

What Drives Inflation in Bangladesh? An Econometric Analysis

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Abstract: This paper delves into the factors that influence the inflationary scenario in Bangladesh, with a focus on both internal and external factors. Using monthly data from July 2012 to April 2023, an Autoregressive Distributed Lag (ARDL) model is employed to investigate the impact of external factors such as global energy price, global food price as well as internal factors such as money supply, gross domestic product (GDP) and exchange rate on inflation in Bangladesh. The findings suggest that both external and internal factors play important roles in shaping inflation rates in Bangladesh. Specifically, changes in world food prices and domestic money supply have a positive significant impact on inflation rates. Multiple diagnostic tests confirm the model is stable, normal, and free of serial autocorrelation or heteroscedasticity concerns. The results have important implications for policymakers in Bangladesh, who must be aware of the various factors that can influence inflation rates and implement policies to mitigate their impact.

Keywords: Inflation, Bangladesh, World Food Price, ARDL, World Energy Price. Views expressed in this article are the authors own. This does not necessarily reflect the views of the organization they work. All remaining errors are the authors own.

Introduction: Inflation is a steady upswipe in a period of time's average price of goods and services. It has the effect of making the same goods or services more expensive. Inflation is a process where prices are increasing, and the currency's purchasing power is decreasing. In Bangladesh, the subject of inflation is of utmost concern because it has profound economic and societal ramifications. Because of increased prices, individuals require more money to conduct daily business, and since the value of money is falling, every consumer must carry around more cash.

The Keynesian school's demand-pull inflation theory claims that rising the demand for goods and services is what causes inflation. The idea states that there is a strong demand for a small number of goods and services (limited supply). Supply is expanding more slowly than demand. As a result, the price of the commodities

increased. Materials, wages, and salaries are only a few of the costs associated with producing or providing services. Prices rise because of rising production and service expenses to preserve a specific profit margin. The imbalance between the supply and demand of products and services triggers the discrepancy in the price of those items. The Monetarist theory is a different one that attempts to explain why inflation occurs. The Monetarist believes that an upsurge in the money supply causes inflation. These concepts have undergone empirical testing. However, yield conflicting data regarding the origins of inflation. While some research claimed that the main trigger of inflation were the money supply and the interest rate, other studies given evidence that the main causes were the exchange rate, imports of goods and services, and other factors. This study endeavors to shed some insight on the variables pertaining to inflation in Bangladesh. In recent months, inflation has become a widespread phenomenon, rising food and fuel prices all over the world mostly because of the inception of COVID-19 in 2020 and the ongoing Russia-Ukraine conflicts. The supply constraints create a historic inflation all over the world. Bangladesh faced growing inflation in accordance with global trends, with Point-to-Point CPI inflation reaching 9.33 percent in March 2023 [1]. Double-digit inflation has been harming the economy of Bangladesh. In Bangladesh, the inflation rate in August 2022 was 9.52 percent, highest in the last twelve years. The Bangladesh Bureau of Statistics publishes data on Bangladesh's inflation rates. Bangladesh's inflation rate historically ranged from FY13 to FY22 at an average of 6.05 percent, with a record high of 12.71 percent in December 1998 and a record low of -0.02 percent in December 2012 [1]. High inflation primarily distorts a nation's economy, making it appealing to understand the underlying causes of inflation. Inflation can be influenced by variety of internal and external factors, including government money printing, rising the production and labor costs, high loan rates, a decline in currency rate, higher taxes, world food and energy price or conflicts. This study uses the Autoregressive Distributive Lagged Model (ARDL) to assess the factors pertaining to Bangladesh's inflation rates. Numerous researchers used various theoretical and methodological approaches to assess the long- and short-term relationships between the inflation rate and its drivers in various nations.

Ahmed and Mortaza (2005) endeavor to evaluate the experimental evidence with the use of annual data sets for Bangladesh's real GDP and CPI for the years 1980 to 2005 through the Error Correction Model (ECM) [2]. They investigated that, there is long-run negative association between CPI and real GDP. The empirical findings pointed out a statistically significant long-run inverse link between inflation and national economic growth.

Article history:

Received 11 March 2023
Received in revised form 25 July 2023
Accepted 20 October 2023
Available online 15 November 2023

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Using monthly data from January 1999 to October 2010, Kabundi (2011) attempted to determine the primary factors influencing inflation in Uganda, both in the long-run and short-run [3]. In order to account for both domestic and external factors, the author employed a single-equation ECM based on the quantity theory of money. Finally, they concluded that there was evidence of inflation, persistence and/or inflation inertia, which can be linked to agent expectations.

However, Ratnasiri (2006) made an effort to use a VAR-based co-integration technique to explore the factors that allowed to inflation in Sri Lanka between 1980 and 2005 [4]. The findings stated that, the money supply and the price of rice play crucial role to increase inflation in Sri Lanka both in the short and long-term. It has been determined that the impact of GDP growth and exchange rate depreciation on inflation is minimal and statistically insignificant. Rice price, money growth, and exchange rate effects all have statistically significant short-term effects on inflation.

Arif & Ali (2012) concluded that the GDP, broad money, government spending, and imports had a positive long-term impact on inflation in Bangladesh using the Johansen-Juselius cointegration methodology based on data 1978 to 2010 [5]. Government spending and exports, however, have a detrimental impact. The government expenditure coefficient is 0.466, and the money supply coefficient is 0.337, meaning that an increase in either by one percent in government spending or money supply will result in an inflation increase of 0.466% or 0.337%, respectively. They found that, money supply was the leading factor in persuading the country's short-term inflation.

Notwithstanding, Fatukasi Bayo (2005) looked into what caused inflation in Nigeria between 1981 and 2003 [6]. They came to the conclusion that the rate of inflation in Nigeria during the study period was considerably and favorably impacted by all explanatory factors such as fiscal deficits, money supply, interest rates, and currency rates.

Majumdar (2006) also identifies several specific supply-side elements that contribute to inflation, including the cost of labor and wages, import costs, exchange rates, the price of oil, market syndication, and the scarcity of agricultural commodities [7]. However, Nazer (2016) scrutinized at how the Saudi Arabian money supply, oil prices, import prices, US interest rate, and real GDP affected inflation [8]. The findings show that Saudi Arabia's inflation is positively correlated with both the money supply and import price. On the other hand, Ramady (2009) used the money supply, the stock price index, oil prices, the US interest rate, and the currency rate to evaluate the external and internal factors of inflation in Saudi Arabia [9]. This paper detected that, inflation of Saudi Arabia is mainly triggered by changes in interest rates, money supply, and the value of the domestic currency relative to foreign currencies.

Al-Ezzee (2016) observed that, among other factors, the currency rate affects inflation [10]. Additionally, he discovered that in the long run, monetary factors like the nominal effective exchange rate (NEER) have a significant impact on the level of the consumer price index (CPI). In addition, Masoodi and Tashkini (2005) used the Vector Auto Regressive approach with spread lags to examine the long-run connection between inflation and its drivers for periods spanning 1959 to 2002 [11]. The Results indicated that the factors influencing inflation in the Iranian economy are production, the import price index, liquidity, and exchange rate. The model predicts that a percentage change in each of these factors over the long term will have an impact on the overall level of prices of -0.37, 0.5, 0.34, and 0.27, respectively.

However, Shakeri et al. (2015) utilized an autoregressive model (VAR) to analyze the factors that contributed to inflation between 1960 and 2011 [12]. The mark-up index, produced in this study corresponding to the Iranian economy's structure, and the model uses its growth along with liquidity growth, nominal exchange rate growth, and productivity growth. According to the Granger causality test results, there is a one-way causal relationship between inflation and the three variables of mark-up growth, exchange rate growth, and labor productivity growth on the one hand, and between money growth and inflation on the other side. Almounsr (2010) used a single equation model, an SVAR model, and a VECM model to investigate the fundamental drivers of inflation dynamics in Yemen [13]. His research revealed that a large portion of the fluctuation in inflation can be attributed to monetary innovations, exchange rate depreciation, domestic demand shocks, and international price shocks.

Chavoshzadeh Tafti (2012) measured and examined the factors that influence inflation in the Islamic Republic of Iran [14]. She employed the Johansen and Juselius maximum likelihood method, with a focus on Impulse Response Functions (IRF) and Forecast Error Variance Decomposition (FEVD), after briefly examining the theoretical background. Results showed that while the consumer price index (CPI) first responds positively to shocks in the import price index and liquidity, it initially responds too feebly to shocks in GDP. Through the use of Johansen Co-integration and Vector Error Correction techniques, Basir et al. (2011) tracked the factors that contributed to inflation in Pakistan between the years of 1972 and 2010 [15]. The study makes estimates for both the long term and the short term of a few variables affecting Pakistan's consumer price index (inflation). The research' findings show that, over time, the money supply, GDP, government spending, and imports all help to raise the consumer price index, whereas increased government revenues always cause the index to fall. The coefficient of the error correction term in the short run is -0.03, indicating 3 percent annual adjustment in the direction of long run equilibrium.

In order to study the key factors affecting inflation in India, Shahadudheen (2012) extracted data from 54 time series with quarterly observations [16]. The Johansen Juselius cointegration methodology was used in the study to see whether the variables had a long-term relationship. The study concluded that the GDP and general money had a long-term beneficial impact on inflation. The impact of interest rates and currency exchange rates is the opposite. However, several studies concentrated on inflation from different country's perspectives. But, very few of the studies even attempted to examine or extract the factors in

perspectives of Bangladesh as per the best of the authors' knowledge. Those were investigated; these gave priority only in internal or external perspectives. Thus, the main objectives of the study are to inspect the factor both in external and internal those affect the inflation scenario in Bangladesh.

Inflationary Scenario in Bangladesh Over the last decade:

Bangladesh's inflationary situation has fluctuated moderately during the last ten years, but it has largely maintained a downward trend (Fig. 1). However, the inflationary pressure appears to be severe since the breakdown of COVID-19 and after the pandemic resurgence and beginning of Russia-Ukraine in February 2022. In November 2021 and August 2022, fuel was adjusted in addition to that to fuel it. In August 2022, it reached a peak of 9.52 percent, the highest level in the previous 12 years. The recent inflationary pressure in Bangladesh has a number of sources. The rise in food prices, which make up a sizeable component of the consumer price sssindex (CPI) basket, is among the primary causes. For basic foods like wheat, cooking oil, and lentils, Bangladesh is severely reliant on imports. Prices for these necessary foods have increased in the neighborhood market as a result of the global rise in food costs and the weakening of the Bangladeshi Taka. Additionally contributing to the current inflationary pressure in Bangladesh is the COVID-19 pandemic. The epidemic has disrupted global supply networks, which has led to a local market shortage of several vital items. The supply disruption caused a rise in these products' pricing. Expansionary fiscal and monetary policies are another element causing inflationary pressure. Government funding on different development initiatives and social safety net programs has increased, which has increased the demand. Expansionary fiscal and monetary policies have led to an increase in aggregate demand, which has contributed to inflationary pressure. Additionally, the continuing crisis between Russia and Ukraine influences the recent inflation in Bangladesh. The violence has, nevertheless, had an impact on the world's oil and food markets, which significantly contribute to Bangladesh's inflation. Due to worries about probable supply interruptions brought on by the fighting, oil prices have risen on the global market. Due to, its reliance on imported oil, Bangladesh may experience an inflationary pressure as a result of any upsurge of energy prices on the global market. The disruption of the supply chain is another indirect effect of the Russia-Ukraine conflict on Bangladesh's inflation. The violence has hampered international trade, which has led to a lack of some necessary items on the market. This paper seeks to examine both internal and foreign factors that have contributed to Bangladesh's inflationary pressure for the time span of July 2012 to April 2023.

The figures (1-6) below show the trends of Inflation rate, Money Supply (M2), GDP, World Energy Price Index, World Food Price Index and Monthly trends of Exchange rate.

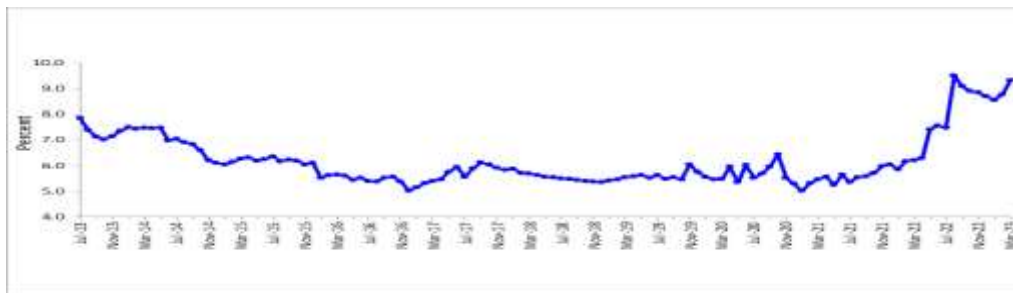


Fig. 1: Monthly Trends of Inflation (Base: 05-06). (Source: Bangladesh Bank).

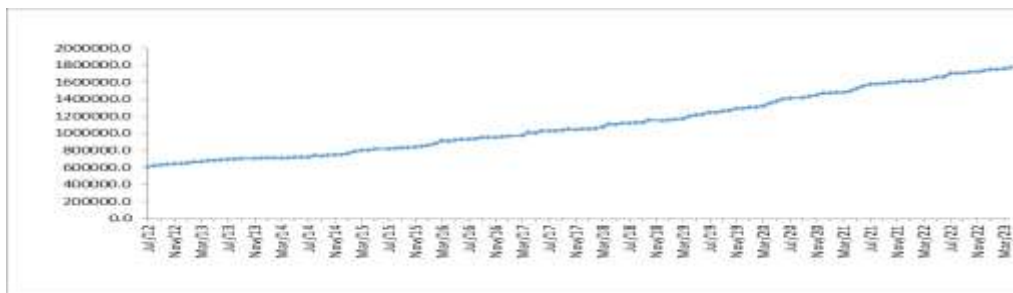


Fig. 2: Monthly Trends of Money Supply (M2). (Source: Bangladesh Bank).

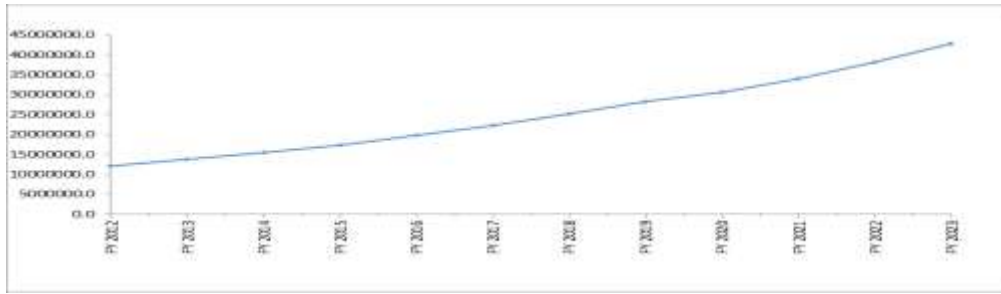


Fig. 3: Trends of Real Gross Domestic Product (Base: 2015-16). (Source: Bangladesh Bureau of Statistics)

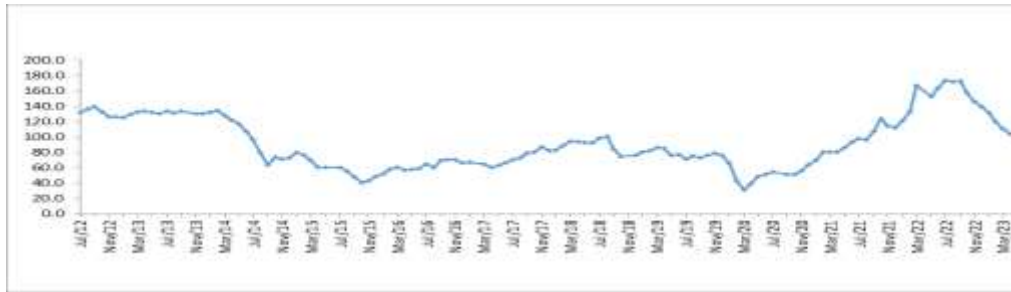


Fig. 4: World Energy Price Index. (Source: World Bank)

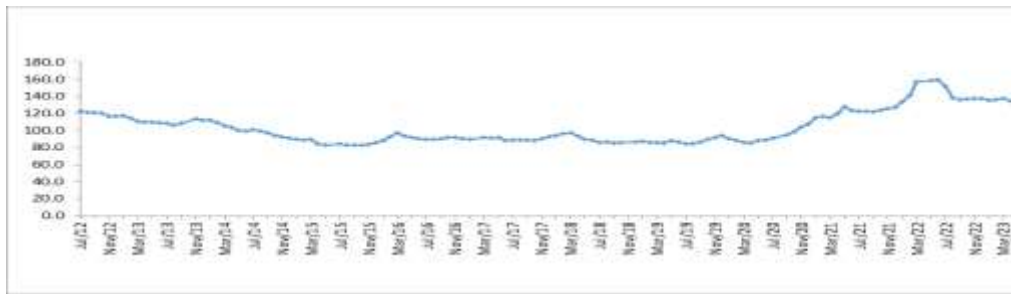


Fig. 5: World Food Price Index. (Source: World Bank)

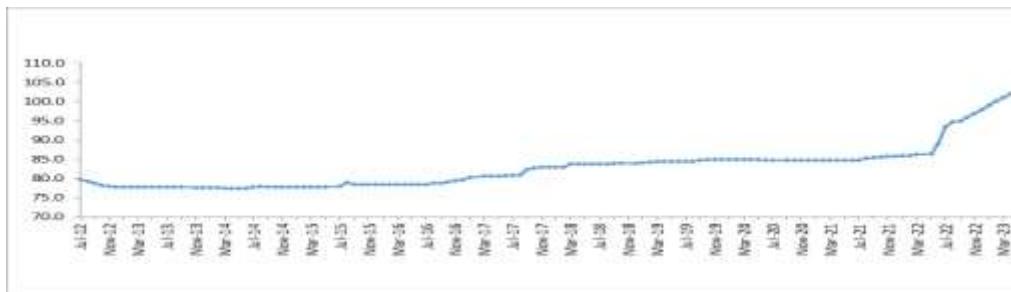


Fig. 6: Monthly Trends of Exchange Rate. (Source: Bangladesh Bank)

Methodology:

Data: The monthly data for the study is collected from Bangladesh Bank [17] and The World Bank’s Commodity Price Data [18]. Monthly Data were obtained for the period from July 2012 to April 2023, on Inflation rate, GDP, Money Supply (M2), Official Exchange Rate, World Energy Price Index and World Food price index. It may be mentioned that, GDP data of Bangladesh has been published only on an annual basis. Hence, the data has been transformed to monthly using Chowlin method on Eviews using Industrial Production as indicator.

Estimation Technique: The following model was employed to assess the factors that influence inflation in Bangladesh.

$$\ln R = f(\text{GDP}, \text{M2}, \text{WE}, \text{WF}, \text{EXR})$$

Where, $\ln R$ = 12-month-average Inflation Rate

M2 = Broad Money

GDP = Gross Domestic product

EXR = Official Exchange Rate (Taka per Dollar basis)

WE = World Energy price Index

WF = World Food Price Index

The model is specified as follows:

$$\ln R_t = c_0 + \theta_1 \ln GDP_t + \theta_2 \ln M2_t + \theta_3 \ln WE_t + \theta_4 \ln WF_t + \theta_5 EXR_t + \varepsilon_t \quad \text{Eq. (1)}$$

To establish the long run relationship among these variables, we relied on the ARDL-bound test approach to Cointegration. One caveat is that we can't apply ARDL bound test approach to cointegration if any of the variables is integrated of order two I (2). In that line, we need to check the unit root test of the variables. The procedure for testing Stationarity is described below:

Unit Root Test:

Augmented Dickey Fuller (ADF) Test:

Table 1. Unit root tests for Stationarity.

Variable	ADF Test (Level)	ADF Test (FirstDifference)	Decision
$\ln R$	-1.9236	-7.3455***	I (1)
GDP	-1.4642	-12.3375***	I (1)
M2	-2.0461	-11.5199***	I (1)
WE	-1.9236	-7.3455***	I (1)
WF	-1.4041	-7.0340***	I (1)
ExR	2.0787	-3.7517**	I (1)

*, **, *** indicates 1%, 5%, 10% significance level, respectively

Source: Author's own calculation using Eviews.

ADF test is applied on all the variables both in their level form as well as in first difference form. From the table 1 we can observe that all the considered variables are in I(1). So based on this result, we have enough evidence to consider all these variables to be I(1) and we are allowed to carry out an ARDL bound test to cointegration to seek for the existence of a long run relationship among the variables.

ARDL Bound Test to Cointegration:

Table 2. Bound F test for cointegration.

F-statistic	= 9.22	
Level of Significance	I(0)	I(1)
10%	2.08	3
5%	2.39	3.38
2.5%	2.7	3.73
1%	4.29	5.61

Source: Author's own calculation using Eviews.

The result from ARDL bound test to cointegration among the considered variables are shown in table 2. The calculated F statistic is 9.22, which is greater than the upper bound critical value and lower bound critical value at 1% level of significance meaning that there is enough evidence to reject the null hypothesis of no cointegrating relationship. This result implies that Inflation rate variable is cointegrated with GDP, M2, world energy price, world food price and exchange rate. To be more specific, it can be concluded from our result that there exists a long run equilibrium relationship among the variables of interest for the time span covered by this study.

Having confirmed the existence of both long run and short run relationship among the variables, we tried to estimate the coefficients of ARDL long run model and that of the short run model which is simply the error correction model (ECM) model. The long run and short run estimates of the ARDL (3,1,0,1,3,0) are presented in the table (3) and (4).

Long Run Result:

Table 3. Long run Results.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNGDP	-0.257851	0.721370	-0.357447	0.7214
LN M2	0.286900	0.133663	-2.146446	0.0341
LNWE	-0.140034	0.546473	-0.256251	0.7982
LNWF	3.865806	1.331112	2.904194	0.0045
ER_E	0.065350	0.042261	1.546351	0.1249

Source: Author’s own calculation using Eviews.

The long run results of the model are presented in table 3. Which shows a positive relationship among Inflation rate and M2 and world food price.

Short Run Result:

Table 4. Short run results.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LNGDP)	-0.075400	0.042379	-1.779188	0.0780
D(LNWE)	-0.067566	0.040666	-1.661504	0.0995
D(LNWF)	0.056786	0.144229	0.393724	0.6946
D(LNWF(-1))	-0.437535	0.150909	-2.899320	0.0045
D(LNWF(-2))	-0.269837	0.144932	-1.861815	0.0653
CointEq(-1)*	-0.36589	0.004435	-8.250072	0.0000
D(LNGDP)	-0.075400	0.042379	-1.779188	0.0780
Adjusted R-squared	0.857179			
S.E. of regression	0.038042			
Durbin-Watson stat	1.993886			

Source: Author’s own calculation using Eviews.

The important part of the short run model is the Error Correction Term. It depicts how much of the previous period's disequilibrium is being fixed in the present period. In other words, it measures the speed of convergence toward the equilibrium if there exists any disequilibrium in the short -run. The error correction coefficient is expected to be negative and lies within 0 to -1. Any positive value of this term will imply divergence from the equilibrium. The coefficient of ECT is -.36589 which is statistically significant at 1% level (Table 4).

Diagnostic Test Checking for stability of the Model:

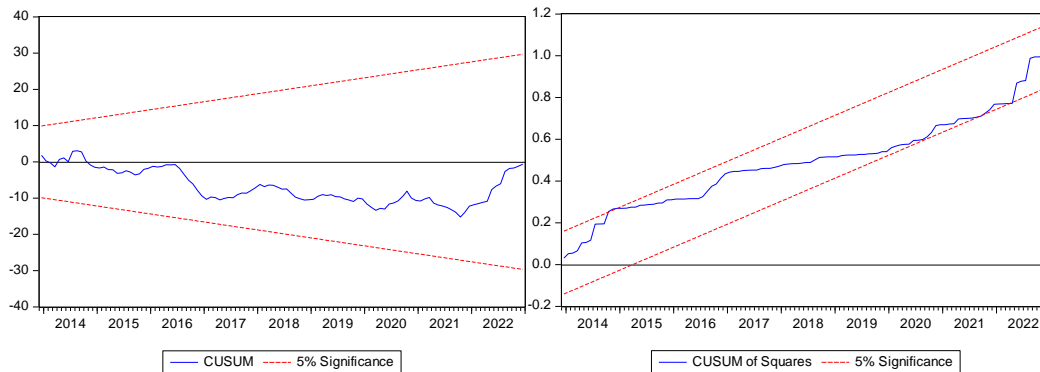


Fig. 7: CUSUM and CUSUMSQ Test (Source: Author’s own calculation using Eviews).

To check for the stability of the long run parameters, both CUSUM and CUSUMSQ are used. The results are depicted in figure 7. In both cases, we failed to reject the null hypothesis as the plots of the tests show there is no root lying outside the 5 % level of significance. Therefore, the ARDL model passes the test of model stability.

Table 5. Short run diagnostic test

Diagnostic Test	F-statistics	p-value
Serial Correlation LM test	0.478725	0.6209
Heteroskedasticity test	1.7421	0.1278
Normality	0.1560	0.9249

Source: Authors calculation using EViews

The results for the residual diagnostic test are illustrated in table 5. The most used test to check the presence of serial correlation in the residuals is LM test and the p value for LM test confirms the absence of serial correlation in the model. To check for the heteroscedasticity in the residuals, BPG test was used. Again, as we can't reject the null hypothesis of no heteroscedasticity, we conclude our model is free of heteroscedasticity. Lastly, the high p value of Jarque-Bera test confirms that the residuals are normally distributed.

Summary of findings and policy option: The ARDL model confirmed that, Inflation rate is cointegrated with GDP, M2, world energy price, world food price and exchange rate. To be more specific, it can be concluded from the result that there exists a long run equilibrium relationship among the variables of interest for the time span covered by this study. This study picked up a long run relationship between the inflation rate of Bangladesh, money supply and world food price index and the relationship were positive and statistically significant. The underlying reason for such relationship goes in line with the quantity theory of money by Irving Fisher. The study conducted found a positive relationship among domestic inflation rate, broad money, and world food prices. This means that as the world food price and broad money supply increases, domestic price level also tends to increase. Thus, it is mentionable that the inflation of Bangladesh is mostly driven by the global food price and broad money. The study also concluded that recent inflationary pressure in Bangladesh is mostly supply driven and both the external and internal factors. The findings have important implications for policymakers, particularly for developing countries like Bangladesh, where food prices are a major concern. It highlights the need for policymakers to focus on managing inflation and money supply to ensure that food prices remain affordable for consumers. Failure to do so can lead to food insecurity and other negative social and economic consequences. The study also underscores the importance of international cooperation in managing price levels. The global food market is interconnected, and shocks in one region can have ripple effects on prices around the world. Therefore, policymakers and international organizations should work together to ensure that there are effective mechanisms in place to stabilize food prices and mitigate the impact of external shocks. Moreover, the country's monetary policy should give emphasis on external shocks and incorporate the world food price scenario.

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