Research Journal of Finance and Accounting
ISSN 2222-1697 (Paper) ISSN 2222-2847 (Online)
Vol.7, No.1, 2016

Has the Indian Finance Market Achieved Efficiency?

Dr.S.Jayaraj
Associate Professor of Management,College of Business and Economics,Bahirdar University,Ethiopia

Abstract
Efficient financial market is one in which prices always fully reflect available information. The most common type of efficiency referred to in financial markets is the allocative efficiency. A trait of allocative efficient financial market is that it channels funds from the ultimate lenders to the ultimate borrowers in a way that the funds are used in the most socially useful manner. Eugene Fama created efficient –market hypothesis. Financial markets are efficient if current prices fully reflect all currently available relevantinformation. If financial markets are efficient, then there is no "best time' to purchase an asset. Apparent past price patterns are not predictive for future prices. If financial markets are efficient, asset price changes are serially random.This paper is concerned with operational efficiency rather than allocative efficiency. The financial sector reforms which were initiated in early 90s were intended to bring about operational efficiency in the financial market in the sense that the prevailing interest rates in different segments of finance market are moving in the same direction so that possibility of arbitrage is eliminated. Strengthening of linkages among money market segments suggests greater operational efficiency of markets as well as conduct of monetary policy. Purpose of the paper is to explain the impact of financial sector reform measures on integration of various segments of financial markets in India. The present study found integration of short term rates- money credit and gilt edged markets-but capital market deviated from the integration path. Reserve Bank of India studied in detail the process of liberalization of financial and money market and also domestic financial with international financial market. This paper analyzed the long run association between different Money market rates, Debt market, Capital market rates and Forex market rates to highlight the integration between them. The study found there is integration between certain segments of finance market in India .Increased policy changes would expedite the process of financial market integration and will help in the elimination of arbitrage avenues and thereby making the finance markets more efficient.
Keywords: Market efficiency, financial market integration, cointegration, Indian finance market, Granger causality

Introduction

Efficient financial market is one in which prices always fully reflect available information. The most common type of efficiency referred to in financial markets is the allocative efficiency. A trait of allocative efficient financial market is that it channels funds from the ultimate lenders to the ultimate borrowers in a way that the funds are used in the most socially useful manner. Eugene Fama created efficient –market hypothesis. Financial markets are efficient if current prices fully reflect all currently available relevant information. If financial markets are efficient, then there is no "best time' to purchase an asset. Apparent past price patterns are not predictive for future prices. If financial markets are efficient, asset price changes are serially random.The important question is whether the financial sector refoms in India have resulted in efficiency .The current paper investigates this question by considering the operational efficiency.

Integration of financial markets is a process of unifying markets and enabling convergence of risk-adjusted returns on the assets of similar maturity across the markets. The process of integration is facilitated by an unimpeded access of participants to various market segments. The success of monetary policy depends upon the speed of adjustment in money market rates in response to changes in policy rates for effective transmission of monetary policy impulses to the economy. This, in turn, depends on the development and integration of various market segments. There is a tendency for different rates getting increasingly integrated as reflected in close co-movements of rates in various segments.

Strengthening of linkages among money market segments suggests greater operational efficiency of markets as well as conduct of monetary policy. However, increased integration has resulted in increased contagion of turbulence originating in one segment is swiftly transmitted across all segments. This imposes additional constraints on the management of market conditions necessitating simultaneous policy actions in various market segments to limit contagion in the presence of asymmetric integration of markets.

Financial markets all over the world have witnessed growing integration within as well as across boundaries, spurred by deregulation, globalization and advances in information technology. Central banks in various parts of the world have made concerted efforts to develop financial markets especially after the experience of several financial crises in 1990s. Deregulation in emerging markets had led to removal of restrictions on pricing of various financial assets, which is one of the pre requisites for market integration. Changes in the operating framework of monetary policy, with shift in emphasis from quantitative controls to

price based instruments such as the short term policy interest rate, brought about changes in term structure of interest rates. This has contributed to the integration of various financial market segments.Harmonisation of prudential regulations in line with international best practices, by enabling competitive pricing of products, has also strengthened the market integration process.

Integrated financial markets assume importance for several reasons.

1. It serves as a conduit for authorities to transit important price signals
2. Efficient and integrated financial markets constitute an important vehicle for promoting domestic savings, investment and consequently economic growth.
3. It fosters the necessary condition for a country's financial sector to emerge as an international or regional financial center.
4. By enhancing competition and efficiency of intermediaries in their operations and allocation of resources, it contributes to financial stability.
5. Integrated markets lead to innovations and cost effective intermediation, thereby improving access to financial services for members of public, institutions and companies alike.
6. Integrated financial markets induce market discipline and information efficiency.
7. Market integration promotes the adoption of market technology and payment systems to achieve cost effective financial intermediation services.

An important objective of reforms in India has been to integrate the various segments of the financial markets for bringing about a transformation in the structure of markets, reducing arbitrage opportunities, achieving higher level of efficiency in market operation of intermediaries and increasing efficacy of monetary of monetary policy in the economy. Financial market in India have also been increasingly integrated with global financial system as a result of calibrated and gradual capital account liberalization in keeping with underlying macro economic developments, the state of readiness of domestic financial system and dynamics of international financial markets.

In the above backdrop this paper attempts to examine empirically the various aspects of integration of financial markets within the country as well as with international markets,

It may be stated that India initiated a number of reform measures in the financial sector in the year1991.They provided some degree of maturity and integration of different segments of India's financial Purpose of the paper is to explain the impact of financial sector reform measures on integration of various segments of financial markets in India. The Chakravarthy Committee (1985) recognized the major weakness of the Indian money market and recommended setting up of a working group to study the weakness of the Indian money market in detail. Accordingly, the Vaghul Working group was appointed by the Reserve Bank of India. It recommended the introduction of new instruments, such as commercial papers, certificates of deposits and 182 day treasury bills, besides the revival of inter-bank participation certificates.Narasimham committee(1991) recommended several banking sector and money market reforms. Interest rate was deregularised.Bhoi and Dhal (1998) have found integration of short term rates- money credit and gilt edged markets-but capital market deviated from the integration path. Reserve Bank of India studied in detail the process of liberalization of financial and money market and also domestic financial with international financial market.

REVIEW OF LITERATURE

Many research studies were conducted on the market efficiency of capital market .Lo and Mckinley(1998) use a variance ratio to analyze the weekly returns of both the equally weighted CRSP indices and find the stock prices do not follow a random walk.Ming,Nor & Guru(2000) showed that variance ratio and multiple variance ratio tests reject random walk for Kuala Lumpur Stock exchange.Vaidyanathan and Gail(1994) also found that Indian capital Market is weak form efficient.Gupta and Basu(2007) evaluated market efficiency in the stock markets from 1991-2006.They used ADF,PP and KPSS procedures to test the unit roots. Theirresults indicate that Indian stock markets do not follow random walk. Thomas and Kumar(2010) use the runs test and Kolmogorov-Smirnov test and find the Indian stock market do not follow random walk.M.R.Borges(2008)tests the existence of random walk and EMH for European stock market.Khan,Ikram and Mehta(2011) used a runs test to analyse the daily returns from BSE Sensex, the S&P CNX Nifty and various publications of RBI from April 2000 to March2010.The runs test indicated that both NSE and BSE do not follow random walk. However Pant and Bisnoi(2001) found that Indian Stock market in a weal form was efficient when using Dickey Fuller test. Another study by Hamid,Suleman,Shah and Akash(2010) tested the weak form of efficiency for the case of Asia Pacific Markets which included 14countries.Mall,Pradhanand Misra(2011) used daily data from June 2000 to May 2011 and found Indian capital market is weal form of efficient.Sharma and Seth(2011) conclude that Indian Stock market does not exhibit weak form market efficiency and thus do not follow random walk .The financial crisis did not impact the behavior of Indian stock markets to a great extent.

Using Corporate Deposit (CD) rate as the domestic borrowing rate and USD, LIBOR as the foreign interest rate, Varma (1997) found CIP deviations to be several times larger than the numbers reported for OECD

markets, and attributed this to market frictions. This result was supported by Bhoi and Dhal(1998), who conclude that financial markets were far from being integrated with global markets, although the various domestic markets appeared to be integrated among themselves.Misra et al (2001) provide further confirmation of CIP failure. Steven and Rao (2015) investigated whether the financial liberalization undertaken in India has resulted in integration of Indian markets with global markets. The results showed little evidence of long term equilibrium relationship between the domestic interest rate and covered interest rate. The mostly negative results indicate the country risk premium and binding regulations on capital movements and/or binding restrictions on interbank borrowing and lending. Next ,they used a VECM model to study the dynamics between the Indian interest rate, the covered interest rate and the US interest rate, suggesting that linkagesless direct that covered interest arbitrage may exist between US and Indian money markets.In his study, Jain(2005) examined the issue of integration of financial markets in India. Given the growing movement of capital flows, particularly short-term capital, into the domestic financial markets, it was necessary to examine this issue so as to reap the positive benefits with having stable markets. For this purpose, the study examined this issue in the post-1991 period by using monthly data on call money rates, 91 day Treasury bill rates, Indian Rupee/US dollar exchange rates, and the London Inter Bank Offered Rate (LIBOR). By using a multiple co-integration approach, the study found that there is a strong integration of the domestic call money market with the LIBOR. Though, the study found that there is a long-term co-movement between domestic foreign exchange market and LIBOR, it is not robust.Samanta (2005) examined the extent of integration between Forex and Stock markets in India during liberalization era.The database cover daily observations on stock price index and exchange rate of Indian Rupee for a period of ten financial years from April 1993 to March 2003. Empirical analysis is carried out by employing two different methodology, first, Granger's causality test in vector auto-regression (VAR) framework and second, the Geweke's feedback measures. Empirical results are no robust on choice of methodology. While, results in VAR framework indicate very poor causal link between returns in two markets in most of the financial years, the Geweke's feedback measures detect strong causal relationship in each financial year.In the context of Indian economy, a few recent studies have examined integration of forex and stock markets empirically using macro-level data for liberalization era. For example, Nag and Mitra (1999-2000) investigated the integration of three financial markets, viz., money market, forex market and stock market. Based on empirical results using daily data on call money rate, exchange rate (Indian Rupee/US Dollar) and stock price index (BSE Sensex) for the period October 1996 to July 1999, they arrive at two important conclusions. First, short- run money market and forex market are gradually getting integrated and prices in these markets are sensitive to price movements in other financial markets. Second, the capital market continues to be somewhat insular to changes in the rate variables.

Greenwood and Jovanovich (1990) contended that the financial institutions are to collect and analyze information to channelize the investible funds to the highest yielding avenues. They showed that there is a positive two-way causal relationship between financial development and economic growth. Bencivenga and Smith (1991) present a model in which they showed that although individuals face uncertain liquidity needs, banks face a predictable demand for liquidity and therefore allocate investment funds more efficiently. The presence of banks provides the benefit of eliminating unnecessary liquidations of investments. An integrated and efficient financial markets promotes economic growth according to Ross (1997).It also helps to eliminate any arbitrage possibilities between different markets.Vasudevan and Menon (1978) showed that the integrated financial markets ensure smooth and quick transmission of monetary policy to the entire spectrum of the market. Recently there are studies either in the framework of standard time series paradigm of testing for unit root and cointegration like that of Bhoi and Dhal (1998) and Patnaik and Vasudevan (1999) or using Artificial Neural Network as that of Nag and Mitra (1999).By collecting data on money market, capital market and also from forex market it tries to estimate whether different segments of money markets are integrated or not. Jain and Bhanumurthy (2005)found that the degree of integration seems to be growing though integration process is far from complete. Sharma and Mitra (2006) analyzed the factors driving the forward premium of dollar against rupee and found that key driver is the interest rate differential, which is supportive of CIP.However they found that the other variables they used in the analysis such as net portfolio flows, current account balance and exchange rate movements also showed some explanatory power. Further they ran separate regressions for an earlier and later period. They found diminished role for the interest rate differential in the later period. They concluded that forward premia are increasingly being influenced by demand and supply. George and Mallik(2009a) conclude that Central Bank actions to smooth interest rates and prices drive a wedge between forward premium and interest rate differential. In a related study George and Mallik (2009b) find that apart from the interest rate differential, the forward premium and interest rate differential, the forward premium is also influenced by international oil prices, the real effective exchange rate (REER) of the rupee and current account openness. They note that forward premia appear to be more strongly influenced by current account transactions than by capital flows.

THEORETICAL FRAMEWORK OF THE STUDY.

In an efficient market different segments of financial markets will respond to new information immediately and completely. If markets are inefficient, financial markets may respond gradually and potentially incompletely for a period of time. Financial markets may overreact than adjust gradually. In an efficient market the purchase or sale of any security at its prevailing market price is a zero NPV transaction. If financial markets are efficient, asset price changes are serially random (or) they should follow random walk.

This part briefly explains the theoretical framework of market integration and the relation between the theory and practical aspects. The Law of One Price (LOOP), advocated by Cournot and Marshall, is the fundamental principle of financial market integration. As per LOOP principle, in the absence of administrative and informational barriers, risk-adjusted returns on identical assets should be comparable across markets. While LOOP provides a generalized framework for financial market integration, the finance literature provides alternative principles, which establishes operational linkages among different financial market segments .They also relate the structure of rate to the capital asset pricing model of Sharpe(1964).This model establishes linkage between market instruments and risk free instruments such as government securities, establishes linkage between market instruments and risk free instruments such as government securities, beyond economic and financial principle.

A well-developed financial market has to

1. Promote overall savings in the economy by providing different alternatives
2. Allocate resources efficiently among sectors
3. Provide an effective channel of transmission of policy impulse.

Regarding the third function financial market can be an effective channel of transmission mechanism when they are competitive, efficient and integrated. A typical competitive financial market has the following characteristics.

1. There should be large number of buyers and sellers of financial products
2. The price of the product should be determined by market demand and supply,
3. There should be secondary market for the instrument.
4. Turnover of the instrument both in the primary and secondary market must be fairly large.
5. Agencies involved in the process of intermediation between buyers and sellers should provide the intermediation services at minimum spread

A market is said to be efficient when the interest rate prevailing at any point of time contains all information about the market. If the realized rates contain all information than future rates cannot be predicted. Future rates may adopt *random walk.* If the rates follow random walk, one would expect the changes in the rates to move around zero over a period of time. Changes in interest rates may settle around mean which may be zero or closer to zero. If all the segments of financial market are competitive there is higher probability that they are fairly integrated. It is very difficult to achieve competitive conditions in all segments of financial markets at a particular point of time.Nevetheless there could be high degree of integration among segments provided that the markets are at least efficient. In general terms, integration is the process by which segmented markets become open and unified so that participants enjoy unimpeded access. It can occur through the removal of domestic and international controls on trade in asset, commodity or service under consideration.

Realizing the fact that integration of financial markets facilitates transmission process, several developing countries undertook reform measures to remove government induced controls on allocation of credit and interest rates. In India also several reform measures were introduced. They include deregulation of interest rates, reduction of pre-emptions of resources from the banks through CLR and SLR,issue of government securities at market related rates, increasing reliance on indirect method of monetary control, participation of same set of players in the alternative markets, development of secondary markets to several financial instruments, dilution of FERA, cross-border movements of capital and worldwide acceptance of the flexible exchange rates, and investor's protection and curbing of speculative activities through wide ranging reforms in the capital market .It will be rewarding if one enquires whether these measures have led to realization of LOOP in India.

OBJECTIVES OF THE STUDY.

The objective of this paper is to provide the trend assessment of financial market integration on Indian experience. Specifically the study attempts to empirically evaluate the integration of financial markets in post liberalization period. It attempts

1. To verify whether Indian financial markets have achievedefficiency through integration.
2. To study the relationship between interest rates and returns pertaining to different markets.
3. To study the extent of financial integration in India
4. To study the integration of domestic rates and international finance market rates.

Hypotheses.

H_{01} = the Indian financial markets have not achieved efficiency

H_{02} = the money market and guilt markets are not related.
H_{03} = the credit market and money market are not related.
H_{05} = the extent of financial integration in India is not significant
H_{06} = there is no co-integration between capital market and money market
H_{07} = the domestic interest rates are not related to international rates.

Data and Methodology

The study is based on published data. The period is analysis is from 1993 to 2013. This period was selected since it represents the post-liberalization era. Many decontrol measures were implemented during this period Monthly data were collected from Handbook of Statistics on Indian economy and from the data banks of Reserve Bank of India (RBI). The US Federal Reserve Board publishes data on Dollar, LIBOR rates. The study used different statistical analyses like cointegrating regression; vector error correction modelling.It uses the Phillips-Peron test, Granger's causality test, co-integration analysis to realize the objectives of the study. Deriving data on money market, capital market and forex market the study tries to bring out the interrelationships among them. The following money market variables are considered on the basis of availability of the data:

1. Call money rate (CMR)
2. Corporate deposit rate (CDR)
3. Commercial paper rate(CPR)

The following gilt market rate is considered.

4. Treasury bill rate for 91 days (Gtr91)

The following Credit market rates are considered.

5. Deposit rate (DRT)
6. Prime lending rate (LRT)

The following forex market rate is considered.

7. Forward premium rate for three months (FWR)

The following capital market rate is considered.

8. Price Earnings Ratio (PER)

The following international financial rates are considered.

9. US treasury rate (UStr)
10. London Interbank Offer Rate (LIBOR).

It may be noticed that PER is the only long term instrument considered. The major determinant of the inclusion of variables is the availability of comparable data.

The key driving force for integration is the amalgamation of private interests. The enduring popular representation of financial market integration is the equalization of the rates of return on similar financial assets. As markets become more open and unified ,differences in rates of return should reflect only fundamental factors such as differences in asset quality, associated risk, liquidity and such factors. The integration of financial markets thus imply an increase in capital flows and a tendency for the prices and returns on traded financial assets in different countries to equalize on a common – country basis. The convergence of returns is typically measured by interest parity conditions over a set of traded assets.

Table 1 provides the correlation between different financial market rates taken into consideration in this study. But mere correlation analysis is far from adequate to understand interrelationship among the market rates.Cointegration technique will be more productive in this regard. Empirical co-integration exercise requires that one should first identify a reference rate. Theoretically, a reference rate is chosen among the class of short term interest rates prevailing in the in the money market or gilt market. A reference rate is defined as the price of a short term low risk instrument in a free liquid market. The reference rate should be statistically well behaving and satisfy certain regularity conditions consistent with the efficient market hypothesis. In an efficient market, all relevant information pertaining to demand and supply conditions prevailing in the market are supposed to be fully utilized and thus the rate variable follows random walk process.Secondly, the first difference of the reference rate should exhibit a pattern similar to Gaussian distribution i.e., independently and identically distributed process. This criterion is very important in determining a reference rate when several rate variables are characterized by unit root, and their first differences are also stationary process. We conduct Phillips-Perron test to verify if rates have unit roots. The estimated results are furnished in table 2.

MARKET EFFICIENCY AND REFERENCE RATE ANALYSIS.

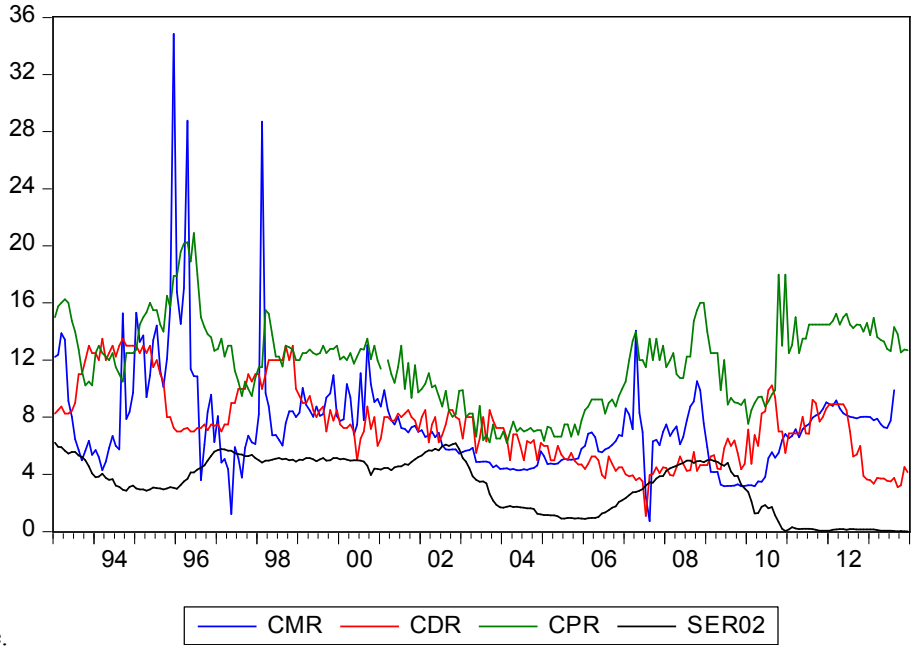
In this study we are concerned with operational efficiency rather than allocative efficiency. In the operational efficiency the basic line of argument is whether interest rates of various money market instruments move together in line with reference rate. Simple measure of correlation coefficient as a measure of market efficiency has been rejected by researchers in view of non-stationary nature of interest rate variables. In this context unit root test and cointegration technique have proved be effective and relevant framework in analyzing efficiency of

financial markets.

The empirical cointegration process involves identification of reference rate. Theoretically a reference rate is defined as the price of short term low risk instrument in a free liquid market. Usually a reference is selected from the short term interest rates prevailing in money market and guilt market. Moreover the reference rate should follow random walk in consistent with efficient market hypothesis. In efficient market all relevant informations pertaining to demand and supply conditions are fully utilized and thus the rate variable follows random walk process. Secondly the reference rate should follow Gaussian distribution pattern i.e., independently and identically distributed. This criterion is very important in identifying the reference rate because many rate variables are characterized by unit root and their first difference also stationary process. A number of statistical properties like unit root, mean, standard deviation, skewness and kurtosis measures also simultaneously taken into account in identifying the reference rate. Table.2 presents the estimated values of these variables .It may be noticed that Gtr91 has minimum standard deviation i.e., 1.9519.

MARKET EFFICIENCY.

In this study Phillips-Perron test was conducted to verify whether interest rates have unit root. The results of the test show that the interest variables have unit root and are stationary. In order to ascertain whether any short term rate has the potentiality of becoming reference rate the basic statistics of various rates in their first difference form have been analyzed. Going by the basic features of typical reference rate it is the rate which influences all rates/interest rates of various parts and sub parts of financial markets. Reference rate should be stable, low volatility short term rate.



In the diagram presented above Ser02 stands for Gtr91.It can be noticed that curve has minimum volatility.

Various domestic interest rate/ returns mentioned in table. 3 are put to various statistical tests to find out domestic reference rate. Results presented in table 2 and 3 indicate that GTR 91 variable has a remarkably low standard deviation, skewness and kurtosis. Further all the variables except two are stationary at their first difference. The reference rate is supposed to have causal relationship with other rates. To verify for this, the Granger's causality test has been carried out in a bivariate framework for the identification of the reference variable.

Although some of the statistical techniques enable to identify a reference rate among a class of short-term rates, it is not a sufficient condition to infer meaningfully on the integration of financial markets. The sufficient condition requires that 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 facts for any meaningful study of integration of different segments of the financial market. Accordingly Granger's causality analysis was carried out within bivariate framework. The results of "F"test reported in Table.4.

The results indicate that there is bidirectional causality between Gtr 91 on the one hand and money market rates(CDR and CPR) on the other.CMR and Gtr91 shows unidirectional relationship. But this occurs at a higher level of significance. Bidirectional causality can be established between CMR and CDR.A significant unidirectional causality between CDR implies that the banks treat certificate of deposits as a cost of funds while

investing in CPR.

In the credit market, there is a significant bidirectional relationship between GTr91 and DRT. The LRT and Gtr91 were also characterized by bidirectional relationship, but at a lower level of significance. This explains causality between gilt market and credit market. The causality between LRT and DRT is unidirectional. A bidirectional causality between DRT and CMR is found whereas there is a unidirectional causality between LRT and CMR.

In the case of exchange market a unidirectional causality flows from Gtr91 to FRW6.This implies that causal link between gilt market and six-month forward premia.No causality was found to exist between FRW3 and Gtr91.

In the above analysis it could be noted that Gtr91 have unidirectional relationship with CMR, CPR.Gtr364 and DRT. Bidirectional relationship was found between CPR and CMR, DRT and CMR.It implies that the various segments of financial market in India are not efficiently linked. Therefore it may be inferred that Indian financial market has not achieved the expected efficiency in terms their integration. Hence we accept the null hypothesis H_{01}.

INTEGRATION OF MARKETS.

Estimation of Cointegration VECM

When several rate variables are characterized by integrated process, the appropriate way of looking at integration of financial markets is to examine whether there is cointegrating relationship between different segments of the market. The concept of co-integration requires that the set of variables should be integrated of the same order, and their linear relationship must be stationary. To examine whether short term interest rates are co-integrated , the Johansen and Juselius methodology has been used. On the basis of Trace test and Maximum Eigen values the existence of co-integration was identified. Then the co-integrating vectors could be estimated with vector error correction framework.

Money and Government Securities Market.

A summary of estimated co-integration is presented in Table.5.Most of the pairs that are listed in the table coincide with those exhibiting bidirectional Granger causality.Acccording to Johansen ,whenever two variables are integrated and showing short run adjustments to bridge the long run disequilibrium, there is causality between them. In the case of money and Government security market CMR and Gtr91 and CPR and Gtr91 are found to be integrated, whereas there is no co-integration between CDR and Gtr91.The slope coefficient between Gtr91 and CMR is 0.699 which shows that there is strong long run relationship between call money market and Treasury bill market. The long run response of CMR on Gtr91 is 0.155 and that of Gtr91 on CMR is 0.699.This response is high considering the monthly nature of data. However the speed with which Gtr91 and CMR adjust to the long run equilibrium is very slow. Within the money market CMR and CPR are found to be integrated and no co-integration relationship was found between CDR and CPR. The χ^2 probability value of Wald test explains that the short term rates of the gilt market rates influence the long term equilibrium of the money market rates.

Money Market and Foreign Exchange Market.

The analysis shows that there is high degree of association between CMR and three months forward premium rate. The slope coefficient is estimated to be 0.669 (CMR on FRW3) and -0.3736 (FRW3 on CMR) was considered. The speed adjustment parameter is estimated to be -0.3375 and -0.00103.This implies that the speed adjustment towards long run equilibrium is 37% in the first case and is 001% in the second which indicates that the adjustment is very slow. The Wald statistic P value is 0.06265 (greater than 5%) when we consider CMR on FRW.This high probability value lead us to infer that the short run coefficient of FRW have influence on CMR.Though these two are found to be integrated the long run adjustment towards equilibrium is not fast enough between them. This study found no co-integration between CDR and FRW. But the slope coefficient of CPR on FRW is found to be 0.0921 and that of FRW on CPR is 0.631.This is very high. The adjustment between CMR on FRW is 0.3736.Similarly the slope coefficient between CPR and FRW is 0.9021 and that of FRW on CPR is 0.631.This indicates there is very strong relationship between CPR and FRW. But speed adjustment parameters (-1537) and (-0.02920) imply that the adjustment of the variables towards long run equilibrium rate is slow. Wald test shows the short run coefficient have impact on the long run equilibrium of FRW3. This study found no co-integration between CDR and FRW.

Credit Market and Money Market.

The co-integration analysis between credit market and money market shows that CMR, CDR and CPR are co-integrated with prime lending rate LRT.Hence, the linkage between credit market and money market is established through call money market, certificate of deposit and the commercial paper market. As per the slope coefficient 0.0075(CDR on LRT) and 5.081(LRT on CDR) there is very strong relationship between LRT and

CDR.The speed adjustment between these two rates (-1.0659) is significantly higher. Therefore it may be inferred that any change in the money market rates has more than proportional effect on loan rates. The significant long run response viz.,1.823(LRT on CMR) ,5.081(LRT on CDR) and 0.947(LRT on CPR) ,of the money market rates to lending rate indicates that money market and credit market are highly interlinked. These results enable us to infer that the integration between credit market and money market is characterized by robust relationship. Hence we reject the hypothesis H_{03} .

Capital Market and Money Market.

The money market and capital markets are supposed to be closely related because most corporations and financial institutions are active in both. Lenders may choose to direct their funds to either or both markets depending on the availability of funds, the rates of return, and their investment policies. Borrowers may obtain their funds from either or both markets according to their requirements. A firm may borrow short-term funds by selling commercial paper or it may float additional shares or bonds. Some corporations and financial institutions serve both markets by buying and selling short-term and long-term securities. All long-term securities become short-term instruments at the time of maturity. So some capital market instruments also become money market instruments. Funds flow back and forth between the two markets whenever the treasury finances maturing bills with treasury securities or whenever a bank lends the proceeds of a maturing loan to a firm on a short-term basis. Yields in the money market are related to those of the capital market. A fall in the short-term interest rates in the money market shows a condition of essay credit which is likely to be followed or accompanied by a more moderate fall in the long-term interest rates in the capital market. However, money market interest rates are more sensitive than are long-term interest rates in the capital market. This paper attempts to study integration of these two markets in the post reform period.

For the analysis of co-integration between capital market and money market, the variables CMR, CDR and CPR were linked to PER(price earnings ratio).The variable PER represent the capital market in this analysis. It can be noticed from the table 4 that the slope coefficient is 0.3329(CPR on PER), 1.24006 (CDR on PER) and 0.1044(CMR on PER).However the speed coefficient parameter is -0.00245, -0.0206 and -0.0023 for (CPR on PER), (CDR on PER) and (CMR on PER)respectively. This indicates that there is co-integration between capital market and the money market. Especially the slope coefficient of CDR on PER is 1.2406 which is considerably high. But the speed with which these variables adjust to the long run equilibrium rate is apparently very slow other than CDR.The high Wald test estimates again indicate that short term variations in capital market influence money market.

Vector Error Correction Model

In an error correction model short term dynamics of the variables in the system are influenced by the deviation from long run equlilibrium.If the variables are cointegrated the residuals from the long run equilibrium equation regression (cointegrating equation) can be used to estimate the error correction model.

If y_t and z_t are cointegrated by order one, the variables have error correction form:

$$\Delta y_t = \propto_0 + \propto_1 \Delta z_t + \propto_2 (y_{t-1} - \beta_0 - \beta_1 z_{t-1}) + \sum_{t=1}^{m} \gamma_t \Delta y_{t-1} + \varepsilon_t$$

Where β_1 the parameter of the normalized is cointegrating vector;

ε_t is white noise disturbance term and, $\propto_0, \propto_1, \propto_2, \gamma_t$ are all parameters.

If $y_t$and Δz_t are two interest rates, a simple error correction model of the form given above indicates the dependent variable interest rate changes in response to stochastic shocks(ε_t) and to the previous period's deviation from long-run equilibrium.ie., $y_{t-1} - \beta_0 - \beta_1 z_{t-1} = \varepsilon_{t-1}$.Long run equilibrium is attained when $y_{t-1} = \beta_0 + \beta_1 z_{t-1}$.It can be noted that $\propto_2$ is called speed adjustment parameter.

It may be noted from the table that 12 out of 34equations estimated the speed adjustment values $(\gamma_t)$are large. They range between 0.25 (CMR and PER)and 1.0659(LRT and CDR).The significant parameters are 0.3113(CMR,CDR); 0.4251(CMR,CPR);0.2747(CMR,Gtr91);0.3375 (CMR,FRW);0.3452(CMR,DRT);0.2503(CMR,PER);0.9639(LRT,CMR);1.0659(LRT,CDR);1.0088(LRT,CPR) ;1.0212(LRT,FRW);0.9952(LRT,Gtr91)The fastest adjustment was noticed between LRT and PERviz.,1.1805.This means the speed adjustment was 118 percent.

FOREX market integration.

The forward premium rate acts as a bridge between domestic and foreign interest rates through the process of covered interest arbitrage. A bank operating in India which has access to borrowing abroad in dollars can convert this dollar borrowing into rupee borrowing by taking a forward cover in the foreign exchange markets. The total

borrowing cost measured in rupees has two components-the dollar interest rate which it pays and the forward premium that it pays for covering the exchange risk. If this total cost (the covered interest rate) is less than the domestic rate at which the bank can borrow, it would prefer to borrow abroad than in India. If more banks make this shift, their action would push up the forward premia (as they all seek forward cover) and would also bring down the domestic interest rate by reducing the borrowing pressure in the domestic market. The reverse shift would take place if the covered interest rates were higher than the domestic rate.

In order to examine the issue of integration of financial markets in India and international rates, the LIBOR, US treasury rates (UStr) were considered. Given the growing movement of capital flows, particularly short-term capital, into domestic financial markets, it becomes necessary to examine the issue so as to reap the positive benefit with stable markets. In this analysis the monthly data on call money rates, 91 days Treasury bill rates, London Interbank Offer rate (LIBOR) and US Treasury Bill rates were considered. The relationship was analyzed both in the bi- variate and in the multi -variate framework.Table.5 shows the estimated results of bi-variate analysis. It could be noticed from the table.5, among the rate variables, CMR, Gtr91, LRT and UStr were found to be integrated. The slope coefficient was estimated to be 0.6304(CMR-LIBOR) and 0.40532(LIBOR-CMR).It is significantly high. The long run adjustment was 32.12 % between CMR and LIBOR which again indicates the long-run association is robust. Wald test χ^2 probability values are 0.8491 and 0.7765 which lead us to reject the null hypothesis that short term interest rates do not influence the long-term equilibrium. Though Gtr91 and LIBOR were found to be integrated the relationship was not found to be robust. The prime lending rate LRT and LIBOR demonstrates high degree of association. The long-run speed adjustment was -1.0541 which is the highest. This indicates the relationship between these rates is robust, though the reverse was not so encouraging. Even though Gtr91 and UStr rates were found to be integrated the association was not strong. The finding enable us to reject the hypothesis H_{07} .

To capture the collective impact of interest rate variables multi-variate cointegration VECM model was estimated. The results are furnished in Table 6. It can be noted from the table CMR,Gtr91 and LIBOR are cointegrated.The slope coefficients were -0.2967 and 1.1639 for Gtr91 and LIBOR respectively. The high value of the slope coefficient indicates strong association between them. The speed adjustment parameter was -0.0879 which is not that robust. The Wald test shows short term Gtr91 and LIBOR rates influence the long-run equilibrium. The Coefficients of UStr and exchange rate of rupee are not found to be significant. The study finds strong integration of the domestic Call money market with LIBOR. Though the study found a long-term movement between domestic foreign exchange market, it is not robust. This may be due to frequent intervention by the Central bank in foreign exchange market.Eventhough the Government Securities Market in India is still in the developing stage, it was found to be integrated with the international Market.

Conclusion

The analysis of financial market integration in India has yielded mixed results. The Money market and Foreign exchange markets have been found to have high degree of integration between them. There is also certain certain degree of integration between money market, gilt market and credit market. Another finding of the study is that there is no long-run relationship between capital market and short term markets. The short term markets were found to have integrated among themselves.The study finds strong integration of the domestic Call money market with LIBOR. Though the study found a long-term movement between domestic foreign exchange market,it is not robust. This may be due to frequent intervention by the Central bank in foreign exchange market.Eventhough the Government Securities Market in India is still in the developing stage, it was found to be integrated with the international Market. In conclusion we can say that the financial markets show encouraging signs of financial integration but the association is not strong enough. Government should sustain and expedite the process of financial liberalization further so the complete integration of financial markets can be achieved in order to eliminate any possibility intertemporal arbitrage in the financial markets both in the domestic and international markets. This leads us to accept null hypothesis H_{05}.

References

1. Bhoi.B.K. and Dhal.S.C.(1998),' Integration of Financial Markets in India:An Empirical Evaluation',RBIOcassional Papers 19.
2. Borges.M.R.(2008)," Efficient market hypothesis in European Journal of Finance",16(7),Pp.711-726.
3. Cole, D.C., Hall S. Scott and Phillip A. Wellons (1995) (ed): "Asian Money Market", OxfordContext:African Development Group, Working Paper no.144.
4. Fisher, I. (1907): "The Rate of Interest", Macmillan, New York.
5. Frankel, J.A. (1993), "On Exchange Rates", MIT Press, Cambridge, Massachusetts.
6. George.P. and Malik.D.(2009a)," Monetary Policy and International Integration: A case of India", The Curie Journal, Vol.2(III), BITS, Pilani.
7. George.P. and Malik.D.(2009b),"Covered Interest Parity and International Financial Integeration", The ICFAI

Journal of Applied Finance, 15(2),58-74.
8. Greenwood.J.and Jovanovic.B.(1990),'Financial Development, Growth, and Distribution of Income' Journal of Political Economy 98,1076-1107.
9.Golaka.C.Nath and Samantha.G.P.(2012) "Integraration between Forex and Capital Market in India" https//research gate net publication/80818208_g.p.samantha.
10. Gupta, L.C.(1998): "What Ails the Indian Capital Market?", Economic and Political Weekly,Income' Journal of Political Economy 98,1076-1107.
11. Gupta.R and Basu.P.K.(2007),"Weak form Efficiency in Indian Stock Markets", International Business and Economics Research Journal, 6(3),Pp 57-64.
12.Hamid.K,Suleman.M.T, Shah,S,Z.a.&Akash.R.S.I.(2010)," Testing the weak form of efficient market hypothesis:Empirical Evidence from Asia- Pacific Markets".International Research Journal of Finance and Economics, 58,Pp.121-133.
13. Khan.A.Q.,Ikram.S and Mehtab,M.(2011),"Testing weak form market efficiency of Capital Market:A case of NSE and BSE", African Journal of Marketing Managemnt,3(6), Pp.115-127.
14. Lo,A.W.and Mckinsky,C.(1998), "Stock Market prices do follow random walks: Evidence from simple specification test", The Review of Financial Studies,3(1),Pp.41-66.
15.Mall.M.,Pradhan.B.B and Misra.P.K(2011)," The efficiency of India's Stock market:An empirical analysis", International Research Journal of Finance and Economics,69, Pp.178-184.
16. Ming.I.M.,Nor.F.M.and Guru.B.K.(2007)," Random walk Model and Technical Trading Rules in the Malaysian Stock Market",Malaysian Accounting Review,Vol.6,No.2, 99-122,Dec.
17. Nag.A.K.and Mitra.A.(1991),'Integration of Financial Markets in India: An Empirical Investigation" Prajan.3
18.Pant.B. and Bishnoi.T.T.(2001),"Testing random walk hypothesis for Indian Stock market indices", Proceedings of Fifth Capital market Conference,UTI Institute of Capital Markets.
19. Patnaik.I. and Vasudevan.D.(1999),'Integration of Money Markets: Evidence from Interest Rates', Project Report sponsored by the Canadian International Development Agency(CIDA) and ICICI.
20. RBI(1976): Money and Finance in Economic Growth and Development, Essays in Honour of E.S.Shaw,M.Dekker,Newyork
21. Reserve Bank of India (1987): Report of the Working Group on Money Market (Chairman, Shri N. Vaghul).
22. Reserve Bank of India (1991): Report of the Committee on Financial System, (Chairman, Shri M. Narasimham).
23. Reserve Bank of India (1997): Report of the Committee on Banking
24. Reserve Bank of India (1998): "Financial Sector Reforms: Review and Prospects", RBI Bulletin, January.
25. Reddy, Y.V. (1997): "Indian Financial Markets : New Initiatives", RBI Bulletin, December.
26. Sharma,Anil.k., and Neha Seth(2011)," Recent Financial Crisis and Market Efficiency:Empirical Analysis of Indian Stock Markets",Indian Management Journal,Vol.2,Issue 4, Jan-March.
27.Sharma.A.K and Mitra.A.(2006),'What drives forward premia in Indian Forex Market?". Reserve bank Of India,Occassional Papers,Vol.27 No.1 and 2.
28. Thomas.A.E.and Kumar.M.C.D.(2010),"Empirical evidence on weal form efficiency of the Indian Stock Market", ASBM Journal of Management.III(1&2),Pp.89-100.
29. Vaidyanathan,R and Gail.K(1994)," Efficiency of the Indian Capita Market", Indian Journal ofFinance and Research,5(2),Pp.35-38.

Table.1.Descriptive Statistics of the Variables

	Mean	Standard deviation	Skewness	Kurtosis	Jarque-Bera
CMR	7.465	3.7709	3.266066	20.64811	3659.285
CDR	7.4068	2.6689	0.491532	2.590497	11.908
CPR	11.782	2.9844	0.181526	2.920781	1.444
DRT	8.736	2.9844	-0.026975	2.521595	1.444
FRW3	4.7248	2.467	-0.368025	1.934504	17.259
FRW6	4.6237	2.4447	-0.367236	1.811434	20.091
GTR364	7.792	2.1604	0.176798	2.029178	9.6522
GTR91	3.245	1.9519	0.628369	2.527111	15.551
LRT	18.829	92.3289	15.6644	247.490	6379.48
PER	20.117	7.597	247.49	7.73587	409.15
LIBOR	3.358	2.220	0.130	1.453	25.729
UStr	3.194040	2.187025	-0.119828	1.510682	23.70317

Table.2.Correlation Matrix

	CMR	CDR	CPR	Gtr91	DRT	LRT	FRW3	PER	LIBOR	USTR
CMR	1.	0.195	0.589	0.087	0.471	0.0424	0.410	0.044	0.361	0.332335
CDR		1	0.175	0.299	0.501	0.137	0.540	0.406	0.288	0.368
CPR			1.	0.088	0.713	0.021	0.678	0.126	0.221	0.162
Gtr91				1	0.429	0.002	0.066	0.008	0.461	0.425
DRT					1.	0.046	0.747	0.164	0.487	0.476
LRT						1.	0.073	0.130	0.098	0.123
FRW3							1	0.327	0.150	0.180
PER								1	0.179	0.267
LIBOR									1	0.968
USTR										1

Table.3.Phillips- Peron Test

S.No	Variable	Level Form (2.87533)	First Difference (3.41)	Inference
1	GTR364	-2.70316 (0.0751)	-17.1006	I(1)
2	CDR	-2.3007 (0.1726)	-21.14873 (0.0000)	I(1)
3	CMR	-8.2827 (0.000)	-27.1795 (0.000)	I(0)
4	CPR	-3.1765 (0.0226)	-22.98923 (0.000)	I(1)
5	DRT	-1.9924 (0.2901)	-16.03535 (0.000)	I(1)
6	FRW3	-1.858197 (0.3518)	-13.64721 (0.000)	I(1)
7	FRW6	-1.631546 (0.4649)	-13.37025 (0.0000)	I(1)
8	GTR364	-2.703161 (0.0751)	-17.10057 (0.000)	I(1)
9	GTR91	-2.347967 (0.1581)	-13.645 (0.000)	I(1)
10	LIBOR	-1.02664 (0.7441)	-11.70147 (0.0000)	I(1)
11	LRT	-15.799 (0.000)	-251.0287 (0.000)	I(0)
12	NASDAQ	-1.7789 (0.3905)	-14.9164 (0.000)	I(1)
13	PER	-2.4157 (0.1384)	-12.4804 (0.000)	I(1)
14	LIBOR	-2.3618 (0.3987	-7.7048 (0.000)	I(1)
16	USTR	-0.8949 (0.7888)	-8.92635 (0.000)	I(1)

Figures in the parentheses indicate probability value

Tab.4.GRANGER CAUSALITY TEST

Pair of Variables	F statistic	Probability	Significance	Relationship
CDR and Gtr91 Gtr91 and CDR	2.25223 2.27127	0.1073 0.1054	B B	Bidirectional
CPR and Gtr91 Gtr91 and CPR	4.54081 1.72598	0.0116 0.1802	A A	Bidirectional
CMR and Gtr91 Gtr91 and CMR	5.64441 0.76470	0.0040 0.4666	A NS	unidirectional
Gtr364 and Gtr91 Gtr91 and Gtr364	3.63186 0.86623	0.0281 0.422	A NS	Unidirectional
FRW3 and Gtr91 Gtr91 and FRW3	 1.18365	0.0044 0.3049	A NS	unidirectional
FRW6 and Gtr91 Gtr91 and FRW6	0.84617 1.85055	0.4303 0.1594	NS B	unidirectional
DRT and GTR91 Gtr91 and DRT	4.01578 6.38223	0.0912 0.0020	A A	Bidirectional
LRT and Gtr91 Gtr91 and LRT	0.91770 1.06979	0.4008 0.3447	B B	Bidirectional
DRT and Lrt Lrt and DRt	0.26600 2.36882	0.7667 0.0957	NS B	unidirectional
CPR and CDR CDR and CPR	0.05443 2.79267	0.9470 0.0632	NS B	unidirectional
CDR and CMR CMR and CDR	1.94407 0.7670	0.1454 0.4656	A NS	unidirectional
CPR and CMR CMR and CPR	5.10976 15.5829	0.0067 4E-07	A A	Bidirectional
DRT and CMR CMR and DRT	4.98329 6.19786	0.0075 0.0024	A A	Bidirectional
LRT and CMR CMR and LRT	2.81738 0.04890	0.0617 0.9823	B NS	unidirectional

A'&'B' denotes significance at 5% and 10% respectively.NS not significant

Table.5.Cointegration Analysis.

Dependent variable	*Independent variable*	*Slope coefficient* Ω	*Speed adjustment parameter* λ	*Wald Statistic Chi square P value* χ^2	*Number of cointegrating vectors*
CMR	CDR	0.354	-0.3113	0.0819	1
	CPR	0.765	-0.4251	0.1309	2
	Gtr91	0.155	-0.2747	0.632	2
	FRW	0.669	-0.3375	0.6365	1
	DRT	0.8936	-0.3452	0.3068	2
	LRT	0.041	-0.0483	0.3290	2
	PER	0.0332	-0.2503	0.0391	1
CDR	CMR	0.1993	-0.0101	0.6428	1
	LRT	0.0075	-0.0027	0.5675	1
	PER	0.155	-0.0524	0.6806	1
CPR	CMR	0.6362	-0.1088	0.0456	2
	FRW	0.9021	-0.1537	0.1875	1
	Gtr91	0.0915	-0.0788	0.1382	2
	DRT	1.0758	-0.1153	0.8572	1
	LRT	0.0017	-0.0032	0.1556	1
	PER	0.0551	-0.0025	0.1258	1
FRW	CMR	0.3736	-0.108	0.0456	1
	CPR	0.631	-0.0292	0.4326	1
	LRT	0.0037	-0.0041	0.9434	1
Gtr91	CPR	0.0614	0.0091	0.6183	2
	CMR	0.699	-0.0018	0.3064	1
	LRT	0.008	-0.0018	0.8540	1
DRT	CMR	0.378	-0.0341	0.9361	1
	CPR	0.568	-0.0759	0.0885	1
LRT	CMR	1.823	- 0.9639	0.0027	2
	CDR	5.081	-1.0659	0.5502	1
	CPR	0.947	- 1.0088	0.2885	1
	FRW	3.0768	-1.0212	0.9658	1
	Gtr91	-0.045	-0.9952	0.2547	1
	PER	2.0297	-1.181	0.003	1
PER	CMR	0.1044	-0.0023	0.2248	1
	CDR	1.24057	-0.0206	0.7937	1
	CMR	0.1044	-0.0023	0.2248	1
	LRT	0.0211	-0.00084	-	1

Table.6.Cointegration Analysis CMR, LIBOR, Gtr91, LRT. USTR

	Slope coefficient	Speed adjustment parameter	Wald Test P value χ^2	Number of cointegrating vectors
CMR-LIBOR	0.6304	-0.3212	0.8491	1
LIBOR-CMR	0.40532	-0.02736	0.7765	1
Gtr91-LIBOR	0.46247	-0.02736	0.0804	1
LIBOR- Gtr91	0.5547	0.00517	0.474	1
LRT-LIBOR	3.252	-1.0541	0.0804	1
LIBOR- LRT	0.004147	0.000575	0.8164	1
Gtr91-USTR	0.4213	-0.02148	0.1159	1
USTR-Gtr91	0.050529	0.002311	0.4558	1

Table 7.Multivariate Co integration Model $CMR = f(Gtr91, LIBOR, UStr, Exrate)$

	Slope coefficient	Speed adjustment parameter of co integrating equation	Wald Statisticχ^2 Probability
Gtr91	-0.29671 (-1.3889)*	-0.087988	0.884
LIBOR	1.16391* (1.7228)		0.3365
UStr	-0.68326 (-0.9467)		0.0089
Exrate	-0.13069 (-1.7116)		