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Determination of Near Term Scenario of Monetary Aggregates of Bangladesh

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Abstract *Monetary aggregates (M2 and RM) and balance of payments (BOP) for the first time is consulted comprehensively examining economic variables for formulation exclusive near term (yearly) scenario of monetary and credit program of Bangladesh Bank (BB) from supply side. The M2 and RM consists both liabilities and assets while BB usually publicises assets side program in the monetary policy statement (MPS). As a result combined (assets and liabilities) monetary programming publication and signalling rational expectation regarding interest rate, exchange rate and inflation is the agenda of the paper. In this regard quantity theory of money, simultaneous equation, cointegration test, ARIMA exercise, participatory and judgemental approach is pursued in quantifying M2, RM and BOP yearly growth. Literature survey found that the money demand function is stable and is highly dominated by the transaction motive for holding money. Consequently, in this paper emphasis has been given in quantifying supply side of money assuming stability in money demand. Central banks prudential policy impact the supply side, while mainly income and interest rate influence the demand for money. The objective of this paper is better monitoring of monetary aggregates ensuring desired economic growth and inflation. For this reason real GDP growth, inflation, income velocity of money, which are elements of money supply are verified scrupulously using economic tools for implementation effective monetary policy.*

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Introduction

Monetary aggregates M2 and RM both have liabilities and assets side. Currency outside banks and deposits including demand and time deposits are liabilities of M2. Currency issued and DMB's balance with BB as reserves encompasses liability of RM. Money multiplier indicator of financial deepening basically derived expounding currency deposit ratio and reserve deposit ratio. The effort of monetary policy is to decrease the currency growth and increase the time deposits for financial deepening. Decrease in cash balance in public hands will grow the time deposit as well as financial deepening of the country. Net foreign asset (NFA) and net domestic asset (NDA) are the two main factors of assets side of M2 and RM. NFA of M2 arrives combining central banks NFA and foreign exchange assets and liabilities of DMB's. Credit to private sector, credit to government (net) and credit to other public sector are the components of NDA of M2. Credit to government sector amount comes from national budget of fiscal sector. Private sector credit is the core element to stimulate the economy. Other public sector relates to state owned enterprises. NFA of BB derives from the overall balance of balance of payment (BOP) addressing external sector. Claims on government (net), claims on other public and claims on DMBs are the constituent of asset side of RM. Claims on government among others the ways and means balance along with overdraft and treasury bills and bonds amount. According to number claims on other public are declining. Repo, loans and advances together with refinancing are reported in the claims on DMB's head. Formulation of M2 and RM is yearly and further divided into quarterly showing different period growth rates.

Credit to the private sector, government sector (net) credit and net foreign assets (NFA) are the main elements of M2 from the asset side. Between private and government (net) sector credit of M2 the share of private and government sector is eighty percent and twenty percent respectively. Private sector credit is random or stochastic variable. Stability of private sector credit depends on micro foundation of individual and firms. This relies on among others assets and liabilities, credit rating, proper collateral, less asymmetric information and moral hazard of the agents, risk proposition of individual and institution, Know Your Client (KYC) rule and global economic situation. Success of credit to the government sectors are supported by proper securitization of treasury bills and bonds and effective secondary market. RM is the economic balance sheet of BB. NFA of RM arises from BOP. Substantial amount of foreign exchange reserves based on import is the cushion from the external sector perspective. Current and blocked nature debt including government bills and bonds outstanding minus deposit comprises government (net) account of RM. Open Market Operation

(OMO) instruments and budgetary tools impact the credit to Deposit Money Banks (DMB's)accounts of BB. Overall surplus of BOP and foreign exchange sale /purchase impact the NFA of RM. The BOP is prepared according to IMF definition consisting current account, capital account and financial accounts. Segmentation of financial accounts demonstrates inflation is the monetary and budgetary phenomenon, which is the target of monetary policy. In monetary programming of Bangladesh these core elements are considered crucially taking into account quantity theory of money, econometric exercise and financial issues. Accordingly, we will derive yearly program number of M2, RM and BOP in this paper due to lack of study in this area. It may be noted that circulation growth rate of cash money (amount of printed money) in a year depends on annual real GDP growth rate (for example seven percent), annual inflation rate (eight percent) and the amount of torn notes in a year say fifteen percent of the total circulated notes subject to financial engineering i.e. debit card, credit card and mobile banking.

M2 developed amalgamating DMB's and BBs balance sheet. Monetary sector, external sector, fiscal sector and real sectors are the territory of monetary programming. To foster economic growth with suitable inflation for poverty alleviation accommodative monetary policy has been followed in this paper reflecting the view of policy makers and stakeholders. The MPS of BB observes the stakeholder including think tanks vision and publishes the economic outlook for each next six months of a financial year. Meticulous exercise is made before publishing any single data relating to MPS. Despite following inflation targeting monetary policy by many countries central bank quantifying RM and M2 as operating and intermediate target (information variables) have due importance. In this paper at the beginning it is identified that monetary programming is impacted by both deterministic and random variables. These variables also dealt econometrically to get inference for forecasting. According to quantity theory of money M2 growth arrives combining real GDP growth, inflation and changes in income velocity of money. Income velocity of money is the ratio of nominal GDP and M2. GDP and inflation derive from real sector. The M2 and RM programs are monitored comparing actual outcome and take essential measures considering the deviation of the path. Noted that the monetization rate in Bangladesh is around fifty percent of GDP (M2 divided by GDP and multiplied by 100), which results scope of rapid monetization with proper monetary policy.

Inflation targeting policy is followed in the U.K., Canada and U.S.A. Bangladesh follow monetary targeting policy with the concentration of inflation and GDP growth. Study reveals that money demand is stable in Bangladesh and BB can impact the quantity of money. Islam (2000) provides new evidence on the money

demand function for Bangladesh using co-integration techniques and a longer quarterly time series data than previously used. Co-integration results indicate that a single co-integrating vector describes the long-run equilibrium money demand relationship in Bangladesh for both the narrow and broad money categories. It is also found that the money demand function is stable and is highly dominated by the transaction motive for holding money. The effects of alternative opportunity cost variables on money demand were not found to be significant.

In the developed countries, for M2 growth formulation GDP and inflation (two elements) are calculated. Income velocity of money is not incorporated due to full monetization. The plot of income velocity (GDP divided by M2) curve is 'U' shaped. We are in the lower part of declining territory of this curve. The bottom of the 'U' shaped curve is zero after that it is positive. The developed country are in the upper part of the U' shaped curve. As a result the developed countries do not add velocity in their broad money program. The cited developed countries are following inflation targeting monetary policy. Historically BBs mandate was in broad nature. At present the core element is to conduct monetary policy in order to attain the objective of price stability with sustainable growth. The short-term goals are determined after a cautious and pragmatic appraisal of the current economic situation. There are three types of monetary policy termed as expansionary, contractionary and accommodative. Decreases in interest rate raise the credit with expansionary outcome. Rise in interest rate occurs opposite effect. Accommodative monetary policy is moderate considering global outcome. Money demand function is steady in Bangladesh and historically influenced by the transaction motive. The short-run money demand function and the speed of adjustment to the long-run equilibrium observe as reasonable for both M1 and M2. Currency outside banks with demand deposit consist narrow money (M1). M1 and time deposit comprises broad money (M2). M3 is calculated combining M2 and postal deposit for instance. The NFA of BB is equivalent to gross foreign exchange reserves deducting liabilities includes for example Asian Clearing Union (ACU) balance, project FC account and FC clearing account. Scheduled Bank Statistics (SBS) and BOP prepared by the Statistics Department of BB are used as underlying statements for preparing monetary programming of Bangladesh.

At the outset we need to examine the recent monetary sector and related variables development. The landscape of monetary policy has been changed due to introduction of repurchase agreement (Repo) and Reverse Repo in 2003 as a part of structural reform of financial sector. Conventionally DMBs can lend eighty one percent of demand and time liabilities keeping nineteen percent as statutory

liquidity ratio (SLR) with Bangladesh Bank (BB). Now a day's DMB's depositing government securities as collateral and can borrow money from the BB. As a result DMB's can run with shortfall of liquidity overnight basis with marginal efficiency. Role of BBs lender of last resort has also been changed subsequently. DMBs are using government treasury bills and bonds as held to maturity (HTM) for maintaining SLR. These securities are amortized over time. Rest of the securities are used held for trade purpose (HFT). Government are interested to borrow money at lower cost from the banking system. Recently the yearly borrowing amount from the banking is around one and half percent of nominal GDP. Consequently determination of cut-off rate of government securities as a risk free instrument is crucial. At the same time off load of BBs holding of more than five year term bonds is important from economic point of view. Gradual securitization of bonds will balance between assets and liabilities improving the duration gap. The procedures of government financing along with monetary and credit programming and balance of payments are described in order to establish better security market and ensuring development in Bangladesh. Hassan, et. Al. (2003) find out both long-term and short-term dynamic relationships among money supply and its component for Bangladesh economy within an Engle –Granger error-correction framework using yearly data for the period of 1972-1997. They find that M1 and M2 money supply have predictable long run relationship exist among M2 and its components indicating the absence of a developed money market in Bangladesh. Hossain (1988) estimated a short-run money demand model for Bangladesh using quarterly data from 1974:1 to 1985:4. The author found a Laidler (1982) short-run real money demand model, which is appropriate for Bangladesh.

We will describe the supply side elements of money in this paper taking into account the money demand inference relating to income and interest rate. Recent OMO and maintenance of high foreign exchange reserves from the BB perspective are crucially verified. M2, reserve money and BOP are compiled in this paper taking into account economic tools and think tanks opinion regarding interest rate, inflation and exchange rates. In this paper monetary, external sector and fiscal (deficit financing) interactions are examined and inferences are made bearing in mind long run relationship and short run deviation of the M2, RM and BOP programmed path as a research question. Prudential monetary policy keeping proper interest rate, exchange rate and inflation can reduce unemployment through Phillips curve. The negative impact of rising inflation over unemployment is actually the existence of theoretical Phillips curve which is evidenced by Bangladesh and it seems to be a result of migration of people

towards employment sources (UKessays.com). Money supply to the productive sector specially the private sector increases the production and reduces the inflation. Proper amount of government investment considering GDP also increase the productivity of the economy. Appropriate rates of the government treasury bills and bonds for budget financing from the banking system as reference rates help to determine the right deposit money banks (DMB's) lending rates. Study observes gross investment over 30 percent of GDP will lower the poverty level in the country below 31.50 percent of 2010 (World Bank statistics). According to World Bank statistics the gross investment of Bangladesh is 27 percent in 2012. This approach can ensure the economic growth and reduce the income inequalities measured by Lawrence curve. GINI index in Bangladesh was measured at 32.12 in 2010, according to the World Bank. In this paper we will utilize the findings of the literature survey for making conclusion relating to macroeconomic stability arising from monetary programming of Bangladesh.

Organization of the paper involved literature review in section-I. Formulation of yearly monetary program path is described in section-II. Section-III deals with balance of payments accounts program in a nutshell. Determination of interest rate, foreign exchange rate and inflation as policy variable is analyzed in section-IV. Conclusion is represented in section-V.

Section I

Literature review

Literature review is conducted to understand the interactions of M2, RM and BOP and money demand functions of Bangladesh in the cross country perspective. One of the Bank of England's two core purposes is monetary stability. Monetary stability means stable prices with low inflation and confidence in the currency. Stable prices are defined by the monetary authorities inflation target, which the Bank seeks to meet through the decisions taken by the Monetary Policy Committee. Canadian monetary policy is concerned with how much money circulates in the economy and what that money is worth. By keeping inflation low, stable and predictable, the Bank contributes to solid economic performance and rising living standards for Canadians. In the United States, the Federal Reserve is in charge of monetary policy. Monetary policy is one of the ways that the U.S. government attempts to control the economy. If the money supply grows too fast, the rate of inflation will increase; if the growth of the money supply is slowed too much, then economic growth may also slow. In general, the U.S. sets inflation targets that are meant to maintain a steady inflation of 2% to 3%.

Ho (2003) has pointed two main purposes: (i) reveal the statistical properties between real money demand and its determinants in Macao; and (ii) diagnose the stability of the specified money demand equations. It is shown that in the long-run models, the demand for currency in circulation and M1 is cointegrated with specified determinants, while the short-run models of demand for currency in circulation and M2 also indicate stability. The determinant of transactions demand, represented by real GDP, is statistically significant with correct sign in both the long and short-run models. The speculative factor, represented by the savings deposit rate, indicates significance in the long and short-run models of M1 only. Meanwhile, the inflation rate, a proxy for the rate of return of goods or real assets, and the Hang Seng Index, a proxy for equity investment, indicate significant and negative relationship with the currency in circulation only. The yield of 10-year US Treasury bond, which represents the rate of investment return of long-term debt securities, has no significant relationship with real money demand across the board.

Nasiruddin (2012) investigates the existence of a long run money demand function for Bangladesh during the period 1975-1997 using the co-integration and error correction modelling approach. It also examines the parameter stability of the money demand function. The empirical results suggest that there exists a unique long-run relationship between real broad money balance, real GDP, and the real exchange rate. The short- term dynamic behaviour of money demand has been investigated by estimating an error correction model in which the error correction term has been found to be correctly signed and statistically significant. Real GDP and the real exchange rate have emerged as important determinants of the demand for money in Bangladesh.

Yu Han (2009) observes that theoretically, the demand for real money balances could be divided into transactions demand component, which is positively related to the income and inversely related to interest rates, precautionary demand component, positively related to income and speculative demand component, inversely related to interest rates. In addition, the paper includes the cost of credit as a determinant of demand for money. Following the previous studies and real world experience, the cost of credit does matter in developing countries like Bangladesh. Since, in developing countries the transaction using broad money (M2) very often takes place. The government, the business and investors are using credit or lending to ensure the smooth running of their development activities. The banking system and other financial institutions create money by giving loans. However, it is a practice that during economic boom the returns on investment is high and it encourages an increase in borrowing and lending activities with a

relatively lower cost of credit. During economic crisis either it is inflation or deflation, the banks and other financial institutions may minimize the cost of borrowing in order to encourage the clients for borrowing. By contrast, an increase in the cost of borrowing is likely to decrease the demand for money.

Pragmatic study on money demand function exists in Bangladesh (see Taslim 1983, 1994 and Hassan 1982). These studies used regression technique to estimate money demand function in Bangladesh using time series data.

The money supply and money multiplier related issues of developed and developing countries have been widely worked out. Johannes and Rasche (1979), Bomhoff (1997), Park (1980), Arby (2000), Ford and Morris (1996), Baghestani and Moot (1997) have pursued studies on money supply and money multiplier of different countries. They highlighted the degree of controllability over money supply by the monetary authority, stability and predictability of money supply, determinants of money supply and policy implications for governing monetary policy.

Mahboob and Anisul (2012) empirically tested the money supply function for Bangladesh using annual time series data. Authors observed that high-powered money played a very significant role in the money supply process of Bangladesh, particularly with respect to the narrow money supply M1, thus providing some support for the monetarist model. However, beyond the monetarist view, additional variables in the light of the Keynesian and structuralist analysis, such as bank rate, external resources, and financial liberalization need to be taken into account in understanding the money supply process of the country. Other aforesaid variables were also found to exert some influence on the broad money supply in Bangladesh. However, given the poor performance of the narrow money model and the existence of multicollinearity issue in both models, the estimated results, even for the broad money model, needed to be interpreted with caution.

Section II

Formulation of yearly monetary program path

Before determination of yearly money supply growth we assume that money demand function is stable and is highly dominated by the transaction motive for holding money. BB conducts series of meeting with the financial expert, think-tank and stakeholders before devising monetary policy of Bangladesh reflected in M2, RM and BOP program. The dialogue is mainly based on interest rate, exchange rate, inflation rate, GDP growth and related macroeconomic variables

of the country. Ultimately, BB formulates monetary program of Bangladesh in consultation with the government. BB publishes MPS half yearly basis assessing current situation and unfolding economic outlook for next six months. Study reveals apart from stochastic approach Bangladesh M2, RM and BOP data have structural adjustment issues of different decades. Different econometric tests are applied in related variables before formulating monetary programming. In the long run equilibrium relationship exists among monetary variables, which identified exercising Unit Root test. ARIMA and seasonality are also consulted as part of monetary programming. Consequently, quantity theory of money, simultaneous equation (Sayed 2001), cointegration test and ARIMA inferences participatory and judgemental approach is suitable in quantifying M2 growth of Bangladesh. The growth rate of M2 for FY 2011-12 is calculated solving real GDP growth, inflation rate and changes in income velocity of money in percent. GDP growth and inflation rate is found in the national budget for upcoming year. Income velocity of money arrives dividing nominal GDP with M2, which is in declining trend. Change in income velocity of money for FY 2011-12 is estimated at -2%. Quantity theory of money can be resolved plugging annual GDP growth rate (7%), annual inflation rate (8%) and annual percent changes in income velocity of money (-2%).

We know MV=PY.

Log function is required to work out the equation.

Thus we get lnM+lnV= lnP+lnY

=lnM=lnP+lnY-(-lnV)

=8%+7%+2% =17% M2 growth is expected for FY 2011-12.

Here, M= M2 growth; V= change in income velocity of money in percent; P= inflation rate and Y= real GDP growth rate. Income velocity of money is declining over time. Velocity for a particular year can be derived as:

MV=PY

Or, $(1+M^{\wedge})\ (1+V^{\wedge}) = (1+P^{\wedge})\ (1+Y^{\wedge})$ [^stands for estimated]

Or, $V^{\wedge} = ((1+P^{\wedge})\ (1+Y^{\wedge})/\ (1+M^{\wedge}))-1$

= ((1.08) (1.07)/(1.1742))-1 [M2 growth programmed as 17.42% for FY 2011-12]

=-0.016 = -1.6%

M2 growth also can be determined calculating income elasticity of nominal demand for money. The equation can be formulated as $E= M^{\wedge}/Y^{\wedge}$ [$M^{\wedge}$= growth

of nominal broad money stock and Y?= growth of nominal income]. Thus $M^{\wedge}=E((1+Y^{\wedge})/(1+P^{\wedge})-1)$. E =1.1 assumed to be stable. Therefore, M? (growth of M2) =1.1((1.07)(1.08)-1)=0.1712 or 17.12%.

More precisely percentage change of GDP deflator along with average CPI inflation and income velocity of money are calculated to derive M2 growth in a fiscal year.

Component wise monetary and credit program

ARIMA, simultaneous equations, historical data and current demand have been observed in the simulation of monetary programming of Bangladesh. Maintenance of optimum inflation and GDP growth is central aspect. BOP end June 2012 overall deficit US$ 40.6 crore (Table-4) is added with RM end June 2011 NFA to arrive June 2012 number, which is equivalent to Tk. 58059.50 crore (Table-3). DMBs asset and liabilities of foreign exchange holdings is added with the NFA of RM in order to get relevant NFA of M2 (Table-1).

Government sector credit expansion from the banking system to implement the Annual Development Program (ADP) is expected to Tk. 18095 crore for FY 2011-12. The borrowing amount declares in the national budget, which is subject to change according to revised annual ADP. Subsequently, additional Tk.5000 crore also estimated bearing in mind declining trend of non-bank and foreign funds maintaining overall budget deficit 5% level of GDP. Through treasury bills and bonds government obtain money from DMBs. Other public sector credit is expected to decline due to privatization process of the state owned enterprises (SOEs). Negative growth rate 7.50% is assumed in this sector. Public sector credit programmed 23.32% expansion for FY 2011-12 (Table-1). Private sector credit component is elaborated in the SBS of BB. This is the thrust sector of the economy. Private sector credit is ranged from personal loan to manufacturing industry. Housing loan, auto loan, crop loan, credit card to the common people like developed country encouraging financial inclusion as well as monetization in Bangladesh. Following ARIMA and related economic standpoint private sector credit growth is expected to 18.53% in FY 2011-12 (Table-1). The main component of other item (net) is inter-bank asset of unclassified asset inter-bank liabilities and contingent liability of unclassified liability. Other item (net) is quadratic (±) nature with two roots.

Econometric forecasting of M2

Alternative to traditional single and simultaneous equations model Box-Jenkins auto regressive integrated moving average (ARIMA) has been deployed to

Table 1: Monetary and Credit Program

(Tk. in crore)

Particulars	Outstanding stock		
	June 2010	June 2011	June 2012
	1	2	3
A. Net Foreign Assets of banking system	**67073.70**	**70620.00** (+5.29)	**67095.00** (-4.99)
B. Net Domestic Assets of banking system	**295957.50**	**369899.90** (+24.98)	**450158.60** (+21.70)
a) Domestic credit	340213.70	433525.90 (+27.43)	518310.60 (+24.98)
Public sector	69453.00	92813.20 (+33.63)	114455.00 (+23.32)
Govt.(net)	54392.30	73436.10 (+35.01)	96531.10 (+31.45)
Other Public	15060.70	19377.10 (+28.66)	17923.90 (-7.50)
Private sector	270760.70	340712.70 (+25.84)	403855.60 (+18.53)
b) Other items (net)	-44256.20	-63626.00 (+43.77)	-68152.00 (+7.11)
C. Broad money (A+B)	**363031.20**	**440519.90** (+21.34)	**517253.60** (+17.42)
i) Currency outside banks	46157.10	54795.10 (+18.71)	57883.31 (+5.64)
ii) Deposits	316874.10	385724.80 (+21.73)	459370.29 (+19.09)
a) Demand deposits	41831.30	48305.90 (+15.48)	57232.49 (+18.48)
b) Time deposits	275042.80	337418.90 (+22.68)	402137.80 (+19.18)

Note : Figures in brackets indicate percentage changes overe A=Actual

forecast the M2. Series of monetary aggregates data is used in this exercise. Seasonality also captured for forecasting of M2 using ARIMA. Steps to forecast the M2 are as follows:

At the outset we need to examine the time series data of M2 whether it is stationary or not. By computing the autocorrelation function (ACF) and the partial autocorrelation function (PACF) this step can be executed verifying the correlogramms of M2 as diagnostic tool.

In the first order we need to find the stationarity of M2 time series data.

The ACF and PACF of the stationary time series imply that M2 is autoregressive and the model can be estimated.

To find out the white noise residuals of the model are also examined. A fundamental problem in time series analysis is to test for white noise (or lack of serial correlation). In statistical modeling, diagnostic checking is an integrable part of model building. A common way of testing the adequacy of the proposed model is by checking the assumption of white noise residuals. Systematic departure from this assumption implies the inadequacy of the fitted model. Thus testing for white noise is an important research topic and it has been extensively studied in the literature of econometrics and statistics.

Finally, we get the forecasted quarterly value of M2 with 95 percent confidence limit. Comparative scenario can be instituted in Table-2.

The value of auto regressive integrated moving average for M2 is ARIMA(1,1,0). Autoregressive with integration is calculated in this regard. The value of moving average is zero due to non incorporation in the forecasting technique. Bangladesh M2 data is non-stationary in the first order differentiation observed from the correlogramm spike. Stationarity of M2 is found in the second order differentiation. The spike is gradually die-off (Sayed 2004). ARIMA(BJ) model produces best forecast for broad money and private sector credit based on the lowest MSE and RMSE (Rahman 2007).

Forecasting of private sector credit of M2 and currency using ARIMA procedure can also be attainable as it is auto regressive. NFA of M2 and RM, government sector credit, claims on DMBs and time deposits are deterministic. As a result prediction of these elements is unyielding using random technique.

Table 2:

(Taka in crore)

FY 2001-2002	Forecast	Lower	Upper	Actual
September	89018.0	87606.0	90429.0	88414.5
December	94111.0	92214.0	95474.0	94364.0
March	95115.0	92724.0	97505.0	93398.7
June	99404.0	96614.0	102194.0	98616.0

Determination of seasonality of M2

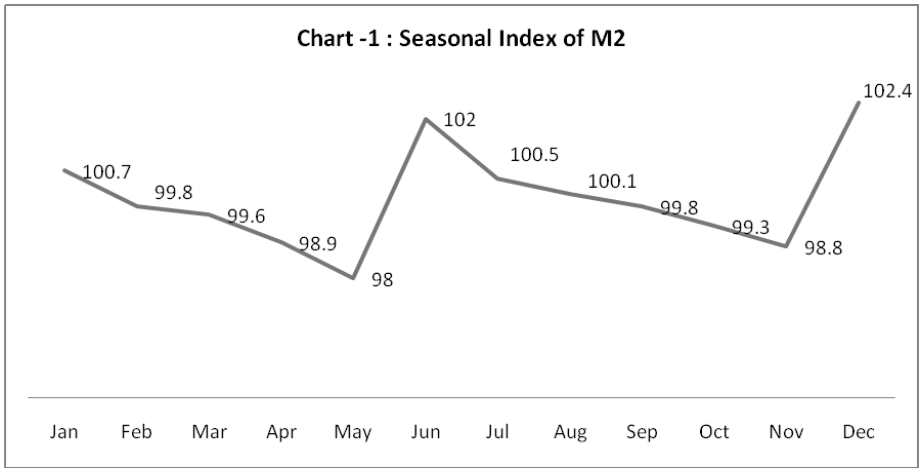
Ratio to moving average method is used to identify the monthly mentioned ARIMA seasonality of M2. Historical data is considered in this succession.

1. The moving averages coverage is 12-month centred on the current observation.
2. By computing ratio to moving average of all the months separately we get the Seasonal Index (SI).
3. Averaging the seasonal Index (S1) and adjusting it with correction factor (CF) Adjusted Seasonal Index (ASI) for M2 can be generated.
4. Dividing the actual data of M2 by ASI and multiplying it with 100 we get the deseasonalised data of M 2. Monthly seasonal index of M2 is shown in Chart-1.

In the seasonal index oscillation is found for the month of June and December. For the surge of M2 during the mentioned period seasonal factor need to understand. Proper seasonal treatment is required to incorporate to watch in-depth each variable of monetary aggregates for monetary programming of Bangladesh.

Reserve money program in brief

In the NDA of RM (Table-3) claims on DMBs depend on liquidity need maintained through repo, refinancing program and loan. Refinancing is provided to export and small and medium enterprise (SME) for poverty alleviation



generating employment. The growth programmed in this sector 10.29% at the end of June, 2012. The government sector credit is programmed 20.31% growth subject to over draft (current) and overdraft (blocked) account adjustment and loan requirement of the government for supporting development works. The government deposits all its cash balances with BB free of interest. BB provides up to Tk. 2000 crore for day to day operation of the government using wage and means account with reverse repo rate (5.75%) as government has taxing capacity. Government can borrow money through overdraft paying reverse repo rate plus one percent (6.75%) with seigniorage effect and inflation. 91-Day government treasury bill rate is applicable for government blocked account loan taken through over draft from BB. Claims on other public sector include SOEs elaborated in the SBS. According to exercise improvement of balance sheet position of SOEs is expected during FY 2011-12.

BBs other item (net) comprises among others interest suspense account of unclassified assets Asian Clearing Union (ACU) and IMF Trust Fund (PRGF) of foreign liabilities. IMF loan increasing liability contributes in gross foreign exchange reserve building.

Gross foreign exchange reserve US$ 10111.0 million for end February 2012 covering different foreign currency (USD, pound, euro and other currency totalling US$ 8717.0 million), SDR holdings (US$727.61 million), Gold (US$654.08 million), reserve position in the IMF (US$0.66 million) and other foreign accounts (US$11.77 million). Exchange rate of end June 2011 is used in this calculation to comprehend the erosion of foreign exchange over time in the BOP frontier. Appreciation of Dollar against SDR for instance will generate less amount of Dollar in a contract with the IMF. The gross foreign exchange reserve using current market rate is US$ 10066.77 million for end February 2012. The NFA of BB is equivalent to gross foreign exchange reserves deducting liabilities includes for example Asian Clearing Union (ACU) balance, project FC account and FC clearing account.

Following monetary aggregates RM and M2 liabilities side currency figure is stochastic. Currency data of different period shows it's positively related to transaction demand with respect to GDP and inflation and inversely related to interest rate of banks and national savings certificates (NSC). Precautionary demand for money represented by broadly demand deposit (checking account) of real money balance (M1) is positively related to income. Speculative demand (time deposit) is inversely related to interest rate. It may be pointed out that printing of notes (Taka) for a year depends on GDP growth, inflation rate and amount of torn notes. Financial innovations include debit card, credit card and

Table 3 : Reserve money program

(Tk. in crore)

Particulars	Outstanding stock		
	June, 2010 A	June, 2011 A	June 2012
	1	2	3
Net Foreign Assets of Bangladesh Bank	**61204.90**	**61388.70**	**58059.50**
		(+0.30)	(-5.42)
Net Domestic Assets of Bangladesh Bank	**19305.40**	**36112.20**	**51166.90**
		(+87.06)	(+41.69)
Claims on Govt.(net)	22320.60	32049.70	38558.20
		(+43.59)	(+20.31)
Claims on other public	830.70	736.70	684.00
		(-11.32)	(-7.15)
Claims on DMBs	6613.90	18608.80	20524.10
		(+181.36)	(+10.29)
Other items (net)	-10459.80	-15283.00	-8599.40
		(+46.11)	(-43.73)
Reserve money	**80510.30**	**97500.90**	**109226.40**
		(+21.10)	(+12.03)
Currency Issued	**50465.40**	**60526.90**	**63882.21**
		(+19.94)	(+5.54)
i) Currency outside banks	46157.10	54795.10	57883.31
		(+18.71)	(+5.64)
ii) Cash in tills	4308.30	5731.80	5998.90
		(+33.04)	(+4.66)
Deposits held with BB	**30044.90**	**36974.00**	**45344.19**
		(+23.06)	(+22.64)
Of which: Excess reserves	12402.90	11849.00	12406.19
		(-4.47)	(+4.70)
Reserve money multiplier	**4.51**	**4.52**	**4.74**

Note: Figures in brackets indicate percentage changes over end June.

mobile banking reducing the amount of cash demand. DMBs maintain reserves with BB for daily transaction consequences. DMBs target is to acquire marginal efficiency in terms of keeping minimum reserves in Taka denomination. DMBs demand and time deposits 6% (CRR) along with foreign currency clearing account balance is preserved as reserves in the balance sheet of BB. To avoid the liquidity shortfall arising from cheque clearing DMBs retain Taka with BB more than cash reserve requirement (CRR). For liquidity management purpose excess

reserves is calculated deducting CRR from local currency balance. Growth in currency reduces the excess reserves of DMBs. Largely deposit growth depends on financial engineering.

High currency deposit ratio and reserve deposit reserve ratio lower the money multiplier increasing high powered money (RM). Accordingly OMO, repo, reverse repo and foreign exchange sale/purchase is deployed allowing for short term liquidity management and keeping the desired rates. Auction of government treasury bills and bonds is used for debt management. These are the indirect instrument of monetary policy. Apart from those direct instruments CRR, SLR, bank rate and discount window is used sparsely. RM is mainly deterministic. BB reins M2 through money multiplier. Currency deposit ratio and reserve deposit ratio elements of liability side of M2 and RM determine the magnitude of money multiplier. RM is the operating target of monetary policy. Credit to government from the DMBs is complementary (necessary) element. On the other hand claim on government from BB is substitute owing to opportunity cost of funds with seigniorage and inflation effect. Eventually the holders of Taka need to bear the cost of government seigniorage gain. Concentration of asset due to unproductive investment in private and public sector stimulate the income inequalities in the country impacting the benefit of GDP growth.

Money multiplier

Money multiplier of Bangladesh observes volatility in some cases influencing interest rate, exchange rate and inflation. Currency deposit ratio (c/d) and reserve deposit ratio (r/d) determines the magnitude of money multiplier. Deposit growth depends on currency demand and financial engineering. The monetization rate in Bangladesh is fifty percent of GDP in relation to interest rate sensitivity and its pass-through in the economy. Currency is a random factor. Excessive government borrowing from BB enlarge the RM creating volatility in money multiplier. Money multiplier can enter solving (1+c)/(r+d). Programmed currency and deposit amount for end June 2012 is Tk. 57883.31 crore and Tk.459370.29 crore. Reserve amount Tk.51343.09 crore contains cash in tills and balances with BB. To arrive money multiplier 4.74 for end June 2012 the calculated c/d is 0.1260 and r/d is 0.1118.

Section III

Balance of payments accounts program in a nutshell

Export and import growth for FY 2011-12 is programmed 10.88% and 9.78% (Table-4) correspondingly keeping the momentum of the economy. Workers remittance is expected to uphold stable growth at 10.01%. As a result US$ 994 million will be surplus in the current account. MLT loans expected to generate US$ 1021 million (Table-4) in the financial account channelizing pipeline credit. Other long-term loan (net) will reach at US$ 55 million at the end of June 2012. DMBs contribute about US$ 138 million. Altogether the overall deficit US$ 406 million is intended. Decrease of BBs asset position US$ 360 million and liabilities number US$ 46 million is calculated in this regard.

According to IMF Balance of Payment Manual (BPM-6) Income and Current Transfer head of BPM-5 will be termed as Primary Income and Secondary Income of Current Account Balance (CAB). There is also among others difference in sign treatment between BPM-5 and BPM-6 for debit and credit entry. Export of Trade Balance is compiled using Export Promotion Bureau (EPB) data on value of goods without shipment cost (f.o.b. price). BB data is used for calculation of Import at f.o.b. (freight on board) price. Service head Debit mainly includes transportation and travel cost for instance comprising medical and education cost abroad. FDI, Portfolio Investment, Other long-term and Short-term interest is included in the Debit account of Primary Income. Grant component Food aid and Commodity aid is included in the Official Transfers of Secondary Income of CAB.

Project aid is integrated in the Capital Account. Portfolio Investment relates to investment in the capital market. FDI is the most precious investment of Financial Account. Financing through Economic Relations Divisions such as loan from World Bank, ADB or other agencies together with specific country is counted in the Medium and Long Term Loans head of Financial Account. Other long-term loans (net) speak about private sector loan. Bangladesh Petroleum Corporation loan is built-in Other short-term loan account. Difference between EPB and BB export data is known as Trade Credit (net). Difference mainly relating to export and import of Export Promotion Zone (EPZ) is captured in Other Assets account. Reporting error and exchange rate difference is reflected in the Errors and Omissions account of Financial Account. Negative sign in the Asset side of BB means decrease. Negative sign indicates increase of Liability. Overall Balance of BOP emerges deducting Asset from Liabilities of BB allowing BPM-6.

Table 4 : Balance of Payments Program

Particulars	FY 2010-11@A	FY 2011-12@@
Trade balance	**-7328**	**-7792**
Exports f.o.b(including EPZ) 1/	23008	25512
		(+10.88)
Imports f.o.b(including EPZ)	-30336	-33304
		(+9.78)
Services	**-2398**	**-2340**
Credit	2570	2672
Debit	-4968	5012
Primary income	**-1354**	**-1514**
Credit	119	129
Debit	-1473	1643
Of which:Official interest payment	-220	163
Secondary income	**12075**	**12640**
Official transfers	127	140
Private transfers	11948	12500
of which : Workers' remittances	11650	12816
		(+10.01)
Current account balance	**995**	**994**
Capital account	**600**	**696**
Capital transfers	600	696
Others	0	0
Financial account	**-1584**	**-2031**
i) Foreign direct investment(net)	768	912
ii) Portfolio investment (net)	-28	16
iii) Other investment(net)	-2324	-2959
MLT loans 2/	1051	1021
MLT amortization payments	-739	811
Other long-term loans (net)	-101	55
Other short-term loans (net)	531	-112
Trade credit (net)	-1895	-1953
Other assets	-1011	-1297
DMBs & NBDCs(net)	-160	138
Assets	-452	-80
Liabilities	292	58
Errors and omissions	**-936**	**-65**
Overall balance	**-925**	**-406**
Reserve assets	925	406
Bangladesh Bank(net)	925	406
Assets	749	-360
Liabilities		
	176	46

Section IV

Determination of interest rate, foreign exchange rate and inflation as policy variable

Interest rate : Rise in interest rate augment the duration gap of assets and liabilities of DMB's reducing the equity value. Higher duration gap is responsible for more volatility. Therefore, DMB's maintain lower capital of their risk weighted assets in Tier 1 and Tier 2 according to Basel II. Proper interest rate lowers the volatility. Higher inflation leads to more currency demand at hands, which may expedite liquidity crisis in the DMB's. Productive investment of resources and planned government borrowing will contain the inflation with higher economic growth. Narrow spread (less than 5%) of deposit and lending rates of banks is indispensable for investment. Prevailing fixed deposit (term deposit) rate for six months tenor 12.50% is ample to attract local currency and foreign funds in the banking system. Bangladesh observed stable money demand function with limited short term fluctuation and long run convergence. Dhaka inter-bank offered rate (DIBOR) is calculated for near term and far term settlement accepting rational expectation. Surge in inter-bank call money rate is addressed using OMO of BB. Organized secondary market trading of government treasury bills and bonds improving liquidity may lower the interest rate. To reduce the currency growth and mobilize the marginal savings risk free instrument of Directorate of National Savings (DNS) has role in Bangladesh. Research reveals that comparing India and Pakistan DNS rates need to be maintained more than 200 basis points of current January 2012 inflation rate (10.91%). Productive investment in the country will increase the GDP growth containing inflation.

Foreign exchange rate : Bangladesh adopted floating foreign exchange rate partially in the capital account of BOP in 2003. Since then the exchange rate is determined through demand and supply of market forces. BB intervenes in the market considering seasonality and special need of the economy. BB uses inter-bank foreign exchange minimum rate for instance Tk.81 for buying from DMB's. Maximum rate for example Tk.82 is used for selling. Volatility in the foreign exchange market largely surface from Bangladesh Petroleum Corporation (BPC) import payment. Bangladesh spends by and large US$6 billion in a year for fuel import. DMB's are allowed to preserve 15% foreign exchange of their risk weighted assets of Tier 1 and Tier 2 of Basel II. Taka-Dollar and cross currency SWAP and forward transaction comprises near leg and far leg is allowed accommodating comparative advantage and rational expectation. DMB's also use long (covered purchase) and short (uncovered sell) according to their foreign

exchange limit determined by BB. Increase in overall net short position enhances the foreign currency demand rising exchange rate in the market.

BB internally uses REER (real effective exchange rate) based exchange rate to monitor the competitiveness of Taka. REER based exchange rate Tk.71.12 arrives multiplying NEER (nominal effective rate), relative price index and market exchange rate and dividing the term with100. [71.12=(56.3×1.55 ×81.5)/100]. To boost up export and remittances devaluation is followed considering the need of the economy. Devaluation or appreciation of Taka comes up calculating deviation of current rate (Tk. 81.5) from the base period rate (Tk.70). The calculation procedure may be mentioned as ((base rate/ current rate) -1)×100. Considered devaluation rate for a particular time is 14.11% ((70/81.5) -1)×100.

Inflation rate : The paper is concern with the safe limit of monetary expansion (quantity of money) and RM subject to GDP containment for effective controlling of inflation. Increasing rational level of RM and monetary (M2) expansion over seventeen percent level (eight percent inflation, seven percent real GDP and two percent change in income velocity), which is the safe limit may fuel inflation. Balanced NDA of RM along with NFA produces effective result to limit inflation. External sector overall balance of BOP through NFA impacts the M2, RM and inflation as well. Accommodating the impact of savings and investment Bangladesh follows balanced growth in expansion of NDA and NFA of RM containing inflation in single digit in current decade. Besides savings and investment to understand the causes of inflation expenditure through annual development program (ADP) has significant role in balancing demand and supply of the country. It may be noted that monetary and fiscal policies action in curbing inflation is reflected in the NFA and NDA of BB and M2 balance sheet. Undesired monetary or fiscal expansion increases the inflation through RM channel affecting financial deepening. Unplanned borrowing from BB and commercial banks may positively impact the inflation.

Section V

Conclusion

Model on monetary programming suggests BBs practice of demonstration of asset side programming of M2 and RM in MPS is partial. For plain and fair monetary policy with proper due diligence publication of comprehensive monetary programming of Bangladesh is important. Less fabrication in calculating demand and supply side of monetary policy with low time series data lags and maintaining

maximum degree of freedom is the essence of publicly presenting asset and liability side prudent monetary policy in Bangladesh. Liability side currency deposit ratio and reserve deposit ratio is needed to observe money multiplier trends. Assets side NFA of RM and M2 is deterministic variable. Increase in FDI and MLT loans can generate more surpluses in the overall balance of BOP improving NFA of BB. In order to improve the ability of payment and asset quality mix in RM foreign exchange reserves more than three months of import payment is vital following credit rating of the country. Private sector credit of M2 is random variable. Housing loan, auto loan, crop loan, credit card to the common people like developed country encouraging financial inclusion as well as monetization in Bangladesh. Currency data of different period shows it's positively related to transaction demand with respect to GDP and inflation and inversely related to interest rate of banks and national savings certificates (NSC). Precautionary demand for money represented by broadly demand deposit (checking account) of real money balance (M1) is positively related to income. Speculative demand (time deposit) is inversely related to interest rate.

Credit to government from the DMB's is complementary (necessary) element. At the same time, claim on government from BB is substitute owing to opportunity cost of funds with seigniorage and inflation effect. Eventually the holders of Taka need to bear the cost of government seigniorage gain. On the other hand, government deposits all its cash balances with BB free of interest. The opportunity cost of money in Bangladesh is virtually limited to housing, land and crops. Unplanned investment channelizing private and government sector will inflate the real asset and commodity prices creating income inequalities in the country. Claims on DMB's in RM depend on liquidity need and refinancing to export and SME for employment generation. Other item (net) component of RM and M2 is quadratic nature bearing two different sign randomly. Liability side component currency growth is stochastic variable. Excess reserves reported in the RM liability side demonstrate the marginal efficiency of DMB's. Excess reserves depend on BBs policy factor for instance CRR and financial engineering. Government sector credit is crucial, which is treated as come forward ad hoc basis encouraging the economic activities of the country. Government can borrow money through overdraft from BB as government has taxing ability. This amount increases the NDA of BB and high powered money generating volatility in money multiplier and economic rates of the economy. Amortization and gradual securitization of government debt taken through overdraft from BB may improve the balance sheet of central bank enhancing market dynamics. In the external sector affairs the book value relating to interest rate encouraging financial

intermediation is not authenticated to some extent. It is influenced by asymmetric information and moral hazard, which is covered by insurance company addressing inflated book value (asset bubble) arising from subprime lending in the housing sector. EU countries among others are concern with austerity issue and recapitalization of banks. These countries are experiencing more government expenditure comparing income. At the same time, due to near term uncertainty the demand is not strong enough in the developed countries encouraging economic growth. This global frontier outcome is largely impacting the NFA of RM in Bangladesh.

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