Monetary Policy Review

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Chief Economist's Unit

Bangladesh Bank

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Authors

Chee Sung Lee, ADB Consultant for the Capacity Development for the Bangladesh Bank Project
Dr. Biru Paksha Paul, Associate Professor of Economics at the State University of New York at Cortland
Dr. Hassan Zaman, Chief Economist at Bangladesh Bank
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Tarun Khanti Ghosh, Deputy General Manager, Statistics Department, Bangladesh Bank

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The Chief Economist's Unit (CEU) of Bangladesh Bank (BB) is mandated to spearhead research on macroeconomic and financial sector issues including monetary, fiscal and financial sector policies. The CEU publishes two flagship periodicals; the yearly *Monetary Policy Review* (MPR), and the *Bangladesh Bank Quarterly* (BBQ); besides policy notes, policy papers, and working papers on selected topics. The objective of CEU research is to provide sound analytical input to BB senior management about policy options on various monetary, financial and macroeconomic issues.

The Monetary Policy Review summarizes the monetary stance for FY13 as well as provides in-depth analysis of specific issues related to monetary policy, based on analytical works carried out at BB. In this context, papers on the relationship of Bangladesh's inflation with India; the use of M2 or M3 in monetary targeting; interest rate spreads; relationship between monetary policy and capital markets; the link between fiscal deficits and inflation; debt management issues have been included.

The CEU welcomes comments and suggestions on the contents of the MPR which can be sent to Chief Economist's Unit

Chief Economist's Unit
Bangladesh Bank

Chapter 1

Monetary Policy Stance in FY 2013

The monetary policy stance in FY13, announced through two half-yearly monetary policy statements (FY13H1 and FY13H2), was designed to maintain the right balance between keeping inflation restrained and supporting economic growth in light of global and domestic conditions. As the following discussion will illustrate, the Bangladesh economy was confronted by a number of challenges and BB's monetary stance played an important role in addressing or mitigating the impact of these events.

Global Economic Context

IMF's latest World Economic Outlook Update (WEO Update October 2013) anticipated that the global economy is growing more slowly than anticipated, and growth is projected to remain subdued at 2.9 percent in 2013 (Table 1). The growth in advanced economies is expected to have slowed to 1.2 percent in 2013. In emerging markets and developing economies, the growth rate is expected to slow to 4.5 percent in 2013, significantly lower than the 6.2 percent growth of 2011.

Table 1: Overview of the World Economic Outlook projections

(annual percentage change)

	2011	2012	Projections	
			2013	2014
World output	3.9	3.2	2.9	3.6
Advanced economies	1.7	1.5	1.2	2.0
United States	1.8	2.8	1.6	2.6
Euro area	1.5	-0.6	-0.4	1.0
Japan	-0.6	2.0	2.0	1.2
Canada	2.5	1.7	1.6	2.2
Other advanced economies	3.2	1.9	2.3	3.1
Emerging market and developing economies	6.2	4.9	4.5	5.1
Developing Asia	7.8	6.4	6.3	6.5
China	9.3	7.7	7.6	7.3
ASEAN-5	4.5	6.2	5.0	5.4
South Asia				
Bangladesh	6.5	6.1	5.8	6.0
India	6.3	3.2	3.8	5.1
Pakistan	3.7	4.4	3.6	2.5
Sri Lanka	8.2	6.4	6.3	6.8
World trade volume (goods and services)	**6.1**	**2.7**	**2.9**	**4.9**
Imports				
Advanced economies	4.7	1.0	1.5	4.0
Emerging and developing economies	8.8	5.5	5.0	5.9
Exports				
Advanced economies	5.7	2.0	2.7	4.7
Emerging and developing economies	6.8	4.2	3.5	5.8
Commodity prices (U.S. dollars)				
Oil	31.6	1.0	-0.5	-3.0
Nonfuel	17.9	-9.9	-1.5	-4.2
Consumer prices				
Advanced economies	2.7	2.0	1.4	1.8
Emerging market and developing economies	7.1	6.1	6.2	5.7
South Asia				
Bangladesh	10.7	8.7	7.6	6.5
India	8.4	10.4	10.9	8.9
Pakistan	13.7	11.0	7.4	7.9
Sri Lanka	6.7	7.5	7.4	6.9

Source : World Economic Outlook, October 2013, IMF.

Weaker growth projections for 2013 can be attributed to slower growth in China as well as in a number of emerging market economies. The forecast of growth rate for China is reduced to 7.6 percent in 2013, which will affect commodity exporters in the emerging market and developing economies. The United States growth rate is projected to decline from 2.8 percent in 2012 to 1.6 percent in 2013. However, activity in the US is regaining momentum due to a recovering real estate sector, higher household wealth, easier bank lending conditions, and more borrowing. In the euro area, economic growth is expected to contract by 0.4 percent in 2013, dampened by still tightening credit conditions in the periphery. This pattern is also reflected in the trade data shown in Table 1.

In advanced economies, consumer prices are anticipated to ease from 2.0 percent in 2012 to 1.4 percent in 2013 (Table 1). In emerging and developing economies, inflation is projected to increase slightly from 6.1 percent in 2012 to 6.2 percent in 2013. Consumer prices are anticipated to increase from 10.4 percent in 2012 to 10.9 percent in 2013. Commodity prices (oil and nonfuel) are projected to remain moderate in 2013.

Domestic economic developments

Economic Growth:

The Bangladesh economy achieved a respectable growth of 6.0 percent during FY13 in a very challenging domestic and global economic environment. Using the FY96 base year, real GDP growth was 0.2 percentage points lower than the 6.2 percent growth recorded in FY12 (Table 2)– however a more updated 2005 base was recently released by BBS where growth in FY13 is estimated at 6.18%. In FY13, the country's per capita real GDP increased by 4.6 percent (Chart 1).

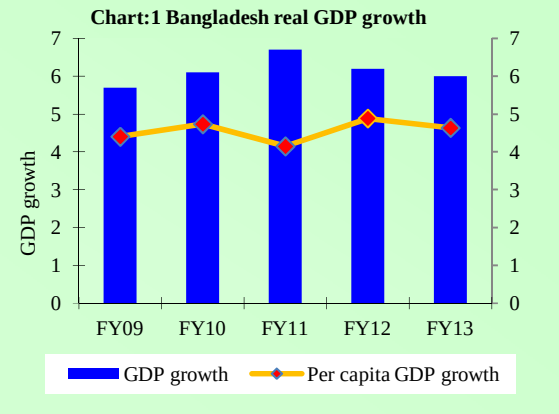


Table 2: Sectoral GDP growth

(at FY96 constant prices: percent)

	FY10	FY11	FY12[R]	FY13[P]
1. Agriculture	**5.2**	**5.1**	**3.1**	**2.2**
a) Agriculture and forestry	5.6	5.1	2.5	1.2
i) Crops and horticulture	6.1	5.7	2.0	0.2
ii) Animal farming	3.4	3.5	3.4	3.5
iii) Forest and related services	5.2	3.9	4.4	4.5
b) Fishing	4.2	5.3	5.4	5.5
2. Industry	**6.5**	**8.2**	**8.9**	**9.0**
a) Mining and quarrying	8.8	4.8	7.8	11.1
b) Manufacturing	6.5	9.5	9.4	9.3
i) Large and medium scale	6.0	10.9	10.5	10.3
ii) Small scale	7.8	5.8	6.5	6.8
c) Power, gas and water supply	7.3	6.6	12.0	8.6
d) Construction	6.0	6.5	7.6	8.1
3. Services	**6.5**	**6.2**	**6.0**	**5.7**
a) Wholesale and retail trade	5.9	6.3	5.6	4.7
b) Hotel and restaurants	7.6	7.6	7.6	7.6
c) Transport, storage and communication	7.7	5.7	6.6	6.7
d) Financial intermediations	11.6	9.6	11.0	9.0
i) Monetary intermediation (banks)	10.5	9.0	11.3	9.3
ii) Insurance	14.9	11.6	10.3	8.2
iii) Other financial intermediation	16.1	10.1	10.0	8.4
e) Real estate, renting and business	3.9	4.0	4.1	4.1
f) Public administration and defence	8.4	9.7	5.8	5.1
g) Education	9.2	9.4	7.2	9.7
h) Health and social work	8.1	8.4	7.9	7.5
i) Community, social and personal	4.7	4.7	4.8	4.9
GDP (at FY96 constant market prices)	**6.1**	**6.7**	**6.2**	**6.0**

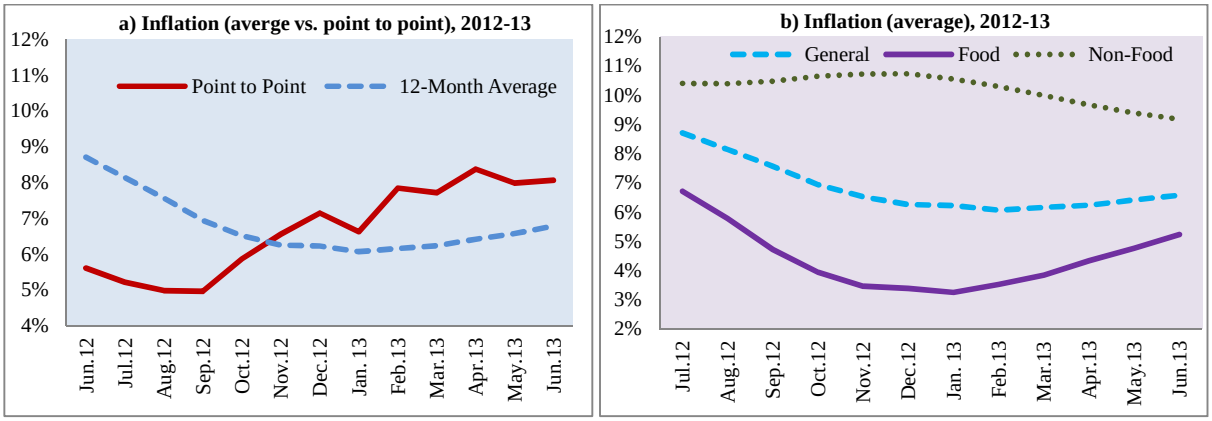
Source: Bangladesh Bureau of Statistics. P= Provisional. R= Revised

GDP growth during the year was based on 9.0 percent growth in the industry sector, 5.7 percent growth in the services sector and 2.2 percent growth in the agriculture sector. Lower crop production due to the falling price of paddy/rice and weather related disruptions led to moderate growth in the agricultural sector. The industry sector growth of 9.0 percent in FY13 from 8.9 percent in FY12 was largely driven by higher activities in mining and quarrying, construction and small-scale industries. Services sector growth decreased to 5.7 percent in FY13 from 6.0 percent in FY12. This can be attributed to lower growth of wholesale and retail trade sub-sector, reflecting weaker domestic demand.

Inflation Scenario:

The average inflation rate, using the FY06 new base, moderated to 6.8 percent at the end of FY13 from 8.7 percent at the end of FY12. Over this period, food and non-food inflation both decreased from 7.7 to 5.2 percent and from 10.2 to 9.2 percent respectively. The decrease in average inflation during FY13 was driven mainly by a gradual fall of food inflation until January 2013 when food inflation bottomed out at 3.2 percent. A steady decline in non-food inflation during the second half of FY13 also contributed to the fall in average inflation. Though average inflation went down, point-to-point inflation increased to 8.1 percent in FY13 from 5.6 percent in FY12, driven by higher food prices.

Chart 2: Inflation (2005/06 base)



External Sector:

FY 2013 witnessed a significant surplus of USD 2525 million in the current account which was (-) 447 million USD in FY 2012. The current account surplus was due to the lower trade deficit resulting from solid export growth (11.2% in FY13) in conjunction with falling imports (-4.0%). Import growth was sluggish in FY13, partly reflecting the significant fall in food import demand, lower petroleum imports as well as slower demand for imports related to manufacturing output. Impressive inward remittances that registered 12.6 percent growth in FY13 and higher net foreign aid also improved the BoP situation in FY13. The overall BoP surplus in FY13 of USD 5128 million was accompanied by significant rise in foreign exchange reserves. This led to a steady appreciation of BDT against USD and other major currencies. Gross foreign exchange reserves were USD 15.3 billion at the end of June 2013 which was equivalent to nearly five months worth of import bills.

Implications for the monetary stance

The rapid growth in NFA posed a new set of challenges for the central bank. First there was an active sterilization program in place to ensure that monetary targets were not breached. Second, the Taka appreciated by 2.6% between January 1st-June 30th 2013 and real exchange rate data indicated a marginal impact on export competitiveness. However, BB's interventions in the foreign exchange market have limited this loss of competitiveness significantly by slowing the appreciation of the Taka. Moreover, BB in the course of FY13 took a number of initiatives to promote export

competitiveness in the form of opening up working capital borrowing at lower interest rates from foreign sources to exporters, and increasing the Export Development Fund size.

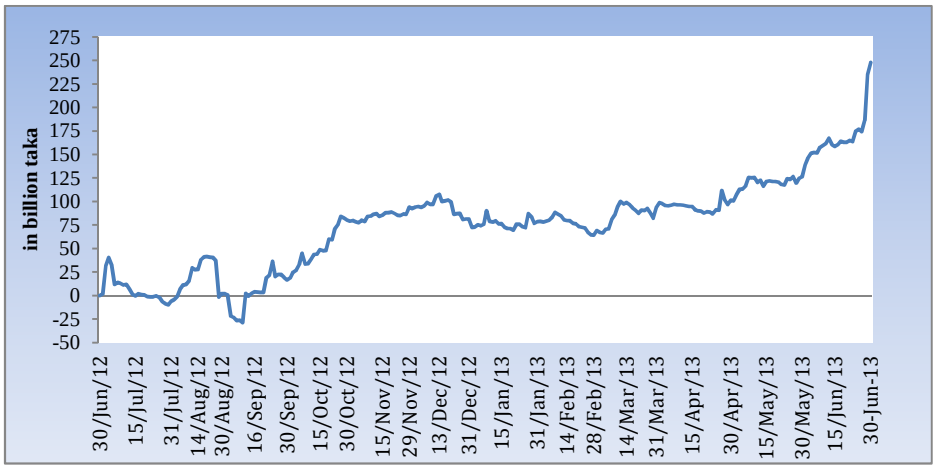
In view of the risks to output growth due to the uncertainties around the global and domestic economy, as well as the gains in inflation control, BB reduced all repo rates by 50 basis points in the H2FY13 MPS. BB created sufficient space in its monetary program to allow for a greater lending appetite in H2FY13 and sufficient to accommodate even an optimistic scenario for FY13 output growth. At the same time BB remained committed to bringing inflation down further while avoiding asset price bubbles, and as such continued to encourage banks to use the space for private sector growth for productive, and not speculative, purposes. As discussed earlier this 'balanced' monetary policy also aimed to minimize excessive volatility of the exchange rate. These objectives involve trade-offs and so the balance between BB's instruments and its targets were reviewed regularly.

Table 3: Monetary Aggregates (Y-o-Y growth in percent)

Items	Actual				July'12 MPS Program for June 2013	Jan.'13 MPS Program for June 2013
	FY10	FY11	FY12	FY13		
1. Net Foreign Assets	41.0	6.2	13.4	43.9	0.9	14.0
2. Net Domestic Assets	19.0	24.7	18.1	11.8	19.0	18.4
Domestic Credit	17.5	28.2	19.3	10.9	18.6	18.9
Credit to the public sector (incd.	-4.2	38.3	17.6	11.1	20.8	20.3
Credit to the private sector	24.2	25.8	19.7	10.9	18.0	18.5
3. Broad money	22.4	21.4	17.4	16.7	16.5	17.7
4. Reserve money	18.1	21.0	9.0	15.0	13.8	16.1

The level and composition of government borrowing in FY13 shows that monetary program was linked with the fiscal stance. In the first half of the FY13 government net borrowing from the banking system was restrained with 58.9 billion taka which is around 29% of the budgeted amount. Government net borrowing from the banking system rose in H2FY13 as chart 3 shows there was a large surge in borrowing in the last two weeks of June 2013.

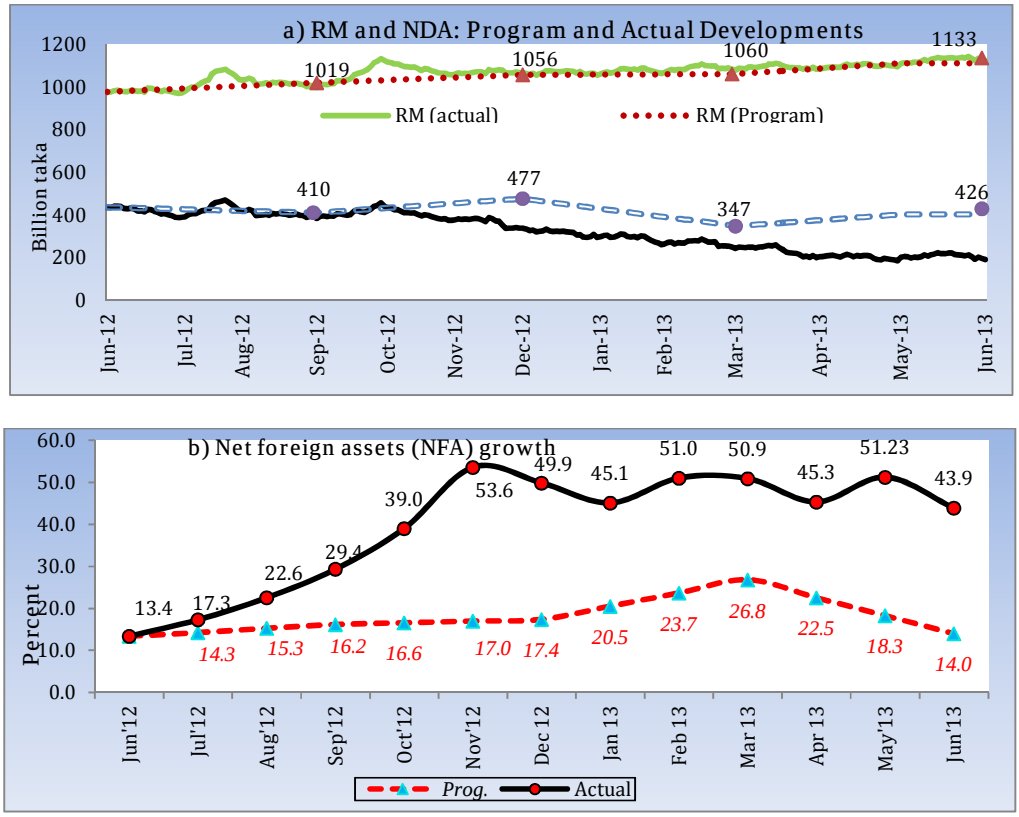
Chart 3: Govt. Borrowing (net) from the banking system in FY13

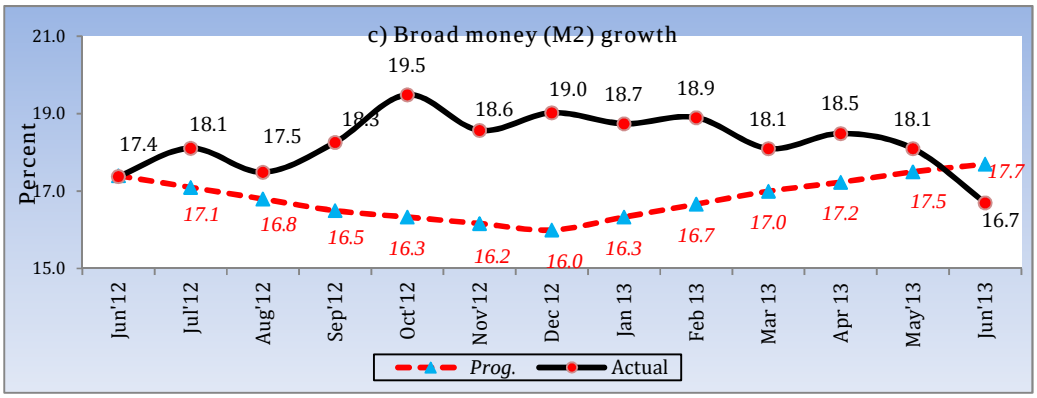


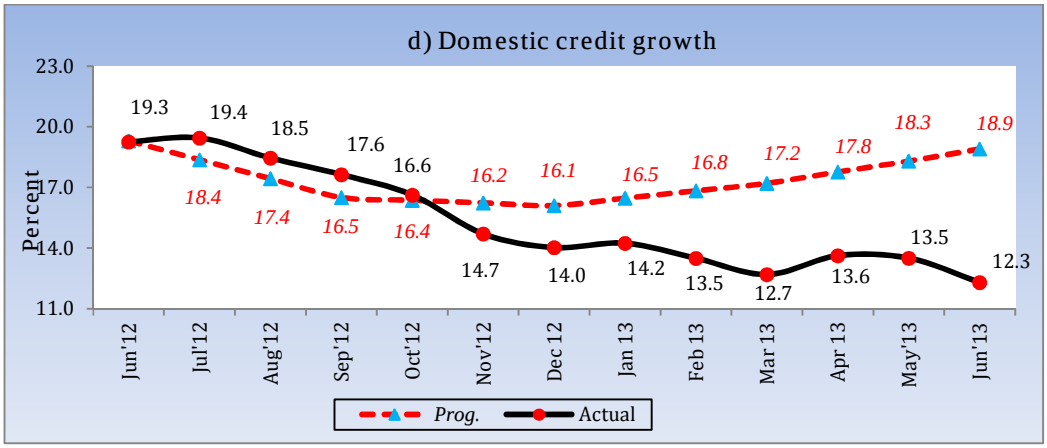
The total net government borrowing amounted to Taka 248 billion in FY13, short of the revised budget figure of Taka 285 billion. However, the ample liquidity position in the banking sector suggests that this increase in government borrowing did not crowd out private sector credit. Most of the monetary growth targets for FY13 were on track reinforcing the credibility of the policy stance. Reserve money growth and growth of Net Domestic Assets (NDA) of BB remained within program targets (see chart 4 a) despite a surge in Net Foreign Assets (NFA) of BB, which rose sharply as BB's intervention in the domestic foreign exchange market with a purchase of foreign currencies amounting to USD 4.5 billion during FY13. The reserve money target was achieved through regular open market operations, selling of BB bills and Islamic Bands.

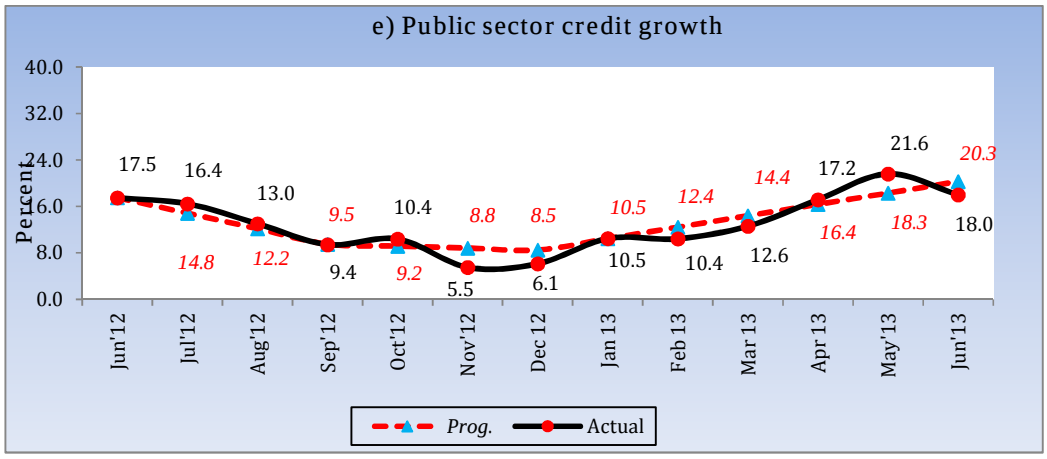
Broad money growth trends (chart 4 c) for June 2013 is 16.7% below the 17.7% program target caused by a fall in domestic credit growth (chart 4 d) which was trending below the expected target for most of the months in FY13 due particularly to a shortfall in private sector credit growth (chart 4f).

Chart 4: Monetary Program Indicators




c) Broad money (M2) growth
Percent
21.0
19.0
17.0
15.0
17.4
18.1
17.5
18.3
19.5
18.6
19.0
18.7
18.9
18.1
18.5
18.1
16.7
17.1
16.8
16.5
16.3
16.2
16.0
16.3
16.7
17.0
17.2
17.5
17.7
Jun'12
Jul'12
Aug'12
Sep'12
Oct'12
Nov'12
Dec 12
Jan 13
Feb 13
Mar 13
Apr 13
May'13
Jun'13
Prog.
Actual


d) Domestic credit growth
Percent
23.0
20.0
17.0
14.0
11.0
19.3
19.4
18.5
17.6
16.6
14.7
14.0
14.2
13.5
12.7
13.6
13.5
12.3
18.4
17.4
16.5
16.4
16.2
16.1
16.5
16.8
17.2
17.8
18.3
18.9
Jun'12
Jul'12
Aug'12
Sep'12
Oct'12
Nov'12
Dec 12
Jan 13
Feb 13
Mar 13
Apr 13
May'13
Jun'13
Prog.
Actual


e) Public sector credit growth
Percent
40.0
32.0
24.0
16.0
8.0
0.0
17.5
16.4
13.0
9.4
10.4
5.5
6.1
10.5
10.4
12.6
17.2
21.6
18.0
14.8
12.2
9.5
9.2
8.8
8.5
10.5
12.4
14.4
16.4
18.3
20.3
Jun'12
Jul'12
Aug'12
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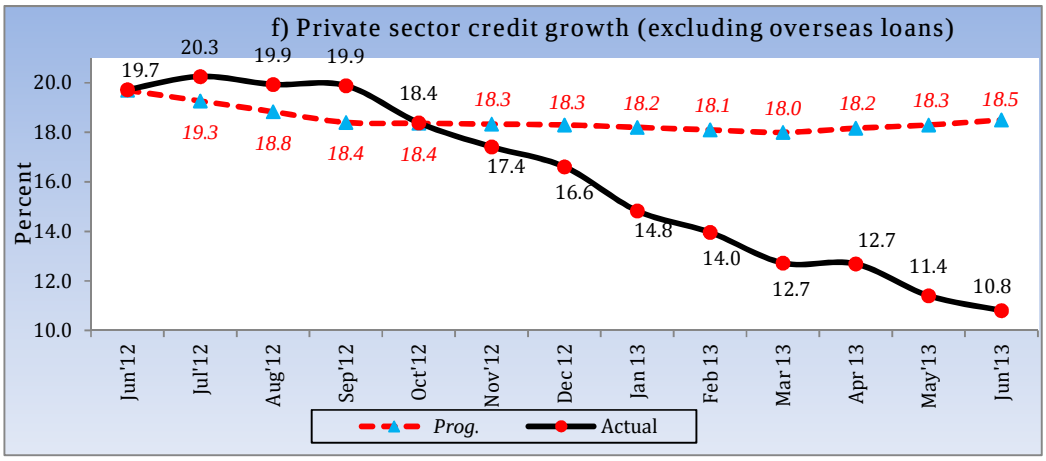
Nov'12
Dec 12
Jan 13
Feb 13
Mar 13
Apr 13
May'13
Jun'13
Prog.
Actual



Private sector credit growth in FY13 slowed in the second half of the year though borrowing by local corporates overseas partly made up for this. In addition to access to credit from domestic sources, Bangladeshi corporates now can also tap foreign sources of financing. Private credit growth from domestic sources slowed to 10.9% growth at the end of FY13 from 19.7% at the end of FY12. This slowdown is partly due to sluggish investment demand in the lead-up to the national elections, tighter lending practices by banks as well as the fact that there are two new channels through which entrepreneurs can access overseas lenders. One existing channel is borrowing by corporates for term credit purposes with most having a maturity beyond five years – around US $1.48 billion was approved in FY13 compared with US $1 billion in FY12. Furthermore, private capital flows to local corporates have also grown due to the addition of short term foreign currency loans for working capital purposes. These newly introduced facilities in the form of 'buyers credit', which importers can avail with a tenure of up to one year, and 'discounted export bills' have led to a $784 million inflow in FY13. The addition of external borrowing with domestic borrowing implies that total private sector credit growth for May 2013 was 13.6%.

Analysis of the economic purpose of outstanding loans to the private sector indicates that over the past year (from June 2012 to June 2013) there has been a very small decrease in the share of loans going to the agriculture sector (from 5.4% to 5.3%). The share of service sector credit declined as the share of loans going towards trading activities marginally declined (from 37.6% to 37.1%), although loans towards transport and communication increased marginally (from 2.1% to 2.2%). There has been a rise in the share of construction loans (from 8.5% to 9.3%), working capital financing (from 13.1% to 13.2%), and advances to industry (other than working capital) from 20.1% to 20.4% during this period compared to a year earlier.

The share of domestic and foreign discounted bills in total advances has fallen during FY13. This is partly linked to lower trade-finance demand and also tighter monitoring over the use of these instruments given their role in recent financial sector scams.

The lack of demand for private sector credit was reflected in significant excess liquidity in the banking system. At the end of June 2013, excess liquidity in the banking system reached Tk. 794.4 billion. The surge in excess liquidity was also reflected in below average advance–deposit ratio that was hovering around 74 percent in June 2013 which was around 79 percent in June 2012 (Chart 5).

Chart 5: Advance to Deposit Ratio

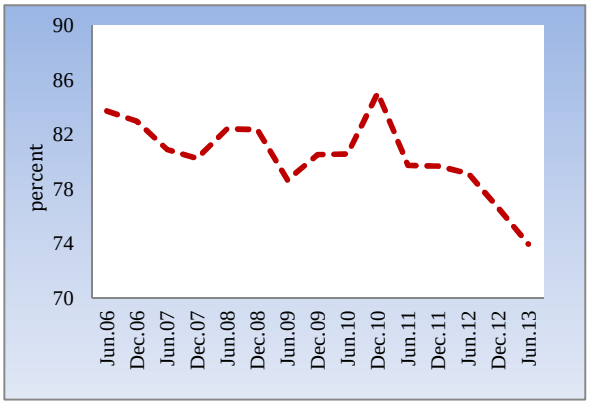
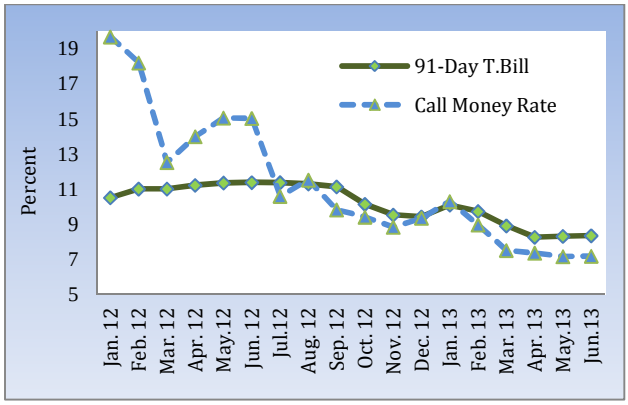
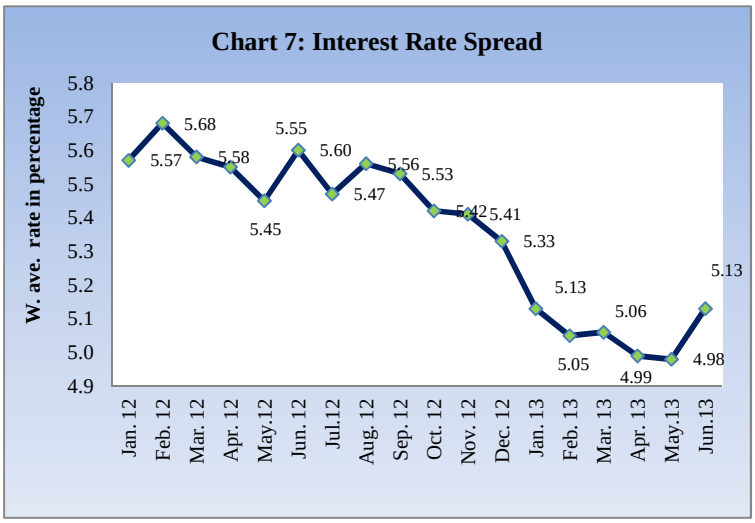


Chart 6: Call Money Ra and Yield on 91-day T.Bill



This scenario was also reflected in the fall in the call money rate and interest rate spreads. Call money rates have declined since their peaks in early 2012 when they were around 20%, and also fell in H2FY13 from around 10% in January 2013 to around 7% in June 2013 signaling further easing of liquidity pressures in the banking system (chart 7). Both deposit and lending rates fell in H2FY13 and since interest rate spreads (IRS) have on average fallen steadily–from 5.60% in June 2012 to 5.13% in June 2013. Domestic lending rates have fallen due to lower demand for credit as well as due to increasing competition from overseas lenders whose lending rates are in the single digits.

Chart 7: Interest Rate Spread



Chapter 2

When and why does Bangladesh's inflation differ from India's?

Biru Paksha Paul and Hassan Zaman*

Introduction

While Bangladesh and India, the two fastest growing economies of South Asia, have many economic aspects in common, their inflation series often deviate from each other without setting a common pattern. Hence, the inflation differential, which can be measured by subtracting India's inflation from Bangladesh's, remains an intriguing area of investigation. The monetarist interpretation of inflation, which is also referred to as the Friedman hypothesis, claims that money supply primarily determines the level of inflation in a country (Friedman 1963, 1977). As Friedman (1963) asserts, inflation is always and everywhere a monetary phenomenon. This view, however, is not entirely endorsed particularly in developing economies where other structural and supply-shock related issues are likely to influence inflation (see Sargent and Wallace 1981, Montiel 1989). Moreover, with the advent of globalization, the factors such as the exchange rate, world inflation, and remittances may play an increasingly important role in finding the inflation differential between these nations in South Asia where economic openness is gathering momentum.

This scenario has raised a number of questions such as 1) Can money growth explain the differences in inflation between Bangladesh and India? 2) Can the open-economy factors such as the exchange rate, world inflation, and remittances explain the inflation differential better than the money-growth differential between these nations? 3) Which country's inflation shows a higher level of sensitivity to money growth? 4) What are the policy implications for the central banks as well as the governments of these countries if money-growth differentials can explain inflation differentials between these economies?

Although the amount of research on inflation of these countries is voluminous, a comparative study of inflation between these two emerging neighbors is starkly absent. There is no single work with the reasoning of the inflation differential and devising policy prescriptions for these two emerging markets of South Asia. This study fills that gap by addressing the questions as mentioned above.

We collect annual data from the World Development Indicators (WDI 2012) of the World Bank over the period from 1979 to 2010. To briefly preview the results, our study finds support in favor

* Biru Paksha Paul is Associate Professor of Economics at the State University of New York at Cortland, and Hassan Zaman is Chief Economist at Bangladesh Bank (Central Bank of Bangladesh). The views and opinions expressed in this article are those of the authors & research based and do not necessarily reflect the official policy or position of any agency of Bangladesh. The authors are thankful to comments of the participants of the seminar on this topic held at Bangladesh Bank on August 13, 2012. Corresponding author: Hassan Zaman, email: hassan.zaman@bb.org.bd Tel: 9511605 (O), 01817 088203 (C)

of the Friedman hypothesis of how money supply primarily determines inflation in a country. The inflation differential between Bangladesh and India appears to be a monetary phenomenon once the country-specific and global supply shocks are accounted for. Our work has two layers: the country level and the differential-variable level that integrates data from both countries. The estimation results, derived through Autoregressive Distributed Lag (ADL) models, are consistent across the layers. This empirical work shows that Bangladesh experienced higher inflation than India whenever Bangladesh's money supply grew faster than India's, and the converse is also true.

The remainder of this work comprises six sections. The next section presents literature review on inflation in these two countries. Section III justifies the selection of variables and describes data issues. Methodology is presented in Section IV. Section V describes period-wise statistics, unit root tests, correlation coefficients, and Granger causality tests. ADL estimations and analyses are presented in Section VI, and Section VII concludes.

Literature Review

The main objective of this paper is to find the principal determinants of inflation in Bangladesh and India, and to examine whether these determinants can explain the inflation differential between these two nations. While the literature on inflation has a respectable volume in each country, here we present only selected papers that exclusively focus on inflation determinants in each country.

The number of studies on Bangladesh's inflation, however, is much less than that on India's. Taslim (1982) is one of the pioneering studies on Bangladesh's inflation determinants. He attempts to analyze the inflationary process in Bangladesh in the light of the structuralist-monetarist controversy. To this end, three models of inflation are constructed and tested: a purely structuralist one, a purely monetarist one, and a hybrid model. Taslim finds that the hybrid model performs best, suggesting that at least for Bangladesh, both sets of factors are relevant. He concludes that money growth and exchange rate movements are key determinants of inflation as are structural bottlenecks in Bangladesh.

Working over the 1974Q2-1985Q4 period, Hossain (1989) finds that global commodity prices, real permanent income, real money growth, lagged inflation, and change in the terms of trade between traded and non-traded goods are responsible for explaining inflation in Bangladesh. He also confirms that temporary shocks such as crop failures cause inflation if there is monetary accommodation. Chowdhury et al. (1996) use quarterly data over the 1974-1992 period and investigate the relationship between money, prices, output, and the exchange rate in Bangladesh. They argue that inflationary pressure in Bangladesh is not entirely caused by monetary factors.

Akhtaruzzaman (2005) works over the 1973Q1-2002Q2 period and identifies the variables, which are believed to generate inflation in Bangladesh. He finds that the exchange rate, money supply, and the deposit interest rate have statistically significant roles in explaining the inflationary process of Bangladesh. Rahman (2005) works with quarterly data from 1974 Q1 to 2003 Q4. He finds that real income growth positively affects inflation. The main message of his paper is that the absence of

pure monetary neutrality exists in Bangladesh. Covering the period from 1980 to 2008, Mujeri et al. (2009) find the application of the P-star model for measuring inflationary pressure in Bangladesh. They estimate inflation as a function of the output gap along with other factors.

In another paper Hossain (2010) investigates the behavior of broad money demand in Bangladesh using annual data over the period 1973-2008. His empirical results suggest the existence of a causal relationship between money growth and inflation. Nasir (2011) uses annual data from 1982 to 2005 and incorporates three new measures of institutional rigidities to estimate an inflation model for Bangladesh. He finds that a higher degree of institutional rigidities leads to higher inflation rates in Bangladesh. Evidence in his work also suggests that inflation is unlikely to be a monetary phenomenon in Bangladesh.

Given the varied results of the works on Bangladesh, the main reasoning for its inflation still remains inconclusive, demanding further investigation into this topic. The papers of India's inflation convey the similar message of controversy over the main factors of inflation in the country. The direction of causality between money supply and inflation is another inconclusive area as well.

Rangarajan and Arif (1990) use data over the 1961-1985 period and find that that money supply mainly determines the price level in India and thus its inflation. They ascertain that the price effects of an increase in money supply are stronger than the output effects in the country. Dave and Rami (2008) used data from June 1953 to December 2005 and argue that reverse Granger causality from price to money supply exists as far as the Indian economy is concerned.

Kar and Sinha (2009) report estimates from some heuristic models that allow the data to select important determinants of Indian WPI inflation during 1971-2004. They find that current growth in money supply, income, agricultural output, and imports are the most important determinants of inflation. In their study, however, money supply alone is the most important contributing variable during 1981-2004. GDP growth, as they show, counters the inflation rate quite substantially.

Mishra et al. (2010) work over the period 1950-51 to 2008-09 and find unidirectional causality from price level to money supply and output in the long run. They also find bidirectional causality between money supply and price level in the short run. Their results infer that money is not neutral and inflation is a short-run monetary phenomenon in India. Patra and Ray (2010) work with the Indian data over the period from April 1997 to December 2008. They argue that inflation expectations in India are influenced by movements in food and fuel prices, as well as the output gap, real interest rates, and the exchange rate. As they note, monetary policy in India has traditionally been conducted in a manner that has anchored inflation expectations around a threshold of 5 percent.

Rami (2010) examines the relationship between money, price and output using pairwise Granger causality tests on annual data of the Indian economy covering a period from 1951 to 2005. The results in Rami's paper strongly support the monetarists view and partially supports the Keynesian view. However, these relationships in his work are sensitive to the lag length selections. Joshi and

Acharya (2011) examine the relationship between international prices of primary commodities and domestic inflation in India for the period 1994 to 2007. The empirical results show that cointegration between international and domestic prices has grown stronger in the period since 2000.

Although a number of papers has examined the determinants of inflation separately at the country level, none of the papers focused on the reasons of the inflation differential between these economies. Moreover, the direction of causality between money and inflation still remains inclusive in both nations, warranting further examination in this regard.

Selection of Variables and Data Issues

Based on literature and theory, we create a list of variables, which are most likely to be determinants of inflation in South Asia. Given the frequency of data and the sample size, it would be pragmatic for us to remain as parsimonious as possible in selecting the possible determinants of inflation. Apart from the variables of money growth, inflation, and their differentials, we further include remittance growth, the output gap, the exchange rate, and world inflation.

Both Bangladesh and India have been experiencing impressive remittance inflows for the last two decades. Both countries fall in the group top-10 remittance recipient countries of the world. In 2010, India topped the list with an amount of 55 billion U.S. dollars. Bangladesh earned 11 billion dollars of remittances and occupied the seventh position in that list, after China, Mexico, Philippines, France, and Germany (WB 2011). Despite a high amount for India, remittances covered only 3.13 percent of its GDP in 2010. The corresponding figure for Bangladesh was 11 percent of its GDP in the same year (WDI 2012). Remittances are often assumed to be inflationary, justifying the inclusion of this variable (see Caceres and Saca 2006, Lopez et al. 2007).

A positive output gap can also be inflationary in South Asia as per the notion of the Phillips curve (see Paul 2009, Singh et al. 2011). If the output gap is above the long-run trend, workers tend to raise their wage, and wage-push inflation is likely to follow. The Lucas supply curve is essentially the same as the expectations-augmented Phillips curve with core inflation replaced by expected inflation. Both state that if we neglect disturbances to supply, output is above normal only to the extent that inflation is greater than expected (see Romer 2006:278). Simply, a positive output gap is expected to have a positive association with inflation, suggesting the inclusion of the output gap in this estimation.

In the last 32 years of our sample, South Asian countries experienced more devaluation against the US dollar than appreciation of their currencies. Devaluation in the exchange rate is likely to increase the prices of imported goods, creating a pressure on a country's inflation. A currency revaluation will trigger opposite results on inflation (see Aigbokhan 1991, Honohan and Lane 2003, Imimole and Enoma 2011). However, these effects are contingent on a number of factors such as 1) how an exchange rate is maintained in a country 2) how much proportion of GDP the imported

goods occupy, and 3) how the government controls prices. For both Bangladesh and India, these factors may dampen the theoretical effect of the exchange-rate movements on inflation.

Despite the progress of liberalization in these countries, price control is still prevalent for many imported goods, and particularly, for fuel. In essence, the exchange rate in these countries experience managed float instead of their proclaimed free float. Given this reality, the effects of the exchange-rate movements on inflation may not be as visible as expected. The CPI-based world inflation is likely to affect domestic inflation in these two countries. Again, the possibility may be distorted due to price control, which is gradually being phased out with the progress of liberalization in these countries.

While this work includes both Bangladesh and India, the data availability for Bangladesh works as the limiting factor in this study. The data on inflation based on the Consumer Price Index (CPI) begin in 1987 in Bangladesh, leaving only 24 observations and thus making our estimations non-robust. Hence, we take inflation based on the Gross Domestic Product (GDP) deflator that begins since Bangladesh's independence in 1971. Now the series of money growth becomes the next constraint, which does not begin until 1975. We, however, need to begin in 1979 to avoid some serious outliers in inflation evident until 1978.Bangladesh's inflation in 1978, for example, was 26%, which can be treated as an outlier from the hindsight. Outliers always distort the estimations and provide spurious coefficients. The post-independence years of Bangladesh, a totally war-ravaged country, experienced huge fluctuations and serious outliers in all macro variables including inflation. That is why most time-series studies on Bangladesh begin in the late 1970s or early 1980s (see Hussain and Naeem 2009, Mamun and Nath 2005, Paul 2011). Similarly, our study begins in 1979 as well.

We collect data on inflation, money growth, remittances, GDP, and the exchange rate for both countries from the WDI (2012). Bangladesh uses broad money (M2) as a key operational target as discussed in the Monetary Policy Statement of Bangladesh Bank (MPS 2012, see also GOB 2012). In Indian literature and studies by the Reserve Bank of India (RBI) in particular, both M2 and M3 are used for money supply. As an RBI study by Ramachandran et al. (2010) asserts, two official measures of monetary aggregates, M2 and M3, are used to understand their role in inflation. We use M2 due to its operational use in both countries, and calculate money growth from this variable for both countries in a consistent manner.

GDP has been used to calculate the output gap for each country. First, we take log of the variable, and second, the output gap is derived by detrending GDP with the Hodrick-Prescott filter. The exchange rate can be defined in two ways. It is the value of one unit domestic currency in terms of the US dollars in our exercise. The variable of global inflation based on the CPI has been collected from the WDI as well. Although it does not matter which way we measure the differential variables, we derive both inflation and money-growth differentials by subtracting India's variable from the respective variable of Bangladesh.

Methodology

Since the objective of the paper is to examine the determinants of the inflation differential between Bangladesh and India, we need to confirm zero degree of integration for each variable. Otherwise, the variables cannot be used for correlation, causality, and OLS estimations if they characterize different degrees of integration. Thus, first we need to make sure that the series are free of unit roots, i.e. the series are stationary to make all results valid and all estimates consistent (see Enders 2010:318).

Usually the Augmented Dickey-Fuller (ADF) test is widely used in this regard (Dickey and Fuller 1979, 1981). Phillips and Perron (1988) proposed a modification of the Dickey-Fuller (DF) test and have developed a comprehensive theory of unit roots. The Phillips-Perron (PP) test has introduced a t-statistic on the unit-root coefficient in a DF regression, corrected for autocorrelation and heteroskedasticity. Formally, the power of a test is equal to the probability of rejecting a false null hypothesis.

Monte Carlo simulations show that the power of the various DF tests can be very low (Enders 2010:234). Maddala and Kim (1998:107) comment that the DF test does not have serious size distortions, but it is less powerful than the PP test. Choi and Chung (1995) assert that for low frequency data like mine the PP test appears to be more powerful than the ADF test. Accordingly, we adopt the PP methodology to test unit roots in the variables.

Once stationarity in all variables is confirmed, we will run a comprehensive correlation test with money growth and inflation including different lags of plausible length appropriate for annual data as per the following specifications:

$$r = [mg_{t-i}, p_t] \text{ and } r = [mg_t, p_{t-j}],\ i = 0,1,2.\ j = 1,2. \quad (1)$$

$$r = [mgd_{t-i}, pd_t] \text{ and } r = [mgd_t, pd_{t-j}],\ i = 0,1,2.\ j = 1,2. \quad (2)$$

where *r* stands for correlation, *mg* denotes money growth, *p* represents inflation, and *t* is time in year. The similar tests will be conducted with money-growth and inflation differentials as shown in Equation (2), where *mgd* is money-growth differential and *pd* stands for inflation differential. The significance of each correlation coefficient will be tested as well. If any relationship is found, the direction by which one variable affects another will be tested by Granger causality tests with plausible length of lags:

$$p_t = c + q_j \sum_{j=1}^{q} mg_{t-j} + e_t,\ \ q = 1,\ 1...2,\ 1.....3. \quad (3)$$

$$mg_t = c + b_i \sum_{i=1}^{p} p_{t-i} + e_t,\ \ p = 1,\ 1...2,\ 1.....3. \quad (4)$$

where *c* stands for constant, and *e* denotes the error term in the estimation. All notations are as before. *q* and *b* are the coefficients of money growth and inflation, respectively. The similar estimation is run for both differential variables. The *F*-statistics at different lags will be tested to understand the direction of causality.

Although we intend to see the influence of the money-growth differential on the inflation differential between the two countries, first we need to start with each of the countries separately. We will examine the role of money growth in affecting inflation, first in Bangladesh and next in India. Accordingly, we will estimate inflation in both Bangladesh and India by including a number of regressors such as remittance growth, the output gap, the exchange rate, and world inflation in addition to money growth.

Since the actual data generating process is unknown, we keep experimenting on different specifications. When the specification uses the lagged dependent variable in the RHS where other exogenous variables appear in the contemporaneous and lagged fashion, this type of specification is called ADL model (Enders 2010:286, Stock and Watson 2011:537):

$$p_t = c + b_i \sum_{i=1}^{p} p_{t-i} + q_j \sum_{j=0}^{q} mg_{t-j} + X_t + D_1 + e_t \qquad (5)$$

where *X* denotes a bunch of variables such as remittance growth, the output gap, the exchange rate, and world inflation. D_1 represents any country level dummy or dummies. Other notations are the same as before. If this ADL model estimated at the country level gives significant *q*, the monetary interpretation of inflation will get its ground, and we will run the model with differential variables as below:

$$pd_t = c + b_i \sum_{i=1}^{p} pd_{t-i} + q_j \sum_{j=0}^{q} mgd_{t-j} + \Delta X_t + D_1 + e_t \qquad (6)$$

where Δ signifies the first difference operator, and other notations are the same as defined before. The RHS variables under *X* may be either in the differential form or in the country-specific original form based on whichever becomes significant in the estimation.

A fundamental idea in the Box-Jenkins approach is the principle of parsimony (Box and Jenkins 1976). It suggests using other selection criteria as more appropriate measures of the overall fit of the model. To that end, the Autocorrelation Function (ACF) and Partial ACF (PACF) derived from the correlogram and some experimentation will be engaged to derive an optimal specification of the model of inflation differential. Simply, the goal will be to select a stationary and parsimonious model that has a good fit.

After every estimation, we will look for the R-squared value. Incorporating additional regressors will necessarily increase fit along with the R-squared value at the cost of reducing degrees of freedom. Hence, the adjusted R-squared value that takes degrees of freedom into account will also be checked. While both the Akaike Information Criterion (AIC) and Schwarz Bayesian Criterion

(SBC) are mostly used for model selection, we will rely on the SBC since it selects a more parsimonious model than the AIC (Enders 2010:120). The objective of a parsimonious model is to minimize the values of the SBC. We need to be parsimonious given the sample size of our low frequency data. Nelson (1991) refers to Hannan (1980) and argues that the SBC provides consistent-order estimation in linear autoregressive models.

The final stage of diagnostic checking ensures that the residuals from the estimated model mimic a white-noise process. The absence of serial correlation, heteroskedasticity, non-normal errors in residuals, and specification errors will be required at this stage. Serial correlation will be tested with the Q-statistics of the ACF and PACF derived from the correlogram of residuals at conventional lag lengths (Ljung and Box 1978). We will check the Q-statistics at the lag lengths of 1, 4, and 8, which appear to be sufficient for annual data. The Q-statistics from the correlogram of squared residuals will be checked for the remaining ARCH errors, whose presence will require estimating the model in an ARCH or GARCH specification.

The check for non-normality in residuals will be conducted with the Jarque-Bera (J-B) statistic. The Ramsey Regression Equation Specification Error Test (RESET) will be deployed to ascertain that the estimation does not have an inappropriate specification. Once the absence of serial correlation, heteroskedasticity, non-normal errors in residuals, and specification errors are confirmed, the estimation with a good fit will be accepted as a model of the inflation differential between Bangladesh and India. Box and Jenkins argue that a parsimonious model produces good forecasts. Hence, the final test of our parsimonious model will be judged by its forecasting power.

Period-wise Statistics, Correlation, and Causality

Panels A and B of Figure 1 show the inflation differential and money-growth differential, respectively. Panel C of the same figure shows how these differentials largely move together, suggesting that the inflation differential is likely to be a monetary phenomenon. We present a period-wise analysis between money growth and inflation for both countries in Table 1. A 2-year special window for the initial years of 1979 and 1980 is made to allow other 5-year and 10-year windows begin in 1981. The table presents not only the figures of money growth and inflation for both countries, but also their differentials. A primary inspection of the table will help portray a positive association between money growth and inflation, reiterating a direct relationship obvious in Panel C of Figure 1.

High money growth has been associated with high inflation in both countries. When Figure 2 plots the period-wise differentials as calculated in the third and sixth columns of Table 1, the monetary phenomenon of inflation becomes much convincing. Positive money-growth differentials, which implies that Bangladesh's money growth was higher than India's, have always been associated with positive inflation differentials, which also confirms higher inflation in Bangladesh than in India in the corresponding period. The reverse is true for negative money-growth differentials. The same pattern becomes effective from India's angle as well. There is no single exception to this pattern in

any 5-year or 10-year sub periods, suggesting a robust association between money growth and inflation in both Bangladesh and India.

Econometric estimations are required to examine the accurate pattern of this relationship and to unveil the direction of effect. Before we run the tests of correlation and causality, we want to make sure that the variables of money growth, inflation, and their differentials are stationary series, so the estimated coefficients can be ascertained as consistent and valid. Table 2 serves this purpose.

Table 2 presents the Phillips-Perron stationarity tests with inflation, money growth, and other inflation-related variables as discussed. The first segment of the table tests Bangladesh's variables, while the second and third segments test Indian and global variables, respectively. The last segment includes inflation and money-growth differentials. All the variables are tested under three different models, although each variable falls under a particular model as shown by the bold statistic. The last column of the table shows that all the variables are integrated of degree zero, and thus stationary. A time series is stationary if its probability distribution does not change over time (Stock and Watson 2011:536). These series, being stationary, are now appropriate for correlation and causality tests, and finally OLS estimations if needed.

Panel A of Table 3 presents a set of correlation tests with Bangladeshi, Indian, and differential variables as per the Equations (1) and (2). While correlation coefficients under India are not significant, those under Bangladesh and the differential column are strongly significant as long as the contemporaneous and lagged effects of money growth on inflation are concerned. Inflation never influences money growth, but money growth does in a lagged fashion, as expected. These results are by and large consistent with those in Panel B of the same table, where the Granger causality tests are presented as per Equations (3) and (4).

Money growth causes inflation in a lagged fashion in Bangladesh. The F-statistics are significant at the 5 percent level. The same is true for India though at the 10 percent level, but the reverse is never true. The influence of money growth on inflation, however, appears to be much stronger in Bangladesh than in India. The differential variables establish the same unidirectional causality, paving our way for OLS estimations where money growth can be placed in the RHS to estimate inflation.

ADL Estimation and Analyses

Before moving to the estimation of inflation differential, we examine the role of the inflation-related variables, and money growth in particular in each country separately, as shown in Table 4. The role of money growth in controlling inflation is consistently evident in correlation, causality tests, and finally in OLS estimations with individual county cases. Regression 1 under Bangladesh in Table 4, which is estimated as per Equation (5), includes all variables as discussed in the stationarity tests. Only lagged money growth and contemporaneous remittance growth become significant at the 10 percent level at this stage. After some experimentation we find Regression 2 as

a better fit than Regression 1. Both the SBC and adjusted R-squared value show an improvement with Regression 2.

Both money growth and inflation with one lag are strongly significant at the 1 percent level to affect Bangladesh's inflation. Although the effect of remittance growth on inflation is significant at the 5 percent level, the coefficient is low, -0.04, compared with 0.27 for lagged money growth for instance. World inflation is expectedly significant in affecting Bangladesh's inflation. All the diagnostic tests confirm that this estimation is free of serial correlation, heteroskedasticity, non-normality in residuals, and specification errors.

The first estimation with Indian inflation, as shown in Regression 3 of the same table, does not show significance for any variable other than the exchange rate, while the coefficient is as low as 0.05. After checking the goodness of fit for the regression, we notice that the fitted line fails in tracking actual inflation in the early years of the 1990s when India's inflation was high and turbulent mainly due to the financial crisis and policy shocks of liberalization. We argue that India's financial crisis and the concomitant inflation of the early 1990s have not been properly addressed in this case, and hence the failure of the model to capture that period.

In the early 1990s, both Bangladesh and India embarked on liberalization in a more serious way than before. While Bangladesh began economic openness in the early 1990s mainly due to its regime change, India's background was starkly different. Although India had regime change at around the same time, the most compelling reason for India's massive liberalization was its worst financial crisis in 1991. To contain the crisis and restore economic health, the new Congress government announced a package of policies in 1991, which we refer to as 'reform' or 'liberalization' in the Indian economy (Acharya 2001). The resolution of the crisis took the form of the IMF entering the scene with a program in July 1991 and the World Bank following with a structural adjustment loan (SAL).

As Panagariya (2008:103) asserts, the IMF program and the World Bank SAL initiated a process of liberalization that has continued to move forward. Agarwal (2003) confirms that India's liberalization process was associated with high inflation and financial crises. As Chakraborty (1999) argues, a country is likely to be at the risk of high inflation when the reforming economy is exposed to financial flows in the initial years of liberalization. This case was more relevant for India than Bangladesh mainly because of its financial crisis.

Koshy (1995) argues that the continuous increase in procurement prices of food articles is the primary contributor to India's inflation of the early 1990s. Koshy adds that agricultural prices went up when the Indian economy began to integrate with the global economy. A country study by the Library of Congress (1995) argues that the high inflation in India in the 1991-1994 period can mainly be attributed to a shortfall in such critical sectors as sugar, cotton, and oilseeds. This financial crisis and liberalization program created some kind of supply shocks in India, and Bangladesh sidestepped high inflation due to a different background. We want to treat this turbulent period with a dummy, "Indian financial crisis," which posts '1's in the years from 1991 to 1994, and '0's otherwise (see also Paul 2009).

Regression 4 in Table 4 shows a drastic improvement in the goodness of fit once the dummy is included in the estimation. R^2 rises from 0.46 to 0.64, adjusted R^2 rises by double from 0.27 to 0.50, and finally the SBC falls from 5.32 to 5.01. The coefficient on the Indian financial crisis becomes highly significant at the 1 percent level. The coefficient on the exchange rate remains significant as before, but no more variables appear to be significant in this regression. After some experimentation, we find Regression 5 a better fit to estimate inflation in India, where lagged money growth becomes robustly significant with a respectable value of the coefficient at 0.35, suggesting a definite role of money growth in determining Indian inflation. Although R^2 went down as expected as we moved to a more parsimonious model than before, adjusted R^2 slightly improved. The selection criterion finds the last regression as the best fit anyway. All the diagnostic tests confirm that this estimation is free of serial correlation, heteroskedasticity, non-normal errors in residuals, and specification errors in the model.

Having confirmed the positive effect of money growth, along with other variables, on inflation in both Bangladesh and India, now we move to estimate the inflation differential between these countries by placing the money-growth differential in the RHS of the regression. Table 5 presents these estimations as per Equation (6). Regression 1 includes contemporaneous and lagged values of money-growth differentials, which alone can drive inflation up as shown in the estimation. The inflation differential with one lag has been added to the RHS to avoid serial correlation. Since money growth is the single common factor that drives inflation in both Bangladesh and India, the money-growth differential would expectedly be a significant determinant of inflation differential between these countries. Although this model does not have an impressive goodness of fit since R^2 and adjusted R^2 are not high, it is an acceptable estimation in that diagnostic tests cannot find any errors of heteroskedasticity and serial correlation at all conventional lag lengths.

In Table 5, Regression 1 has been extended to Regression 2 by adding world inflation and other country-specific elements such as India's financial crisis and its exchange rate, and also Bangladesh's remittance growth. These items were significant in the country-specific estimations in Table 4. While the Indian financial crisis is strongly significant, the small coefficient on Bangladesh's remittance growth is significant only at the 10 percent level. The goodness of fit has increased substantially in Regression 2. This model can be improved by dropping the insignificant elements, as shown in Regression 3. All the coefficients on money-growth differentials, with no lag and lags 1 and 2, are significant at the 5 percent level, suggesting that the inflation differential between Bangladesh and India is primarily a monetary phenomenon.

The inflation differential has a mean reversion mechanism, a pattern normal for any stationary series, as shown by the negative and significant coefficient, - 0.24, on the lagged inflation differential. Regression 3 is an improvement over Regression 2 since adjusted R^2 has marginally increased from 0.65 to 0.67. The SBC prefers the latter to the previous since the SBC score has gone down from 4.94 to 4.76. The Ramsey F-statistic and Jarque-Bera statistic confirm that the model does not have any specification error or non-normality in residuals. Ljung-Box Q-statistics at

all conventional levels confirm that the model has no issues of serial correlation or Autoregressive Conditional Heteroskedasticity (ARCH) errors.

Although Regression 3 can be taken as the final model of the inflation differential between Bangladesh and India, there is still room for improvement. We observe in Panel A of Figure 3 that the fitted value of the inflation differential deviates from the actual observations in 2008 – a year when the world experienced a spike in the oil price. In 2007, the crude oil price was around 60 U.S. dollars per barrel, but it went up to as high as 147 dollars in 2008, and then dropped back to around 40 dollars, creating a never-seen-before spike in oil prices. Part of this spike is supposed to be embodied in the variable of world inflation, but the rest can be addressed by adding another dummy for that single year (see Gelos and Ustyugova 2011, Kapoor 2001). Hence, we create a dummy, named 'Fuel shock 2008.' The addition of this dummy clearly improves the model as shown in Regression 4. Both R^2 and adjusted R^2 have increased, and the SBC prefers Regression 4 to Regression 3. There is no evidence of serial correlation, ARCH errors, non-normality, and specification errors at the 5 percent level in the new model.

We have also checked that the fuel shock dummy remains insignificant at the country level while it appears to be highly significant at the differential level. The investigation of this reason, which is not the main objective of the paper, goes beyond the scope of this work. We may assume that although fuel prices are controlled in both countries, the magnitude of control differs between them, making it insignificant at the country level and strongly significant at the differential level. All the coefficients in Regression 4 of Table 5 are highly significant. All the coefficients on money-growth differentials are positive and strongly significant, reiterating the Friedman hypothesis about the role of money growth in inflation. The added value of these significant coefficients implies that almost 50 percent of the inflation differentials between Bangladesh and India can be explained by the current and two previous years' money-growth differentials. Panel A of Figure 3 presents goodness of fit for two different estimations. The lower part of this panel shows an impressive goodness of fit for Regression 4 of Table 5. Once we exclude the dummies of the Indian financial crisis and fuel shock 2008 from this regression, we get a less efficient goodness of fit as shown in the upper part of Panel A, which corresponds to the RHS values. We see a poor performance of the fitted value particularly during two periods: India's financial crisis of the early 1990s and the fuel shock of 2008. Thus, adding these dummies turns out to be appropriate for improving the goodness of fit for the model.

The robustness of a model can further be checked with its power of predictability. Hence, we run dynamic forecasting from Regression 4 of Table 5. The dynamic method of forecasting calculates dynamic, multi-step forecast starting from the first period in the forecast sample. In dynamic forecasting, previously forecasted values for the lagged dependent variables are used in forming forecasts of the current values. The forecast ceiling is created by adding one standard error (SE) to the forecasted series, as shown in Panel B of Figure 3. Similarly, we create the forecast floor by subtracting one SE from the forecasted series. The floor is also shown in the same figure.

With the ceiling and floor, we present a forecast band for the inflation differential between the two countries. The forecast band keeps on falling until the early 1990s. It remains almost flat in the 2000s with a spike in 2008. The way the actual inflation differential remains within the band looks impressive, suggesting the robustness of the model used for forecasting. Although we notice a few points where the actual inflation differential slightly broke either the ceiling or the floor, this type of minor deviations is quite normal in forecasting exercises.

Conclusion

Bangladesh and India are comparable mainly due to their similar historical background, institutional similarities and policy synchronization of gradual liberalization since the mid-1980s. They, however, display different pattern of inflation dynamics, suggesting the inflation differential between them as an intriguing area of examination.

Working over the 1979-2010 period, this study finds that the inflation differential between Bangladesh and India can greatly be attributed to the money-growth differential between them. The causality runs from money growth to inflation, but not the reverse. Correlation coefficients also justify this unidirectional causality. This study has two layers: the country level and the differential level. The Friedman hypothesis that inflation is primarily a monetary phenomenon has empirically been grounded on both layers in a consistent way.

Other variables such as the exchange rate, remittance growth, and world inflation become significant at the country level, but not in the final estimations with differential variables. The dummies for the Indian financial crisis of the early 1990s and the fuel price shock of 2008 have shown strong significance in the estimations with the inflation differential. As the diagnostic tests show, the final ADL model of estimating the inflation differential is free of serial correlation, heteroskedasticity, non-normality in residuals, and specification errors. The model also shows its robustness in dynamic forecasting. Finding the main reasons of the inflation differential between these countries has policy implications for the central banks and the respective governments, which must control money supply whenever they become serious about lowering the level of inflation in their economy. Clearly other factors also matter, such as remittances and the exchange rate, though curiously the output-gap does not in our estimations.

This paper raises some additional questions such as 1) What role does public policy play in these countries to influence money growth and thus inflation? 2) Why was India's financial crisis of the early 1990s associated with remarkably high inflation? 3) Why are higher remittances associated with inflation in Bangladesh but not in India? 4) What should be the optimal rate of money growth for Bangladesh and India? 5) Is there a significant relationship between the degree of monetary policy independence and inflation in these countries? These questions, though interesting, go beyond the scope of this study, and are left for future exploration.

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TABLE 1

Comparison of money growth and inflation between Bangladesh and India: 1979-2010

	Money growth			Inflation		
Periods	Bangladesh	India	Differential	Bangladesh	India	Differential
2-year window						
1979-1980	21.77	16.80	4.97	15.06	13.62	1.44
5-year window:						
1981-1985	23.84	17.28	6.56	10.79	8.53	2.26
1985-1990	15.55	16.67	-1.11	8.26	8.69	-0.43
1991-1995	13.55	16.70	-3.15	4.20	10.32	-6.12
1996-2000	13.34	17.38	-4.04	3.82	5.86	-2.04
2001-2005	14.65	15.29	-0.64	3.72	4.65	-0.93
2005-2010	18.32	20.04	-1.72	6.75	7.38	-0.63
10-year window:						
1981-1990	19.70	16.97	2.72	9.52	8.61	0.91
1991-2000	13.44	17.04	-3.59	4.01	8.09	-4.08
2001-2010	16.48	17.66	-1.18	5.24	6.02	-0.78
Entire sample						
1979-2010	16.87	17.20	-0.33	6.81	7.95	-1.14

Note: The figures, expressed in percentage, are the averages of the respective period. Differentials are calculated by subtracting India's value from Bangladesh's. A special window only for 1979 and 1980 has been created to allow other 5-year and 10-year windows begin in 1981. Source: WDI 2012.

TABLE 2

Phillips-Perron stationarity tests with inflation and related variables of Bangladesh and India: 1979-2010

	Model A: Constant		Model B: Constant + Trend		Model C: None		Integration
Bangladesh's Variable:	Statistic	*p*-value	Statistic	*p*-value	Statistic	*p*-value	
Inflation	**-4.95**	**0.00**	-4.74	0.00	-3.46	0.00	I (0)
Money growth	**-3.91**	**0.01**	-3.96	0.02	-1.07	0.25	I (0)
Remittance growth	**-3.93**	**0.01**	-3.94	0.02	-2.91	0.01	I (0)
Output gap	-4.87	0.00	-4.84	0.00	**-4.92**	**0.00**	I (0)
Exchange rate	**-8.96**	**0.00**	-8.33	0.00	-5.47	0.00	I (0)
India's Variable:							
Inflation	-4.15	0.00	**-5.15**	**0.00**	-0.40	0.53	I (0)
Money growth	**-5.21**	**0.00**	-5.22	0.00	-0.66	0.43	I (0)
Remittance growth	**-6.48**	**0.00**	-6.39	0.00	-4.89	0.00	I (0)
Output gap	-2.86	0.06	-2.79	0.21	**-2.92**	**0.00**	I (0)
Exchange rate	-3.50	0.01	-0.31	0.99	**-5.88**	**0.00**	I (0)
Global Variable:							
World inflation	-4.69	0.00	**-5.89**	**0.00**	-2.55	0.01	I (0)
Differential Variable:							
Inflation differential	-6.52	0.00	-6.41	0.00	**-6.31**	**0.00**	I (0)
Money-growth differential	-3.79	0.01	-3.86	0.03	**-3.85**	**0.00**	I (0)

Note: The critical values and details of the test are presented in Phillips and Perron (1988). The bold elements indicate the actual model as per the unit root estimations. The differential variables have been calculated by subtracting the Indian variable from the respective Bangladeshi variable. Source: WDI 2012.

TABLE 3

Correlation and Granger causality tests with money growth and inflation of Bangladesh and India: 1979-2010

	Variables		
Panel A: Correlation tests	Bangladesh	India	Differential
Correlation coefficients of:			
Corr[money growth(t), inflation(t)]	**0.46 (0.01)**	0.12 (0.52)	**0.39 (0.03)**
Corr[money growth(t-1), inflation(t)]	**0.60 (0.00)**	-0.04 (0.82)	**0.49 (0.01)**
Corr[money growth(t-2), inflation(t)]	**0.41 (0.02)**	0.21 (0.26)	**0.35 (0.06)**
Corr[money growth(t), inflation(t-1)]	0.21 (0.25)	-0.03 (0.88)	0.19 (0.29)
Corr[money growth(t), inflation(t-2)]	0.24 (0.19)	0.06 (0.77)	0.18 (0.33)
Panel B: Granger causality tests			
Money growth doesn't Granger cause inflation			
F-statistic at Lag 1	**7.00 (0.01)**	0.39 (0.54)	**6.03 (0.02)**
Lag 2	**5.03 (0.01)**	1.77 (0.19)	2.04 (0.14)
Lag 3	**4.17 (0.02)**	**2.30 (0.10)**	1.28 (0.30)
Inflation doesn't Granger cause money growth			
F-statistic at Lag 1	0.29 (0.59)	0.05 (0.83)	0.40 (0.53)
Lag 2	1.27 (0.30)	0.24 (0.79)	1.77 (0.19)
Lag 3	0.31 (0.82)	0.19 (0.90)	0.74 (0.54)

Note: The p-values of each statistic are in the parentheses. The statistics are bold when thery are significant at the 10 percent level. Statistics under 'Differential' include money-growth and inflation differentials. The differential variable is calculated by subtracting the Indian variable from the respective Bangladesh's variable. Source: WDI 2012.

TABLE 4

Role of money growth and other factors in the estimations of inflation for Bangladesh and India: 1979-2010

	Bangladesh		India		
Regression No. →	1	2	3	4	5
Regressors:					
Constant	-2.651 (1.60)	-1.77 (1.08)	-4.47 (6.09)	2.242 (5.42)	-0.837 (2.85)
Inflation (t-1)	0.21 (0.17)	0.27*** (0.09)	0.31 (0.18)	-0.16 (0.20)	-0.05 (0.15)
Money growth (t)	0.05 (0.09)		0.18 (0.22)	(0.09) (0.20)	
Money growth (t-1)	**0.25*** (0.08)	**0.27***** (0.06)	0.03 (0.20)	0.01 (0.17)	
Money growth (t-2)	0.03 (0.07)		0.29 (0.21)	0.28 (0.17)	**0.35**** (0.16)
Remittance growth (t)	0.04* (0.02)	0.04** (0.02)	0.01 (0.02)	0.01 (0.02)	
Output gap (t)	-33.65 (66.58)		-11.22 (31.43)	53.87 (32.33)	
Exchange rate (t)	0.02 (0.04)		0.05*** (0.02)	0.08*** (0.02)	0.06*** (0.02)
World inflation (t)	0.11 (0.10)	0.17*** (0.05)	-0.11 (0.08)	-0.09 (0.07)	
Indian financial crisis				5.80*** (1.71)	4.36*** (1.29)
R-squared	0.77	0.77	0.46	0.64	0.58
Adjusted R-squared	0.70	0.73	0.27	0.50	0.51
Schwarz Bayesian creterion	4.96	4.56	5.32	5.01	4.64
Diagnostic tests:					
Serial correlation test:					
Q-stat at lag 1	0.49 [0.49]	0.03 [0.85]	1.63 [0.20]	1.52 [0.22]	2.55 [0.11]
Q-stat at lag 4	1.47 [0.83]	2.34 [0.67]	3.37 [0.50]	5.19 [0.27]	6.02 [0.20]
Q-stat at lag 8	8.71 [0.37]	7.87 [0.45]	10.03 [0.26]	12.34 [0.14]	9.84 [0.28]
Heteroskedasticity test:					
Q-stat at lag 1	0.17 [0.68]	0.00 [0.98]	0.10 [0.75]	0.09 [0.77]	0.01 [0.92]
Q-stat at lag 4	1.72 [0.79]	2.54 [0.64]	3.05 [0.55]	0.70 [0.95]	1.20 [0.88]
Q-stat at lag 8	2.82 [0.95]	3.03 [0.93]	6.32 [0.61]	5.17 [0.74]	4.7 [0.79]
Normalty test:					
Jarque-Bera stat	0.39 [0.82]	0.69 [0.71]	1.81 [0.40]	0.24 [0.89]	1.97 [0.37]
Specification test:					
Ramsey F-stat	0.01 [0.95]	0.02 [0.88]	1.76 [0.20]	5.25 [0.03]	0.90 [0.35]

Note: The coefficients of interest are made bold when significant. *, **, *** indicate that the coefficients are significant at the 10%, 5%, and 1% levels, respectively. "stat" stands for statistic. Null hypotheses for diagnostic tests are: (1) No serial correlation (2) No heteroskedasticity (3) No nonnormal errors in residuals and (4) No specification error.Values in parentheses against coefficients are their standard errors, and values in brackets are p-values of the respective statistics. Source: WDI 2012.

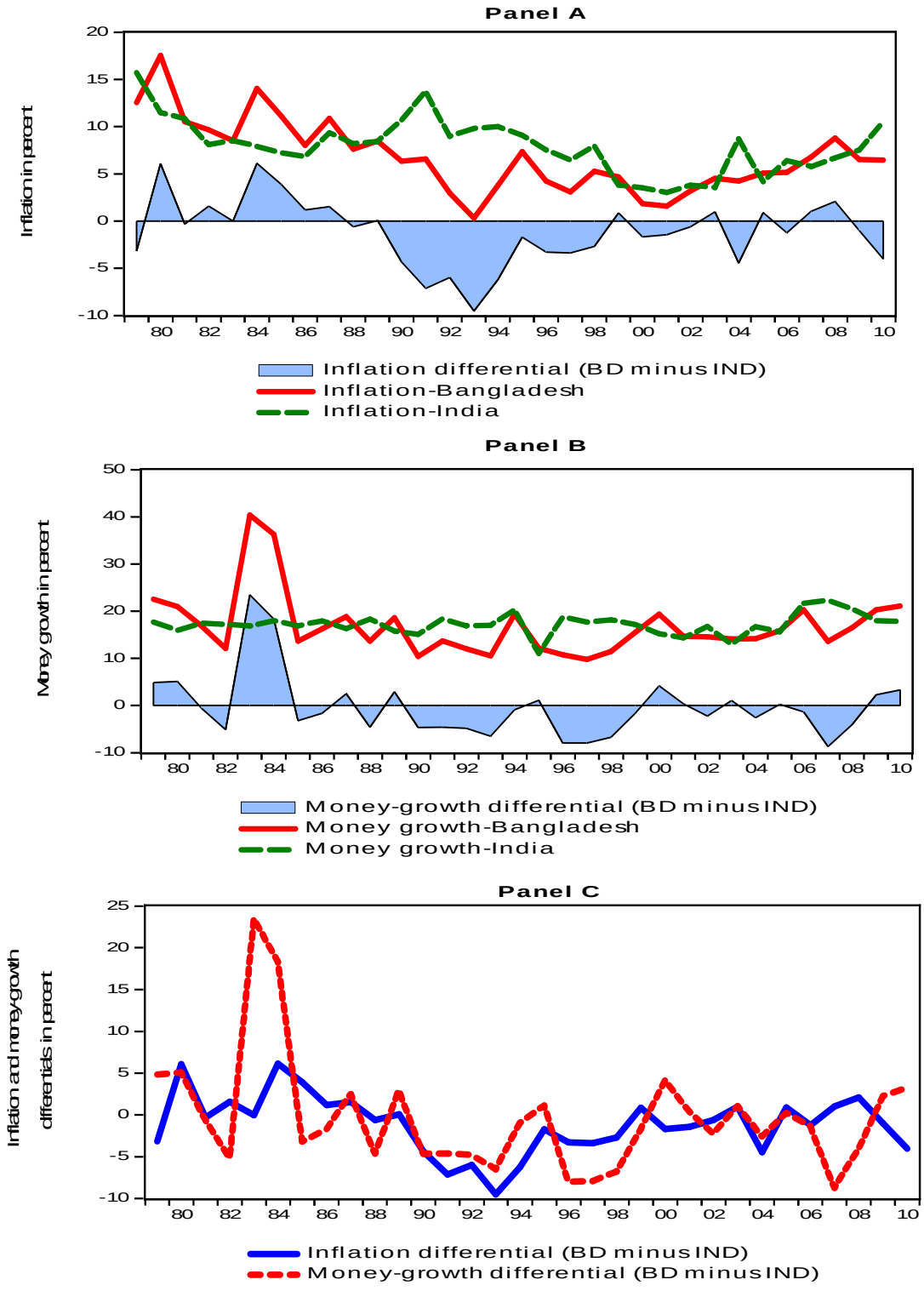
TABLE 5

Role of money-growth differentials in the estimations of inflation differentials between Bangladesh and India: 1979-2010

Regression No. →	1	2	3	4
Regressors:				
Constant	-1.03* (0.54)	-1.55* (0.87)	-1.01* (0.51)	-1.10** (0.48)
Inflation differential (t-1)	-0.05 (0.11)	-0.31** (0.12)	-0.24*** (0.08)	-0.25** (0.08)
Money-growth differential (t)	**0.18**** (0.09)	**0.14*** (0.08)	**0.14**** (0.06)	**0.15***** (0.06)
Money-growth differential (t-1)	0.13 (0.09)	0.10 (0.08)	**0.14**** (0.07)	**0.17***** (0.06)
Money-growth differential (t-2)	**0.17*** (0.09)	**0.13*** (0.07)	**0.15**** (0.06)	**0.16**** (0.06)
Indian financial crisis		-7.00*** (1.36)	-6.53*** (1.23)	-6.31*** (1.16)
Remittance growth (t)-Bangladesh		0.04* (0.02)	0.04** (0.02)	0.04** (0.02)
Exchange rate (t)-India		0.03 (0.03)		
World inflation (t)		-0.06 (0.10)		
Fuel shock 2008				4.30** (2.02)
R-squared	0.36	0.74	0.73	0.78
Adjusted R-squared	0.26	0.65	0.67	0.71
Schwarz Bayesian creterion	5.43	4.94	4.76	4.70
Diagnostic tests:				
Serial correlation test:				
Q-stat at lag 1	2.47 [0.12]	0.10 [0.75]	0.04 [0.85]	0.51 [0.48]
Q-stat at lag 4	4.81 [0.31]	2.02 [0.73]	1.72 [0.79]	3.24 [0.52]
Q-stat at lag 8	7.90 [0.44]	2.67 [0.95]	2.26 [0.97]	4.31 [0.83]
Heteroskedasticity test:				
Q-stat at lag 1	0.76 [0.38]	0.01 [0.93]	0.43 [0.51]	1.21 [0.27]
Q-stat at lag 4	2.31 [0.68]	0.21 [1.00]	0.82 [0.94]	8.30 [0.08]
Q-stat at lag 8	6.14 [0.63]	1.69 [0.99]	3.53 [0.90]	11.51 [0.17]
Normalty test:				
Jarque-Bera stat	0.52 [0.80]	0.33 [0.85]	0.42 [0.81]	0.57 [0.75]
Specification test:				
Ramsey F-stat	0.34 [0.56]	0.12 [0.72]	0.08 [0.77]	0.46 [0.51]

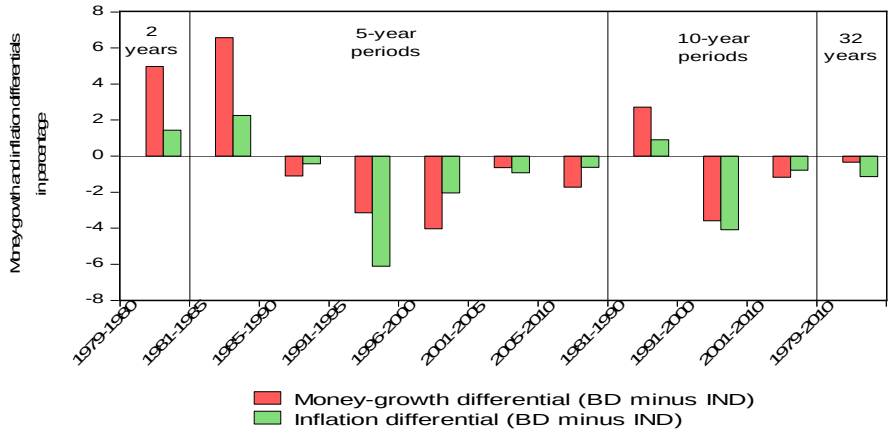
Note: A differential variable is calculated by subtracting India's values from Bangladesh's. The coefficients of interest are made bold when significant. *, **, *** indicate that the coefficients are significant at the 10%, 5%, and 1% levels, respectively. "stat" stands for statistic. Null hypotheses for diagnostic tests are: (1) No serial correlation (2) No heteroskedasticity (3) No nonnormal errors in residuals and (4) No specification error. Values in parentheses against coefficients are their standard errors, and values in brackets are p-values of the respective statistics. Source: WDI 2012.

FIGURE 1
Inflation and money-growth differentials between Bangladesh and India: 1979-2010



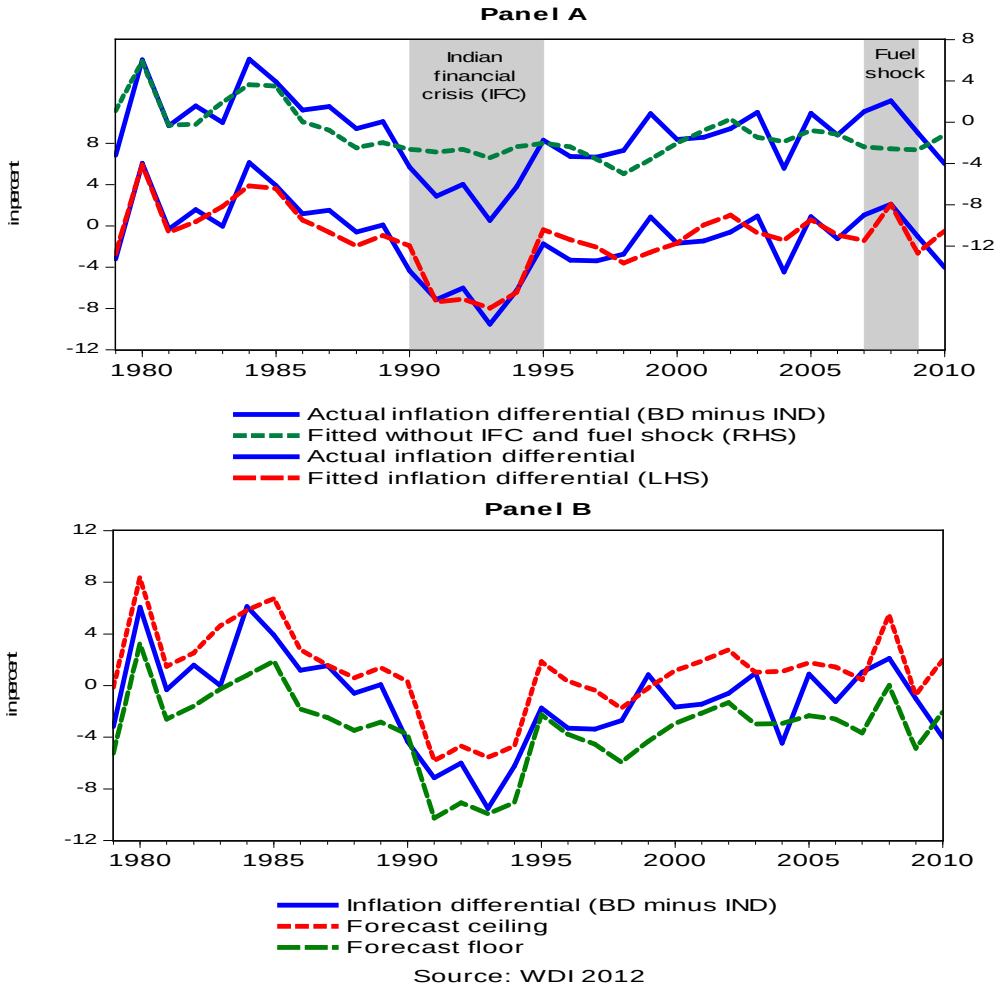
Source: WDI 2012

FIGURE 2
Period-wise relationship between money-growth and inflation differentials



Source: WDI 2012

FIGURE 3
Goodness of fit and dynamic forecasting of inflation differential between Bangladesh and India: 1979-2010



Source: WDI 2012

Chapter 3

Bangladesh Bank's Monetary Programming: M2 versus M3

Dr. Md. Habibur Rahman*

1. Background

Like other central banks in the world, Bangladesh Bank (BB) is responsible for formulating and implementing monetary policy in Bangladesh. Monetary policy pursued by the BB aims at maintaining low price with reasonable stability while supporting the highest sustainable growth of domestic output. The price stability target is a moderate CPI inflation which is realistically attainable and maintainable without unduly depressing output. Of the two common strategies of monetary policy, monetary and inflation targeting, BB has chosen to work with the former. The success of monetary targeting depends on strong and reliable relationship between goal variables (e.g., low inflation and high output growth) and target variables (e.g., reserve money and broad money) in addition to a stable money demand function.[1] Currently BB assumes a close, stable and predictable relationship between broad money (M2) growth and inflation in formulating its annual monetary program based on a projected real GDP growth and targeted inflation rate by employing reserve money (RM) and broad money (M2) as operating and intermediate targets respectively.

Recently, by incorporating monetary data of non-bank depository corporations (NBDC), BB has started calculating and publishing M3 with relatively broader coverage than that of M2.[2] The objective of this paper is to examine if the use of M3 instead of M2 in BB's monetary programming would provide better outcome in terms of: (a) explaining CPI inflation and (b) reducing errors while targeting monetary growth. In view of examining the money growth-inflation relationship simple ordinary least square (OLS) econometric technique and pair-wise correlation coefficients are used while in view calculating the errors from targeted monetary growth simple statistical procedures, such as mean square errors (MSE) and root mean square errors (RMSE) have been used based on annual data during 1999-2009. Besides, other data presentation techniques, namely Tables and Charts have also been used in the paper.

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* Dr. Md. Habibur Rahman is the Deputy General Manager at Bangladesh Bank (Central Bank of Bangladesh).

[1] A stable money demand function is a necessary condition for a predicable relationship between money supply growth and inflation.

[2] As we know, M2 is compiled on the basis of the data of the Bangladesh Bank as well as all scheduled and specialized commercial banks. As per recommendation of the IMF's multi-sector statistical mission of 1998, BB has decided to expand the coverage of money supply by including monetary data of other non-bank deposit taking institutions. Accordingly, the Statistics Department of Bangladesh Bank has been compiling and publishing M3 by incorporating data of NBDC (comprising major Micro-credit Institutions (i.e., Grameen Bank, Ansar-VDP Development Bank, Karmasangsthan Bank and Bangladesh Samabaya Bank), Finance and Leasing Companies, Central Co-operative Banks and Land Mortgage Banks) and National Savings Scheme with the monetary data of Deposit Money Banks (DMBs) and Bangladesh Bank. In order to make M3 data more meaningful, this paper incorporates monetary data of 3 more micro-finance institutes, namely ASA, BRAC and Proshika along with BB's published M3.

2. Methodology

A simple model of the price level based on the equation of exchange relating to the quantity theory of money is the fundamental basis for annual monetary programming at BB. According to the equation of exchange, we have:

$$MV = PY$$

Where, M=nominal money (M2 or M3), V=income velocity of money[3], P=price level (12-month average CPI index) and Y=real income (GDP at constant price). In growth form equation (1) could be rewritten as:

(2a) inflation = money growth + velocity growth - income growth

(2b) money growth = income growth + inflation - velocity growth

Equations (2a) and (2b) can be rewritten as:

(3a) inflation = α (money growth) + β (velocity growth) - γ (income growth) + ε (error)

(3b) money growth - [income growth + inflation - velocity growth] = 0

(3c) money growth - [programmed/targeted money growth] = 0 (error)

While equation (3a) [4] is the basis for OLS regression in explaining money growth-inflation relation, equation (3c) is used for calculating errors in the monetary target from actual money growth.

3. Trends in money, income and inflation

Trends in money, income velocity, national income and inflation during FY00-FY09 are displayed in Table 1. Both the measures of money, M2 and M3, displayed a reasonably stable growth pattern during FY00-FY09. Both the money maintained a similar spread of growth range remaining within the range of 13.13-19.30 percent and 13.96-19.46 percent respectively during FY00-FY09. The data also indicate that while growth in M2 remained higher in the last five years (FY05-FY09), the growth in M3 was higher in the initial five years (FY00-FY04) of the sample period. In FY09, M2 and M3 registered a growth of 19.17 percent and 17.04 percent against 17.63 percent and 15.99 percent respectively in FY08. Both the income velocities of money experienced an increasing trend during FY00-FY04 then decreased for couple of years before increasing to -1.79 percent and -0.40 percent respectively in FY08. The growth in income velocity of M2 and M3 then decreased to -5.46 percent and -3.74 percent respectively reflecting relatively lower GDP growth in FY09.

Despite some major national and international crisis both the nominal and real national income in Bangladesh witnessed a robust growth trend during the last decade. Nominal national income started to achieve double digit growth from FY03 registering 15.52 percent and 12.66 percent annual growth respectively in FY08 and FY09. Real national income, on the other hand, registered around a 6.0 percent growth during the last six years. Despite the devastating global economic crisis

[3] Defined as a ratio of nominal income to money.

[4] Where α, β and γ are the regression coefficients of money growth, velocity growth and income growth respectively.

the real sector of Bangladesh economy recorded a growth of 5.88 percent in FY09 slightly lower from 6.19 percent in FY08.

Table 1: Growth trends in money, income and inflation

Period	Growth in						CPI inflation
	M2	M2 velocity	M3	M3 velocity	Nominal income	Real income	
FY99	--	--	--	--	--	--	--
FY00	18.62	-9.02	19.46	-9.67	7.91	5.94	2.79
FY01	16.60	-8.28	18.01	-9.38	6.94	5.27	1.94
FY02	13.13	-4.75	15.30	-6.55	7.75	4.42	2.79
FY03	15.59	-4.82	15.94	-5.11	10.02	5.26	4.38
FY04	13.80	-2.65	13.97	-2.80	10.78	6.27	5.83
FY05	16.75	-4.64	15.49	-3.60	11.33	5.96	6.49
FY06	19.30	-6.00	17.89	-4.87	12.14	6.63	7.16
FY07	17.06	-2.92	16.21	-2.20	13.65	6.43	7.20
FY08	17.63	-1.79	15.99	-0.40	15.52	6.19	9.94
FY09	19.17	-5.46	17.04	-3.74	12.66	5.88	6.66

The sample data indicate that the average CPI inflation in Bangladesh remained well below 10.0 percent during the last decade. Propelled by historical international price hike the CPI inflation in Bangladesh increased to 9.94 percent in FY08 before moderating to 6.66 percent in FY09 due to international price moderation and improved domestic supply condition.

4. Money growth-inflation relationship

In view of anchoring inflation and inflation expectation clear understanding of money growth and inflation is required for conducting monetary policy in an effective manner. Although there are some research in investigating the causal relationship between M2 growth and inflation, the issue of M3 growth and inflation relationship remained unexplored. The current paper made an attempt to examine the relationship using both the definitions of money based on some simple econometric techniques, e.g., simple OLS regression and correlation coefficients analysis.

The basis of the OLS regression is equation (3a) where the impact of money growth is tested on CPI inflation in presence of real GDP and income velocity growth. The estimated results using both M2 and M3 based on annual data during FY99-FY09 are shown in Tables 2a and 2b.

Table 2a: Equation based on M2

Dependent Variable: CPI inflation
Method: Least Squares
Sample(adjusted): 2000 2009
Included observations: 10 after adjusting endpoints
Newey-West HAC Standard Errors & Covariance (lag truncation=2)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Constant term	-3.84	0.86	-4.45	0.00
Growth in M2	0.76	0.05	15.39	0.00
Growth in real GDP	0.29	0.19	1.55	0.17
Growth in income velocity of M2	1.01	0.05	21.79	0.00
R-squared	0.97	Mean dependent var		5.52
Adjusted R-squared	0.96	S.D. dependent var		2.50
S.E. of regression	0.51	Akaike info criterion		1.80
Sum squared residual	1.59	Schwarz criterion		1.92
Log likelihood	-4.99	F-statistic		68.97
Durbin-Watson stat	2.71	Prob(F-statistic)		0.00

Estimated results indicate that growth in both the measures of money have significant positive impact on CPI inflation in presence of real income and velocity growth. While 1 percent change in M2 growth produces an estimated 0.76 percent positive impact on CPI inflation, same changes in M3 growth brings about 0.67 percent increase in the inflation rate indicating relatively stronger relationship of CPI inflation with M2 than that of M3 (Tables 2a and 2b).

Table 2b: Equation based on M3

Dependent Variable: CPI inflation
Method: Least Squares
Sample(adjusted): 2000 2009
Included observations: 10 after adjusting endpoints
Newey-West HAC Standard Errors & Covariance (lag truncation=2)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Constant term	-2.73	0.97	-2.82	0.03
Growth in M3	0.67	0.07	10.15	0.00
Growth in real GDP	0.31	0.19	1.66	0.15
Growth in income velocity of M3	0.96	0.05	19.41	0.00
R-squared	0.97	Mean dependent var		5.52
Adjusted R-squared	0.96	S.D. dependent var		2.50
S.E. of regression	0.50	Akaike info criterion		1.75
Sum squared residual	1.51	Schwarz criterion		1.87
Log likelihood	-4.74	F-statistic		72.61
Durbin-Watson stat	2.89	Prob(F-statistic)		0.00

In line with the outcome of regression analysis, the matrix of correlation coefficients also indicates relatively stronger association between M2 and price than that of M3 and price. Table 3 shows a correlation coefficient of 0.998 between M2 and CPI compared with a coefficient of 0.997 between M3 and CPI. The correlation coefficient matrix also indicate that while M2 growth and CPI inflation shows positive correlation of 0.360, M3 growth and CPI inflation shows negation correlation of 0.312 (Table 3).

Table 3: Matrix of correlation coefficients

	Correlation coefficients	
	in level	in growth
Variables	CPI	CPI
CPI	1.000	1.000
M2	0.998	0.360
M3	0.997	-0.312

5. Estimating errors from the targeted monetary growth

In view of examining the appropriateness of using M2 instead of M3 in monetary programming of Bangladesh Bank, an attempt has been made to calculate the errors in money growth from the targeted growth based on the equation (3c). In order to get rid of the negative signs from the estimated errors, squares of all the errors are calculated and depicted in Chart 1. The mean value of sum of squares (MSE) and the square root of the MSE (RMSE) are shown in Chart 2.

The data plot of the squares of errors in actual money growth from targeted money growth, as shown in Chart 1, indicate that there are relatively smaller errors made when M2 is used during whole sample period except for FY04, FY07 and FY09 when M3 produced relatively smaller errors (shaded areas).

Char 1: Sum of squares of errors calculated from M2 vs. M3 growth

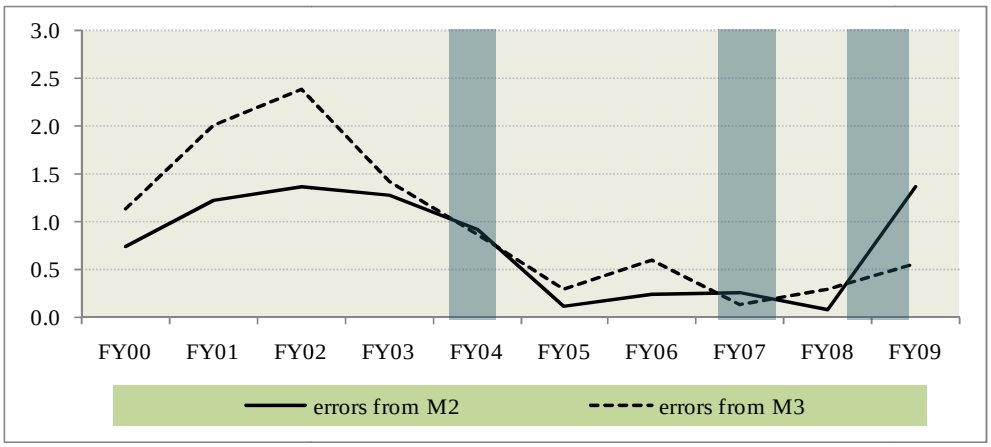
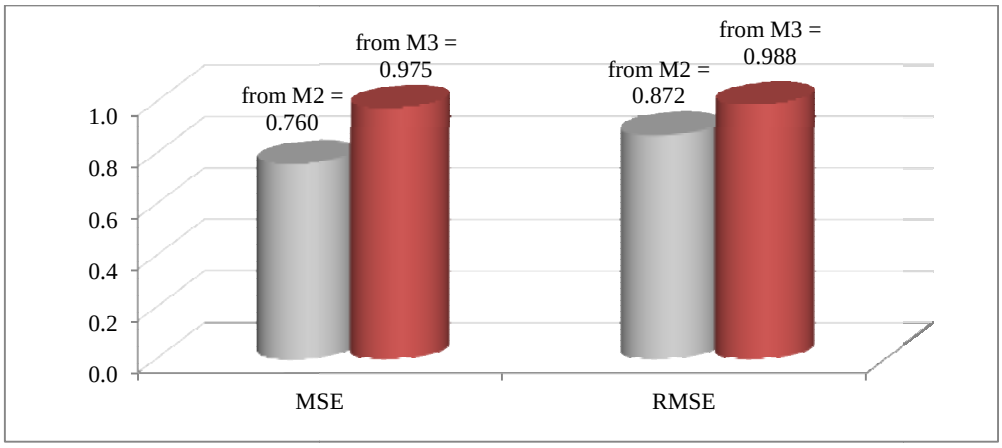


Chart 2: MSE and RMSE-M2 vs. M3



Although M3 produces smaller errors in the some of the recent years, the consistency in producing smaller errors is required in order to make a case for using M3 in monetary programming. Estimated MSE and RMSE, on the other hand, also produces relatively lower value when M2 rather than M3 is used reflecting the appropriateness of using M2, as currently practiced, in BB's annual monetary programming (Chart 2).

6. Summary findings

As mentioned earlier the objective of the paper is to examine if the use of M3 instead of M2 in BB's monetary programming would provide better outcome in terms of: (a) explaining CPI inflation and (b) reducing errors while targeting monetary growth. The estimated outcome from various Tables, Charts, regression equations and correlation coefficients indicate that:

M2 contains relatively stronger explanatory power in explaining CPI inflation,

M2 has relatively stronger correlation with CPI inflation and

There are relatively smaller errors in actual money growth from the programmed growth when M2 is used.

7. Concluding remarks

Statistical as well as simple econometric evidences indicate that M2 has relatively stronger association with price and use of M2 in monetary targeting produces relatively smaller errors in actual money growth from targeted growth. However, obtaining relatively smaller errors from M3 compared with M2 in some of the recent years provides an indication that M3 may come into the picture in near future by outperforming M2 in explaining inflation and producing consistently smaller errors. Therefore, BB may continue using M2 in its annual monetary programming as currently practiced with keeping an eye on the relationship between M3 and price.

8. References

1. Bangladesh Bank Quarterly (Various issues), Bangladesh Bank.

2. Monthly Economic Trends (Various issues), Bangladesh Bank.

Chapter 4

A Comparative Analysis of Interest Rate Spread in the Banking System

Dr. Md Ezazul Islam (DGM), Mr. Tarun Khanti Ghosh (DGM), Mr. Md. Habibour Rahman (JD), Mr. Mohammad Shahriar Siddiqui (JD), Mr. Md. Aminur Rahman Chowdhury (JD), Mrs. Rafeza Akhter Kanta (JD)*

Introduction

Financial sector spread measures the effectiveness of the bank's intermediation function in borrowing and lending money and also the intensity of competition among banks (Rose, 2002). Bangladesh Bank is keen on minimizing intermediation cost because the lower spread indicates an efficient and a competitive financial system.

In a liberal interest rate regime, banks are allowed to set deposit and lending rates except for pre-shipment export credit and agriculture loans.[1] BB monitors interest rate spread and the Statistics Department of BB calculates the spread as difference between weighted average lending and deposits rate (WAIS). However, this methodology is sometimes called into question which prompted us to carry out a study comparing various potential methods. Also BB on various occasions has asked banks to limit spreads below 5%. This is also controversial since some banks have a large pool of low cost deposits which they mobilized by investing huge amounts on technology, infrastructure, and service and brand reputation. As such there is one view among bankers is that the ability to retain market share while keeping higher spreads in their banks is due to the overall service package which they provide, and hence should not be capped.

Apart from the above mentioned WAIS method, there are different methods of spread measurement. These are: (1) interest income and expense method: difference between yield on interest earnings assets and yield on interest bearing liabilities; (2) business spread method: percentage change of total yields on interest + non interest earning to total asset and total interest expense to total liabilities; and (3) net interest margin to net assets of banks.

The objectives of the present study are: (i) to calculate interest rate spread by taking all above methods for last five years of types of banks, and (ii) to compare the spreads of different methods for policy purpose.

The spread in the banking system depends on many factors, i.e., overall efficiency in financial markets, market regulation (CRR, supervision, and, credit allocation etc.), market segmentation and

* The authors are working at the Chief Economist's Unit, Statistics Department, Financial Stability Department, Department of Off-Site Supervision, and Banking Regulation and Policy Department of Bangladesh Bank. The views expressed in the study are authors own and do not reflect that of Bangladesh Bank.

[1] See BRPD Circular No.-02, January 4, 2012.

the extent of competition. The major factors for high spread in the financial system of Bangladesh are discussed in different studies summarized below.

Mujeri andYounus (2009) find that deposit rate, market share of deposits of a bank, NSD certificate interest rates, and statutory reserve requirements impact positively on spread while non interest income as a ratio of total asset impacts negatively on spread. They also find that that IRS is significantly influenced by operating costs and classified loans for state owned commercial banks (SCBs) and specialized banks (SBs); while inflation, operating costs, market share of deposits, statutory reserve requirements, and taxes are important for the private commercial banks (PCBs). On the other hand, non-interest income, inflation, market share, and taxes matter for the foreign commercial banks (FCBs).

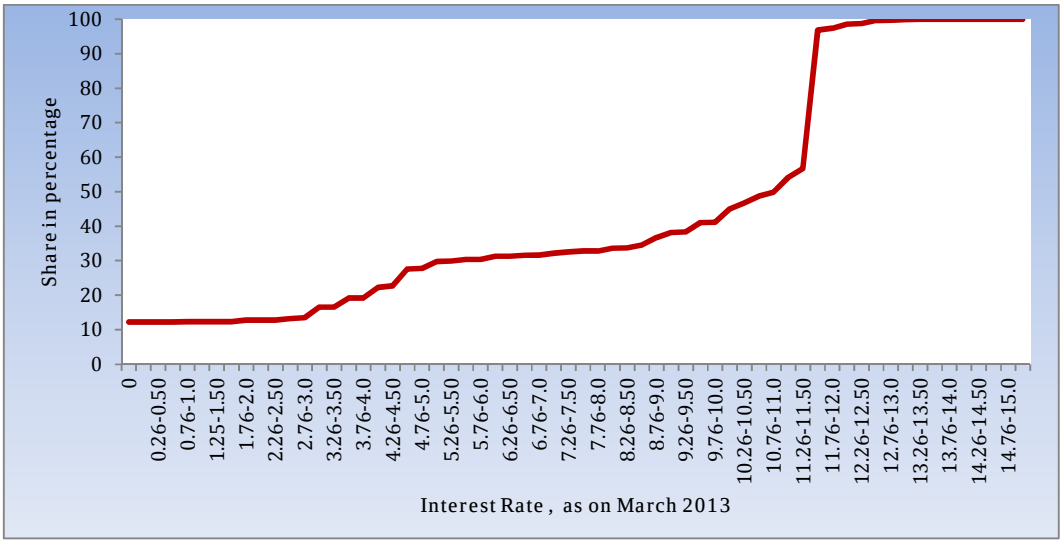
Hossain, M.(2010) identifies that high administrative costs, high non-performing loan ratio and some macroeconomic factors are the key determinants of persistently high spread and margins in private banks.

Economic literature on finance indicates that the simplest loan pricing model (cost-plus loan pricing model) assumes that the rate of interest charged on any loan includes four components: i) the cost to the bank of rising adequate funds to lend; ii) the bank's non-fund operating cost (including wages and salaries, the cost of material and physical facilities); iii) necessary compensation paid to the bank for the degree of default risk inherent in a loan, and iv) the desired profit margin on each loan that provides the bank's stock holders with an adequate return on their capital.

The analysis of market share of financial intermediation in the banking system shows that PCBs and FCBs appear as a market leader over SOBs and SBs to intermediate financial sources (both deposit and advances). The share of PCBs and FCBs deposit in total deposit was 32.0 percent in 1990 which increased to 38.2 percent in 2000 and sharply increased to 69.0 percent at the end of March 2013. The share of advances to total advances rose for PCBs and FCBs to 72.12 percent at the end of March 2013 from 35.4 percent in 1990. Hence to a certain extent, the pricing of loan and deposit depends on price setting by PCBs and FCBs. So the higher lending rate and lower deposit rate offered by some PCBS and FCBs lead to high spread in the banking system of Bangladesh.

Data plot from March 2013 against interest rate show that about 57 percent share of deposit in total deposit is collected at 12.16 percent interest rate and only 7 percent share of deposit is interest free (Chart 1).

Chart 1: Deposit distribution against interest rate by PCBs

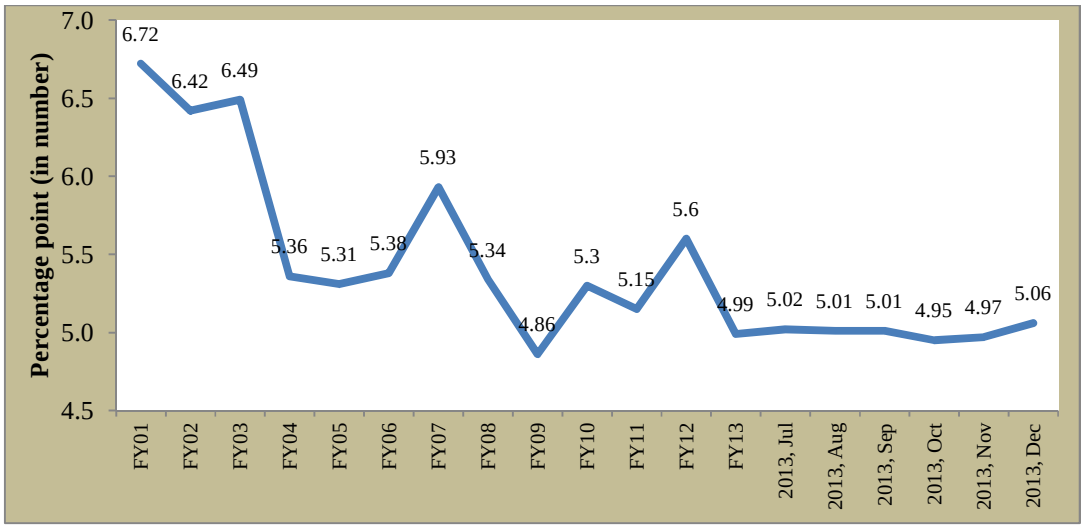


Source: Authors own calculation based on data available in Scheduled Bank Statistics, March 2013.

Trend in Spread in the Banking System Based on WAIS Method

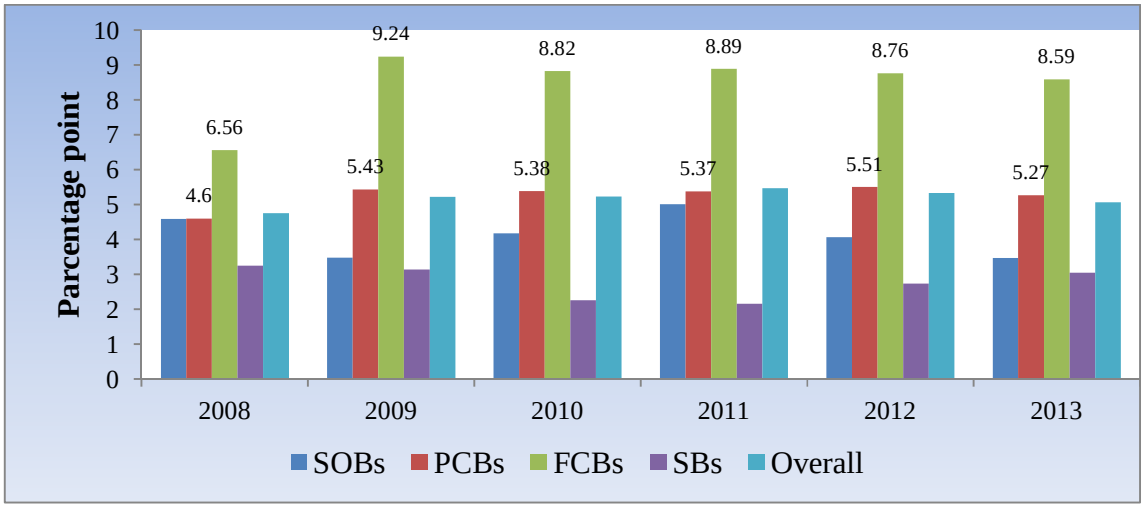
Historical data using the WAIS method indicates that the annual average spread in the banking system was more than 5 percentage point since FY 01 up except in FY09. The spread was 6.72 percentage points in FY01 which gradually came down to 4.86 percentage point in FY09 and again it increased to 5.60 percentage points in FY12. The last few months show that spreads are generally declining (Chart 2). FCBs have the highest spreads (Chart 3).

Chart 2: Trend in overall spread in the banking system of Bangladesh



Source: Statistics Department, Bangladesh Bank.

Chart 3: Trend in high spread in PCBs and FCBs during 2008-June 2013.

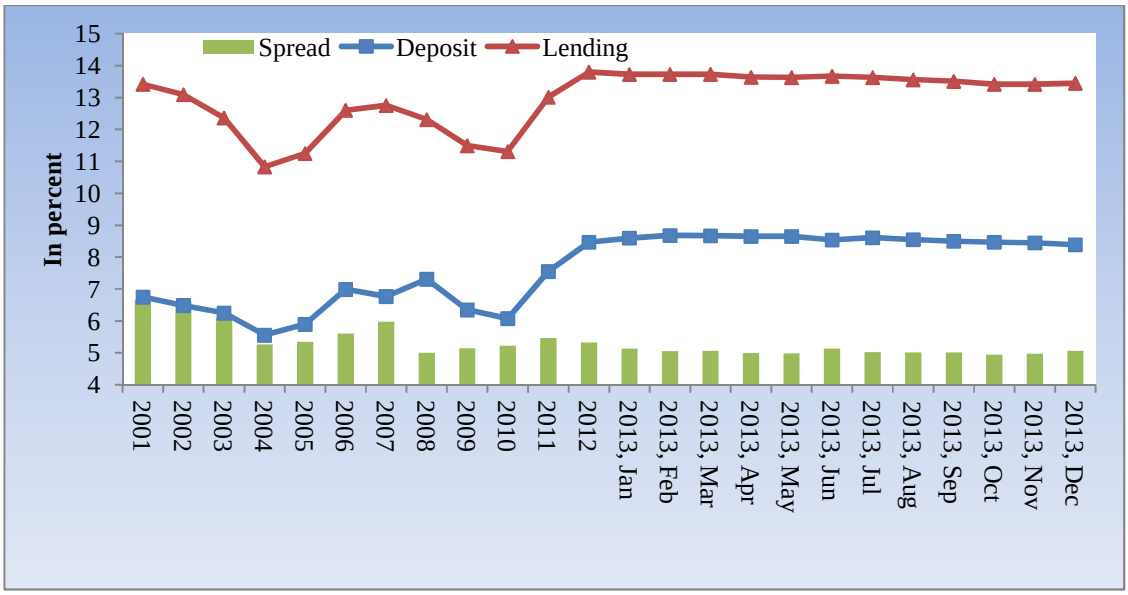


Source: Statistics Department, Bangladesh Bank.

Overall Trend in Deposit and Lending Rates

Chart 4 plots overall deposit and lending rates in the banking industry which indicate an increasing trend since 2011.

Chart 4: Trend in Overall Deposit and Lending Rates of Industry during 2001-December 2013

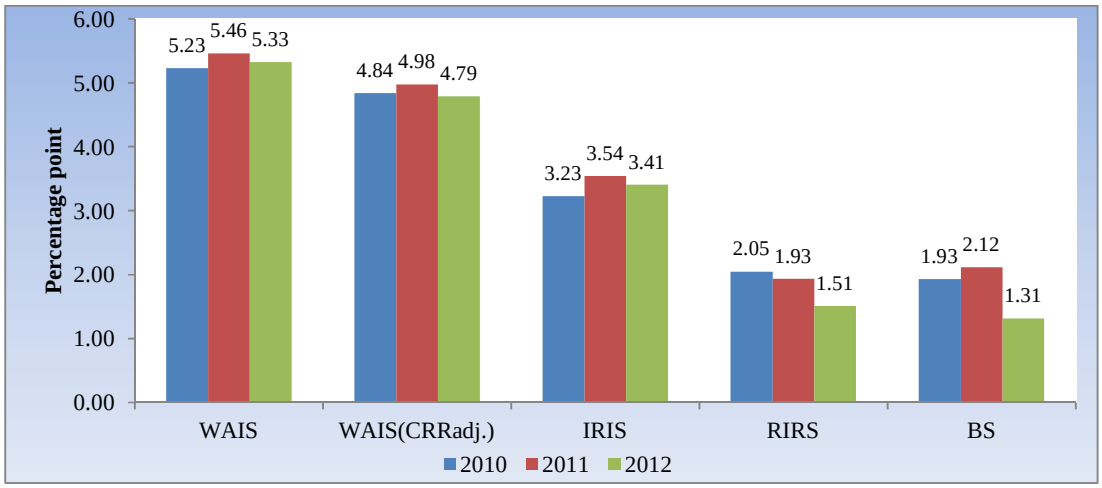


Source: authors' own calculation, based on data available in Statistics Department

Comparative Analysis of Spread Based on Different Methods

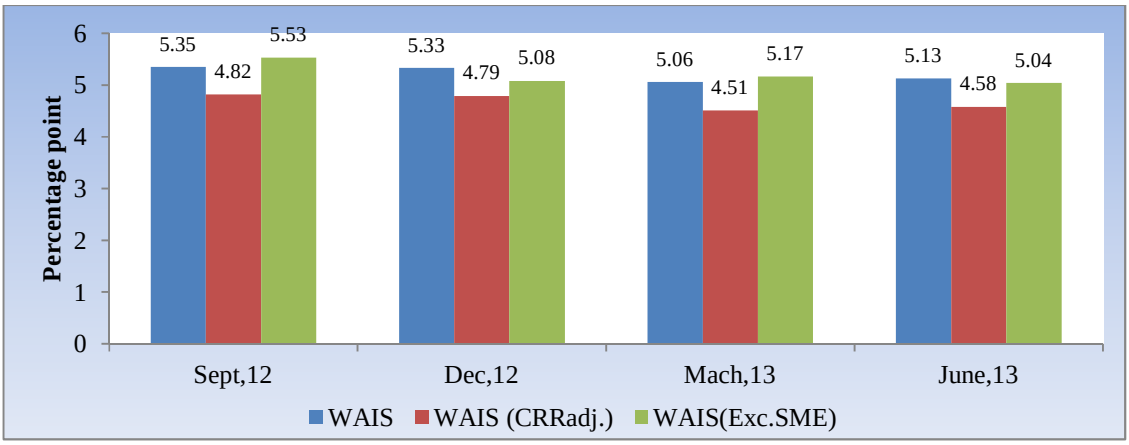
Interest rate spreads based on different methods, i.e., Weighted Average Interest Rate Spread (WAIS), Interest Income and Expenses Method (IRS), Revised Interest Income and Expenses Method (RIRS), Total Income and Expenses Method (BS) are given in Chart 5-6 and Table 1-2. In addition two variations of WAIS are given, one which excludes the bank's SME portfolio as these have higher administrative costs and therefore disadvantage those with higher share of these, as well as WAIS without the Cash Reserve Requirement portion. The calculation methodology are given in Annexure I. Data indicate that spread on the basis of WAIS is higher than that of others methods during 2010-2012 (Chart 5).

Chart 5: Trend in spread based on different methods during 2010-2012



Source: Department of Off-site Supervision and Statistics Department, BB.

Chart 6: Trend in spread based on WAIS, CRR adjusted WAIS and Excluding SME WAIS during September, 2012-June 2013.



Source: Department of Off-site Supervision and Statistics Department, BB.

Table 1: Interest rate spread in different methods

	WAIS	WAIS (CRRadj.)	WAIS (exc.SME)	IRIS	RIRS	BS
December 2010						
SoB's	4.18	3.86	n.a	2.86	1.93	2.20
PCB's	5.38	4.95	n.a	3.59	2.72	3.64
FCB's	8.82	8.63	n.a	2.88	1.15	1.49
SB's	2.26	1.81	n.a	3.57	2.39	0.38
December 2011						
SoB's	5.01	4.63	n.a	2.41	2.04	2.42
PCB's	5.37	4.82	n.a	3.15	2.24	2.33
FCB's	8.89	8.60	n.a	6.19	1.32	1.59
SB's	2.16	1.66	n.a	2.43	2.13	2.13
December 2012						
SoB's	4.06	3.60	3.78	1.41	1.01	1.98
PCB's	5.51	4.92	5.37	3.64	2.27	1.90
FCB's	8.76	8.40	8.14	6.71	1.55	1.38
SB's	2.73	2.11	2.14	1.86	1.22	0.00

Source: Department of Off-site Supervision and Statistics Department, BB.

Table 2: Trend in Overall Interest Rate Spread in Different methods during 2010-2012

	2010	2011	2012
WAIS	5.23	5.46	5.33
WAIS(CRRadj.)	4.84	4.98	4.79
WAIS(Exc.SME)	n.a	n.a	5.08
IRIS	3.23	3.54	3.41
RIRS	2.05	1.93	1.51
BS	1.93	2.12	1.31

Source: Department of Off-site Supervision and Statistics Department, BB.

Conclusion

Calculation of interest rate spreads based on different method, i.e., three types of Weighted Average Interest Rate Spread (WAIS), Interest Income and Expenses Method (IRS), Revised Interest Income and Expenses Method (RIRS), Total Income and Expenses Method (BS) was conducted.

Our analysis suggests that WAIS method excluding SME is the best method for monitoring interest rate spreads on a monthly basis. This is because the spread formula measures intermediation costs, data can be found monthly, and excluding SME's leads to better comparisons of intrinsic bank efficiency. IRS, RIRS and BS are not the best measure for spread because they can only be

calculated quarterly and indicate different components of bank business performance rather than efficiency of intermediation. However, BB can publish IRS, RIRS and BS statistics along with WAIS for greater data transparency.

Many countries use the banking spread indicator for monitoring efficiency of overall sector but not as a regulatory tool compelling banks to reduce spreads below a certain threshold. The contribution of this study was to recommend the choice of the core monitoring tool. BB management will need to assess the merits of having a target spread level as a regulatory tool compared with having it only for monitoring purposes.

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Hossain, Monzur (2010). Financial Reform and Persistently High Bank interest spread in Bangladesh: Pitfalls in institutional Development? MPRA PAPER No.24755, Posted 4, September 2010, 01:57 UTC.

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BB: Bangladesh Bank, Banking Regulation and Policy Department, Circular Letter No.1, January 22, 2012.

Annexure: 1

Different Methods of Spread

A. Weighted Average Interest Rate (WAIS) Method:

Spread based on weighted average method is defined as the difference of weighted average lending and deposit rates. Weighted average interest rate for deposit and lending are calculated on the basis of the following formula.

$$WAIS = \frac{\sum (Amount \times Rate)}{\sum Amount}$$

Spread = WAIRA - WAIRD

B. Interest Income and Expenses Method (IRS):

To determine the Interest Rate Spread (IRS) on the basis of total yield on Income and expenses method, the detailed methodology is as below:

Interest income from Advances = I_a

Interest income from Investment = I_i

Interest income from Money at Call = I_m

Total interest income (T_1) = $I_a+I_i+I_m$…….(i)

Total Advances = t_a

Total Investment = t_i

Total Money at Call = t_m

Total Earning Asset (T_a) = $t_a+t_i+t_m$……..……..(ii)

Percentage yield on earning Asset (P_i) = (T_1/T_a) x 100……..…….……...(iii)

Interest expenses for Deposits = I_d

Interest expenses for Borrowings = I_b

Total interest expenses (T_2) = I_d+I_b ……...……..….(iv)

Total Deposits = t_d

Total Borrowings = t_b

Total interest bearing Liabilities (T_l) = t_d+t_b ……..(v)

Percentage cost of Interest bearing liabilities (P_c) = (T_2/T_l) x 100……..…..(vi)

Interest rate spread (IRS) = $P_i - P_c$…… ..(vii)

C. Revised Interest Income And Expenses Method (RIRS):

To determine the Revised Interest Rate Spread (IRS) on the basis of total yield on Income and expenses method, the detailed methodology is as below:

Interest income from Advances = T_1

Total Advances excluding actual provision = T_a

Percentage yield on earning Asset (P_i) = (T_1/T_a) x 100

Interest expenses for Deposits = T_2

Total Deposits excluding DMB* = T_l

*DMB: Deposits of deposit Money Bank

Percentage cost of Interest bearing liability (P_c) = (T_2/T_l) x 100

Interest rate spread (IRS) = $P_i - P_c$

D. Total Income and Expenses Method (BS):

$$\text{Percentage Yields on Earning} = \frac{\text{Total Income}}{\text{Total Assets}} \times 100$$

$$\text{Percentage Cost of liability} = \frac{\text{Total Cost}}{\text{Total Liabilities}} \times 100$$

Business Spread = Percentage Yields on Earning - Percentage Cost of Liability.

Annexure Table II: Comparison WAIS with Excluding SME WAIS for Individual Bank

	Spread (WAIS)		Spread (Excluding SME)		Difference	
Name of Bank	Mar'13	June'13	Mar'13	June'13	Mar'13	June'13
	1	2	3	4	5= 1-3	6= 2-4
SOBs	**3.55**	3.34	3.61	3.4	-0.06	-0.06
AGRANI BANK LIMITED	4.13	3.69	4.03	3.83	0.1	-0.14
JANATA BANK LIMITED	3.43	3.51	3.37	3.68	0.06	-0.17
RUPALI BANK LIMITED	5.09	4.54	5.07	4.32	0.02	0.22
SONALI BANK LIMITED	2.89	2.59	3.07	2.64	-0.18	-0.05
SBs	**2.47**	1.63	0.96	0.09	1.51	1.54
BANGLADESH KRISHI BANK	1.84	0.33	1.78	0.31	0.06	0.02
RAJSHAHI KRISHI UNNAYAN BANK	0.97	1.32	0.7	1.15	0.27	0.17
BASIC BANK LTD.	4.57	4.63	4.75	4.68	-0.18	-0.05
BANGLADESH DEVELOPMENT BANK LTD.	-0.1	-1.25	-0.43	-1.55	0.33	0.3
FCBs	**8.55**	8.71	7.89	7.79	0.66	0.92
STANDARD CHARTERED BANK	9.78	10.32	8.52	8.53	1.26	1.79
STATE BANK OF INDIA	5.09	6.26	4.98	6.18	0.11	0.08
HABIB BANK LTD.	5.41	2.32	5.34	2.48	0.07	-0.16
CITI BANK NA	8.35	9.83	8.36	9.84	-0.01	-0.01
COMMERCIAL BANK OF CEYLON LTD	6.3	6.88	6.27	6.87	0.03	0.01
NATIONAL BANK OF PAKISTAN	1.93	1.43	2.86	2.17	-0.93	-0.74
WOORI BANK	10.16	8.95	9.7	8.25	0.46	0.7
HSBC	8.43	8.03	8.23	7.78	0.2	0.25
BANK AL-FALAH LTD.	4.93	4.48	4.82	4.44	0.11	0.04
PCBs	**5.65**	5.68	5.74	5.68	-0.09	0
AB BANK LTD.	5.37	5.19	5.43	5.19	-0.06	0
ISLAMI BANK BANGLADESH LTD.	3.97	3.77	5.54	5.19	-1.57	-1.42
NATIONAL BANK LTD.	7.33	6.35	7.33	6.35	0	0
THE CITY BANK LTD.	6.94	6.53	6.51	5.76	0.43	0.77
IFIC	6.36	6.95	5.97	6.45	0.39	0.5
UNITED COMMERCIAL BANK LTD.	7.24	7.29	6.8	6.91	0.44	0.38
PUBALI BANK LTD	5.84	6.87	5.89	6.96	-0.05	-0.09
UTTARA BANK LTD.	6.15	6.02	4.69	4.61	1.46	1.41
EASTERN BANK LTD.	5.53	5.26	4.39	4.06	1.14	1.2
NCCBL	4.95	5.03	4.8	5.35	0.15	-0.32
PRIME BANK LTD.	6.25	6.22	6.18	6.03	0.07	0.19
SOUTHEAST BANK LTD.	4.83	4.86	4.59	4.7	0.24	0.16
DHAKA BANK LTD.	5.72	5.6	5.71	5.6	0.01	0
AL-ARAFAH ISLAMI BANK LTD.	4.36	4.56	3.91	4.17	0.45	0.39
SOCIAL ISLAMI BANK LTD.	5.92	5.15	5.7	4.82	0.22	0.33
DUTCH-BANGLA BANK LTD.	8.45	8.76	8.22	8.43	0.23	0.33
MERCANTILE BANK LTD.	3.58	4.58	3.4	4.47	0.18	0.11
STANDARD BANK LTD.	5.79	5.75	5.75	5.63	0.04	0.12
ONE BANK LTD.	5.66	5.71	5.53	5.69	0.13	0.02
EXIM BANK LTD.	5.33	5.41	4.8	5.34	0.53	0.07
BANGLADESH COMMERCE BANK LTD.	3.6	5.14	3.61	5.11	-0.01	0.03
MUTUAL TRUST BANK LTD.	6.25	5.9	6.13	5.95	0.12	-0.05
PREMIER BANK LTD.	5.86	5.03	5.67	4.81	0.19	0.22
FIRST SECURITY ISLAMI BANK LTD.	4.8	5.72	5.15	6.17	-0.35	-0.45
BANK ASIA LTD.	6.34	5.9	6.16	5.78	0.18	0.12
TRUST BANK LTD.	4.05	4.82	3.98	4.78	0.07	0.04
SHAHJALAL ISLAMI BANK LTD.	4.88	4.98	4.66	4.7	0.22	0.28
JAMUNA BANK LTD.	6.06	6.11	5.71	5.76	0.35	0.35
BRAC BANK LTD.	9.35	9.43	7.33	6.86	2.02	2.57
ICB ISLAMIC BANK	3.09	2.42	2.97	2.13	0.12	0.29
NRB COMMERCIAL BANK LTD.		4.13		4.15		-0.02
SOUTH BANGLA AGRICULTURE AND COMMERCE BANK LTD.		5.98		5.98		
MEGHNA BANK LTD.		0.31		2.75		-2.44
UNION BANK LTD.		2.42		2.23		0.19
THE FARMERS BANK LTD.						
Grand Total	**5.26**	5.18	5.17	5.04	0.09	0.14

Source: Statistics Department, Bangladesh Bank.

Chapter 5

Effects of Monetary Policy on Capital Market in Bangladesh

Khan Md. Saidjada, Md. Sakhawat Hossain, Md. Habibour Rahman*

I. Introduction

Capital market plays an important role in mobilizing financial resources from surplus units and transferring those to deficit and productive units of an economy. It provides an alternative source of funds for the firms for long-term investment purpose. In addition, a developed capital market also provides access to the foreign capital for domestic industries by creating a platform for foreign companies or investors to invest in domestic securities. Though the capital market of Bangladesh is one of the smallest in the world, it is the third largest in the South Asian region after India and Pakistan in terms of market capitalization[1]. During the last few years, the stock market of Bangladesh has shown noteworthy growth in terms of indicators such as market capitalization, turnover and the price index. At the same time, the market has experienced notable volatility. Since stock prices are sensitive to economic conditions, it is crucial for policymakers as well as investors to know the relationship between macroeconomic variables and stock price in Bangladesh.

Like many other countries, maintaining low and stable inflation and fostering higher inclusive growth are two main objectives of monetary policy in Bangladesh. However, instruments of monetary policy do not influence these objectives directly and immediately. Bernanke & Kuttner (2005) argue that the most direct and immediate effects of monetary policy actions are on financial markets; by affecting asset prices and returns, policymakers try to modify economic behavior in ways that will help to achieve their ultimate objectives. Against this backdrop, this paper explores how monetary policy and asset prices, particularly stock prices, are related in Bangladesh.

Bangladesh Bank (the Central Bank of Bangladesh) pursues its monetary policy within a framework of monetary targeting with reserve money as the operating target, and broad money (M2) as an intermediate target[2]. Until the early 1990s, the financial sector of Bangladesh was mostly government controlled. In the early 1990s, like many other developing countries, Bangladesh underwent financial sector reforms. The salient features of the Financial Sector Reform Program (FSRP) were interest rate liberalizations, development of money market instruments (i.e., repo and reverse repo), introduction of Open Market Operation (OMO) by various government

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[1] *Monthly Review*, December 2012, Vol. 27, No.12, Dhaka Stock Exchange

[2] *Monetary Policy Review*, October 2005, Vol. 1, No. 1, Bangladesh Bank

treasury bills (e.g., 28-day, 91-day, 182-day, 364-day, 2-year, and 5-year) auction etc. These reforms allow Bangladesh Bank to conduct monetary policy relying on market based instruments along with direct instruments. Among the market-based instruments, yield rate on 91-day T-bill auctions, as a measure of short term interest rate, can be used as one proxy for monetary policy stance in Bangladesh.[3] This paper also considers broad money (M2) and reserve money as monetary policy variables.

As the openness of Bangladesh economy increases over time, the relationship between exchange rate and stock prices becomes evident. This relationship can be explained by the Flow Oriented Model (Dornbusch & Fischer, 1980) and the Stock Oriented Model (Branson, 1983 & Frankel, 1983). According to the Flow Oriented Model, which works through current account or trade balance, depreciation of a currency raises competitiveness of its domestic firms which lead to an increase in foreign demand for its exportables. As a result, revenue of the firm and its value increases which increases stock price in turn. On the other hand, Stock Oriented Models predict that an increase in domestic stock prices will lead to an appreciation of the domestic currency.

In addition, this paper has an interest in looking into the relationship between stock prices and inflation, as one of the main objectives of monetary policy is price stability. The relationship between inflation and stock price is not direct and straightforward. Empirical evidence is also inconclusive. For these reasons, apart from monetary policy variables, this paper also includes exchange rate and domestic inflation.

Despite a number of papers on this issue in Bangladesh, none of these papers considers these variables simultaneously. This gap induces us to estimate the dynamic responses of stock prices to monetary policy changes, nominal exchange rate movements and domestic inflation in Bangladesh using recent data.

The rest of the paper is organized as follows: In Section II we present literature review. Section III discuses empirical methodology and data, while Section IV presents empirical results. Section V provides concluding remarks.

II. Literature Review

Though literature on the relationship between stock prices and macroeconomic variables has been enriched by a large number of empirical research during the last few decades, only a handful of empirical studies are found in Bangladesh's context and their results are inconclusive. In this section we first review the studies related to foreign countries and then discuss papers in the context of Bangladesh.

Sprinkel (1971), Keran (1971), Homa and Jaffee (1971) found a significant relationship between money supply changes and stock prices in the United States for the period of 1918-1963, 1956-1970

[3] Ahmed, Akhtaruzzaman & Barua (2006) provides a convincing argument in favor of using treasury bill as a monetary policy variable for Bangladesh, though they used 28-day treasury bill rate. Instead of 28-day treasury bill rate, we use 91-day treasury bill rate in this paper, because auction of 28-day treasury bills have not taken place after 29 June, 2008.

and 1954-1969 respectively. Using monthly data Cooper (1974) found a positive relationship between the S&P 500 Index and money supply in the United States for the period 1947-1970. Using monthly data for the period 1947-1972 in the United States, Rozeff (1974) found that the lag effect of monetary policy on stock market was essentially zero. Stock returns did not lag behind growth rates of money supply. However, current stock returns bore a significant relationship to current monetary growth rates. All relationships of stock returns to monetary variables were significantly improved when current stock returns were related to future monetary data. Hafer (1985) studied the above relationship for the period of 1977-1984 using monthly data. He examined how stock returns change due to changes in anticipated and unanticipated money supply growth. Based on evidence from several different stock price indexes, unanticipated changes in money have a statistically significant effect on stock prices. Expected changes in money do not display a statistically significant effect.

Mukherjee and Naka (1995) studied the relationship between Tokyo stock prices and several Japanese macroeconomic variables, which include exchange rate, money supply, index of industrial production, inflation and interest rates. They used data ranging from January 1971 to December 1990 and employed a Vector Error Correction Model. They observed that the stock price index had a positive relationship with all other variables except for inflation and interest rates.

Ratanapakorn and Sharma (2007) use the Granger causality approach in order to investigate the long-term and short-term relationships between the US Stock Price Index (S&P 500) and six macroeconomic variables over the period 1975 until 1999. In the long-run relationship, they find that the stock prices negatively related to the long-term interest rate, and positive relationship between stock prices and the money supply, industrial production, inflation, the exchange rate and the short-term interest rate.

Arshad and Javed (2009) examined the relationship between stock returns of Karachi stock exchange and monetary variables in Pakistan such as money supply, Treasury bill rates, foreign exchange rates, and the consumer price index for the period of June 1998 to June 2008. Using standard time series techniques, they found that equity returns had a positive relationship with money supply and negative relationship with interest rate, inflation and exchange rate.

Agrwal, Srivastav and Srivastav (2010) analyzed the relationship between stock returns and Indian rupee-US Dollar exchange rates using daily data for the period October 11, 2007 to March 9, 2009. They found a negative correlation between stock returns and exchange rates and unidirectional causality running from stock returns to exchange rate.

Ahmed, Akhtaruzzaman and Barua (2006) analyzed the relationship between monetary policy and stock price in Bangladesh using the methodology of structural VAR. This study employed monthly data on consumer price index, industrial production index, 28-day Treasury bill rate, money supply (M1) and All Share Price Index of Dhaka Stock Exchange for the period spanning from April 1997 to March 2006. This study found that a contractionary monetary policy shock, measured by increase in the short-term policy interest rate (28-day treasury bill rate), has a small negative effect on the stock price index and the effect is short lived in Bangladesh.

Banerjee and Adhikary (2009) investigated the dynamic effects of interest rate (weighted average interest rate on bank deposit) and exchange rate (USD against BDT) changes on All Share Price Index (ASPI) of Dhaka Stock Exchange. They applied the Johansen-Juselius procedure and the Vector Error Correction Model (VECM) respectively to test the co-integrating relationship and the existence of long–run equilibrium relationship among the variables for the period of January 1983 to December 2006. They found that the interest rate and exchange rate changes affect for the stock market in the long-run and there is no significant influence in the short-run.

Quadir (2012) studied the effects of macroeconomic variables of Treasury bill interest rate and industrial production on stock returns on Dhaka Stock Exchange for the period between January 2000 and February 2007 on the basis of monthly time series data using Autoregressive Integrated Moving Average (ARIMA) model. This paper found a positive relationship between Treasury bill interest rate and industrial production with market stock returns but the coefficients have turned out to be statistically insignificant.

Rahman and Uddin (2009) investigated the interactions between stock prices and exchange rates in three emerging countries of South Asia named as Bangladesh, India and Pakistan. They used average monthly nominal exchange rates of US dollar in terms of Bangladeshi Taka, Indian Rupee and Pakistani Rupee and monthly values of Dhaka Stock Exchange General Index, Bombay Stock Exchange Index and Karachi Stock Exchange All Share Price Index for period of January 2003 to June 2008 to conduct the study. Using Johansen cointegration and the Granger causality test, this study found neither any cointegrating nor causal relationship between stock prices and exchange rates in the countries.

III. Data and Methodology

Monthly data on Dhaka Stock Exchange General Index (DGENI), Reserve Money (RM), Broad Money (M2), Treasury bill rate (TRB), Consumer Price Index (CPI) and Nominal Exchange Rate of BDT against USD (ER) for the period July 1999 through June 2012 have been used in this study. The Dhaka Stock Exchange General Index (DGENI) is used as a proxy for stock prices in Bangladesh. This paper considers M2, RM and TRB alternatively as a monetary policy variable. To capture the relationship between stock prices and exchange rate, nominal exchange rate of Bangladeshi Taka *vis-à-vis* the United States dollar (BDT/USD) has been included in this study. Moreover, to estimate the impact of inflation, we have chosen the Consumer Price Index to include in the study. All variables, with the exception of TRB, are expressed in natural logarithms. The data used in this study are collected from Bangladesh Bank, Bangladesh Bureau of Statistics and Dhaka Stock Exchange Ltd.

Most of the macroeconomic variables are likely to have unit roots i.e., non-stationary. Regression of non-stationary variables may lead to spurious results. The Augmented Dickey-Fuller (ADF) test (Dickey and Fuller 1979, 1981) is widely used to test unit roots in the variables. However, Monte Carlo simulations show that the power of the various DF tests can be very low (Enders, 2010).

Phillips and Perron (1988) introduced an alternative to the ADF test that considered autocorrelation and heteroskedasticity. Choi and Chung (1995) argue that Phillips-Perron (PP) test appears to be more powerful than the ADF test in case of low frequency data. For these reasons, both the PP and ADF methodologies have been used in this study to test unit roots in the variables.

If the variables are found to be I (1), the existence of a cointegrating relationship among the variables will be checked using the Johansen approach, due to Johansen (1988), and Johansen and Juselius (1990). If the series are cointegrated, the number of the cointegrating relation must be less than the number of variables in the model. If both the trace and maximum eigenvalue tests suggest the presence of a cointegrating relationship, there exists a long-run relationship among the variables. Through using the cointegrating relationship, a Vector Error Correction (VEC) model will be developed which explains the short-run dynamics of the variables. After the VEC estimation, we will proceed to unveil innovation accounting that includes impulse responses and variance decompositions.

IV. Estimation Results: Cointegration, Vector Error Correction and Innovation Accounting

As per the methodology, Table 1 presents the results of the ADF and PP unit root tests for the variables included in the study. We conduct each type of unit root test for different specifications i.e., without trend and with trend. The outcomes of both tests are robust and consistent in that all the series are I(1) in level, and I(0) in first difference irrespective of their specifications. Since all the variables are I(1) in level, this property qualifies the variables to be examined in the Johansen cointegration test. However, the results of the Johansen cointegration test are lag length sensitive. To determine the optimal lag length, the most common procedure is the Akaike information criterion (AIC) or Schwartz Bayesian criterion (SBC). Though the SBC selects a more parsimonious model, we consider both of the criteria in this experiment[4].

[4] In practice, the SBC will select a more parsimonious model than will either the AIC or *t*-tests. Nevertheless, whichever method is used, the researcher must ensure that residuals act as white-noise processes (Enders, 2010:217).

Table 1: Unit root tests for variables

Variables	Augmented Dickey-Fuller Test				Phillips-Perron Test				Remark
	In level		In first difference		In level		In first difference		
	Intercept	Int. and trend	Intercept	Int. and trend	Intercept	Int. and trend	Intercept	Int. and trend	
DGENI	-0.83 (0.81)	-2.22 (0.47)	-12.24 (0.00)	-12.21 (0.00)	-0.84 (0.80)	-2.57 (0.29)	-12.24 (0.00)	-12.21 (0.00)	I(1)
TRB	-2.58 (0.10)	-2.48 (0.34)	-4.89 (0.0001)	-4.97 (0.0004)	-1.93 (0.32)	-1.70 (0.75)	-7.69 (0.00)	-7.83 (0.00)	I(1)
M2	2.86 (1.00)	-0.24 (0.99)	-18.68 (0.00)	-19.34 (0.00)	2.34 (1.00)	-0.44 (0.99)	-17.45 (0.00)	-18.45 (0.00)	I(1)
RM	-0.05 (0.95)	-2.55 (0.30)	-20.68 (0.00)	-20.62 (0.00)	0.23 (0.97)	-2.53 (0.32)	-21.87 (0.00)	-21.80 (0.00)	I(1)
CPI	3.64 (1.00)	-2.13 (0.53)	-9.92 (0.00)	-10.75 (0.00)	3.42 (1.00)	-2.11 (0.54)	-10.03 (0.00)	-10.70 (0.00)	I(1)
ER	-0.58 (0.87)	-1.98 (0.60)	-10.96 (0.00)	-10.93 (0.00)	-0.59 (0.87)	-2.11 (0.54)	-10.87 (0.00)	-10.84 (0.00)	I(1)

Note: The null hypothesis states that the variable has a unit root. P-values are shown in the parentheses following each adjusted t-statistic.

As mentioned earlier, this paper considers M2, RM and TRB rate alternatively as a monetary policy variable. If we consider M2 or RM as a monetary policy variable, SBC suggests one lag for four variables (DGENI, M2, CPI and ER) Vector Autoregression (VAR), while AIC suggests two lags. But, we do not find any cointegration vector among the variables for both lag specifications.[5]

If we use 91-day treasury bill rate as a monetary policy variable instead of M2 and RM, then for the four variables case (DGENI, TRB, CPI and ER), SBC and AIC suggest 1 and 3 lag in VAR respectively. In this case, under one-lag in the VAR assumption, we find no cointegrating relation among the variables. However, under three-lag in the VAR specification, both the trace and maximum eigenvalue suggest one cointegrating relation among the variables, indicating the existence of the long-run relationship in the system (Table 2). Then a Vector Error Correction (VEC) model is used to understand the short-run dynamics in the system.

[5] Test results can be found in a detailed version of this paper that can be reached by http://www.bb.org.bd/pub/research/workingpaper/wp1301.pdf

Table 2: Johansen cointegration tests

			λ Stat	Critical Values	Probability	No. of CE
λ_{trace} tests:						
	H_0: r=0	H_A: r > 0	60.06	47.86	0.00	1
	H_0: r≤1	H_A: r > 1	28.31	29.80	0.07	
λ_{max} tests:						
	H_0: r=0	H_A: r = 1	31.75	27.58	0.01	1
	H_0: r=1	H_A: r = 2	18.77	21.13	0.10	

Note: The λ_{trace} and λ_{max} are calculated as per Johansen (1988) and Johansen and Juselius (1990). P-values are calculated as per MacKinnon et al. (1999). Critical values reported here are for the 5 percent significance level. CE stands for cointegrating equation. r stands for the rank of the matrix, which denotes the number of the CE between the variables. H_0 and H_A denote the null and alternative hypotheses, respectively.

Table 3 presents VEC (3) estimates for stock price index, T-bill rate, consumer price index and exchange rate in Bangladesh. The cointegrating equation, as placed at the top of the table, shows a long-run significant negative relationship between stock prices and T-bill rate; and positive relationship of consumer price index and exchange rate with stock prices. However, the coefficient of exchange rate is not significant at the 5 percent level. The coefficient of error correction term on the regression with first difference Stock Price Index is significant, suggesting the adjustment nature of stock prices if the long-run equilibrium relationship is shocked. Pesaran and Pesaran (2009) assert that the sign of the error correction term must be opposite to that of the coefficient on the same variable in the cointegrating equation. The long-run equilibrium equation in this study has been normalized on stock prices, and hence possesses a positive sign. The corresponding error correction term on the first differenced Stock Price Index has a negative sign, as expected.

Table 3: Cointegrating Equation and Vector Error Correction estimates

CE for VECM(3): ECT=	DGENI(-1)	+ **0.1188** TRB(-1)	**-2.32** CPI(-1)	-1.0527 ER(-1) + 8.10
		[6.49]	[-6.52]	[-1.42]
Error Correction:	D(DGENI)	D(TBR)	D(CPI)	D(ER)
ECT(-1)	-0.1758	-0.1193	0.0068	0.0080
	[-4.79]	[-0.62]	[2.64]	[1.37]
R-squared	0.26	0.31	0.13	0.07

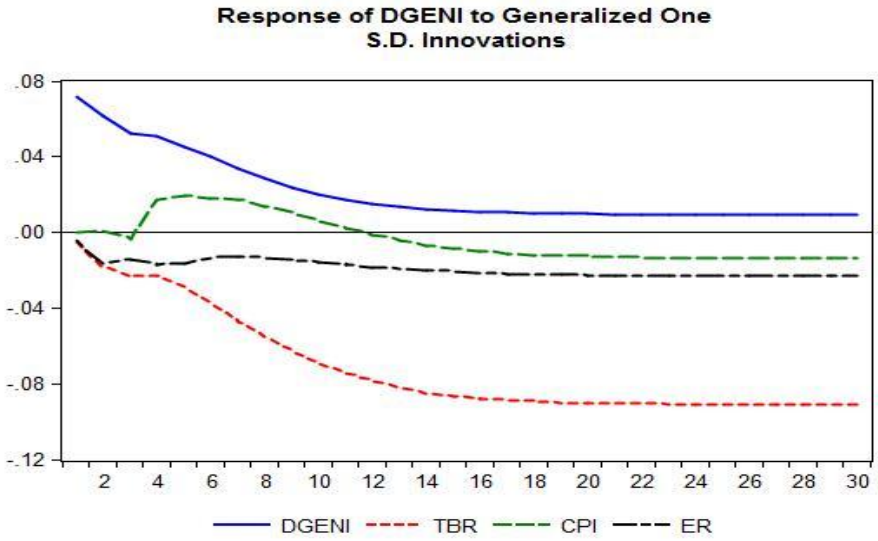
Note: All values in the parentheses against each coefficient are t-statistic. ECT denotes error correction term.

In the same fashion, the coefficient of Consumer Price Index is statistically significant both in the long-run cointegrating equation and short-run error correction dynamics and the corresponding error correction term on first differenced Consumer Price Index (though it is very weak) has appropriate sign. The coefficient of T-bill rate appears with a significant negative sign in the cointegrating equation. The sign of corresponding error correction term is negative as expected, but is insignificant. This suggests that the T-bill rate is weakly exogenous in the T-bill rate–stock price relationship. Exchange Rate is insignificant both in the long-run cointegrating equation and in the short-run error correction dynamics. Although there is a long term relationship among stock prices, T-bill rate and consumer price index, it is only stock prices and Consumer Price Index that adjust any disequilibrium once the system is shocked; T-bill rate and Exchange Rate do not adjust any disequilibrium. The coefficient of the error correction term on first-differenced stock price index is -0.1758. This implies that only 17.58 percent of the last month's disequilibrium is corrected this month, requiring almost 6 months to bring the system into the steady state once it is disturbed. In the growth equations of four variables, there exist short-run interactions between stock prices and any other variables in the model, but are not significant at the 5 percent level of significance. Hence, looking into short-run dynamics through innovation accounting becomes imperative.

In case of impulse response, this paper employs a generalized approach. Pesaran and Shin (1998) argue that unlike the traditional impulse response analysis, generalized impulse response analysis does not require orthogonalization of shocks and is invariant to the ordering of variables in the VAR. This approach is also used in the construction of order-invariant forecast error variance decompositions.

Based on the VECM (3), generalized impulse responses and forecast error variance decompositions of stock prices in Bangladesh are presented in Figure 1 and Table 4 respectively. The response of stock prices (DGENI) due to one standard deviation innovation in T-bill rate appears to be negative and very strong. However, the response of stock prices to one standard deviation innovation in Consumer Price Index becomes positive after three months, reaches its peak in five months and declines thereafter. On the other hand, the response of stock prices to the innovation in exchange rate seems to be negative, but very weak.

Figure 1: Generalized impulse Response of Stock Price (DGENI)



While impulse responses are useful in assessing the signs and magnitudes of responses to specific shocks, the variance decomposition analysis provides an important insight into the relative importance of each variable in the system. Table 4 shows the share of the forecast error variance of stock prices (DGENI) for different forecast horizon that can be attributed to different variables included in this system.

The share of the forecast error variance of stock prices (DGENI) due to its own shock declines gradually as the forecast horizon increases, while the share of interest rate (T-bill rate) and consumer price shock increases as the forecast horizon increases. At the six month forecast horizon, 80 percent of the forecast error variance of stock prices (DGENI) is accounted for its own shock, but at the one year forecast horizon it decreases to 41 percent. At this horizon, interest rate shock is the most important source of the variability of stock prices (53 percent). The share of consumer price shock to the forecast error variance of stock prices (DGENI) increases up to 5 percent at eight month forecast horizon, while the contribution of exchange rate remains very small at any forecast horizon. These results further strengthen the previous results of VEC.

Table 4: Generalized Forecast Error Variance Decomposition of (DGENI)

Variance Decomposition of LDGENI:

Period	S.E.	LDGENI	TBR	LCPI	LER
1	0.071	100.00	0.00	0.00	0.00
4	0.127	89.38	5.98	2.03	2.62
8	0.173	66.38	25.70	5.29	2.63
12	0.228	41.34	53.13	3.43	2.11

V. Conclusion

This paper is an attempt to estimate the responses of stock prices to monetary policy changes, exchange rate movements and domestic inflation in Bangladesh for the period July 1999-June 2012. To measure the monetary policy changes we use three alternative variables, namely broad money, reserve money and 91-day Treasury bill rate. In this study we adopt the widely used Johansen approach to cointegration along with VEC model to unveil both the long-run and short-run relationship among the above mentioned variables. If we consider the 91-day treasury bill rate as a monetary policy variable instead of broad money or reserve money, we find existence of a cointegrating relationship among the variables. The cointegrating equation shows a significant long-run relationship between stock prices, T-bill rate and Consumer Price Index, which is theoretically consistent. However, the relationship between Exchange Rate and Stock Prices is not significant at the 5 percent level. This may be due to very limited foreign portfolio investment in the capital market of Bangladesh and that profits of exporting domestic firms are inelastic to exchange rate movement. The positive significant relationship between consumer price index and stock price index for the period of study indicates the presence of wealth effect of stock prices. Higher stock prices increase the wealth of households, prompting consumers to spend more which in turn influences inflation. Although there is a long term relationship among stock prices, T-bill rate and consumer price index, it is only stock prices and consumer price index that adjust any disequilibrium once the system is shocked; T-bill rate and exchange rate do not adjust any disequilibrium. When we use broad money (M2) or reserve money (RM) as a monetary policy variable, no cointegration and hence no long-run relationship among the variables is found. If there is a robust relationship between monetary policy and stock prices, the empirical results for the three alternative monetary policy variables are expected to be found in the same line. In this study we find that stock price has a negative relationship with the Treasury bill rate, but no long-run relationship with broad money or reserve money. Against this backdrop, the results of this paper, however, remain inconclusive particularly in respect to the relationship between monetary policy and stock prices, at least for the 1999-2012 sample period.

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Chapter 6

Fiscal deficits and inflation: the case of Bangladesh

Sadia Afrin*

1 Introduction

A fundamental macroeconomic objective for a country is to achieve price stability and, the monetary authority sets policies accordingly to prevent any persistent rise in the general price level. Although inflation is undesirable, we see it because of policymakers' efforts to achieve other goals such as maintaining high employment and managing fiscal deficits. Persistent fiscal deficits create inflation, when deficits are financed by either borrowing money from a central bank through printing money or issuing a large number of government debt instruments and those instruments end up in the hands of the central bank through open market purchase (Mishkin 2010). This monetization of debt, instead of increasing tax revenue, can be a significant source of inflation in many countries. A similar line of reasoning works behind the theory named, the Fiscal Theory of Price Level (FTPL), proposed by Woodford (1995). The FTPL identifies the wealth effect of government debt as an additional channel of fiscal influence on inflation where increased government debt adds to household wealth and thereby to demand for goods and services, creating pressure on the price level (Kwon et al. 2006).

Developing countries, aiming to achieve high economic growth, often sacrifice price stability in the short run. After its independence in 1971, Bangladesh was under persistent inflationary pressure due to the high money supply (Hossain 1995). In later years, the government was cautious in controlling inflation and registered improved inflation performance during the 1990's relative to the neighbouring countries. However a lower level of financial deepening (measured by M2/GDP) could explain the lower inflation during this time (Mortaza 2007). The general government budget balance in Bangladesh is always negative, and because of the narrow tax base and underdeveloped bond market the government relies on bank borrowing to finance a significant portion of the deficit each year.

In this situation it is important to investigate whether government budget deficits are inflationary in Bangladesh. Many empirical works have found that deficits can be inflationary particularly in those countries where the government securities market and tax system are not well developed. Identifying the active factors behind persistently rising price levels is important because inflation decreases the purchasing power of money and erodes living standards, thereby adding to uncertainties in life (Lipsey et al. 1982) and making economic planning difficult. Inflation

* The author of this paper works as a Deputy Director in the Monetary Policy Department of Bangladesh Bank. Any comments can be sent to sadia.afrin@bb.org.bd. The views and opinions expressed in this article are those of the author's and do not necessarily reflect the official policy or position of any agency of Bangladesh.

decreases market efficiency by providing wrong signals about the relative scarcity of goods in the market, making the market environment cloudy and transactions inefficient (Bank of Canada 2011).

The financing of budget deficits and their impact on the economy are important issues to investigate for analysing the monetary policy effects and fiscal policy effects on an economy. Much of the inflation literature investigates the inflation-budget deficit relationship using time series and panel data analysis and the outcomes have been mixed.

2 Literature Review

What causes inflation has long been a contested issue among economists. This macroeconomic debate arises mainly because of the disparity between developing and developed countries' internal circumstances and the varying views on inflation control. The two main schools of thoughts about inflation are the Keynsians, or structuralists, and the monetarists, or reduced-form thoughts.

The Keynsians explain inflation as a result of an increase in fiscal expenditures, which shift aggregate demand positively and thus increase the price level. However, a unit increase in government expenditure will result in an incremental increase in price level, not a persistent increase. Monetarists, on the other hand, explain inflation solely as a result of money growth, that is, an increase in money supply by the central bank causes inflation. In this view, the central bank can control inflation by controlling the money supply.

Sargent and Wallace (1981) in their seminal paper "Some Unpleasant Monetarist Arithmetic" demonstrate that under certain circumstances, the monetary authority has very little control over inflation when monetary and fiscal policies are coordinated in a particular way. Being limited to divide government debt only between the bond and base money and with no possibility of budget surplus, the monetary authority that wants to control inflation tries to do so by reducing base money growth and letting public bond holdings increase. But eventually, the public bond holding will reach its limit and then to finance due interest and principal payments, the only resort available will be seignorage (revenue from money creation). So, governments running persistent budget deficits have to finance those deficits sooner or later by money creation. Hence, when fiscal policy dominates monetary policy, money supply becomes endogenous.

In the fiscal view of inflation, fiscal imbalance remains the most important factor behind inflation. Woodford (1995) argues in the Fiscal Theory of Price Level (FTPL) that a government's decision about how to finance its debt plays a crucial role in determining the time path of inflation rate if the government can behave fundamentally differently from households. Households must satisfy an inter-temporal budget constraint but the government can follow a non-Ricardian policy under which the intertemporal budget constraint is satisfied for only some, not all price paths.

Kocherlakota and Phelan (1999) show, following Obstfeld and Rogoff (1983), that agent's current money demand depends on its future inflation expectations. Thus, controlling only money supply is not sufficient to pin down the time path of inflation rate. In an empirical work, De Haan and Zelhorst (1999) analyse the relationship between the budget deficit and money growth among 17 countries from Asia, Europe and Latin America. They find that the fiscal deficit has a significant

positive temporary impact on reserve money growth for seven countries and a long run influence of budget deficits on the money growth of Greece, India, Korea and the Philippines. They conclude that the evidence for a positive relation between government budget deficits and money growth exists only for a few countries and during a period of acute inflation.

Cottarelli et al. (1998) find that budget deficits have a significant effect on inflation, particularly in those countries where government securities markets are not well developed. In Bangladesh, the focus of this study, the bond market (especially secondary market) is not well developed and the government faces many constraints in raising tax revenue for fiscal expenditure. Fischer et al. (2002) show, using fixed effects in a panel of 94 developed and developing countries that a one percentage point improvement in the budget balance to GDP ratio leads to around a 4.25 per cent decrease in inflation, holding all other variables constant. They also find that the effect of changes in the budget balance is not significant in low inflation countries or in the low inflation episodes of high inflation countries.

In a recent work, Catao and Terrones (2005) investigate the budget deficit-inflation relationship using a broad cross country data set (107 countries over the period 1960-2001) and find that inflation is directly related to the budget deficit scaled by narrow money. Their findings provide support for the FTPL than some earlier studies, which had different model specifications of the deficit-inflation relation than Catao and Terrones (2005). The deficit-inflation relationship is stronger in the case of developing countries; however, they conclude fiscal deficits have no significant positive impact on long run inflation in some countries with a long history of low single digit inflation.

There are a number of empirical studies on inflation in the context of Bangladesh that try to identify the factors behind inflation but very few are recent. In an earlier study, Taslim (1982) finds that any devaluation of the domestic currency leads to an equal proportionate increase in inflation. During the period of this study, Bangladesh had a fixed exchange rate regime[1] and the study does not consider the effect of fiscal balance on inflation directly. However, Begum (1991) formulates the inflation model in Bangladesh's context considering both demand and supply side factors and identifies significant contributing factors to inflation including agriculture and import bottlenecks, fiscal expenditure, interest rate, bank loans and expected inflation. Using unrestricted vector auto regression (VAR), Mortaza (2006) finds inflation sources based on data from 1990 to 2006 and concludes that demand management policy is important for the price stability of Bangladesh.

The IMF selected issues paper (2007) on Bangladesh show the most important factors for Bangladesh inflation are money creation and inflation inertia rather than supply side shocks. Among the supply side factors, this study finds only exchange rate has some significance on the inflation process in Bangladesh. This gives some indication that budget deficits may be inflationary

[1] From1972-1999 the exchange rate was pegged to the pound sterling and then to a basket of currencies, 2000-2002 crawling band and from May 2003 floating exchange rate regime (Hossain & Ahmed 2009).

if the deficits are monetized continuously since this paper finds that monetary factors are important determinants of inflation in Bangladesh.

Akhtaruzzaman (2005) analyses the factors which are believed to generate inflation in Bangladesh, using the co-integration and Vector Error Correction approach over the period 1973-2002. The author states that fiscal and monetary policies are closely related in Bangladesh because fiscal deficits are mainly financed by increasing the money supply. Thus, government borrowing from the central bank is viewed as inflationary, but this study does not include budget balance as a separate control variable in the model.

Hence, the validity of the relationship between budget balance and inflation in the case of Bangladesh has not been established in the existing empirical works. This paper attempts to fill this gap by analysing the effects of budget balance on Bangladesh inflation for the period 1974-2010. The principal research question of this study is, whether fiscal theory of price level works in Bangladesh or, equivalently, whether there exists a significant positive relationship between the budget deficits and inflation under the current deficit financing system in Bangladesh. The results indicate that budget deficits along with supply side factors are important determinants of inflation in Bangladesh.

This study contributes to the existing empirical works by testing the theoretically and empirically important relationship between fiscal deficits and inflation in the case of Bangladesh, based on the inter-temporal optimization model developed by Catao and Terrones (2005) for the first time. Second, this paper uses a more sophisticated econometric technique and empirically appealing model than previous inflation literature on Bangladesh. Third, the analysis covers data up to the most recent period (1974 – 2010) and hence, is able to explain the recent inflation dynamics. Finally, this analysis sheds light on the effectiveness of monetary policy and recent trends in government deficit financing and its impact on price level of the economy.

The rest of the paper is organised as follows: Section 3 includes methodological issues and data description. Section 4 presents the empirical results and Section 5 presents policy implications based on the empirical results and draws concluding remarks.

3 Model

Using a small open economy version of general equilibrium models surveyed by Ljungqvist and Sargent (2000), a parsimonious and testable specification of the long run relationship between deficit and inflation is derived by Catao and Terrones (2005). In the model, the authors show, economy wide budget constraint and stationary equilibrium imply that inflation is proportional to the product of the ratio of government budget deficit to GDP and the inverse of the narrow money to GDP. Or, equivalently, inflation is directly proportional to the ratio of budget deficit over money supply, which can be expressed as:

$$\pi = \alpha \frac{(G-T)}{M} \qquad (1)$$

Where, π = rate of inflation, G - T = government expenditure – tax revenue = budget deficit, M= money (narrow money) and α = semi elasticity parameter.

Following Catao and Terrones (2005), this particular specification of inflation-budget deficit relationship is used in this paper because this is less *ad hoc* than the previous standard practice of scaling the deficit by GDP and it also seems empirically relevant. In terms of methodology, this paper uses the more recent technique - autoregressive distributed lag (ARDL) structure (Pesaran & Shin 1995, 1999; Pesaran et al. 1996; Pesaran 1997; Pesaran et al. 1998) in which dependent and independent variables appear in the right hand side of equation with lags p and q respectively:

$$\pi_t = \alpha + \sum_{k=1}^{p} \gamma_k \pi_{t-k} + \sum_{j=1}^{m} \sum_{i=0}^{q_j} \delta_{ji} X_{j,t-i} + DER_t + \varepsilon_t \qquad (2)$$

Where, π_t is the inflation rate at time t and X_j denotes explanatory variables such as Ln(real GDP), weighted inflation of trade partner countries, and fiscal deficits [$\frac{(G-T)}{M}$]. The dummy variable DER_t is to control for exchange rate regime. The model does not include oil price as the oil price is administered by the government in Bangladesh. The subsidy given to oil price may already be captured by the budget deficit term.

The ARDL co-integration approach (Pesaran et al. 2001) involves estimating an unrestricted (conditional) error correction version of the ARDL model which can be written as:

$$\Delta\pi_t = \alpha_0 + \sum_{i=1}^{n} \rho_i \Delta\pi_{t-i} + \sum_{i=0}^{n} \theta_i \Delta bd_{t-i} + \sum_{i=0}^{n} \varphi_i \Delta lnRGDP_{t-i} + \sum_{i=0}^{n} \lambda_i \Delta MINF_{t-i} + \delta_1\pi_{t-1} + \delta_2 bd_{t-1} + \delta_3 lnRGDP_{t-1} + \delta_4 MINF_{t-1} + \delta_5 DER_t + \vartheta_t \qquad (3)$$

Where, $bd_t = \frac{budget\ deficits}{money\ supply} = \frac{Governemnt\ expenditure - revenue}{M2}$

at time t; $lnRGDP_t$ = ln(Real GDP) at time t; $MINF_t$= weighted foreign inflation rate (from Bangladesh' major import partners) at time t and the dummy variable DER_t is to control for exchange rate regime. Δ is the first difference operator and p is the optimal lag length. ϑ_t is the error term. The F test is used to test for the existence of long run relationship among the variables in the model with an intercept but no trend. Here, the null hypothesis is no co-integration:

H_0: $\delta_1 = \delta_2 = \delta_3 = \delta_4 = 0$ (no long run relationship exists) and the alternative is, H_1: $\delta_1 \neq \delta_2 \neq \delta_3 \neq \delta_4 \neq 0$ that is, a long run relationship exists between the dependent and explanatory variables in the model.

If evidence in the first step suggests the existence of long run relationship, then we move to second step to estimate the long run and short run parameters of the inflation model. The econometric software that conveniently selects the optimal lag structure for ARDL model for each of the conventional model selection criteria, after setting maximum lags, is Microfit (Pesaran & Pesaran 1997) and this paper estimates the ARDL model, using Microfit 4. One benefit of using Microfit is, after having cointegration, Microfit calculates the long run parameters from the underlying short run model with the standard errors and t-ratios automatically.

Data

The model is analysed using annual data from period 1974-2010. The variable inflation rate (π_t) in this model is the annual percentage change in Consumer Price Index (CPI). The variable bd_t is calculated as $\frac{G-T}{M2}$ where G is the general government expenditure and T is the general government revenue. Hence the difference is the budget deficit, which is scaled by M2 money. MINF is the CPI inflation rate of Bangladesh's major import partners calculated as:

$MINF_t = \sum_{j=1}^{5} inflation_j(\frac{import\ from\ country\ j}{total\ imports})$. MINF is an import weighted foreign inflation rate. The dummy variable DER is included in the model to control for exchange rate regime. The various series of this study are taken from World Economic Outlook (WEO) database, International Financial Statistics (IFS), World Development Indicators, Direction of Trade Statistics database, Ministry of finance Bangladesh.

4 Empirical results and discussion

In the first step we carried out the cointegration test by estimating equation (3) for the period 1974-2010 whilst ensuring that there was no evidence of serial correlation, as emphasized by Pesaran et al. (2001).

Table 1 Cointegration test (F-test)

(Lag length selected by SBC)				Bound critical values (restricted intercept & no trend)	
Test statistics	value	lag	Significance level	I(0)	I(1)
F-statistics	8.54	1	1% [a] (Pesaran et al. 2001)	3.56	4.66
			1% [b] (Narayan 2004)	4.522	5.792
			5% [a]	2.79	3.67
			5% [b]	3.160	4.218

The lag length was chosen by minimizing the Schwarz Bayesian criterion. Since we have annual data with 37 initial observations, we chose 2 as the maximum lags. Here we find, lag 1 minimizes the SBC, and hence, it is chosen as the optimal lag. Result of the F test is presented in Table 1 along with the corresponding critical values calculated by Pesaran et al. (2001) and Narayan (2004).

The calculated F statistic (8.54) is greater than upper bound critical value (5.792) at 1% level. So we reject the null hypothesis and conclude that a long run relationship (cointegration) between the dependent variable and independent variables exists in the model, tested at 1% level.

Since we have evidence of cointegration in the first step, we move to the next step of estimating the ARDL model to get the long run and short run dynamics of inflation-budget deficit relationship. The calculated long run parameters and corresponding standard errors (in parentheses) are reported in Table 2. Here, input is the intercept term.

The ARDL lag structure (2, 0, 0, 0) is automatically selected based on Schwarz Bayesian criteria, after setting 2 as the maximum lags to be used. From Table 2 we see that budget deficits, scaled by M2 money and the log of real GDP, affect the long run inflation rate significantly.

The coefficient of the ratio (G-T)/M2 is positive and significant at 10 percent, which implies that fiscal theory of price level works in Bangladesh in the long run. A one unit increase in the ratio budget deficit over M2 increases inflation by 6 percentage points in the long run, holding the effects of all other variables constant. So, the fiscal deficit is an important determinant of Bangladesh's inflation.

Table 2 Long run model

ARDL(2,0,0,0) selected based on Schwarz Bayesian Criterion

Dependent variable is Π_t (inflation rate)		
Regressors	Coefficients	P-value
bd	5.99*	.087
	(3.384)	
lRGDP	-7.47**	.000
	(1.414)	
MINF	0.24	.196
	(.181)	
DER	5.85**	.000
	(1.363)	
inpt	59.76**	.000
	(10.574)	

** & * denote significant at 1% and 10% respectively.

The result of this study is consistent with Habibullah et al. (2011) who investigate the budget deficit-inflation relationship among 13 Asian countries, including Bangladesh, and find that budget

deficit granger causes inflation in Bangladesh both in the long and short run. The conclusion of Catao and Terrones (2005), who find the deficit-inflation relationship as positive and significant, and particularly strong for developing countries, is also in line with this study.

The coefficient of ln(RGDP) is negative and significant at 1 percent level. The study finds that if real GDP or output increases by 1 per cent then inflation decreases by 7.5 percentage points approximately in the long run, holding all other effects on inflation constant. It is typical in the non FTPL literature to consider budget deficit as a percent of GDP (budget deficit/GDP). The approach taken in this paper models the effect of budget defcit/M2 (= bd) which is the core of the FTPL literature in addition to GDP. Hence, this is a generalization of the existing literature.

The significant negative effect of real GDP indicates the important role of the supply side in determining inflation dynamics of Bangladesh. This result is similar to Akhtaruzzaman (2005) who also finds a strong deflationary effect of real output in Bangladesh economy. The increase in GDP, especially the high growth in agricultural output significantly reduces the upward pressure on general price level of the economy. For industrialized countries, the relation between inflation and output gap is expected to be positive, following the expectation augmented Phillips curve; for Bangladesh, a predominantly agricultural economy, a reversed relationship is expected[2].

Rising inflation in Bangladesh is largely dominated by food price inflation (Shahiduzzaman 2009). As Akhtaruzzaman (2005) explains, an increase in real output or income increases the demand for real money balances for transactions which in turn decreases the price level. The highly significant negative effect of real output on long run inflation implies a concave upward sloping aggregate supply curve, as shown in the Appendix, indicating strong supply side effects. The figure depicts that as real output increases, the change in price level decreases. Since real GDP has significant impact on inflation, the hypothesis – inflation is a purely monetary phenomenon, is not very robust in the case of Bangladesh.

[2] The sectoral contribution of agriculture to GDP in FY 2008-2009 was approximately 21 per cent and 48 per cent of total labour force is engaged in agriculture (Bangladesh Economic Review 2010).

Error correction model

Table 3 Short run model (Error correction model)

ARDL(2,0,0,0) selected based on Schwarz Bayesian Criterion

Dependent variable $d\Pi_t$		
Regressor	Coefficient	P-value
$d\Pi_{t-1}$	0.32**(.05996)	.000
dbd_t	5.9 (3.7027)	.123
$dlRGDP_t$	-7.33** (1.385)	.000
$dMINF_t$	0.235 (.168)	.172
$dDER_t$	5.74** (1.4)	.000
$dinpt_t$	58.63 (10.59)	.000
ecm_{t-1}	- 0.981** (.125)	.000

Diagnostic tests	
R-bar squared	0.74
DW statistics	1.825
Breusch-Godfrey LM test for serial correlation $\chi2(1)$	0.138 [0.711]
Functional form (Ramsey's RESET test) $\chi2(1)$	0.217 [0.641]
Normality $\chi2(2)$	3.8795 [0.144]
Heteroscedasticity $\chi2(1)$	0.106 [0.745]

** indicates significant at 1% level.

The coefficient of foreign inflation has the positive sign as expected and indicates that a one percent increase in foreign inflation will increase domestic inflation by 0.24 percent, but this coefficient appears insignificant. The World Bank (2008) points out that rising global price may not increase domestic price level to the same extent for several reasons such as the weakening dollar, domestic infrastructure and price stabilization policies. The result of this paper is consistent with the inflation study by Akhtaruzzamn (2005) which finds no cointegration between domestic inflation and foreign price level.

The short run inflation dynamics and speed of adjustment are presented in Table 3 with the results of a number of diagnostic tests applied to the error correction (short run) model. The values in parentheses are standard errors of the short run parameters and the values inside the square brackets in the diagnostic test part are p-values of the respective tests.

In contrast to the long run model, the effect of budget deficits on inflation is insignificant or less significant in the short run. The coefficient of the ratio of budget deficit over M2 is still positive but insignificant, implying that fiscal theory of price level works in Bangladesh's case only in the long run, not in the short run. The government is able to shift its debt inter temporally. As Sargent and Wallace (1981) stress, a persistent budget deficit is inflationary in the long run, not necessarily in the short run. Instead of seignorage, the government can rely more on debt instruments (domestic and foreign) in the short run to finance persistent budget deficits.

Eventually it will reach the borrowing limit when all the repayments are due after a sufficiently long time. Then government has no alternative but to create money to meet its debt obligations. Thus the persistent budget deficit is inflationary in the long run, but may not be so in the short run.

The coefficient of the difference of lagged inflation ($d\Pi_{t-1}$) is positive and significant at 1 percent level indicating that inflation expectations are important determinants of short run inflation in Bangladesh. This finding is consistent with the findings of Begum (1991) and Akhtaruzzaman (2005) in the context of Bangladesh. The high significance of inflation expectations in determining the short run inflation dynamics reveals that that inflation is not purely a monetary phenomenon in the case of Bangladesh.

The short run effect of real GDP is significant at 1 percent level, similar to the long run case, but the magnitude of the effect is slightly lower than the long run case. The intercept term in the error correction model is also highly significant. Macroeconomic theory suggests that the exchange rate regime can have impacts in determining short run inflation. Here we find the effect of exchange rate regime on inflation is significantly positive. While fixing monetary policy, the central bank considers consumer price inflation which is a weighted average of the inflation for domestic goods and imported goods (Sorensen & Whitta-Jacobsen 2010):

$\pi_c = \gamma(\Delta e + \pi^f) + (1-\gamma)\pi$, where,$0 \leq \gamma \leq 1$, π_c is the targeted inflation and π is the inflation from domestic goods. π^f is foreign inflation. Any fluctuations in nominal exchange rate (Δe) under the floating regime affect domestic inflation through import price as can be seen from the equation above. Even if π^f is not important for short run inflation (here, the insignificant effect of

MINF in the error correction model), import price can still affect domestic inflation by devaluation of Bangladesh's currency.

Finally, Table 3 shows the adjustment mechanism of inflation by the coefficient of error correction term (ecm_t) which is highly significant (at 1 per cent level). The adjustment coefficient -0.98 means, almost 98 percent of the deviation of inflation rate from its long run equilibrium level is corrected within a year, tested at 1 percent level.

The last part of Table 3 describes a battery of diagnostic tests to understand the validity of the result of error correction model. The adjusted R square shows around 74 percent of the variation of data is explained by the model. The model has no autocorrelation problem and has correct functional form. Additionally, the residuals are normally distributed and no heteroskedasticity problem exists in the model.

5 Conclusion and policy implications

The purpose of the study is to explore the fiscal deficit-inflation relationship in the case of Bangladesh. The findings in this study are more favourable to the fiscal-based inflation theory than previous inflation studies on Bangladesh. However, the overall findings imply that both the demand and supply side management policies are important to control inflation in the long run.

The significance of the effects of budget deficits on inflation leads us to conclude that demand management policies, such as government revenue and expenditure management, play important roles in controlling inflation. Besides monetary policy, fiscal policy also has a crucial role to play in restraining prices. Catao and Terrones (2005) find that the statistical significance of the deficit-inflation relationship is violated in the case of low inflation, advanced countries where central banks enjoy a reasonable level of autonomy. The level of the Bangladesh Bank's autonomy and its relation with fiscal deficits and inflation can be an area of further research.

In addition, revenue mobilization needs to be strengthened to limit the deficits to a reasonable level. The strong effect of real output in dampening inflation suggests the dominance of supply side factors in determining inflation. This is in contrast with the monetarist view that inflation is purely a monetary phenomenon everywhere. Real sector activity, especially high output performance in the agricultural sector, has been found to be effective in stabilising price level in Bangladesh as CPI is heavily weighted by food items. However, this implication is not distinct from the monetarist view as inflation is the excess of money supply growth over real output. If real sector output growth is higher than money supply growth, it is expected theoretically to reduce inflation.

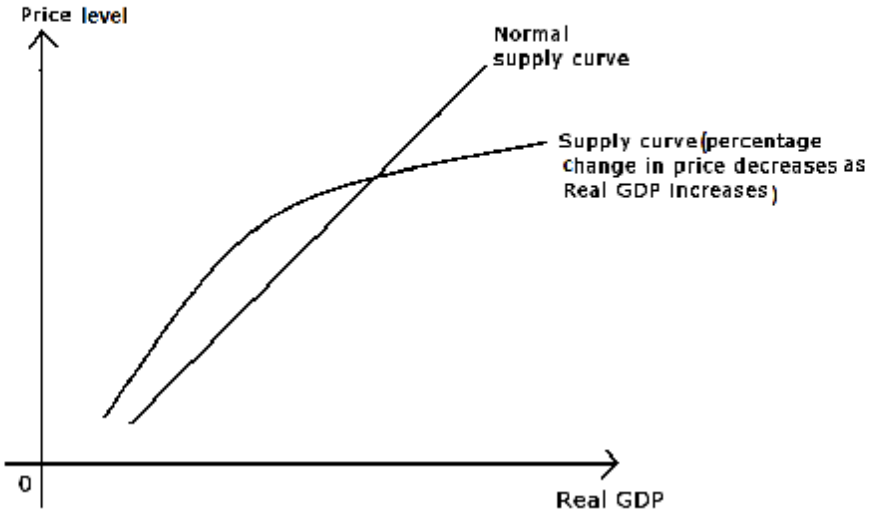
In addition to achieving high agricultural output/food stock, the supply side inflation view also suggests that accumulating enough foreign exchange reserves can also mitigate price fluctuations through sterilization type intervention.

Economic theory presumes a causal relationship between budget deficit and inflation. The empirical testing of the theory requires a long time series and the appropriate econometric technique to capture the dynamic aspects of this relationship. Although this study uses small time series annual

data due to unavailability of high frequency data, the deficit-inflation relationship is modelled as nonlinear in the inflation tax base (money). Here, the fiscal deficit-inflation relationship has been investigated by an ARDL framework with a more logical model specification, by scaling deficit with money (M2), rather than the traditional *ad-hoc* way to scale deficit by GDP. In sum, the evidence of this study suggests that fiscal deficits are inflationary in Bangladesh, at least in the long run, and real sector output also significantly affect inflation in Bangladesh.

Appendix

Figure Aggregate supply curve



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Chapter 7

Government Domestic Debt Management: Forward-Looking Issues

Mr. Chee Sung Lee and Samir Ashraf*

Introduction

A well-developed and deep domestic debt market offers a reliable source of funding for both the government and the private sector. International experience has shown that development of a well-functioning domestic debt market must emanate from the growth of a government securities market. The government domestic debt management strategy is thus closely and inherently linked to the organization of the market for government debt instruments.

Development of a well-functioning market for government debt is complex and closely related to policies to broaden the financial sector of the economy. It is thus also international good practice that the main task for developing the government securities market is delegated to the central bank. In many countries, the central bank is the principal agent for issuing marketable government debt instruments. For this reason, Bangladesh Bank (BB), the issuer and manager of government debt in Bangladesh, plays a critical role in the development of the domestic debt market as a part of its broader mandate for broadening the financial sector of the country to support sustained and inclusive economic growth and eradicate poverty over time. BB has a separate Debt Management Department (DMD) that works as the debt manager of the government in consultation with the Ministry of Finance (MoF). BB and MoF have worked together to achieve considerable progress in the government debt market during the last decade or so. As part of efforts to further develop the debt market, the authorities need to take immediate and longer-term measures to resolve some key issues that continue to hinder the advancement of the government debt market.

This chapter provides an overview of the domestic debt market condition and highlights the issues that need to be addressed. The rest of the paper is organized as follows. Section 2.0 outlines the developments that have taken place since 2000 in the domestic debt market of Bangladesh. Section 3.0 discusses current issues in the area that require the attention of policymakers. Section 4.0 provides a list of recommended actions to be carried out in phases. Section 5.0 reviews a case study that compares the stances of the central banks of India and Bangladesh given similar conditions.

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* The authors are ADB Consultant for the Capacity Development for the Bangladesh Bank Project and Assistant Director, Chief Economist Unit of Bangladesh Bank respectively. The authors would like to thank Ms. Masuma Sultana, Mr. Shadril Ahmed and Ms. Syeda Rezwana Begum (officials of Debt Management Department, Bangladesh Bank) for their assistance and support. The views expressed in the note are the authors' own and do not necessarily reflect the views of Bangladesh Bank.

Section 6.0 concludes the chapter by providing a summary of the recommendations. Annexure-A & B describe the accounting treatment for different classes of debt instruments as per Bangladesh Bank and Reserve Bank of India regulations.

Developments since 2000 in the Government Debt Market

The Bangladesh government debt market before 2006 was represented by ad hoc issuance by BB of non-marketable treasury bills (TBs) to fund government deficits reflected mainly as shortfalls in treasury cash flow covered in the first instance by overdrafts with BB. Since 2005, Bangladesh has taken measured steps that have evolved into what could be considered a government domestic debt strategy. The initial efforts focused on moving away from ad hoc issuance by BB of government securities. It was based on the recognition that the normal management of the government's cash mismatch should be separated from the government domestic financing or borrowing requirements to cover budget deficits.

The non-marketable TBs were subsequently converted by BB into marketable TBs and later widened to include Bangladesh Treasury Bonds (BGTB). An array of TBs of various denominations, including up to maturities of 5 years, were issued. Subsequently in 2003, BGTBs with maturities of 5-year and 10-year with fixed coupons were issued. Afterwards, BB added 2-year, 15-year and 20-year BGTBs to the mixture of government securities to better reinforce the creation of a yield curve and reliable benchmarks. BB also introduced reissuance process for BGTBs in 2013 that will prevent fragmentation in government debt instruments.

Substantial efforts have been devoted to strengthening the process for the primary issuance of government securities. The Cash and Debt Management Committee (CDMC) and the associated technical committee (CDMTC) oversee the management of the domestic borrowing requirement of government over the budget year. On this basis, the auction calendar and the distribution of the amounts and maturity of the TBs and BGTBs are set. Overtime, the yield on the range of government securities has become better aligned with market interest rates.

CDMTC has also improved its monthly projections of the borrowing requirement in recent times. These projections form the foundation for setting the auction calendar for government securities and the amount and tenor at each of these auctions. The Ways and Means Advance (WMA) cap has also been increased from BDT 2000 crore to BDT 4000 crore. The government is currently considering proposals made by CDMC to put a cap on borrowing from BB through overdraft and specify the borrowing period. Previously, the government tended to exceed the WMA cap continuously and was not obliged to repay loans in the absence of repayment tenures. These occurrences indicate serious problems in cash flow management, with implications for the credibility of borrowing requirement projections. With the developments in the conduct of WMA and overdraft, the borrowing behavior of the government is expected to become more disciplined.

BB introduced the Primary Dealer (PD) system in 2003.The system has been enhanced with incentives and liquidity support against collateralized securities from the central bank. Bidding commitments for TBs and underwriting obligations for BGTB applicable to PDs were introduced in 2007 to strengthen their role as market makers in the government securities market. From September 2012 onwards, PDs also get exemption from devolvement obligations equal to the amount of their successful bids in previous auctions of the corresponding year. BB also announced a proportionate devolvement mechanism among PDs and non-PDs in 2012 so that the allocation of government securities among the banking companies are more balanced.

The tax and regulatory environment for government securities has been modified to support market development. The upfront tax on government securities was removed in 2007. Mark to market requirements in the accounting framework for government securities were introduced in 2005. The one-year lock-in period requirement for overseas investment in BGTBs was waived in 2013 to attract more foreign investors to the bond market.

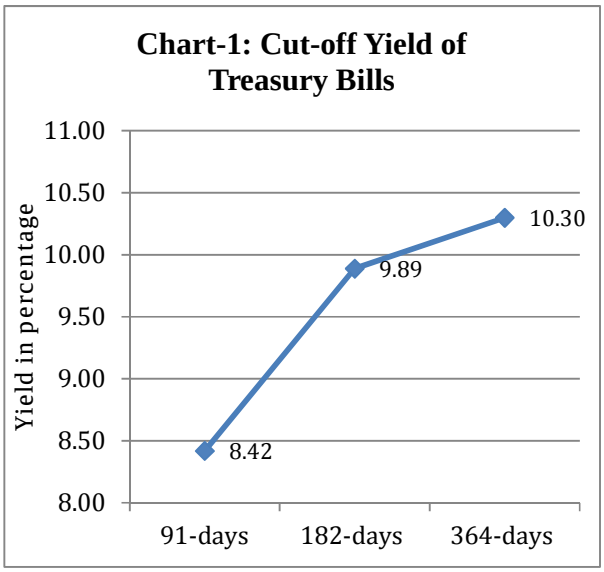
The market infrastructure underpinning the government securities market has been significantly strengthened. The soundness of the market has been secured through the introduction of an automated delivery versus payment (DvP) settlement system in 2009. BB set up a Market Infrastructure (MI) Module in 2011. The MI module is an electronic platform that BB uses to hold online auctions and primary issues of TBs and BGTBs; operate repo transactions; provide liquidity support to PDs, etc. BB has also introduced Trader Work Stations (TWS) under the MI Module to facilitate online secondary dealing of securities at the end of 2012. With the introduction of TWS, any individual/institution can participate in the secondary trading of government securities through PDs/banks/financial institutions.

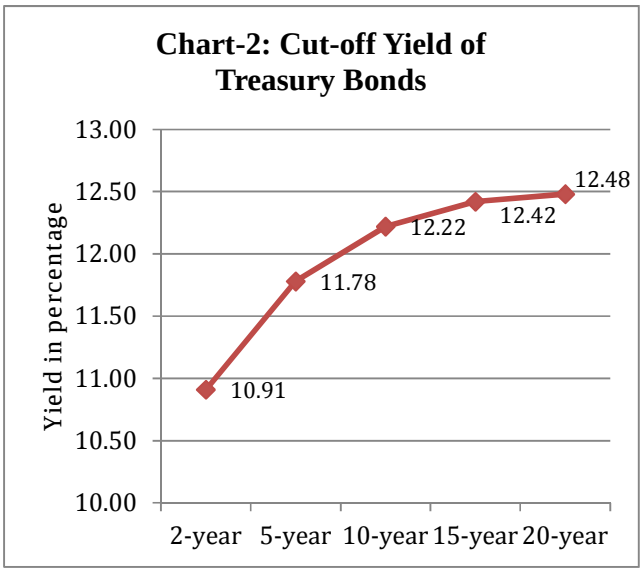
BB has established a separate Debt Management Department, which acts as the Debt Manager of the Government in consultation with the Ministry of Finance (MoF). The main activity of the department is to manage the internal debt of Government. The Department also monitors the activities of PDs. It has the responsibility for developing the government securities market. The Department also handles policies and administrative matters pertaining to the flotation of National Saving Instruments.

The Current Situation in Bangladesh

Present Status of the Market

Currently, there is a range of TBs and BGTBs with different cut-off yields in circulation. There are 91-days TB, 182-days TB and 364-days TB. There are also 2-year BGTB, 5 year BGTB, 10-year BGTB, 15-year BGTB and 20-year BGTB. Chart-1 and Chart-2 depict the cut-off yields for TBs and BGTBs of different maturities respectively.





Source: Bangladesh Bank website (as on 23 October, 2013)

The government securities market has grown progressively since 2000 with the introduction of new securities. From a total of around BDT 360 billion of mostly non-marketable securities in 2000, the stock of debt has grown about five-fold to BDT 1807 billion (17% of GDP) by June 2013 (Source: *Major Economic Indicator*, October 2013).

From Table-1, it can be seen that the outstanding balance of BGTBs was BDT 85,043.07 crore (about US$ 10.94 billion) up to June 2013. The outstanding balance of TBs stood at BDT 29,426.61 crore (about US$ 3.79 billion) at the end of June 2013. Of note is that long-term marketable debt, which was only issued beginning in 2004, constituted about 44% of debt at the end of June 2013 (Table-1).

While the government securities market grew over time, foreign investment in BGTBs has remained sparse. At the end of September 2013, foreign holding of BGTBs stood at around US$ 120 million (Source: *Debt Management Department, Bangladesh Bank).*

Table 1: Outstanding Balance of Government's Domestic Borrowing

Instrument	Outstanding Balance as on 30-Jun-2013 (Taka in crore)		Percentage of Total (%)
Borrowing from BB (WMA, OD current, OD block)		23855.50	12.33
Govt. Treasury Bills		29426.21	15.21
Govt. Treasury Bonds		85043.07	43.95
2-Year BGTB	600.00		
5-Year BGTB	27409.44		
10-Year BGTB	36490.18		
15-Year BGTB	11336.25		
20-Year BGTB	9207.20		
Other Treasury Bonds		16259.20	8.40
National Saving Instruments		38931.51	20.12
Grand Total		193515.49	100.00

Source: Debt Management Department, Bangladesh Bank

Issues

In spite of the progress made thus far, several impediments continue to hinder the development of the debt market in Bangladesh.

First, the mode of government borrowing does not fully consider the supply or cost of loanable funds available in the market. In addition, despite the recent improvements in the borrowing projections of CDMTC, critical mismatches still prevail between the timing and amount of financing needed by government relative to the absorptive capacity of the market. This has resulted in continuous use of devolvement on PDs. This practice has a negative impact on market price discovery.

Moreover, large devolvement in an environment where the secondary market remains thin may undermine the balance sheet of PDs and exert pressure on the financial stability of banks in general. BB has responded to this situation by spreading the devolvement of securities to non-PD banks. Finally, the hindrance in the development of the secondary market is also affecting the debt market conditions, as a well-functioning and deep secondary market is essential to support the primary issuance market and the primary dealer system. Despite the implementation of several measures

ranging from performance-based incentives to setting up of the online trading platform taking place, a robust secondary market for the government securities has failed to materialize.

In order to improve the situation, the authorities need to take an array of measures in multiple areas. Some of these actions must be undertaken immediately, in the short term and others over a longer medium- to long-term period. Many of these measures need to be adopted simultaneously in a coordinated manner, while others need to be undertaken in a sequential manner. These measures are discussed in detail in the next section.

Next Steps in the Development of the Government Debt Market

The framework for managing the continuation of current efforts and the adoption of new measures and initiatives to further build the government securities market is best assembled into policies that are urgently needed in the immediate short term as well as medium/longer-term actions. While longer-term polices are those that will require a longer gestation period for implementation or will involve sequential actions, very often they also require that initial measures must be taken urgently to begin the process.

Immediate Policy Measures

The following proposed urgent measures are recommended to move the development of the government securities market forward.

Analyzing the market: The issuance of securities needs to be aligned to market absorptive capacity. Hence, the government must consider financial market conditions, and devise its debt issuance strategy accordingly. Efforts must be made to analyze the supply of loanable funds, when considering the auction calendar and the associated amounts and tenor of securities to be auctioned. BB should be in a position to provide monthly estimates of loanable funds in the banking system and NBFIs and the future streams of such funds on a continuous basis. BB should also strive to provide an estimate of the average costs of funds of banks and NBFIs, in addition to information on the array of interest rates in the market. This additional indicator will provide hints on the spread margins. These steps will ease liquidity tension in the market and temper volatility in yields and securities prices.

Borrowing Projections: CDMTC should continuously review its monthly projections of borrowing requirements. CDMC should provide credible explanations and discuss implications when deviations cross an agreed threshold. Any decisions for revising the projections should be reflected in changes in the auction calendar and the mix of securities and the amounts varied as needed to meet the revised circumstances. Better projections of the budgetary financing requirement will improve the matching of borrowing needs to market liquidity and thereby contribute to better price discovery and market development

Devolvement: The incidence and size of devolvement should be reduced. Implementation of the above measures should contribute to diminishing the need for devolvement.

Primary Market: Several measures could be adopted to further strengthen the *primary market*.

BB should prepare primary market guidelines to enforce PDs in playing their role as market makers.

Tenure of liquidity support provided to PDs may be lengthened and priced accordingly.

Competitive underwriting commitments for PDs should be introduced. PDs would submit bids at an underwriting auction prior to the auction day, which would include the desired commission rate. This auction will facilitate market development and efficient pricing.

BB could absorb more issues whenever market demand falters to build up a stock of securities to support market development or conduct Open Market Operations as part of its monetary policy.

Secondary Market: Simultaneously, several measures to strengthen the *secondary market* are also needed.

To stimulate secondary market development, BB should increase its presence in the secondary market and become a more prominent player. BB should open a window to engage in purchases and sales of Bills and Bonds. Outright sales or purchases could be made, as well as use of repos or reverse repos, depending on market development or monetary policy objectives.

The number of participants in the secondary market has to be increased to develop secondary trading. Allowing brokers to take part in trading of government securities could be one way to increase the number of participants. Another way is permitting PDs and other authorized traders to undertake short sales with appropriate safeguards. Additionally, a framework maybe set up to develop a derivative market, e.g. interest swaps and futures.

Other Measures: The following additional measures may also be considered:

A promotion campaign & awareness raising events should be undertaken on the attractiveness of investing in Bills and Bonds, similar to that for NSD & other special bonds.

The capacity of BB as issuing agent for government securities has to be improved. Debt department in BB should be provided with adequate staff, equipment and resources to perform its functions effectively.

Tick size (ie minimum size of purchase) may also be reviewed to stimulate trades in thin markets. Currently, they are set at BDT 1.0 lakh.

Medium to Long-Term Policy Measures

Medium-term measures are those that are sequential and are essential follow-up actions from the immediate short-term measures described above.

Issuance and borrowing: The government should clarify the rationale and objectives behind issuing new securities, and align the yield of non-marketable securities to marketable securities. It should also distinguish between the management of its regular cash flow and budget borrowing requirements. The number of days of OD beyond the WMA limit should be capped. At the same time, BB should actively float CMBs or undertake reverse repos on government account.

BB Activity: BB should consider establishing a better link between government debt market development and its monetary policy objectives. Thus, BB could consider the following proposals:

- BB should consider gradually influencing call rates so that it fluctuates within an interest band, with the upper bound set by the BB repo rate and lower bound by the BB reverse repo rate. BB seems to be on-track to achieve this objective since the weighted average interest rates in the call money market have shown an overall downward trend during the last 12 months (Source: *Monthly Economic Indicators, Various Issues).*

- BB may also consider restricting two-way accesses to the call money market exclusively to banks. NBFIs may be allowed to make unlimited liquidity offers in the call market, but should make liquidity purchases through only interbank repo or BB repo markets. This will reduce uncollaterized trading by NBFIs in the call market and encourage the use of TBs and BGTBs, thus broadening access to the secondary market for government securities.

- BB may also direct NBFIs to hold SLR in government Bills or Bonds. This will partially reduce the burden of PDs and banks from excessive holdings of government debt.

Investor Base: The investor base for government securities should be expanded. These securities are primarily held by commercial banks to meet prudential statutory liquidity requirements, and this in turn constitutes a captive market for such assets. Presence of other potential investors such as insurance companies, pension funds, and mutual funds in the market will enhance the demand for government securities. Accordingly, the following steps may be considered:

- The Insurance Development and Regulatory Authority (IDRA), regulator for the local insurance market has been formally established. This authority can monitor the financial soundness of insurance companies, including setting guidelines for investments and prudential requirements. Subsequently, it can establish and enforce statutory minimum requirements for investments of insurance companies in government Bills and Bonds.
- Complete legislation to require Pension/Provident Funds to be fully funded schemes and participation in Pension schemes should be made mandatory. Establish minimum prudential requirements for investments of retirement funds in government Bills and Bonds.
- Allowing foreign mutual funds and other investment vehicles to enter the domestic economy may be contemplated; as this will widen the investor base.

Relaxing Tax Regulations: The government has already waived the upfront tax on government securities. It can further consider special tax treatment for earnings from government and private securities. It may rationalize the overall direct tax burden on earnings and capital gains from financial investments, taking into consideration tax treatment for similar earnings in neighboring countries and in the region.

Debt Strategy: The domestic government debt framework has to be integrated into an overall medium- and long-term debt strategy of Bangladesh. There should be clarity on the operational framework of the overall debt strategy. Additionally, the role of Bangladesh Bank should be well defined. A Risk Management Strategy should be formulated to analyze risk management and

sustainability of the public debt. The institutional governance and risk management framework to support the long-term domestic and external borrowing requirements of government in a sustainable and financially stable manner would need to be determined.

Adjustments in HTM Regulations in India and Bangladesh: A Case Study

RBI stance during 2013

On January 2013, HR Khan, Deputy Governor of the Reserve Bank of India (RBI) announced that following a recommendation from a central bank committee, RBI was contemplating the lowering of the held-to-maturity (HTM) bond limit for banks in SLR (statutory liquidity ratio) in a 'non-disruptive manner'. At that time, the limit had been set at 25 percent of total demand and time liabilities (DTL). Later, RBI instructed banks to reduce their HTM ceiling for SLR securities gradually by 200 basis points (bps) to 23 percent of DTL in its annual 'Monetary Policy Statement for 2013-14', issued on May 03, 2013. To quote the RBI announcement: "Banks may exceed the present limit of 25 per cent of total investments under the HTM category, provided the excess comprises only of SLR securities; and the total SLR securities held in the HTM category is not more than 23 per cent of their DTL as on the last Friday of the second preceding fortnight, *i.e.*, in alignment with the current SLR requirement."

The rationale behind this decision was that the HTM ratio had traditionally been aligned with the overall SLR holding requirement set by RBI. However, the HTM ratio stood at 25 percent despite the SLR coming down to 23 percent in recent months. This tightened liquidity in the secondary market since the additional 2 percent that the banks could put under the HTM category became unavailable for trading/sale. Thus, the RBI decided to cut the SLR limit in HTM by 200 basis points and realign the HTM ratio with the existing SLR requirement. Sensing that such a large-scale reduction in the HTM limit needs to be internalized in the economy in phases, the RBI opted for a gradual process. Adopting the recommendations made by the Working Group on 'Government Securities and Interest Rate Derivatives Markets', the RBI decided to trim the HTM ceiling by at least 50 bps every quarter, beginning with the quarter ending June 2013 and reaching the 23 percent mark by end March 2014.

The major expected outcome from this decision was increased trading of government securities from the release of the additional 2 percentage points of HTM. In addition, banks were expected to purchase a higher volume of non-SLR securities (corporate bond, commercial paper etc.) because of the ease in restrictions. This conduct would spur the trading of such securities. Moreover, exchange of securities with different maturities would increase in volume, which would help build a better yield curve.

Subsequently, RBI had to suspend its decision to bring down the HTM limit to the level it desired because of other developments that took place in the interim. On June 2013, RBI announced several measures to address the falling rupee prices that also had implications for the valuation of SLR

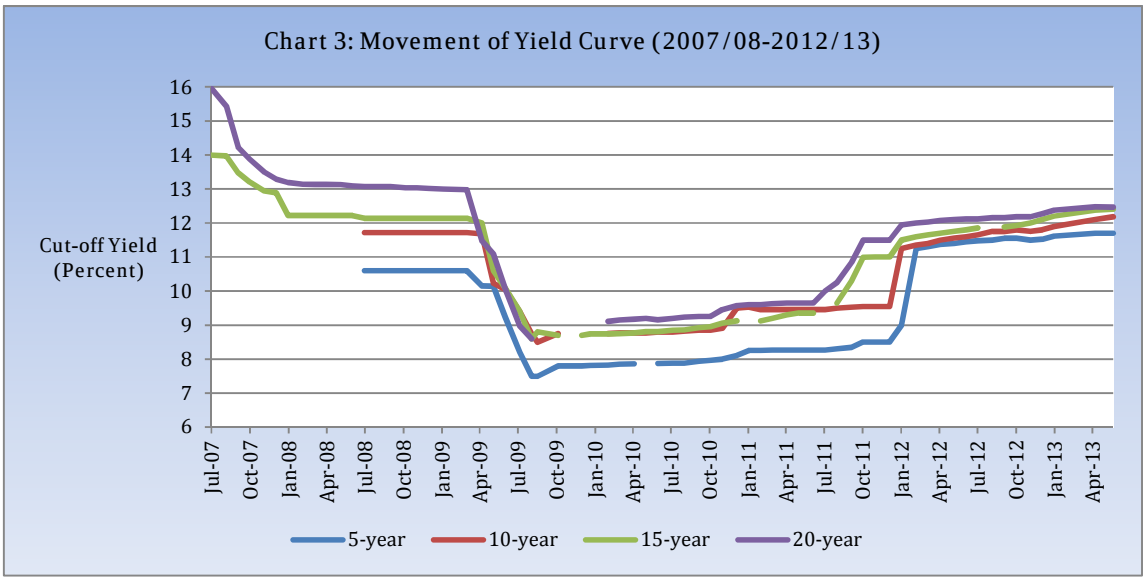
securities. RBI adopted tightening policies including open market sale of government securities to increase short-term interest rates, and thus reduce volatility in the exchange rate.

However, long-term bond yields surged along with short-term rates because of these initiatives. The rise in bond yields produced significant mark-to-market loss in the investment portfolio of banks. Subsequently, on August 2013 RBI declared that banks are not required to cut their SLR limit in HTM below 24.50 percent of DTL until further instructions. RBI also permitted banks to transfer SLR securities under AFS/HFT category to HTM category up to the 24.50 percent level at the end of July 15 2013. Under the standard regulations, banks can make these transfers only at the beginning of the accounting year, which is 1st of April for India. Furthermore, RBI allowed banks to spread losses due to the mark-to-market requirements over the corresponding fiscal year in equal installments, instead of reporting them in the quarter when they occur. To ease the liquidity conditions of the market, RBI announced that it would carry out open market purchase of government securities. As of 30 November 2013, the SLR limit in HTM securities in India stays fixed at the 24.50 percent level.

BB stance since 2008

BB faced a similar predicament in its pursuit to bring down the HTM limit. However, the dilemma in the debt market in Bangladesh occurred solely because of the upward inclination of the yield curve since 2011. On the other hand, factors outside the periphery of debt management were responsible for the situation in India.

In 2008, Bangladesh Bank (BB) was pursuing the same objective of curtailing HTM limit. In a bid to revitalize secondary trading, BB instructed the banks in a DOS circular dated May 26, 2008, to gradually scale down the proportion of their investment in securities under the HTM category (70% by January 2009, 50% by January 2010 and 25% by January 2011). However, movement of the yield curves of BGTB in later years forced BB to reconsider this decision. The yield curves plummeted sharply in July 2009 and continued to be relatively steady until July 2011. Afterwards, the curves rose sharply and have remained on an upward trajectory ever since. (Chart-3)



Source: Debt Management Department, Bangladesh Bank

Because of the upward trend of cut-off yields, the revalued price of the bonds (based on yield rate of the most recent primary issue auction) issued during the June 2009-June 2011 period fell below their cut-off price. The holding companies of these securities were poised to incur huge losses in their profit and loss account if they held these securities under the HFT category due to the marking-to-market based revaluation requirement. Therefore, it became necessary to increase the upper limit of holding securities under HTM category so that the holding companies can reduce their losses.

BB responded by gradually increasing the upper limit of holding HTM securities in the total SLR. It increased HTM limit to 50 percent and 75 percent on May 2011 and September 2011 respectively. BB further raised the limit for PDs to 85 percent on December 2011. The HTM limits stays at 85 percent for PDs and at 75 percent for non-PDs as of 30 November 2013.

In the DOS Circular-02 dated 19 January 2012, BB also permitted banks to re-measure treasury bonds issued within the 2009-2011 period and held under HFT at amortized cost (as on January 1, 2012) instead of fair value. A provision was also included allowing BGTBs (held under HFT) to be re-measured at amortized cost if they remain unsold after 2 years from the date of purchase. Banks should amortize any difference between the new amortized cost and maturity amount over the remaining life of the security. The re-measured securities will be eligible for SLR, repurchase agreement (REPO) and assured liquidity support (ALS).

Since January 2013, BB has also been allowing banks to convert up to 15 percent of their HTM securities into HFT once every calendar year with the approval of their board of directors (or Chief Executive in case of foreign banks). Banks would report resulting gain/loss due to reclassification as gain/loss for the corresponding period.

BB has attempted to rejuvenate the secondary trading of government bonds and bills by offering various types of facilities for the investors (Section 2.0).

Implications for BB

Both BB and RBI had to reassess their decisions with regard to the HTM ratio, and adopted measures to help the investor banks reduce their MTM losses. However, there were some basic differences between the outlooks of the two central banks. The contrasting approaches pursued by BB and RBI in some key aspects and the underlying implications are discussed below.

BB raised the HTM limit to 85 percent of SLR to enable banks to reduce their MTM losses. On the other hand, RBI suspended lowering the HTM limit at 24.50 percent. Banks usually trade SLR securities that are not included in the HTM classification. Lowering the HTM ratio to align with the SLR limit offered the scope for greater trading volume of non-SLR securities in India. The RBI approach could contribute to the secondary trading of government and non-government securities, and as a result the secondary market could have been more robust in India compared to Bangladesh.

BB increased the HTM limit from 25 percent to 85 percent of SLR over the span of eight months. That amounts to 6000 basis points in two quarters, or 3000 basis points (bps) per quarter. On the other hand, RBI had decided to lower the HTM limit by 50 bps per quarter. Allowing large deviation in regulatory requirements in a relatively short time period may potentially cost central banks to lose control over debt market developments.

RBI carried out open market operations to reduce exchange rate volatility at one stage and ease liquidity at the next phase. BB may consider designing issuance and pricing of BGTBs and TBs around its monetary policy and financial sector stability objectives.

Conclusions

Bangladesh has made considerable improvements in the domestic debt market area. However, there are topics that require urgent attention of the policymakers. These issues have been discussed in section 3.0 of this chapter and recommended actions have been elaborated in section 4.0. Primarily, the government debt management has to be aligned with the liquidity and the absorptive capacity of the market. The practice and extent of devolvement also needs to be addressed. Moreover, development of a robust secondary market has become essential to support the progress of the domestic debt market.

The case study of RBI suggests useful lessons for policy makers. Bangladesh Bank may consider increasing its presence in the debt market through operating OMOs and embracing a less lenient approach to changes in regulations. It may also better utilize the issuance and yield/pricing information of the debt securities to achieve its objectives as a central bank. The case study also points out why central banks should have more instruments at their disposal to counter unforeseen events that may originate from any sector of the macroeconomic structure.

To conclude, the central bank and the government of Bangladesh need to work together to devise a more pragmatic debt management strategy and implement prudential regulations that will utilize the liquidity condition of the market properly and develop the secondary market for trading of debt securities. Adoption of the accurate strategy will enable the government and the private sector to acquire the required funding for their various undertakings, and will develop a healthy debt market. A sound debt market will improve monetary policy transmissions; broaden the financial sector; enforce accountability of domestic institutions; and exploit idle money in the market to propel economic growth.

Annexure-A: Accounting Treatment of HTM as per RBI rules

Definition: "Held-to-maturity securities are debt investments, such as notes or bonds, that a company intends to hold until their maturity date. Held to maturity securities are primarily purchased to earn interest revenue." (Warren, M, & E, 2008)

Classification of investments by FIs: According to the Master Circular of RBI titled 'Prudential Norms for Classification Valuation and Operation of Investment Portfolio by FIs' issued on July 2, 2012, FIs of India are allowed to maintain their investment portfolio under three categories. These are:

Held to Maturity (HTM)
Available for Sale (AFS)
Held for Trading (HFT)

As per international norms, an FI can put only debt instrument under the HTM category. The only exceptions permitted are- the equity held in subsidiaries and joint ventures, investment in the preference shares in the nature of advances, non-project related redeemable shares and the investments in units of close-ended schemes of mutual funds only if such units are listed on the stock exchange.

Accounting Treatment: Investments under HTM category do need not be marked to market and will be carried at acquisition cost unless it is more than the face value, in which case the premium should be amortized over the period remaining to maturity. FIs are allowed to shift their investment to/from the HTM category with the approval of the Board of Directors once a year.

Annexure-B: Accounting Treatment of HTM and HFT as per BB rules

Both HTM and HFT securities may be held for SLR purpose.

HTM securities have to be held until the maturity period is over. These securities have to be amortized at year-end. The gain/loss due to amortization will be taken to Capital Account and disclosed in the 'Statement of Changes in Capital'.

HFT securities are held for trading purpose. These Securities should be revalued at least at weekly intervals based on marking-to-market or current market prices. The gain/loss due to this revaluation will be shown in the 'Profit and Loss Account' of the concerned period.

Govt. securities held under HFT category are revalued using either the most recent yield prevailing in the secondary trading, or in absence of such trading the yield rate of the most recent primary issue auction.

Exception to the Marking to Market Requirement: Treasury bonds issued between April 2009 and December 2011 and categorized as 'held for trading (HFT)' by the PDs may be re-measured at amortized cost instead of fair value. Here the book value carrying amount of the bonds under consideration as on January 1, 2012 shall be taken as the new amortized cost. Fair value denotes valuation based on the marking to market requirement.

In addition, from January 2012 onward, treasury bonds under HFT that remain unsold for two years from the date of purchase may be re-measured at amortized cost.

The re-measured securities will be eligible for SLR, repurchase agreement (REPO) and assured liquidity support (ALS).

From January2013, banks are allowed to convert up to 15 percent of their HTM securities into HFT once every calendar year with the approval of their board of directors (or Chief Executive in case of foreign banks). The resulting gain/loss due to reclassification has to be shown as gain/loss for that period.

HTM securities are generally not for sale. However, under special conditions, banks can sell up to 15 percent of their HTM securities with the approval of their board of directors (or Chief Executive in case of foreign banks) once in a given year.