THE ANNOUNCEMENT IMPACT OF BANK RATE ON COMMERCIAL PAPER RATES

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Abstract

Central bank actions are designed to influence asset prices and yields, which in turn affect economic decisions. Following the reforms in the Indian financial sector, the Bank rate has emerged as an important indicator for signalling the stance of monetary policy for the market and guiding the interest rates to the desired trajectory. Commercial Paper (CP) has evolved as an important source of resource mobilization by the corporates during last few years. Like other money market rates, CP rates are also influenced by the changes in the Bank rate. This paper attempts to capture the extent and nature of influence of announcement of bank rate changes on Commercial Paper rates in India. It concludes that the time series data of CP rates and Bank rate are non-stationary at level. However, these data series are found to be cointegrated. The Error Correction Model reveals that the changes in Bank rate are not quickly reflected in the CP rates. The regression equations reveal that there is a statistically significant relationship between Bank rate and CP rates. The result obtained from using regression analysis for 30 days window period for each of the eight times when Bank rates have changed reveals that compared to 1999-2000, the CP rates have become more sensitive to Bank rate changes during 2001-2003. The bank rate has thus established itself as a potent signalling rate for CP rates in recent years.

Key Words: Bank rate, Commercial Paper rates, Announcement impact, Monetary Policy transmission

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1. Introduction

Monetary policy in our country has multiple objectives such as ensuring price stability, currency stability, liquidity, financial stability and overall growth in the economy by creating employment and income. Any monetary policy change brings both short and long term effects. Monetary policy actions are known to have important implication on financial markets especially in short-run. Therefore, understanding of transmission mechanism of monetary policy actions on financial markets is important to devise the monetary strategies and tactics. The key objectives of monetary policy in India have been those of maintaining price stability and ensuring adequate flow of credit to the productive sectors of the economy. Monetary policy *targets* are proximate goals which, if attained, will work directly toward achieving the longer-term objectives of policy. Monetary *instruments* that affect operating targets are generally classified as either direct or indirect. Direct instruments function according to regulations prescribed by the central bank that directly affect either interest rate or the volume of credit: for example, administratively set interest rate ceilings, individual bank credit ceilings, changes in reserve requirements, and directed lending. Direct instruments become increasingly ineffective as money and financial markets develop (Khan, 2003); besides, they are known to create distortions, and promote financial disintermediation. In India also we have gone through similar experience after the liberalization measures were initiated in early 1990s. Indirect instruments are also termed "market-based instruments," since their use affects the market-determined price of bank reserves as the central bank engages in transactions with both financial and non-financial institutions. There are two main types of indirect instruments—open- market operations, and central bank lending policies—that are used to inject and absorb liquidity. Bank rate, representing the latter type, is the rate at which the RBI lends to commercial banks and acts an important benchmark in determination of interest rates charged by banks from the ultimate borrowers.

By definition, Bank rate is the rate at which RBI rediscounts bills of exchange presented by the commercial banks. The Bank rate influences the cost of credit of refinance and other financial accommodation extended to commercial banks and other specified financial institutions. The efficacy of the Bank rate as monetary policy instrument depends essentially upon commercial bank's dependence on the RBI for funds and the influence it welds on other interest rates. In the context of deregulation of interest rates Bank rate is operationalised as a reference rate for the entire financial system.

Commercial Paper (CP) has emerged as an effective instrument for meeting short term financing requirements of corporates and an investment avenue for commercial banks to park their surplus funds. The CP rates usually lie between prime lending rate of commercial banks and some benchmark interest rate like 91-day Treasury bill rate, bank rate, 3 month MIBOR, Average Call Money Rate, etc. Except for the bank rate, which is a policy-induced rate, other rates are market determined. The subject of investigation of this paper is the relationship between bank rate and the CP rates.

The objective of this paper is to examine the role of bank rate in determination of Commercial paper rates in India in the recent years. It also examines the announcement impact of Bank Rate changes on Commercial paper Market Rates**.** The period under study is January 1999 to June 2003. The period chosen is deliberately very short due to the fact that the Commercial papers have become a popular channel of financial mobilization by corporates only during last few years. The paper also makes an attempt to examine the rate of adjustment of Commercial paper rates to announcements made by RBI to change the Bank Rate.

The remainder of this paper is organized as follows; section 2 describes the data and the methodology followed for the study. Section 3 discusses the theoretical perspectives on monetary policy transmission mechanism, the stance of recent monetary policies in India and the importance and nature of Bank rate and Commercial Paper (CP) rates. Section 4 examines the econometric relationship between CP rates and Bank rates and section 5 gives the conclusions of the study.

2. Data and Methodology

We have collected CP rates and Bank rate data for the period is January 1999 to June 2003. The following table presents the details of these data sources.

Table 1: Data Sources

Rate	Period	Basis	Source
Commercial Paper Rate (for 90 days of well-rated papers)	January 30 June 2003	Daily Basis	Moneyline telerate.
Bank rates	January 1999 to June 2003	As announced in the Monetary Policy by RBI	Reserve Bank of India (as given in various circulars).

We have tested for stationarity and cointegration of time series data using Augmented Dickey Fuller Test. The relationship between CP rates and bank rate has been examined through regression analysis using Ordianary Least Square (OLS) method. The changing sensitivity of CP rates to Bank rate change announcements have been examined by using regression analysis on 30 days window period before and after the date of effecting the change in Bank rate.

3. Theoretical Perspective of Monetary Policy Transmission Mechanism

The monetary policy stance has to respond to the evolving developments during a year and, therefore, the actual conduct of policy cannot be defined *a priori* at any point of time. The overall approach, however, is generally pronounced annually in the third Week of April after Central Government Budget, with mid-year reviews prepared in October. The union budget provides certain important inputs for monetary policy such as fiscal deficit as percentage of GDP, market-borrowing requirement of the government and interest rate in small saving instruments.

The monetary policy significantly influences economic behavior in every sector, including the commercial sector, of the economy. The monetary transmission process links monetary policy actions to the ultimate objectives of policy. Monetary policy has

four transmission channels: the interest rate channel, the quantum channel, especially relating to money supply and credit; the exchange rate channel, and the asset prices channel. Monetary policy impulses under the quantum channel affect the real output and price level directly through changes in either reserve money, money stock or credit aggregates. The remaining channels are essentially indirect as the policy impulses affect real activities through changes in either interest rates or the exchange rate or asset prices (Reddy, 1999).

The interest rate channel of monetary policy transmission operates within an IS-LM[1] framework and is considered as a conventional view. Negative monetary shocks limit the banking system's ability to sell deposits. Demand for bonds increases while demand for money decreases. If prices are not fully adjustable, real money balances will decline, pushing up interest rates, and raising the cost of capital. Investment spending declines, reducing both aggregate demand and output. The monetary transaction mechanism under this view works through the liability side of bank balance sheets. Taylor (1995) argues that financial market prices are key components of how monetary policy affects real activities. In his model, a contractionary monetary policy raises short-term interest rates. Since prices and wages are assumed to be rigid, real long-term interest rates increase as well. These higher real long-term rates lead to a decline in real investment, real consumption, and thereby on real GDP. In the long run, after wages and prices of goods begin to adjust, real GDP returns to normal. In summary, this view emphasizes the role of interest rates in responding to monetary policy and affecting economic activity.

The credit channel is not actually an alternative view to the traditional monetary transmission mechanism. It is a set of factors that amplify and propagate the conventional interest rate effects. In other words, the credit channel is an enhancement mechanism, not a truly independent or parallel channel. This new view of monetary transmission emphasizes how asymmetric information and costly enforcement of contracts creates agency problems in financial markets (Bernanke and Gertler ,1995). As described by the credit channel, an external financial premium, which is the gap between the cost of funds raised externally (by issuing equity or debt) and the opportunity cost of funds raised

[1] Investment- Saving, Liquidity preference- Money Supply

internally (by retaining earnings), has an important role in economic activities. The size of an external finance premium reflects imperfections in credit markets that drive a wedge between the expected return received by lenders and the costs faced by potential borrowers. Monetary policy, which alters interest rate, tends to affect the external finance premium in the same direction. Thus, the direct effects of the monetary policy on interest rate are amplified by changes in the external financial premium. This complementary movement in the external finance premium may help explain the strength, timing, and composition of the monetary policy effects better than a reference to interest rates alone. In summary, the credit channel view supposes that banks play a special role in the financial system, because they are especially suited to dealing with certain types of borrowers, especially small firms, where the problems of asymmetric information can be pronounced.

The traditional explanation concentrates on the demand for money, that is, the liability side of the financial system. However, since the late 1980s, researchers have been re-examining this transmission process from the asset side of banks' balance sheets, namely credit to the private sector. It has two implications that are of particular relevance for policymakers. First, in many instances credit may serve as a superior intermediate variable for monetary policy, as well as a leading indicator for economic activity. Bernanke and Blinder (1988) show that if one considers the impact of monetary policy on the ability of the banking system to lend, credit succeeds as an intermediate variable where monetary aggregates fail, specifically, when demand for money is unstable, as is the case when a country is undergoing a process of financial development. Thus, in these circumstances policymakers may get a clearer picture of inflation or longer-term economic growth by observing credit rather than monetary aggregates.

Second, identifying the credit channel of monetary transmission has permitted a greater understanding of the nature and characteristics of business cycles. As a series of studies following Bernanke and Gertler (1995) and Gilchrist (1999) and others during the late 1990s shows, the impact of monetary policy and other shocks to the macro economy tends to be stronger and more persistent than traditional models would predict, and the credit channel helps to explain this discrepancy. The credit channel contains an

amplifying mechanism whereby difficulties in the real sector lead to tightness in credit markets, thus shrinking the credit available for investment, which in turn exacerbates the real sector's downturn. Furthermore, it is now apparent that shocks to bank credit itself may have a considerable impact on economic activity.

The entire monetary policy transmission could be conceptually analysed in terms of stages. At the first stage, central bank action affects 'quantify' variables like bank reserves (or base money) or 'price' variables like Bank rate. At the second stage, the changes in reserves or the Bank rate begin to affect 'quantity' variables like narrow or broad money and 'price' variables like the long-term interest rates. At the third stage, the changes in the monetary and financial variables begin to affect aggregate demand, while at the fourth and the final stage the interaction of aggregate demand and supply leads to a change in the prices and output. At every stage, the process of monetary transmission mechanism is extremely complex and the channels through which monetary policy begin to affect the real sector is one of the most widely debated areas in economics. To complicate the matter further, the relative strengths of different channels may very sharply across countries and over time.

3.1. The Stance of Recent Monetary Policies in India

Steps to liberalize interest rates started in the late 1980s. The first major initiative was removal of ceiling on call money interest rates in 1989. In the process of widening the money market, Certificates of deposits were introduced in June 1989 and Commercial paper in January 1990. Treasury bills of various maturities were introduced and the institutional mechanisms were brought in place to provide liquidity to these instruments by creating a secondary market. However, the reforms gained real momentum only after 1992 when, on the basis of Narsimham Committee recommendations, rates of interest in India were gradually decontrolled in a variety of ways. The most important interest rates are now market determined. These include all deposit rates except interest on saving accounts. Banks are allowed to freely determine their lending rate for all types of loans.

The policy framework proposed by the Narasimham Committee I (and Narasimham Committee II later in 1997 on Banking Sector Reforms) guided the course of the monetary and banking sector reforms during most of the nineties in the areas of structural reforms, prudential regulation and deregulation of financial markets. These changes, inter alia, have allowed market forces to play a greater role providing the Reserve Bank much needed room in the implementation of its monetary policy. Under the new liberalised environment of the nineties, the key objectives of the monetary policy are sought to be achieved in an environment of orderly conditions in financial markets and by strategically relying more and more upon indirect instruments like Bank Rate and Open Market Operations.

The RBI has generally assigned priority to low and stable inflation objective, with all other objectives often remaining secondary to this objective. In other words, monetary instruments have been assigned to other objectives only when that is viewed as not very much detrimental to the inflation objective. In recent years, monetary and credit policy have focused on (a) provision of adequate liquidity to meet credit growth and support investment demand in the economy while continuing a vigil on the movements in the price level, (b) a preference for soft interest rates, and (c) to impart greater interest rate flexibility to the interest rate structure in the medium-term. The stance of monetary policy and the rationale are communicated to the public primarily through announcement of annual (and mid term review) monetary policy statement by the Governor of RBI. Of late, the monetary measures are announced by the RBI not necessarily in the annual policy statements but as and when the circumstances warrant. The RBI's communication strategy and provision of information have facilitated conduct of policy in an increasingly market oriented environment. (Reddy, 2002)

The Monetary Policy framework in India from the mid-1980s till 1997-98 can be largely characterized as a monetary targeting framework on the lines recommended by Chakravarty Committee (1985). "From 1998-99 onwards RBI has been following a multiple indicator approach. In this approach, the interest rates or rates of return in different markets along with movements in currency, credit, fiscal position, trade, capital flows, inflation rate, exchange rate, refinancing and transactions in foreign exchange

available on higher frequency basis – are juxtaposed with output data for drawing policy perspectives". (Reddy, 2002).

The Liquidity Adjustment Facility (LAF) which was introduced effective June 05, 2000 has gradually emerged as an effective mechanism for absorbing and/or injecting liquidity on a day-to-day basis in a flexible manner while providing an informal corridor for the call money rate and signalling the stance of policy. Prior to the introduction of LAF, the RBI used to provide liquidity to the banks through its standing liquidity facilities, particularly general and export refinance at rates linked to the Bank Rate. With the introduction of the Interim Liquidity Adjustment Facility (ILAF) in April 1999, the general refinancing was replaced by Collateralised Lending Facility (CLF) and Additional Collateralised Lending Facility (ACLF) at rates linked to the Bank Rate whereas liquidity absorption was done through fixed rate repos announced on a day- to-day basis, supplemented by Open Market Operations in government dated securities and treasury bills depending on the liquidity conditions. Under ILAF, thus, liquidity was injected at different rates and absorbed at a fixed repo rate. As a result, an informal corridor for the call rate emerged with the refinance rate operating as the ceiling and the repo rate setting the floor.

3.2. Bank Rate and Commercial Paper rates

As discussed earlier, Bank rate is the minimum rate at which the central bank provides loans to the commercial banks. It is also called the discount rate. The banking system draws substantial amount of money from the RBI at this rate. Most of this is drawn as refinance entitlement in lieu of providing cheap finance to exporters. There is an intimate relationship between the bank rate and the other interest rates prevailing in the money markets. It acts as a benchmark rate in the money markets. Usually, an increase in bank rate results in commercial banks increasing their lending rates. Changes in bank rate affect credit creation by banks through altering the cost of credit. The influence of change in bank rate can be understood both in terms of interest rate transmission mechanism as well as credit channel transmission mechanism described in the foregoing.

Table 2 provides the number of times the main instruments of monetary policy are used since the 1970s in response to economic circumstances. The table shows that the number of times the three instruments (the Bank Rate, CRR and SLR) were used was the maximum in the 1990s compared with the 1980s and the 1970s. It however shows that the minimum ratios/rates were lower in 1990-2000 than in the preceding decades. During the 1990s, the Reserve Bank used the Bank rate and SLR on more occasions in the 1990s than in the 1970s and the 1980s. CRR, however, was most frequently used in the 1980s (31 times). But even in the 1990s, CRR use was fairly high, having been changed as many as 29 times. As on end-December 2003, the Bank rate has been 6.0 per cent, and CRR and SLR have been at 4.5 per cent and 25 per cent, respectively.

Table 2: Frequency of Changes in Major Monetary Policy Instruments (Number of times)

Year	Bank Rate	CRR	SLR
1970-80	5 (9.0 – 5.0)	11 (7.0 – 3.0)	7 (34.0 – 26.0)
1980-90	1 (10.0 – 9.0)	31 (15.0 – 6.0)*	8 (34.0 – 34.0)
1990-2000	15 (12.0 – 7.0)	29 (15.0* – 8.0)	12 (38.5 – 25.0)
1990-92	2 (12.0 – 10.0	2 (15.0 – 15.0)*	2 (38.5 – 38.0)
1992-2000	8 (12.0 – 7.0)	27 * (15.0 – 8.0)	10 (38.5 – 25.0)
1998-2003	8 (11.0 – 7.0)	19 (11.0 – 4.5)	– (–)

Source: A. Vasudevan (2002)

Notes: Figures in brackets are rates/ratios in percentages. First the maximum is given and then the minimum.

* When CRR touched 15 per cent, it was accompanied by additional reserve requirements of 10 percentage points on incremental net demand time liabilities.

The Bank rate has been used more sharply between 1998- 2003 – eight times, as against eight times during the eight years of 1992-2000, thus indicating the growing significance of the rate variables in the Indian economy. This development is reflective of the heightened financial sector development and the increase in financial innovations. The significant change introduced in operating monetary policy is reactivating the Bank Rate by linking it to other rates including the RBI's refinance rates (Monetary Policy April 1997). Thus, the refinance facility has also served as an active instrument for modulating liquidity in the economy. During this period, the reactivation of the Bank Rate served as an effective signalling device and a reference rate for the entire financial system. Subsequently, the market for repos also expanded and created an informal interest rate

corridor, where repos act as floor and bank rate as ceiling. Thus, in operating the monetary policy since April 1997, Bank rate has emerged as an effective signalling instrument. It is now well recognized that monetary policy decisions must be based on some idea of how decisions will affect the real world and this implies conduct of policy within the framework of a model.

During the period of our study the Bank rate has been changed 8 times. The details are given below in table 3;

Table 3: Changes in the Bank Rate

SN	Date of change of Bank Rates	The Bank rate (%)
1	With effect from 2-Mar-99	8
2	With effect from 2-Apr-00	7
3	With effect from 22-Jul-00	8
4	With effect from 16-Feb-01	7.5
5	With effect from 1-Mar-01	7
6	With effect from 22-Oct-01	6.5
7	With effect from 30-Oct-02	6.25
8	With effect from 30-Apr-03	6

Commercial paper (CP) is a short term unsecured promissory note issued by well rated corporate entities to raise the short-term funds especially for meeting their working capital needs. The permitted maturity is less than one year, but normally most of the corporates are issuing CP for a period of 90 days. Initially this instrument was restricted to large corporates whose net worth and working capital requirements are substantially high. But, gradually RBI has relaxed the minimum entry norms which enabled many companies to successfully raise short-term resources through Commercial paper (see Appendix 1 for the current guidelines). The resources raised by corporates through CP have increased from Rs. 54,723 Crore during 1993-94 to Rs.1, 93,449 Crore during 2002-03, in a period of 10 years, showing a compounded annual growth rate of 15% per annum (Table 4). In the past few years CP has emerged as popular instrument for corporates to meet their short-term financial requirements and for the commercial banks an easily accessible investment instrument to park their short-term surplus funds. The CP market has grown more than ten times the size of the market for 91 day Treasury Bills. The amount of CPs issued in the year 2002-03 is Rs. 193449 Crore, where as the 91 day

Treasury bills amount raised is Rs.17997 Crore[2]. The CP market is basically a primary issue market, where deals are settled on cash basis and the secondary market is very thin. These features of the market make the investors to follow buy and hold strategy with respect to their CP holdings. In comparison to many other short-term financial instruments the positions in CP are longer. The swings in bank liquidity drive the CP market. Though the CP is issued by private enterprises its default risk is non-existent. Investors choose the CP, which is carefully priced against a representative money market rate. As per the RBI "the pricing of CP usually lies between the scheduled commercial banks' lending rate and some representative money market rate"[3]. Commercial banks are active investors of both CP and Treasury Bills, and are quick to exploit the significant divergences between the returns on investment prices for money in the two markets This representative money market rate also indicates the opportunity cost of bank funds. Undoubtedly, CP is priced by certain degree of arbitrage against the money market rate. The CP market may be an effective channel through which monetary policy affects the financing activity of corporate sector.

Table 4: The Amount mobilized by raising Commercial Paper

Year	Amount Raised (Rs. in Crore)
1993-94	54723
1994-95	66619
1995-96	10619
1996-97	8181
1997-98	67350
1998-99	108334
1999-00	166457
2000-01	161853
2001-02	190280
2002-03	193449

(Source: Hand Book of Statistics on the Indian Economy, Reserve Bank of India, 2002-03)

[2] Hand Book of Statistics on the Indian Economy, Reserve Bank of India, 2002-03)
[3] Report on Currency and Finance, Reserve Bank of India, 1999-2000.

4. Relationship between CP and Bank Rates

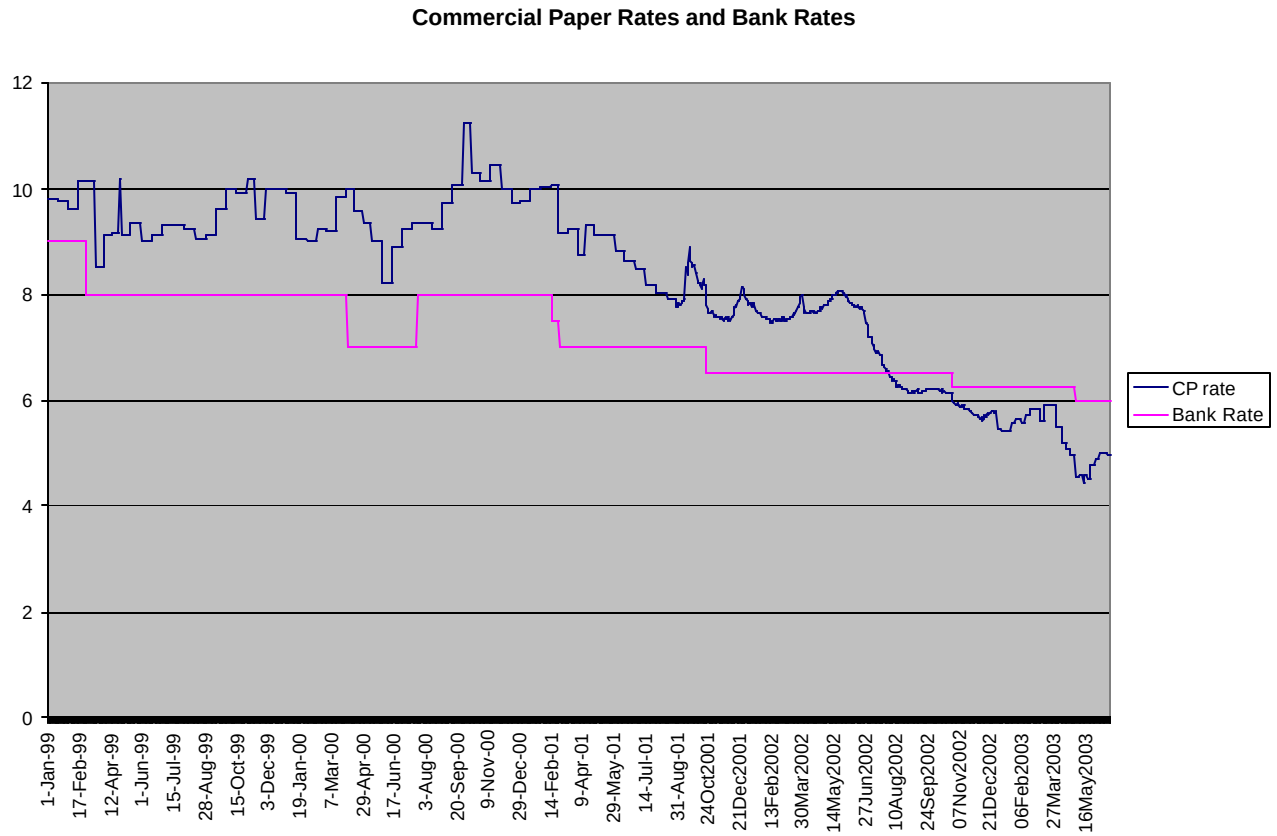
The Table 5 gives descriptive statistics of well-rated 90 day CP rates and the Bank rates.

Table 5: Descriptive Statistics of 90 day CP rate and the Bank rate

Rate	Period	Average Rate (%)	Standard deviation (%)	Kurtosis
Commercial Paper Rates (90 days, well-rated papers)	1 January 1999 to 30 June 2003	8.28	1.59	-0.64
Bank rates	1 January 1999 to 30 June 2003	7.21	0.79	-1.12

The following chart (Chart 1) traces the movements in the CP rates and bank rate during the period 1 January 1999 to 30 June 2003;

Chart 1: Movement of Bank Rate and CP rates



4.1 Testing for Stationarity of data

To test for relationship between CP rates and bank rate, we first establish whether these rates are stationary or not. This is done by performing a unit root test on time series data on these rates. The unit root test identifies variables that are non stationary, meaning that they contain stochastic trend that leads them to wander randomly. The presence of unit root is tested using the Augmented Dickey-Fuller test suggested by Dickey and Fuller (Said 1991).To test whether a series, z(t), is stationary or not we model it as:

$$? z(t) = a + ßt + (?-1)z(t-1) + S_{(j=1 \text{ to } n)} ?(j) ? z(t-j) + e(t) \qquad (1)$$

Both drift and time trend are taken in modeling the series, as financial series are observed to have both these components. The n lag terms have been taken to protect against the possibility that z(t) follows a higher order autoregressive process.

The null hypothesis of H0: ?=1 implies that there exists a unit root and, hence, the time series z(t) is non-stationary. This is tested against the alternate hypothesis that H1: ¦ ?¦ <1which implies that the unit root does not exist and the series z(t) is stationary. The test statistic is a pseudo t-stat, called Dickey-Fuller (DF) statistic, whose critical values have been documented by MacKinnon (1991). We have also used Phillips Perron test statistic to examine the presence of unit root. If the computed absolute value of 'τ' statistic exceeds the critical DF 'τ' then we reject the null hypothesis that the given time series is non-stationary. If, on the other hand, it is less than the critical value, the time series is considered to have unit roots and hence non- stationary. The result of unit root test is given in table 6.

Table 6: Testing Presence of Unit Roots

Augmented Dicky- Fuller Test for Stationarity						
Rates		**Without Trend**		**With Trend**		**Conclusion**
	No. of Observations	**Computed** 't' **statistic**	**Critical** 't' at 5%	**Computed** 't' **statistic**	**Critical 't' at 5%**	
CP Rates	1286	-0.027	-2.86	-1.93	-3.41	H0 not rejected, unit root exists.
Bank Rate	1286	-1.88	-2.86	-3.21	-3.41	-do-

Phillips Peron Unit Root Test						
CP Rates	1286	-0.64	-2.86	-2.52	-3.41	-do-
Bank Rate	1286	-1.79	-2.86	-3.24	-3.41	-do-

4.2 Cointegration Test

Once we established that both CP rates and the Bank rate series are non-stationary, we explored the existence of any long-term equilibrium relationship between Commercial paper (CP) rates and Bank rate. To test this, the concept of cointegration has been used. Cointegration is an equilibrium relationship that provides a formal framework for testing and estimating long run (equilibrium) relationship among selected variables. The cointegration methodology is the two-step process suggested by Engle and Granger (1987).

Two series, y(t) ~ I(1) and x(t) ~ I(1) are said to be cointegrated if there exists a ß such that y(t) – ßx(t) is I(0) (Maddala 2001). This leads to the following regression equation:

$$y(t) = ßx(t) + u(t) \qquad (2)$$

being valid, as u(t) being I(0), y(t) and x(t) do not drift too far apart from each other over time. If y(t) and x(t) are not cointegrated, then u(t) is I(1), which means that x(t) and y(t) can drift apart more and more over time. In this case, the relationship obtained by regression y(t) over x(t) is not valid and is of the nature of "spurious regression".

Let y(t) be the CP rates and x(t) the Bank rate. The cointegration regression is performed on the two series by the ordinary least squares (OLS) method. This gives us:

$$y'(t) = a + ß\, x(t) \qquad (3)$$

Where y'(t) is the estimated y(t)

Next, the cointegrating residuals, u(t), are retrieved as:

$$u(t) = y(t) - y'(t) \qquad (4)$$

The residuals u(t) are tested for stationarity using the ADF unit root test. A slight modification is made to the normal test (equation 1) as it is based on calculated least square residuals. The model used is:

$$? u(t) = (?-1)u(t-1) + S_{(j=1 \text{ to } n)} ?(j) ? u(t-j) + e(t) \qquad (5)$$

We can see that, when compared to (1), the drift and the trend part have been removed in (5). The null hypothesis H0 is ? =1. This implies that u(t) are non-stationary. Hence, x(t) and y(t) are not cointegrated. The alternate hypothesis H1 is x(t) and y(t) are cointegrated. We now test whether residuals from above regression are I(0) or stationary by using Dicky-Fuller test. The results are given in table 7.

Table 7: Results of Augmented Dicky – Fuller test for Cointegration

Series tested for cointegration with CP rate series	**Number of Terms**	**Observed t- stat**	**t - critical at 5%**	**Conclusion**
Bank Rate	1286	-4.18	-3.34	H0 rejected, cointegration exists.

From the results it is concluded that the CP rates and Bank rate are non-stationary at level. However, these data series are found to be cointegrated. The cointegration between two non-stationary series means that both the variables i.e. Bank rate and CP rate reveal a tendency to converge systematically in the long-run, even if they may drift apart in the short-run. This finding is in line with the observations of RBI[4] (2002-03), "Empirical investigation of relationship between the money market rates in a co-integration framework in India indicates the presence of unique and stable long-run co-movement, despite being unstable (non-stationary) individually."

[4] RBI Annual Report 2002-03.

4.3. Error Correction Mechanism

On establishing cointegration and long run equilibrium between CP and the bank rate, we have examined the short run equilibrium by using the Granger representation theorem (Gujarati 1995). We express the short-term relationship between the two rates in the form of an Error Correction Model (ECM).

$$?CP = a_0 + a_1?BR + a_2 u_{t-1} + e_t \qquad (6)$$

Where ? denotes the first difference operator, e_t is a random error term, and $u_{t-1} = CP_{t-1} - ß_1 - ß_2 TB_{t-1}$), that is, the one period lagged value of error from the co integrating regression. BR is the bank rate.

To examine the short run dynamics, the equation (6) is tested. Performing multiple regressions on model given in (6), we get the following results:

$$?CP = -0.00366 + 0.04703*?BR - 0.00049 * u_{t-1} + e_t \text{ ---------- } (7)$$

As (7) shows, short-run changes in the bank rate have a positive impact on the CP rates. In other words they move in the same direction in the short run. The negative value of a_2 shows that 0.04% of the discrepancy between the two rates is eliminated in the next time period, i.e. next day. The low coefficient (a_1 = .047) tells us that the changes in Bank rate are not quickly reflected in the CP rates.

4.4 Statistical Relationship between CP rates and Bank rate

To examine the relationship between CP rate and Bank rate, we have taken the dates on which monetary policy announcements for changing bank rates have been made. We

have selected a window period of 14 days before and after the date of changing bank rate and examined the effect on CP rates. The regression output is given in the table 8.

Table 8 :Regression Output (14 days window period)

Regression Equation: y(t) = a+ ßx(t) + u(t), where y: CP rates, x: Bank rate				
Regression Statistics				
Adjusted R Square	**0.67**			
Observations	234			
	Coefficients	***Standard Error***	***t Stat***	***P-value***
Intercept	-5.652	0.644	**-8.779**	3.66E-16
BANK RATE	1.953	0.089	**21.996**	1.1E-58

From the above output it can be interpreted that about 67% of variation in CP rates is explained by variations in bank rate. The bank rate coefficient is statistically significant and a decrease of 100 basis points in bank rate is likely to reduce the CP rates by 195 basis points. At 95% confidence level, the bank rate is observed to be a statistically significant variable which influences CP rates. Extremely low (almost zero) p-value corroborates this observation.

To further examine the speed with which the CP rates adjust to changes in Bank rates, we reduced the window period from 14 days to 7 days. The regression output thus obtained is reported in table 9.

Table 9: Regression Output (7 days window period)

Regression Equation: y(t) = a+ ßx(t) + u(t), where y: CP rates, x: Bank rate				
Regression Statistics				
Adjusted R Square	**0.67**			
Observations	122			
	Coefficients	***Standard Error***	***t Stat***	***P-value***
Intercept	-5.842	0.909	**-6.426**	2.768E-09
BANK RATE	1.986	0.125	**15.850**	3.284E-31

There is no significant difference in the regression output by decreasing the window period. This corroborates our earlier findings of error correction mechanism that changes in bank rate are not quickly reflected in the CP rates.

4.5 The Announcement Impact of Change in Bank Rate on CP Rates

To study the changing sensitivity of CP rates to Bank rate change announcements, we have used regression analysis on 30 days window period before and after the date of effecting the change in bank rates. In other words, the changes in CP rates during 30 days prior to and after the change in Bank rate have been analyzed and thus we have got eight regression equations. The key results from these regressions are given in Table 10.

Table 10: Regression Results (Announcement impacts)

Regression Equation: y(t) = a+ ß x(t) + u(t), where y: CP rates, x: Bank rate

Date of Bank rate change	**Change in Bank Rate from-to**	***a*** **Intercept (t statistic)**	***ß*** **Coefficient (t statistic)**	**Adj. R square**	**DW Statistics**
2-Mar-99	9% to 8%	3.97	0.65	0.22	1.62
		(2.96)	(4.17)		
2-Apr-00	8% to 7%	11	0.17	0.07	1.45
		(20.17)	(-2.41)		
22-Jul-00	7% to 8%	8.12	0.15	0.25	1.56
		(33.2)	(4.63)		
16-Feb-01	8% to 7.5%	3.63	0.8	0.76	1.33
		(8.21)	(13.86)		
1-Mar-01	7.5% to 7%	2.95	0.89	0.78	1.48
		(6.66)	(14.98)		
22-Oct-01	7% to 6.5%	2.11	1.49	0.81	1.11
		(3.44)	(16.49)		
30-Oct-02	6.5% to 6.25%	1.96	1.25	0.91	1.21
		(6.45)	(26.17)		
30-Apr-03	6.25% to 6%	1.12	2.62	0.76	1.56
		(9.83)	(14.12)		

Note: The number of observations is 61 in respect of each of the regressions.

From the above results we can discern interesting patterns emerging. The ß coefficient has been steadily increasing as we move from changes in bank rates in 1999-2000 to recent changes in bank rate during 2001-03. This indicates an increasing responsiveness

of CP rates to changes in Bank rates in recent years. This is corroborated by the Adjusted R square statistics also. As we move to recent periods, the larger portion of variation in CP rates is being accounted for by changes in bank rates. The t-statistic for intercept term is observed to be significant for all the regression equations. However, its coefficient is showing a declining trend, which indicates that the influence of explanatory variable (Bank rate) is becoming stronger in recent years. This leads us to infer that Bank rate is slowly emerging as a potent signalling rate as far as discovery of CP rates is concerned.

5. Conclusion

This paper has attempted to analyze the effect of changes in Bank rates on the changes in CP rates during last four years. The exercise is broadly in alignment with the current thinking in RBI to use short-term liquidity models making use of high frequency data for deciding changes in monetary policy instruments. The interaction of the financial markets with monetary policy have been have been emphasized by RBI in recent years. This paper concludes that the time series data of CP rates and Bank rate are non-stationary at level. However, these data series are found to be cointegrated. The cointegration between two non-stationary series means that both the variables i.e. Bank rate and CP rate reveal a tendency to converge systematically in the long-run, even if they may drift apart in the short-run. The Error Correction Model reveals that the changes in Bank rate are not quickly reflected in the CP rates. The plausible explanation could be that "the financial sector in India is still, in a state of transition, because of ongoing reforms and growing integration between different segments"[5]. The regression equations reveal that there is a statistically significant relationship between Bank rate and CP rates. The regression results obtained by reducing the window period from 14 day to seven days before and after changes made in Bank rates reveal no significant differences. This implies again that the rate of adjustment of CP rate to changes in Bank rate is very slow. The results obtained from using regression analysis for 30 days window period, for each of the eight times when Bank rates have changed, reveal that compared to 1999-2000, the CP rates

[5] YV Reddy, "Development of Money Market in India" Speech delivered by Dr. YV Reddy of RBI at the Fifth JV Somayajulu, Memorial Lecture, at Madras on February 1, 1999,www.rbi.org.in.

have become more sensitive to Bank rate changes during 2001-2003. The bank rate has thus established itself as a potent signaling rate for CP rates in recent years.

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APPENDIX- I

RBI Guidelines for issue of Commercial Paper:

On July 23, 2001*, RBI has issued revised guidelines for issue of commercial paper. The guidelines, *inter alia*, include the following important points;

1 A corporate would be eligible to issue CP Provided (a) the tangible networth of the company as per the latest audited balance sheet is not less than Rs. 4 crore; (b) Company has been sanctioned working limit by any bank or financial instruction; (c) the borrowal account is classified as standard asset.

2 The minimum credit rating shall be P-2 which means 'highest safety' of CRISIL or any such equiv alent rating by other agencies.

3 The minimum maturity of CP is 15 days and the maximum up to one year from the date of issue.

4 As per the July 23, 2001 guidelines CP is issued as stand alone product and no issues shall have the issue of commercial paper under written or coaccepted. But in order to provide flexibility, it has been decided that non-bank entities (including corporates) may provide unconditional and irrevocable guarantee for credit enhancement of CP issue (IECD No. 19/8.15.01/2002-03, dated April 30, 2003).

*(*Ref. No. IECD.2/08.15.01/2001-02 dated July 23, 2001)*