evolving monetary frameworks (Ariyasinghe & Cooray, 2021).

Economic activity, often proxied by per capita GDP, is another factor influencing exchange rate dynamics. Higher income levels may increase import demand and foreign currency requirements, potentially exerting depreciation pressure, while simultaneously reflecting improved productive capacity and export potential. As a result, the net effect of economic growth on exchange rates remains ambiguous and warrants empirical investigation.

2.3 Evidence from Bangladesh and Related Economies

In the context of Bangladesh, existing studies have primarily focused on the determinants of foreign exchange reserves rather than directly examining their interaction with exchange rate depreciation. Chowdhury et al. (2014) identify a long-run relationship among reserves, exchange rates, remittances, the money supply, and per capita GDP, highlighting the importance of macroeconomic fundamentals in shaping reserve dynamics. Similarly, Khan and Amin (2021) emphasize the role of trade openness and remittance inflows in shaping reserve accumulation in Bangladesh.

While these studies provide valuable insights, they largely treat exchange rates as explanatory variables rather than outcomes influenced by reserve movements. Moreover, much of the Bangladesh-focused literature does not explicitly test whether reserve depletion generates systematic exchange rate pressure consistent with the domino effect hypothesis. Comparable studies from other developing economies suggest that the reserve–exchange rate relationship is highly context-specific and sensitive to data frequency, sample period, and econometric specification (Arize et al., 2004; Ali et al., 2018).

2.4 Research Gap and Contribution

Despite a growing body of literature on foreign exchange reserves and exchange rate dynamics, several gaps remain. First, there is limited empirical evidence

directly testing the reserve-driven domino effect hypothesis using long-horizon time-series data for Bangladesh. Second, existing studies often focus either on reserve accumulation or exchange rate determination in isolation, without jointly examining their dynamic interaction. Third, relatively few studies employ the ARDL bounds testing approach to explore both short-run and long-run relationships in the Bangladeshi context.

This study seeks to address these gaps by applying an ARDL framework to annual data from 1973 to 2022 to examine whether declining reserves exert systematic pressure on exchange rate depreciation in Bangladesh. By explicitly testing the existence and strength of both short-run and long-run relationships, the study contributes to a more nuanced understanding of reserve–exchange rate dynamics and clarifies the empirical relevance of the domino effect hypothesis in an emerging economy setting.

3.0 Methodology

3.1 Sources & Description of Data

The World Development Indicator publications (WDI, 2023) are the data sources for this study. Data on the exchange rate (ER), Inflation (IN), per capita GDP (PGDP), and Reserves (RE) are collected annually from 1973 to 2022. We used the exchange rate as the dependent variable and the remaining variables as explanatory variables. All variables in the study were converted to logarithms before the tests were performed, allowing elasticities to be calculated. The exchange rate series is strictly positive throughout the sample period, allowing for meaningful elasticity interpretation. Annual data are employed due to data availability constraints for earlier years; however, it is acknowledged that annual frequency may limit the ability to capture short-term crisis dynamics. The focus of the analysis is therefore on long-run relationships and medium-term adjustments rather than high-frequency market fluctuations. The Augmented Dicky Fuller (ADF) test, Autoregressive Distributed Lag (ARDL), and other crucial tests associated with the ARDL model, such as the normality test, serial correlation test, heteroscedasticity test, model specification test, and parameter stability test, were also carried out. The results of the aforementioned tests will enable us to recommend an appropriate policy framework for Bangladesh's ongoing exchange rate depreciation and its connection to falling reserves.

3.2 Methods

According to Nelson and Plosker (1982), the utilization of time series data may lead to misleading results if unit root issues are present, hence hindering the achievement of our research objectives. Consequently, prior to conducting the autoregressive distributed lag (ARDL) analysis, it is necessary to assess the presence of a unit root in order to ascertain the validity of the model. The

Augmented Dickey-Fuller (ADF) test is widely used to detect the presence of a unit root. The subsequent statement presents an illustration of an ADF equation:

$$\Delta Y_t = \alpha + \beta t + \delta Y_{t-1} + \lambda_i \sum_{i=1}^{n} \Delta Y_{t-i} + u_t$$

Cointegration is a term used to describe the presence of a stationary linear combination or long-term relationship between variables. There are several methods available for examining variable cointegration, with the ARDL bounds test being a widely utilized approach due to its ability to accommodate both I(0) and I(1) series. Given that our series comprises a combination of I(0) and I(1) components, the ARDL limits test is deemed suitable for our analysis.

The ARDL (1, 1) model is presented in a simplified form as follows:

$$Y_t = \alpha_0 + \alpha_1 . Y_{t-1} + \beta_0 . X_t + \beta_1 X_{t-1} + \varepsilon_t$$

3.2.1 Model Specification

To examine the dynamic relationship between exchange rate depreciation and foreign exchange reserves in Bangladesh, the following ARDL (p, q_1, q_2, q_3) model is specified:

$$\ln(EX_t) = \alpha_0 + \sum_{i=1}^{p} \alpha_i \ln(EX_{t-i}) + \sum_{j=0}^{q_1} \beta_j \ln(IN_{t-j}) + \sum_{k=0}^{q_2} \gamma_k \ln(PGDP_{t-k}) + \sum_{l=0}^{q_3} \delta_l \ln(RE_{t-l}) + \varepsilon_t$$

where EX_t denotes the nominal exchange rate, IN_t represents inflation, $PGDP_t$ denotes per capita GDP, RE_t represents foreign exchange reserves, and ε_t is a white-noise error term.

3.2.2 Error Correction Representation

Following confirmation of cointegration using the ARDL bounds test, the short-run dynamics are estimated using an error-correction model (ECM). The ECM captures both short-run adjustments and the speed at which deviations from the long-run equilibrium are corrected. The ECM is specified as:

$$\Delta\ln(EX_t) = \phi_0 + \sum_{i=1}^{p-1} \phi_i \Delta\ln(EX_{t-i}) + \sum_{j=0}^{q_1-1} \theta_j \Delta\ln(IN_{t-j}) + \sum_{k=0}^{q_2-1} \psi_k \Delta\ln(PGDP_{t-k}) + \sum_{l=0}^{q_3-1} \omega_l \Delta\ln(RE_{t-l}) + \lambda ECM_{t-1} + u_t$$

where ECM_{t-1} represents the lagged error correction term derived from the long-run relationship. A negative and statistically significant coefficient of ECM_{t-1} indicates convergence toward long-run equilibrium, with its magnitude reflecting the speed of adjustment.

Finally, the Unit root properties of the variables are examined using the

Augmented Dickey–Fuller (ADF) test with a constant term. The specification with a constant is selected as it is most appropriate for macroeconomic time series exhibiting non-zero means. To avoid ambiguity, the integration order is determined by this consistent specification.

4.0 Results and Discussion

This section presents and discusses the empirical results obtained from the Autoregressive Distributed Lag (ARDL) model, focusing on the dynamic relationship between exchange rate depreciation and foreign exchange reserves in Bangladesh. The analysis proceeds in four stages: unit root testing, lag length selection and ARDL estimation, cointegration analysis, and short- and long-run dynamics through the error-correction framework.

Table 1. Results of ADF Unit Root Test

Null Hypothesis: the variable has a unit root

		At Level			
		EX	IN	PGDP	RE
With Constant	t-Statistic	-4.0660	-4.4393	5.1825	-0.3957
	Prob.	***0.0025***	***0.0008***	***1.0000***	***0.9014***
		***	***	n0	n0
With Constant & Trend	t-Statistic	-3.2095	-4.6102	-0.0869	-2.9252
	Prob.	***0.0945***	***0.0029***	***0.9937***	***0.1639***
		*	***	n0	n0
Without Constant & Trend	t-Statistic	3.9019	-1.7423	2.2515	3.3376
	Prob.	***0.9999***	***0.0773***	***0.9934***	***0.9997***
		n0	*	n0	n0
		At First Difference			
		d(EX)	d(IN)	d(PGDP)	d(RE)
With Constant	t-Statistic	-4.5126	-10.2525	-1.7596	-7.7130
	Prob.	***0.0007***	***0.0000***	***0.3954***	***0.0000***
		***	***	n0	***
With Constant & Trend	t-Statistic	-5.2091	-10.2067	-13.0724	-7.6122
	Prob.	***0.0005***	***0.0000***	***0.0000***	***0.0000***
		***	***	***	***
Without Constant & Trend	t-Statistic	-3.4836	-10.3181	0.1247	-5.8100
	Prob.	***0.0008***	***0.0000***	***0.7171***	***0.0000***
		***	***	n0	***

Note: a: (*) Significant at the 10%; (**) Significant at the 5%; (***) Significant at the 1%, and (no) Not Significant

4.1 Unit Root Test Results

Before estimating the ARDL model, the stationarity of the variables is examined using the Augmented Dickey–Fuller (ADF) test. Table 1 presents the outcomes of the ADF unit root examination. Assuming "with constant & trend," the t-statistics for EX, IN, PGDP, and RE are -3.2095, -4.6102, -0.0869, and -2.9252, respectively. The corresponding p-values are 0.0945, 0.0029, 0.9937, and 0.1639. With the exception of the p-value for IN, all other p-values exceed 0.05. This indicates that EX, PGDP, and RE are non-stationary in level form. After computing the first differences of EX, IN, PGDP, and RE, the corresponding t-statistics were -5.2091, -10.2067, -13.0724, and -7.6122, respectively. The resulting p-values were 0.0005, 0.0000, 0.0000, and 0.0000, respectively. Given that all p-values are below the 0.05 significance level, the null hypothesis can be rejected, indicating that all variables are stationary. Hence, the series EX, IN, PGDP, and RE are a combination of both I(0) and I(1) series. These findings justify the use of the ARDL methodology, which allows for the estimation of both short-run and long-run relationships without requiring all variables to be integrated of the same order.

4.2 Lag Selection and ARDL Model Estimation

Lag lengths for the ARDL model are selected using the Akaike Information Criterion (AIC), which is well-suited for small-sample time-series analysis. Based on this criterion, the selected specification is ARDL(3,0,1,2), with exchange rate depreciation as the dependent variable.

The estimated ARDL model reveals strong persistence in exchange rate movements. Lagged exchange rate values are highly significant, indicating that current depreciation is strongly influenced by its own past behavior. This result suggests the presence of inertia or adjustment frictions in the foreign exchange market, consistent with the observed gradual exchange rate adjustment over time.

Inflation does not exhibit a statistically significant contemporaneous effect on exchange rate depreciation. This suggests that inflationary pressures, at least within the annual data framework, do not directly drive exchange rate movements once other variables are accounted for. Per capita GDP shows marginal short-run significance, while foreign exchange reserves exhibit weak, unstable effects across lags. These findings indicate that reserve movements do not exert a strong or consistent short-run influence on exchange rate depreciation.

Table 2. ARDL Model

Dependent Variable: EX

Model selection method: AIC

Selected Model: ARDL (3, 0, 1, 2)

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
EX (-1)	1.370091	0.093705	14.62140	0.0000
EX (-2)	-0.721312	0.127093	-5.675461	0.0000
EX (-3)	0.336173	0.081918	4.103783	0.0002
IN	-0.005603	0.006787	-0.825566	0.4143
PGDP	0.710847	0.374947	1.895860	0.0658
PGDP (-1)	-0.613311	0.378819	-1.619010	0.1139
RE	-0.033347	0.017091	-1.951122	0.0586
RE (-1)	-0.038186	0.022501	-1.697104	0.0981
RE (-2)	0.033800	0.018611	1.816120	0.0775
C	0.270461	0.121214	2.231266	0.0318
R-squared	0.997353	Mean dependent var		3.800677
Adjusted R-squared	0.996709	S.D. dependent var		0.558069
S.E. of regression	0.032016	Akaike info criterion		-3.858829
Sum squared resid	0.037927	Schwarz criterion		-3.465181
Log likelihood	100.6825	Hannan-Quinn criterion.		-3.710697
F-statistic	1548.792	Durbin-Watson stat		2.217079
Prob (F-statistic)	0.000000			

* Note: p-values and any subsequent tests do not account for the model selection.

4.3 ARDL Bounds Test for Cointegration

The ARDL bounds test is employed to examine the existence of a long-run equilibrium relationship among exchange rate depreciation, inflation, per capita GDP, and foreign exchange reserves. The computed F-statistic exceeds the upper critical value at conventional significance levels, indicating cointegration among the variables.

The bounds test F-statistic is 5.22254, surpassing the upper bound critical value of 4.66 at the 1% level as established by Pesaran et al. (2001). Therefore, it can be inferred that the variables EX, RE IN, and PGDP are highly cointegrated. Thus, the hypothesis of a degenerate lagged dependent variable is refuted. The present study's findings suggest that the variables in question exhibit cointegration and demonstrate long-term convergence.

Table 3. ARDL Bounds Test

Null Hypothesis: No long-run relationships exist		
Test Statistic	Value	k
F-statistic	5.292254	3
	Critical Value Bounds	
Significance	I0 Bound	I1 Bound
10 %	2.37	3.2
5 %	2.79	3.67
2.5 %	3.15	4.08
1 %	3.65	4.66

4.4 Short-Run Dynamics and Error Correction Mechanism

Following confirmation of cointegration, the short-run dynamics are analyzed using the error-correction model (ECM). The coefficient of the lagged error correction term is negative and statistically significant, confirming the presence of long-run equilibrium adjustment.

However, the magnitude of the ECM coefficient is relatively small (approximately –0.015), indicating that only about 1.5 percent of deviations from long-run equilibrium are corrected each year. This implies a very slow adjustment process, suggesting that shocks to the exchange rate–reserve system persist for extended periods before convergence occurs. Such slow adjustment is consistent with the use of annual data and the presence of structural rigidities in the economy.

In the short run, changes in the exchange rate continue to exhibit strong dependence on their own past values, reinforcing the finding of exchange rate persistence. Changes in inflation remain statistically insignificant, while per capita GDP shows a positive and significant short-run association with exchange rate depreciation. This may reflect demand-side pressures associated with income growth, such as increased import demand and higher foreign-currency requirements, rather than a causal mechanism linking growth to depreciation.

Changes in foreign exchange reserves display mixed signs across lags and are only weakly significant. This instability suggests that reserve fluctuations do not exert a systematic short-run influence on exchange rate depreciation, further weakening support for a reserve-driven adjustment mechanism.

Table 4. ARDL Cointegrating and Long Run Form

Short Run Result				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
D (EX(-1))	0.398791	0.085538	4.662138	0.0000
D (EX(-2))	-0.345375	0.080119	-4.310771	0.0001
D (IN)	-0.002929	0.005268	-0.555914	0.5816
D (PGDP)	0.705695	0.134901	5.231223	0.0000
D (RE)	-0.034401	0.014684	-2.342708	0.0246
D(RE (-1))	-0.032334	0.015826	-2.043083	0.0482
ECM (-1)	-0.015155	0.002810	-5.393500	0.0000
ECM = EX - (-0.3723*IN + 6.4814*PGDP -2.5074*RE + 17.9725)				

4.5 Long-Run Coefficients and Interpretation

The estimated long-run coefficients for inflation, per capita GDP, and foreign exchange reserves are statistically insignificant in Table 5. This indicates that, over the long run, none of these variables individually exerts a robust influence on exchange rate depreciation within the model framework.

The insignificance of the reserve coefficient in the long run is particularly important for evaluating the "domino effect" hypothesis. While reserve depletion is often assumed to generate sustained exchange rate pressure, the empirical evidence does not provide strong support for this mechanism in the Bangladeshi context. Instead, exchange rate dynamics appear to be driven primarily by internal persistence rather than by reserve movements alone.

Table 5. Long Run Coefficients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
IN	-0.372339	0.612865	-0.607538	0.5472
PGDP	6.481377	10.615745	0.610544	0.5452
RE	-2.507407	4.442822	-0.564372	0.5759
C	17.972545	32.339694	0.555743	0.5817

4.6 Diagnostic and Stability Tests

A series of diagnostic tests is conducted to assess the adequacy of the estimated ARDL model. The Breusch–Godfrey serial correlation test indicates no evidence of autocorrelation, while the Breusch–Pagan–Godfrey test suggests homoscedastic residuals. The Jarque–Bera test confirms that the residuals are normally distributed.

A key limitation of this study is that, although the CUSUM and CUSUMSQ tests indicate overall parameter stability, they also reveal signs of structural

breaks over the sample period. In particular, the analysis spans two distinct exchange rate regimes—a fixed exchange rate period (1973–1993) followed by a floating or managed (dirty floating) regime thereafter. The model does not explicitly account for these regime shifts, which may mask underlying parameter instability and lead to biased or averaged effects across fundamentally different policy environments. Therefore, we suggest interpreting the results with caution, as using annual data across heterogeneous economic regimes may obscure important structural changes.

Breusch-Godfrey Serial Correlation LM Test:			
F-statistic	0.441157	Prob. F(2,35)	0.6468
Obs*R-squared	1.155687	Prob. Chi-Square(2)	0.5611

Heteroskedasticity Test: Breusch-Pagan-Godfrey			
F-statistic	0.710024	Prob. F(9,37)	0.6960
Obs*R-squared	6.921842	Prob. Chi-Square(9)	0.6453
Scaled explained SS	4.003887	Prob. Chi-Square(9)	0.9112

Normality Test

In order to conduct a normality test, it is necessary to ensure that the residuals of the null hypothesis exhibit a normal distribution. The results indicate that the residuals are normally distributed, as evidenced by the JB statistic of 0.403 and the corresponding p-value of 0.817, both of which exceed the 5% significance level. The normality plot depicted in Figure 1 is presented below

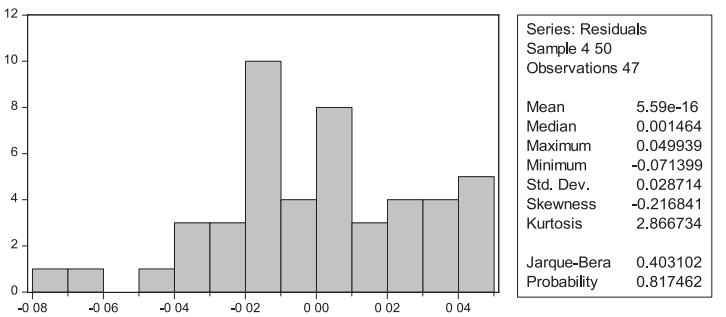
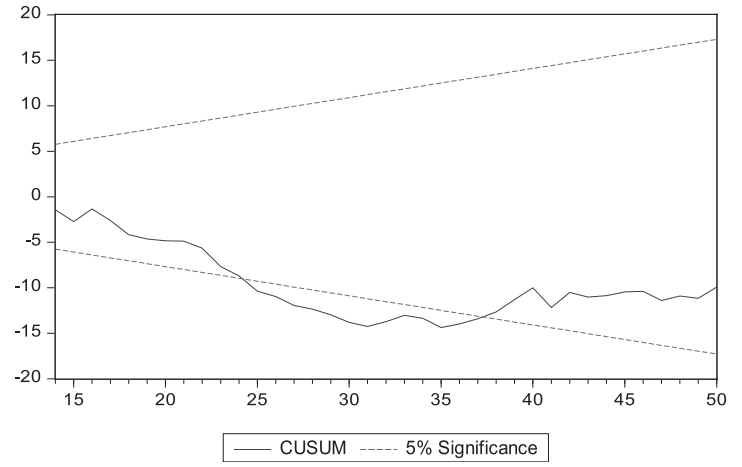
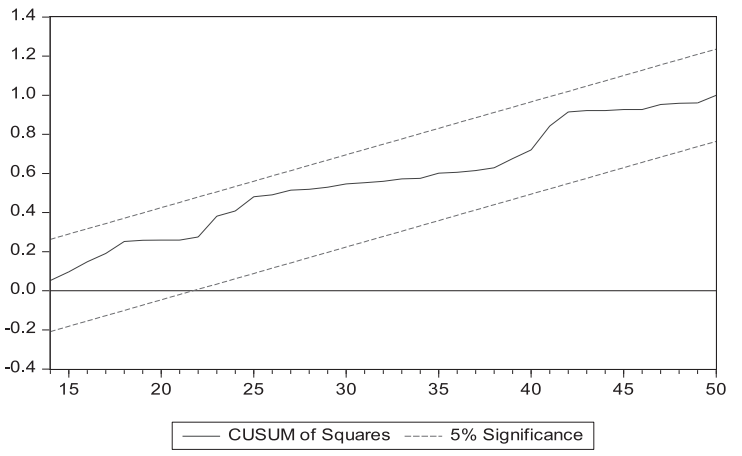


Figure 1. Normality Test

Both the CUSUM and CUSUM square demonstrate a consistent correlation over time, but only a slight break in the CUSUM test. This finding suggests the possibility of a structural change in the relationship between the variables under investigation





4.7 Discussion: Implications for the Domino Effect Hypothesis

Taken together, the empirical results provide limited support for a reserve-driven "domino effect" in Bangladesh. While exchange rate depreciation and foreign exchange reserves are cointegrated, reserve movements do not exert statistically significant or stable effects on exchange rate depreciation in either the short- or long-run. This suggests that reserve depletion, by itself, does not constitute a dominant transmission channel through which exchange rate pressures materialize in the Bangladeshi economy.

One possible explanation for this outcome is that exchange rate dynamics in Bangladesh are influenced by broader macroeconomic and institutional factors that are not fully captured by reserve levels alone. The presence of strong exchange rate persistence indicates that past exchange rate movements play a more important role in shaping current depreciation than contemporaneous reserve changes. This persistence may reflect gradual policy adjustments, market expectations, and administrative interventions that smooth exchange rate

movements over time rather than allowing abrupt adjustments driven solely by reserve fluctuations.

The slow speed of adjustment captured by the error correction mechanism further reinforces this interpretation. With only a small fraction of deviations from long-run equilibrium corrected each year, the adjustment process appears gradual rather than crisis-driven. Such slow convergence suggests that shocks to the exchange rate–reserve system tend to have prolonged effects, consistent with structural rigidities and policy constraints in the economy. As a result, even substantial reserve changes may not immediately translate into pronounced exchange rate responses.

These findings also imply that the commonly cited domino effect—whereby declining reserves rapidly erode confidence and trigger accelerated depreciation—may not operate strongly in the Bangladeshi context, at least when examined using long-horizon annual data. Instead, reserve movements and exchange rate depreciation may respond jointly to underlying macroeconomic conditions, such as external shocks, trade imbalances, or demand pressures, rather than one variable systematically driving the other.

Overall, the evidence suggests that exchange rate depreciation in Bangladesh is more closely associated with internal persistence and broader macroeconomic dynamics than with reserve depletion alone. This underscores the importance of cautious interpretation when attributing exchange rate movements to reserve changes and highlights the need to consider a wider set of structural and policy factors when evaluating exchange rate behavior in emerging economies.

5.0 Conclusions and Policy Implications

This study examined the relationship between exchange rate depreciation and foreign exchange reserves in Bangladesh using annual data from 1973 to 2022 and applying the Autoregressive Distributed Lag (ARDL) bounds testing framework. The analysis was motivated by the widely held assumption that declining reserves may exert systematic pressure on the exchange rate through a reserve-driven "domino effect." By distinguishing between short-run dynamics and long-run equilibrium relationships, the study provides a focused empirical assessment of this hypothesis within the Bangladeshi context.

The empirical results reveal strong persistence in exchange rate movements, indicating that current depreciation is largely influenced by past exchange rate behavior. While the bounds test confirms the existence of a long-run relationship among exchange rate depreciation, inflation, per capita GDP, and foreign exchange reserves, the estimated long-run coefficients are statistically insignificant. In the short run, inflation does not exert a meaningful influence on

exchange rate depreciation, while per capita GDP shows a positive but context-dependent association. Importantly, foreign exchange reserves do not exhibit a stable or statistically robust effect on exchange rate depreciation in either the short- or long-run.

The error correction mechanism indicates a statistically significant but very slow speed of adjustment toward long-run equilibrium, with only a small fraction of deviations corrected each year. This slow convergence suggests that shocks to the exchange rate–reserve system tend to persist over extended periods, which may reflect structural rigidities, policy inertia, or the limitations inherent in annual data. Taken together, these findings suggest that exchange rate depreciation in Bangladesh is better characterized by internal persistence and broader macroeconomic conditions rather than by reserve depletion alone.

From a policy perspective, the results caution against viewing foreign exchange reserve depletion as a sole or dominant driver of exchange rate depreciation. While maintaining adequate reserves remains important for confidence, liquidity provision, and external payment obligations, the empirical evidence does not support strong claims that reserve losses mechanically trigger sustained exchange rate depreciation. Policymakers should therefore avoid overreliance on reserve drawdowns as a primary tool for exchange rate stabilization and instead consider a broader set of macroeconomic and structural factors influencing exchange rate dynamics.

Several limitations of the study should be acknowledged. The analysis is based on a relatively small set of macroeconomic variables and relies on annual data, which may not fully capture short-term crisis dynamics or high-frequency market adjustments. Additionally, potential structural breaks over the long sample period may affect the estimated relationships, despite evidence of overall parameter stability. Future research could extend this analysis by incorporating higher-frequency data, additional macroeconomic variables such as interest rate differentials or trade balances, and alternative econometric techniques to further explore exchange rate–reserve interactions.

Finally, this study contributes to the literature by providing long-horizon empirical evidence on the exchange rate–reserve relationship in Bangladesh and by offering a cautious evaluation of the reserve-driven domino effect hypothesis. The findings highlight the importance of disciplined interpretation when linking reserve movements to exchange rate outcomes and underscore the need for comprehensive policy frameworks that address exchange rate dynamics beyond reserve management alone.

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