

Does Money Supply Drive Inflation in Bangladesh? Evidence from ARDL Bounds Testing Approach.

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Abstract: This paper examines the relationship between money supply and inflation in Bangladesh using annual data from 1991 to 2023 obtained from the World Development Indicators (WDI). The Autoregressive Distributed Lag (ARDL) bounds testing approach is used in this study to evaluate the short- and long-run link between broad money and consumer price inflation. The Augmented Dickey-Fuller (ADF) unit root tests show that the variables - inflation and wide money - are stationary at levels, i.e., $I(0)$, hence meeting the ARDL estimation criterion. The optimal lag length (lag 2) is determined by all lag length selection criteria (FPE, AIC, SC, HQ). The ARDL limits test (F-statistic = 5.21) exceeds the upper constraint at the 10% and 5% levels of significance, indicating long-run co integration between broad money and inflation. The long-run coefficient of broad money is 8.48 ($p = 0.01$), which means that a 1% increase in broad money causes an 8.48% increase in consumer price inflation in the long run. The coefficient of error correction is estimated at -0.71, implying that 71.06% of the error correction occurs within a year, confirming that the adjustment is very fast. Tests rule out serial correlation, heteroskedasticity and nonnormality of residuals. The CUSUM and CUSUM of Squares tests of stability show that the model remains stable throughout time. These findings provide strong empirical evidence in support of the quantity theory of money in Bangladesh, with consequences for monetary policy.

Keywords: Money supply, Inflation, ARDL bounds test, Co integration, Error correction model, Bangladesh, Monetary policy, Quantity theory of money.

I. INTRODUCTION

One of the major macroeconomic problems that the policymakers have to deal with is inflation, which has an effect on economic stability, income distribution and welfare. It is essential to determine the factors that contribute to inflation to aid in formulating monetary policies particularly in emerging economies such as Bangladesh, where inflation may play a key role in influencing economic growth and poverty reduction. One of the most controversial issues is the effect of money supply on inflation since it relies on the classical theory of money, which shows that the money supply is positively correlated with the price level, all other factors held constant.

One of the common economic issues that may undermine the economy, derail growth and devalue a currency is inflation. The supply of money is regarded as a major factor of determining inflation. The Quantity Theory of Money states that the money supply rises, and the inflation rises, other factors held constant. However, this relationship can vary between nations and throughout time depending on the myriad of macroeconomic factors.

Both high inflation and varying money supply have been experienced in Bangladesh which has brought concerns as to how the two phenomena relate. Some studies have been done to establish the causal relationship between money supply and inflation over the years, with mixed results. Some have found that there is a positive and direct relationship whereas others have found a more complex relationship between the money supply and inflation. With the continuously evolving environment of the economy in Bangladesh, it is imperative to know whether money supply and inflation are strongly correlated or other factors like exchange rates, external shocks and government fiscal policies are equally important.

The interaction between money supply and inflation has become an issue of concern in Bangladesh because of the changing economic set up of the nation, and recent progress in both. Wide money control is often used by the governments to maintain inflation. Such policies rely on the relationship between money supply and inflation which determines their success. The policy-makers in Bangladesh ought to ask themselves whether fluctuations in money supply are a contributing factor to the inflation.

This study aims at exploring the money-inflation nexus in Bangladesh through the ARDL bounds testing method. It examines the short-run and long-run correlation between broad money and consumer price index between the year 1991 to 2023. ADRL model is suitable in this study as it facilitates the combination of both variables of different order $I(0)$ and $I(1)$ and will give reliable estimates even in small sample sizes.

Findings of this research contribute to the existing discussions on the determinants of inflation and the findings have significant policy implications to Bangladesh. This article looks at the role of wide money with regards to inflation and whether money supply can be controlled as a tool of containing inflation in the country.

The remainder of the paper will be formatted as follows. In Section 2, we review theoretical and empirical literature. Section 3 will cover the data and methodology. Section 4 summarizes the empirical results that contain unit root tests, lag lengths, the limits test of cointegration, long-run coefficients and the error correction model. Section 5 deals with the policy implications. The research is completed in Section 6.

II. Literature Review

Money supply and inflation is a significant issue to policy makers and economists in developing countries like Bangladesh. The purpose of this literature review is to examine the link between money supply and inflation in Bangladesh, with a focus on studies that use econometric models such as the Autoregressive Distributed Lag (ARDL) model.

The concept of "inflation is always a monetary phenomenon" is true in developed economies at full employment, but may not hold entirely in developing economies such as India. Although inflation can be managed through monetary policy in developed economies (increasing money supply to stimulate a recessionary economy or decreasing money supply to reduce inflation), developing economies have different inflation patterns. Sabade (2014) explores the truth of the quantity theory of money in India and offers a new perspective. In India, aggressive monetary policy steps were unable to control inflation below 5% but resulted in a down in GDP growth rate to 5% and an increase in unemployment, suggesting insufficient reliance on monetary policy in these economies.

Jahan (2024) uses the ARDL model to investigate the long-run relationship between Bangladesh's currency rate, inflation, money supply, and GDP between FY1995 and FY2023, resulting in a long-run equilibrium. The Augmented Dickey-Fuller test validates the series' stationarity, and the ARDL bounds test indicates long-run cointegration. The findings suggest that the money supply, inflation, and exchange rate all play an essential effect in economic growth. The study suggests that growth-oriented expansionary monetary policy should be employed to encourage investment and production, making loans more appealing for investment.

Simwaka, Ligoya, Kabango and Chikonda (2012) examine the effect of monetary variables on inflation in Malawi, employing a stylized model of inflation. The findings suggest that both monetary and supply factors affect inflation dynamics, with the growth in money supply affecting inflation with a lag of 3-6 months, while exchange rate movements are more prevalent in cost-push inflation. Furthermore, falling output is also a source of inflation. The research highlights that while the Reserve Bank of India should target broad money supply growth to nominal GDP growth, supply-side shocks cannot be tackled through monetary policy.

Dey and Salma (2023) look at how the money supply affects inflation in Bangladesh in the long and short term from 1986 to 2021. The paper has used the Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) tests to determine the stationarity and the autoregressive distributed lag (ARDL) model to suggest that there is long-run cointegration between money supply, GDP, and exchange rate. This means that the contribution of broad and narrow money supply in the inflation is significant, and the short-run adjustment rate is relatively high (almost 97%). The report suggests fiscal and monetary policies, exchange rate controls, supply-side policies and international cooperation to fight inflation.

Buthelezi (2023) focuses on the impact of money supply on inflation and economic growth in South Africa with focus on various states (low, high, or both). The study uses Markov-switching dynamic regression (MSDRM) and time-varying parameter structural vector autoregression (TVP-VAR) models and finds that a 1% increase in money supply reduces GDP by 0.70% in state 1, but the effect is minor in state 2. The influence of money supply on inflation varies by state, with 0.05% negative in state 1 and 0.35% positive in state 2.

Gatawa, Abdulgafar, and Olarinde (2017) use the vector autoregression (VAR) model and the Granger Causality test in an error correction model to examine the impact of money supply, inflation, and interest rates on Nigerian economic growth from 1973 to 2013. Their findings imply that wide money supply has a favorable long-run effect on growth, whereas inflation and interest rates have a negative impact. The broad money supply and interest rates have a detrimental influence in the short run. However, causality tests show that none of the factors influence economic growth, meaning that money supply, inflation, and interest rates have no effect on growth in Nigeria.

Hussain and Haque (2017) use the Vector Error Correction Model to investigate the causal relationship between money supply and per capita GDP growth in Bangladesh from 1972 to 2014. The primary variables analyzed are broad money

to GDP (BMGDP), real interest rate (RIR), and annual per capita GDP growth rate (GRGDP). The findings imply that consistent BMGDP growth is positively associated to economic growth, and that the money supply has a considerable long-term impact on production growth.

Aikaeli (2007) uses a GARCH model and monthly seasonally adjusted data from 1994 to 2006 to explore the lag effect of changes in the money supply on inflation in Tanzania. It concludes that money supply changes have a major impact on inflation seven months after they occur. The key policy implication is that in order to influence inflation in a specific month, policy should be set seven months ahead.

Roy and Younus (2024) use time-varying causality tests to analyze the relationship between money supply increase and inflation in Bangladesh, with the goal of testing the quantity theory of money. The traditional Granger causality test reveals modest unidirectional correlation between money supply increase and inflation. Nevertheless, the time-varying causality analysis shows the existence of various causality patterns over time, especially at points of structural change and exaggerated macroeconomic volatility, that the relationship between money supply and inflation in Bangladesh is not consistent and it is subject to the economic environment.

The paper, by reviewing the literature, gives a detailed description of all the theoretical and empirical approaches to the topic, their findings and methods of research, and the unanswered questions that must be filled in. The contrasting findings in country-specific research highlight the necessity to apply the ARDL limits testing approach to data from Bangladesh from 1991 to 2023.

III. Data Sources and Methodological Approach

3.1 Data Description

This analysis examines the relationship between inflation and wide money from 1991 to 2023, using annual data from the World Development Indicators (WDI) database. The sample has 33 annual data, which is a tiny sample size but sufficient for ARDL modelling because it has been proved to be resistant to small sample sizes (Pesaran, Shin, and Smith, 2001).

- Dependent Variable: Inflation, consumer prices (annual %).
- Explanatory Variable: Broad money (current LCU).
- Time Frame: 1991–2023 (33 years).
- Data Source: World Development Indicators (WDI), World Bank.

In Bangladesh, broad money (M2) includes cash outside of banks, demand, time, and savings deposits, as well as other deposits with the banking system held by the non-banking private sector. Consumer price inflation is calculated as the annual percentage increase in the consumer price index (CPI). The two variables are significant macroeconomic indicators that influence monetary policy transmission. This is because broad money measures the quantity of liquidity in the economy, whereas CPI inflation measures the fall in families' purchasing power, resulting in a theoretically and empirically solid combination.

3.2 Econometric Methodology

3.2.1 Augmented Dickey-fuller Test for Unit Root Analysis

In order to prevent false regression, it is important to test the stationarity of the variables before estimating any time series model. This is achieved through the Augmented Dickey-Fuller (ADF) test which was suggested by Dickey and Fuller (1979) and developed by Said and Dickey (1984). ADF test formula is:

$$\Delta Y_t = \alpha + \beta t + \gamma Y_{t-1} + \sum \delta_i \Delta Y_{t-i} + \epsilon_t$$

Y_t is the series to be studied, t is time trend, Δ is the first difference operator and ϵ_t is a white noise error term. The null hypothesis is that the series has a unit root (not a stationary series). At standard significance levels, we can reject the null hypothesis, which means that it is stationary.

3.2.2 Selection of Optimal Lag Length

The standard information requirements are minimized to determine the best lag duration of the VAR system that will support the ARDL model. The methods used in the research are Final Prediction Error (FPE), Akaike Information Criterion (AIC), Schwarz Information Criterion (SC) and Hannan-Quinn Information Criterion (HQ). These criteria trade off model fit and parsimony and a consensus selection of criteria provides good reasons to select lags.

3.2.3 Bound Testing Approach Using the ARDL Model

In order to examine the long-term link between inflation and wide money, the current study used the ARDL limits testing methodology developed by Pesaran, Shin, and Smith (2001). This methodology offers several important advantages over traditional cointegration methodologies such as the Engle-Granger (1987) two-step method and the Johansen (1988) trace and maximum eigenvalue tests. For example, the ARDL model:

- It does not require that all variables be integrated in equal order and can be applied to variables of I(0), I(1), or a combination of the two.
- More efficient in limited and finite sample sizes, which is especially relevant given the 33-year data set of this study.
- Gives unbiased estimates and valid t-statistics when there are endogenous regressors.
- In a single equation model, the short- and long-run dynamics are estimated simultaneously.

ARDL model is specified as:

$$\Delta Y_t = \alpha + \sum \beta_i \Delta Y_{t-i} + \sum \gamma_j \Delta X_{t-j} + \varphi_1 Y_{t-1} + \varphi_2 X_{t-1} + \varepsilon_t$$

Where: Y_t is the dependent variable (inflation), X_t is the independent variable (broad money), Δ is the first difference operator, and β_i and γ_j are the coefficients of the lagged level variables in the limits test; p and q are the optimal lags that are calculated using information criteria (AIC, SBC); and ε_t is the white noise error.

The limits test involves estimating the ARDL model with OLS and calculating the F-statistic for the joint null hypothesis $H_0: \alpha = 0$ (no long-run relationship). Pesaran et al. (2001) offer two asymptotic critical values, $I(0)$ and $I(1)$. When the estimated F-statistic exceeds the upper bound, the null hypothesis is rejected and the long-run cointegrating connection is established, regardless of the variables' integration order.

3.2. 4 Estimation for the Long and Short Run Relationship

To avoid misleading regressions, any time series model should test for variable stationarity. We employ the Augmented Dickey-Fuller (ADF) test, which was proposed by Dickey and Fuller (1979) and then improved by Said and Dickey (1984). The ADF test equation is:

$$\Delta Y_t = \alpha + \beta t + \gamma Y_{t-1} + \sum \delta_i \Delta Y_{t-i} + \varepsilon_t$$

Y_t is the series under test, t is the time trend, Δ is the first difference operator, and ε_t is white noise. The null hypothesis states that the series has a unit root (that is, it is not stationary). Stationarity is demonstrated by a rejection of the null at standard levels of significance.

3.2.5 Diagnostic Checking and Stability Analysis

A battery of diagnostic tests is utilized to ensure the robustness of the predicted ARDL model. The Breusch-Godfrey Serial Correlation LM test is used to see if the residuals are autocorrelated or not. The Breusch-Pagan-Godfrey Heteroskedasticity test is used to determine whether the variance of the residuals is constant. The Jarque-Bra test evaluates the hypothesis that the residuals are normal. Finally, Brown, Durbin, and Evans (1975) advocate using the Cumulative Sum (CUSUM) and CUSUM of Squares tests to assess the structural stability of model parameters. The tests are especially significant in the context of making sure that the estimated relationships are not volatile and caused by structural breaks in the data.

IV. Empirical Results

4.1 Unit Root Test Results

The initial empirical investigation aims to determine the stationarity of inflation and wide money. Table 1 shows the findings of the Augmented Dickey-Fuller (ADF) test.

'Table 1: Unit Root Test (Augmented Dickey-Fuller Test)'

Variables	'Level T-Statistic'	'Level P-Value'	'1st Diff. T-Statistic'	'1st Diff. P-Value'	Order of Integration
Inflation	-3.80	0.01	-7.30	0.00	I(0)
Broad Money	-4.14	0.003	-0.52	0.88	I(0)

Source: 'Authors' Calculation using E-views'. Data Source: World Development Indicators (WDI).

According to the ADF test results, both variables are at their respective levels because the test statistics and p-values show that they are stationary. In the case of inflation, the T-statistic is -3.80, $p = 0.01$, indicating that the null hypothesis of a unit root is rejected at the 1% level of significance. This demonstrates that the order of integration for inflation is zero, I(0). In the instance of Broad Money, the T-statistic at level is -4.14, with a p-value of 0.003, rejecting the null hypothesis at the 1% level and accepting I(0) stationarity.

The fact that both variables are stationary at different levels has important methodological consequences. Although in classical cointegration, all variables must be I (1), the ARDL limits testing method works when the variables are I (0), I (1), or a combination of the two. ARDL is especially appropriate to analyze the two series because of their I(0) classification. Notably, both variables are not I(2) making the bounds testing procedure invalid. The findings can therefore be considered a strong statistical basis to continue with ARDL estimation.

4.2 Lag Selection Criteria

The optimal lag time of the underlying VAR system is determined using a variety of information guidelines. Table 2 displays the outcomes of the lag selection.

Table 2: Selection Criteria for VAR Lag Order

'Lag'	'LogL'	'LR'	'FPE'	'AIC'	'SC'	'HQ'
0	-601.43	NA	2.77e+14	38.93	39.02	38.96
1	-497.13	188.41	4.29e+11	32.46	32.74	32.55
2*	-480.40	28.06*	1.90e+11*	31.64*	32.10*	31.79*

Source: 'Authors' Calculation in E-views'. * specifies the lag order determined by the criterion. LR: Sequential modified LR test statistic (each test at the 5% level). Final prediction error (FPE); Akaike information criterion (AIC); Schwarz information criterion (SC); and Hannan-Quinn information criterion (HQ).

Table 2's lag selection findings reveal that all four criteria, including FPE, AIC, SC, and HQ, agree that lag 2 is the best lag length for the model. At lag 2, the log-likelihood value is -480.40, with FPE = 1.90e+11, AIC = 31.64, SC = 32.10, and HQ = 31.79, all of which represent improvements over lag 0 and lag 1. The asterisks make the selection of lag 2 by any criterion clear. The agreement of all criteria gives good statistical evidence that the dynamic adjustment process can be well represented by using two lags in the model and still keep the parsimony of the small sample of 33 observations. According to this, the ARDL (2, 2) specification is taken up to further estimation.

4.3 ARDL-Based Co integration Testing Approach

After defining the stationarity properties and determining the best lag length, the ARDL bounds test of cointegration is performed. Table 3 shows the results.

Table 3: Bounds Test Results for Cointegration

'F-Statistic' = 5.21

'Level of Significance'	'Lower Bound Value I(0)'	'Upper Bound Value I(1)'
10%	3.02	3.51
5%	3.62	4.16
1%	4.94	5.58

Source: 'Authors' Calculation using E-views'. Data Source: World Development Indicators (WDI).

The results of the ARDL limits test show that there is a long-term relationship (cointegration) between inflation (consumer prices) and wide money between 1991 and 2023. The calculated F-statistic (5.21) is more than the upper bound critical value at both the 10% (3.51) and 5% (4.16) significance levels, implying that the null hypothesis of no cointegration is rejected. This demonstrates that inflation and wide money have a stable long-run equilibrium connection.

At the 1% level of significance, however, the value of F (5.21) does not exceed the upper bound critical value (5.58), rendering the conclusion ambiguous at this highest level of rigour. Nonetheless, the 10 percent and 5 percent results are enough to draw the conclusion that long-term inflationary trends in Bangladesh are significantly related to changes in broad money. These findings pave the way for estimating long-run coefficients to evaluate the impact of broad money on inflation, as well as evaluating short-run dynamics using an error correction model.

4.4 Estimates of Long-Run Co efficient

Table 4 gives the long-run coefficients estimated using the ARDL model.

Table 4: Estimated ARDL Long-Run Coefficients

Variables	'Coefficient'	'Std. Error'	'T-Statistic'	'P-Value'
BROAD_MONEY	8.48	8.13	1.042844	0.005
C (Constant)	5.76	0.76	7.57	0.00

Source: Authors' Calculation using E-views. Data Source: World Development Indicators (WDI).

The computed ARDL long-run coefficients confirm a strong and positive association between broad money and inflation across the research period. The broad money coefficient is 8.48 which means that the level of broad money by 1 unit will increase inflation by 8.48 percentage points, all other conditions held constant. This association is statistically significant at the 1% level (P-value = 0.005), emphasizing the strong and long-term effect of broad money on inflation.

This result is generally consistent with the forecast of the Quantity Theory of Money, that there is a proportional long-run relationship between the money supply and the price level, and it is consistent with the empirical findings of Dey and Salma (2023) and Uddin et al. (2019) in Bangladesh, as well as the empirical results of Maune et al. (2020) in Zimbabwe. The large coefficient (8.48) indicates that, in the long run, monetary expansion in Bangladesh has a significant inflationary effect, which may be due in part to structural features of the Bangladeshi economy, such as the presence of supply-side rigidities, fiscal dominance, and the Bangladesh Bank's inability to sterilise the economy.

The autonomous component of inflation is the constant term (5.76), which represents the level of inflation in the absence of monetary forces when broad money is held constant at zero. It is also very significant (P-value = 0.0000), which implies the existence of structural inflationary pressures in Bangladesh which are not determined by monetary conditions, i.e., cost-push factors, imported inflation, and inertial inflation expectations.

4.5 Short-Run Dynamics: Error Correction Model (ECM)

The Error Correction Model (ECM) defines the process and rate of transitioning from short-run disequilibrium to long-run equilibrium. The most important ECM consequence is shown in Table 5.

Table 5: ECM for the Estimated ARDL Model

'Variable'	'Coefficient'	'Std. Error'	't-Statistic'	'Prob.'
'CointEq(-1)*'	-0.71	0.17	-4.09	0.00

Source: 'Authors' Calculation in E-view's. Data Source: World Development Indicators (WDI).

The estimated ARDL model is further verified by the Error Correction Model that there is a strong and significant adjustment mechanism of inflation to short-term shocks in broad money. The error correction term (CointEq(-1)) coefficient is -0.71, representing the rate of adjustment to long-run equilibrium following a short-run shock. The disequilibrium in inflation is rectified at a rate of about 71.06 in just one year, indicating a rather quick recovery into equilibrium. P-value of 0.00 is extremely significant, which proves that the error correction mechanism is statistically sound.

The minus sign of the coefficient is critical: it demonstrates the stability of the long-run relationship and assures that the movements are towards equilibrium rather than explosion. This is a necessary requirement to the cointegration result being economically significant. The rate of adjustment of 71%/year is quite large compared to the 40%/month adjustment of Uddin et al. (2019) based on monthly data with M2, but this difference is partly due to the different frequency of data and period of adjustment. In general, the statistically significant and negative error correction value supports the fact that the inflation rate in Bangladesh is highly responsive to deviations due to short-term shocks in broad money, which supports the validity and reliability of the long-run cointegrating relationship.

4.6 Diagnostic Tests

A complete series of diagnostic tests is performed to assess the predicted ARDL model's strength and stability. Table 6 summarizes the findings.

Table 6: Short-Run Diagnostic Tests

'Diagnostic Test'	'F-Statistic' / Statistic	'P-Value'	'Interpretation'
'Serial Correlation LM Test'	0.83	0.45	No evidence of serial correlation
'Heteroskedasticity Test'	2.68	0.09	No strong evidence of heteroskedasticity
'Normality (Jarque-Bera) Test'	0.22	0.89	'Residuals are normally distributed'

Source: 'Authors' Calculation in E-view's. Data Source: World Development Indicators (WDI).

Serial Correlation LM Test: The null hypothesis of no serial correlation is not rejected since the p-value (0.45) is significantly higher than the 5% level of significance. This finding indicates that the model residuals are uncorrelated with time, as well as the validity of the ARDL model's dynamic specification and the unbiased and efficient estimation of coefficients.

Heteroskedasticity Test: There is no significant difference between the null hypothesis of homoskedasticity and the 5% significance threshold because the p-value (0.09) is less than 5%. The outcome of this implies that heteroskedasticity in

the residuals is not strong, which means that the error term variance is not very different over the sample period. The reported standard errors of the long-run coefficients are thus reliable.

Normality (Jarque-Brau) Test: The null hypothesis of regularly distributed residues is accepted, with a p-value (0.89) significantly higher than the 5% level. The histogram of residuals shows a bell-shaped distribution that is in line with the normal distribution. This establishes that the stochastic error terms meet the classical linear regression assumption of normality making t-statistics and F-statistics valid in testing hypotheses.

Overall, the diagnostic test findings confirm all of the major assumptions of the estimated ARDL model. Lack of serial correlation, heteroskedasticity and non-normality is a confirmation that the model is well-specified and that statistical conclusions made using the model, especially on the long-run significance of broad money as a source of inflation in Bangladesh, are plausible, sound, and appropriate to inform monetary policy.

4.7 Stability Tests

Brown, Durbin, and Evans (1975) proposed using the Cumulative Sum (CUSUM) and Cumulative Sum of Squares tests to assess the structural stability of the ARDL model parameters. The tests apply to the estimated model's recursive residuals.

The CUSUM test is a plot of the cumulative sum of recursive residuals versus time, and gives critical values at the 5% significance level. The CUSUM of Squares test conducts a test analogous to the cumulative sum of squared recursive residuals, which adds to evidence of parameter constancy. The blue lines (CUSUM and CUSUM of squares statistics) in the two tests fail to intercept the two red 5% significance lines throughout the entire sample period 1991-2023. This illustrates that the model parameters are structurally sound and there exist no structural discontinuities in the relationship that exists between broad money and inflation over the research period.

A significant result of the study in the case of Bangladesh is the stability of the ARDL model, as the country was exposed to some potentially destabilizing macroeconomic shocks throughout the sample time, such as the Asian financial crisis of 1997-98, the global food and commodity price boom of 2007-2008, the global financial crisis of 2008-2009, and the fact that the relationship between broad money and inflation has been structurally stable between these episodes provides additional evidence that broad money is a predictable and stable source of inflation in Bangladesh and that the estimated coefficients can provide a valid foundation on which monetary policy can be tuned.

V. Discussion and Policy Implications

The empirical results of this study have significant implications on the monetary policy and macro economy management of Bangladesh. The empirical evidence of a consistent, large long-run relationship between broad money growth and consumer price inflation (long-run coefficient of 8.48 and rapid error correction of 71.06 per year) is a strong empirical basis of a wide range of policy implications.

5.1 Strengthening Monetary Targeting Framework

The results provide the first-hand empirical data of the use of broad money within monetary policy of Bangladesh Bank. The statistically significant long-run elasticity of inflation to broad money suggests that long-run increases in broad money beyond that rate that is consistent with real economic growth will produce endogenous inflationary pressure. The Bangladesh Bank ought to have a strict money growth policy, then tuning its annual money growth targets on the aggregate of projected real GDP growth alongside the inflation target in line with Friedman k percent rule and the suggestions of Hussain and Haque (2017).

5.2 Pre-emptive and Forward-Looking Monetary Policy

The coefficient of error correction = -0.71 indicates that, while long-run adjustment is very rapid, around one-quarter of any disequilibrium remains unresolved after a year. This implies that a financial increase leading to a short-term inflationary shock will remain on the inflationary pressure through the second year. Together with Aikaeli (2007)'s showing that money supply increases have a several-month lag effect on inflation, the results suggest that the Bangladesh Bank should pursue a proactive monetary policy - restricting the money supply increase rather than responding to it.

5.3 Addressing Non-Monetary Sources of Inflation

The large constant (5.76, $p = 0.00$) shows the existence of a sizeable structural or autonomous element of inflation in Bangladesh that cannot be attributed to broad money. This is consistent with the determinants of supply-side and cost-push inflation identified in the comparative literature (Simwaka et al., 2012; Sabade, 2014). Low inflation in Bangladesh can therefore not be achieved and maintained by the monetary policy alone. The autonomous inflation component

requires complementary supply-side measures such as investment in agricultural productivity, cut in trade barriers, enhancement of domestic supply chains, and control of imported inflation using an exchange rate policy.

5.4 Fiscal-Monetary Policy Coordination

Fiscal deficits funded by banking system are one of the stimulating factors of broad money growth in most developing economies like in Bangladesh. Monetary tightening by using interest rate instruments will not be enough to curb money supply growth provided the government is borrowing heavily either through the Bangladesh Bank or the banking sector. In order to successfully manage inflation, the fiscal and monetary authorities must work together, with the government exercising fiscal discipline to reduce the inflationary pressure created by deficit monetization. The results of this research give a further urgency to such coordination.

5.5 Exchange Rate Management

One of the stimulating factors of broad money growth in most developing economies such as in Bangladesh is fiscal deficits that are financed through banking system. Interest rate instrument monetary tightening will not suffice to control the money supply growth as long as the government is heavily borrowing either via the Bangladesh Bank or bank system. Effective inflation management will thus necessitate coordination between fiscal and monetary authorities, in the sense that the government will be held accountable to ensuring that the inflationary pressure caused by deficit monetization is kept to a minimum. This research provides an additional urgency to such coordination.

VI. Conclusion

This paper examines the linkage between consumer price inflation and money supply (broad money, M2) in Bangladesh in the 1991-2023 timeframe with the help of the ARDL bounds test. The study proceeds in a certain order: ADF unit root testing, optimal lag selection, boundaries test of cointegration, calculation of the long-run coefficient, estimation of the error correction model, diagnostic testing, and structural stability.

The ADF tests show that the inflation and the broad money are at the equilibrium values ($I(0)$) which satisfies the preconditions of the ARDL estimation. All four lag selection criteria concur that the best lag is 2. The ARDL limits test results in an F-statistic of 5.21, which is above the upper critical values of the 5% and 10% significant levels, and illustrates that there is a stable long-run cointegrating relationship between broad money and inflation.

The long-run coefficient of broad money is estimated at 8.48 ($p = 0.005$) which means that a one-unit shift in broad money will lead to a 8.48-percentage-point rise in long-run inflation. The coefficient of error correction, -0.71 ($p = 0.0003$) shows that in one year, a short-run disequilibrium would be solved by about 71.06 percent and the convergence would be rapid and steady to the long-run equilibrium. The autonomous constant value of 5.76 ($p = 0.00$) shows that monetary policy cannot counter significant non-monetary structural inflationary forces.

A vast amount of diagnostic tests demonstrates that there is no serial correlation ($p = 0.45$), no significant heteroskedasticity ($p = 0.09$) and no skewed residual ($p = 0.89$). The CUSUM and CUSUM of Squares tests of stability show that the model parameters do not change their structure during the sample period even during severe economic shocks.

These results are a strong empirical confirmation of the quantity theory of money in Bangladesh that general money growth is a considerable and consistent long-run activator of inflation. The results have both practical and direct implications on the monetary policy: Bangladesh Bank should proceed with a disciplined money supply targeting policy, take a pre-emptive posture on monetary policy guidance that will be informed by the money growth projections, coordinate with fiscal authorities to hold down deficit monetisation, and complement monetary tightening with supply-side and exchange rate policies to address the structural elements of inflation.

Further studies might build on this analysis by adding more explanatory variables like oil prices, food price indices, government spending, exchange rates into a multivariate ARDL or VAR equation to establish the relative importance of monetary and non-monetary drivers of inflation. By applying time-varying parameter models (as proposed by Roy and Younus, 2024), it would also be possible to further analyze whether the relationship between money and inflation has been altered across time, especially in the process of financial deepening and shift in the monetary policy operating procedures of Bangladesh.

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