

Volatility in the Overnight Money-Market Rate in Bangladesh: Recent Experiences PN 0707

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Abstract

This paper tries to investigate the pattern of volatility in the overnight money market rate (call money rate) in Bangladesh using subjective judgment as well as econometric techniques during the period Jan '03 to Dec '06. The study results show significant variation in volatility during the sample period: a "clustering" of large and small variances of call money rate. In addition, there is strong evidence that the volatility shocks are quite persistent. The volatility in the call money rate perhaps reflects the effect of the open market operations and seasonal factors, and it is closely linked with the behavior of the repo rate.

1. Introduction

Call money rate -the rate at which short term funds are lent and borrowed among banks- is the core of an overnight money market for credit. Volatility of the overnight money market rate (call money rate) is a very usual phenomenon for a well-functioning market. Market participants determine the rate according to their perceptions of the current and future liquidity condition in the market. Thus this rate reflects the supply and demand behavior of bank reserves, and hence, gives important signals to the central bank to understand the market pressure. Given this reasoning, the rate is often closely linked with other interest rates in the market or the foreign exchange rate. Therefore, many central banks implement policy in a way such that the call money rate does not deviate much from the central bank's policy rate. In cases, where call money rate shows extra-volatility-higher and lower than the normal-central bank tries to find the reasoning behind this; whether the pressure comes from demand side of the market, or because of seasonality, and whether the rate is going to die out automatically, or whether intervention of the central bank is required to stabilize the rate. Of course, the extent to which central bank intervenes in the market depends on the perception of the central bank regarding the volatility. In many cases, the overnight money market rate is used itself as the central bank policy rate (federal funds rate in case of USA) and in other cases central banks uses the rate as a market clearing rate. Although operational procedures of monetary policy determine largely whether it is a policy rate or market clearing rate, central banks all over the world monitor the rate on a day-to-day basis and try to stabilize the market as much as possible.

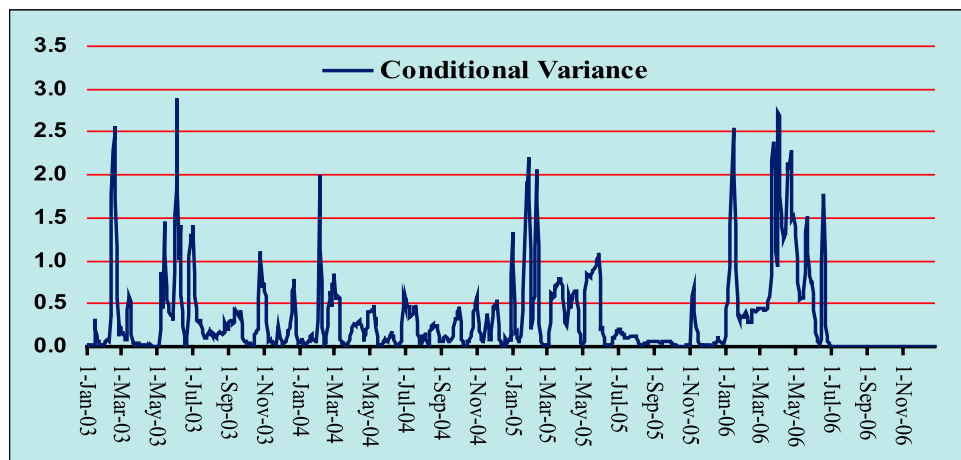
The purpose of this study is to analyze the fluctuations in call money rate in Bangladesh during the period from July 1, 2003 to December 31 2006. While rate volatility is measured using the high frequency daily data, monthly analysis is employed to understand the overall pattern and the interaction with the monetary policy instruments.

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2. Volatility pattern in the call money rate during January '03 to December '06

Chart 1 shows the conditional variance of the call money rate over the period Jan '03 to Dec '06 using daily data. The horizontal axis in the graph shows the time period starting from Jan 1' 03 to Dec' 26, 2006. As can be seen from Chart 1, volatility in the call money rate is followed by a clustering at some particular points of time; there are periods of high volatility followed by periods of low volatility. Volatility in the call rate showed a break during Feb-Jun' 03. This is the period when the floating exchange rate system was introduced in Bangladesh.¹ In the period immediately before the change, BB tightened liquidity in the market as a precautionary measure to curb speculative tendencies in the foreign exchange market. As a result of tight open market operations, the overnight money market interest rates faced additional pressure and reached high levels. From the end of 2004, the call rate, however, became volatile, which continued during the whole of the first quarter and a part of the second quarter of 2005. This is in fact the period when the central bank tightened liquidity in the market as it found problems relating to the prices of essentials and balance of payment situation more pressing. In 2006, the monthly average call money rate remained relatively unstable in the first half before settling down in the second half.

Chart 1: Conditional variance estimated from GARCH model, Jan' 03- Dec' 06



Source: Bangladesh Bank Quarterly and Monthly Review, DSE

The volatility in the first half of 2006 has been explained by Bangladesh Bank (2006) as the result of seasonal effects. In each instance of volatility, BB undertook its open market operations to reduce the volatility in the overnight money market. During the entire second half of 2006 the call rate remained exceptionally stable. The next section discusses the factors affecting the volatility in call money rate in Bangladesh. A related query is about the persistence of volatility shocks. Our study shows that volatility shocks in the call money rate are quite persistent in case of Bangladesh (see Appendix 1 for details).

3. Factors affecting the volatility in the call money rate in Bangladesh

Call money rate in Bangladesh can be viewed as a market clearing rate. Fluctuations in the overnight rates come mainly from supply and demand for liquidity in the money market. Periodic change in reserve requirements as well as economic and seasonal factors may cause the demand to rise. The overnight money market rate can also be impacted on the days when Bangladesh Bank (BB) conducts open market operations. Apart from repo and reverse repo operations, Bangladesh Bank performs the T-Bill auction on a pre-specified day of each week. These issues are discussed below.

¹ Bangladesh stepped into fully market based exchange rate effective from May 31, 2003.

3.1 Supply and demand for bank reserves

The call money rate arises as an interaction of demand for and supply of bank reserves. As a result, factors influencing demand and supply conditions of bank reserves influence the call money rate. These factors are: periodic change in reserve requirement, Bangladesh Bank's intervention through open market operations, commercial banks cash' requirements to meet their daily payment obligations and other factors like seasonal effects or signs of economic boom (or downturn) etc. The market facilitates efficient distribution of reserves throughout the banking system. While both banks and non-banking financial institutions can now participate in the call money market in Bangladesh, the latter institutions can borrow only up to 15 percent of their net assets.² The Bangladesh Bank regulation requires that banks and non-bank financial institutions licensed by BB to maintain a certain percent of their deposit liabilities as statutory reserve.³ Reserve requirement is calculated as a proportion of average level of deposits held over a month, called reserve computation period. The calculated amount must be satisfied on average over a reserve maintenance period, which is fortnight.

Demand for bank reserves can be divided into a demand for required reserves and a demand for excess reserves defined as deviation from the level of required reserves holdings. In Bangladesh, the reserves maintenance period follows the reserves calculation period with a lag. Moreover, BB allows reserve averaging and limits the degree to which banks' daily reserve balances can deviate from the average requirement level. The averaging provision in bank reserves permits individual banks to use part of their reserves to offset short-term or seasonal fluctuations in liquidity, which in turn provides greater interest rate sensitivity in the demand for bank reserves during the early and middle part of the maintenance period. Banks, however, would be indifferent about the amount of reserves they held if they expected no significant fluctuations in the inter-bank rate. Moreover they may be cautious to deviate from the average level of reserve position they maintained for the fear of not being able to adjust their position as the number of days remaining in the maintenance period reduces. So the demand for bank reserves tends to be interest inelastic especially at the end of the reserve maintenance period. Apart from this, seasonal factors like major festivals can cause the demand for reserves to be unstable. As a result, BB has to be more attentive in managing the supply of bank reserves in the face of uncertainty due to low interest rate elasticity and volatile demand for bank reserves when seasonality arises.

Everyday BB, through its liquidity forecasting exercise predicts changes in external factors affecting its balance sheet and causing autonomous supply of bank reserves in order to take differences in demand for and supply of bank reserves. BB takes these differences into consideration in order to assess its intervention in the money market through daily open market operations to offset excess reserves the following day to balance the supply and demand. Thus, BB corrects these differences with a one-day lag and brings the amount of reserve money expansion in line with its target so that supply of broad money can be guided to remain within the programmed range.

² Since April 1998, non-bank financial institutions having license from Bangladesh Bank are allowed to participate in the call money market.

³ The present Bangladesh Bank circulars require the scheduled banks to maintain 18 percent of their deposits as Statutory Liquidity Ratio (SLR), where Cash Reserve Requirement (CRR) must be kept at the rate of 5 percent on the daily average on a two-week basis but no less than 4 percent on any given day (BRPD Circular No. 11/2005 and 12/2005). Non-bank financial institutions who accept term deposits are required to maintain a rate of 5 percent of total liabilities as SLR, of which 2.5 percent of term deposit must be kept as CRR on the daily average on a bi-weekly basis but no less than 2 percent on a given day (FID Circular No. 06/2003 and 02/2004).

3.2 Interaction with repo, reverse-repo and T-bill rates

The call money market in Bangladesh is affected by BB's open market operations. While BB traditionally conducts the weekly Treasury bill auction as part of the open market operation, a recent development is the introduction of repo (repurchase agreement), reverse repo and interbank repo operations from July 2002, April 2003 and July 2003, respectively. Both repo and reverse repo transactions are conducted through auctions held on any working day. Through repo operations, BB lends fund to a bank or financial institution by purchasing securities, which the bank or financial institution repurchase upon maturity. The reverse repo facility enables participating institutions to purchase government securities from Bangladesh Bank upon commitment of resale after the agreed upon term. Both repo and reverse repo arrangements are for overnight to seven-day terms.⁴

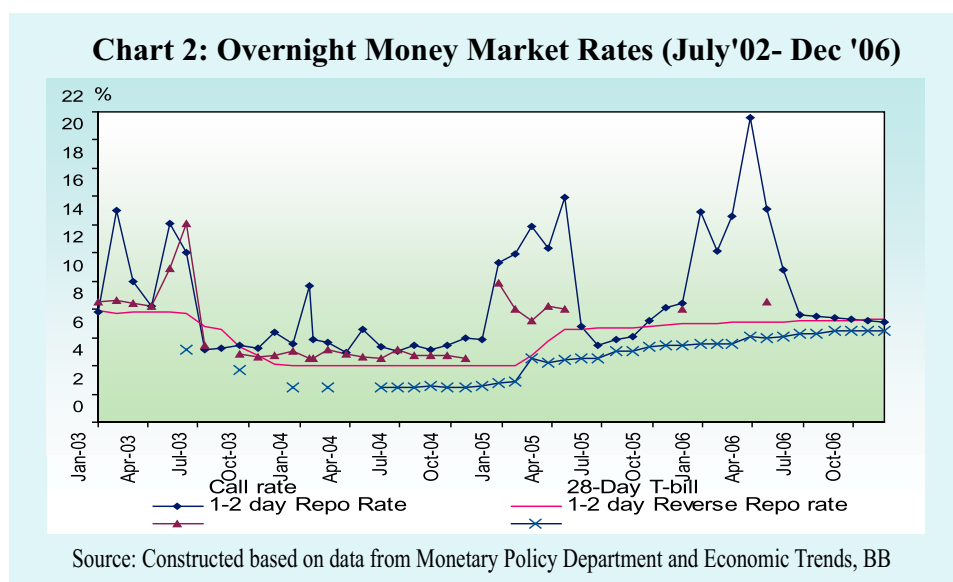


Table 2: Correlation Coefficients among Various Money Market Rates (July '02-Dec '06)

	Call rate	1-2 day Repo Rate	1-2 day Reverse Repo rate	28-Day T-bill rate
Call rate	1.00			
1-2 day Repo Rate	0.73	1.00		
1-2 day Reverse Repo rate	0.38	0.66	1.00	
28-Day T-bill rate	0.40	0.72	0.95	1.00

Figure 1 shows the monthly trend of T-Bill rate, 1-2 day repo rate, 1-2 day reverse repo rate and the call money rate. As mentioned above, the first three rates emerge from an auction process at BB and the call money rate is determined in the marketplace. While all the four rates positively correlate with each other, the call money rate has the highest correlation with the 1-2 day repo rate (0.73, Table 2). However, the correlation coefficient between call money rate and 1-2 day repo rate is still less than perfect because of the withholding of repo operation by BB for most of the periods since June '05 on account of restrained monetary policy stance. Again, 28-day T-Bill rate shows high correlation especially with the reverse repo rates. This is because both are deposit instruments and the auction process is similar with same participating agents. It can be generally suggested that all the four rates are closely linked with each other. The reason behind the high

⁴ The term can be extended by the number of Bank holidays.

among various money market rates and call market is that BB uses the open market operation to maintain a desired amount of liquidity in the market. During the period of high demand for central bank money, the bidders quote higher repo rate in order to increase their chance to get the central bank money. Thus, a higher overnight market rate (i.e. call money rate) leads to a higher repo rate from the auction. Similarly, the injection or withdrawal of funds to and from the market by BB in turn exerts an impact on the call money rate for overnight transactions in the appropriate direction. It is observed from Chart 2 that volatility was higher in different periods during Jan' 03-Dec' 06.

4. Conclusion

This paper has examined the pattern of volatility in the money market in Bangladesh over the period of Jan' 03 to Dec' 06. The study results suggest volatility follows a cluster, which perhaps reflects the effect of the open market operations and seasonal factors. It is also evident that the volatility shocks are quite persistent. The high correlation between call money rate and 1-2 day repo rate indicates the effectiveness of open market operation of Bangladesh Bank.

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Appendix 1

Estimation of the persistent of volatility in call money rate using GARCH model

The GARCH model is an extension of the original ARCH model introduced by Engle (1982).⁵ The central focus of the GARCH model is that the variances of the error terms are not equal at all points or ranges of the data. In such a situation, regression coefficients for an ordinary least squares estimation can give a false sense of precision (Engle 2001). The ARCH/GARCH model solves the problem by modeling the variances.

The GARCH model is widely used to estimate the variance of a series at a particular point in time. Examples include study on high frequency series of interest rate, inflation and stock market returns. The present study, a standard GARCH (1, 1) model is estimated with no regressor in the mean and variance equation. The dependent variable is log of the daily call money rate.

$$\text{Call R} = C + E_t \quad (1)$$

$$h_t^2 = c_0 + a_0 E_{t-1}^2 + b h_{t-1}^2 \quad (2)$$

Equation 2 is the variance equation, which contains three components: a constant, last period volatility (the ARCH term) and last period variance (the GARCH term). The autoregressive root which governs the persistence of volatility shocks is the sum of a and b . If the sum of a and b is very close to unity then the shocks die out rather slowly. Equation (3) shows the estimated variance equation.

$$h_t^2 = 0.0000306 + 0.7838 E_{t-1}^2 + 0.4563 h_{t-1}^2 \quad (3)$$

$$(1.41) \quad (29.42) \quad (42.44)$$

$$\text{Log likelihood} = -171.08, \quad s = 0.4648$$

Equation (3) predicts the persistence of the volatility. Both the ARCH and GARCH terms are statistically significant and their sum is close to unity. It suggests that the variance of the regression error depends on the volatility of the errors in the past. The sum of the ARCH and GARCH coefficients is close to one, indicating that volatility shocks are quite persistent.

5 The GARCH model was introduced by Bollerslev (1986). See Palombini (2003) and Joshi (2004) for recent studies on interest rate volatility using GARCH model.