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DRIVERS OF INFLATION IN BANGLADESH: AN ECONOMETRIC ANALYSIS

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Abstract: The paper aims to explore the internal and external factors that influence inflation in Bangladesh during FY 2011 to FY 2023. The data has been gathered from the Bangladesh Bank's Statistics Department's Monthly Economic Trends and the World Bank pink sheet. It employs an autoregressive distributed lag (ARDL) model to examine the consequences of explanatory variables on the inflation in Bangladesh. The model uses the monthly CPI index to represent the inflation in the Bangladesh economy. Results from ARDL bounds test display that the variables are co-integrated as well as the regressors have a significant impact on inflation in Bangladesh in the both short and long run. Moreover, inflation in Bangladeshis heavily influenced by broad money supply (M2) and Lending rate (LR). In the long run, a 1% rise in M2 will lead to a 30% drive of inflation in Bangladesh. On the other hand, inflation decreases by 38% due to a 1% rise in Lending rate. So, M2 and LR both are the major drivers of inflation in Bangladesh throughout the sample period. Finally, the policy implications of the study propose that government would have to take fiscal policy in coordination with the Monetary Policy as well as focus on non-economic factors like syndicate, hoarding, geopolitical environments etc. along with economic factors to curb inflation in Bangladesh.

Keywords: Inflation, Money supply, Lending rate and ARDL.

JEL classification: E31, E51, E59.

INTRODUCTION

Price stability is one of the major challenges for a developing country like Bangladesh. It's a pivotal challenge for the country right now like the boosting

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up of foreign exchange reserve and stabilizing exchange rate. Inflation occurs when the general level of prices for goods and services increases over time. It can affect individual, business, and even the overall economy. As inflation rises, real wages reduces, the purchasing power of money falls and ultimately downgrades the living standard of people. It negatively affects savings, investment, and ultimately economic growth if it's higher than the interest rates. If the demand for goods and services in an economy exceeds its production capacity, it can lead to demand-pull inflation. On the other hand, when the cost of production increases due to the several factors like supply chain disruption, higher cost of raw materials, increased import prices etc. which drives cost-push inflation. The classical theory suggests that inflation is primarily a monetary phenomenon. If central bank prints more money, this excess money drives inflation. According to Milton Friedman, 'inflation is always and everywhere a monetary phenomenon'. The keynesian theory mainly focused on the role of aggregate demand and aggregate supply in determining the inflation in economy. Moreover, inflation rate in Bangladesh over the last decade is driven by both internal external factors. Global inflation surged significantly in the beginning of 2022. During the first half of 2023,the Ukraine-Russia war hampers supply chain disruption in the global market in case of food grains, energy etc. which drives food and energy prices, increases the import cost for most of the countries and ultimately led to the cost-push inflation around the world as well as in Bangladesh. Inflation is further fuelled by the global supply chain disruption caused by the Red Sea problem in the Middle East. The factors that are the main drivers of inflation in Bangladesh include increases in M2, credit to the private sector, market capitalization, government borrowing, remittances, exchange rate fluctuations, and market syndicates (Bangladesh Bank, IMF and CPD, 2007).

INFLATION SCENARIO OF BANGLADESH OVER THE LAST DECADE

Bangladesh inflation rate has been shown ups and down trend over the last decade due to the ongoing global and internal factors. Bangladesh bureau of statistics (BBS) publishes inflation rate based on the Consumer Price Index (CPI) headed in two broad categories such as headline inflation and point to point inflation. Since 2023, headline inflation has been over 9.0 percent, due to the cost-push shock by the Ukraine-Russia war, reaching a peak of 9.93 percent in October 2023. Bangladesh imported food grains like wheat, edible oil and energy

products like imported oil, LNG gas etc. from Russia and Ukraine, the supply chain hampers excessively as a consequence of war which increased the import cost of the country mainly food and energy prices and further drives inflation in the domestic market. Inflation is further driven due to the depreciation of BDT against US dollar, which raised import costs and continuing to inflationary pressures. Moreover, government had taken expansionary fiscal policy most of the time during the last decade as well as taken excess liquidity from Bangladesh Bank, which increases money supply, raises aggregate demand, and led to the demand pull inflation. The point to point inflation stood at 9.33 percent on March 2023 which also elevated to 9.75 percent on May 2023 (BBS). According to BBS, Point to point inflation was 7.56 percent in June 2022, which raised to 9.74 percent in June 2023.Food inflation is another drivers of overall inflation in Bangladesh. Due to the formation of syndicate by some unethical businessmen, hoarding of agricultural products, regional price difference, higher input costs drive higher food prices in the domestic market which ultimately lead to the rise of the price level. According to BBS, food inflation raised to 9.76 percent in June 2023 from 8.37 percent in June 2022. Apart from these, some non-food factors specially increase in transportation cost due to the rise of energy price hiked inflation rate. Non-food inflation fuelled by 9.60 percent in June 2023 which was 6.33 percent in June 2022 (BBS).

The objective of this paper is to assess the internal and external drivers of inflation in Bangladesh during FY2011 to FY2023. The chart below displays the trends of inflation rate, Broad money supply, Lending rate and exchange rate in Bangladesh as well as the trends of world energy prices during the mentioned period.

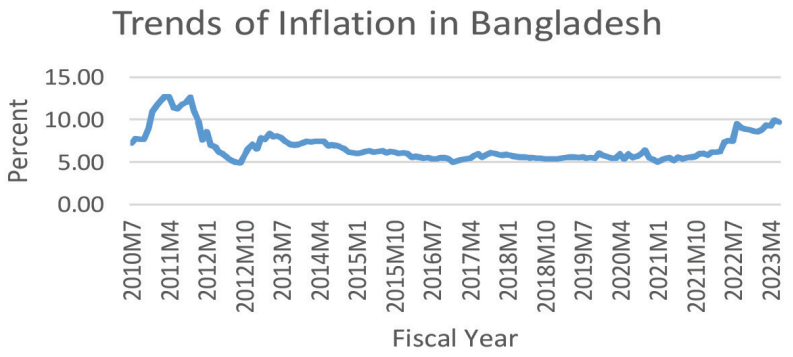


Figure 1: Trends of inflation rate in Bangladesh from FY2011 to FY2023

Data source: Bangladesh Bureau of Statistics; Base: 2020-21

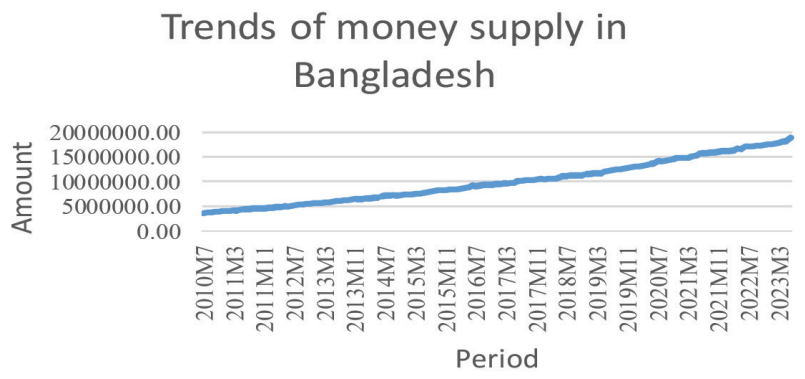


Figure 2: Trends of money supply (M2) in Bangladesh from FY2011 to FY2023

Data source: Statistics Department, BB.

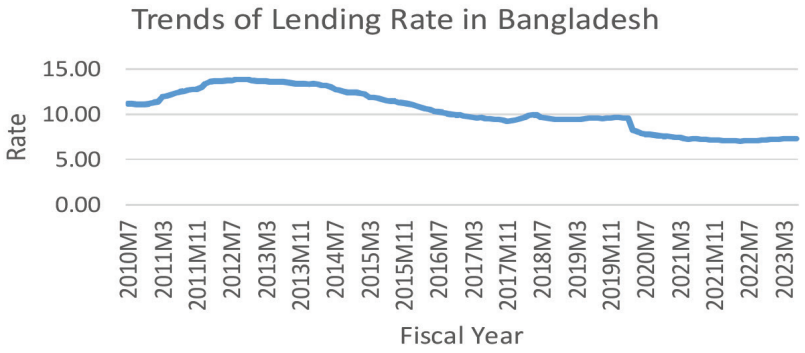


Figure 3: Trends of lending rate (LR) in Bangladesh from FY2011 to FY2023

Data source: Statistics Department, BB.

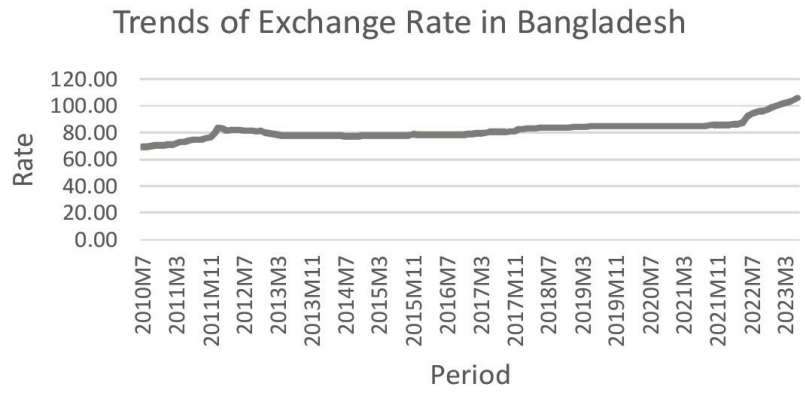


Figure 4: Trends of exchange rate (ER) in Bangladesh from FY2011 to FY2023

Data source: Statistics Department, BB.

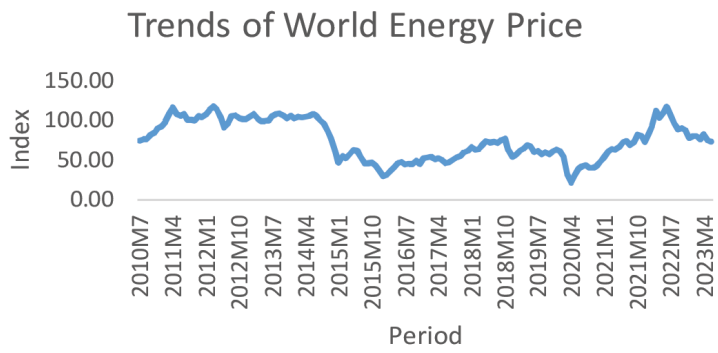


Figure 5: Trends of world energy price from FY2011 to FY2023

Data source: World Bank, Pink sheet.

OBJECTIVES OF THE STUDY

The aim of this analysis is to assess the internal and external drivers of inflation in Bangladesh during FY2011 to FY2023.

The precise goals are as follows:

(i) To investigate the internal and external drivers of inflation in Bangladesh.

(ii) To recommend some policy measures to curb inflation in Bangladesh.

The rest of the part of the study has been structured as follows: the following part contains review of the existing literature; the next portion concentrates on data and methodology; the fourth and fifth sections focus on results and findings; and finally, the sixth and seventh sections cover limitations as well as conclusion and policy recommendation.

LITERATURE REVIEW

Researchers reviewed various studies to find out the factors that determine inflation in different countries. Here we reviewed some local and international studies to explore the internal and external drivers that affect inflation scenario in Bangladesh are as follows:

Thomas Habanabakize and Zandri Dickason-Koekemoer (2024) analyzed 'A Comparative Analysis between Intrinsic and Extrinsic Drivers of Inflation' as well as investigated both internal and external drivers of inflation in South Africa. They adopted the Johansen cointegration test, vector error correction approach, impulse response function, and variance decomposition, covering the quarterly data from 1994 to 2022. They found that external factors mainly drive inflation in South Africa, as compared to internal factors. Moreover,

trade openness, exchange rates, and imported prices elevated inflation as external factors, while sustainable government expenditure, interest rates, and net export prices were internal factors that also drove inflation in South Africa. Maaz Ahmad et al.'s (2024) assessed the impacts of oil prices, technological advances, and labor market dynamics on inflation in South Asian countries from 1995 to 2022 employing the Panel ARDL model under the title 'Effect of the Supply-Side Factors on Inflation in South Asia: An Analysis of Oil Price, Technology, and Labor Market Dynamics'. The findings showed that oil prices elevated inflation in South Asian economies. Technological advancement could reduce inflationary pressures and short-term demand-pull inflation results due to labor tightening. Moreover, cost-push inflation might take place if wages increase gradually over time. Sojib Bhawmick, Shamima Akhter, and Fazlul Haque (2023) explored the impacts of inflation and unemployment on GDP in Bangladesh under entitled 'The Effect of Inflation and Unemployment on GDP: Evidence from Bangladesh'. The autoregressive distributed lag (ARDL) bound test and the error correction model (ECM) have been employed to assess the relationship between the two variables, covering the period 1991 to 2021. The ARDL bound test showed that both inflation and unemployment caused constraints on GDP growth over the period, and a high correlation exists between these variables in both periods, as suggested by the ECM model. The findings recommend that policymakers should concentrate on inflation and unemployment since they have significant effects on GDP growth. Rejoana Islam, Refat Ferdous, Nahida Sultana, and Marzia Nomi (2022) investigated 'Major Macroeconomic Determinants of Inflation in Bangladesh: An ARDL Bound Test Approach' using the time series data from 1981 to 2020 employing an ARDL Bound Test Approach. They found that gross domestic product (gdp), broad money supply (m2), export growth (xg), import growth (mg), and growth of population (pg) had statistically different but significant impacts on inflation, and all these regressors are the key determinants of inflation in Bangladesh. Moreover, it is notable that broad money supply and import growth had a positive impact on inflation over the long and short run during the sample period. Akhtar Hossain, Mala Raghavan (2019) examined 'Drivers of Inflation and Inflation Volatility and Their Effects on Macroeconomic Fluctuations in Indonesia and Thailand'. They adopted the SVAR approach covering the monthly data from 2000 to 2015. The empirical findings display that inflation is more responsive to external shocks than domestic ones in both Indonesia and Thailand, but inflation volatility is similarly vulnerable

to both. A positive inflation shock has adverse impacts on domestic output for emerging countries. While positive output shocks decrease inflation, in line with the monetary interpretation of inflation. The relationship between inflation and volatility remains positive even though they have a negative impact on output through a number of channels, such as exchange rates and asset prices. Nazima Ellahi (2017) inspected 'The Determinants of Inflation in Pakistan: An Econometric Analysis' covering the period from 1975 to 2015, employing the ARDL model to examine the effects of each regressor on inflation. They found that money supply and national expenditure had a considerable impact on inflation in the long run. Apart from these, imports of goods and services have positive effects on inflation. None of the variables didn't determine inflation in the short run. The study recommended some policies to keep inflation at the required level. Mohammad Mizanur Rahman (2015) inquired into 'Food Price Hike in Bangladesh: A Supply Side Approach to its Determinants and Solutions', examining the core elements from the supply side of the commodity market that were the driving causes of food inflation in Bangladesh over the years. The empirical findings suggested that both demand-side and supply-side factors drive inflation in Bangladesh. Apart from these, non-economic factors, along with economic factors, are also responsible for the recent price hike in Bangladesh. The concerned authorities should focus on not only economic but also non-economic factors to control the inflation scenario in Bangladesh. Rashed Al MamunTitumir and Md. Aslam Hossain (2014) examined the nature of the relationship and the direction of causality between growth and inflation in Bangladesh, entitled 'Inflation and Growth: An Empirical Analysis of Bangladesh'. Co-integration, the Vector Error Correction Model (VECM), the Granger causality test, and multiple regression analysis have been adopted to analyze the collected data. They found a statistically notable positive relationship between the two variables in the long run, although the same didn't exist in the short run. The findings had major policy implications for formulating the monetary policy taken by the central bank. The data suggested that in the short term, attention should be focused on understanding price levels, the causes of inflation, and linkages with other supporting policies affecting growth and employment instead of focusing on an inflation targeting strategy. Sheikh Jafar Emran and Mohammad M. Islam (2013) examined a study entitled 'Assessing the Relationship between Inflation and Some Other Macroeconomic Variables in Bangladesh: An Econometric Analysis' using the data from 1987 to 2011. The findings indicate

that a long-run relationship between inflation-money supply and inflation-remittance exists over the sample period. An increase in the money supply and the inflow of remittances by 1 billion taka will lead to a rise in inflation of 0.00347 and 0.289 percentage points, respectively. They didn't find any long-term relationship between exports and GDP growth on the CPI. Kazi Mostafa Arif and Munshi Murtoza (2012) investigated 'Determinants of Inflation in Bangladesh: An Empirical Investigation', covering the period from 1978 to 2010. The Johansen-Juseliuscointegration test has been adopted to find out a long-term relationship between these variables. They found that regressors like GDP, broad money, government expenditure, and imports have a positive impact on inflation in the long run, except for government revenue and exports. A 1% increase in the broad money supply and government expenditure will lead to a rise in inflation of 47% and 34%, respectively. In the short run, money supply is the main determinant of inflation in Bangladesh.

So, from the findings of the reviewed literature, we conclude that inflation is significantly influenced by both internal and external factors like broad money supply, remittance, sustainable government expenditure, interest rates, lending rate, exchange rate, exports and imports of goods and services, energy prices etc. in Bangladesh as well as in different countries around the world.

DATA AND METHODOLOGY

Data

A sample of monthly data from FY11 to FY23 was examined to determine the long-term co-integration of the model's dependent variables and regressors, as well as the influence of those macroeconomic factors on Bangladesh's economic growth rate. The data came from the Bangladesh Bank's Statistics Department's Monthly Economic Trends report and World Bank pink sheet. The CPI growth rate has been used to estimate the economy's inflation rate. The natural logarithm was adopted for all variables in the model. Moreover, the crisis dummy has been introduced to capture the impacts of the COVID-19 period.

METHODOLOGY

Testing Stationary

The unit root test is just an alternative to the correlogram for assessing stationary. Stationary tests incorporate mainly the Augmented Dickey-Fuller (ADF), and Phillips-Perron (PP) tests.

(a) Augmented Dickey-Fuller (ADF) test: The most widely used experiment for confirming stationary for a time series is the ADF test, which is an extension of the Dickey-Fuller test with upper-order lags to detect the higher-order autocorrelation with a loss of degree of freedom and structural change. According to Dickey and Fuller (1981) ΔCPI_{t-i} can be added as the lagged difference form for embracing serial autocorrelation. The equations of ADF test including both trend and intercept for our model as follows:

$$\Delta CPI_t = \propto_0 + \propto_1 CPI_{t-1} + \propto_2 t + \sum_{i=i}^{n} \beta_i \Delta CPI_{t-i} + \in_t \ldots (i)$$
$$\Delta M2_t = \propto_0 + \propto_1 M2_{t-1} + \propto_2 t + \sum_{i=i}^{n} \beta_i \Delta M2_{t-i} + \in_t \ldots (ii)$$
$$\Delta LR_t = \propto_0 + \propto_1 LR_{t-1} + \propto_2 t + \sum_{i=i}^{n} \beta_i \Delta LR_{t-i} + \in_t \ldots (iii)$$
$$\Delta ER_t = \propto_0 + \propto_1 ER_{t-1} + \propto_2 t + \sum_{i=1}^{n} \beta_i \Delta ER_{t-i} + \in_t \ldots (iv)$$
$$\Delta WEP_t = \propto_{0+} \propto_1 WEP_{t-1} + \propto_2 t + \sum_{i=1}^{n} \Delta WEP_{t-i+} \in_t \ldots (v)$$

Where, ΔCPI_t, $\Delta M2_t$, ΔLR_t, ΔER_t and ΔWEP_t are first difference for CPI, M2, LR, ER and WEP respectively. $\in_t$ represents the white noise error term.

(b) Phillips-Perron (PP) test: Phillips Perron (1998) uses a nonparametric unit root trial technique to examine if the data series is I(1) or not. The PP test yields good results even in the presence of an unknown higher-order autocorrelation, which may lose degrees of freedom and heteroscedasticity). It uses the Newey-West estimator, which corrects for any serial correlation and heteroskedasticity without adding additional lagged terms to the model. The equations of PP test for our model as follows:

$$\Delta CPI_t = \propto_0 + \propto_1 CPI_{t-1} + \in_t \ldots (vi)$$
$$\Delta M2_t = \propto_0 + \propto_1 M2_{t-1} + \in_t \ldots (vii)$$
$$\Delta LR_t = \propto_0 + \propto_1 LR_{t-1} + \in_t \ldots (viii)$$
$$\Delta ER_t = \propto_0 + \propto_1 ER_{t-1} + \in_t \ldots (ix)$$
$$\Delta WEP_t = \propto_0 + \propto_1 WEP_{t-1} + \in_t \ldots (x)$$

Where, ΔCPI_t, $\Delta M2_t$, ΔLR_t, ΔER_t and ΔWEP_t are first difference for CPI, M2, LR, ER and WEP respectively. $\in_t$ represents the white noise error term.

Estimation Technique

The econometric model is specified to assess whether these explanatory variables affect inflation rate in Bangladesh as follows:

$$INF_t = \alpha_0 + \beta_1 M_2 + \beta_2 LR + \beta_3 ER + \beta_4 \text{WEP} + \mu_t$$

Where,

INF = Inflation rate which is calculated from the monthly CPI index

M2 = Broad money supply

LR = Lending rate

ER = Exchange rate (Taka per dollar)

WEP = World energy price

μ_t = Error term

To examine co-integration between inflation rate and the explanatory variables, we adopted the ARDL Bounds test approach developed by Pesaran and others (1999) and then modified by Pesaran et al. (2001).

Autoregressive Distributed Lag (ARDL) Model

Some of the variables in our model are stationary at I (1), while others are at I (0), a combination of both. Therefore, it suggests applying the ARDL Bounds testing approach ((Pesaran and others (1998) and the work of Pesaran et al. (2001)).

Using this approach, we could assess thelong and short term co-integration between inflation and the explanatory variables of the model. In case of endogenous regressors, the ARDL approach usually yields appropriate t-statistics and authentic estimations in the long run. Moreover, dummy variables can be launched in the bound test, and critical values still hold faithfulin the presence of these variables. Finally, the bounds testing approach alsomonitors autocorrelation and missing variable problems by simultaneously assessing the model's long- and short-run constituents.

Assumptions of the ARDL model

The basic assumptions of the ARDL model are as follows:

1. No autocorrelation: The absence of autocorrelation is the first condition for ARDL. The model desires that the error terms have no autocorrelation with one another.
2. No heteroscedasticity: The variance and mean of error terms should remain constant throughout the model.
3. Normal distribution: The residuals need to be normally distributed.
4. Stationarity of Variables: The ARDL model requires that the time series be stationary at I (0)) or I (1)). However, it doesn't allow at I (2).

Stability of the model: It ensures that our model is treated as a genuine model, allowing for reliable and valid inferences throughout the CUSUM and CUSUMSQ tests.

The OLS estimation technique is adopted in the ARDL-bound testing approach to estimate a conditional, unconstrained error correction model (ECM).

The equation can be symbolized in the following way using this method:

$$\Delta CPI_t = \beta_0 + \sum_{i=0}^{\rho} \emptyset_i \Delta CPI_{t-i} + \sum_{i=0}^{\rho} \theta_i \Delta M2_{t-i} + \sum_{i=1}^{\rho} \varphi_i \Delta LR_{t-i} + \sum_{i=1}^{\rho} \alpha_i \Delta ER_{t-i} + \sum_{i=1}^{\rho} \gamma_i \Delta WEP_{t-i} + \delta_1 CPI_{t-1} + \delta_2 M2_{t-1} + \delta_3 LR_{t-1} + \delta_4 ER_{t-1} + \delta_5 WEP_{t-1} + \varepsilon_t \ldots\ldots \text{(xii)}$$

Where, CPI, M2, LR, ER and WEP are natural logarithms of the Consumer Price Index which is used to calculate inflation rate in Bangladesh, Broad money supply, Lending rate, Exchange rate and World energy price respectively. The highest number of lags is denoted by ρ, whereas Δ represents the first difference operator.

The initial phase of the ARDL bound testing method assumes estimating equation based on the OLS method, followed by conducting a Wald test or an F-test to assess the collective significance of the model's lagged level variable coefficients. The null hypothesis states that H_0: $\delta_1 = \delta_2 = \delta_3 = \delta_4 = 0$, while the alternative hypothesis H_1: $\delta_1 \neq \delta_2 \neq \delta_3 \neq \delta_4 \neq 0$. Two different sets of critical values for the F-test have been presented by Pesaran and others (2001); one set postulates that all regressors are I(0), while the others are I(1).Regardless of the variables' integration order, a long-term co-integration exists if the calculated F-statistic is larger than the upper critical value, and vice versa.

If co-integration exists in the first stage, the succeeding ARDL (a, b, c, d, and e) of a long-term model is estimated in the second step:

$$CPI_t = \beta_1 + \sum_{i=0}^{a} \emptyset_{1i} CPI_{t-i} + \sum_{i=0}^{b} \theta_{1i} M2_{t-i} + \sum_{i=1}^{c} \varphi_{1i} LR_{t-i} + \sum_{i=1}^{d} \propto_{1i} ER_{t-i} + \sum_{i=1}^{e} \gamma_{1i} WEP_{t-i} + \varepsilon_{1t} \quad \text{(xiii)}$$

Where, the variables' optimal number of lags is represented by a, b, c, d and e.

In the final phase, ECM can be constructed in the following way to build up the short-term dynamics of the ARDL specification:

$$\Delta CPI_t = \beta_2 + \sum_{i=0}^{\rho} \emptyset_{2i} \Delta CPI_{t-i} + \sum_{i=0}^{\rho} \theta_{2i} \Delta M2_{t-i} + \sum_{i=1}^{\rho} \varphi_{2i} \Delta LR_{t-i} + \sum_{i=1}^{\rho} \alpha_{2i} \Delta ER_{t-i} + \sum_{i=1}^{\rho} \gamma_{2i} \Delta WEP_{t-i} + \mu ECM_{t-1} + \varepsilon_{2t} \quad \text{(xiv)}$$

Where, μECM_{t-1} is the error correction term, and specify it as:

$$ECM_t = CPI_t - \beta_1 - \sum_{i=0}^{a} \emptyset_{1i} CPI_{t-i} + \sum_{i=0}^{b} \theta_{1i} M2_{t-i} + \sum_{i=1}^{c} \varphi_{1i} LR_{t-i} + \sum_{i=0}^{d} \alpha_{1i} ER_{t-i} + \sum_{i=0}^{e} \gamma_{1i} WEP_{t-i} \quad \text{(xv)}$$

The short-term dynamics of the model's convergence to equilibrium are represented by all of the coefficients in equation (xiv), where μ is the speed of adjustment.

EMPIRICAL RESULTS AND FINDINGS

Stationarity of the Unit Root Test

The time series requires to be integrated at I(0) or I (1) for the ARDL technique, but not I (2). The ADF and PP tests are applied to check the stationary and order of integration of time series. Table 1 presents the result of the unit root test as follows:

Table 1: Findings of the Unit Root Test

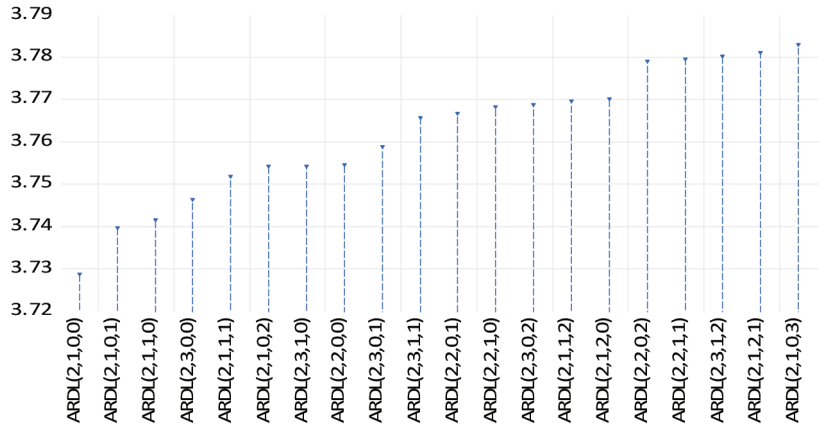
Variables	*Augmented Dickey-Fuller (ADF)*			*Phillips-Perron (PP)*		
	Level	*1st Difference*	*Decision*	*Level*	*1st Difference*	*Decision*
lnCPI	-2.01723	-4.0147***	I (1)	-1.3809	-10.5536***	I (1)
lnM2	-5.1421***	-5.1535***	I (0)	-5.1535***	-15.1732***	I (0)
lnLR	-0.0032	-5.7703***	I (1)	-0.1481	-9.7629***	I (1)
lnER	-0.5984	-6.9252***	I (1)	-0.7439	-7.0004***	I (1)
lnWEP	-1.9286	-9.1756***	I (1)	-1.9451	-8.4306***	I (1)

*, **, and *** indicate significance at 10%, 5%, and 1% levels, respectively. *All variables are in natural logarithm form. Source: Authors' own Calculation in E-Views 13. Data Source: Statistics Department of BB, Pink sheet, WB.

Based on the results, it is found that all variables are stationary at I (1), while M2 is stationary at I (0). Since the variables are in mixed order, an ARDL bounds testing method is adopted to explore the impacts ofregressorson the dependent variable (Pesaran et al., 2001).

Model Selection Criterion

Following the Akaike Information Criteria (AIC), the optimal lag choice is presented in the following graph. The ideal lag length has been selected for the top twenty models. According to the AIC, our best model for this study is ARDL (2,1,0,0) among the top twenty models.



Source: Authors' Calculation in E-views 13. Data Source: Statistics Department of BB.

Results of ARDL Bound Tests for Co-integration

The ARDL bounds test is employed to assess the long-term interaction amid the regressors. The findings of the bounds test for co-integration are exposed in Table 3.

Table 2: Bounds Test Result for Co-integration

F-Statistic =4.513		
Level of Significance	*Lower Bound Value I (0)*	*Upper Bound Value I (1)*
10%	1.90	3.01
5%	2.26	3.48
1%	3.07	4.44

Source: Authors' own Calculation in E-views 13. Data Source: Statistics Department of BB, pink sheet, WB.

The calculated F-statistic (4.513) successfully passes the upper bounds at the 10%, 5%, and 1% significance levels presented in Table 3. Consequently, the null hypothesis of no-cointegration is denied, as is ensuring the presence of co-integration, i.e., there is a long-term equilibrium relationship among the dependent variable and the model regressors. So, the outcomes recommend that inflation is co-integrated with money supply (M2), lending rate (LR), exchange rate (ER), and world energy price (WEP)for the covered period of our study.

The outcomes of Long-Run and Short-Run Dynamics

Since co-integration has been found, the next step is to assess the long and near term dynamics of the model. The computed long and short term coefficients are displayed in tables 4 and 5 in that order.

Table 3: Estimated ARDL Long-Run Coefficients

Variables	*Coefficient*	*Std. Error*	*T-Statistic*
LGER	0.108399	0.233213	-0.464806 (0.6427)
LGLR	-0.381190	0.053365	-7.143066*** (0.0000)
LGM2(-1)	0.296489	0.054983	-5.392407*** (0.0000)
LGWEP(-1)	0.013028	0.034571	-0.376849 (0.7068)

*** indicates significance at 1% level. *All variables are in natural logarithm form. Figures in the parentheses indicate probability value. Source: Authors' own Calculation in E-views 13. Data Source: Statistics Department of BB, pink sheet, WB.
CE = LGCPI (-1) - (0.108399*LGER - 0.381190*LGLR + 0.296489*LGM2 (-1) + 0.013028*LGWEP (-1))

The findings highlight that the inflation rate of Bangladesh is significantly and considerably impacted by M2, LR, ER, and WEP. From Table 4, it is found that M2 is highly significant and positive at the 1% level, indicating that every 1% increase in M2 will result in a 29% rise of inflation in Bangladesh which is similar to the findings of Kazi Mostafa Arif, and Munshi Murtoza (2012) i.e., a 1% increase of M2 will lead to 34% rise of inflation in the long. Another crucial factor is LR, which is also extremely significant and positive at the same level. A 1% increase in LR will lead to a 38% fall in inflation in Bangladesh. So, we can say that money supply (M2) and lending rate (LR) are the two important drivers of inflation in Bangladesh. Another key factor is the exchange rate (ER), and the world energy price (WEP) is also positive but not significant in our model. Since energy prices in our country are administered, the ups and downs of WEP do not necessarily reflect our energy prices. Thus, it is inferred that Bangladesh's inflation rate is heavily influenced by money supply (M2) and lending rate (LR).

Table 4: Short Run Dynamics and ECM for the estimated ARDL Model

Variables	*Coefficient*	*Std. Error*	*T-Statistic*
COINTEQ*	-0.074370	0.015445	-4.815224*** (0.0000)
D(LGM2)	-0.136710	0.065688	-2.081206** (0.0391)

Variables	*Coefficient*	*Std. Error*	*T-Statistic*
D(LGM2(-1))	0.130200	0.072175	1.803960 (0.0732)
D(LGWEP)	-0.011882	0.006599	-1.800624 (0.0737)
CRISIS_DUMMY	-0.003535	0.002221	-1.591771 (0.1135)

, and * indicate significance at 5%, and 1% levels, respectively. *All variables are in natural logarithm form. Figures in the parentheses indicate probability value. Source: Authors' own Calculation in E-views 13. Data Source: Statistics Department of BB, pink sheet, WB.

The error correction term is the most critical component of the short-run model. It (COINTEQ*) shows an adverse sign, is less than 1, and demonstrates strong significance even at the 1% level. These indicate a long-term correlation between the inflation rate of Bangladesh and the model regressors. Moreover, the coefficient value of ECT -0.07437 signifies the pace of adjustment to equilibrium. Thus, the system takes almost 14 months to return to long-term equilibrium.

ARDL Model Fitness Checking

Table 6 explains the diagnostic tests for the projected model. To examine the constancy and adequacy of our estimation, we employed the normality test, serial correlation test, and heteroscedasticity test.

Table 5: ARDL Diagnostic Checking

Diagnosis	*Test Statistic (F)*	*P-value*
Breusch-Godfrey Serial Correlation LM Experiment	0.20478	0.8009
Breusch-Pagan-Godfrey Heteroscedasticity Test	0.86325	0.4980
Normality (Jarque-Bera) Test	1.7877	0.4091
Ramsey RESET Test	0.11775	0.7320

Source: Authors' own Calculation in E-views 13. Data Source: Statistics Department of BB, pink sheet, WB.

According to F-statistics with probability values, the calculated model successfully overcomes diagnostic tests for residual serial correlation, heteroscedasticity, and non-normality. Moreover, in case of Ramsey RESET test, the p-value of t and F statistics as well as the Likelihood ratio indicate the acceptance of null hypothesis i.e., there is no specification errors in the model and the regression equation is best fitted. Thus, we may conclude that our model is a good fit because it satisfies all clinical trials.

Table 6: Chow Break-down Test

Single point test			
Null hypothesis: No breaks at specific breakpoints			
Variable	Break period	F-statistics	P-value
lnM2	2020	0.457179	0.7670
lnLR	2020	0.457179	0.7670
lnER	2020	0.457179	0.7670
lnWEP	2020	0.457179	0.7670
Multiple point test			
Null hypothesis: No breaks at specific breakpoints			
Variable	Break period	F-statistics	P-value
lnM2	2020, 2021	1.216439	0.2776
lnLR	2020, 2021	1.216439	0.2776
lnER	2020, 2021	1.216439	0.2776
lnWEP	2020, 2021	1.216439	0.2776

Source: Authors' own Calculation in E-views 13. Data Source: Statistics Department of BB.

Since the p-value is higher than 0.05 for both single point and multiple point test, so the null hypothesis can't be rejected and we can say that there is no structural break for the regressors in our model during the mentioned sample period.

Stability of the test

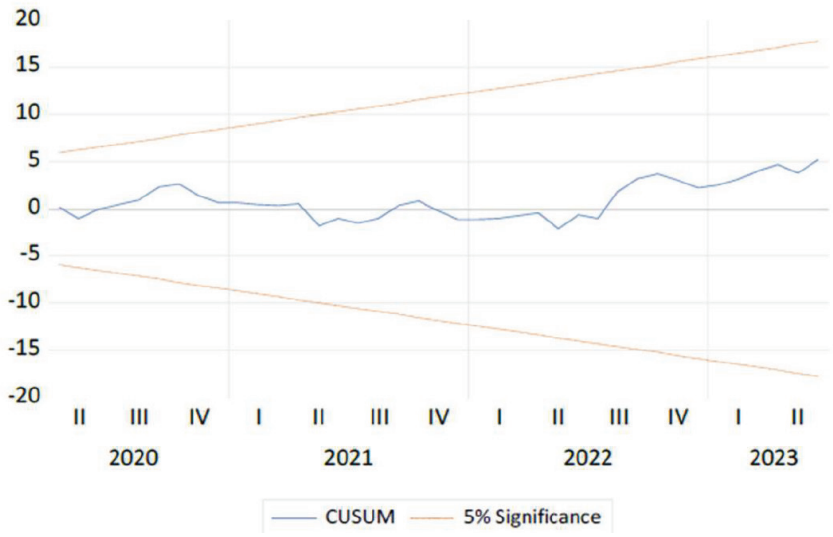


Figure 6: CUSUM test

Source: Authors' Calculation in E-views 13.

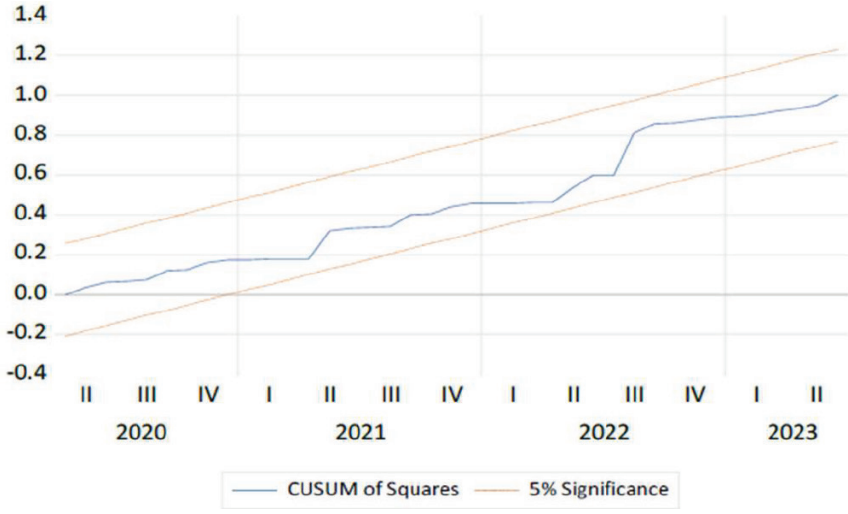


Figure 7: CUSUM Square test

Source: Authors' Calculation in E-views 13.

Moreover, to check the strength of our investigation's long-run and short-run inferences, we performed structural stability tests on the parameters with the CUSUM and CUSUMSQ experiments. These trials indicate the regression coefficients are typically constant across the period of the sample, as the blue band is within the two red bands at the 5% level for both tests (Figures 2 and 3).

Finally, the diagnostic tests of the model successfully meet up with every basic assumption of the ARDL model, i.e., absence of autocorrelation, homoscedasticity, normal distribution, as well as ensuring the stability of the regression coefficients with the CUSUM and CUSUMSQ tests.

LIMITATIONS OF THE STUDY

The inflation rate of the Bangladeshi economy could be influenced by a wide range of significant macroeconomic factors, including money supply, exchange rates, lending rate, world food price, imports, exports, remittances, interest rates, policy rate taken by Bangladesh Bank, unexpected shocks, non-economic factors, etc. Out of all of them, we have chosen several macroeconomic factors, like M2, LR, ER, and WEP to assess the impacts of those variables on the inflation rate of Bangladesh. Furthermore, we explored how those factors affected the inflation scenario in Bangladesh from FY2011 to FY2023. In the future, more variables would have to be considered to conduct a broader analysis of the inflation rate in Bangladesh.

CONCLUSION AND POLICY IMPLICATION

The aim of this study is to investigate the internal and external drivers of inflation in Bangladesh during FY2011 to FY2023. The data was assembled from Bangladesh Bank's Statistics Department's Monthly Economic Trends and World Bank pink sheet. The unit root test (ADF) is used to ensure the stationarity of the data. Moreover, The ARDL Bounds test approach is adopted to examine if the selected variables have a long run relationship, i.e., whether the explanatory variables affect inflation in Bangladesh. Finally, clinical and stability tests are embraced to verify if the model is appropriate and stable.

The findings of the ARDL bound tests specify that all the variables are co-integrated, indicating a long-run relationship between inflation in Bangladesh and the model regressors. Inflation in Bangladesh is heavily influenced by both money supply (M2) and Lending rate (LR) in the near-term and long run. Precisely, 1% rise in M2 corresponds to almost 30% rise in inflation, whereas a 1% increase in LR leads to a 38% fall in inflation.

Finally, the diagnostic tests of the model successfully meet up with every basic assumption of the ARDL model, i.e., absence of autocorrelation, homoscedasticity, normal distribution, as well as fulfill the stability requirement of the regression coefficients with the CUSUM and CUSUMSQ, and Chow-Breakdown tests which further ensure that our model is appropriate and stable throughout the sample period.

Bangladesh Bank (BB) and Government of Bangladesh jointly taken so many initiatives to control the rising trend of inflation in Bangladesh. BB implemented several initiatives for curbing inflation in Bangladesh of which significant steps included: During H1FY24[1], key policy measures adopted under a contractionary policy stance incorporated implementation of the interest rate corridor (IRC), establishment of a reference[2]-based interest rate for lending, removal of the lending rate cap, elimination of the interest rate floor on deposits, unification of the exchange rate, and a cumulative 175 basis point increase in the policy rate. In the latter half of FY24, policy rate hike furthered by 75 basis points in H2FY24[3], narrowing IRC from +200 basis points to +150 basis points, discontinued practice of devolvement of T-bills and T-bonds on BB etc. Recently, BB further increased the policy rate by 50 basis points which is 9 percent from 8.50 percent in order to discourage money supply to control the hike of the price level. So, the policy implications of the study recommend that concerned policymakers specially the government would have to take fiscal policy in coordination with the Monetary Policy as well as focus

on non-economic factors like formation of syndicate, hoarding of agricultural products, proper monitoring of the markets, good governance etc. along with economic factors to control inflation in Bangladesh.

NOTES

1. H1FY24 indicates first half of fiscal year 2024.
2. The SMART (Six Months Moving Average Rate of Treasury Bill) based interest rate system has been abolished for shifting towards a full-fledged market-based interest rate system that is effective from 08 May 2024.
3. H2FY24 indicates second half of fiscal year 2024.

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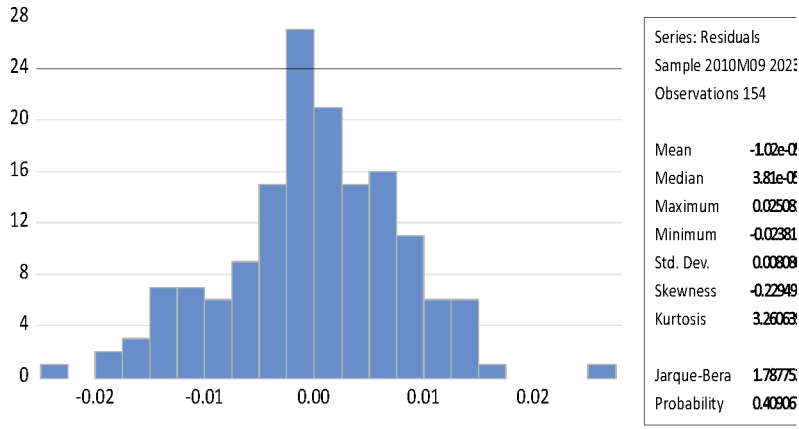
APPENDIX



Source: Authors' Calculation in E-views 13.