Integration of Financial Markets in India: An Empirical Analysis[1]

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Abstract

During the last decade, significant progress was achieved in terms of policy and institutional reforms in the financial sector in India. A question that needs to be addressed is: how far have these initiatives resulted in narrowing the inter-market divergences and achieved reasonable degree of the market integration? This paper examines this issue empirically and attempts to provide some evidence on the market integration in India. It found that while the reform process has helped removing institutional bottlenecks to the free flow of capital across various segments of the financial market; this has not yet been translated into complete integration among them.

Key Words: Market integration, Financial deepness, Institutional reform, Capital market

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I. Introduction

Since independence the financial sector has been subject to strong government control in India. This period is characterized by government control over all financial institutions and the markets, directed credit programmes, a pre-emption of funds through SLR and CRR, controls over pricing of financial assets, barriers to entry into different sectors, and restrictions on transactions and flows (Bhole, 1999). This resulted in highly segmented and arguably inefficient markets (Chakravarty Committee Report 1985). The secondary market of Government securities was dormant. Both the money and capital markets were underdeveloped. The foreign exchange market was extremely thin, mainly due to stringent restrictions under Foreign Exchange Regulation Act (FERA)[2]. Moreover, the basket-linked exchange rate was administered and the financial markets stood segmented. Although financial sector grew considerably in the regulated environment, it could not achieve the desired level of efficiency.

A comprehensive package of financial sector reforms were undertaken following the recommendations of Narasimhan Committee (1991) in order to build an operationally and allocatively efficient financial market by allowing the market forces to determine both rates and volumes in different segments of the market since 1991. The reforms have taken the form of opening several sub sectors of the financial system to the private sector, deregulation of interest rates and a greater market orientation for financial institutions as regards both sources and placements of funds. The convertibility of the rupee on current

[2] For instance, see, Ananthakrishnan, V. (1994)

account together with dilution of FERA has activated the foreign exchange market (Reddy, 1999). An important objective of reform has been to develop the various segments of the financial market into an integrated one, so that their inter-linkages can reduce arbitrage opportunities, help achieve higher level of efficiency in market operation and increase the effectiveness of monetary policy in the economy (Reddy, 1999). During the last decade, significant progress has been achieved in terms of policy and institutional reforms. A question that needs to be addressed is: how far have these initiatives resulted in narrowing the inter-market divergences and achieved a reasonable degree of market integration? This paper looks at the issue from an empirical perspective and attempts to provide some evidence on market integration in India.

The rest of the paper is organized as follows. In section II, a brief account of the theoretical aspects of market integration is given. Section III discusses the design of the empirical analysis and the findings. Concluding observations are given in section IV.

II. Theoretical Aspects

Arthur Lewis (1954) observed that the central fact of economic development is rapid capital accumulation (including knowledge and skills with capital). The question of capital accumulation immediately focuses attention on how to raise resources for investment, and therefore how to increase savings. This in turn brings up the question of the role of the financial system, and the best way to organise it. The believers of free market argue that in a competitive and well-developed financial system the rate of interest signals profitable avenues of investment, thus allocating funds efficiently across different investment

projects, and also helps raise savings to the required level (McKinnon, 1973, Shaw, 1973). It should be noted that there are some strong assumptions behind this argument. One is that the financial system is well developed, with deep and wide financial markets. Another is that it is efficient, firstly ensuring free capital flows across different segments of the financial sector, and secondly, allocating funds efficiently across the sectors.

In recent years there has been a large literature highlighting, at both theoretical and empirical level, the importance of having a deep financial system to promote economic growth. This literature emphasizes the allocative effects of financial markets, by which they are able to allocate investible funds into their most profitable uses. At the same time, by pooling risk, financial markets are able to smooth consumption of individuals having volatile income. Thus, portfolio diversification allows stable consumption, while investible funds can be allocated to high-risk and high-return activities.

Recent theoretical work has incorporated the role of financial factors in models of endogenous growth in an attempt to analyse formally the interactions between financial markets and long-run economic growth. Greenwood and Jovanovic (1990) present a model in which both financial intermediation and growth are endogenous[3]. In their framework, the role of financial institutions is to collect and analyse information to channel investible funds to the investment activities that yield the highest return. Since the activity performed by financial intermediaries involves costs, Greenwood

[3] See also Greenwood and Smith (1993).

and Jovanovic show that there is a positive two-way causal relationship between economic growth and financial development. On the one hand, the process of growth stimulates higher participation in financial markets thereby facilitating the creation and expansion of financial institutions. In the model, agents need to pay a fixed cost to create a financial intermediary, and hence, the cost as a fraction of income declines as growth proceeds. On the other hand financial institutions, by collecting and analysing information from many potential investors, allow investment projects to be undertaken more efficiently and, hence, stimulate investment and growth.

Bencivenga and Smith (1991) present a model in which individuals face uncertainty about their future liquidity needs. They can choose to invest in a liquid asset, which is safe but has low productivity and/or an illiquid asset, which is riskier but has high productivity. In this framework, the presence of financial intermediation increases economic growth by channelling savings into the activity with high productivity, while allowing individuals to reduce the risk associated with their liquidity needs. Although individuals face uncertain liquidity needs, banks, by the law of large numbers, face a predictable demand for liquidity and can, therefore, allocate investment funds more efficiently. In the absence of financial intermediaries, individuals may be forced to liquidate their investment (i.e., their savings held in illiquid assets) when liquidity needs arise. Thus, the presence of banks also provides the benefit of eliminating unnecessary liquidations. Interestingly, Bencivenga and Smith show in their model that growth increases even when aggregate savings are

reduced as a result of financial development, the reason being the dominant effect that financial development has on the efficiency of investment. Along similar lines, Ross (1992) analyses the effects of alternative financial structures on economic growth. In his model, financial institutions raise the fraction of total savings devoted to investment and avoid premature liquidations of capital.

An efficient[4] and integrated financial market is thus an important infrastructure that facilitates savings, investments and consequent economic growth (Ross, 1997). An underdeveloped and rigidly segmented financial market works against efficient allocation of financial resources within an economy. As segmentation arises mostly due to policy rigidities and poor technical and legal infrastructure, economic agents tend to spend considerable resources to circumvent such institutional road-blocks in search of profits. The rates of return of various financial instruments tend to get equalized in an integrated financial market if returns on individual instruments are adjusted for risk and maturity. This means there are no arbitrage possibilities between markets at one point of time. So efficient markets must be integrated[5]. The integrated financial market is also of good help to the monetary authorities in their policy making endeavour. Transmission of monetary policy becomes smooth and quick only when the impact of policy intervention at one end of the market goes quickly transmitted to the entire spectrum of the market (Vasudevan and Menon 1978). Now the claim is that perfectly competitive markets are efficient and

[4] An individual market is said to be efficient if the price at any point of time contains all the information about the market. This means that the future rate cannot be predicted; so intertemporal arbitrage cannot take place.

therefore integrated. However in view of the discussion above, it is debatable whether financial markets, even after reforms and liberalization, are perfect. On the other hand, even with intervention, markets may be integrated, depending upon the policy rules followed by the authorities. The primary pre-requisite for the financial system to result in efficient allocation of funds is that the markets are integrated. This is a matter for empirical verification.

The concept of integration of financial market is a broader issue as the financial system includes foreign exchange market. Integration of various segments of financial market is reflected on the movement of the term structure of interest rates, forward premia, and behaviour of asset prices. Opening of the economy in post-reform period has created an avenue for the interaction of domestic markets and the foreign exchange market. Forward premia in the foreign exchange market and interest rate differential in the money market are the major driving forces behind the investment decisions. The financial market integration gets momentum once funds move freely from one market to another, wiping out arbitrage opportunities. Integration of markets can be better studied by analysing the turnover and prices of domestic financial markets and foreign exchange market. Since financial reforms play a catalytic role in financial market integration and they are of recent origin, the empirical literature is very limited on this subject. There are few studies done on this subject in India. Most of these studies have been carried out either in the framework of standard time series paradigm of testing for unit root and cointegration

[5] Efficient markets must be integrated, but the integrated markets may not be efficient.

(Bhoi and Dhal, 1998, Pattnaik and Vasudevan, 1999) or using the technique of Artificial Neural Network (Nag and Mitra, 1999).

These studies show that the issue of financial market integration is a continuously changing (evolving) phenomenon. It requires periodic assessment and updating. This paper follows the time series approach and attempts to examine whether various segments of financial market in India are moving towards integration. An important follow-up of cointegration analysis, namely error-correction mechanism (ECM), is also being attempted in this study.

III. Design of Empirical Analysis

India's financial sector can be broadly divided into organized and unorganized markets. But the data on unorganized market is hardly available. The empirical analysis below has been done taking into account the organized financial sector only. Organized financial markets can be further classified into two categories, short-term and long-term. The important segments within the short-term category are: (a) money market, (b) credit market, (c) government securities market, and d) foreign exchange market. Within the long-term category, the important segments are (a) capital market, (b) corporate debt market, (c) pensions fund market, (d) insurance market, and (e) mutual funds market. It is however difficult to get reliable data on several of these markets and particularly term lending, insurance, pension funds, and mutual funds. On the basis of data availability, five markets are identified, viz. money market, credit market, capital market, government securities market and foreign exchange market for the purpose of testing market

integration hypothesis (the definitions of variables used and the data period are given in the appendix).

Market efficiency and Reference rate analysis

Most of the empirical studies on integration of financial markets focus on the operating efficiency indicator of the financial market (Cole *et al*. 1997). In this, the basic line of argument is whether interest rates of important money market instruments move together with a reference rate. There are different approaches to quantify the operating efficiency. One simple way of addressing such an issue is using correlation coefficient. However, the use of correlation coefficient as a measure of market efficiency has been rejected (Adler and Dumas, 1983) in view of non-stationary nature of rate variables. To overcome this, the time series tools especially unit root test and co-integration analyses are found to be useful for analysing market efficiency[6].

The empirical cointegration exercise entails that one should first identify a reference rate. Reference rate is one which presents ideal characteristics which other rates would approach. In this case, reference rate would be taken as an equilibrium rate to which other rates would tend to, if they were integrated. Theoretically, a reference rate is the price of a short-term low risk instrument in a free liquid market. One of the

[5] However, there is some reservation regarding the use of cointegration analysis to examine market integration. It is argued that cointegration among the markets essentially involves an error correction mechanism. This implies that the cointegrated variables tend towards an equilibrium situation for that the divergence between their values keep on vanishing in the short-run. This adjustment by the market interest rates may lead to arbitrage opportunities and hence inefficiency in the market. Some others argue that correlation, cointegration and other standard measures of degree of market integration actually show the linkage among the markets (Ayuso and Blanco, 1999). They argue that closer linkages do not necessarily imply higher financial market integration.

characteristics of the reference rate is that the first difference of the reference rate should exhibit a pattern similar to Gaussian distribution. Further it should be an independently and identically distributed (i.i.d.) process.

In order to ascertain whether any of the short-term rates has the potential to emerge as a reference rate, the basic statistics of these rates in their first difference form have been computed and presented in Table 1. The skewness and kurtosis measures of first difference series indicate that none of the series except CPR could satisfy the normality assumption viz. zero skewness and excess kurtosis equals 0. These two measures are not statistically different from zero for CPR. For the other six instruments, one or the other measure is significantly different from zero. This rules them out as possible reference rates. Therefore, CPR may possibly qualify for 'reference rate'.

Test of Stationarity

The first step in the time series analysis is to examine the stationarity properties of the variables. Among the different tests for stationarity, we have used Phillips-Perron test for this study[7]. The critical values for this test are the same as those for augmented Dickey-Fuller distribution. The results of the Phillips-Perron test are provided in Table 2. The Phillips-Perron test shows that only CMR does not have a unit root in levels. All other variables have unit root in levels and thus are non-stationary.

[7] Other important tests for stationarity are DF and ADF tests. The test statistic proposed by Phillips and Perron termed as z-statistic, arises from their consideration of the limiting distributions of the Dickey-Fuller statistic, when the assumption of i.i.d. process for the disturbance term is relaxed. Further, the error term could be serially correlated and heterogeneous.

However, considering the fact that CMR has exhibited high volatility, a 3-month moving average series of CMR (CMR3) is considered. This variable is also found to be non-stationary in level. Then, unit root test is conducted in first differences. All the series are now found to be stationary or, in other words, they are all I (1) series.

Causality Test

Although some of the stylised statistics are used to identify a 'reference rate' among a class of short-term rates, it is not a sufficient condition to derive meaningful inferences on the integration of financial markets. The sufficient condition is that the chosen 'reference rate' should substantially induce changes in several other rate variables. In other words, the causal relationship and the size of long-run elasticity are important factors for any meaningful study of integration of different segments of the financial market. Accordingly, Granger causality[8] analysis was carried out within a bi-variate framework and the lag lengths chosen are 2, 4 and 8. The results of 'F' tests are reported in Table 3.

The results of the Granger causality test suggest that there is significant causal relationship among the money market instruments, viz. CMR, CPR, and CDR. The changes in credit market and money market cause each other to change. The unidirectional causality between FRWD and TB-91 is significant, which can be interpreted as showing that the fluctuations in foreign exchange market can affect government securities market. However, an overall view of the causality test suggests that a significant causal relationship exists among short-term interest rates, which is an indication of integration

[8] There are also other forms of causality tests, e.g. Sim's (1972) causality.

among them. However, there appears to be some interesting results also. Three pairs namely (CMR, PER), (PER, CDR), (PER, FRWD) do not show any causality between them. Three of these involve capital market instrument, PER. In other words, capital market instrument do not bear any causality with the short-term interest rates. This finding concludes that there is no causal relationship between long-term and short-term interest rates.

Cointegration Analysis

When several rate variables are characterized by integrated processes, say I(1) series, the appropriate way of looking at the integration of financial markets is to examine whether there exists a cointegrating relationship between different segments of the market. Further, in order to draw meaningful policy implications, it would be necessary to see if a cointegrating relationship exists between the term structures of the interest rates. The concept of co-integration requires that the set of variables should be integrated of the same order, and their linear combination must be stationary. To examine whether the short-term and long-term interest rates are cointegrated, we have used the Johansen and Juselius methodology[9], which uses the relationship between the rank of a matrix and its characteristic roots. Following Johansen (1988), the co-integrating vector(s) could be estimated within a vector error correction framework after setting an appropriate lag order.

[9] 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. In order to circumvent the use of two-step estimation Johansen and Juselius (1990) developed a method which can estimate and test for the presence of multiple cointegrating vectors.

Money and government securities market

We summarise the co-integration results, i.e. pairs of market instruments showing co-integration, in Table 4. Most of the pairs that are listed in this Table 4 coincide with those exhibiting bi-directional Granger causality. This implies, by and large, whenever there is bi-directional causality, the two markets tend to indicate co-integration. These results meet Johansen's criterion for a reasonable model. According to Johansen, whenever, two variables are cointegrated and showing short-run adjustments to bridge the long-run disequilibrium, there is causality between them. In case of money and government securities market, CMR3 and TB-91 are found to be cointegrated, where as there is no co-integration between CDR and TB-91, and CPR and TB-91.

The slope coefficients between TB-91 and CMR3 show that there is strong long-run relationship between Call money market and Treasury bill market. The long-run response of CMR3 on TB-91 is 0.71 and that of TB-91 on CMR3 is 1.043. This response is very high, considering the monthly nature of the data. This finding may be justified, if we consider the highly volatile period of the financial market in the mid-90s. The exchange rate pressure in 1993 and in 1995, the East Asian crisis in 1997 etc. are some of the reasons for the volatile situation in the financial market. Within the money market, all the three variables namely, CMR3, CPR, and CDR are cointegrated.

Money and foreign exchange market

There is a high degree of co-movement between call money rate as well as certificate of deposit rate and 3-month forward premium. Specifically, (CMR3, FRWD) and (CDR,

FRWD) in both ways are cointegrated. It is clear that the long-run relationship between call money and foreign exchange markets is very strong since the slope coefficient of FRWD on CMR3 is 2.49 and that of CMR3 on FRWD is 0.40. Similarly, the slope coefficients between CDR and FRWD are also fairly large to substantiate the view that money market and foreign exchange market have been integrated closely after the financial liberalization in India.

Credit market and money market

The results of co-integration between credit market rate and various money market rates show that CMR3 and CPR are cointegrated with the prime lending rate. There seems to be no co-integration between CDR and PLR. So, credit market is linked with the money market through both call money market and the commercial paper market. Further, the response of PLR to changes in CMR3 is quite high (the regression coefficient is 1.35). Similarly, the slope coefficient of CPR on PLR is also fairly large (1.009). Therefore, it can be inferred that any change in the money market rates has a huge and more than proportion effect on the loan rates. There has also been significant long run response of the money market rate from the loan rates, which clearly indicates that money market and credit are thus highly interlinked.

Capital market

For testing of integration between capital market and money market, all the three variables, namely, CMR3, CDR, and CPR were taken to represent money market and PER was taken as the capital market variable. A mere casual look at the results of co-

integration between three pairs of variables, namely (CMR3, PER), (CPR, PER), and (CDR, PER) show that they are not co-integrated. The capital market and money market are yet to be integrated. This result is also supported by findings of the causality test between money market instruments and capital market instrument.

Error correction model

In an error correction model, the short-term dynamics of the variables in the system are influenced by the deviation from long-run equilibrium. If the variables are cointegrated the residuals from the long-run equilibrium regression (cointegrating equation) can be used to estimate the error correction model. If $\{y_t\}$ and $\{z_t\}$ are *CI* (1,1), the variables have the error-correction form:

$$\Delta y_t = \alpha_0 + \alpha_1 \Delta z_t + \alpha_2 (y_{t-1} - \beta_0 - \beta_1 z_{t-1}) + \sum_{i=1}^{m} \gamma_i \Delta y_{t-i} + \varepsilon_t$$

where β_1 is the parameter of the normalized cointegrating vector; ε_t is white noise disturbance term and α_0, α_1, α_2, and γ_i (i = 1,2,…,m) are all parameters.

If $\{y_t\}$ and $\{z_t\}$ are two interest rates, a simple error-correction model of the above form indicates that the LHS interest rate changes in response to stochastic shocks (represented by ε_t) and to the previous period's deviation from long-run equilibrium (i.e., $y_{t-1} - \beta_0 - \beta_1 z_{t-1} = e_{t-1}$). Long-run equilibrium is attained when $y_{t-1} = \beta_0 + \beta_1 z_{t-1}$. Notice that α_2 is called speed of adjustment.

In this study, 16 (out of possible 21) pairs of variables are found to be co-integrated (see Table 4). The error correction model is applied to all these 16 pairs of

variables. The estimation results suggest that all of the interest variables have shown short-run adjustments to reach long-run equilibrium, or, in other words, these interest rate variables are continuously trying to bridge the gap between them to converge to a long-run equilibrium. This finding is indicated by significant coefficients for lagged residuals (α_2 values in Table 4), to retrieve short-run impacts from long-run co-integrating regression.

A perusal of the last column of Table 4 shows that in 8 out of 16 ECM equations the speed of adjustment values (α_2) are large. They are 0.27 between CDR and FRWD, 0.687 between CDR and CMR3, 0.217 between CPR and CDR, 0.752 between CPR and CMR3, 0.27 between FRWD and CMR3, 0.53 between TB-91 and CMR3, 0.50 between PLR and CMR3, and 0.234 between PLR and CPR. This shows that the speed of adjustment of the interest rates to the long-run equilibrium is very rapid. These results are in conformity with the other studies (Bhoi and Dhal, 1998, Nag and Mitra, 1999) that show that within the short-term markets interest rates are more integrated than across the markets.

IV. Conclusions

The attempt to test the integration between various segments of financial market in this paper has yielded mixed results. At the shorter end of the financial market, there is evidence of convergence of interest rates. Money market and foreign exchange market have shown high degree of integration between them. The high volatility in the forex market has been transmitted into the money market through call rates in the mid-nineties. There is also some degree of integration between money market, government securities

market and credit market. However, there seems to be no long-run relationship between the capital market and other short-term markets. While short-term markets are integrated among themselves, similar linkage between short-term and long-term markets is yet to be found. Both the correlation matrix and the cointegration test support this view.

In conclusion, therefore, one can say that while the reform process has proceeded in the direction of removing institutional impediments to the free flow of capital across various markets, this has not yet been translated into complete integration of the markets. While there appears to be a relatively free movement, and therefore reduction of arbitrage, between different short-term markets, this is not so between the capital market and various short-term markets. Further development of the financial market is still required, reflecting that we are still in the process of transition. However, the movement of various interest rates in uniform direction shows an encouraging sign towards financial market integration and thereby efficiency.

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Table 1: Basic statistics of returns on various financial instruments (first differences)

Variables	Mean	Variance	Skewness	Excess Kurtosis
TB-91	0.04	0.47	1.62	5.25
CMR	0.06	32.26	0.48	1.73
CDR	0.07	1.50	-1.24	4.71
CPR	0.06	0.98	-0.19	-0.63
FRWD	0.03	5.21	0.41	4.86
PLR	0.06	0.12	1.49	7.53
PER	0.11	6.37	0.24	1.18

Table 2: Estimated z-statistic values for Phillips-Perron test

Variable	Level form		First difference form	
	Without Trend	**With Trend**	**Without Trend**	**With Trend**
TB-91	-1.76	-1.97	-11.21*	-11.15*
CPR	-2.23	-2.49	-8.81*	-8.77*
PLR	-1.89	-2.94	-10.48*	-10.41*
FRWD	-3.08	-3.05	-8.48*	-8.43*
PER	-1.10	-1.42	-6.47*	-6.44*
CMR	-5.88*	-6.17*	-13.92*	-13.98*
CDR	-2.56	-3.00	-7.97*	-7.93*
CMR3	-2.72	-3.12	-10.35	-12.33

The critical values of z-statistic for a sample size of 110 are – 4.04, - 3.45, and – 3.15 at 1%, 5%, and 10% level of significance respectively. *: Significant at 1% level **: Significant at 5% level

Table-3: Results of Granger Causality Test

Variables (X→Y)	F-Statistic	Variables (X→Y)	F-Statistic
CMR-CDR	3.23(2)**	CDR-CMR	2.56(4)**
CMR-CPR	3.02(4)**	CPR-CMR	5.28(2)*
CMR-PLR	2.59(8)*	PLR- CMR	2.42(4)**
CMR-TB-91	2.92(4)**	TB-91-CMR	2.75(8)*
CMR-FRWD	1.22(4)	FRWD-CMR	1.50(2)
CMR-PER	2.02(2)	PER-CMR	0.97(4)
CDR-CPR	2.69(2)***	CPR-CDR	8.70(2)*
CDR-PLR	0.64(8)	PLR-CDR	2.92(4)**
CDR-TB-91	2.30(2)***	TB-91-CDR	3.81(2)**
CDR-FRWD	6.23(2)*	FRWD-CDR	15.56(2)*
CDR-PER	1.69(4)	PER-CDR	1.38(8)
CPR-PLR	2.03(8)**	PLR-CPR	6.38(2)*
CPR-TB-91	3.11(4)*	TB-91-CPR	12.63(2)*
CPR-FRWD	1.81(2)	FRWD-CPR	12.30(2)*
CPR-PER	0.85(2)	PER-CPR	2.42(2)***
PLR-TB-91	2.33(2)***	TB-91-PLR	2.65(2)**
PLR-FRWD	2.05(8)**	FRWD-PLR	1.47(8)
PLR-PER	2.20(8)**	PER-PLR	2.61(4)**
TB-91-FRWD	1.02(2)	FRWD- TB-91	4.95(4)*
TB-91-PER	0.93(8)	PER- TB-91	2.63(8)*
FRWD-PER	0.53(8)	PER-FRWD	1.45(4)

The entries correspond to maximum 'F' value with the associated lag length given in parenthesis. The Null hypothesis is X does not Granger cause Y.
*: Significant at 1% level, **: Significant at 5% level, ***: Significant at 10% level.

Table 4: Results of cointegration analysis

Dependent variable	Independent variable	λ_{trace} statistics	Slope coefficient	Adjustment parameter (α_2)
CMR3	CDR	27.17*	0.91 (0.261)	0.037 (0.042)
	CPR	32.30*	0.91 (0.237)	- 0.011 (0.035)
	PLR	22.37*	0.74 (0.352)	- 0.018 (0.012)
	TB-91	38.76*	0.71 (0.281)	- 0.064 (0.022)
	FRWD	27.42*	0.40 (0.189)	- 0.112 (0.075)
CDR	CPR	4.60**	1.08 (0.18)	0.07 (0.079)
	FRWD	16.33**	1.04 (0.197)	0.27 (0.084)
	CMR3	27.17*	1.10 (0.182)	0.687 (0.145)
CPR	CDR	4.60**	0.92 (0.172)	0.217 (0.098)
	PLR	19.054**	0.99 (0.209)	0.013 (0.023)
	CMR3	32.30*	1.10 (0.173)	0.752 (0.144)
FRWD	CMR3	27.42*	2.49 (0.501)	0.27 (0.075)
	CDR	16.33**	0.96 (0.315)	0.07 (0.045)
TB-91	CMR3	38.76*	1.403 (0.216)	0.53 (0.106)
PLR	CMR3	22.37*	1.35 (0.008)	0.50 (0.115)
	CPR	19.054**	1.009 (0.169)	0.234 (0.058)

The λ_{trace} statistic rejects the null hypothesis r = 0 against the alternative hypothesis r = 1, where r is the number of cointegrating vectors in the equation. In our case, all the cointegrating equations reported in the table have one cointegrating vector. Figures in parenthesis indicate the standard error. *: Significant at 1% level, **: Significant at 5% level.

APPENDIX

Variables and data period

The financial instruments, available for transaction in both the short-term and long-term segments of the financial market are the following:

A: Short-term instruments (up to one-year maturity):

Call Money, Certificate of Deposit, Commercial Paper, 91-day Treasury Bill, Foreign exchange premium, and Credit market: Deposit & Credit.

B: Long-term Instruments (more than one-year maturity):

Dated securities of Central & State governments, PSU bonds, Mutual Fund units, Equities, and Preference shares.

On the basis of availability of monthly data, the following seven instruments are chosen for the study. These include:

call money rate (CMR), certificate of deposit rate (CDR), commercial paper rate (CPR), 91-day Treasury bill rate (TB-91), prime lending rate (PLR), 3-months forward premium (FRWD), and price earning ratio of 100 scrips BSE index (PER).

Note that, PER is the only long-term instrument considered here. The study is based on monthly data spanning from March 1993 to March 2002. Assuming deterministic seasonality in the monthly data set, deseasonalization has been done using the moving average method. All the subsequent empirical analysis was carried out with this deseasonalized data.