

Integration Of Indian Money Market In The New Monetary Policy Framework Regime Of 2011: An Empirical Analysis

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ABSTRACT

Monetary Policy operates through the money market. It therefore becomes important to see if the sub markets of the money market are integrated. It is in this context that we shall study if market integration amongst the sub markets of the Indian Money Market (IMM) in the long run has taken place or not subsequent to the new Monetary Policy framework of 2011. The period of study is from January 2011 to March 2021. The econometric methodology begins with tests of stationarity, which is a prior before setting up Vector Autoregressive Model. The possibility of a cointegrating relationship between the variables is tested using the Johansen and Juselius (1990, 1992) methodology to draw inferences about long run relationship. The various sub markets of money market have shown high degree of integration between them.

Keywords: Monetary Policy Framework; market integration; sub markets; co-movement of interest rates

I Introduction

Money market deals in short term credit instruments whose main purpose is to provide liquidity. The need for liquidity arises due to a gap between current outflows and current inflows of short term liquid funds (Sarker et al, 2007). Sen et al (2000) defines it as the market where the strain on the banking system is first felt in periods of pressure, and where ease in the banking system is first felt in periods of monetary superfluity. The money market instruments have the ability to shift funds quickly from near liquid form to liquid form (Gupta, 2000). Under conditions of equilibrium in the money market (including its sub markets) the premium paid for obtaining liquidity should be equal to the premium expected for parting with liquidity. In the event of scarcity, the interest rates would rise. They would be highly volatile if the market is unable to cope with such scarcities and if funds do not flow from other sub markets. It is in this sense that market integration has to be defined.

When we say that the markets are integrated it means that the fluctuations in prices between the markets would adjust to each other prices (Ravallion (1986), Golletti et al (1995), Jha and Murthy et al (2005)).

Taking off from the studies on the commodity market, our study has extended the study of market integration to the sub markets of the money market.

So long as market integration is complete, the long run interest rate would stabilize across markets, that is, individually each market might be volatile or non-stationary, but jointly the rate of interest across the integrated markets would be stable. In the context of the money market this implies cointegration of interest rates across sub markets in the long run (Dua, 2004).

Our study concentrates on market integration of rates of interest in the sub markets of the money market namely Call Money Market (CMM), Policy repo rate (PRR), Commercial Paper Market (CP), Certificates of Deposit (CD), Treasury Bills Market (TB), Market Repo (MR) and Collateralised Borrowing and Lending Obligations (CBLO). The time period taken is from January 2011 to March 2022. With the new monetary policy framework introduced in 2011 (RBI, 2011), there is a transition from multiple policy rates to a single independently varying policy rate, which is expected to more accurately signal the monetary policy stance. This is to say if there is a change in the policy rate; it should not lead to any vital instability if the sub markets of money market are integrated in the long run. We shall study whether there exists a long run stable relationship amongst submarkets of the Indian money market although the interest rates in different sub markets might be volatile or non-stationary in the short run.

The paper is organized as follows. The next section discusses the rationale behind the paper followed by literature review in section 3. Section 4 describes the data. Section 5 gives the empirical strategy and estimation results. Section 6 discusses the results and concludes the paper.

II Literature Review

Market integration is an important concern for optimal allocation of scarce resources to most productive purposes and thus contributes to economic growth of a country. In an integrated market, savings are optimally allocated to productive investment in a way that benefits everyone (Sarker et al, 2007; Ramasastri, 2001; Damele et al, 2004).

There have been many studies which talk of integration of capital markets. Some of the studies are (Alam et al. (1999); Magnusson et al (2000); Chian et al (2000); Narayan et al, (2004); Wickremasinghe, (2007). The background literature is also heavily concentrated on integration of capital markets with other markets like forex market and bullion market. Some of the studies include (Ang and Ghallob (1976); Poshakwale (1996); Pathe et al, (2000); Sarma et al (2003), Dua and Sen (2004)).

We have also come across many Indian studies which talk of the relationship between money market, government securities market and foreign exchange market. Some of them to mention are ((Joshi (1998); Bhoi and Dhal (1998); Jena et al (2002); Bhattacharya et al (2001); Bhatt and Virmani (2005); Jain and Bhanumurthy (2005); Rastogi (2005); Mohan (2007); Ogbuji et al (2020); Varma (1997) and Parmar (2002)).

Thus we come across several studies talking of market efficiency of capital markets amongst different countries, market efficiency of stock markets, forex and bullion market. We, to the best of our knowledge, haven't come across any study in the context of Indian Money market which studies the impact of new monetary policy on long term cointegration. We have a reason to deviate from background

literature because our concern is the Monetary Policy Framework of 2011 and its subsequent effect on the integration of sub markets of the Indian Money market.

III Motivation

When sub markets are integrated it is expected that funds flow from one market to another. Integrated markets serve as a channel for authorities to transmit important price signals (Reddy, 2000). In situations where the markets are not integrated there would be artificial scarcities, persistence of interest rate differentials, the possibilities of arbitrage, prices between sub markets would not be linked (Trichet, 2005). There would be short and long-term volatility of interest rates. In such a situation where market cannot take care of itself it is not possible for the monetary policy framework and the associated operating procedure to improve the implementation and transmission of monetary policy on its own (Bhattacharyya et al, 2011).

In general the monetary policy makes intervention in the money market which leads to changes and uncertainty in this market. The monetary policy prior to 2011 operated with the help of multiple policy rates. However, since 2011, the new monetary policy operates through a single rate. Therefore, the main question that this paper addresses is whether the sub markets are integrated and are able to stabilise in the long run in the light of the new policy regime. This is to say if the policy rate and the other rates act in tandem and the minimum condition of cointegration or long run stability exists amongst the sub markets or not. According to Mammem (1973) the repo market is an important means by which the Central bank conducts monetary policy and provides daily liquidity.

Monetary Policy Framework

The monetary policy has been laid down in two periods. The first period refers to the period before 2011 and the second period refers to the period since 2011. Initially we shall be discussing the MPF before 2011 followed by the discussion on the new MPF

In the early 2000, under the monetary policy procedure, the LAF was operated through overnight fixed rate repo and reverse repo. The LAF helped to develop interest rate as an instrument of monetary transmission. In the new operating procedure the weighted average overnight call money rate was explicitly recognised as the operating target of monetary policy. Also, the repo rate was made the only one independently varying policy rate. This would reduce the volatility in the call money market and hence in the other sub markets of the money market. A fixed corridor was defined with the repo rate placed in the middle of the corridor, the reverse repo rate below the repo rate and marginal standing facility rate placed above the repo rate (RBI, 2011 ; Mohanty, 2011).

Laying down the new monetary policy framework, let us now briefly discuss why it becomes important to study integration of sub markets of the money market. First, announcement of an operating target makes it clear to the market participants about the desired policy impact. Second, a single policy rate removes the confusion arising out of policy rate alternating between the repo and the reverse repo rates which are expected to improve the accuracy of signalling monetary policy stance. It will help stabilise the overnight interest rate around the repo rate, particularly during deficit liquidity situation. Third, a fixed interest rate corridor, by reducing uncertainty and avoiding communication difficulties associated with a variable corridor, will help keep the overnight average call money rate close to the repo rate (RBI, 2011). Money market is the basis for the entire economy, that is, it is a fundamental policy market and

cannot be completely left to the forces of demand and supply. Although it is desired that interest rates be freed, controls be minimised, and the markets to adjust on their own, yet there is a need to have some limits on the variations in the interest rates (RBI, 2011). Policy requires some degree of freedom and at the same time control instruments should also be effective.

We need to examine if with introduction of new monetary policy framework, the sub markets of the money market are allowed to sufficiently integrate? That is whether a change in the policy rate, leads to any vital instability in the sub markets of the money market if the money market is cointegrated.

In the light of these changes, our interest is in identifying the appropriate econometric procedure for measuring the market integration of the submarkets post 2011. This is to say why Johansen and Juselius (1990, 1992) methodology has been used. The second question that we shall answer is to implement the above mentioned model. Finally we need to analyse our results.

We in this paper are searching for a different purpose of monetary policy which is a direct impact of monetary policy on the sub markets. A method to test and establish whether the new monetary policy with the single policy rate has resulted in market integration amongst the sub markets or not. The interaction and volatility amongst sub markets would lead to both short term and long term patterns in the relationship between sub markets. Volatility by itself is not undesirable but if volatility leads to instability (non stationarity), a question remains whether the individual non stationary properties of the sub markets collectively leads to stationarity or not.

The new monetary policy framework is supposed to work more efficiently. It is relatively less complex and has unique signalling. All that we have to see is how new monetary policy framework which is expected to perform more efficiently affects the money market including its sub markets. Apriori, there is no expectation that all markets will run in consonance. The transient nature of the sub markets is integral to the functioning of the money market. This implies that the volatility would always remain in some measure. However the volatility should not be explosive. This can be tested with the help of unit roots. Secondly, in the presence of different sub markets being non stationary, the immediate question is whether they are mutually reinforcing which implies that in spite of individual rates being non stationary, collectively they are cointegrated. This can be tested by verifying whether there exists atleast one cointegrating vector or not. Under the assumption that all sub markets influence each other, the ideal methodology for testing cointegration is Johansen Juselius methodology (JJ). The NMP framework of 2011 talks of the impact of monetary policy on investment, consumption and production. It also talks about the lending rates. We however in our study will talk about the sub markets of the money market.

IV Objectives

In this backdrop, the study has the following objectives:

- 1) To study market integration amongst the sub markets of the Indian Money Market.
- 2) To estimate the cointegrating equation.
- 3) To measure the effectiveness of the error correction mechanism between short run and long run stability.

The paper has the following null hypotheses to be tested to meet the above objectives.

V Hypotheses

- 1) The sub markets of the Indian Money Market do not have a long term cointegrating relationship.
- 2) The error correction mechanism is not effective in removing instability between short run and long run.

To facilitate hypothesis 1, it is necessary to establish that atleast one cointegrating relationship exists amongst the sub markets of the money market. To facilitate hypothesis 2, error correction mechanism has been used to see if variations in short run are able to stabilise in the long run.

VI. Data and Methodology

The variables used in the study are the Call money market rate(CMM), policy repo rate (PRR), Commercial paper rate(CP), Certificate of deposit rate (CD), 91-day Treasury bills rate (TB), the Collateralised Borrowing and Lending Obligations rate (CBLO) and market repo rate (MR). The estimates are based on monthly data from January 2011, through March 2021. The data has been drawn from Report on Currency and Finance, Reserve Bank of India Bulletin, and All India Handbook of Statistics (various issues). Let us very briefly explain the variables used in the study.

Call money is defined as borrowing or lending in unsecured funds on overnight basis (RBI, 2021). As per RBI notifications commercial paper is defined as an unsecured money market instrument issued in the form of a promissory note (RBI, 2017). As per RBI notifications dated 04th June, certificate of deposit is defined as a negotiable, unsecured money market instrument issued by a bank as a usance promissory note against funds deposited at the bank for a maturity period upto one year (RBI, 2021). Market repo is defined as a collateralised segment like the CBLOs enabling smooth adjustment of short-term liquidity among varied categories of market participants such as banks, primary dealers, NBFCs, listed companies as per comprehensive guide for current statistics of the RBI Bulletin, June 20, 2017 whereas CBLO is defined as a money market instrument introduced in 2003 for a maturity period of one day to one year.

With a view to set out testing for market integration in the long run following the NMP framework of 2011, econometric analysis is carried out following the time series approach to examine whether various sub markets of money market in India are moving towards integration following the NMP framework of 2011. For this there are the following empirical issues which need to be established. The first step is to check for variability amongst individual interest rates. This we do by testing for the existence of unit root to find out if the variables taken into consideration are non-stationary or not. The subsequent procedure involves repeating the above tests on first difference variables to verify whether the differenced variables are stationary. Non-stationarity or the presence of a unit root can be tested using the augmented Dickey-Fuller (ADF) test (1979), the Phillips Perron (PP) test (1988). If all the variables are I (1), we estimate a multivariate Vector Autoregressive model (VAR).

VAR is a non-structural approach to model the relationship between several variables. The Vector Autoregressive is commonly used for forecasting systems of interrelated time series and for analyzing the dynamic impact of random disturbances on the system of variables. The VAR approach sidesteps the need for structural modeling by modeling every endogenous variable in the system as a function of the lagged values of all of the endogenous variables in the system. The mathematical form of a multivariate VAR is:

Consider the p-dimensional vector autoregressive model:

$$y_t = A_1 y_{t-1} + \dots + A_p y_{t-p} + A_0 + \varepsilon_t \quad (1)$$

Where y_t is an $m \times 1$ vector of endogenous variables. A_1, \dots, A_p are matrices of coefficients to be estimated, and ε_t is a vector of innovations that may be contemporaneously correlated with each other but are uncorrelated with their own lagged values and uncorrelated with all of the right-hand side variables. In our study m is 7, and it stands for the seven sub markets under consideration. The whole system of autoregressive equations has to be simultaneously solved as a multivariate VAR system

The next step is to test if different interest rates which could be acting in different direction and with different magnitude can have joint long run stable relationship. This is to say that we need to determine if the $I(1)$ variables included in a VAR framework are cointegrated. The possibility of a cointegrating relationship between the variables is tested using the Johansen and Juselius (1990, 1992) methodology to draw inferences about long run relationship in a multivariate system of equations in which no single variable takes precedence over another.⁴ It may happen that the multivariate VAR has more than one cointegrating vector which specifies the long run relationship. This has been tested for with the help of max-eigenvalue test⁵. The next step is to determine the lag structure between the short and long term interest rates. If such lag exists, it takes time for the short run shocks to be absorbed and become stable. This we test using the error correction model.

An error correction model is a restricted multivariate VAR that has cointegrating restrictions built into specification so that it is designed for use with non-stationary series that are known to be co integrated. The VEC specification restricts the long run behaviour of the endogenous variables to converge to their cointegrating relationships while allowing a wide range of short run dynamics. The cointegration term is known as the error correction term since the deviation from long run equilibrium is corrected gradually through a series of partial short run adjustments. For testing the hypothesis of cointegration the model is reformulated in the vector error-correction form

$$\Delta y_t = -\Pi y_{t-1} + \sum_{i=1}^{p-1} \Gamma_i \Delta y_{t-i} + A_0 + \varepsilon_t \quad (2)$$

where

$$\Pi = I_m - \sum_{i=1}^p A_i, \quad \Gamma_i = - \sum_{j=i+1}^p A_j, \quad i = 1, \dots, p-1.$$

⁴ There are other methods for cointegration test, like Engel Granger (1987) methodology. However, this test has some limitations. For example, it uses a two-step estimator. The first step is to generate the error series, and the second step uses these generated errors to estimate regression. Hence, any error that may occur in step 1 is carried onto step 2. Also this test is used when there are two variables only. Second possibility is the use of ARDL methodology. This is used when the variables are of mixed order of integration- $I(0)$ and $I(1)$.

⁵ While we could have used both the trace test and the eigen value test, our purpose is to establish atleast one cointegrating vector. Hence we have not used the trace test.

$$\pi = \alpha\beta'$$

Here the rank of Π is equal to the number of independent cointegrating vectors. If the vector y_t is $I(0)$, Π will be a full rank $m * m$ matrix. If the elements of vector y_t are $I(1)$ and cointegrated with rank $(\Pi) = r$, then, where α and β are $m * r$ full column rank matrices and there are $r < m$ linear combinations of y_t .

Under cointegration, the VECM can be represented as

$$\Delta y_t = -\alpha\beta' y_{t-1} + \sum_{i=1}^{p-1} \Gamma_i \Delta y_{t-i} + \varepsilon_t$$

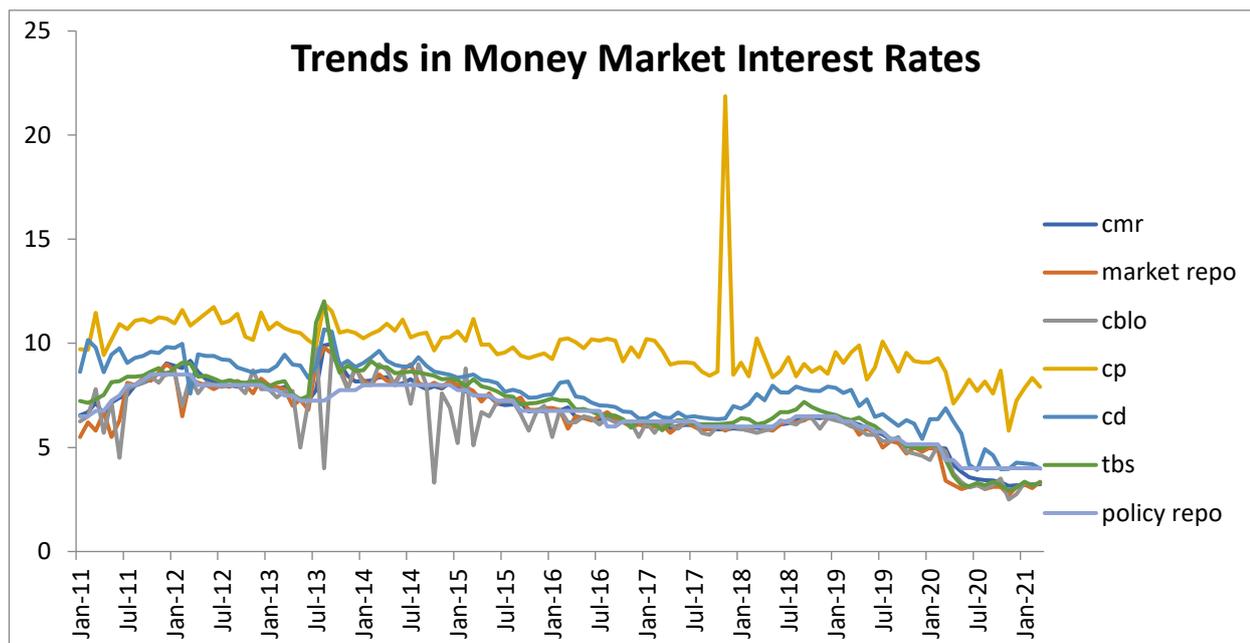
Where α is the matrix of adjustment coefficients. If there are non-zero cointegrating vectors, then some of the elements of α must also be non zero to keep the elements of y_t from diverging from equilibrium.

So long as market integration is complete, the interest rates would stabilize across markets, that is, individually each market might be non-stationary, but jointly the rate of interest across the integrated markets would be stable. After all, the equilibrium relationship means that the variables cannot move independently of each other.

VIII Empirical Analysis

A preliminary exercise has been carried out to examine the overall trends in the interest rates considered in our study. Except for some differences amongst some instruments, we find that the interest rates of all the sub markets of the IMM move in tandem.

Figure 1: Trends in Interest Rates on Short Term Instruments



From the graphical representation in Figure 1, it can be seen that the trends in the various interest rates movement in the money market are somewhat similar from the period 2011 to 2021 except for some temporary volatility observed in the case of CPs. On the whole the co-movement is more apparent, and the volatility is apparently much less. Overall, there is a declining trend in the movement of interest rates of all the instruments.

However, the econometric measurement and justification is very complex. There can be situations when they don't move together and in the same direction. There is volatility but still there exists a stable joint relationship amongst all the variables. One of the reasons for it could be that it is the market which works on signals. It is heavily dependent upon actions of central bank. There is no financial market which has so many sub markets and yet they all serve the same market. These actions are rooted through the policy rate. Prior 2011, the operating policy rate alternated between repo and reverse repo rates depending upon the prevailing liquidity condition. This led to a complex signalling mechanism. Since the different markets are independent but close substitutes, we expect interlinkages between markets. A change in the policy rate would have a cascading effect, but the direction of change need not be the same.

The motivation for the New Monetary policy is driven by the relative complexity of the monetary policy prior 2011. With multiple policy rates, there is increase in the complexities since sub markets are related to each other. There is no natural consonance. This would lead to a complex volatile relationship amongst sub markets and their relevant rates.

Moving on to econometric analysis, the first step in the time series analysis is to examine the stationarity properties of the variables used in the study. Among the different tests for stationarity, we have used Phillips-Perron (PP) (Phillips and Perron, 1988) and augmented Dickey Fuller (ADF) (Dickey and Fuller, 1979) tests for the same. The results of the tests are provided in Table 1. The PP and the ADF tests show that all the variables have a unit root in levels and thus are non-stationary. The unit root test is then conducted on first differenced variables. All the series are found to be stationary or, in other words, they are all I (1) series. We find these series are integrated of the same order.

Table 1: Tests for Unit Root

Variable	Level						First Difference					
	ADF			PP			ADF			PP		
Model	1	2	3	4	5	6	7	8	9	10	11	12
CD	-1.42	- 1.19	- 4.14	- 1.30	- 0.47	- 3.85* *	- 14.0 7	- 14.16 *	- 14.12 *	- 15.0 6	- 17.32 *	- 18.97 *
CMM	- 1.11	0.04	- 3.38	- 0.94	0.08	-3.00	- 8.11	-8.21*	-8.39*	- 8.65	-8.65*	-9.21*
CP	-0.62	- 2.53	- 11.1 0	- 0.60	- 9.02	- 11.11 *	- 11.7 8	- 11.74 *	- 11.71 *	- 50.6 8	- 55.04 *	- 60.64 *
Market Repo	-0.75	- 0.77	- 4.04	- 0.60	- 0.95	-3.80	- 13.9 6	- 13.94 *	-14.1*	- 14.9 1	-15.1*	- 16.72 *
Tbs	- 1.02	- 0.13	- 2.83	- 1.02	- 0.46	-3.10	- 11.0 9	- 11.13 *	- 11.29 *	- 9.18	-9.55*	- 12.21 *
Cblo	-0.92	- 0.51	- 2.75	- 0.90	- 5.21	-9.8*	- 18.4 1	-18.42	-18.50	- 37.9 8	-9.01	- 11.42
Policy Repo	-1.14	0.73	- 3.30	- 0.91	0.08	-3.31	- 5.36	-9.99	-10.49	- 10.5 4	-10.48	-10.83

Note:

Model 1, 4, 7 & 10 is without intercept and without trend. Model 2, 5, 8 & 11 is with intercept and without trend. Model 3, 6, 9 & 12 is with intercept and with trend.

The critical values (without trend) of z-statistic are -3.48 and -2.89 at 1% and 5% level of significance respectively. The critical values (with trend) of z-statistic are -4.03 and -3.44 at 1% and 5% level of significance respectively. The critical values (without trend, without intercept) of z-statistic for a sample size of 110 are -2.58 and -1.94 at 1% and 5% level of significance respectively. *:significant at 1% level **: significant at 5% level

Since all the variables are I(1), the appropriate way of looking at the integration of sub markets of the money market is to examine whether there exists a cointegrating relationship between different sub markets of the money market. Johansen and Juselius (1990, 1992) methodology is used, to estimate the presence of cointegrating vectors. To test for cointegration, we use the maximum eigenvalue test. In Table 2, the first column indicates the null hypothesis; this is tested against the alternative hypothesis given in second column. The third column gives the test statistic while the fourth column reports the critical value of the test statistic at 5 percent level of significance. The null hypothesis of no cointegrating vectors ($r=0$) against the alternative of $r=1$ is rejected at 5 percent level. Next we test the null of $r \leq 1$ against the alternative of $r=2$. We cannot reject the null hypothesis at 5 percent level of significance. Thus there exists one cointegrating relation in the model. The rank of the VAR is one

Table 2: Results of Cointegration Analysis

H ₀ :	H ₁ :	Statistics	Critical Values		Results	No. of C.V.
			95 percent	90 percent		
r = 0	r = 1	40.463	36.361	21.58	Reject Null Hypothesis	1
r ≤ 1	r = 2	28.053	30.439	15.57	Do not Reject Null Hypothesis	

r is the rank of VAR.

C. V. denotes the cointegrating vector. λ_{max} tests

Table 3: Estimate of Cointegrating Vectors

Estimated Cointegrated Vectors in Johansen Estimation (Normalized)

	Vector 1
MR	1.000
CD	0.259078
CBLO	-0.25856
CMM	0.153948
TB	-0.86335
CP	0.039983
PRR	-0.34944

β is a vector of coefficients: $\beta = (\beta_1, \beta_2, \beta_3, \beta_4, \beta_5, \beta_6, \beta_7)$ where

$\beta_1 = 1$ (coefficient of market repo)

$\beta_2 = 0.259078$ (coefficient of CD)

$\beta_3 = -0.25856$ (coefficient of CBLO)

$\beta_4 = 0.153948$ (coefficient of CMM)

$\beta_5 = -0.86335$ (coefficient of TB)

$\beta_6 = 0.039983$ (coefficient of CP)

$\beta_7 = -0.34944$ (coefficient of PRR)

The normalised cointegrating equation is

$$1mrepo - 0.316 - 0.258CBLO + 0.259CD + 0.153CMM - 0.349prepo - 0.863TB + 0.039CP=0$$

S.E	0.0775	0.0688	0.2122	0.1122	0.1568	0.0302
T value	(-3.329**)	(3.744**)	(0.714)	(-3.111**)	(-5.504**)	(1.291*)

*significant at 10% level

**significant at 1% level

Table 4: Estimate of Error Correction Coefficient

Error Correction	D(MR)	D(CD)	D(CBLO)	D(CMM)	D(TBS)	D(CP)	D(PRR)
CointEq	-0.37788	0.15597	0.20291	0.08851	0.227149	-2.2514	0.027986
Standard Error	-0.14656	-0.13205	-0.2701	-0.05361	-0.13158	-0.461	-0.05268
t value	-2.57825**	1.18118*	0.75139	1.65085*	1.72638*	-4.887**	0.53119

*significant at 10% level

**significant at 1% level

In the estimation of the cointegrating vector, it is possible to specify different models by normalizing on each of the markets separately. We have normalised on each variable one by one and it turns out that the most effective variable is the market repo rate⁶. A change in the policy repo rate leads to a significant change in other variables.

In an error correction model, the short-term dynamics of the variables in the system are influenced by the deviation from long-run equilibrium. Large value of the adjustment parameter shows the rate of interest is highly responsive to the previous period’s deviation from long run equilibrium. Speed of adjustment coefficient is expressed as change per unit of time. The speed of adjustment coefficient is of particular interest in that they have important implications for the dynamics of the system. At least some of them should be significantly different from zero, if the variables are cointegrated. After all, if all adjustment coefficients are zero, there is no error correction.

From Table 4 we find that the coefficient of ECT is -0.3778. The inverse of the error correction coefficient gives the speed of adjustment (2.65 months) within which the model will restore equilibrium

⁶ Normalization exercise was done on all the variables. The speed of adjustment when we normalize on call money market is 25 months, for cblos it is 22 months, 16 months for cds and 6.5 months for tbs. The coefficient of the policy rate is insignificant when we normalize on cmm, cds. For detailed results the authors can be contacted.

following any disturbances. It implies whenever there are short term shocks in the sub markets of money market, it takes around 2.65 months for the system to come back to long run equilibrium.

In the above cointegrating vector, all the variables are statistically significant except the call money and commercial paper market. This shows that although long run efficiency exists in an overall sense, the two markets are weak in terms of long run efficiency.

We started the exercise to fill in the gaps to see if monetary policy has any role to play in case markets are volatile. We have established that monetary policy plays a stabilising role.

The intention of New Monetary Policy is very clearly established from the above results. Since there is a given policy rate, we expect that the whole market should look towards that rate. The policy repo rate is the reference rate and amongst all short term markets, it is the market repo rate which is the most efficiently cointegrated with the policy rate.

We now present the results of the hypotheses which have been tested with the help of appropriate tools.

a All the sub markets of the IMM have a long term cointegrating relationship .

On the whole, from the cointegration results given in Table 3, we find that the Indian Money Market is integrated in the long run whereas the role and significance of different markets vary amongst each other.

b There is no error correction mechanism which allows the instability between short run and long run to be resolved.

The error correction term represents the deviations from the long run relationship amongst the six variables. The signs of the coefficients of all the variables (Table 4) are in line with the economic theory. Furthermore, most of the speed of adjustment coefficients were significantly different from zero which further strengthens our results that the variables are cointegrated (Table 4). The coefficient of ECM is most effective in the case of market repo. The speed of adjustment is 2.5 months which shows that the new monetary policy is effective in bringing about market integration. The policy repo rate essentially operates through the market repo. On the whole, we can conclude that the process of short run and long run adjustment is entirely efficient.

IX Conclusions

The attempt to test the integration amongst various sub markets of Indian money market in this paper has yielded good and positive results. We have tried to establish three empirical issues. First, we have checked for variability amongst individual interest rates using unit root tests. We find that all the variables are I(1). Second we have tested for different interest rates which could be acting in different direction and with different magnitude have long run joint stable relationship. We find such a relationship to exist with all variables having significant effect except the commercial paper market which has a weak relationship. Third to find out the lags between short run and long run interest rates we have established that such lags exists, and the average time it takes time for the short run shocks to be absorbed and become stable is around 2.5 months. .

The various sub markets of the money market has shown high degree of integration. The changes in the policy repo rate have been transmitted to different sub markets of the money market. Also we find long-run relationship between the sub markets of money market. In conclusion, therefore, one can say that the new Monetary Policy framework has proceeded in the direction of smoothening flow of funds across various markets.

X Limitations

At the outset we wish to clarify that most of the extant studies relate to the capital market or stock market. Therefore, one of our limitations is that our results may not be strictly comparable with those studies. In such studies the questions that are being raised are somewhat different. Secondly, in terms of coverage our study is restricted to market integration within the sub markets of the IMM. It does not extend to efficiency across different financial markets within the economy nor does it examine money market efficiency with respect to international financial markets. The implication for methodology is that our approach uses market integration as the basis and rests upon the methods largely developed in the context of commodity markets rather than using the common approach to market efficiency as implied by EMH and used in extant studies relating to the stock market.

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