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Exploring the Nexus between Money Supply and Interest Rates: A Focus on Bangladesh

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Abstract: Theoretically, money supply and interest rates are interrelated. The purpose of this study is to examine the relationship between money supply and interest rates from the perspective of Bangladesh. Using yearly time series data, this paper employs the Autoregressive Distributed Lag Model and Bound test. The main findings of the study indicate both long-run and short-run positive correlations between these variables. So, to formulate the monetary policy for our country, policymakers should consider the empirical evidence of the positive correlation between money supply and interest rate. This study has significant policy implications for shaping the monetary policy of Bangladesh.

Key words: Money Supply, Interest Rate,

Introduction

The relationship between the money supply and interest rates stands as one of the fundamental pillars of modern financial theory. This intricate interplay between the quantity of money circulating within an economy and the prevailing interest rates exerts a profound influence on a wide range of economic phenomena, from investment decisions to inflation management. Bui and Kiss[1] (2021) stated that understanding this relationship is pivotal for policymakers, investors, and economists alike, as it provides critical insights into the functioning of financial markets and the broader macroeconomic landscape.

Economic theories present two apparently conflicting perspectives on the relationship between money supply and interest rates. The first perspective, arising from the money market (the interaction between money supply and money demand), asserts a negative correlation between money and interest rates. According to this viewpoint, the demand for money depends on the nominal interest rate because the interest rate represents the cost of holding money. Consequently, a reduction in the money supply would lead to an increase in interest rates to maintain equilibrium in the money market. In contrast, the Fisher[2] equation posits a positive correlation, indicating that rising interest rates necessitate an increase in the money supply growth rate.

Moreover, Milton Friedman[3] is a renowned American economist and one of the leading figures in the field of monetary economics during the 20th century. His theory on the money supply, often referred to as the "Quantity Theory of Money," has had a significant influence on economic thought and policy. Friedman believed that changes in the money supply have a significant impact on nominal variables like interest rates. In his view, an increase in the money supply, all else being equal, leads to lower nominal interest rates, while a decrease in the money supply leads to higher nominal interest rates. This relationship stems from the equation of exchange (M * V = P * T), where M represents the money supply, and V represents the velocity of money.

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However, Friedman makes a distinction between the short run and the long run. In the short run, changes in the money supply can have real effects on output and employment, aligning with the Keynesian view. However, in the long run, he believes that monetary changes primarily affect nominal variables, such as prices and interest rates, while having minimal impact on real variables like real GDP and employment. This concept aligns with his notion of "monetary neutrality" in the long run.

Friedman also argues that inflation is primarily a monetary phenomenon. He believes that sustained inflation can only occur if the money supply grows faster than the real output of goods and services. Consequently, to control inflation, Friedman recommends that central banks should target a stable and predictable rate of growth in the money supply.

In this paper, we aim to assess the relationship between money supply and interest rates in the context of our country. The rest of the paper is structured as follows. The next section discusses the literature review. Section 3 provides a brief description of the empirical model and econometric methodology, and section 4 presents the data and the estimated results of the study. Section 5 concludes the study with some policy implications for Bangladesh.

Literature Review

The determinants of money supply have always been a subject of interest for macroeconomists worldwide. However, this area in Bangladesh is still relatively unexplored. Since interest rates impact money supply through money demand, we also explored literature related to money demand. Notably, some of these studies, such as those conducted by Ahmed[4] (1977) and Murty and Murty[5] (1978), consider the nominal interest rate as the opportunity cost of holding money.

Using quarterly data from Bangladesh, Hossain and Younus[6] (2009) examined the sensitivity of money demand to interest rates. Their conclusion is supported by both Ordinary Least Squares (OLS) and Dynamic Ordinary Least Squares (DOLS) methodologies. Furthermore, their findings suggest that their estimated money demand model demonstrates stability.

However, Taslim[7] (1984) criticizes the inclusion of the interest rate variable as an opportunity cost for holding money. He argues that institutionally determined rates are typically set below the expected inflation rate, resulting in negative real interest rates. He also suggests that expected inflation is a good enough measure for the opportunity cost of money; the nominal interest rate would not reflect the opportunity cost of holding money. Aid and Benelbar[8] (2023) found a positive association between money supply and the exchange rate in Algeria.

We understand that the ultimate effect of changes in the money supply on nominal interest rates can be positive or negative: liquidity and credit effects exert downward pressure on the rate, while higher inflationary expectations work in a positive direction. Using a vector auto regression (VAR) approach and Granger causality statistics, Yunana[9] et al. (2014) examine the effects of money supply on interest rates in a market-based monetary regime and the bilateral relationships between these variables in Nigeria. The results of their study confirm that the effect of money supply on interest rates is negative, while fiscal deficits are found to have a positive association with interest rates. The Granger causality statistics reveal a bilateral relationship between money supply and interest rates.

Blejer's[10] (1978) research on Argentina highlights the dominance of the expectations effect, emphasizing that any degree of monetary disequilibrium significantly impacts nominal interest rates.

Hossain[11] (2010) delves into the appropriateness of monetary targeting as a policy strategy for Bangladesh. Employing annual data spanning from 1973 to 2008, Hossain examines the causal relationship between money supply and inflation using cointegration techniques alongside variables such as broad money, GDP, time deposit interest rates, US T-bill rates, and NEER.

Furthermore, Jaradat[12] et al. (2014) investigate the relationship between interest rates and inflation in Jordan's economy. Their methodology includes testing the impacts of inflation, economic growth, money supply, and budget deficits on interest rates. Subsequently, they explore the causal link between interest rates and inflation through multiple regression, cointegration, and causality tests. Their empirical findings unveil a positive relationship between inflation and interest rates and identify a bidirectional causal relationship between these two pivotal variables.

In this study, I aim to explore the relationship between money supply and interest rates using updated data. I expect that this research will add value by enhancing the understanding of the short-run and long-run relationship between money supply and interest rates in Bangladesh.

Models and Methodology

The aim of this paper is to investigate the relation between broad money supply and interest rate. To do this Dornbush and Fischer use the following equation.

$$i = \frac{1}{h}(\mathrm{ky} - \frac{M}{P}) \qquad \text{------------------------------(1)}$$

Where, i is the interest rate, y is real output, M is money supply, p is price level and are constants.
In this study I use as

$$dp = \beta_0+\beta_1 lgdp+\beta_2 lm2+\beta_3 cpi+\varepsilon i \qquad \text{-----------------------------(2)}$$

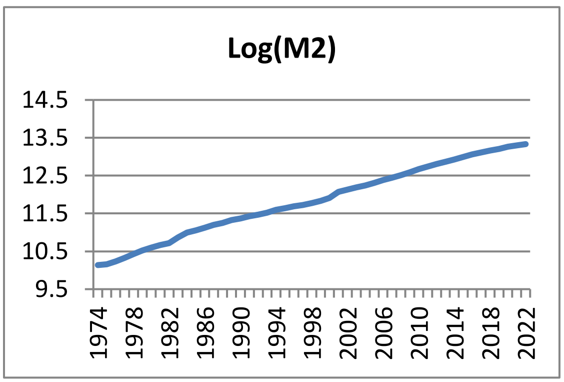
Where, dp= deposit interest rate (dp) offered by commercial or similar banks for demand, time, or savings deposits, lgdp= log of Gross Domestic Product (GDP) at local currency unit, lm2=log of Broad Money Supply (M2) at local currency unit, cpi=Consumer Price Index (CPI) and εi=error term.
However, in time series econometrics regression analysis cannot be done without stationarity checking. If these variables are combination of integrated of order one and zero, I can use Autoregressive Distributed Lag (ARDL) model for analysis. The ARDL model is a versatile modeling approach based on Ordinary Least Squares (OLS) regression, suitable for analyzing both non-stationary time series data and time series with a mixed order of integration

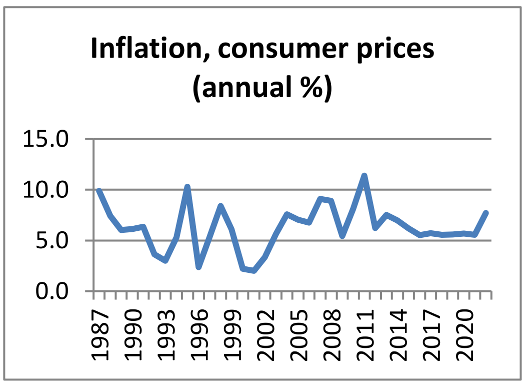
Data and Estimation

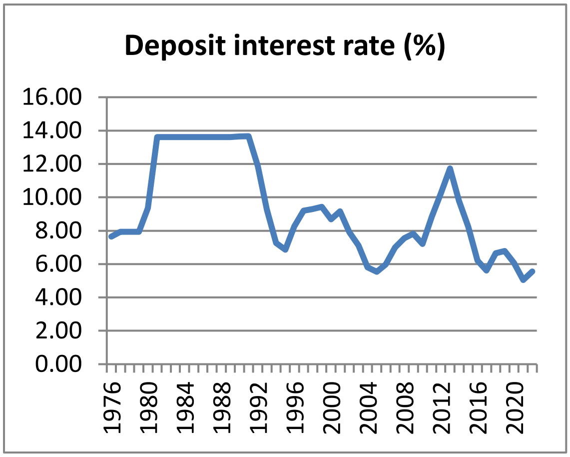
i) Source of Data

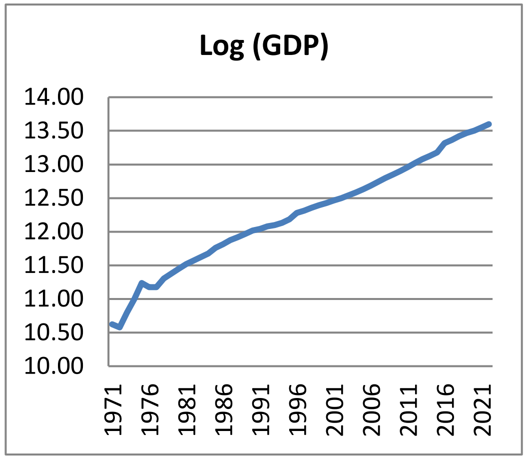
The variables Broad Money (M2), GDP, Interest Rate and Consumer Price Index are collected from World Bank website[13].

Figure 1: Time series Plot









Source: World Bank Website

ii) Unit Root Test

The Augmented Dickey-Fuller[14] (ADF) test is a statistical test used in time series analysis to determine whether a given time series data set is stationary or non-stationary. It is also an essential tool in time series analysis for model selection.

According to the ADF test, dp and lm2 have unit roots at level and stationary at first difference. However, CPI and lgdp are stationary variable. As the dataset consists of variables with different orders of integration, ARDL can handle this situation.

iii) Lag selection

The lag order determines how many past observations of a variable should be included in the model to effectively capture its temporal dependencies. There are various lag order selection criteria, such as the Akaike Information Criterion[15] (AIC) (Akaike 1973, 1974), the Schwarz Bayesian Criterion (SBC) (Schwarz, 1988), and the Hannan-Quinn Criterion (HQC) (Hannan-Quin, 1979). Selecting the right lag order requires a combination of statistical techniques and domain knowledge. Considering all of these factors, in this analysis, I use up to 2 lags for dp, 4 lags for lgdp, and 1 lag for CPI and lm2.

iv) Autoregressive Distributed Lag (ARDL) model

From our result (reported in appendix) I can see that deposit rate and money supply are positively associated in the short run and the coefficient is statistically significant. From the F statistic I can conclude that the model is jointly significant. The value of R squared and adjusted R squared is 91.6% and 89.0% respectively. Therefore we can conclude that the model is well explained.

v) Bound test

The ARDL (Autoregressive Distributed Lag) bound test is a statistical method used in econometrics to test for the presence of a long-run relationship between two or more time series variables. From the bound test result it can be concluded that there exists a significant positive long term relationship between money supply and interest rate.

Conclusion

In this study, the relationship between money supply and interest rates is investigated using annual data of Bangladesh. The findings of the analysis indicate a positive long-term association between money supply and interest rates. However, using quarterly or monthly data may reveal more information though historical data is unavailable for GDP. This outcome holds significant policy implications for our nation. Before implementing any expansionary measures, like seigniorage, it is imperative for the central bank to thoroughly evaluate their long-term effects on interest rates.

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Appendix

- Regression Output

ARDL(2,4,1,1) regression

Sample: 1988 - 2022	Number of obs = 35
	F(11, 23) = 26.76
	Prob > F = 0.0000
	R-squared = 0.9275
	Adj R-squared = 0.8929
Log likelihood = -35.558921	Root MSE = 0.8244

depositinterestrate	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
depositinterestrate						
L1.	1.242277	.1614625	7.69	0.000	.9082665	1.576288
L2.	-.4762823	.1472931	-3.23	0.004	-.7809812	-.1715833
loggdp						
--.	4.020057	8.204465	0.49	0.629	-12.95217	20.99229
L1.	12.25806	10.26608	1.19	0.245	-8.978948	33.49507
L2.	-6.015869	10.01661	-0.60	0.554	-26.7368	14.70506
L3.	-10.32612	10.17868	-1.01	0.321	-31.38232	10.73007
L4.	5.820841	8.3809	0.69	0.494	-11.51637	23.15805
logm2						
--.	13.62972	7.586934	1.80	0.086	-2.065052	29.32448
L1.	-18.72399	9.088944	-2.06	0.051	-37.5259	.077923
var21						
--.	.1609927	.0873797	1.84	0.078	-.019766	.3417515
L1.	.1353269	.0791839	1.71	0.101	-.0284775	.2991313
_cons	-11.81791	13.77532	-0.86	0.400	-40.31433	16.67851

- Bound Test

```
Pesaran, Shin, and Smith (2001) bounds test

H0: no level relationship                                  F =     5.003
Case 3                                                     t =    -2.869

Finite sample (3 variables, 35 observations, 7 short-run coefficients)

Kripfganz and Schneider (2020) critical values and approximate p-values

   | 10%               | 5%                | 1%                | p-value
   |    I(0)     I(1)  |    I(0)     I(1)  |    I(0)     I(1)  |    I(0)     I(1)
---+-------------------+-------------------+-------------------+------------------
 F |   2.895    4.215  |   3.579    5.106  |   5.263    7.282  |   0.013    0.054
 t |  -2.504   -3.413  |  -2.877   -3.841  |  -3.649   -4.720  |   0.051    0.214

do not reject H0 if
    either F or t are closer to zero than critical values for I(0) variables
      (if either p-value  > desired level for I(0) variables)
reject H0 if
    both F and t are more extreme than critical values for I(1) variables
      (if both   p-values < desired level for I(1) variables)

decision: no rejection (.a), inconclusive (.), or rejection (.r) at levels:

             |       10%        5%        1%
-------------+-------------------------------
    decision |        .         .a        .a
```