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**THE EMERGING INDIAN BOND MARKET:
EVOLUTION, PROBLEM AND PROSPECTS**

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Abstract

During the 1990s, as the Indian government and the Reserve Bank of India brought an end to financial repression, the Indian bond market faced the prospect of blossoming into an efficient market. Indeed, data pertaining to the September, 1995-March, 2002 period suggests that there was a significant improvement in both the depth and width of the secondary market for dated government securities, the most traded debt instrument in India by far. However, analysis of the data suggests that the market continues to be imperfect and that the rule of one price continues to be violated. The paper concludes that the salvation of the secondary market for bonds perhaps lie in the amelioration of informational asymmetry that is innate to the microstructure of the market, and in the liberalisation of the domestic insurance and pension sectors that would allow the entry of more market participants engaged in speculation and active portfolio management.

Non-Technical Summary

The importance of the debt market in an emerging economy cannot be overemphasised. In the presence of uncertainty and prudential norms, banks often decline to lend for long term projects, and borrowing from overseas markets may be constrained by country risk perceptions and restrictions on capital mobility. At the same time, businesses in these countries are often closely held within families and communities, and the fear of loss of power often keep such companies away from the primary market for equities. In such cases, the market for debt securities may emerge as the mainstay of the credit and capital markets. Even in a fairly well developed emerging financial market like that in India, only INR 58.92 billion, INR 36.78 billion and INR 98.55 billion respectively were raised by way of equity shares during 1997-98, 1998-99 and 1999-2000. On the other hand, the amounts raised through non-convertible debentures during the corresponding years were INR 265.39 billion, INR 286.98 billion and INR 363.93 billion.

Besides, the debt market allows appropriate evaluation of non-systematic risk, and dissemination of the perception of the investors about firm specific risk by way of the spreads that the corporate bonds command over the benchmark rates. Finally, the debt market helps generate the (zero coupon) yield curve which reflects the expectations of the investors about future interest rates, and thereby becomes an invaluable analytical tool for both monetary authorities and investors in instruments like financial derivatives.

Recent research on the bond market has focussed primarily on the term structure of interest rate. For example, attempts have been made to bridge the gap between stylised models like those by Cox, Ingersoll and Ross, and Heath, Jarrow and Morton . Others have used non-parametric techniques to estimate the term structures of specific countries and specific types of securities. And yet others have explored the covariance between the prices of futures contracts and the cost-of-carry relationship that is determined by the underlying interest rates.

However, analyses of the structure of the emerging debt markets are few and far between. Indeed, the literature on the impact of market structures on the price discovery mechanism and market efficiency has largely been limited to the equity market, with special emphasis on the market for limit orders. But it is safe to hypothesise *a priori* that market structures have a definitive impact on the price discovery process in the debt markets, and hence on their efficiency. The endeavour of this paper was twofold: it would

trace the evolution of the Indian bond market, and draw conclusions about the nature of the market itself from the available data. Given that the market for dated government securities is much deeper and wider than the market for corporate bonds, the empirical analysis will be restricted to the data available from the market for dated securities.

The data indicates that the following conclusions can be drawn about the Indian bond market:

The market for government bonds in India has matured significantly during the 1990s, adding to both width and depth. However, the market remains illiquid, with not more than 20 percent of the outstanding securities traded on a given day even in the more liquid government bond segment of the market. Indeed, an average government bond is often not traded for weeks or even months. Government bonds are traded heavily immediately after they are introduced into the market. Thereafter, these bonds are rarely traded till their time-to-maturity decline to the point where they become *de facto* money market instruments. The initial trading activity can be attributed to the process of price searching and duration matching by banks, mutual funds and insurance companies, while the lack of trading thereafter may be the manifestation of the inability of the market to formulate accurate expectations about long term interest rates.

Even though the Wholesale Debt Market at the National Stock Exchange facilitates on-screen trading, most transactions are still over-the-counter in nature, and are often not reported to the NSE and/or the Reserve Bank of India on the same day. Hence, there is a persistent informational asymmetry which lingers despite the emergence of additional informational sources like Reuters and Bloomberg terminals.

The informational problem in the market leads to pricing anomalies, and the law of one price that is the hallmark of a perfect market is conspicuous by its absence. Given any arbitrarily small time period, the variation among the prices of the same bond, or bonds of similar characteristics and time-to-maturity is usually significant.

The study, though pioneering in nature, suffers from the shortcoming that some of the arguments have not been adequately backed up by data. This is, in part, the consequence of a conscious attempt to reduce the time taken for analysis, given that market structures in a country like India, which is in transition, can change fast, thereby rendering carefully done analysis anachronistic. Hence, stylized facts like the dominance of large traders like Unit Trust of India in the bond

market has not been substantiated with data. The analysis also manifests the fragmented nature of data of the Indian bond market which makes statistical and econometric analysis difficult if not impossible. The challenge in the future would, therefore, be to rigorously evaluate the hypotheses that have been explicitly and implicitly generated by the above analysis, as the depth and width of the bond market increase over time.

1. Introduction

The importance of the debt market in an emerging economy cannot be overemphasised. In the presence of uncertainty and prudential norms, banks often decline to lend for long term projects, and borrowing from overseas markets may be constrained by country risk perceptions and restrictions on capital mobility. At the same time, businesses in these countries are often closely held within families and communities, and the fear of loss of power often keep such companies away from the primary market for equities. In such cases, debt securities may emerge as the mainstay of the credit and capital markets. Even in a fairly well developed emerging financial market like that in India, 63.29 percent, 70.74 percent and 87.83 percent of the new capital raised during 1999-2000, 2000-01 and 2001-02 respectively were raised by way of non-convertible debentures.¹

Besides, the debt market allows appropriate evaluation of non-systematic risk, and dissemination of the perception of the investors about firm specific risk by way of the spreads that the corporate bonds command over the benchmark rates. Finally, the debt market helps generate the (zero coupon) yield curve which reflects the expectations of the investors about future interest rates, and thereby becomes an invaluable analytical tool for both monetary authorities and investors in instruments like financial derivatives.

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However, analyses of the structure of the debt market are few and far between.³ Indeed, the literature on the impact of market structures on the price discovery mechanism and market efficiency has largely been limited to the equity market, with special emphasis on the market for limit orders. But it is safe to hypothesize *a priori* that market structures have a definitive impact on the price discovery process in the debt markets, and hence on their efficiency. The endeavor of this paper would be twofold: it would trace the evolution of the Indian bond market, and draw

conclusions about the nature of the market itself from the available data. Given that the market for dated government securities is much deeper and wider than the market for corporate bonds, the empirical analysis will be restricted to the data available from the market for dated government securities.⁴ As we shall see later, the data indicates that while the market for government bonds in India has matured significantly during the 1990s, the structure of the market still fosters illiquidity and, as a consequence, perverse pricing of government securities.

The paper has been structured as follows. In Section 2, we trace the evolution of the secondary market for government securities in India. Based on the microstructure of the market described in the previous section, Section 3 argues that the Indian secondary market for bonds is imperfect and that this imperfection is reflected in mispricing of the securities. It then proposes two tests, one direct and the other indirect, to test the hypothesis of mispricing. Using data provided by the Reserve Bank of India (RBI), the hypothesis is tested in Section 4, and the hypothesis finds favor with the data. Section 5 concludes.

2. The Market for Government Securities

The most pervasive feature of the Indian bond market is that while a large number of financial institutions, banks and corporate entities issue bonds on a regular basis, trading in the secondary market is overwhelmingly dominated by government securities. Indeed, on average, T-bills and dated government securities account for more than 85 percent of the trade in the secondary market for debt instruments. Hence, we shall focus on the structure of the secondary market for dated government securities.

Prior to April 1993, the prices/yields of government securities were not market driven. The government fixed the yields (and coupons) at low levels in the primary market, so as to reduce its cost of borrowing. As a consequence, banks had little incentive to purchase government securities, and hence the statutory liquidity ratio (SLR) was continually raised during the 1970s and 1980s. Since banks purchased government securities largely (if not wholly) to meet their SLR requirements, transactions in the secondary market were few and infrequent. Further, the secondary market remained an over-the-counter (OTC) market with scheduled commercial banks as the main market participants. Hence, there were significant barriers to dissemination of information about prices and yields in the secondary market, and it was marked by absence of market makers. The resultant informational problems, and the ability of large buyers and sellers

to influence prices added to the unattractiveness of trading in the secondary market for government securities.

The years 1994 and 1995 were marked by developments that are likely to shape the future of India's debt market. In June, 1994, the wholesale debt market (WDM) of the National Stock Exchange (NSE) commenced operation with 224 securities carrying an outstanding debt value of INR 135 billion.⁵ The WDM provides a fully automated screen-based trading platform that is order driven. It matches best buy and sell orders on a price-time priority, while maintaining complete anonymity.

The initiative taken by the NSE found official support in March, 1995 when the government and the RBI oversaw the emergence of primary dealers. The emergence of primary dealers (PDs)⁶ coincided with auction-based sale of government securities in the primary market, replacing the earlier system whereby government securities were wholly underwritten by the RBI at some pre-determined price-yield. More importantly, the PDs were in a position to make markets⁷ and provide two-way quotes to participants in the secondary market.⁸ Screen based trading, together with two-way quotes for securities, was expected to alleviate the informational problems in the secondary market. Further, the SLR requirements were reduced to 30 per cent in March 1995, from 37.5 per cent in 1992, thereby *releasing* government securities for price-driven trade in the secondary market.⁹

In 1995, the RBI also introduced the delivery-against-payment system for all government securities. Apart from making it difficult for traders to manipulate prices with uncovered long or short positions, which could be netted out before actual delivery, the system was aimed at eliminating counterparty risk. This system, which mandated that all trades in government securities be routed through the subsidiary general ledger (SGL) accounts with the RBI, was followed, in 1998, by the establishment of custodial and depository services for these securities by National Securities Depository Limited (NSDL), Stock Holding Corporation of India Limited (SHCIL) and National Stock Clearing Corporation Limited (NSCCL). The establishment of these services significantly reduced the probability of bad deliveries, and therefore encouraged trading in the secondary market. Further encouragement came from the government in 1998, in the form of elimination of stamp duty on trades in debt securities.

It is evident that the Indian market for government securities has come a long way since the days of financial repression which persisted till the early 1990s. However, several problems continue to persist. First, the market continues to lack in width. On any given day, only about 25-30 government securities, known as “benchmark securities,”¹⁰ are traded in the secondary market, the total number of dated government securities outstanding being well over 100. The consequence of this lack of width is that during most days and indeed weeks it is difficult if not impossible to find trades in securities across the spectrum of the term structure, thereby making the generation of a viable yield curve extremely difficult.

INSERT Figures 1a and 1b about here.

Further, while the depth of the market has increased considerably both in terms of the aggregate rupee turnover and number of trades (see Figure 1a), as also in terms of the n -bond concentration ratio,¹¹ the number of trades per security continues to be low on average. Indeed, there are few liquidity providing speculators in the market, and most of the trades in the government securities market be traced back to “asset-liability mismatch of participating institutions or in their statutory obligations” (Nag and Ghose, 2000). Since the number of trades per “average” bond is the best possible indicator of competitive trading in the secondary market,¹² especially when the market is OTC and is dominated by large players like State Bank of India (SBI), Life Insurance Corporation of India (LIC) and Unit Trust of India (UTI),¹³ the extent to which the secondary market for government bonds experiences competitive price setting is questionable *a priori*.

Finally, data indicates that while the growth of turnover at the WDM has been impressive, until March, 2002 trades registered at the WDM did not account for more than 50-55 percent of the turnover in the government securities market, as recorded in the SGL of the RBI (see Figure 2). In other words, price signals associated with trades are not necessarily available for all traders at the time when the trades are negotiated. This further strengthens the hypothesis that trading in the secondary market for government securities does not yet take place in a competitive price-searching environment.

INSERT Figure 2 about here.

3. Expected Impact of Market Structure on Prices

As mentioned above, an important role played by a bond market is that the prices negotiated in this market signals interest rate expectations of the market participants, interest rate being a key macro-financial variable that affects many other macro-financial variables like the GDP and the stock market index. Hence, the key issue that demands a close look is the impact of the market microstructure on the pricing process. If prices do not accurately signal the expectations of the market participants about future interest rates, there is a strong case for altering the market structure to ensure that the pricing process becomes more efficient.

A priori, what can we expect about the pricing process in the secondary market for government securities in India, in the light of its evolution during the 1990s? We have already noted that the secondary market is dominated by a few large players, and that the negotiated prices for a significant proportion of the trades remain private information until they are registered with the SGL of the RBI. In such a market, the probability of market manipulation and mispricing is high, and prices may be determined more by relative bargaining powers of the buyer and the seller rather than by expectations about the future interest rates. We can, therefore, expect to find evidence of mispricing in the secondary market for government securities in India.

The direct evidence for mispricing can be derived from the fact that, unlike stock prices, bond prices have precise relationships with an important macroeconomic variable: the interest rate (Fabozzi, 1996, ch. 14). Hence, while a stock market is deemed to be efficient if the stock prices are a random walk, efficiency in the bond market would imply that, given a well-defined term structure of interest rates reflecting the market's expectations about future interest rates, bonds of similar maturities and characteristics would have similar prices. In other words, if intra-month variations in prices/yields of securities of similar maturities and characteristics are high, it can be concluded that the law of one price is violated.

The indirect evidence for mispricing can be derived from the behaviour of traders. If it is widely believed that the term structure derived from market prices is accurate, rational traders should not refrain from trading in securities of all maturities after pricing them using the available yield curve. If, on the other hand, it is widely believed that the estimated prices, and hence the available term structure, are inaccurate, traders would have to depend on their private information to price the bonds, and are therefore likely to refrain from trading in longer term securities, given that a

trader is more likely to have accurate private information about short term movements in interest rates than about long term movements in interest rates. In other words, a bond is likely to be traded more when it is close to maturity and is therefore a short term instrument than when it is far from maturity and is a medium or long term instrument.

4. Evidence on the Pricing of Government Bonds

Available data suggest that while the pricing process in the secondary market is not completely arbitrary, the intra-month variance of a bond's yields is significant. For example, while the price of a zero coupon bond (ZCB) maturing on January 18, 1999 monotonically increases and approaches its face value (INR 100) over time, wide intra-month variations in prices is evident even for this highly traded security (see Figure 3).¹⁴

INSERT Figure 3 about here

How significant, however, is the intra-month variation in price? Theories about bond pricing indicate that there would necessarily be a difference between the prices of the bond at the beginning of a month and at the end of the same month. In case of a zero coupon bond, where accrual of coupon payments are a non-issue, the price at the end of a month would be greater than the price at the beginning of the month, unless there is a significant revision in expectations about future interest rates. During the June, 1996-March, 1997 period, for example, the geometric mean of the intra-month price range of these months was about INR 1.03. Given this level of intra-month variation, and a price of INR 70.00 for the INR 100.00 par value bond 2.5 years from maturity, it can easily be verified that the implicit change in the yield to maturity (YTM) of the bond would be about 119 basis points over a 12 month period which is fairly steep given the historical spot rates in times of relatively easy money policy (Nag and Ghose, 2000; Money and Finance, various issues). In other words, the intra-month variation in the YTM that is implicitly suggested by the intra-month price range of the ZCB is higher than expected, i.e., the price range itself is higher than expected. This result found support in similar experiments involving other government securities involving coupon bonds.

The indirect evidence about the imperfections associated with the pricing process is equally compelling. Data presented in Figures 4a and 4b indicate that trading in bonds follow an U pattern.¹⁵ When a bond is first introduced, it is traded heavily for a few months. Then the trading in the bond subsides and very few trades take place, if at all. Finally, when the bond nears

maturity and becomes a *de facto* money market instrument, it is traded heavily once again. The only plausible explanation that fits this observed pattern of trading is as follows: When a bond is introduced in the market, there is trading among market participants for price discovery and to facilitate asset-liability management of some of the participants. Once this process is completed, prevailing uncertainty about long term interest rates prevent any further trading. Finally, when the bond nears maturity, market participants, who have a better view of short term interest rates than longer term rates, once again actively trade the bond.

INSERT Tables 4a and 4b about here.

Is this explanation, which emphasizes the lack of trust of market participants on expected longer term interest rates manifested by a yield curve, consistent with the actual interest rates? A yield curve provides us with spot interest rates for various time horizons. Suppose that we know the spot rates for the t -th and the $(t+1)$ -th time periods. In a perfect market, the rule of no-arbitrage will guarantee that if we buy a bond that matures in period t and then invest it for one more period at the prevailing 1-year interest rate, the return from this investment strategy will equal the return from the investment in a bond that matures in period $(t+1)$. From this no-arbitrage relationship, we can estimate the 1-year rate that is expected to prevail in period t , and this is known as the 1-period forward rate, t periods from now. If, the market is perfect and the state of the macro-economy is stable, then this expected rate should be arbitrarily close to the actual 1-year spot rate prevailing in period t .

INSERT Table 1 about here.

Data presented in Table 1 indicate that there is a significant difference between expected future spot rates, as given by the forward rates, and the actual spot rates realized in the future. The gap between the expected and the actual rates are even greater when we compare the latter with 1-year rates expected two or three years in advance (i.e., the 1-year forward rate 2 or 3 years from now).¹⁶ Moreover, while the extent of divergence between actual and expected interest rates has come down considerably since 1997,¹⁷ the gap between the actual and expected 1-year rates remained steady at 150-200 basis points between 1998 and 2001. While it is difficult to say how much of this divergence can be attributed to market imperfections and how much of it to macro-economic instability, it is evident that a rational market participant is unlikely to accept the

forward rates implied by the Indian yield curves at their face value, and this would impede that pricing of and trading in medium and long term securities.

5. Concluding Views

The Indian bond market has matured significantly during the past decade. The amount raised by the government, public sector and quasi-government entities and corporate organizations from the market for fixed income securities far outstrip the amount raised by way of equity. This has been matched by an increase in the depth and width of the secondary market for bonds, both in terms of the face value of the bonds traded and in terms of the average frequency of trading per bond. At the same time, the fixed income instruments have become increasingly sophisticated. Both the government and corporate organizations issue floating rate bonds, and bonds with embedded options have made their appearance. Indeed, with the abolition of stamp duty, and the introduction of rupee denominated interest rate derivatives, the bond market may be poised for a take off.

However, the growth of the secondary market for bonds has been held back by three factors that continue to haunt the Indian market. First, while there has been a significant improvement of the Indian economy in so far as macroeconomic stability is concerned, high fiscal deficit and the consequent dependence on monetary policy as the engine of growth – even as it remains the instrument for managing inflation and exchange rates – has made it difficult to form accurate expectations about future spot rates. Second, the market is dominated by large buyers and sellers like the UTI and SBI who can influence the market price significantly, and many of the large buyers and sellers are commercial banks who buy and sell bonds largely to mitigate problems associated with asset-liability mismatch. As a consequence, the market lacks an abundance of speculators who typically provide liquidity in any financial market. Finally, the market has been largely OTC in nature, and hence, despite the existence of the primary dealers, the WDM of the NSE, and Reuters and Bloomberg terminals, dissemination of information about bond prices (and hence interest rate expectations) is neither spontaneous nor widespread. While the Negotiated Dealing System (NDS), introduced by the RBI in February 2002 provides an electronic platform facilitating negotiated trades in government securities, it is not mandatory to buy and sell these securities through the NDS, and hence there is no compulsion on the part of the market participants to abandon OTC trading.¹⁸ In brief, on the one hand, market making is limited and, on the other hand, informational asymmetry continues to be a dominant feature of the market.

Macroeconomic stability is a goal that is desirable by its own right, and its discussion lies outside the scope of this paper. Other than enhancement of such stability, the need of the hour is not only mandatory real time online trading of all debt securities, but also a manifold increase in the number of active portfolio managers who would roll over their bond portfolios often, sometimes for speculative purposes, and who would collectively provide two way quotes for a wide array of securities, thereby adding to both the depth and width of the market. Three major developments suggest that the secondary market for government securities in India may attain the desirable level of width and depth in the foreseeable future. First, the liberalisation of the insurance industry has brought into existence a number of private market participants who can be expected to be more active in portfolio management than public sector organisations. Second, the bifurcation of UTI into two mutual funds, and the imposition of a hard budget constraint on at least one of them is likely to make the financial giant more sensitive to the accuracy of prices/yields on debt instruments. Finally, and perhaps most importantly, the Government of India might soon introduce mandatory exchange-based trading in all government securities.¹⁹

The study, though pioneering in nature, suffers from the shortcoming that the existing data is not conducive for rigorous econometric exercises that are consistent with the literature on bond markets in developed countries. The data also does not permit the substantiation of stylized facts like the dominance of institutions like UTI and SBI in the Indian secondary market because available data does not identify buyers and sellers of debt instruments. The challenge in the future would, therefore, be to econometrically evaluate the hypothesis about market imperfection that has been discussed in the above analysis, as the depth and width of the bond market increase over time, thereby generating the type of time series data that is required for such econometric analysis.

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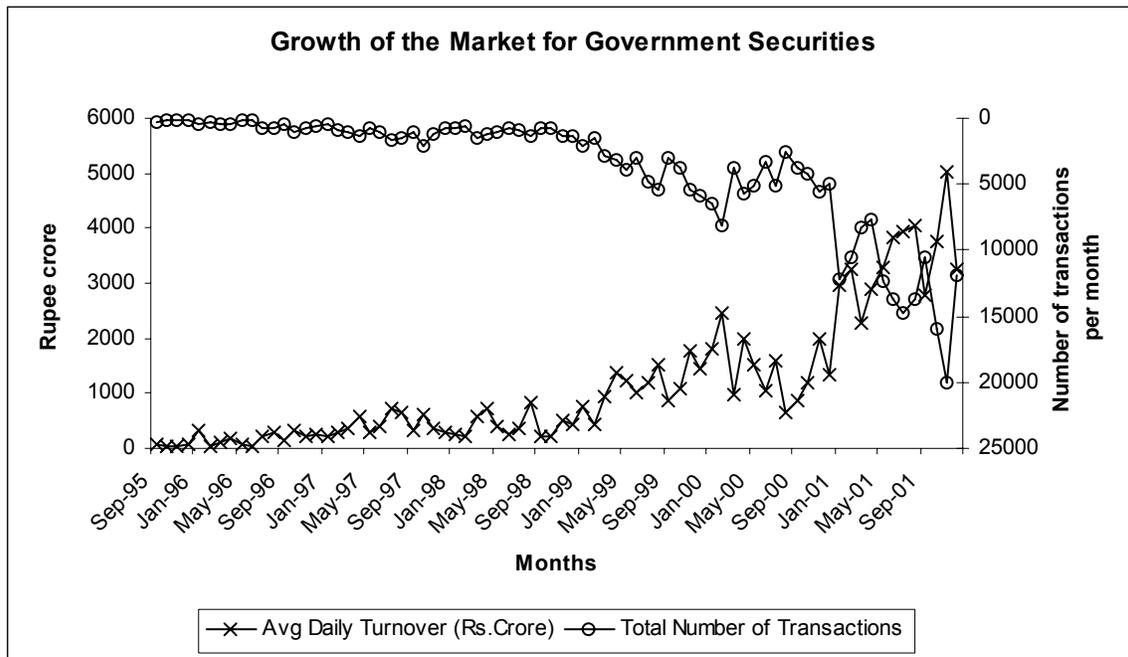
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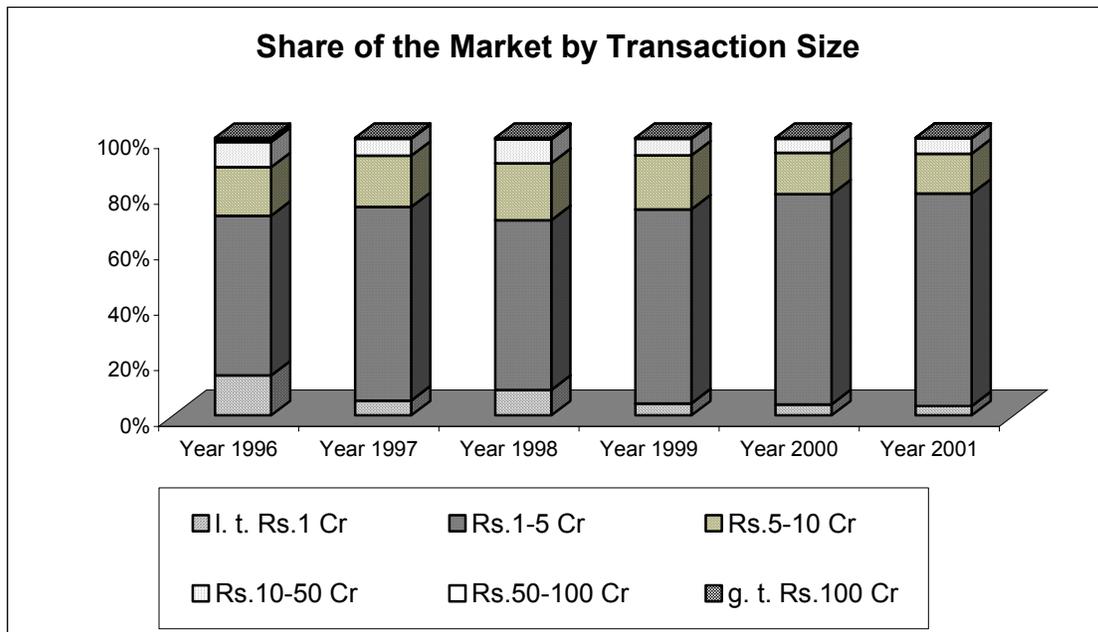
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Figure 1a



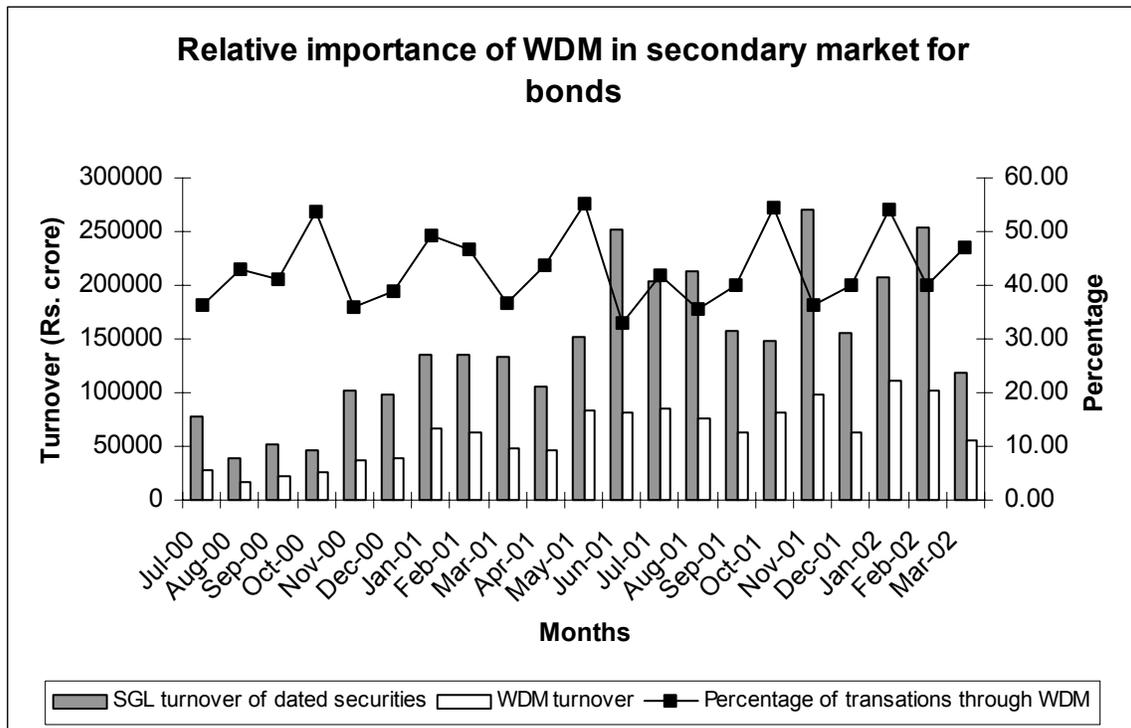
Note: 1 crore = 100 million

Figure 1b



Note: 1 cr. (i.e., crore) = 100 million

Figure 2



Note: 1 crore = 100 million

Figure 3

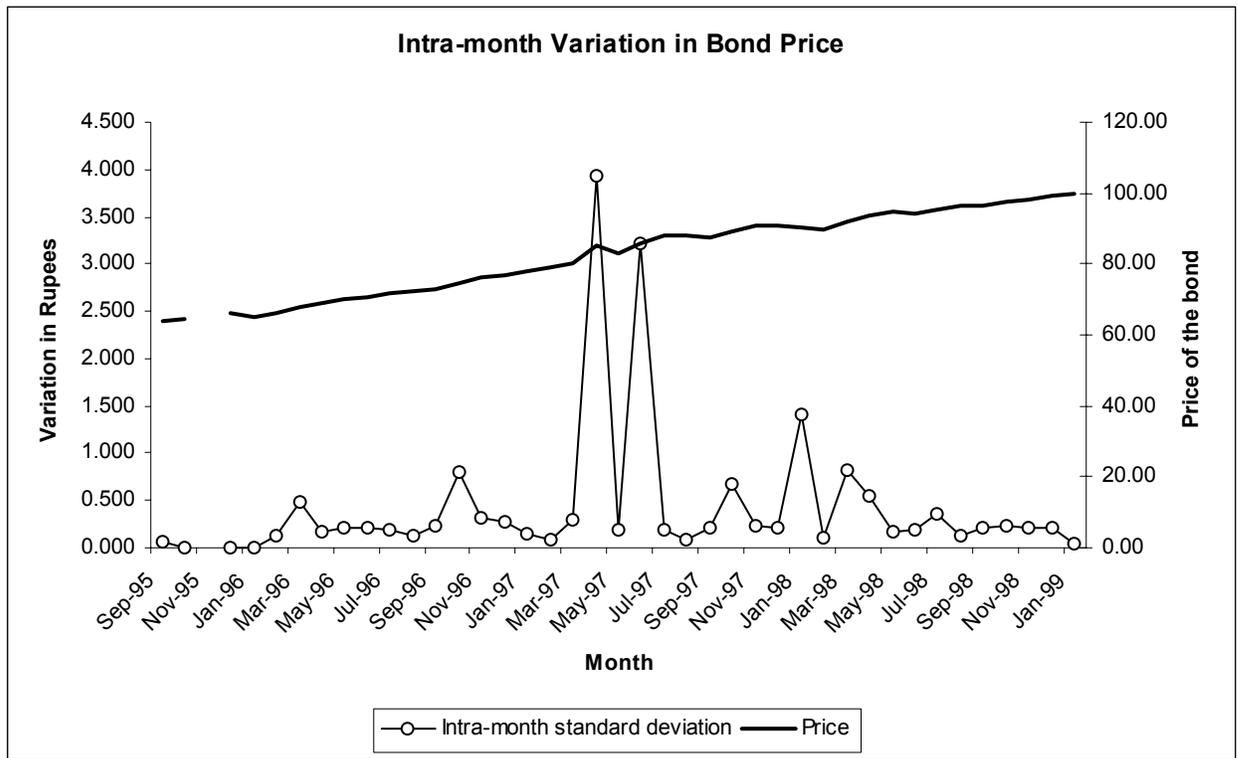
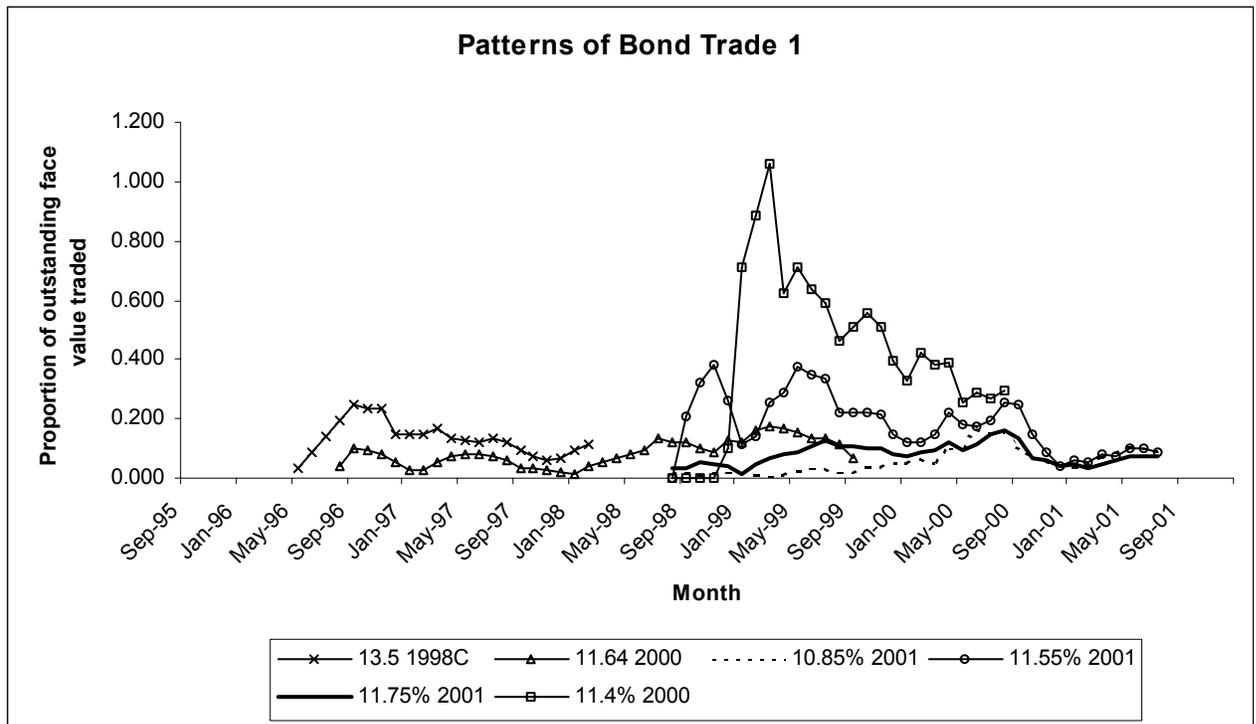
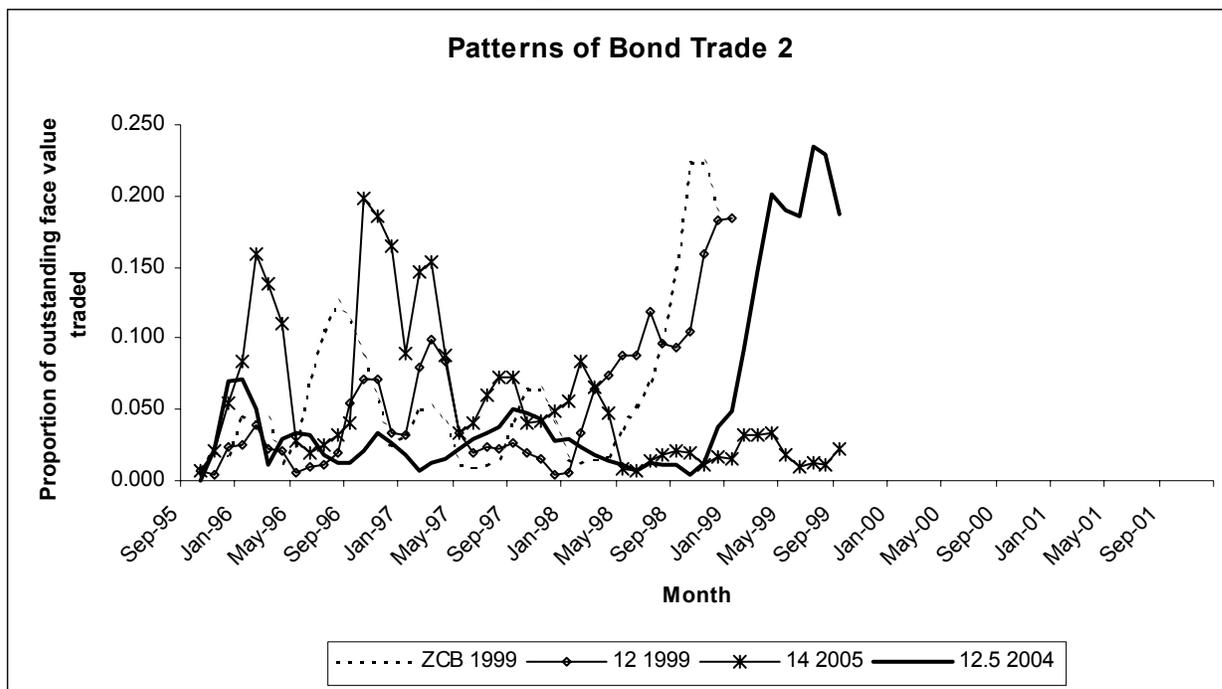


Figure 4a



Note: The numbers are identifiers for the government securities. For example, 13.5 1998C refers to tranche C of the Government of India dated security carrying a coupon of 13.5 percent and maturing in 2001.

Figure 4b



Note: The numbers are identifiers for the government securities. For example, ZCB 1999 refers to the zero coupon

Government of India dated security maturing in 1999.

Table 1

Spot and Forward Rates										
Months	spot 97	fwd-11:96	Months	spot 98	Fwd-11:97	fwd-12:96	Months	spot 99	fwd-11:98	fwd-12:97
Jan-97			Jan-98	12.29			Jan-99	10.55	13.91	
Feb-97	10.64		Feb-98	11.83	13.77		Feb-99	10.48	12.00	13.73
Mar-97	10.41		Mar-98	11.01	13.64		Mar-99	10.35	10.90	
Apr-97	9.55		Apr-98	9.15	11.95		Apr-99	10.58	11.18	13.19
May-97	10.18		May-98	9.61	12.37		May-99	10.55	12.19	13.82
Jun-97	9.51	12.88	Jun-98	10.16	12.32	13.20	Jun-99	10.40	12.01	13.78
Jul-97	9.22	15.34	Jul-98	9.97	10.79	13.53	Jul-99	10.32	12.17	12.13
Aug-97	9.18	15.50	Aug-98	9.53	9.99	13.52	Aug-99	10.12	12.37	12.13
Sep-97	9.03	13.56	Sep-98	n.a	11.82	13.24	Sep-99	10.51		12.11
Oct-97	8.58	13.21	Oct-98	10.94	10.86	12.47	Oct-99	10.51	11.90	11.96
Nov-97			Nov-98	10.02			Nov-99			
Dec-97	9.33		Dec-98	10.70	10.88		Dec-99			
Months	spot 00	fwd-11:99	fwd-12:98	fwd-13:97	Months	spot 01	fwd-11:00	fwd-12:99	fwd-13:98	fwd-14:97
Jan-00	10.20	12.16	7.77		Jan-01	9.69	10.68			
Feb-00	9.66	12.26	11.41	13.53	Feb-01	9.21	9.83			9.38
Mar-00	10.03	11.84	12.78		Mar-01	8.73	10.14			
Apr-00	9.60	11.37	11.66	15.25	Apr-01	8.77	9.66	11.20	11.49	4.12
May-00	9.36	11.20	10.98	12.80	May-01	8.63	9.63	11.24	11.63	7.30
Jun-00	9.72	11.36	12.01	12.51	Jun-01	8.01	9.95	11.21	13.40	6.57
Jul-00	9.80	11.26	12.43	10.89	Jul-01	7.45	10.18	11.35	11.91	7.05
Aug-00	10.75	10.73	12.56	11.26	Aug-01	7.19	10.73	11.01	12.20	5.48
Sep-00	10.81	10.84		11.26	Sep-01	7.29	10.58	10.92	12.02	7.93
Oct-00	10.45	13.15	12.16	9.77	Oct-01	7.04	10.81	8.53		7.46
Nov-00	10.26				Nov-01	6.78	10.37			
Dec-00	10.31		11.89	10.47	Dec-01	6.93	10.11			7.54

Note: fwd-1n:yy = one year forward rate n year(s) from now, computed in 19yy or 20yy.

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- ¹ Note that the financial year in India stretches from April of a year to March of the following year.
- ² See, for example, de Jong and Santa-Clara (1999), Pritsker (1998), Inui and Kijima (1998), and Conley et al. (1997).
- ³ The only significant studies about the Indian bond market are by Leonardo (2000), Thorat (2000) and Shah and Thomas (1997). But these studies restricted themselves to overview and analysis of policies, and have not attempted to quantify the pricing anomalies that manifest the imperfection of the market microstructure.
- ⁴ Dated government securities are medium to long term bonds with maturity of one year or more, i.e., when issued they are not money market instruments. Such securities largely take the form of plain vanilla coupon bonds, but of late zero coupon bonds and floating rate bonds have also made their appearance.
- ⁵ The growth of the WDM has been phenomenal. As early as the end of 1999, the number of securities listed and permitted to trade on the WDM increased to 1,306, and by 2001 the average monthly turnover at the WDM had exceeded Rs. 500 billion.
- ⁶ The number of PDs increased from 6 in 1996 to 13 in 1999. In 1997, 17 satellite dealers were added to the system to add to the market making ability of the dealers.
- ⁷ It is a stylised fact that market making either by speculators with diverse expectations about the future, or by “specialist” individuals and organisations like the PDs is an essential part of the structure of a liquid market.
- ⁸ Since 1998, two-way quotes for some government securities are available online, and are made available through Reuters and Bloomberg terminals.
- ⁹ The SLR requirement was further reduced to 25 per cent in October, 1997.
- ¹⁰ Since there is little theoretical structure to justify the emergence of a handful of “benchmark securities” in a market, we have to fall back on anecdotal evidence as provided by market insiders, the RBI and institutions like Reuters and Bloomberg. Such evidence suggests that, during a period of time, a security emerges as a benchmark security if, out of a necessity to alleviate problems associated with asset-liability mismatch, large market participants buy and sell large amounts of the bond, thereby giving it substantial liquidity. Often, benchmark bonds are those that have been newly issued, and hence which are bought and sold frequently over a period of time to enable price search and allow major market participants to acquire them in conformity with their requirements for asset-liability management.
- ¹¹ It is easy to see that a decline in the n -bond concentration ratio implies an increase in the turnover of an average security that is not among these n bonds. The 6-bond concentration ratio declined from nearly 30 percent in 1996 to less than 10 percent in 2002.
- ¹² The greater the number of trades, the greater the number of price signals received by the market participants, and hence the greater the capability of the participants to update their private information such that informational rent cannot be extracted by dominant market players.
- ¹³ Indeed, even though the average “size” of a trade in the secondary market for dated government securities is INR 10-50 million and even though the share of transactions of this size has increased over time (see Figure 1b), suggesting that a number of small and medium sized players are active in the market, players like UTI, LIC and SBI continue to dominate the market. Their size allows them to play the role of liquidity providers and hence in an imperfect market they have bargaining power *vis a vis* the other market participants. Further, they hold a huge proportion of the outstanding face value of dated government securities, and hence any significant increase in the turnover of the secondary market requires their active participation.
- ¹⁴ Note, however, that during December, 1995 and January, 1996 there was one trade involving the ZCB per month, and hence the standard deviation was zero for those months. There was no trade involving the security in November, 1995.
- ¹⁵ The U shaped pattern was verified by regressing the proportion of the outstanding face value of the bonds highlighted in Figures 4a and 4b traded in a month on their *age* (i.e., the number of months since the time a bond was introduced in the primary market) and the square of age. The regression coefficients supported the U shaped trend in almost all the cases.
- ¹⁶ The 1-year forward rates for 2001 estimated in 1997 (fwd-14:97) in Table 1 are clearly aberrations, and possibly highlight the impact of thin markets for bonds that are 4 years away from maturity.
- ¹⁷ The average monthly divergence between the actual and expected 1-year rates for 1997, the expectations having been formed a year in advance, was 499 basis points.

¹⁸ The RBI, however, has attempted to lure traders into using the NDS by ensuring that all trades negotiated on the NDS are guaranteed by the Clearing Corporation of India Limited (CCIL). But trades are guaranteed even if they are merely *reported* on the NDS, thereby making the NDS as ineffective in disseminating real time price information as the WDM of the NSE.

¹⁹ Details of the proposal can be downloaded from www.finmin.nic.in, www.sebi.gov.in and www.rbi.org.in.