INTEGRATION OF FINANCIAL MARKETS IN INDIA: AN EMPIRICAL ANALYSIS

A DISSERTATION SUBMITTED TO
THE UNIVERSITY OF HYDERABAD
IN PARTIAL FULFILMENT FOR THE DEGREE OF

MASTER OF PHILOSOPHY
IN ECONOMICS

BY.
PRADYOT RANJAN JENA

DEPARTMENT OF ECONOMICS
SCHOOL OF SOCIAL SCIENCES
UNIVERSITY OF HYDERABAD
HYDERABAD - 500 046

INDIA
2002

CERTIFICATE

Dr. V. Narasimhan
Reader,
&
Prof. K.N. Murty
Professor and Head,
Department of Economics

University of Hyderabad
Hyderabad – 500 046
Date: 22.06.02

We certify that the dissertation entitled **"Integration of Financial Markets in India: An Empirical Analysis"** submitted by Mr. Pradyot Ranjan Jena in partial fulfillment of the requirement for the award of the degree of Master of Philosophy in Economics, has been carried out under our supervision.

V Narasimhan

Dr. V. Narasimhan
(Supervisor)
READER
Department of Economics
University of Hyderabad.
HYDERABAD 500 134.

Prof. K. N. Murty
(Supervisor)
PROFESSOR
DEPARTMENT OF ECONOMICS
UNIVERSITY OF HYDERABAD
P. O. CENTRAL UNIVERSITY
HYDERABAD-500 046

Head
Department of Economics
अध्यक्ष/Head
अर्थ शास्त्र विभाग
Department of Economics
हैदराबाद विश्वविद्यालय
University of Hyderabad
Hyderabad-500 046

Dean
School of Social Sciences
DEAN
School of Social Sciences

DECLARATION

This is to state that the dissertation entitled **"Integration of Financial Markets in India: An Empirical Analysis"** submitted to the Department of Economics, University of Hyderabad in partial fulfillment for the award of degree of Master of Philosophy in Economics, is the original work carried out by me under the supervision of Dr. V. Narasimhan and Prof. K.N. Murty respectively Reader, and Professor and Head, Department of Economics, University of Hyderabad; and the same has not previously formed the basis for the award of any degree, diploma, associateship, fellowship or any other similar title of recognition.

Hyderabad
Date: 27.06.02

(Pradyot Ranjan Jena)

DEDICATED TO
CHHUANA

ACKNOWLEDGEMENT

I express my deep sense of gratitude to my supervisors Dr. V. Narasimhan and Prof. K.N. Murty (Head of the Department) for their entirely sincere guidance and help throughout my research work. I am very much thankful to them for their concern about my career and me.

I am thankful to Prof. G.Haragopal Dean of the School for his help.

I owe a great deal to all the faculty members for their valuable and timely advice, and encouragement.

I am thankful to the Librarians and Library staff of University of Hyderabad, IIT Kanpur, Administrative Staff College of India and Centre of Economic and Social Studies, for their help in collecting materials.

I always remember Mr. M.A. Baig for his constant encouragement and timely help, at various stages of my research work. I am grateful to Mr. Bibhu Prasad Nayak for his constant moral as well as academic support in building up of my work and I am also thankful to my seniors, Pratap, Prabir, Chakradhar, and Marshal for their valuable help.

I thank to all my friends whose direct and indirect help enabled me to complete my work. Particularly I would like to mention Prabha, Khirod, for their needful help. Their company and wonderful time we are sharing together will always remain in my mind and I also thank to my juniors in the department.

I am grateful to my parents, brothers and sisters for their constant encouragement and immense pleasure in my higher study. My father's care, mother's love and brothers' sincere guidance made me what I am now.

Lastly, my sincere thanks to all my friends and seniors in the university campus for their direct and indirect help throughout my study period.

Pradyot Ranjan Jena

Contents

List of Tables and Figures

Chapter I

Introduction, Background and Objectives of the Study

1.1 Introduction and motivation of the study

Arthur Lewis (1954) observed that: "The central problem in the theory of economic development is to understand the process by which a community which was previously saving and investing 4 to 5 per cent of its national income or less, converts itself to an economy where voluntary saving is running at about 12 to 15 per cent of national income or more. This is the central problem because 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 answer to this depends on the strategy of development followed. There are different paradigms suggesting alternative strategies of development with associated strategies to raise the resources required for capital accumulation. Following the apparent success of the Soviet Union, the strategy adopted by most developing countries in the 20th century viewed the process of industrialization as necessary for development and emphasized the role of the state in the process. The allocation of the resources, once they are raised, is done by the state according to its plan priorities. The role of the financial system in this strategy is basically to raise the resources, which are then garnered by the state. This was

sought to be carried out by a regime of controlled rates of interest, with savings directed to specific 'priority' areas, or pre-empted by the government. This was the strategy adopted by India after independence. The primary role for mobilization and allocation of savings was assigned to the state.

The alternative paradigm involved a market-determined strategy of development. In recent years, with the growing perception that the earlier strategy failed in achieving rapid growth of incomes or industrial development, and with the prodding given by the IMF and World Bank, most countries have shifted to this, instituting a 'structural adjustment programme'. In this strategy, the garnering as well as the allocation of resources has to be done by the market. This leads to a changed perception about the role of the financial system. Liberalised product markets require a strong and smoothly functioning financial system for mobilisation and allocation of funds. In this paradigm, financial institutions are seen as important instruments for both augmenting and allocating savings among alternative investment uses according to their relative efficiency.

The role of the financial sector is crucial in facilitating the economic growth of a country. Without financial intermediation, savers are the investors. As a result, no resources flow from one sector to another. This requires that all the sectors should be self-sufficient which is not conducive for economic growth. The qualities that are expected from the savers are different from those that are associated with the investors. Savers are generally risk-averse, whereas investors are the people who take risk while

making investments. A flow of resources from ultimate saversto ultimate investors is therefore required. In principle this could be obtained by direct credit. But there are two problems with this. Investors typically need much larger funds than individual savers can give, and the risk involved in lending to unknownlarge producers is too high for the small savers. This is where the financial institutions come into the picture by playing the role of mediator between ultimate lenders and ultimate borrowers. Financial institutions provide liquid and less risky financial assets to the lenders for which they have a definite preference. And through the provision of these financial assets, the financial intermediary is in a position to accumulate resources, which can then be lent to the ultimate borrowers.

Thus financial intermediation achieves two things: one, by providing the savers with different varieties of financial assets to meet their diverse preferences it enables them to increase their savings, pooling together small and scattered savings under this scheme; two, it provides investors with large-scale finance required to enable them to take advantage of scale economies.

This is the minimum that is expected to be done by the financial system, whatever the nature of organization of production, i.e., state or private enterprise. The extent to which it does this is obviously important. It is sometimes argued that a free interest rate mechanism helps to augment savings. In addition, financial intermediation, through the mechanism of the rate of interest, also has a role to play in the efficient allocation of resources. In an economy where production (and therefore investment allocation)

decisions are taken by the state, this role may appear to be secondary, but in a market/private-enterprise economy, this role of 'allocation' is very important.

Most of the theoretical debate about the organization of financial institutions revolves around this question. When the development strategy is one of planning and state intervention, the financial system is also subject to a good deal of state regulation. This school of thought believes it is important to keep the rate of interest low, and to channel credit to preferred sectors, and so advocates a system of administered interest rates. Advocates of the free market, on the other hand, argue for the virtues of the market, through the rate of interest, both in garnering resources, and in efficient allocation of them. The argument is 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. 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, facilitating firstly a smooth transfer of funds between savers and investors, and secondly free capital flows across different segments of the financial sector, with freely adjusting rates of interest. The argument for free financial markets claims that it is repression that leads to segmentation of markets and inefficiencies. But others claim that financial markets are inherently imperfect, and so these assumptions may not hold. This draws attention to two aspects. One is the institutional organisation, as it exists. The second is the actual functioning of the markets.

The institutional background in which the financial sector works in India has changed over time. Until the 1980s the development strategy, as we noted, emphasised state guided initiatives, with the state playing the primary role in mobilising and allocating savings. Over this period commercial banks and other financial institutions were nationalised. Interest rates were fixed below the market clearing level, directed credit programmes with minimum targets for priority sectors like agriculture and small scale industries were extensively used, and government appropriated a substantial share of total credit at low rates of interest (Hanson and Craig, 1986). There were high levels of SLR and CRR. This system was characterised by McKinnon (1973) and Shaw (1973) as 'financial repression'.

Starting in the mid-1980s, India undertook some steps towards liberalising the financial system. After institution of the structural adjustment programme, the financial liberalisation gained momentum. The core aspects of financial liberalisation consist of abolition of directed credit programmes, and freeing interest rates, promotion of competition among banks, and other wide-ranging reforms to develop and deepen the government securities market, money market, capital market, and the foreign exchange market.

In this context, our earlier discussion raises the question of whether the financial sector reforms have been successful in increasing the efficiency of the sector and in particular whether they have lead to a greater integration of the markets. This is what provides the motivation for this study.

1.2 Objectives of the study

Our primary objectives in this study are (1) to review the process of reform to assess whether it has moved in the direction of removing legal restrictions and impediments to the flow of capital between different segments/sectors of the financial system, and (2) to empirically assess the integration of the markets in the post-reform period.

1.3 Methodology of the study

We identify different markets within the financial sector, and pick some financial instruments from each of these markets. We first check whether the rates of return on these instruments are correlated. Granger causality test is carried out to see the direction of the relationship. Then we use cointegration and error correction mechanism to check whether the rates of return are cointegrated in the long run; and whether they converge to each other over the short-run.

1.4 Nature and sources of data

The study is based on monthly data for the variables considered in the study. The monthly averages of call money rate, commercial paper rate, and certificate for deposit rate are considered to represent the money market, 91-day treasury bill rate for government securities market, prime lending rate for credit market, price earning ratio of 30 scrips BSE index for stock market, and 3-month forward premia for foreign exchange market. The economic rationale behind taking these variables has been discussed in the

relevant chapter. The data relating to all the variables are collected from the various issues of Handbook of Statistics on Indian Economy, RBI, and from various issues of RBI bulletin.

1.5 Organisation of the study

The study is organised as follows. The current chapter motivates and introduces the study. The second chapter reviews some theoretical issues and theoretical debates regarding the organisation of the financial system. The third chapter looks at the structure and working of the Indian financial system (IFS), and its evolution in the post-independence era. Emphasis is placed on the discussion ofthe background of financial sector reforms and the emerging horizon of financial market integration. The fourth chapter is basically designed to carry out the empirical analysis on the integration of various segments of the financial market in India. We place this in the background of other empirical studies, which are reviewed, and finally the fifth chapter brings out the summary of findings and the conclusion of the study.

Chapter II

Review of Theoretical Issues

As pointed out in the introduction, most strategies of development see the importance of finance and the financial sector in the role of development. However, they differ on how it should be organized and particularly on the role and extent of government intervention in it. To a large extent, the debate is about whether financial markets would be efficient if they are left free, and whether government intervention leads to segmentation of the markets and brings about inefficiencies. In this chapter some of the theoretical views and issues in the literature are briefly reviewed.

Until the 1960s, the Keynesian views dominated the literature. Keynesian models view physical capital and monetary balances as substitutes and so advocate keeping interest rates low in order to foster capital accumulation. In a background that emphasized the role of the state in the process of development, this led to the adoption of a regime of administered interest rates, and directed credit programmes with credit rationing. These policies, whereby banks are directed by the state to provide credit to prioritized sectors at low rates of interest below the market-clearing rate, were followed in most newly independent, developing countries including India. Further, since the government also played a direct role in capital accumulation, a lot of the financial resources were pre-empted by the government at the low rates of interest. Until the

1980s, commercial banks and other financial institutions were nationalized in these countries.

However, due to the apparent failure of this strategy of development the whole set of policies was reconsidered and criticized from different angles. Industrial development in these countries did not take place at the expected rate. Even though saving rates were high, rate of growth of incomes was low, pointing to inefficiencies in the allocation and use of resources. At the same time, some countries like Japan and the East Asian countries, which followed a different system, did remarkably well. This lead to the questioning of state intervention, both in commodity markets as well as in financial markets. Krueger (1995) first set forth the argument of 'rent-seeking behaviour' and 'government failure' in planned economies. The view taken by the international financial institutions like World Bank and IMF, and the financial liberalization literature of the 1970s and 1980s was that the 'financial repression' inherent in the interest rate and exchange rate controls was the most important source of inefficiency. McKinnon (1973), and Shaw (1973) were the best known and among the earliest advocates of this view. We shall briefly go over this argument as spelt out by McKinnon.

He claims that the Keynesian view was based on the assumption that capital markets were 'perfect' and therefore their argument concentrated only on raising aggregate investment through keeping interest rates low. He disputes this assumption and claims that these were essentially fragmented markets with firms and households (i.e. the saving and investing agents) being isolated. This results in a misallocation of resources.

His argument is that this fragmentation is in fact a result of government policy (what he calls financial repression). The financial policies keep the rate of interest low, so saving is low and investment too is misallocated. While intervention in the factor and commodity markets is bad, the repressed capital market is the real problem. The appropriate policy is therefore to free the capital market, which will then successfully monitor the efficiency with which the existing capital stock is used by equalizing returns on all physical and financial assets. McKinnon (1973) emphasizes the importance of the financial sector for the following reasons. Firstly, investment is mainly not self-financed, so there must be access to outside finance for firms. Further, the sources of these funds are mainly not primary securities: indirect financing (i.e., financial intermediation) is important. In fact, in underdeveloped countries indirect financing through the monetary mechanism is the main artery of the modern financial sector. Moreover, for the underdeveloped economy, McKinnon (1973) claims that there is a complementarity between the holding of cash and physical capital. Thus, high rates of interest on money holding aid the investment process. But the rate of interest on deposits will be high only if the rate of interest earned by banks (and other financial intermediaries) is high. Thus the case is made out against financial repression. The basic criticism is against directed credit and administered rates of interest, which are kept below the market-clearing rate.

While 'financial liberalization' has been the predominant view through the early nineties, there have been dissenting voices. The New Structuralists (Taylor, 1983; Wijnbergen, 1983) argue that an increase in rates of interest on bank deposits would led

to a fall in the supply of total credit, basically arising out of a lack of confidence in the bank, thereby leading to financial crises. This in turn would lead to a cutback in output. There are two points to be made here, however. Firstly, the financial liberalization envisaged by McKinnon and Shaw does leave ample room for government/central bank supervision, despite freeing of interest rates, and removing 'directed credit'. This would prevent a loss of confidence. Secondly, in situations like this the 'liberal school' merely argues for an expansion in the money supply to keep the rate of interest low. The liberalization only makes the transmission mechanism of monetary policy work better, so this is possible.

In recent years, there has been further reassessment of this 'liberal view'. This is so particularly after the structural adjustment programme initiating liberalization of the financial sector (freeing interest rate and etc.) was seen to lead to wide spread bankruptcy and stagnation in many Latin American and Afro-Asian countries. The most recent example is the East Asian crisis, which involved precisely those countries that had earlier been held up as models. It is now also realized that the earlier "East Asian Miracle" took place in fact in countries that did not have complete financial liberalization. McKinnon (1988, 1993) himself in later writings admits that there are problems with the financial liberalization programmes, and not enough is known about the process.

The theoretical literature of the New Keynesian School applies theories of adverse selection and incomplete contracts to financial markets to point out that market failure is more inherent in financial markets, thus making out a case for intervention. We

may note that the liberal argument that market forces in the financial market achieve allocative efficiency is based on the assumptions of perfect competition, freely available and complete information and that individuals can make credible commitments to honouring contracts. Under these assumptions, the rates of interest across markets differ only by a risk-premium. So everybody is able to borrow at risk-corrected rates of interest.[1] However the assumptions of perfect markets are questionable. As Greenwald and Stiglitz (1992) point out, financial markets have certain special characteristics. In them, money is exchanged today against promises in future. This brings in various kinds of uncertainties, and they are characterized by asymmetric information between providers of capital and the recipients. The Stiglitz-Weiss model (Stiglitz and Weiss, 1983) argues that given the moral hazard involved and the adverse selection problems inherent in the capital markets, banks use low interest rates as screening devices, and voluntarily ration credit. Thus interest rate is kept lower than the equilibrium rate at which supply is equal to demand and allocative efficiency is not realized. There is market failure, so this gives rise to a role for the government. It also brings back to center-stage the structure of the financial system, because some types of financial institutions are better equipped to handle this kind of risk.

Yet another perspective on why financial structure matters, is given by Hart (1995), based on the theory of incomplete contracts. It starts with the difference between

---

[1]: It is worth pointing out an implication of this, viz. that the financial structure is then both irrelevant and indeterminate, even though McKinnon and Shaw do recognize the importance of the presence of financial intermediation.

debt and equity instruments of external finance, which obviously have different implications for the suppliers. The suppliers of these different instruments face different circumstances regarding control over the firm and the uncertainty of return. The theory of incomplete contracts can be used to show that the bank-based financial systems may favour growth more than market based systems (banks supplying debt usually have a closer involvement in corporate activities, while market based systems, with highly dispersed equity holders give rise to the free-rider problem). Further, the legal infrastructure that is required in situations of incomplete contracts could act as impediments to financial intermediation.

In the Indian literature, Rakshit (1994), points out that in less developed countries there is a gap between social and private returns on extension of banking services to the unorganized sector, leading to market failure[2] and thus creating the argument for government to enter the banking sector (either through nationalized banks, or by directed credit programmes). Rakshit also takes issue with the McKinnon-Shaw view that the low interest rate regime leading to excess demand with credit rationing implies lack of allocative efficiency. His argument is that even though it is generally true that rates of interest serve the purpose of efficient allocation of investment, sometimes market forces could lead to suboptimal saving. So, there is scope for government intervention in promoting saving. Further, there could be developmental social goals based on equity

[2] : This is different from the Stigltz-Wiess argument which could hold even when private and social returns on investment are identical.

considerations, which, in an economy operating under severe fiscal constraints, creates scope for public intervention in the financial markets, for directed credit controls.

Rakshit also reiterates the Stiglitz-Weiss argument that even when social and private returns are identical, the nature of the capital market could lead to suboptimal allocation of credit. And the extent of misallocation is more serious when market prices of factors and products differ from the shadow prices. In such a situation, the first best solution would be a system of appropriate taxes and subsidies. But when these are difficult to implement- as they usually are in less developed countries - the next best solution might well be a system of administered interest rates with directed credit programmes.

However, it must be noted that in spite of all these caveats, none of these authors speak up for, or advocate the kind if financial repression that commonly characterized less developed economies. There is still room for some convergence of views with the liberals. As Rakshit points out, directed credit programmes could still be run, but with the interest rate structure being freed so that the rates of return on various financial instruments could find their own levels with respect to each other. Further, there should be free entry and exit of private banks to promote competition and efficiency; and for the same reasons, public banks should operate with the same set of rules as commercial banks.

However, the process of financial liberalization has to be embarked upon carefully. As Bimal Jalan (1999) cautions, based on the experience of the East Asian crisis, the success of financial liberalization requires a stable macro-economic environment. In fact, the experience of the Latin American countries, such as Argentina, Chile, and Uruguay after implementation of the structural adjustment programme led McKinnon (1988, 1993) himself to advocate caution. The point made is that there exists a two-way relationship between the macro-economic environment and financial liberalization. Macroeconomic stability, price stability, and fiscal discipline are necessary preconditions for financial liberalization to work smoothly. Otherwise, it could lead to further macroeconomic instability. As an example, in considering the Stiglitz-Weiss framework, where credit rationing is used to check adverse selection, McKinnon (1993) argues that this adverse selection may not in fact be checked with credit rationing, if there is macroeconomic instability to begin with. Assuming that macroeconomic instability implies higher risk, that is, higher variance in returns on investment projects, together with a positive covariance among expected returns on projects on any one risk class, McKinnon shows that a higher level of macroeconomic instability will lead to even greater credit rationing, and even lower loan-rates. Thus, instead of inducing allocative efficiency, the process of financial liberalization could worsen it. However, if deposit insurance by government is prevalent then moral hazard may emerge, with banks undertaking very risky lending at very high loan rates. Thus, an unfavourable outcome of

the project could lead to large losses for the banks, which ultimately the monetary authority has to bear.

It is known that there are atleast three inherent elements in the macro economy that lead to macroeconomic instability through the process of financial liberalization. The first concerns the well-known effects that could follow the removal of controls on capital account while 'opening the external economy. An increase in the capital account surplus, without government intervention in the exchange market, would lead to an increase in domestic absorption and thus an increase in the current account deficit. But if government does intervene and increase foreign exchange reserves the resulting increase in money supply could lead to price instability. Whether sterilization of this intervention is at all possible depends upon the structure of the financial system. But if it does take place, then domestic rates of interest once again rise and the external instability remains.

The second element concerns the government deficit. If financial liberalization requires the government to shift to a higher (market determined) rate of interest on the public debt, then this could cumulatively lead to an even higher deficit, and unsustainable growth in the public debt. This will make macroeconomic instability worse.

The third element is the influence that financial intermediaries can have on savings. Liberalization of the financial sector could lead to an increased presence of financial intermediaries. The consequent ease in getting credit could lead to an increase in propensity to consume, so the saving rate would fall. This in turn would lead to a decrease in investment, or a rise in external borrowing.

However, as mentioned earlier and as Jalan (1991), mentions, this does not say that financial liberalization is not required. Reforms are necessary, and the earlier kind of financial repression cannot continue. Efficiency has to be brought in. But liberalization of markets and financial reforms are not ends in themselves, but means to an end. In applying them, one has to be careful. The timing and sequencing of reforms is of importance, and a 'gradualist' approach is prudent to see that further destabilization does not take place. Further, an appropriate balance should be struck between financial regulation and market freedom. "Hence, a proper system of regulation relating to prudent risk limits, short-term foreign borrowing and the degree of tolerable maturity mismatches in the banking system assumes critical importance for minimizing risks to the stability of the financial system" [Jalan, 1999, pg.14].

To summarize the debate, the basic question is whether, and to what extent there should be intervention in the financial sector. If financial markets were perfectly competitive and integrated, then they would be efficient. The discussion is then two-fold. Does intervention make them fragmented and therefore inefficient? Or, are financial markets by nature imperfect, so that market mechanism does not work to bring efficiency? One way to settle this question is to empirically examine the markets to see whether they are efficient and integrated. We end this chapter by looking at these notions as used in the empirical literature.

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 the future rate cannot be

predicted, so intertemporal arbitrage cannot take place. There are two notions of efficiency. One is weak form efficiency, in which current prices reflect all information contained in past prices. The second is strong form efficiency, in which current prices reflect all publicly available information. If a market is efficient, the price will show a lower degree of volatility. Efficiency relates to individual markets. A further question is whether the markets in the system are integrated. In integrated markets, the price/rates of return are closely related. Shocks in one market get quickly transmitted to the other, so that the rates of return move together. So the rates of return across markets and instruments should get equalized up to risk and maturity differences. This means there are no arbitrage possibilities between markets at one point of time. So efficient markets must be integrated.

Now the claim is that perfectly competitive markets are efficient and 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.

Chapter III

Financial System in India: Structure and Evolution

3.1 Introduction

The financial system of any country is comprised of the financial institutions, financial markets, financial instruments, and financial services. These constituent parts of the financial system are interdependent and work complementary to each other. The financial system contributes to growth and development of the economy by mobilizing savings and allocating these to investors. The initiation of financial reforms in the early 1990s was essentially to bring about a transformation in the structure, effectiveness and stability of the financial system. In order to assess the limitations and prospects of the reforms, we need an understanding of the organizational structure of the financial system. This chapter is designed to look at the structure and working of the Indian financial system (IFS), and its evolution in the post independence era. In section 2, an attempt is made to look at the way the financial environment in India has evolved over time. In section 3, the structure of the IFS is discussed in terms of its institutions. Lastly, in section 4, the evolution of the financial markets is looked at. Special emphasis is laid on discussing the reforms with a view to seeing whether they facilitate the removal of institutional barriers preventing the effective functioning of the system.

3.2 Evolution of the financial environment

The environment in which the Indian financial system has functioned in the post-independence era can be divided into three distinct periods. The first period is between the nationalization of RBI in 1949 and the nationalization of the commercial banks in 1969. The fairly liberal environment in which the banking sector operated marks this period. The second period is from 1969 till 1991 when the structural adjustment cum stabilization programme was initiated. This period is basically characterized by the active participation of the Reserve Bank in the banking policy formulation and re-orientation. The nationalization of 14 commercial banks in 1969 was a turning point in the evolution of financial sector policies in India. Due to the more direct and active role of RBI in devising the policies so as to meet the social objectives such as the reduction in inequalities of income and the concentration of economic power, this period is dominated by the policies of financial repression - interest rate controls, directed credit programmes, etc. The third period starts in 1991, when the attempt is made by the policy-makers to deregulate and develop the financial markets. In this period, a more comprehensive liberalization of the financial system was aimed at, though the initial steps had actually started in the late 1980s.

Soon after independence, the banking sector was recognized as the major sector of Indian financial system. The RBI was nationalized in January 1949 and has consolidated its position as the supervising and controlling agency of the banks. All scheduled banks were required by the RBI Act to maintain a minimum cash reserve of 5

percent of their demand liabilities and 2 percent of their time liabilities on a daily basis. In addition banks had to maintain liquid assets in cash, gold or government securities amounting to not less than 20 percent of demand and time liabilities. This was referred to as the statutory liquidity ratio (SLR). In 1962 the RBI was empowered to vary the cash reserve requirements (CRR) between 3 percent and 15 percent of total demand and time liabilities while the SLR was raised to an additional 25 percent over and above the CRR. RBI was also empowered to stipulate minimum lending rates and ceiling rates on various types of advances. There was a voluntary agreement among the important banks operating in India regarding the interest payable on deposits prior to 1964. Since 1964, RBI directly regulated the interest rates on various deposits.

Right from the beginning, the RBI was envisaged to play a promotional role in augmenting the advancement of credit to the agricultural sector. However, the allocation of credit from commercial banks was largely to industry and, in particular, to the corporate sector. Between 1951 and 1968 there was an increase in the share of credit to industry from 34 percent in 1951 to 67.5 percent in 1968, whereas the share of bank credit to agriculture was a little over 2 percent (Gupta 1988, Ch. 6).

The second period of the development of financial system started with the nationalization of the 14 largest Indian scheduled commercial banks. The broad objective of the nationalization of banks was to mobilize and disburse resources in accordance with the needs of development. This led to an emphasis on lending to the priority sectors, viz., agriculture and other allied activities. The public sector banks were directed to advance

40 percent of their total credit to the priority sectors with not less than 16 percent going to agriculture. Other financial institutions like LIC, UTI, IDBI, IFCI, and ICICI etc. had been nationalized in this period with special objectives. UTI was envisaged to promote the stock market and the IDBI to provide direct and indirect long-term finance to firms in industrial sector. Term loans were also provided by the IFCI and ICICI.

The rationale for such social controls was diluted subsequently with the government's increasing need to use the banking sector for financing its own deficits. It was at this time that the financial repression could be said to have set in. It was in the 1970s and 1980s that government started using the banking sector as a captive source of funds by raising the SLR and CRR. The SLR requirement, which was 28 percent in 1970-1, was gradually increased to 38.5 percent in 1989-90. The CRR requirement was raised from 7 percent in 1973-4 to 15 percent in 1989-90. At the same time, to keep the cost of borrowing low for itself, the government systematically suppressed the government securities markets and money markets during this period. This financial repression led to segmented and underdeveloped financial markets, inefficient use of credit, and most of all, adversely affected the bank profitability. The nationalization of banks also meant that the competition in the banking sector was inhibited.

It was against this background that the need for financial reforms was felt. The impetus for this came with the submission of the two influential committee reports to the RBI- the Chakravarty committee report in 1985 and the Vaghul committee report in 1987. The Chakravarty committee, which was meant to suggest measures to improve the

efficiency of monetary policy recommended to (i) develop treasury bills as a monetary instrument to make the open market operation as a dominant instrument of monetary policy, (ii) revise upwards the yield structure of government securities so as to create a demand for public debt; and (iii) adopt monetary targeting as an important monetary policy tool with price stability being the ultimate objective of monetary policy. The second committee, which was set up to study the money market, recommended for a phased decontrol and development of money markets and the gradual integration of these markets with other key short-term markets such as the treasury bills market.

The actual reform in the financial sector started in the mid-eighties with the RBI implementing some of the recommendations of the two committees. The major steps in this regard are introduction of 182-day treasury bills in 1986, commercial paper and certificate of deposits in 1989, institution of DFHI in 1988 etc. In May 1989, as a further step towards the liberalization of the money markets, the ceiling on the call money rate was withdrawn. More radical reforms have taken place in 1991, when the government of India adopted the structural adjustment cum stabilization programme. Two conditions called for financial sector reform. Firstly, the government's use of banking sector to finance its fiscal deficit has reduced drastically. Secondly, the reforms in the industrial and trade sectors necessitated the allocation of resources to be market-driven and therefore required reforms in the financial sector.

The financial sector reform got a major boost with the implementation of some of the recommendations of the Narasimham committee set up in 1991 to study the working

of the financial system. These recommendations were: (i) lowering the SLR to 25 percent in a phased manner and to use CRR as an instrument of monetary policy, (ii) phasing out directed credit programmes and to bring the interest rate on government borrowing in line with other market-determined interest rates, (iii) that banks and financial institutions achieve a minimum 4 percent capital adequacy ratio in relation to risk weighted assets by March 1993, (iv) that banks and financial institutions adopt uniform accounting practices in regard to income recognition and provisioning for non-performing loans, (v) liberalizing policies towards foreign banks with regard to the opening of offices as branches or subsidiaries, and (vi) that freedom be given to issuers of capital to decide on the nature of the instrument, its terms and its pricing in the capital market (Narasimham committee report, 1991). Most of these recommendations have been implemented by 1995-96. All this led to significant deregulation and development of the money market. Thus we note that while the financial sector had been repressed earlier, several reforms were undertaken from the mid-eighties to deregulate and liberalize it. Also a wide range of financial institutions had been set up. This facilitated the comprehensive reform package brought about in 1991.

3.3 Financial intermediation: pattern and institutions

The financial sector mediates between the ultimate savers and investors, acting as a mobilizer of credit and finance. The level of financial development is indicated by the extent of mobilization and dispersion of funds, viz. the financial intermediation process.

Several indicators are used in the literature to show the level of financial development[1] (Goldsmith, 1969). Over time the level of financial development in India has shown a steady growth, whichever indicator is used (Sen and Vaidya, 1997). However, the general pattern appears to have been a growth in the banking sector in the 1970s while the capital market grew in the 1980s.

Looking at the financial intermediation process in terms of the flow of funds, the flow has been from the household sector and the rest of the world to the government sector including the public sector enterprises and the private corporate sector. The surpluses of the household and the rest of the world sectors have increased steadily over time and so have the deficits of the government and private corporate sector (Sen and Vaidya, 1997, pg. 26). Government sector has been the largest borrower till 1991. After the 1991 reforms, there is an indication of a reversal of this trend with the government sector reducing its dependence on external funds. While government securities are still the most important instrument, the non-financial sector has increased its holding of corporate and other financial institutions' securities. The household sector too has been shifting towards holding corporate securities and mutual funds. As we would expect, this reflects the rising differential between the rate of return on these securities and on bank deposits. The private corporate sector's dependence on external funds has increased steadily till 1985-86, after which it has reduced, with an improvement in the availability

[1] The indicators of financial development are (i) finance ratio, (ii) financial inter-relations ratio, (iii) new issue ratio, and (iv) intermediation ratio. The definitions of these ratios basically imply the importance of financial institutions relative to non-financial units in raising resources to finance investment.

of internal funds. Other financial institutions as a source of funds for the private sector have increased relative to banks in the 1990s. Also, banks have increased their lending to the government, though a larger share of their funds is held with the RBI or in government securities due to high SLR and CRR.

Next we look at the structure of the financial system in terms of its institutions. Financial institutions are business organizations that act as mobilizers and depositories of savings, and as purveyors of credit or finance. Financial institutions are divided into banking and non-banking institutions; The distinction between them is that banks can advance credit by creating claims against themselves while other institutions can lend only out of their resources put at their disposal by savers.

The banking sector consists of the RBI, commercial banks and cooperative banks. Among these, commercial banks form the dominant component. Other non-bank financial institutions can be classified into three groups term lending institutions including development banks, mutual funds and the insurance sector. We briefly review developments in the banking and non-banking sectors in this section.

Commercial banks

Since the nationalization of the commercial banks in 1969, there has been a significant growth of banking systems in India both in geographical coverage and amount of resources mobilized. There has been an increase in deposits as a percentage of national income from 15.3 percent in 1969 to 51.8 percent in 1994. Most of this increase in

deposits has been in the form of time deposits,[2] which has resulted in a spectacular increase in the M3/GDP ratio since the late sixties.

There are two reasons for mobilization of such high levels of deposits. Firstly, the geographical area covered by the commercial banks has increased significantly with a more than seven-fold increase in the number of bank branches since 1969. Most of the new branches have been set up in the rural areas, which led to a sharp decline in the population per bank branch and mobilized savings from the rural sector. Secondly, the impressive performance in the mobilization of deposits is due to the positive real rate of return on the deposits, which McKinnon (1973) had argued is an essential prerequisite for financial deepening.

It has been argued that the social control of banks had led to a decline in the productivity and efficiency and reduction of the profitability of the banking sector (Ministry of Finance, 1991). The reduction of profitability of banks has ensued from factors influencing both income and expenditure in the banking industry. On the income side, banks have not been able to realize their potential income due to various restrictions on the use of funds. The most important of these have been the directed credit programmes and high levels of SLR and CRR in the late eighties. However, since 1991, there has been a scaling down of the directed credit programmes and a reduction in the SLR and CRR. On the expenditure side, the over-expansion of the banking sector due to

---

[2]: Between 1973 and 1993, 84.5 percent of the increase in aggregate bank deposits was in the form of time deposits. In end-March 1993, time deposits constituted 84.3 percent of total deposits.

the rigidly enforced branch licensing policy is an important contributing factor in the poor profitability performance of the commercial banks (Narasimham committee report, 1991).

Other financial institutions

As mentioned earlier, the other financial institutions can be classified into three groups, with almost all the majorinstitutions in all three categories being government owned. The first category consists of Development Banks, which include Industrial Development Bank of India (IDBI), Industrial Credit and Investment Corporation of India (ICICI), Shipping Credit and Investment Company of India (SCICI), Industrial Finance Corporation of India (IFCI), and Small Industries Development Bank of India (SIDBI). The largest in size and influence among these are the IDBI and the ICICIThe IDBI was started in 1964 as a subsidiary of the RBI, but in 1975, the ownership of IDBI was transferred to the Government of India. It has been operating as the apex financial institution that is responsible for the coordination of all financial institutions engaged in financing the industrial sector. Till 1990, the IDBI used to provide loans to the small scale and large-scale industries. In April 1990, IDBI set up a subsidiary company called SIDBI to which it handed over all operations pertaining to the financing of small-scale industries. The ICICI, a public limited company, was set up in 1955 as a private sector development bank. Its share capital was subscribed to by foreign institutions, banks and insurance companies. The other development banks, likewise, cater to the financing needs in specific areas.

Till 1990, the rates of interest at which these institutions lent credit to firms were fixed. But in August 1991, the government permitted all term lending institutions to charge interest rates according to the riskiness of the project. This basically freed the interest rates. The interest rates initially rose after this, but subsequently fell between 1993 and 1996. Another major change in their functioning since 1990-91 has been the reduced dependence on the government of India and the RBI for funds. Some of them, specifically the ICICI and the IDBI, have diversified their operations into various fields of activity since 1991. Broadly speaking, in the post-liberalization period they have attempted to transform themselves into financial institutions with a reduced dependence on the government for subsidized and captive sources of funds and having a diversified field of activity.

Among the mutual funds, by far the largest in size is the UTI (though in recent years, several new mutual funds have also arrived on the scene). It was set up in 1964. It is a 50 percent subsidiary of IDBI, the rest of the share capital being held by the LIC, commercial banks, ICICI, and IFCI. UTI was never constrained in any way either by regulation or by policy decisions of the Government of India in the manner in which it invested its resources, and it has invested in both equity and fixed income securities. Financial liberalization of this sector, thus has involved a removal of legal barriers to entry in the mutual funds business in a phased manner, and a strengthening of regulations aimed at ensuring transparency, and the provision of reliable information to investors. Till 1987, UTI had a monopoly position but in 1987-88 commercial banks and other

publicly owned financial intermediaries were allowed into the mutual fund sector. In 1993-94, it was opened out to the private sector, and SEBI announced regulations aimed at increasing transparency and safety. The investments of the UTI have undergone significant changes over the time. After 1990-91, the share of investments in government securities and deposits with banks has declined, while the share of investments in equity shares has dramatically increased.

The major insurance funds are the LIC and the GIC, both of which are government owned. The LIC was established in September 1956 by nationalizing all life insurance companies operating in India at that time. Unlike UTI, LIC since its inception had to operate under severe constraints regarding the way it could allocate its investible resources among various instruments. A large part of its investments had to be in government securities, and in socially oriented sectors like public sector, cooperative sector, house building, etc. As of March 1992, the LIC owned about 13.3 percent of all outstanding central and state government securities. The restrictions imposed on LIC have significantly reduced the yields on investments. However, the situation has improved in recent years with the yields of government securities increasing significantly. In 1994, the Malhotra committee has recommended that the private sector should be allowed into insurance, and the LIC and GIC should reduce investment in government securities.

This brief overview of the financial institutions allows us to make the following remarks. Earlier, most of the institutions, even if not completely in government control,

had been strictly regulated in terms of rates of interest, source of funds, and the priority areas to which they could advance credit. However, starting mid-eighties, and picking up momentum in the nineties, we can say that several areas have been opened up to private firms; there has been a phased deregulation of interest rates; captive and subsidized sources of funds to the development banks has been reduced and they have had to turn to the market for funds; and above all, the pre-emption of funds by the government has been reduced. The whole process however has been gradual, and it is to be noted that mandatory lending requirements of commercial banks to priority sectors is still maintained.

3.4 Structure and evolution of financial markets

We look now at the financial markets in which these institutions participate. Financial markets are the centres or arrangements that provide facilities for buying and selling of financial claims and services. The participants on the demand and supply sides of these markets are financial institutions, agents, brokers and savers. Financial markets may be classified as organised and unorganised markets. Unorganised market refers to a place where the financial transactions take place outside the well-established exchanges or without systematic and orderly structure or arrangements and largely cater to the rural and unorganised sector. The financial sector reforms are naturally centred on organised markets, although it is expected that they will have an indirect effect on unorganised markets as well. Discussion in this section is confined to the organized financial markets.

These may in turn be classified into the money market, capital market, credit market, government securities market, and foreign exchange market, each of which we discuss separately.

Most of the financial markets were characterized till the early nineties by controls over the pricing of financial assets, restrictions on flows or transactions, barriers to entry, low liquidity and high transaction costs. These characteristics came in the way of developments of the markets and allocative efficiency of resources channelled through them. The initiation of financial sector reforms in the early nineties was essentially to bring about a transformation in the structure, efficiency and stability of financial markets, as also an integration of markets. Some of the important structural changes enabled by financial sector reforms relate to introduction of free pricing of financial assets in almost all segments, relaxation of quantitative restrictions, removal of barriers to entry, new methods of flotation of securities, increase in the number of instruments and enlarged participation, improvement in trading, clearing and settlement practices, improvement in the informational flows, transparency and disclosure practices.

Money market

The money market performs the crucial role of providing a conduit for equilibrating short-term demand for and supply of funds thereby facilitating the conduct of monetary policy. The instruments traded in money market are short term in nature. Important among them are (i) call money, (ii) certificate of deposit, and (iii) commercial paper. The

RBI and Securities and Exchange Board of India (SEBI) regulate the participants and use of instruments in the money market.

Call money market is that part of the national money market where the day-to-day transactions in surplus funds of banks are done. Call loans are short term in nature, their maturity varying between one day and a fortnight and are payable on demand. They are given to the bill market, for the purpose of dealing in the bullion markets and stock exchanges and between banks. Among these uses, inter-bank use has been the most significant and their use on stock exchanges and other markets has been modest. In the inter-bank call money market, funds are supplied by the member banks that have reserves on a particular day in excess of reserve requirements. Banks borrow from other banks in order to meet a sudden demand for funds, large payments, large remittances, and to maintain liquidity with RBI.

Participants in the call money market are scheduled commercial banks, non-scheduled commercial banks, foreign banks, cooperative banks, and some financial institutions and multinationals. A characteristic of the call money market in India had been that of a few large lenders viz. LIC and UTI and a large number of borrowers. This led to a deficiency in obtaining short-term funds. But in 1988, the RBI set up the DFHI, which participated as both lender and borrower. Steps were also taken to widen the market in 1990. At one time, only a few large banks particularly foreign banks operated in the call money market. Over time, however the market has expanded and now small

banks and non-scheduled banks also participate in this market. There has been a significant increase in annual turnover since 1991.

The rate of interest in the call money market was market determined till 1973, but between 1974 and 1989 there were ceilings fixed. In May 1989, the ceiling on interest rate was removed. The removal of the ceiling on the call money rate lead to an increase in fluctuations since 1991, and the rate is highly variable from day to day. As a consequence, companies hesitate to issue floating rate bonds in the capital market. Another fall-out of the fluctuations in the call money rate is that the rate presents arbitrage opportunities to players in the foreign exchange market. Foreign banks now participate in the market, borrowing foreign exchange from their overseas branches and selling in the swap market in India. This has led to an increase in the forward premia on the foreign exchange. To combat this, the RBI introduced 'Repos', which were meant to even out liquidity. However, as Rangarajan (1994) pointed out, the RBI has only used repos to drain reserves from banks and not to replenish them.

Commercial paper (CP) is quite a new instrument in the money market. CPs are short-term promissory notes with fixed maturity. In 1990 RBI introduced a scheme under which certain borrowers could issue CPs in the Indian money market. This enables highly rated corporate borrowers to diversify their sources of short-term borrowings and to borrow at a lower rate than the bank-lending rate.

CPs are issued at a discount to their face value and the discount rate is freely determined by the company issuing them. The success of CPs and the development of the

market depend crucially on the emergence and growth of the secondary market for them. But so far, the secondary market for CPs has not grown significantly in India. In an attempt to deepen the market some relaxations have been made in the recent past. The maturity period, has been changed from between 91 days to 6 months, to between 15 days to 1 year. The minimum size has been reduced from Rs 1 crore to Rs 5 lakhs. The issue base has also been widened by allowing Primary Dealers, Satellite Dealers and AIFIs to issue them.

The major part of demand for CPs comes from the commercial banks, which in turn is governed by bank liquidity. Though, there is a positive interest rate differential between the bank loan rate and CP rate, commercial banks purchase CPs because bank loans involve a greater transaction cost. As inter-bank Call rates are lower than the CP rate, banks used to borrow in the call money market and invest in CP market to grab the arbitrage opportunity.

Certificate of deposit (CDs) is a short term securitized time deposit issued by commercial banks at the time of tight liquidity condition. They are negotiable because they are payable either to the bearer or to the order of the depositor and are traded on the secondary markets. CDs are virtually riskless in terms of default of payment of interest and principal. Banks issue or sell CDs either directly to the investors or through the dealers. CDs are quite flexible in respect of maturity period, which varies between 2 weeks to 5 years; the more common period is 3 months to 1 year.

Since the beginning of the 1980s, the possibility of introducing CDs in India was being seriously assessed. The Tambe Working Group, in 1982, recommended against it because there were no secondary money markets, there was an administered system of interest rates and there was the possibility that CDs might give rise to fictitious transactions. The Vaghul committee studied the matter again 5 years later (1987) and was in favour of introducing CDs, provided short-term deposit rates were aligned with other interest rates in the system. Ultimately, following the rationalization of interest rates on short-term deposits, the RBI formulated and launched, in June 1989, a scheme permitting banks to issue CDs.

Initially, the issuance of the CDs was limited to a certain percentage of fortnightly average of the outstanding aggregate deposits of 1989-90. Over time the limits were raised and subsequently it was abolished on October 16, 1993, enabling the CD to emerge as a market determined instrument. Again, to deepen themarket for CD, the issuance size has been reduced to Rs 5 lakhs and the minimum maturity period has been reduced to 15 days in April 2000.

Reforms in money market

In 1985, the Chakravarty committee first underlined the need to develop money market instruments in India, while in 1987 the Working Group on the Money Market (Chairman: Shri N. Vaghul) laid the blueprint for the institution of money markets. The Reserve Bank has gradually developed money markets through a fivepronged effort: (i) interest rate ceilings on inter-bank call/notice money, inter-bank term money, rediscounting of

commercial bills and inter-bank participation without risk were withdrawn effective May 1, 1989. (ii) several financial innovations in terms of money market instruments, such as, auctions of treasury bills (beginning with the introduction of 182-day treasury bills effective November 1986), certificates of deposit (June 1989), commercial paper (January 1990) and RBI repos (December 1992) were introduced. (iii) barriers to entry were gradually eased by increasing the number of players (beginning with the DFHI in April 1988 followed by primary and satellite dealers and money market mutual funds), relaxing both issuance restrictions and subscription norms and allowing determination of yields based on demand and supply of such paper, and enabling market evaluation of associated risks, by withdrawing regulatory restrictions, such as bank guarantees in respect of CPs. (iv)the development of markets for short-term funds at market determined interest rates has been fostered by a gradual switch from a cash credit system to a loan-based system, shifting the onus of cash management from banks to borrowers and phasing out the 4.6 per cent 91-day tap treasury bills, which in the past provided an avenue for investing short-term funds. (v) institutional development has been carried out to facilitate inter-linkages between the money market and the foreign exchange market, especially after a market-based exchange rate system was put in place in March 1993.

The changes in the money market structure need to be seen in the context of a gradual shift from a regime of administered interest rates to a market-based pricing of assets and liabilities. The development of money markets in India in the last few years has been facilitated by three major factors. Firstly, the limiting of almost automatic

funding of the government, largely realized with the replacement of *ad hoc* treasury bills (which bore a negative real interest rate for most part of the period) by ways and means advances at interest rates linked to the bank rate, and the development of the government securities market, discussed later in the chapter, permitting a gradual de-emphasis on cash reserve ratio as a monetary policy instrument. Secondly, the development and use of indirect instruments for monetary policy such as the bank rate, the strategy of combining auctions, private placements and open market operations in government paper (put in place in 1998-99) and the liquidity adjustment facility (instituted in June 2000). Thirdly, an enabling institutional framework was introduced in the form of primary and satellite dealers and money market mutual funds. The monetary authority uses money markets to adjust primary liquidity in the domestic economy and monetary policy is often, in turn, shaped by developments in the money and the foreign exchange markets.

Credit market

With a relatively underdeveloped capital market and with little internal resources, firms or economic entities depend largely on financial intermediaries for their fund requirements. Credit market is the predominant source of finance. The major institutional purveyors of credit in India are banks and non-banking financial institutions, i.e., development financial institutions and other financial institutions and non-banking financial companies including housing financial companies. While banks and NBFCs

predominantly cater to short-term needs, FIs provide mostly medium and long-term funds.[3]

Prior to the financial system reforms, this sector had been highly repressed with government restrictions on both pricing and allocation of credit. There were mandatory lending requirements to the priority sectors as well as administered rates. This led to low productivity and efficiency, and low profitability in the banking sector. It is in this background that the recommendations of the Narasimham committee were made in 1991. The consequential financial sector reforms envisaged interest rate flexibility for banks and reduction in reserve requirements, besides a number of structural measures. Interest rates, as a consequence, have emerged as a major signalling device for resource allocation. Credit market reforms included introduction of new instruments of credit, changes in the credit delivery system and integration of functional roles of diverse players such as banks, financial institutions and non-banking financial companies. The gradual introduction of a loan system in the place of a cash credit system has facilitated banks in planning their cash flows better, and in reducing the costs of uncertainty. There has also been greater competition with the introduction of new private sector banks and the permission given to foreign banks to open branches, as also with progressive improvement in the role of the nonbanking sector. Restrictions on project financing by banks have been removed.

---

[3]: However, there are non-institutional sources of credit as well. These are basically the indigenous bankers and moneylenders. It is in the field of credit that the unorganized sector is most important.

There has been considerable deregulation. While lending requirements still remain, there has been rationalization of the lending rates and a scaling down of cash reserve and statutory liquidity requirements. Selective credit controls have been eliminated over time. Credit restrictions have been gradually removed/relaxed for purchases of consumer durables, and loans to individuals against shares and debentures/bonds. As a result, the share of term loans as percentage of total bank loans has increased.

A large variety of non-bank financial institutions such as development banks, specialized financial institutions, investment institutions, and refinance institutions also function in the credit market. As noted earlier, development banks (IDBI, IFCI, ICICI, SIDBI and IIBI) occupy an important position in the financial system as the main source of medium and long-term project finance to industry. Investment institutions in the business of mutual fund and insurance activity have also played significant roles in the mobilization of household sector savings and their deployment in the credit and the capital markets. In the agriculture and rural sector and the housing sector, the NABARD (1982) and NHB (1988) respectively, are the chief refinancing institutions. Besides providing direct loans (including rupee loans, foreign currency loans), financial institutions also extend financial assistance by way of underwriting and direct subscription and by issuing guarantees. Recently, some development financial institutions (DFIs) have started extending short term/working capital finance, although term lending continues to be their primary activity.

Historically, the Reserve Bank and the Central Government have played a major role in financing these institutions by subscribing to the share capital, by allowing them to issue Government guaranteed bonds and by extending long-term loans at concessional terms. However, with the financial sector reforms, concessional lending by the Reserve Bank and the Government was phased out, leaving the financial institutions to rely for their financing needs on the equity capital and the debt markets. Expansion of their equity base through public offers and public issues of long-term bonds has become an important element of their market-based financing. In order to provide flexibility, the Reserve Bank has also allowed FIs to raise resources by way of term deposits, CDs and borrowings from the term money market. A large number of them have also been entering various businesses - venture capital, mutual funds, banking and finance. This portends well for a greater integration of the financial system.

Capital market

Capital market structure has evolved over time, with market practices earlier reflecting government policies and five-year plan priorities. The stock market in India has been fairly well developed. Its role in financial markets had increased during the 1980s, with household savings in corporate securities increasing between 1985-86 to 1994-95 (Sen and Vaidya, Ch 3). But an important feature of the pattern of stockholding had been that a large proportion of shares belongs to government owned financial institutions e.g. UTI.

The implication of this is that government was capable of indirectly influencing the market.

Till the reforms in the early 1990s, pricing was not determined by market conditions. Though volume of transaction was high, securities continued to exist in the physical form creating uncertainties for the investor, and increasing transaction cost. Long and uncertain settlement cycles created serious problems for clearing houses. Informational flows to the participants were also deficient. Raising of capital from the securities market before 1992 was regulated. Under the Capital issues (control) act, 1947, firms were required to obtain approval from the Controller of Capital Issues (CCI) for raising resources in the market. New companies were allowed to issue shares only at par. In 1992, the Capital Issues (Control) Act, 1947 was repealed and with this ended all controls relating to raising of resources from the market. SEBI was given statutory powers in 1992 to undertake the tasks of regulation and supervision. The most important fall-out of the reforms was the freeing of pricing and setting up of new guidelines regarding new issues.

Initially, only fixed price mechanism of floating new capital issues was followed. An alternative mechanism of book building[4] was introduced in 1995 giving the issuer the choice to raise resources either through this or the fixed price mechanism. Although the

[4]: Book building mechanism is a method through which an offer price of an Initial Public Offering (IPO) is based on investors' demand.

book building guidelines were prescribed in 1995, no issue was floated due to certain restrictive guidelines, which were modified in 1999. The book building mechanism of floating new capital issues has been devised in such a way that small investors are also able to subscribe to securities at a price arrived at through a transparent process. Issuers of capital are required to meet the guidelines of SEBI on disclosure and investor protection.

In September 1992, foreign institutional investors were allowed unrestricted entry in terms of volume of investment in both primary and secondary markets. In the secondary market, major reforms were the laying down of capital adequacy ratio for brokers; the banning of inside trading and the introduction of computer based trading system.

Till recently, trading on the Indian stock exchanges took place through open outcry system barring NSE and OTCEI, which adopted screen-based trading system from the beginning (i.e., 1994 and 1992, respectively). At present all other stock exchanges have adopted on-line screen-based electronic trading, replacing the open outcry system. Of the two large stock exchanges, the BSE provides a combination of order and quote driven trading system, while NSE has only an order driven system. All stock exchanges operating in India have over 8000 terminals spread wide across the country. While in 1999-00, the SEBI issued guidelines for opening and maintaining the trading terminals abroad, no trading terminal could be opened abroad due to high cost of connectivity. For

ensuring greater market transparency, the SEBI has recently banned negotiated and cross deals (where both the seller and the buyer operate through the same broker). In September 1999, all private off-market deals in both shares as well as listed corporate debts were banned. All such deals are now routed only through the trading screens. There are three main advantages of electronic trading over floor-based trading as observed in India, viz. transparency, more efficient price discovery, and reduction in transaction costs. It also reduces the segmentation of markets.

Thus the emphasis has been on disclosure of information, safeguarding of investors' interests and opening up to foreign investors. The result of this has been a dramatic increase in the number of new issues and amount of capital raised after 1991-92. While traditionally, mainly two instruments, viz., debt and equity, were traded, a large number of new and hybrid instruments were introduced in the first half of the nineties, through the increase in new issues.

Markets have widened with an increase in the number of players such as mutual funds and foreign institutional investors[5]. A major implication of this is that firms may be in a position to substitute one source of funds for another, depending on relative costs.

---

[5] There are now 34 mutual funds operating in the country with total asset base of over Rs. one lakh cr. At the end of November 2000, there were about 551 FIIs registered with the SEBI. They made investment to the extent of about US $ 11.5 billion in equity. With large investment base and active trading operations, FIIs now significantly impact the Indian stock markets.

Also, while the amounts raised on foreign markets are modest, this also enables firms to diversify their source of funds.

Government securities market

Government securities consist basically of treasury bills and dated securities, the difference being that the former consists of maturity less than one year, while the latter are longer-term. They are strictly speaking, part of the money and the capital markets respectively. But this market is discussed separately in this section since the characteristics of government securities and therefore the issues concerning them are different.

The market for government securities had been relatively underdeveloped until the mid-eighties, largely because the returns (administered rates) had been kept artificially low. The demand for government securities was therefore largely restricted to a captive market, consisting of commercial banks, cooperative banks, and some financial institutions like the LIC, UTI etc. and this too through the SLR requirements. Most of the treasury bills were 91-day ad hocs meant to monetise the budget deficit, and ended up being held by the RBI. However, following the Chakravarty committee report, in 1986 a phased deregulation was carried out. Rates of interest were revised upwards, even within the context of administered rates. The idea here, as mooted by the committee, was to help the transition from direct tools of monetary policy (such as credit controls, CRR), to the use of indirect instruments like open market operations. Thus the 182-day treasury bill

was introduced in November 1986 to increase the real rate of interest. This was phased out in April 1992, when 364-day treasury bill to be sold on an auction basis, was introduced. In 1993, an auction system for 91-day treasury bill was also introduced. At present, the sale of government securities is carried out both through auction and through pre-determined coupon issues. Non-competitive bids are, however, accepted outside the notified amount. The Reserve Bank also participates on a non-competitive basis in treasury bills and dated securities to primarily take up some part of the issues in case of under-subscription. In the recent years, with a view to moderating the market impact of the large borrowing programme on interest rates, the Reserve Bank has accepted private placement of government stocks and released them to the market when the interest rate expectations turned out to be favourable.

These measures have led to a significant growth in the primary market for treasury bills, with the amount outstanding for 91-day auction based Treasury bills rising from Rs 250 crores in January 1993 to Rs 3450 crores in August 1994. In August 1994, only sixteen percent was held by the RBI. The amount outstanding for 364-day treasury bills rose from Rs. 666 crores in April 1992 to Rs. 7160 crores in August 1994. This is mainly due to the use of open market operations by the RBI. Secondary activity has however not developed. Deregulation has given rise to a tendency for the rates of interest to fluctuate; but the 364-day Treasury bill has been more stable.

Following the Chakravarty committee recommendations, the rates of interest on dated securities has also been gradually aligned with other rates of interest, and the maximum maturity period has also been reduced from twenty to ten years. The main investors in the Government securities market in India are commercial banks, co-operative banks, insurance companies, provident funds, financial institutions, mutual funds, primary dealers, satellite dealers, non-bank finance companies and corporate entities. The Reserve Bank also absorbs primary issues of government securities, either through private placement or devolvement. Though banks have traditionally been the dominant investors in the government securities due mainly to SLR requirements, they have, in recent years, found it advantageous to invest in the government securities beyond the statutory requirements partly because of the better risk-return characteristic of such securities in the context of adherence to capital adequacy requirements and partly because of relatively sluggish demand for commercial credit. The share of commercial bank holdings continued to rise during the eighties and the nineties.

A large participant base reduces the borrowing cost for the government, reduces market volatility and imparts competition in the market. A market with adequate depth and liquidity for participants with different perceptions and liquidity requirements should emerge. The present structure of the government securities market is pre-dominantly institutional, while the household participation is negligible or nearly absent. Foreign institutional investors are also permitted to invest in the dated government securities and treasury bills, both in the primary and secondary markets, within the overall debt ceilings.

Since the secondary activity is not very high, to promote the retail market segment and provide greater liquidity to retail investors, the Reserve Bank allowed banks to freely buy and sell government securities at prevailing market prices, removing restrictions on the period between sale and purchase. Furthermore, the interest income on government securities was exempted from the provision of tax deduction at source with effect from June 1997, facilitating quotations at 'clean prices' and genuine trading in the secondary market. This has led to some growth as is evident from the fact that secondary market transactions in government securities increased to Rs. 5,39,255 crores in 1999-00 as against Rs. 1,27,179 crores in 1995-96 (Bhole, 1999). Thus it can be said that the size of the government securities market is large and is growing.

Foreign exchange market

Foreign exchange market includes the market for all deposits, credits and balances payable in any foreign currency, and any instrument payable at the option of the drawee partly in foreign currency. It facilitates the transfer of purchasing power denominated in one currency to another. In the context of globalisation of the Indian economy, the foreign exchange market is an important element of the financial system.

The working of the foreign exchange market depends upon the exchange rate mechanism followed. In India, till 1975, the par value of the Rupee was expressed in terms of gold. Between 1975 and 1992, the rupee was linked to a basket of currencies, and the exchange rate followed a managed float system. The regime was characterized by

a daily announcement by the RBI of its buying and selling rate to authorized dealers (ADs) for merchant transactions. Given the various exchange controls that were in position, these were the rates around which the market operated, with the RBI performing a market-clearing role on a day-to-day basis. In 1992, the liberalized exchange rate management system involving a dual exchange rate was introduced and the rupee became convertible for all approved external transactions. Under this system, exporters were able to sell sixty percent of their exchange receipts to ADs at market determined rate. However, it was the unification of the exchange rates in 1993 that ushered in the market-determined exchange rate, based on demand and supply in the foreign exchange market. Full current account convertibility, introduced in August 1994, was a further step in this regard.[6]

The structure of the foreign exchange market in India may be briefly described. It operates from major centres like Mumbai, Delhi, Calcutta, Chennai, Bangalore, Kochi, and Ahmedabad. It is comprised of customers, ADs in foreign exchange and the RBI. It consists of two segments, the customer or merchant segment consisting of transaction of customers to meet transaction needs, and the interbank segment encompassing transaction between banks (ADs). The customer segment includes major public sector units, corporates, and other business entities with foreign exchange exposure. Of late, foreign institutional investors have also been playing a major part. The inter-bank

---

[6] See for instance, V. Ananthakrishnan (1987), "Foreign Exchange Market of India: Structure and Functioning".

segment is dominated by a few large Indian banks, particularly SBI and a few foreign banks.[7]

Since 1993, several steps have been taken to widen and deepen the foreign exchange market. Firstly, banks have been given the freedom to (i) fix net overnight position limits and gap limits, (ii) initiate trading position in the overseas markets, (iii) determine the interest rates of NRI deposits and maturity period. Secondly, inter-bank borrowings have been exempted from statutory pre-emptions of SLR and CRR. Thirdly, banks have been permitted the use of derivative products for asset-liability management. Fourthly, in order to facilitate integration of domestic and overseas money markets, ADs have been allowed to borrow abroad. The funds so borrowed are allowed to be used for any purpose, other than lending in foreign currencies. Fifthly, corporates have been provided significant freedom in managing their foreign exchange exposures.

They are permitted to hedge anticipated exposures, though this facility has been temporarily suspended after the Asian crisis. Other risk management tools like cross-currency options on back-to-back basis, lower cost option strategies like range forwards and ratio range forwards and hedging of external commercial borrowing (ECB) exposures have been allowed subject to prudential requirements.

At any time in the exchange market there is a spot exchange rate at which current transactions are carried out, and a forward rate for deliveries in the future. Both of these

---

[7] See for instance, Y.V. Reddy (1999), Development of Forex Markets: Indian Experience.

are market determined. In the absence of transaction cost, the difference between the two rates (i.e. the forward premium) should reflect the interest differential between the two countries. This obviously requires the exchange market to be integrated firstly with the other domestic financial markets, and secondly with foreign financial markets.

3.5 Conclusion

We may sum up the discussion in this chapter as follows: since independence the financial sector has been subject to strong government control. While it was relatively liberal initially leaving some room for the market after 1969 till 1991, the financial environment may be described as one of financial repression. This period is characterized by government control over all financial institutions and 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. This resulted in highly segmented, and arguably inefficient, markets. Subsequently, since 1991 financial sector reforms were undertaken. The reforms have taken the form of opening several subsectors 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. So even though directed credit programmes still remain, the rates of interest on these are market determined, as are those on government borrowing.

The convertibility of the rupee on current account together with dilution of FERA, has activated the foreign exchange market. There has also been a reduction in pre-emption of bank resources. Together with a greater permissiveness towards financial institutions entering different markets, this has led to diversification of activities across different markets and sectors.

Thus the reforms appear geared towards allowing market forces to determine rates and volumes in different segments of the market, and in allowing greater capital flows between them. So the institutional impediments to interlinkages between markets have, to a large extent, been removed. This is of course a necessary step towards bringing about an efficient financial system, by reducing segmentation. Whether, and to what extent, market integration has actually been achieved is an empirical question, to be taken up in the next chapter.

Chapter IV

Empirical Analysis

4.1 Review of empirical studies

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. Openness of the economy in post-reform period has created 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 is 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 for this subject. A brief review of these studies is given below.

Bhoi and Dhal (1998) studied the integration of Indian financial market in the post-liberalization period. They have taken five major segments of financial market, viz. money market, credit market, government securities market, capital market and foreign exchange market. Using monthly data of several interest rates ruling in these markets

during 1993 to 1998, they have conducted a cointegration analysis and found interesting results.

As per their study several segments of financial market have achieved operational efficiency, though the Indian financial sector is not yet fully developed and competitive. They have taken 91-day treasury bill seems to emerge as a potential reference rate in Indian context to measure the degree of integration. India's financial markets are getting integrated at the short end of the market, such as money market, credit market, government securities market since April 1993. But, capital market is least integrated with the rest of the financial sector. There are indications about integration of money market and forex market. However, integration of domestic and overseas financial markets is not yet significant.

Nag and Mitra (1999) have done a study on Indian financial market. They found that an integrated financial market is of great help to the monetary authorities in their policy making endeavor. Transmission of monetary policy becomes smooth and quick only when the impact of policy intervention at one end of the market gets quickly transmitted to the entire spectrum of the market. Efficient and integrated financial market is an important infrastructure that facilitates savings, investments and consequent economic growth. In their study, they have examined the nature and degree of integration of the Indian financial market. They have used different artificial intelligence techniques like the self-organizing feature maps and neural network modeling.

From a statistical point of view, artificial neural network (ANN) may be described as a non-linear, non-parametric, multivariate and completely data driven inference procedure. There are several features of ANN, which make it attractive as a forecasting tool. A group of markets is said to be integrated when shocks arising in one market get quickly transmitted to other inter-linked markets. In a highly integrated system of competitive financial markets, it is expected that the principal mechanism of transmission will work through rate channels and tends to move in tandem. As a result, a multivariate vector of price variables of related markets should be tightly clustered around a central reference rate. They have taken three closely related segments of financial market, viz. short-term money market, forex market and capital market. Call money rate, rupee-dollar rate and BSE sensex have been taken as representative price variables of these markets.

After studying the degree of integration of these variables, they examined the nature of association between these three markets by assessing the predictability of one market's price variable by using price information of other two markets. The methodology used is somewhat similar to the one advocated by Granger for causality test. On the basis of their results, they concluded that the short-term money market and forex market are gradually getting integrated and price variables in these markets are sensitive to price movements in other financial markets also. However, the capital market continues to be somewhat insulated to the changes in rate variables in the other segments of the financial market.

Pattanaik and Vasudevan (1999) have examined the behaviour of domestic financial markets in the post-liberalization period. They concluded that integration of the domestic market with the foreign money markets would be a natural outcome of the financial sector liberalization. In an attempt to identify the factors determining interest rates in India, they have conducted cointegration analysis between interest rates, real money supply, output and expected return by foreign investors, which shows emerging dynamics of interest rate determination. Further, the parameter of openness (as measured by the coefficient of the expected foreign return variable in the cointegrating regression) has increased significantly in the period April 1996- June 1998. Rising foreign portfolio inflows, greater exposure to Indian markets by foreign institutions and funds and sustained rise in foreign direct investment, account for the stronger linkages observed between domestic and foreign interest rates.

According to the RBI (2000) study, there is a close integration between the money market and foreign exchange market. This is due to the fact that both interest rates in the money market, especially call rate and exchange rate are short-term in nature and commercial banks play a dominant role in both the markets. Integration in these markets is more pronounced, as the call rates showed volatility at the time of adverse situation in foreign exchange market. It is found that in mid-nineties, foreign exchange market was under pressure, which immediately got reflected in call money market. The call rates and exchange rate have shown high degree of volatility at this juncture. This again happened in 1997-98, which made the call rates to vary widely from the mean. So, these two

markets are highly correlated. When there is excess demand for foreign exchange and the domestic currency is undergoing depreciation, bank liquidity is highly adversely affected. At this time, exporters delay the repatriation of proceeds and importers rush for cover. To maintain the liquidity position, banks undertake several measures. Banks liquidate securities over and above the SLR obligation, withdraw money from inter-bank call money market. This raises the call rate and government securities coupon rate. At the time of prolonged volatile conditions, banks liquidate CPs and issue CDs at high cost. This puts upward pressure on interest rates in money market. However, capital market in India is the least volatile segment of financial market. According to the studies by RBI, the volatility in the capital market has declined significantly after the reforms.

After the institution of a market based exchange rate mechanism in March 1993, in forex market, the exchange rate remained stable. During 1992-93 to 1994-95, stability in the currency market was supported by the Reserve Bank's policy of absorbing the excess supply resulting from strong capital inflows. As a result, all segments of financial market witnessed easy liquidity conditions. The Reserve bank divested net domestic assets through open market operations to maintain monetary stability, while modulating interest rates in the money market. The domestic currency came under minor pressure during November 1994 and in mid-March 1995, but stability was quickly restored. The later period of nineties however showed more volatility in the money and foreign exchange market, which underscored the gradual integration of the domestic money market, and the foreign exchange market.

The above review of existing studies shows that the issue of financial market integration is a continuously changing (evolving) phenomenon. It requires periodic assessment and updating. The present study broadly follows the approach of Bhoi and Dhal (1998) and attempts to update and improve upon that study. Bhoi and Dhal (1998) have stopped at cointegration analysis in their study. An important follow-up of cointegration analysis, namely error-correction mechanism (ECM), is also being attempted in this study.

4.2 Present study

India's financial sector can be broadly divided into organized and unorganised markets. But the data on unorganised 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 forex market for the purpose of market integration hypothesis.

Variables and data period

The instruments, available for transaction in both the short-term and long-term markets are given below:

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

1. Call Money

2. Certificate of Deposit

3. Commercial Paper

4. 91-day Treasury Bill

5. Forex trading instruments

6. Credit market: Deposit & Credit

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

1. Dated securities of Central & State governments

2. PSU bonds

3. Mutual Fund units

4. Equities

5. 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 30 scrips BSE index (PER). However, PER is the only long-term instrument considered here.

This study is concerned with the post liberalization period, which covers the beginning of massive privatisation drive and deregulation of the financial sector on a large scale to globalise the economy. All these changes tactically shifted the public eye to the stock market. This resulted in a boom in the stock market, which was short-lived. Though the financial sector reform process started in 1991, the first two years are excluded because of the high volatility in those years. Hence, the study is based on monthly data spanning from March 1993 to August 2000[1]. Assuming deterministic seasonality[2] in the monthly data set, depersonalisation has been done using the moving average method. All the subsequent empirical analysis was carried out with this depersonalised data.

4.3 Design of the empirical analysis

Most of the empirical studies on integration of financial markets focus on the operating efficiency indicator of the financial market. 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

---

[1] The bulk of the empirical work was done during the first half of 2001. Since then, some more data must have been accumulated. This data could not be used in this analysis.

[2] Alternatively, one can assume and test the presence of seasonal unit roots. This has not been attempted here.

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[3].

The empirical cointegration exercise entails that one should first identify a reference rate. Reference rate is one, which presents ideal characteristics, according to 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. The reference rate should be statistically well behaving and satisfy certain regularity conditions consistent with the theoretical implications. One of the 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.

---

[3] 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, cointegartion 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.

In order to ascertain whether any of the short-term rate 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.

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

Variable	Mean	Variance[+]	Skewness	Excess Kurtosis
TB-91	0.003	0.45	-0.97*	3.54*
CMR	0.01	29.99	-0.34	3.47
CDR	-0.02	1.37	0.73	4.65
CPR	-0.02	0.69	-0.01	0.45
FRWD	-0.02	4.35	0.21	2.43*
PLR	-0.09**	0.15	-0.76*	3.86*
PER	-0.01	5.03	-0.007	1.18**

*: Significant at 1% level, **: Significant at 5% level.
[+]: For sample variance, significance level is not available.

The variance and kurtosis measures of first difference series indicate that three of the series, namely all the money market instruments, could satisfy the normality assumption viz. zero skewness and excess kurtosis equals 0. These two measures are not statistically different from zero for money market instruments. For the other four instruments, one or the other measure is significantly different from zero. This rules them out as possible reference rates. Among the money market rates, CPR has numerically smallest values for skewness and excess kurtosis values. This instrument may possibly

qualify for 'reference rate'. In contrast to this, Bhoi and Dhal (1998) have found TB-91 as the reference rate. Difference in sample period might be responsible for the discrepancy in the result.

4.4 Causality test

Although some of the stylized statistics are used to identify a 'reference rate' among a class of short-term rates in the previous section, 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[4] analysis was carried out within a bi-variate framework. Lag lengths 2, 4 and 8 are tried. The results of 'F' tests are reported in Table 2.

---

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

The results show that there is bi-directional Granger causality between 11 pairs, viz., (CMR, TB-91), (CMR, CDR), (CMR, PLR), (CMR, CPR), (TB-91, CDR), (TB-91, PLR), (TB-91, CPR), (PER, PLR), (CDR, FRWD), (CDR, CPR), and (PLR, CPR). These include instruments from all the five markets considered here. A majority includes money market instruments. This shows that the changes in credit market and money market cause each other to change. There is significant Granger causality between (CDR, CPR), (CDR, CMR), and (CPR, CMR). So, money market rates cause each other to change within the market. There is however only unidirectional Ganger causality between 6 pairs, viz., (PER, TB-91), (FRWD, TB-91), (PER, CPR), (PLR, CDR), (PLR, FRWD) and (FRWD, CPR).

The unidirectional causality between FRWD and TB-91 is significant, which can be interpreted that the fluctuations in foreign exchange market can affect government securities market. Another result shows that CDR causes the TB-91 in a weaker way. So, money market rates can affect the government securities market rate as well. The opposite link is of course much stronger. An overall view of the Granger causality test suggests that there is causal relationship between both short-term and long-term interest rates, which is an indication of integration among them. However, there appears to be some conflicting results also. Four pairs namely (CMR, FRWD), (CMR, PER), (PER, CDR), (PER, FRWD) do not show any causality between them. Three of these involve capital market instrument, PER. In other words, market instruments in these pairs are independent of each other.

Table 2: 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.

4.5 Integration of markets

The broad integration of financial markets can be seen from the Figure 1. Except PER and TB-91, all other rates moved in tandem. This shows that there is a fair degree of integration between money market, forex market and credit market. Thus, all these short-term markets show close interlinkage between them. As anticipated, the Capital market is less integrated with other segments. Table 3 supports this result. Further, It is evident from this table that the variability is the highest in the case of price earning ratio and call Money rate ranks second. Thus, the two extreme ends of the financial markets i.e. the long and short ends are relatively more volatile.

The statistical distributions of all the variables (rates of return of market instruments) are positively skew (except prime lending rate), and platty kurtic (except forward premium and call money rate). The high degree of volatility in some of these markets might be one of the contributing factors.

4.6 Correlation coefficients

Another crude (informal) way of looking at the integration of financial markets is to examine the pair-wise correlation coefficients. These are given in Table 4. Broadly speaking, the cross correlation coefficients give us the degree of pair-wise association of various rates. From the table, it is clear that the PER is moving significantly in the opposite direction with one short-term money market rate (CDR) and foreign exchange rate (FRWD).

Figure 1: Interest rate movements in post-reform period in India

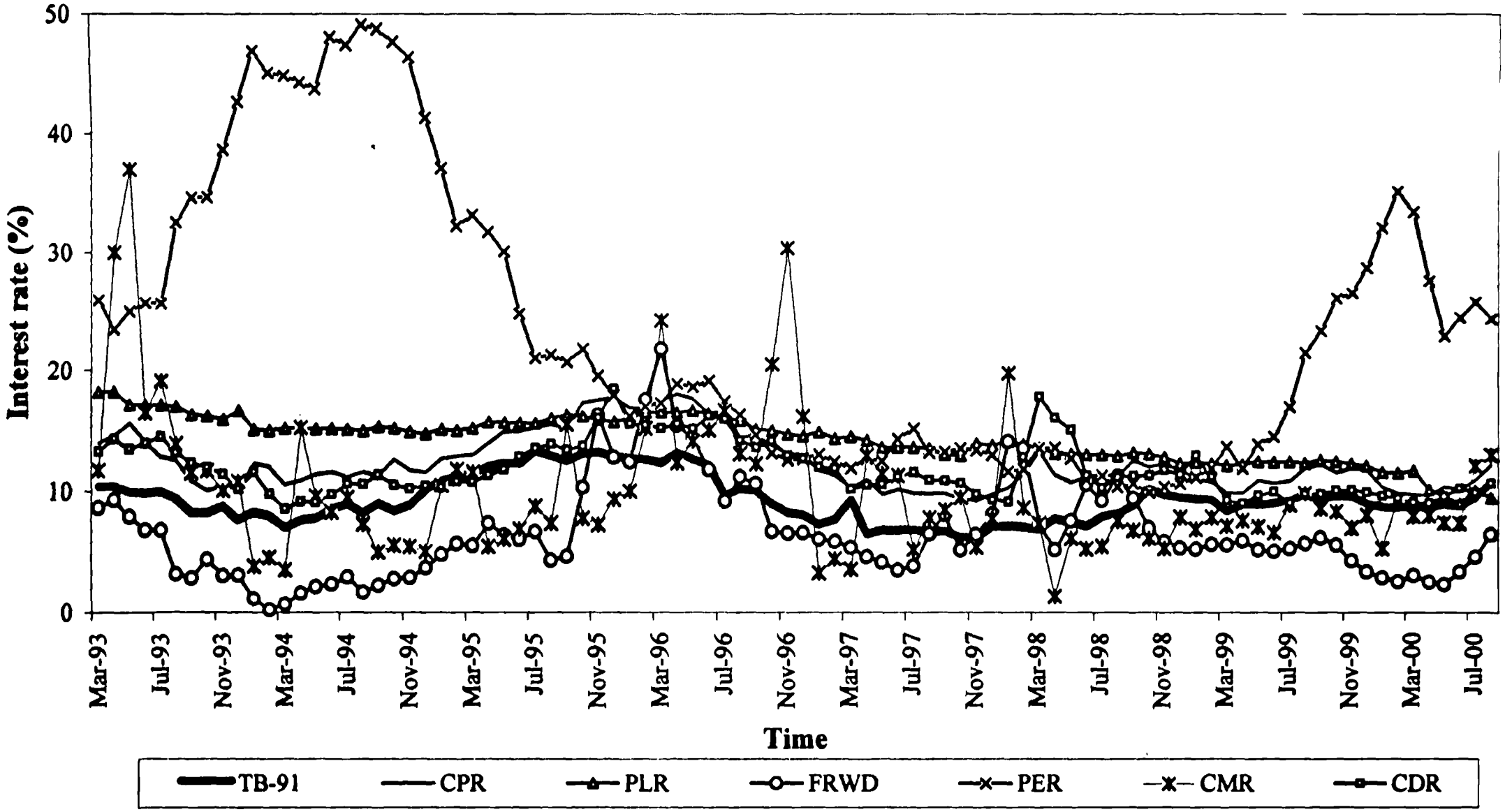


Table 3: Basic statistics of returns on various financial instruments (level form)

Variable	Mean	Variance[+]	Skewness	Excess Kurtosi
TB-91	9.30*	3.51	0.60**	-0.46
CPR	12.30*	5.34	0.96*	-0.02
PLR	14.18*	3.86	-0.43***	-0.13
FRWD	6.46*	15.52	1.34*	2.29*
PER	23.40*	142.00	0.81*	-0.55
CMR	10.07*	34.85	2.18*	6.34*
CDR	11.73*	5.00	0.86*	0.05

*: Significant at 1% level, **: Significant at 5% level, ***: Significant at 10% level.
[+]: For sample variance, significance level is not available.

Table 4: Matrix of simple correlation coefficients between returns on financial instruments

Variabl	TB-91	CPR	PLR	FRWD	PER	CMR	CDR
TB-91	1.000	0.765**	0.316**	0.448**	0.047	0.189*	0.466**
CPR	-	1.000	0.582**	0.665**	-0.039	0.377**	0.785**
PLR	-	-	1.000	0.310**	0.201*	0.345**	0.495**
FRWD	-	-	-	1.000	-0.479**	0.427**	0.626**
PER	-	-	-	-	1.000	-0.097	-0.270**
CMR	-	-	-	-	-	1.000	0.310**
CDR	-	-	-	-	-	-	1.000

*: Significant at 1% level (1-tailed), **: Significant at 5% level (1-tailed).

This may indicate very less linkage between capital market and money market. On the other hand, there is fair degree of positive association between forex market and money market, as shown by the high and significant positive correlation between FRWD and CMR, PLR, CPR and CDR. Further, TB-91 and CPR are highly correlated (second largest correlation, namely 0.765), which proves that the government securities market and money market are closely related. However, the PLR and CMR are also positively correlated, but the degree of correlation between them is low. This implies although money market and credit market are linked, but the association is somewhat weak.

4.7 Test of stationarity

The first step in the time series analysis is to examine the stationarity properties of the variables. A stochastic process $\{y_t\}$ is said to be stationary if for all t and k,

$$E[y_t] = E[y_{t+k}] = \mu$$

$$E[(y_t - \mu)^2] = E[(y_{t+k} - \mu)^2] = \sigma^2$$

$$E[(y_t - \mu)(y_{t+k} - \mu)] = E[(y_{t+j} - \mu)(y_{t+j+k} - \mu)] = \gamma_k \quad \text{for all } j$$

where, μ, σ^2 and all γ_k are constants independent of time of observation, t. The auto-covariance may depend on k, the lag length. The above conditions are also refereed to as

conditions of weak stationarity, second order stationarity or wide sense stationarity. A strongly stationary process need not have finite mean and/or variance (i.e. μ and/or σ^2 need not be finite).

In time series literature, there are both informal and formal tests of stationarity. The informal tests include time series plots (as in Figure 1) and use of correlogram. Like any such informal tests, these can involve subjectivity. Statistical packages also use Box-Pierce Q-statistic and Ljung-Box (LB) statistic for testing stationarity of a series. These two statistics are based on auto-correlation coefficients of several lag lengths. The formal tests of nonstationarity, also known as unit root tests or test of random walk series, are pioneered by Dickey and Fuller (1979). Augmented Dickey Fuller (ADF) test is suggested for situations involving serially correlated random disturbance term in unit root tests. Modifications of these are attributed to MacKinnon (1991), which incorporates a time trend into the unit root test. Yet, another unit root test is proposed by Philips and Perron (1988).

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 heterogenous. We therefore use this test for our purpose. The results of Phillips-Perron test for unit root are given in Table 5.

Table 5: Estimated z-statistic values for Phillips-Perron test

Variable	Level form		First difference form	
	Without Trend	With Trend	Without Trend	With Trend
TB-91	-2.03 (4)	-1.96 (4)	-11.21* (2)	-11.15* (2)
CPR	-2.46 (4)	-2.55 (4)	-8.81* (4)	-8.77* (4)
PLR	-0.94 (1)	-2.32 (4)	-10.48* (3)	-10.41* (3)
FRWD	-3.06** (1)	-3.04** (1)	-8.48* (1)	-8.43* (1)
PER	-1.32 (4)	-1.33 (4)	-6.47* (2)	-6.44* (2)
CMR	-5.52* (1)	-5.73* (1)	-13.92* (4)	-13.98* (4)
CDR	-3.03** (2)	-3.11** (2)	-7.97* (1)	-7.93* (1)

The critical values of z-statistic for a sample size 100 are -3.51 and -2.89 at 1% and 5% level of significance respectively. These values include a constant term. Figures in parenthesis are the lag length.

*: Significant at 1% level **: Significant at 5% level

The critical values for this test are the same as those for augmented Dickey-Fuller distribution. The Phillips-Perron test shows that only CMR does not have a unit root in levels. All other variables have a unit root in levels and thus are non-stationary. Then, unit root test is conducted in first differences. All the series are now found to be stationary. In other words, they are all found to be I(1) series.

4.8 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. Within a bi-variate framework, the estimated residuals from a regression can be viewed as a linear combination of the two given variables and can be tested for their (residuals') stationarity. If the estimated residuals are found to be stationary, then the original two variables can be declared co-integrated according to Engel-Granger (1987). Following Engel-Granger methodology, if the two series are I(1), then the long-run relationship, also known as cointegrating equation,

$$y_t = \beta_0 + \beta_1 z_t + e_t \qquad (4.1)$$

is a valid relationship provided $\{e_t\}$ is a stationary process.[5]

If the variables are cointegrated, OLS regression yields a super consistent estimator of the cointegrating parameters β_0 and. β_1. In order to determine whether the variables are actually cointegrated, consider the autoregression of the residuals:

$$\Delta e_t = a_1 e_{t-1} + \varepsilon_t$$

---

[5] Unfortunately, since $\{e_t\}$ series is not invariant to the choice of dependent and independent variables in (4.1), the conclusion about co-integration can vary between the two situations. The empirical results given below in fact illustrate this. This particular possibility is somewhat disturbing and calls for caution in interpreting the very concept of co-integration.

Since the $\{e_t\}$ sequence is a residual from a OLS regression equation, there is no need to include an intercept term; the parameter of interest is a_1. If we reject the null hypothesis that $a_1 = 0$, we conclude that the residual series do not contain a unit root and therefore the $\{y_t\}$ and $\{z_t\}$ sequences are cointegrated of order (1,1). On the other hand, if $\{y_t\}$ and $\{z_t\}$ are not cointegrated and $\bar{R}^2 > DW$, the Durbin-Watson statistic, then the regression equation (4.1) may be termed spurious, i.e. the underlying variables do not have any meaningful relationship. We apply the above methodology to all pairs of financial instruments that are considered here.

Money and government securities market

We summarise the co-integration results, i.e. pairs of market instruments showing co-integration, in Table 6. The pairs that do not show co-integration are given in Appendix for completeness. Most of the pairs that are listed in this Table 6, coincide with those exhibiting bi-directional Granger causality given in Table 2. This implies, by and large, whenever there is bi-directional causality, the two markets tend to indicate co-integration. However, there are two exceptions, (CMR, FRWD) and (CMR, PER). These two pairs do not show Granger causality but seem to be co-integrated in that order. Some of the regressions showing no cointegration are likely to be spurious since $\bar{R}^2 > DW$ values. Most of the regressions seem to suffer from autocorrelation and low explanatory power. Between money market and government securities market, two pairs, viz. (CMR,

TB-91), and (CPR, TB-91) are found to be co-integrated, where as there is no co-integration between CDR and TB-91.

From Table 6, it is evident that TB-91 is not influencing any of the money market instruments (slope parameter is not significant) despite significant bi-directional causality between these instruments. But TB-91 is influenced by only one money market instrument, namely CPR. This implies that the long-run response, which is also the elasticity, of CPR on TB-91 is 0.67, i.e. corresponding to a 1% increase in commercial paper rate, there will be a 0.7% increase in treasury bill rate. This response is very high, considering the monthly nature of the data. This finding though sounds surprising can 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, only unidirectional co-integration seems to exist, despite bi-directional Granger causality between all the three pairs.

Money and foreign exchange market

There is a high degree of co-movement between call money rate as well as certificate deposit rate and 3-month forward premium of the US dollar. The correlation coefficients given in Table 4 further vindicate the view that money and forex markets are integrated. Specifically, (CMR, FRWD) in that order, and (CDR, FRWD) in both ways are co-integrated. Also, (FRWD, CPR) are co-integrated. It is clear that the long-run

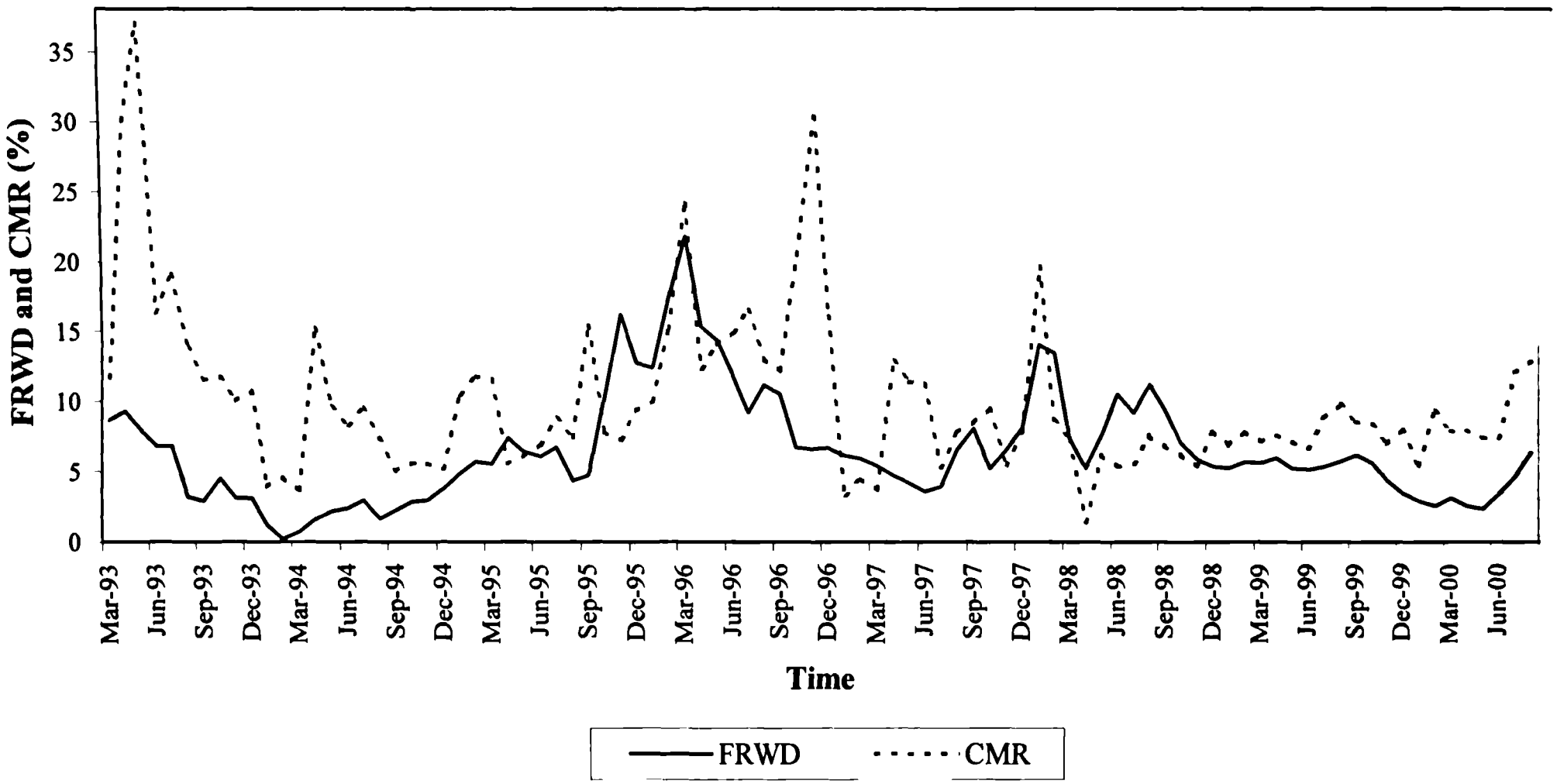
Table 6: Results of cointegration analysis

Dependen variable	Independen variable	Constant	Slope coefficien	$\bar{R}^2$	DW	DF
CMR	CDR	0.09 (0.03)	0.84* (3.19)	0.09	1.00	-5.40*
	CPR	-1.97 (-0.62)	0.97* (3.89)	0.13	0.98	-5.36*
	PLR	-7.33 (-1.75)	1.22* (4.19)	0.15	1.01	-5.40*
	TB-91	4.39 (1.40)	0.61 (1.85)	0.02	0.90	-5.08*
	FRWD	6.77* (5.96)	0.51* (3.39)	0.10	0.91	-5.08*
	PER	11.13* (8.07)	-0.04 (-0.86)	-0.002	0.85	-4.87*
CDR	CPR	2.52* (3.08)	0.74* (11.46)	0.59	0.58	-3.85**
	FRWD	9.49* (26.19)	0.34* (7.24)	0.36	0.69	-4.30*
CPR	TB-91	2.73* (3.96)	1.02 (14.11)	0.69	0.60	-3.85**
FRWD	CPR	7.09* (-4.09)	1.10* (7.95)	0.41	0.53	-3.68**
	CDR	-6.16* (-3.47)	1.07* (7.24)	0.36	0.70	-4.32*
TB-91	CPR	1.00 (1.67)	0.67* (14.11)	0.69	0.60	-3.81**

Figures in parenthesis indicate the t-value. The entries given in the last column are the τ-values corresponding to the coefficients of the DF test for the residuals. The critical values for a sample size 100 for the DF test are - 4.07 and - 3.37 at 1% and 5% level of significance respectively.

*: Significant at 1% level, **: Significant at 5% level.

Figure 2: Movements in FRWD and CMR



relationship between CDR and FRWD is not very strong since the slope coefficient is 0.34. Further, any change in the foreign exchange market has a larger effect on the call money market (slope coefficient is 0.51) than on market for certificate deposit rate.

Figure 2 shows the relationship between money market and forex market. It is evident from the figure that CMR and FRWD moved in tandem though there is high volatility in these two rates.

Credit market and money market

The results of co-integration between credit market rate and various money market rates show that the call money rate and prime lending rate are co-integrated, without the opposite being true. There seems to be no co-integration between (CPR, PLR), and (CDR, PLR). So, the credit market is linked with the money market only through call market. Further, the response of CMR to changes in PLR is quite high (the regression coefficient is 1.22). So, it can be inferred that any change in the loan rate in the banking system has a huge and more than proportion effect on the call money rate. Call money market and loan market are thus highly interlinked. The regressions between (CDR, PLR), and (CPR, PLR) suffer from autocorrelation. The Durbin-Watson statistic in these regressions is 0.42 and 0.23 respectively. And also the regression of PLR on CPR is likely to be spurious because the $\bar{R}^2$ values (0.36) is greater than the Durbin-Watson statistic (0.14).

Capital market

For testing of integration between capital market and money market, CDR and CPR were taken as money market variables and PER was taken as the capital market variable. A mere casual look at the results of co-integration between two pairs of variables, namely (CPR, PER) and (CDR, PER) show that they are not co-integrated. Moreover, the regressions involving PER have poor explanatory power. The cross correlation coefficients also show that there is negative association between these rates. It is not surprising to find a negative correlation as Indian stock indices have often moved in opposite direction to the fundamentals of the economy. The capital market and money market are yet to be integrated.

4.9 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 (i.e., if the null hypothesis of no cointegration is rejected), 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:

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

where β_1 is the parameter of the normalized cointegrating vector: ε_y are white noise disturbance term and α_0, α_1 α_y, 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., $y_{t-1} - \beta_0 - \beta_1 z_{t-1} = e_{t-1}$). The LHS interest rate would rise. 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, 10 pairs of variables are found to be co-integrated (see Table 6). Further, two of these namely (CPR, TB-91) and (CDR, FRWD) are co-integrated in the reverse order also. The error correction model is applied to all these 12 pairs of variables. The empirical results show that all these pairs, except one, show the need for error correction mechanism, as indicated by significant coefficient for lagged residual, to retrieve short-run impacts from long-run co-integrating regression. The non-significant ECM equation is between TB-91 and CPR. The estimated ECM equations are given below:

$$\Delta CMR_t = \underset{(-.50)}{-0.23} \underset{(-.90)}{-0.36\,\Delta CDR_{t-1}} \underset{(-5.64)}{-0.54^{*}\,e_{t-1}} + \underset{(1.31)}{0.13\,\Delta CMR_{t-1}} \qquad (4.2)$$

$$\bar{R}^2 = 0.26, \text{DW} = 2.25$$

$$\Delta CMR_t = \underset{(-.59)}{-0.26} \underset{(-2.62)}{-1.45^{*}\,\Delta CPR_{t-1}} \underset{(-6.12)}{-0.58^{*}\,e_{t-1}} + \underset{(1.71)}{0.16\,\Delta CMR_{t-1}} \qquad (4.3)$$

$$\bar{R}^2 = 0.32, \text{DW} = 2.28$$

$$\Delta CMR_t = \underset{(-.43)}{-0.20} \underset{(.18)}{- 0.22\ \Delta PLR_{t-1}} \underset{(-5.46)}{- 0.56^{*}\ e_{t-1}} + \underset{(1.34)}{0.13\ \Delta CMR_{t-1}} \qquad (4.4)$$

$$\bar{R}^2 = 0.26, DW = 2.14$$

$$\Delta CMR_t = \underset{(-.45)}{-0.21} + \underset{(.05)}{0.03\ \Delta TB_{t-1}} \underset{(-5.41)}{- 0.51^{*}\ e_{t-1}} + \underset{(1.09)}{0.10\ \Delta CMR_{t-1}} \qquad (4.5)$$

$$\bar{R}^2 = 0.26, DW = 2.20$$

$$\Delta CMR_t = \underset{(-.48)}{-0.22} \underset{(-1.02)}{- 0.24\ \Delta FRWD_{t-1}} \underset{(-5.57)}{- 0.53^{*}\ e_{t-1}} + \underset{(1.24)}{0.12\ \Delta CMR_{t-1}} \qquad (4.6)$$

$$\bar{R}^2 = 0.26, DW = 2.21$$

$$\Delta CMR_t = \underset{(-.46)}{-0.22} + \underset{(-1.17)}{0.25\ \Delta PER_{t-1}} \underset{(-5.10)}{- 0.46^{*}\ e_{t-1}} + \underset{(.62)}{0.10\ \Delta CMR_{t-1}} \qquad (4.7)$$

$$\bar{R}^2 = 0.25, DW = 2.21$$

$$\Delta CDR_t = \underset{(-.27)}{-0.03} \underset{(-.30)}{- 0.04\ \Delta CPR_{t-1}} \underset{(-5.01)}{- 0.43^{*}\ e_{t-1}} + \underset{(2.30)}{0.24^{**}\ \Delta CDR_{t-1}} \qquad (4.8)$$

$$\bar{R}^2 = 0.24, DW = 1.93$$

$$\Delta CDR_t = \underset{(-.23)}{-0.02} + \underset{(-1.73)}{0.09\ \Delta FRWD_{t-1}} \underset{(-4.81)}{- 0.32^{*}\ e_{t-1}} + \underset{(3.16)}{0.28^{*}\ \Delta CDR_{t-1}} \qquad (4.9)$$

$$\bar{R}^2 = 0.31, DW = 2.05$$

$$\Delta FRWD_t = \underset{(-.14)}{-0.02} \underset{(-.91)}{- 0.23\Delta CPR_{t-1}} \underset{(-3.47)}{- 0.26^{*}\ e_{t-1}} + \underset{(2.49)}{0.27^{*}\Delta FRWD_{t-1}} \qquad (4.10)$$

$$\bar{R}^2 = 0.11, DW = 1.85$$

$$\Delta FRWD_t = \underset{(-.23)}{-0.05} \underset{(-3.36)}{- 0.62^{*}\Delta CDR_{t-1}} + \underset{(1.86)}{0.25^{***}} e_{t-1} + \underset{(1.32)}{0.15}\ \Delta FRWD_{t-1} \qquad (4.11)$$

$$\bar{R}^2 = 0.11, DW = 1.93$$

$$\Delta CPR_t = \underset{(-.24)}{-0.01} + \underset{(2.32)}{0.31^{**}}\ \Delta TB_{t-1} - \underset{(2.90)}{0.25^{*}}\ e_{t-1} + \underset{(.04)}{0.004}\ \Delta CPR_{t-1} \qquad (4.12)$$

$$\bar{R}^2 = 0.20, DW = 1.95$$

$$\Delta TB_t = \underset{(.11)}{0.008} + \underset{(1.91)}{0.16^{***}}\ \Delta CPR_{t-1} - \underset{(-.37)}{0.02}\ e_{t-1} - \underset{(-.76)}{0.09}\ \Delta TB_{t-1} \qquad (4.13)$$

$$\bar{R}^2 = 0.018, DW = 2.01$$

Figures in parenthesis are the t-statistics. *: Significant at 1% level **: Significant at 5% level.

A perusal at the above equations shows that all of them have fairly high goodness of fit statistics- $\bar{R}^2$, significant t-ratios and DW statistic closure to the value 2. All of them also satisfy stability condition, namely the coefficient of lagged dependent variable less than 1 in magnitude. Interestingly, all these ECM equations, except one, show uniformly negative sign for the α_2 parameter. The lone positive α_2 is significant only at 10% level. Further, all the α_2 values are large and vary in a narrow range. This shows that the speed of adjustment to long-run equilibrium is very rapid in most of the cases. As expected, the short-run responses of the rates of return to their cointegrating pair are numerically small compared to the corresponding long-run responses in the cointegrating equations. But, only 4 of these short-run responses are statistically significant. Since both

the dependent and independent variables are rate variables (or their first differences), the long-run and short-run responses can be treated as elasticities in all the regressions.

In the ECM equations (4.2) to (4.12), the coefficient of the error terms (e_{t-1}) are significant. The implication of significant α_2 is that the LHS series adjust to deviation from its own long-run equilibrium.

In (4.2), the coefficient of e_{t-1} is -0.54, which shows that the speed of adjustment is 54 percent and the negative sign shows that the two variables, CMR and CDR, move in opposite direction to reduce the divergence between them. Or, in other words, either of the variables which is higher is reducing and the other is increasing in order to bridge the gap between them. On the other hand, in (4.11), the coefficient is 0.25, which shows that both the variables are moving in the same direction, and the speed of adjustment is 25 percent. It can be inferred from this is that the divergence between FRWD and CDR is relatively less compared to other pairs. This result is in conformity with the other studies (Bhoi and Dhal, 1998), and (Nag and Mitra, 1999) that within the money market, interest rates are more integrated than across the markets.

4.10 Conclusion

The attempt to test the integration between various segments of financial market in this chapter has yielded mixed results. At the shorter end of the financial market, there is evidence of convergence of interest rates. Money market and forex 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. Broadly, the conclusion is that while short-term markets are integrated among themselves, similar linkage between short-term and long-term markets is yet to be found. The movement of various interest rates in uniform direction shows an encouraging sign towards financial market integration and thereby efficiency.

Appendix: Regression results that do not show cointegration

Dependent Variable	Independent Variable	Constant	Slope Coefficient	$\bar{R}^2$	DW	ADF
CDR	CMR	10.50* (23.55)	0.12* (3.19)	0.09	0.42	-3.22(0)
	PLR	3.03** (2.07)	0.61* (5.99)	0.28	0.42	-3.17(0)
	TB-91	6.15* (5.99)	0.59* (5.44)	0.24	0.37	-2.96(0)
	PER	13.05* (26.05)	-0.05* (2.95)	0.07	0.30	-2.71(0)
CPR	CMR	10.79* (23.99)	0.15* (3.89)	0.13	0.26	-2.54(0)
	CDR	2.91* (3.30)	0.79* (11.46)	0.59	0.44	-3.29(0)
	PLR	2.07 (1.46)	0.72* (7.27)	0.36	0.23	-2.07(0)
	FRWD	9.84* (27.79)	0.37* (7.95)	0.41	0.38	-3.08(0)
	PER	12.65* (23.36)	-0.01 (-0.71)	-0.005	0.12	-1.88(4)
PLR	CMR	12.81* (33.94)	0.13* (4.19)	0.15	0.21	-1.83(0)
	CDR	8.63* (9.16)	0.47* (5.99)	0.28	0.19	-1.85(0)
	CPR	7.78* (8.68)	0.52* (7.27)	0.36	0.14	-1.23(0)
	TB-91	10.35* (10.61)	0.41* (4.00)	0.14	0.07	0.66(4)
	FRWD	13.21* (34.46)	0.14* (2.94)	0.07	0.06	-0.62(0)
	PER	13.23* (29.60)	0.04* (2.38)	0.04	0.04	-0.70(4)

Contd.

Appendix Table contd.

Dependent Variable	Independent Variable	Constant	Slope Coefficient	$\bar{R}^2$	DW	ADF
TB-91	CMR	8.68* (22.44)	0.06*** (1.85)	0.02	0.18	-2.06(0)
	CDR	4.37* (4.74)	0.42* (5.44)	0.24	0.23	-2.21(0)
	PLR	3.98* (2.98)	0.37* (4.00)	0.14	0.15	-1.52(4)
	FRWD	7.90* (23.15)	0.21* (4.79)	0.19	0.19	-2.08(0)
	PER	9.17* (20.86)	0.005 (0.34)	-0.01	0.12	-2.01(4)
FRWD	CMR	4.17* (5.35)	0.22* (3.39)	0.10	0.33	-2.87(0)
	PLR	-2.06 (0.70)	0.60* (2.94)	0.07	0.29	-2.59(0)
	TB-91	-2.43 (-1.28)	0.95* (4.79)	0.19	0.34	-2.89(0)
	PER	10.63* (13.64)	-0.17* (-5.99)	0.28	0.37	-3.06(0)
PER	CMR	25.27* (10.12)	-0.18 (-0.86)	-0.002	0.03	-1.63(4)
	CDR	42.17* (6.52)	-1.59* (-2.95)	0.07	0.06	-1.28(4)
	CPR	28.23* (4.11)	-0.39 (-0.71)	-0.005	0.03	-1.41(4)
	PLR	2.23 (0.24)	1.49* (2.38)	0.04	0.03	-1.71(4)
	TB-91	21.25* (3.30)	0.23 (0.34)	-0.01	0.03	-1.62(4)
	FRWD	33.94* (16.52)	-1.62* (-5.99)	0.28	0.12	-1.76(0)

Figures in parenthesis indicate the t-value. The critical values for the regression for a sample size 100 are 2.35 and 1.98 at 1% and 5% level of significance respectively. The entries given in the last column are the τ-values corresponding to the coefficients of the DF test for the residuals. The critical values for a sample size 100 for the DF test are - 4.07 and - 3.37 at 1% and 5% level of significance respectively.

Chapter V

Concluding Observations

A well-organized financial system is an essential prerequisite for the smooth functioning of any real economy. There are, however, different viewpoints regarding how the financial system should be organized. But clearly, the answer to this should take into account the mode of organization of production in the real sector. India has had a well-developed financial sector for long. Since the 1970s, steps were taken to make it both deep and well diversified. However, given the government emphasis on planned development, the financial sector was used to obtain funds at low rates of interest for what it considered priority sectors. This resulted in what is characterized as a 'repressed' system.

In the financial literature there has been a lot of discussion regarding whether the financial sector should be liberalized or subject to regulation. We have reviewed this literature in chapter 2, and find that there are different viewpoints on whether the financial sector should be left entirely to the market. One strand argues that a competitive liberalized financial sector is essential for an efficient allocation of resources. Another however, argues that this may not be true because the financial sector by its very nature is not perfectly competitive. So, market failure is the norm in such markets. Therefore, this calls for government regulation. Yet another strand argues that, if left completely in private hands, financial intermediaries would not channel funds to high-risk areas, viz.,

agriculture and unorganized sectors in general. With the large population dependent on these sectors, and the overall importance of these, not only for subsistence but also for growth, this argues for regulation in the form of directed credit programmes. In chapter 2, we have reviewed the theoretical issues concerning this, and find that despite differences, all strands seem to argue that a certain amount of liberalization is required, particularly in the context of the real economy, being market-based.

In India with the inception of the SAP, steps were taken more than a decade ago to liberalize the real economy and to orient it towards the market. This called for a liberalization of the financial sector as well, and several steps have been taken towards this regard. In chapter 3, we have first of all reviewed the financial system in India as it has evolved over time, prior to liberalization, and then looked at steps taken towards liberalization of the financial sector in the 1990s. Prior to liberalization, we find the financial sector in India was diversified and multi-tiered. Two major sets of institutions in this sector were the commercial banks and the development finance institutions. These institutions have made the financial intermediation process deep and broad based. With the nationalization of scheduled commercial banks, the geographical coverage of their operation and the volume of transactions have increased significantly. The other financial institutions viz., term lending institutions and insurance companies have also grown significantly over the years and contributed substantially to the mobilization of funds. However their functioning was subject to various social controls exercised by the government. Most institutions were directly under government control. Even those in the

private sector were subject to strong regulation. The interest rates in the banking sector were administered by the government and several other restrictions were imposed on the banking sector in form of SLR and CRR requirements. Banks were instructed to follow the directed credit programmes to the prioritized sector. Government pre-empted a large proportion of the funds to finance its deficit at low rates of interest. Broadly, all these features added up to what may be termed 'financial repression' with widespread inefficiency bred by lack of competition.

Against the backdrop of a worldwide financial liberalization taking place in the 1980s, India also initiated reforms in the financial sector starting from the mid-1980s. The financial reform took place gradually with initial steps being taken towards increasing efficiency. A greater liberalization, with an opening up of the financial markets, took place only after the real sector reform had already proceeded in the 1990s. The deregulation in the financial market started with the money and treasury bill markets first and was then followed by the credit market and ultimately by the stock market. This took the form of deregulating interest rates, included that on treasury bills, reducing levels of resource pre-emption, promoting competition within each market segment by allowing freer access to the private sector, and developing transparent working of capital and money markets. In short, all the deregulation was aimed at achieving an integrated and efficient financial market. It may be noted that this has led to the development of primary markets, but the secondary markets are still dormant. Also, some mandatory lending requirements are still in place.

So, a look into the nature of the reform in the financial sector in India leads to the conclusion that there is a gradual reduction in impediments to the free movement of capital. However, whether this has led to a more efficient mobilization and allocation of financial resources still needs verification. It is generally argued that liberalization of the financial sector is the first step towards the integration of markets. It is only if markets are integrated that the financial system works efficiently. If they are not integrated, there is the existence of arbitrage possibilities across markets and this leads to wasteful use of funds for speculative purposes. Further, the integration of markets is required for an effective transmission of monetary policy to the economy. So, the culmination of our study has been to check whether the liberalization process set in place in the 90s, has lead to the integration of markets. This is an empirical question and has been taken up in the chapter 4.

To study this question empirically, we need to look at the equalization of rates of return across different markets. The idea is that in an integrated system, differences in rate of return should only reflect fundamental factors. We have taken seven interest rates from five important segments of the market. These segments are money market, credit market, government securities market, foreign exchange market, and the capital market. Except the capital market, all other markets are basically short-term in nature. The interest rates considered for our study are call money rate (CMR), commercial paper rate (CPR), certificate of deposit rate (CDR), 91-day treasury bill rate (TB-91), prime lending rate (PLR), 3-month forward premia (FRWD), and the price earning ratio (PER). Among

these CMR, CPR, and CDR are the money market rates, TB-91 represent the government securities market, PLR represents the credit market, FRWD the foreign exchange market, and the PER the capital market.

To examine the integration between the interest rates, we have first tried to select a reference rate. Theoretically, reference rate means an ideal rate around which other rates revolve. The idea is that all other rates tend towards this rate. We have used the basic statistics of the interest rates to select the reference rate. We found that the non-money market rates do not qualify as a reference rate. From among the money market rates the CPR appears to be the most suitable.

As a simple measure of integration, correlation coefficients of all the variables were computed. The results show that there is fair amount of positive relationship between various short-term rates. Money, foreign exchange, and the government securities markets are closely linked. However, there is hardly any linkage found between the capital market in one hand and other short-term markets on the other.

However, simple correlation coefficients are necessary conditions but are not sufficient to show integration. So we used cointegration and ECM for further testing of markets, after checking all rates of interest for stationarity. If the rates are cointegrated, we can expect a long-run relationship between them, while ECM model shows the speed of adjustment of the rates in the short-run. Our study produced mixed results. We found that there is a fair degree of convergence of interest rates among the short-term markets, i.e., money, credit, and securities. There is also strong integration within the short-term

markets. All the three money market rates viz., CMR, CPR, and CDR are cointegrated and the speed of adjustment is also very high between them. However, capital market is not integrated with other markets. Both the correlation coefficients and the cointegration results show that there is hardly any integration between the capital markets on the one hand and other short-term markets on the other hand.

In conclusion, therefore, we 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.

References

Adler, and B. Dumas (1983), "International Portfolio Choice and Corporation Finance: A Synthesis", *Journal of Finance*, Vol.38, pp: 925-984.

Aliber, R. (1978), "Integration of National Financial Markets", *Review of World Economics*, Vol. IX, pp. 26-35.

Ananthakrishnan, V. (1987), "Foreign Exchange Market of India: Structure and Functioning", *Journal of Foreign Exchange and International Finance,* Vol.1, No. 2, pp. 169-76.

_____ (1994), ""Foreign Exchange Market of India", *Journal of Foreign Exchange and International Finance,* Vol. 7, No. 4, pp. 394-99.

Athukorala, P. (1995), "Interest Rates, Saving and Investment in India", *Austrelia Sotk Asia Research Centre, Australian National Universty, Mimco*

Avadhani, V. A. (1998), "Studies in Indian Financial System", Trico, Bombay.

Ayuso, J. and R. Blanco (2000), "Has Financial Market Integration Increased During Nineties", BIS conference Volume, *International Financial Markets and the Implications for Monetary and Financial Stability,* pp: 175-95.

Bernanke, B. S. and A. S. Blinder (1992), "The Federal Funds Rate and The Channels of Monetary Transmission", *American Economic Review*, Vol. 82(4), pp: 901-921.

Bhatt, R. S. (1996), "Unit Trust of India and Mutual Funds: A Study", *UTI Institute of Capital Markets, Bombay.*

Bhoi, B.K. and S.C. Dhal (1998) "Integration of Financial Markets in India: An Empirical Evolution", *RBI Occasional Papers*, vol.19, No.4.

Bhole, L. M. (1985), "Administered Interest Rates in India", *Economic Political Weekly*, June, pp: 22-29.

Bhole, L. M. (1995), "Financial Sector Reforms: An Alternative Agenda ", Denoument, Aug-Sep.

Bhole, L. M. (1999), "Financial Institutions and Markets", Himalaya Publishing House, Bombay.

Brouwer, de G. (1999), "Financial Integration in East Asia", *Cambridge University Press*, UK.

Business Line (1997) "Integration of Financial Markets Well on the Way", November 06.

Chakravarty, S. (1987), "Development Planning: The Indian Experience", *Oxford University Press,* New Delhi.

Cole, D.C., S.S. Hall and A.W. Phillips (1995), "Asian Money Market", *Oxford University Press*, Oxford.

Dicky, D. and W.A. Fuller, "Distribition of the Estimates for Autoregressive Time Series with a Unit Root", *Journal of the American Statistical Association*, Vol.74, pp: 427-431.

Engle, R. and C.W.J. Granger (1987), "Cointegration and Error Correction: Representation, Estimation and Testing", *Econometrica*, Vol.55, pp: 351-376.

Fratzscher, M. (2000), "Financial Market Integration in Europe: On the Effects of EMU on Stock Markets", *Department of Economics, European University Institute,* Italy.

Friedman, B. (1990), "Targets and Instruments of Monetary Policy", in B.Friedman and F. H. Hahn (eds), *Handbook of Monetary Economics*, Vol.II, Elsevier Science Publication.

Gertler, M. and A. Rose (1994), "Finance, Public Policy and Growth", in G. Caprio, I. Atiyas and J. Hanson (eds.), *Financial Reform: Theory and expeience, New York*, Cambridgr University Press.

Goldsmith, R. W. (1969), "Financial Structure and Development", New Haven, Yale University Press.

Gopala Rao, P.R. (2000), "Current Developments in Money and Government Securities Markets", RBI Bulletin, Sep., pp. 939-44.

Grenwald, B. and J. Siglitz (1992), "Information, Finance and Markets: The Architecture of Allocative Mechanisms", *Journal of Industrial and Corporate Change*, Vol.1(1), pp: 37-63.

Gupta, L.C. (1998), "What Ails the Indian capital Market? ", *Economic Political Wekly*, July 18, 1961-66.

Gupta, S. B. (1988), "Monetary Economics: Institutions, Theory and Policy", S. Chand and Co., New Delhi.

Hanson, J.H. and R. Craig (1986), "Interest Rate Policies in Selected Developing Countries" *World Bank, Industry and Finance Series*, Vol. 14.

McKinnon, R.I. (1973), "Money and Capital in Economic Development", The Brookings Institution, Washington, D.C.

Nag, A.K. and A. Mitra (1999), "Integration of Financial Markets in India: An Empirical Investigation", *Prajnan*, vol. XXVIII, No. 3, Oct-Dec.

Pattanaik,I, and D. Vasudevan (1999), " Integration of Money Markets: Evidence from Interest Rates", A project report sponsored by the *Canadian International Development Agency (CIDA) and the Industrial Credit and Investment Corporation of India (ICICI).*

Rakshit, M. (1994), "Issues in Financial Liberalisation", *Economic and Political Weekly*, September 24, pp. 2547-52.

Rangarajan, C. (1994), "Indian Financial System: The Emerging Horizon", *RBI Bulletin,* June, pp. 747-58.

RBI (1995), Report on Trend and Progress of Banking in India, Mumbai.

RBI (2000), "Financial Market Integration", *Report on Currency and Finance*, VI- 26.

RBI (2000), Report on Money and Finance.

Reddy, Y.V. (1997), "Indian Financial Markets: New Initiatives", *RBI Bulletin,* December, pp. 1019-25.

_____ (1999), "Financial Sector Reform: Review and Prospects", *RBI Bulletin,* January, pp. 33-43.

_____ (1999), "Development of Money Market in India", *RBI Bulletin,* March, pp. 387-401.

_____ (1999), "Development in Forex Market: Indian Experience", *RBI Bulletin*, October, pp. 1173-83.

Robert, E. C. and R.C. Marston (1995), "International Financial Integration- A Study of Interest Differentials Between the Major Industrial Countries", *Journal of Economic Literature*, vol. XXXVI, No.1.

Ross, L. (1997), "Financial Development and Economic Growth", *Journal of Economic Literature*, Vol. XXXV, No.2.

Sargent, T and N. Wallace (1975), "Rational Expectations: The Optimal Monetary Instrument and the Optimal Money Supply Rule", *Journal of Political Economy*, Vol.3, pp. 241-54.

_____ (1981), "Some Unpleasant Monetarist Arithmetic", *Federal Reserve Bank of Minneapolis Quarterly Review*, Vol.5 (3), pp 1-17.

Sen, K. and R. R. Vaidya (1997), "The Process of Financial Liberalization in India", Oxford University Press, Delhi.

Shaw, E. (1973), "Financial Developing in Economic Development", OUP, New York.

Sims, C.A. (1972), "Money, Income, and Causality", *American Economic Review*, Vol. 62, pp. 540-52.

Stiglitz, J. and A. Weiss (1981),"Credit Rationing in Markets with Imperfect Information", *American Economic Review*, June, Vol. 71 (3), p. 393-410.

Subramanyam, G. (1996), "India's Financial Sector Reforms and Monetary Policy Linkages", Vol.2, No.1, pp: 17-48.

Subrmanyam, G. (1993), "Productivity Growth in India's Public Sector Banks", *Journal of Quantitative Economics*, Vol. 9 (2), pp: 209-24.

Taylor, L (1983), "Structuralist Macroeconomics", Basic Books, New York.

Wijnberger, S. (1983), "Interest Rate Management in LDC's", *Journal of Development Economics*, Vol. 12, pp. 432-52.