

PRICING OF RISK IN THE INDIAN CORPORATE BOND MARKET: SOME EVIDENCE

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ABSTRACT

Government bond issues have traditionally dominated primary and secondary Indian debt markets. Corporate bonds account for less than a fifth of outstanding issues. This study is a pioneering effort to identify the determinants of risk premium in the Indian corporate bond market between 1998 and 2002. Results of Ordinary Least Square (OLS) multiple regression indicate that the factors influencing risk premium differed for institutional and non-institutional trades. The reasons for this are discussed.

Keywords: institutional trades, retail trades, risk premium determinants, yield spreads

INTRODUCTION

Corporate bonds in India are traded within two distinct subgroups of investors, namely institutional investors (banks, foreign institutional investors and mutual funds) and non-institutional investors (known as retail investors). The risk-return relationship implicitly assumes that institutional and retail investors have uniform risk perceptions with regard to a specific risk-contributing variable. This is refuted for corporate bonds traded on the National Stock Exchange (NSE) between 1998 and 2002. The determinants of risk premium identified through OLS double log multiple regression, explained more than two thirds of the variation in risk premium for retail trades, but only one fourth of the variation for institutional trades. This was ascribed to two reasons – differing credit quality preferences of each subgroup, and differences in trading transparency for each subgroup.

DETERMINANTS OF YIELD SPREADS

A bond's yield is affected by default risk (Chatfield & Moyer, 1986; Ogden, 1987; Kao & Wu, 1990; Delianedes & Geske, 2001; Li, 2003), liquidity risk (Chen, Lesmond, & Wei, 2005), interest rate risk (Schwartz & Longstaff, 1992; 1995), systematic risk (Elton, Gruber, Agrawal, & Mann, 2001) and unsystematic risk (D Amato & Remolona, 2003). Non risk factors also affect spreads. Kamin and Kliest (1999) found regional differences in investment grade yield spreads across developing markets even after controlling for risk and maturity.

The existence of a call option raises yield spread (Kraus, 1982; Wall, 1988), while a put option reduces it (Chatfield & Moyer, 1986), as does a convertibility option. The influence of default risk (Delianedes & Geske, 2001), sector specific variables, industry specific variables, firm specific variables (Ramaswami, 1991) economic variables (Li, 2003), and the age of the bond (Asquith, Mullins, & Wolf, 1989) on yield spread, varies with bond rating. Default risk accounted for 5% of the yield spread on "AAA" rated and 22% of the yield spread on "BBB" rated bonds in the US market (Delianedes & Geske, 2001); yield spread on investment grade debt is determined primarily by non-credit risk factors such as liquidity and stock price volatility (Delianedes & Geske, 2001), while investment grade bonds in the US market are less influenced by sector specific, industry specific and firm specific variables as compared to high yield bonds (Ramaswami, 1991). The influence of economic variables on yield spread also differs based on bond rating. The prime rate, changes in the short end of the yield curve, and changes in the Treasury yield curve explained 64% of the variation in yield spread of "BB" bonds but only 9% and 8% respectively of "AAA" and "CCC" bonds (Li, 2003). Default losses were lower for privately placed rated corporate paper in the US market than for similarly rated public issues (Carey, 1998). The effect of bond age on yield spread is uncertain. The older the bond and the closer it is to redemption, the lower is the probability of default. But default rates rose with junk bonds' age (Asquith et al., 1989).

The effect of bond issue size on yield spread is uncertain. Large issue size implies a higher interest burden, a greater possibility of default and a higher yield spread (Jalilvand & Park, 1994). Conversely a large outstanding bond issue would more likely trigger restructuring rather than outright default and therefore reduce yield spread (Shulman, Bayless, & Price, 1993). A high market capitalization for the issuing firm signals higher future earnings, lower default risk and lower yield spread (Fisher, 1959).

BOND MARKETS IN INDIA

More than three fourth of corporate bond issues in India are privately placed, and till September 2003, credit rating was not mandatory for such issues. Institutional investors own four fifths of outstanding bonds (Barua & Raghunathan, 1997; Sathe, 1997). Corporate bonds are primarily traded on the NSE and the Bombay Stock Exchange (BSE) though they are tradeable on all 23 stock exchanges in India. The secondary market lacks width. The "5" bond concentration ratio and "15" bond concentration ratio on the NSE and BSE between 1997 and 2001 were 58 and 78%, respectively (Bose & Coondoo, 2003). The market also lacks depth (Tables 1 and 2). The reasons ascribed for illiquidity range from the "hold to maturity" tendency of institutions (Barua & Raghunathan, 1997; Bose & Coondoo, 2003), the virtual absence of market making (Bose & Coondoo, 2003; Patil, 2004), the slow pace of dematerialization, the delay in transfer of title of bond physicals (of up to six weeks due to procedural requirements), and the levy of stamp duty on "physicals". As of November 2000, just over 200 of the 1,200 bonds listed on the NSE had been dematerialized; transfer of "physicals" is effected through a deed, and procedural requirements include the need to take Directors' signatures, bankers' attestation of signatures, and stamp of the transfer agents for previous transfers. Stamp duty is a state subject in India, and a contentious issue. Rates vary between 1 (in Gujarat, Karnataka, Maharashtra, & Tamil Nadu) and 13%.

Table 1
Trends in corporate bond trading on NSE

Year	Number of trades	Traded quantity (million)	Trading volume (rupees million)
1997–1998	52278	16.10	1075.50
1998–1999	47158	10.40	857.10
1999–2000	28240	13.60	1036.70
2000–2001	4152	0.20	119.50
2001–2002	9266	5.40	588.10
2002–2003	2439	0.41	683.90

Source: NSE News, April 2003, p. 18, Table 5

Table 2
Trading frequency of bonds in the sample

Number of days traded	Number of bonds			
	1998–1999	1999–2000	2000–2001	2001–2002
Less than 10 days	20	14	14	23
10–20 days	2	3	–	2
More than 20 days	9	5	7	–
Total	31	21	21	25

Note: Number of trading days in each year: 251, 254, 251 and 247

As a result of thin trading, institutional investors use matrix-pricing methodology to determine bond yields and portfolio values. Mutual funds use a model mandated by the Securities and Exchange Board of India (SEBI) in 2001, where markups are added for four variables in each residual maturity-duration bucket (namely credit rating, liquidity, promoters' background, and issuer activity). Prior to 2001, a model developed by ICICI Securities was used, where markups were added for four variables in each of the residual maturity-credit rating bucket (namely, liquidity, promoters' background, issuer activity, and bondholding in a portfolio). SEBI, Mutual Funds Department, Guidelines for Valuation of Securities For Mutual Funds, September 18, 2000; the earlier model was developed by ICICI Securities.

METHODOLOGY

The objective was to identify the determinants of risk premium on corporate bonds issued by manufacturing companies, traded on the NSE between 1998–1999, 1999–2000, 2000–2001 and 2001–2002. Sixteen independent variables were initially selected. They were credit rating, interest coverage ratio, debt-equity ratio, hierarchy of bond in event of liquidation, experience of promoter group, issue size, trading frequency, size of bid-ask spread, trade size, bond age, residual maturity, term structure effect, coupon rate, duration, redemption mode, and bond beta. Market capitalization was not considered because several of the bonds in each year's sample belonged to the same issuer. This was particularly problematic in the last two years, in which the regression results were extremely disappointing. In 2000–2001, four firms issued just over half of the sample of bonds traded, and six firms issued 58% of the sample of traded bonds in 2001–2002. In 2000–2001, the four issuers were Gujarat Ambuja Cements, MRPL, Nirma and Tata Chemicals. In 2001–2002, the issuers were ACC, Grasim Industries, Gujarat Ambuja Cements, Indian Hotels, Nirma and Tata Power.

Credit rating reflects a bond's default risk. Default risk is higher for subordinated bonds (hierarchy in event of liquidation). In developing countries bonds issued by a firm run by an experienced promoter group with a track record of successful ventures, are perceived by institutional investors as less risky than bonds of a firm with inexperienced promoters (bond valuation models in India assign a lower markup to the former). A large issue size (with its larger number of bonds and higher interest burden) may either increase default risk or decrease it (due to better prospects for restructuring in financial distress) and also improve liquidity. Trading frequency, the size of the bid-ask spread, and trade size reflect liquidity risk. The size of the bid-ask spread is inversely related to trading frequency, and low trading frequency connotes illiquidity. In an illiquid market

with very few buyers and sellers, a small trade is easier to execute (and has more liquidity) than a large one.

Bond age affects default risk and yield. The older a bond, the lower the possibilities of rating downgrade and default. Also older bonds with higher coupons have lower yields when interest rates decline (as during the period of this study). Liquidity premium (term structure effect) depends upon a bond's residual maturity. A bond's coupon rate and its residual maturity determine its sensitivity (measured by duration) to changes in interest rates. Duration is also influenced by the mode of redemption of principal – a bond with bullet redemption has a higher duration than one with redemption in installments. Lastly, the systematic risk component can be estimated through bond beta.

Data on bonds in India is either unavailable or extremely limited, and in some cases inaccurate, while most bonds are rarely traded or not traded at all. Sources of data on corporate bonds include the Stock Exchange Mumbai fortnightly, Stock Exchange Official Directory, the websites of BSE and NSE, the *Economic Times*, and the rating manuals of ratings agencies. None of them is comprehensive, and cross-referencing revealed anomalies with respect to issue particulars, redemption years, redemption amounts (in case of staggered redemption) and coupon rate.

This forced the dropping of six variables – bond beta, size of the bid-ask spread, issue size, age of the bond, duration, and hierarchy in event of liquidation. Bond betas could not be calculated for all the bonds in the sample since extremely low trading frequency per year (some bonds traded only once), precluded the generation of a price series. Debt equity ratio and interest coverage ratio are subsumed under credit rating, so they were dropped since credit rating methodology incorporates leverage and interest coverage ratios.

Data was collected from daily debt trading details for the NSE published in the *Economic Times*. The year wise sample sizes were 31, 21, 21 and 25 bonds, respectively. In each sample, the number of institutional trades were 13, 7, 19 and 24, respectively. The drop in retail trades after 1999–2000 is an accurate representation of the year wise trend that persists to date. The secondary market for retail trades is miniscule, accounting for only 0.03% of total traded volume in 2003–2004 (Sharma & Sinha, 2006). The year-wise annual breakup of the number of institutional trades and retail trades for the 251, 254, 251 and 247 trading days on the NSE between 1998–1999 to 2001–2002 is unavailable in the archives for debt on the NSE's website.

Regression results were obtained and stepwise regression was conducted for each year. Risk premium was measured as the difference in yields between a

corporate bond and a government security with the same year of maturity. The term structure effect was measured as the difference between 10 and 1 year government securities traded on the day that risk premium was measured. This was a variant of the measure used by Fama and French (1993) who calculated the difference between 10 and 1 year pure discount government securities.

In each year, trading frequency for every bond in the sample was determined for the 12-month period between April 1 and March 31. Promoters' "experience" was identified on the basis of data from CMIE's PROWESS database. Those with a track record of business ventures were treated as "experienced". The model was:

$$RP = B_0 + B_1CR + B_2Term + B_3TS + B_4TF + B_5CPN \\ + B_6RM + B_7RED + B_8P + e$$

where

- RP = logarithm of risk premium
- CR = credit rating (0 = AAA, successive lower ratings = 1 to 17)
- Term = logarithm of term structure effect
- TS = logarithm of trade size
- TF = logarithm of trading frequency
- CPN = logarithm of coupon rate
- RM = logarithm of residual maturity
- RED = redemption mode (1 = bullet redemption, 0 otherwise)
- P = promoter status (1 = inexperienced, 0 otherwise)

RESULTS

The adjusted R^2 in 1998–1999 and 1999–2000 was 0.67 and 0.86 (Table 3). Credit rating was statistically significant in 1998–1999 and 1999–2000, and was also identified in stepwise regression. In both these years, retail trades dominated the samples, trade sizes were as low as 10, and bonds ranging between "AAA" and "D" were traded.

$$1998-1999: RP = 2.917 + 0.07 CR - 0.29 TERM - 0.07 TS + 0.02 TF \\ - 0.47 CPN + 0.06 RM + 0.12 RED + 0.36 P$$

$$1999-2000: RP = 4.99 + 0.20 CR - 0.17 TERM - 0.03 TS - 0.11 TF \\ - 1.73 CPN + 0.08 RM + 1.19 RED - 0.61 P$$

Table 3
Regression results

Year	1998–1999	1999–2000	2000–2001	2001–2002
R^2	0.76	0.91	0.56	0.24
Adjusted R^2	0.67	0.86	0.27	0.00
"F" value	8.56	17.88	1.94	0.97
Statistically significant variables (at 1%)	CR TS	CR RED	–	–
Stepwise regression:				
Model 1	CR	CR	RED	–
Model 2	CR TS	CR RED	–	–

Notes: CR = credit rating; RED = redemption mode; TS = trade size

$$2000-2001: RP = -1.10 + 0.08 CR - 0.79 TERM - 0.08 TS - 0.13 TF + 1.00 CPN - 0.02 RM + 0.39 RED - 0.33 P$$

$$2001-2002: RP = -5.03 + 0 CR - 0.09 TERM + 0.17 TS + 0.02 TF + 1.36 CPN + 0.16 RM^*$$

(* All the promoters of firms whose bonds were in the sample were "experienced" so promoter experience was not included due to the absence of binary values. Similarly redemption mode was not included as there were no binary values.)

The regression equation indicates that for a bond with an "AAA" rating, no bullet redemption at maturity, issued by a firm headed by an "experienced" promoter, the risk premium in 1998–1999 and 1999–2000 was 2.16 and 3.03, respectively. The slope coefficient for credit rating had the expected sign in both years. In 2000–2001 and 2001–2002, when only bonds with ratings "A" and above were traded, institutional trades dominated, and CM trades all but vanished, the adjusted R^2 was 0.27 and 0 (Table 3). None of the independent variables was statistically significant. Stepwise regression identified "redemption mode" in 2000–2001, and none was identified in the last year.

Taking all four years together, only the signs of the slope coefficients for credit rating and the term structure effect exhibited consistency. The values of slope coefficients were not stable over time. In all four years together, the sign for trading frequency (TF) is of particular interest. In an illiquid market, higher trading frequency should lead to greater opportunities for price discovery, fewer price distortions and lower risk premium. But in the first and last years, TF had a positive sign.

Overall, the selected independent variables successfully explained the variation in the risk premium when retail trades were predominant (1998–1999 and 1999–2000) but not when institutional trades were predominant (2000–2001 and 2001–2002). There are two possible reasons – differences in the credit quality of bonds traded by retail and institutional investors, and differences in trade execution. In 1998–1999 and 1999–2000, retail investors traded bonds with a wider credit rating variety (from "AAA" to "D"), and the information contained in credit rating was relevant to pricing default risk. In 2000–2001 and 2001–2002, when institutional investors traded bonds with ratings of "A" and above, default risk was less important. Even if it were, institutions have the clout to restructure repayment schedules. Carey (1998) found that the mode of issue influences subsequent default. Default losses were lower for privately placed rated corporate paper in the US market than for similarly rated public issues. Secondly, institutions undertook bilaterally negotiated telephonic trades outside the exchange, that may not have been at market clearing prices (there was no mandatory voice recording of trades during the period under study) while retail bond trades were exchange based. Thus, the scope for price distortions was greater in institutional trades. Additionally, institutions reported trades to the NSE after a lag of two to three days (Patil, 2004), and this might have affected the results.

CONCLUSION

The pricing of risk on debt instruments in India is an area that has not attracted research attention. Preliminary evidence presented in this paper shows that default risk, liquidity risk and bond specific variables could explain the variation in the risk premium on retail bond trades, but not in the case of institutional bond trades.

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