



Determinants of Inflation in Bangladesh: A Pre and Post Covid-19 Analysis

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Abstract

The aim of this study is to explore the determinants of inflation in Bangladesh. To do that, this study applied the ARDL model using monthly time series data on selected economic variables such as money supply, exchange rate and industrial production index data from July 2010 to June 2023. This study also incorporated the Covid-19 dummy to understand the impact of the Covid-19 pandemic on the inflation dynamics of Bangladesh. The empirical findings of this study showed that inflation has a strong positive association with the money supply in Bangladesh in the long run. Besides, the exchange rate positively affects the inflation in the short run as well in the long run. Other variables such as industrial production index and Covid-19 dummy variables were not found statistically significant during the sample period. The findings of the study have some implications for the policymakers of Bangladesh. As there exists a strong positive association between money supply and inflation in the long run implies that policymakers need to consider the long-term impacts of the amount of money supply. Moreover, there is a strong positive relationship between the exchange rate and inflation in both the long as well as short run, therefore, policymakers should also be careful in determining the exchange rate.

Keywords: Inflation, ARDL, Exchange rate, COVID-19.

JEL Classification: E31, E42, C32

1 Introduction

Inflation control is an important macroeconomic policy objective for any economy, affecting economic growth, saving, and investment. Bangladesh is no exception in this regard. Bangladesh Bank is charged with the role of ensuring price stability by making sound decisions based on policy tools, which include the policy rate, money supply, and credit controls. The success of such policy actions, however, largely depends on clearly identifying the determinants of inflation that underlie these actions. Moreover, the changing nature of the economy requires that researchers conduct studies periodically to en-

sure that the current scenario is reflected in policy decisions.

The economy of Bangladesh has been growing tremendously over the last two decades, especially in the 2010s. The inflation rate was around 6.0 percent (except for FY2011 and FY2012) before the emergence of the Covid-19 pandemic, which indicates the policymakers' ability to make appropriate decisions. The roles of money supply, policy rate, and exchange rate are immensely important in determining the level of inflation and stabilizing the economy. Researchers have conducted numerous studies to understand the determinants of inflation in Bangladesh.

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The recent dynamics of Bangladesh's economy have seen some major changes, mostly after the emergence of the pandemic. Most of the studies conducted on determining the inflation dynamics of Bangladesh have incorporated annual data. Furthermore, the focus has specifically been solely on the relationship between money supply and inflation. However, there is a set of economic variables that contribute to the changes in inflation. Additionally, very few studies have considered the impact of the pandemic on inflation in Bangladesh. A number of studies have focused on the immediate effect of the pandemic on the inflation dynamics in Bangladesh. This study has a special focus on Covid-19 to understand its impact on inflation in Bangladesh by incorporating monthly data up to June 2023. The policy implications drawn from this study, therefore, are more credible and reliable.

The rest of the paper is organized as follows: Section two presents the literature review, Section three discusses the methodology, Section four outlines the empirical results, and Section five provides the conclusion and policy recommendations.

1.1 Objectives of the Study

The primary objective of this study is to explore the intricate relationship between the money supply and the inflation dynamics of Bangladesh, with a specific focus on the pre- and post-COVID-19 periods. Besides, other objectives of the study include, exploring the impacts of other variables such as the Exchange Rate and Industrial Production Index on the level of inflation.

2 Literature Review

Over the past few decades, extensive studies have been conducted by researchers to understand the determinants of inflation in various countries across the globe. The methodological approaches undertaken by the researchers have uncovered interesting insights into the

complex dynamics of inflation. For instance, [Amassoma et al. \(2018\)](#) found that no causality between money supply and inflation or vice versa for Nigeria using data from 1970 to 2016. [Yousfat et al. \(2015\)](#) identified a momentous positive affiliation between money supply and inflation rate using annual time series data from 1970 to 2013 for GCC countries. [Göçmen \(2016\)](#) discovered a significantly strong causal connection between money supply and inflation. The author discovered such causality in both the bivariate and multivariate models. Using Pooled Mean Group (PMG) and Generalized Method of Moments (GMM), [Nguyen \(2015\)](#) estimated the impact of deficit financing and broad money on the inflation level of nine Asian countries. The outputs of the PMG estimate suggested that broad money supply positively affects the inflation level of countries. [Tékam \(2018\)](#) sought to determine the connection between the country's monetary policy and inflation utilizing data from 1980 to 2016 for Cameroon. The author found no significance of interest rates in influencing the country's inflation level. However, the study found that inflation is positively and significantly associated with money supply. On the other hand, [Diermeier and Goecke \(2016\)](#) found no connection between the growth of monetary aggregates and the inflation level of a few countries in the Euro Zone. Another study was conducted by [Berger and Österholm \(2011\)](#) on the countries of the Euro Zone utilizing data from 1970 to 2006. The authors found that the capacity of money supply in forecasting inflation for the present period was considerably lower compared to the earlier periods such as the 70s or the 80s.

In the context of Bangladesh, there exists numerous studies regarding the determinants of inflation. [Uddin et al. \(2014\)](#) investigated the determinants of inflation in Bangladesh by using the time series data from 1972 to 2012. By employing the ARDL method they found that GDP, money supply, interest rate and exchange rate are contributing factors of in-

flation in Bangladesh. Alam (2018) examined the determinants of CPI in Bangladesh from 1980 to 2016. This study found that GDP, imports, government revenue and money supply are the main drivers of inflation during the period under examination. Arif and Ali (2012) explored the determinants of inflation in Bangladesh for the period from 1978 to 2010. By employing Johansen-Juselius cointegration methodology they found that GDP, broad money, government expenditure and imports are the major determinants of inflation in Bangladesh. By using Granger Causality, as well as Error Correction Modelling, Hosain (2011) found that a broad money supply causes inflation to rise in both the long as well as short run but not vice-versa. Murshed et al. (2018) applying the Granger causality and Vector Error Correction Model (VECM), found no such causal relationship between money supply to inflation in Bangladesh. The study involved annual time series data from 1980 to 2014. Islam et al. (2022) investigated the inflation dynamic of Bangladesh to figure out the macroeconomic variables that influenced inflation. Based on the analysis of data ranging from 1981 to 2020, the study figured that broad money supply, along with export, import, and GDP strongly influence the inflation level of the country. Another empirical analysis of the inflation dynamics of Bangladesh by Biswas (2023) found no cointegration among inflation, GDP, broad money supply, and the exchange rate in Bangladesh. Sultana et al. (2019), in their effort to determine the causal relationship between the supply of money and the level of inflation in Bangladesh, found that the money supply does not necessarily influence the level of inflation in the short run.

Though many studies have been conducted to understand the inflation dynamics of various countries, the outcomes of these studies indicate diverse findings. There is no clear consensus on the determinants of inflation. Moreover, inflation dynamics are observed to be different in different periods. Considering

the complex dynamics of inflation, the determinants of inflation have become an area of immense interest for researchers. On top of all this, economic disruptions cause the inflation dynamics of countries to undergo major adjustments, which oftentimes alter the impacts of certain variables. For instance, the emergence of the COVID-19 pandemic caused major upheaval in the economies of countries all over the world. Researchers have responded swiftly by conducting in-depth research to determine the impact of the pandemic on the inflation dynamics of countries. However, a limited number of studies have been conducted to determine the impact of the pandemic on inflation in Bangladesh. The goal of this research is to address this gap in the existing literature. Most of the studies in this domain have focused on analyzing annual time series data. This study will make use of monthly data, which will increase the rigor of the outcomes generated through this research. Additionally, a specific focus on the pre-and-post-pandemic period while understanding the dynamics of inflation in Bangladesh adds a new dimension to the study.

3 Methodology

3.1 Data and Variables

This study makes use of data from July 2010 to June 2023 on a monthly basis. The data on CPI, Broad Money, and Exchange Rate were collected from the Bangladesh Bank (BB), while the Industrial Production Index data was collected from the Bangladesh Bureau of Statistics (BBS). The variable CPI represents the overall changes in the price of goods and services, real money supply refers to total money supply adjusted for inflation, the exchange rate is defined as BDT vis-à-vis USD and the industrial production index measures the changes in industrial production. Covid-19 serves as a dummy variable. This study considers the pre-Covid period to span from July 2010 to February 2020 and the post-

Covid period from March 2020 to June 2023 to understand the impacts of the pandemic on the inflation dynamics of Bangladesh.

3.2 Model Specification

Existing empirical studies on the determinants of inflation in Bangladesh suggest that inflation depends on money supply, exchange rate, GDP, government revenue and government expenditure. In this study, we used the Industrial Production Index as a proxy for GDP, as monthly GDP is not calculated by the Bangladesh Bureau of Statistics. We also incorporated the Covid-19 Dummy as an independent variable to understand the impacts of the pandemic on the inflation dynamics of Bangladesh. Due to unavailability of monthly data, we cannot use the government revenue and government expenditure data in this study. By following [Biswas \(2023\)](#), [Dey and Salma \(2023\)](#) and [Uddin et al. \(2014\)](#), this study specified the following model for the determinants of inflation in Bangladesh:

$$\text{CPI}_t = \beta_0 + \beta_1 \text{RMS}_t + \beta_2 \text{ER}_t + \beta_3 \text{IPI}_t + \beta_4 D_t + \varepsilon_t \quad (1)$$

Where, CPI = Consumer Price Index, RMS = Real Money Supply, ER = Exchange Rate, IPI = Industrial Production Index, and D = Covid-19 Dummy.

Among the independent variables, Real Money Supply represents a proxy for monetary policy instruments. Exchange Rate and Industrial Production are considered control variables, whereas Covid-19 serves as a dummy variable. Except for the dummy variable, all the other variables have been log-transformed for convenience. The log-transformed form of the model is as follows:

$$\ln \text{CPI}_t = \beta_0 + \beta_1 \ln \text{RMS}_t + \beta_2 \ln \text{ER}_t + \beta_3 \ln \text{IPI}_t + \beta_4 D_t + \varepsilon_t \quad (2)$$

The study considers the pre-Covid period to span from July 2010 to February 2020

and the post-Covid period from March 2020 to June 2023 to understand the impacts of the pandemic on the inflation dynamics in Bangladesh.

3.3 Estimation Strategy

3.3.1 Test of Stationarity

Most of the financial data is nonstationary by nature. Therefore, to avoid spurious regression, it is mandatory to check the stationarity of the variables used in the model. In this study, both the Augmented Dickey-Fuller (ADF) test ([Dickey and Fuller, 1979](#)) and the Phillips-Perron (PP) test have been conducted on each variable to test for stationarity at level as well as at first difference. The lag length for both test has been selected automatically by EViews based on the Schwarz Info Criterion (SIC) with a maximum lag length of 10.

The statistical significance of the p-values of the unit root tests was determined by employing a significance level of 5%.

3.3.2 Auto Regressive Distributed Lag (ARDL) Model

Generally, in empirical time series analysis, variables often exhibit mixed orders of integration and there is possibility to exist cointegrating relationships among the dependent and independent variables. Under such circumstances, ARDL estimation method proposed by [Pesaran et al. \(2001\)](#) provides an appropriate and robust framework for model estimation. This approach is the most appropriate method when the variables are mixed order of integration at the order of I(0) or I(1). Moreover, in the case of small samples this method is useful and gives the more precise estimation. Furthermore, in the presence of endogeneity, the lag specification in the ARDL model gives fair estimations of the long run and effective t-statistic value even. Finally, this method estimates both the long-run as well as the short-run relationship between dependent and independent variables. The ARDL specification corresponding to equation (2) as proposed by [Pesaran et al. \(2001\)](#), is expressed

as follows:

$$\begin{aligned} \Delta \ln(\text{CPI}_t) = & \alpha_0 + \sum_{i=0}^p \beta_{1i} \Delta \ln(\text{CPI}_{t-i}) \\ & + \sum_{i=0}^q \beta_{2i} \Delta \ln(\text{RMS}_{t-i}) + \sum_{i=0}^r \beta_{3i} \Delta \ln(\text{ER}_{t-i}) \\ & + \sum_{i=0}^s \beta_{4i} \Delta \ln(\text{IPI}_{t-i}) + \sum_{i=0}^m \beta_{5i} \Delta D_{t-i} \\ & + \beta_6 \ln(\text{CPI}_{t-1}) + \beta_7 \ln(\text{RMS}_{t-1}) + \beta_8 \ln(\text{ER}_{t-1}) \\ & + \beta_9 \ln(\text{IPI}_{t-1}) + \beta_{10} D_{t-1} + \varepsilon_t \end{aligned} \quad (3)$$

Here, Δ denotes the first-difference operator. The ARDL Error Correction representation associated with equation (3) is specified as follows:

$$\begin{aligned} \Delta \ln(\text{CPI}_t) = & \alpha_0 + \sum_{i=0}^p \beta_{1i} \Delta \ln(\text{CPI}_{t-i}) \\ & + \sum_{i=0}^q \beta_{2i} \Delta \ln(\text{RMS}_{t-i}) + \sum_{i=0}^r \beta_{3i} \Delta \ln(\text{ER}_{t-i}) \\ & + \sum_{i=0}^s \beta_{4i} \Delta \ln(\text{IPI}_{t-i}) + \sum_{i=0}^m \beta_{5i} \Delta D_{t-i} \\ & + \gamma \text{ECM}_{t-1} + \nu_t \end{aligned} \quad (4)$$

4 Empirical Results

4.1 ADF Unit Root Test Results

The Augmented Dickey–Fuller (ADF) unit root test results are presented in Table 1. The findings indicate that $\ln \text{CPI}$ and $\ln \text{IPI}$ are stationary at level, while $\ln \text{RMS}$, $\ln \text{ER}$, and D become stationary after first difference.

4.2 PP Unit Root Test Results

The Phillips–Perron (PP) unit root test results are reported in Table 2. The findings indicate that $\ln \text{IPI}$ is stationary at level, whereas $\ln \text{RMS}$, $\ln \text{CPI}$, $\ln \text{ER}$, and the dummy variable D become stationary after first difference.

4.3 F-Bounds Test Results for Cointegration

The bound test results for cointegration are presented in Table 3. It is evident from the

results that the F-Statistic value of ARDL bound test is 4.41 which surpasses the upper bound critical value at a 1% level of significance. The bound test results suggest that there exists a cointegration relationship among the variables in the model.

Table 3: F-Bounds Test Results

Null Hypothesis: No Levels Relationship				
Test Statistic	Value	Significance	I(0)	I(1)
F-statistic	4.41	10%	2.20	3.09
k	4	5%	2.56	3.49
		2.5%	2.88	3.87
		1%	3.29	4.37

4.4 Long-Run Results

Table 4 illustrates the long-run results. The long-run results suggest that both real money supply and exchange rate have a positive association with inflation for Bangladesh in the long run and the relationship is statistically significant at a 1% level of significance. Similarly, exchange rate and inflation have also positive relationship which indicate that depreciation of exchange rate would increase the inflation in Bangladesh.

Table 4: Long-Run Results

Dependent Variable: $\ln(\text{CPI})$				
Variable	Coeff	Std. Error	t-Statistic	Prob.
$\ln \text{RMS}$	0.879*	0.132	6.647	0.000
$\ln \text{ER}$	0.631*	0.136	4.613	0.000
$\ln \text{IPI}$	-0.002	0.071	-0.037	0.970
D	-0.006	0.019	-0.313	0.754

Note: * denotes significance at the 1% level.

The error-correction representation of the long-run relationship is given by:

$$\begin{aligned} EC = & \ln(\text{CPI}) - \left(0.879 * \ln(\text{RMS}) + \right. \\ & \left. 0.631 * \ln(\text{ER}) - 0.002 * \ln(\text{IPI}) - 0.006 * D \right) \end{aligned} \quad (5)$$

On the other hand, the Industrial Production Index and Covid-19 dummy is observed to

Table 1: ADF Unit Root Test Results

2*Variable	Level		First Difference		2*Decision
	Intercept	Intercept & Trend	Intercept	Intercept & Trend	
ln CPI	-3.015 (0.035)	-3.977 (0.011)	-9.540 (0.000)	-10.075 (0.000)	I(0)
ln RMS	3.457 (0.010)	1.638 (1.000)	-8.372 (0.000)	-9.463 (0.000)	I(1)
ln ER	0.554 (0.988)	-0.782 (0.964)	-4.660 (0.000)	-4.784 (0.000)	I(1)
ln IPI	-0.799 (0.816)	-9.047 (0.000)	-10.142 (0.000)	-10.120 (0.000)	I(0)
D	-0.578 (0.870)	-1.859 (0.670)	-12.409 (0.000)	-12.427 (0.000)	I(1)

Note: Figures in parentheses represent p-values. The null hypothesis of the ADF test is the presence of a unit root.

Table 2: PP Unit Root Test Results

2*Variable	Level		First Difference		2*Decision
	Intercept	Intercept & Trend	Intercept	Intercept & Trend	
ln CPI	-1.958 (0.305)	-3.034 (0.126)	-10.103 (0.000)	-13.586 (0.000)	I(1)
ln RMS	2.958 (0.041)	-3.150 (0.098)	-16.742 (0.000)	-26.953 (0.000)	I(1)
ln ER	0.705 (0.992)	-0.379 (0.987)	-8.705 (0.000)	-8.767 (0.000)	I(1)
ln IPI	-1.031 (0.741)	-9.118 (0.000)	-48.800 (0.000)	-49.011 (0.000)	I(0)
D	-0.578 (0.870)	-1.866 (0.667)	-12.409 (0.000)	-12.427 (0.000)	I(1)

Note: Figures in parentheses denote p-values. The null hypothesis of the PP test is the presence of a unit root.

have a negative relationship with inflation in the long run. However, the coefficient values are statistically insignificant. Although these variables are observed to be negatively associated with inflation, such a relationship lacks statistical significance.

4.5 Short-Run Results

The short run results are displayed in Table 5. The outcomes show that real money supply, industrial production index, and Covid-19 dummy are negatively linked with inflation. The coefficients for these variables, however, are statistically insignificant. On the other hand, the exchange rate is observed to have a positive association with inflation that is statistically significant, implying that an increase in exchange rate is likely to cause a rise in the inflation of the country.

The coefficient of ECM is -0.079 , which indicates a negative relationship, and it is statistically significant at a 1% level. A negative coefficient with the value of 0.079 suggests a

swift adjustment to the current period deviations of the long-run relationship in the next period. A monthly adjustment of about 7.95 percent indicates that a notable portion of errors from the preceding period are adjusted annually.

Table 5: Short-Run Results

Dependent Variable: $D(\ln \text{CPI})$ Selected Model: $\text{ARDL}(4,4,0,0,0)$		
Variable	Coefficient	Prob.
$D(\ln \text{RMS}(-3))$	-0.049	0.4579
ln EX	0.050	0.0002
ln IPI	-0.000	0.9705
D	-0.000	0.7575
CointEq(-1)*	-0.079	0.0000
R^2	0.999508	
F-statistic	23538.41	
Prob(F-statistic)	0.000000	
Durbin-Watson statistic	2.031179	

Note: * denotes significance at the 1% level.

4.6 Discussion

It is evident from the estimation results that the relationship between money supply and inflation is positive and significant at the 1%

level in the long run. However, the short-run coefficient of money supply is negative and insignificant. The positive and significant long-run coefficient implies that a 1.0 percent increase in the money supply ultimately increases inflation by about 0.88 percent in the long run in Bangladesh during the period under consideration. This finding is consistent with the previous findings of Hossain (2011), Uddin et al. (2014), Biswas (2023); however, it differs from the findings of Sul-tana et al. (2019) for Bangladesh. Additionally, the coefficients of the exchange rate with respect to inflation are positive and significant in both the short run and the long run. These findings signify that depreciation of the exchange rate creates inflation in Bangladesh. In the long run, the coefficient is 0.63, indicating that a 1.0 percent depreciation in the exchange rate increases inflation by about 0.63%. Bangladesh is a net importing country, as its imports surpass its exports. It relies on foreign countries for a major portion of raw materials and inputs for domestic production and exports. Therefore, depreciation of the exchange rate makes raw materials more expensive, increases domestic production costs, and contributes to inflation.

On the other hand, other variables, such as the industrial production index, which was used as a proxy for GDP, and the Covid-19 dummy, are negative and insignificant in both the short run and long run. These findings imply that the industrial production index and the Covid-19 dummy have no significant impact on inflation in Bangladesh during the period under consideration.

4.7 Diagnostic Tests

This study employed a number of diagnostic tests such as serial correlation LM test, Jarque –Bera Normality test and CUSUM and CUSUM of square test for stability. In this study we assume that errors are homoscedastic.

The probability value of serial correlation LM is 0.187 suggests that no serial correlation exists among the variables in the model. The outcome of the normality test indicates that the variables under study are normally distributed. The outcomes of CUSUM and CUSUM of square tests indicate that the model is stable (Appendix). All in all, the outcomes of the diagnostics tests indicate that the model satisfies several desirable properties making the outputs of the model reliable.

Table 6: Diagnostic Tests Results

Test	Prob.	Decision
Serial Correlation LM	0.187	No serial correlation
Normality (Jarque–Bera)	0.151	Normal residuals
CUSUM Test	–	Stable
CUSUM of Squares	–	Relatively stable

5 Conclusion and Policy Recommendations

The aim of this study was to investigate the determinants of inflation in Bangladesh during the period from July 2010 to June 2023. The study found a strong positive correlation between the money supply and inflation during the period under investigation. Such a finding underpins the pivotal role of the amount of money supplied in the economy in determining inflation. This study also found a statistically significant positive relationship between the exchange rate and inflation in both the long and short run. Other variables, such as the industrial production index and COVID-19 dummy variables, were not found to have statistically significant results.

The findings of the study have some implications for policymakers in Bangladesh. As there exists a strong positive correlation between money supply and inflation, policymakers should be cautious in determining the amount of money supplied in the economy. Moreover, given the strong positive relationship between the exchange rate and inflation

in both the long and short run, policymakers should also be careful in determining the exchange rate. The short-run and long-run associations emphasize the critical role that BB needs to play in maintaining stability in the exchange rate. The Industrial Production Index and Covid-19 dummy were not found to have a significant relationship with the inflation dynamics of Bangladesh; however, continuous monitoring and reevaluation of these variables remain essential.

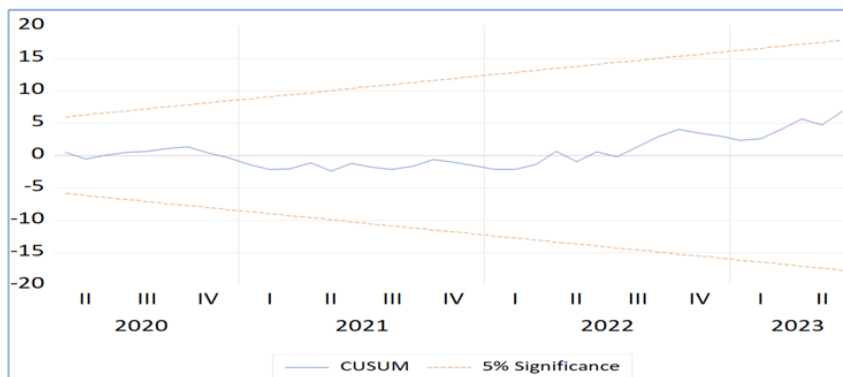
Disclosure Statement

Views expressed in this paper are the authors' own and do not necessarily reflect the views of institutions they are affiliated with.

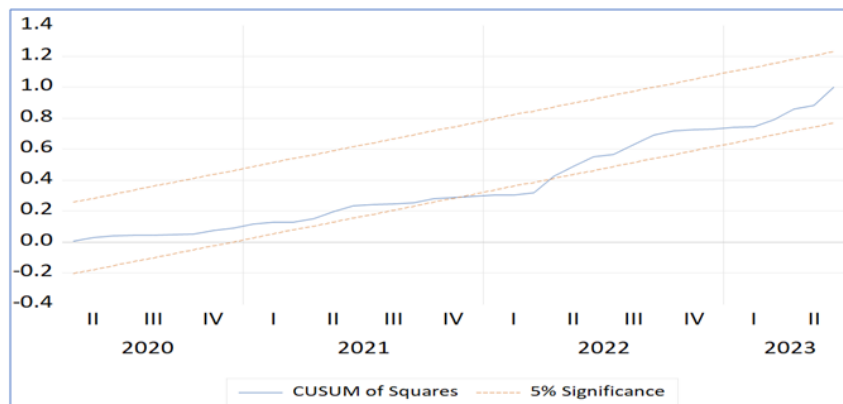
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Appendices



CUSUM Test



CUSUM of Squares Test