Pricing anomalies in the Indian corporate bond market

Harsh Vardhan [1]

Rajeswari Sengupta[2]

This version: December 2021

Please do not circulate

Abstract

In this paper we document the consistent and sustained presence of pricing anomalies in the Indian corporate bond market. We manually collect detailed information on the yield, credit rating, maturity, sector and ownership of the issuer for every bond issued in the debt market during the period April 2016 to March 2021, amounting to a total of 7,455 primary issuances. Using this data, we find that there exist sizeable variations in the pricing of debt securities of identical maturity and credit rating issued within a few days of each other. Theoretically, the only factors determining the pricing of bonds should be the market risk and the credit risk embedded in them and indicated respectively by the maturity and credit rating of the bonds. Any other factor influencing the pricing of these bonds suggests anomalies in pricing. We find that other than these two factors, issue size as well as the sector and the ownership of the issuer influence bond pricing. The anomalies are particularly stark for bonds issued by government owned enterprises. Interestingly credit rating does not seem relevant for the bonds issued by the government owned enterprises. This kind of a pricing anomaly arguably reflects the differential perception of risk among investors. For long, there has been a persistent attempt to improve the functioning of the Indian corporate debt market. Taking policy actions to remove this kind of pricing anomalies is a concrete step that will help develop the bond market and boost the confidence of the investors.

Key words: Bond pricing, Pricing anomalies, Credit rating, Maturity, Liquidity, Public-sector enterprises, Risk perception.

JEL Codes: G12, G32, G34

1 Executive in Residence at the Center for Financial Studies (CFS) at the SP Jain Institute of Management and Research. Email: harshv89@yahoo.com.

2 Associate Professor of Economics at the Indira Gandhi Institute of Development Research (IGIDR). Email: rajeswari@igidr.ac.in. The authors are thankful to Debojit Roy and Surbhi Bhatia for their excellent research assistance.

1. Introduction

In the present situation when the Indian economy is endeavouring to recover from the slowdown triggered by the Covid-19 pandemic and thereafter sustain a high growth rate, it is imperative that financing constraints in any form be removed and alternative financing channels be developed in a systematic manner for supplementing traditional bank credit. In this context, the development of the corporate debt market can play a critical role in the mobilization of the huge magnitude of funding required to finance potential business expansion and infrastructure development.[3] India however has been lagging behind other emerging economies in developing its corporate debt market.[4]

As mentioned in RBI (2019), the issues plaguing the corporate bond market reflect a complex interaction of demand and supply side factors. One critical manifestation of this interaction happens through the pricing of corporate bonds. While much has been written on the Indian corporate bond market in the last decade, surprisingly scant attention has been paid to the important issue of pricing of bonds. In this paper we aim to address this gap using a novel dataset.

Analysing how corporate bonds are priced, and what factors determine their prices will facilitate our overall understanding of the characteristics of the Indian corporate bond market. Our study is motivated by our finding that there exist certain anomalies in the pricing of corporate bonds. To the best of our knowledge, this issue of pricing anomalies has not been studied in the context of the Indian debt market so far. This issue is extremely important because appropriate pricing of debt securities at their issuance is critical to ensure that the issuer and the investors are incentivised to participate in the issuance. Persistent mis-pricing of bonds on the other hand acts as a serious impediment for the development of a well-functioning debt market.

Over the last decade, the Indian corporate bond market has grown rapidly. As of March 31, 2021 the total value of outstanding corporate bonds was Rs 34 trillion which is equivalent to about 30 percent of total loans extended by the commercial banks. For highly rated Indian corporations, bond market is gradually emerging as a reliable source of debt financing. These corporations are are increasingly using the bond market to raise both long term capital through bonds or non-convertible debentures (NCDs) and short-term capital through commercial papers (CPs). However, there is still a long way to go for the bond market to emerge as a reliable source of capital for majority of the Indian corporations.

Traditionally, bank finance, coupled with equity markets and external borrowings have been the preferred funding sources for Indian firms. While the equity market in India has been quite active, the size of the corporate debt market is small in comparison to not only developed markets, but also some of the other emerging market economies. For instance, corporate debt to GDP ratio in India was only 17 per cent in June 2017, as compared to 123 per cent in the US, 74 percent in South Korea, 44 percent in Malaysia, 99 percent in Brazil and 19 per cent China (RBI, 2019).

3 See RBI (2019) for a detailed discussion of the market microstructure related issues of the Indian corporate bond market. See Anand and Sengupta (2014a) and Banerji et al (2012) for a general description of the Indian corporate bond market.

4 See for example Anand and Sengupta (2014b) for a comparison of Indian corporate bond market with that of South Africa.

The debt market in India suffers from deficiencies in products, participants and institutional framework. The problems persist despite a large number of initiatives taken in the past particularly in the form of committees that have suggested myriad policy actions to help develop the bond market.[5] Instead of trying to implement reforms to comprehensively improve the functioning of the market, a more plausible approach might be to identify specific problems in the market and target policy actions to correct these, one at a time. In this context, studying the issue of bond pricing assumes much significance.

Corporate bonds present two risks to the investors – credit risk and market risk.[6] Credit risk is the risk that the issuing firm may not be able to meet its repayment obligations to the investor i.e. it reflects the probability of default. Market risk is the risk that the interest rates in the economy would change in a manner such that the investor can get higher returns on her investment. Debt securities issued by firms in India are called non-convertible debentures (NCD) or bonds.[7] While issuing these securities a firm has to 'price' both these risks i.e. offer the investor returns to compensate them for taking on these risks.

Credit risk is summarily captured in the credit rating of the bonds. Rating agencies provide default probabilities for each rating grade. Most of the bonds that are issued are rated by accredited rating agencies. Bonds rated at the same grade therefore have the same default probability and hence the same level of credit risk.

Market risk is a function of the maturity of the bond. Zero coupon yield curve describes the basic risk free interest rates in the economy. It denotes the risk free interest rates i.e. interest rates on securities with no credit risk in them (for example, government bonds) for various maturities. In an environment with a rising yield curve, as is mostly the case, longer the maturity of the bond, higher is the expected interest rate. Bonds with identical maturity, thus, are expected to carry the same level of interest rate risk in them.[8]

For corporate bonds therefore, two critical elements in the pricing of the bonds are their maturity, and their rating. Other features such as optionality and bond covenants could also impact the pricing of these bonds. Optionality refers to the presence of options – put and call – that empowers the issuer or the investor to redeem the bonds before it reaches contractual

5 For example Patil (2005) and multiple initiative by the Securities and Exchange Board of India, such as SEBI (2016, 2017, 2018, 2018a) among others.

6 We could add a third risk which is liquidity risk. However, we can consider liquidity risk as an extreme form of market risk.

7 While there are legal differences between the two, they are not relevant for the economics of issuing or investing in these securities.

8 Liquidity risk, on the other hand, is the risk that the bonds bought by the investors are illiquid and cannot be easily sold in the secondary market should the investor desired to do so. Liquidity can vary across bonds with some bonds getting traded much more than others. In the Indian bond market, the government bonds are traded at significantly higher volumes than corporate bonds. Hence as a class of securities, the government bonds are more 'liquid' than corporate bonds. While there are differences in liquidity of corporate bonds, overall all of them are generally very illiquid.

maturity. Bond covenants are the legal contractual terms that govern the rights and obligations between the issuer and the investor.

Bonds with identical maturities and credit rating that are issued in close proximity of each other with standard covenants and that carry no optionality should be expected to be priced identically or very close to each other. Any difference in the pricing of such identical bonds will be an anomaly reflecting inefficiencies in the bond market. It is this phenomenon that we aim to explore in our paper i.e. is there evidence of anomalies in corporate bond pricing in India and if so, can this be established in a robust manner?

We use detailed data on the primary issuance of corporate bonds. The biggest contribution of our work is that we put together a novel data-set by manually collecting granular information on every bond issued in the corporate debt market over the last 11 years. This amounts to 13,360 bond issuances. For the purpose of this paper, we have focused on the bonds issued in the last five financial years from FY2017 to FY2021. This amounts to 7,455 issuances. We describe the data in greater detail in Section 2. In this data-set, we have issuance-wise information on bond yield, credit rating, maturity, as well as ownership and sector of the issuing corporation. This is by far the most extensive data-set on corporate bond issuance in India.

The second most important contribution is that ours is the first study to document and also empirically establish the presence of anomalies in the pricing of corporate bonds in India. We first estimate the extent of anomalies by computing the yield differences between identical securities that are issued in close proximity. We classify the anomalies according to maturity buckets and also develop a time series of these anomalies over the period from April 2018 to March 2021.[9]

We find that bonds that have the same credit rating and are of the same maturity, i.e. bonds that bear similar credit risk and interest rate risk, and are issued within close proximity to each other, are consistently priced differently and this pricing gap has existed over time. We also find that bonds issued by government owned or public sector enterprises (PSU) have always been best priced i.e. carried the lowest yields, whereas bonds issued by private corporations have been worst priced, despite being of the same credit rating and having the same maturity profile.

Next, in order to better understand this issue and to examine the anomalies in a more robust manner, we analyse the determinants of bond pricing. In absence of any pricing anomalies, once we hold maturity of the bonds constant i.e. we account for the market risk, the pricing of the bond should only reflect the 'credit spread' i.e. the difference between the yield on the bond and the yield on the government security (GSec) of comparable maturity.

This credit spread should ideally be a function of only the default probability of the bond represented by the credit rating and nothing else. If any other factor influences the credit spread that means investors are giving importance to factors other than credit risk and market risk when pricing the bonds and that is a clear indication of mispricing. Indeed we find that over and above default probability, maturity of the bond, issue size, ownership and sector of the issuer also seem to impact the credit spreads.Interestingly, we also find that for bonds issued by government owned or public sector enterprises default probability is not a relevant factor. This implies that

9 Going forward to plan to extend this for a longer time period to show a more comprehensive picture of evolution of pricing anomalies over time.

government ownership is considered a mitigating factor for credit risk in a bond even though these bonds do not carry any explicit government guarantee.

Our paper is related to the strand of literature that studies determinants of bond pricing.[10] However ours is the first attempt, at least in the Indian context, to aim a comprehensive study of determinants of corporate bond pricing and specifically to document anomalies in this regard.

It is interesting to study this issue because of multiple reasons. Anomalies at the primary issuance stage are likely to carry forward to secondary markets in the respective securities and this in turn can create arbitrage opportunities. Significant and persistent pricing anomalies also imply that some risks in bonds are under or overpriced which may impact capital allocation in the bond markets. They also reflect lack of investor confidence in the key foundations of the bond market such as the yield curve and credit rating. In other words, such pricing anomalies are important impediments for the smooth functioning and development of the bond market. It is imperative, therefore, to understand the extent and the drivers of these anomalies so that policy actions can be taken to address them.

The rest of the paper is structured as follows. In Section 2 we present the data that we hand-collect, provide an illustration of the kind of pricing anomalies we uncover from the data and also discuss descriptive statistics. In Section 3 we present an empirical analysis that might facilitate our understanding of the mispricing that exists in the bond market. We discuss important policy implications of our findings in Section 4 and finally in Section 5 we conclude by outlining the next steps.

2. Data

Data on the pricing of corporate bond markets can be obtained from two sources – primary markets, i.e. the pricing data at the time of issuance of the bond, or secondary markets where bonds are traded and their prices are 'discovered' every day. In any securities market, secondary market data is more reliable as the prices in the secondary market, embody information from a large number of participants. In case of corporate bonds in India however, the secondary market is extremely illiquid. A very small number of bonds are traded and even the trading volumes of such bonds is a small fraction of the outstanding bonds. Most corporate bonds are not traded in the secondary market. As a result, there is very limited corporate bond price data available from the secondary market. For this paper, therefore, we have used data from the primary markets.[11]

We hand-collect data on all corporate bonds issued in the last 11 years, from FY2011 to FY2021 using the IndiabondInfo (https://www.indiabondinfo.nsdl.com/) service of National Securities Depository Limited (NSDL). For our analysis we use the data from FY2017 to FY2021 because

10 See for example Elton et al (2001), Gabbi and Sironi (2005), Paiva and Savoia (2009) among many others.

11 It may be noted that anecdotal evidence suggests that pricing anomalies in the primary markets are carried to the secondary market and in fact are amplified in many cases.

the data prior to FY2017 is sparsely populated. This gives us data on 7,455 bond issuances. We eliminate all the bonds with optionalities, and also a tiny fraction of bonds that had floating rates of interest.

Table 1: Descriptive statistics for total bond issuances, FY2017-FY2021

Year	**FY17**	**FY18**	**FY19**	**FY20**	**FY21**	**FY17-FY22**
Aggregate						
No. of issuances	1321	1255	1066	1509	2304	7455
Aggregate volume (Rs. bn)	5015	4792.4	5508.4	5685.5	7675.1	28676.4
Avg coupon rate (%)	10	10	10.4	10.4	9.3	9.9
Ownership						
Share of PSUs in number of bonds issued (%)	8.7	5.8	12.9	9.8	8	8.8
Share of PSUs in total value of bonds issued (%)	35	25	43.5	50.2	47	41.2
Avg coupon rate (%)	7.9	7.8	7.9	7.1	6.4	7.4
Sector						
Share of finance firms in number of bonds issued (%)	49.1	36.9	51.5	42.5	44.2	44.5
Share of finance firms in total value of bonds issued (%)	62.8	47.8	72.5	61.8	58.9	60.9
Avg coupon rate (%)	9.02	8.6	9.4	9.3	8.8	9.1

Source: NSDL and authors' calculations

The data-set we put together captures key attributes of corporate bonds issued. The key variables that we collect data on are:

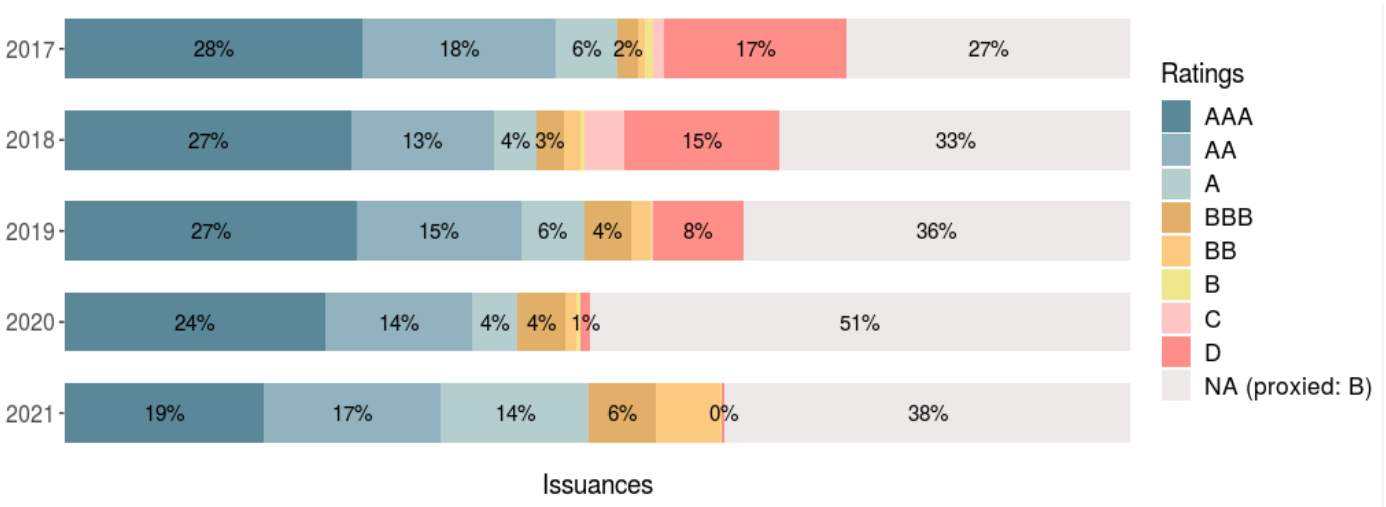
- Date of issuance
- Name of the issuer along with key attributes of the issuer (ownership – public sector versus private and broadly defined sector)
- Issue size
- Credit rating of the bond along with the name of the rating agency; for bonds with multiple ratings, all the ratings are available
- Maturity of the bond at the time of issuance
- Optionality embedded in the bond i.e. any put or call option offered on the bond
- Pricing of the bond ie the interest rate offered at the time of issuance and the nature of interest payment (simple, compound) etc.

In Table 1 we present a detailed description of this data for the aggregate sample as well as for the bonds issued by PSU firms and finance firms. We find that there has been a consistent growth in the volume of bond issuances during the sample period. We also see that the issuances are skewed towards higher rated paper – those rated AAA and AA dominate the issuances. Also, public sector companies and financial companies (i.e. Non banking finance companies or NBFCs) account for bulk of the issuances.

2.1 Analysing pricing anomalies

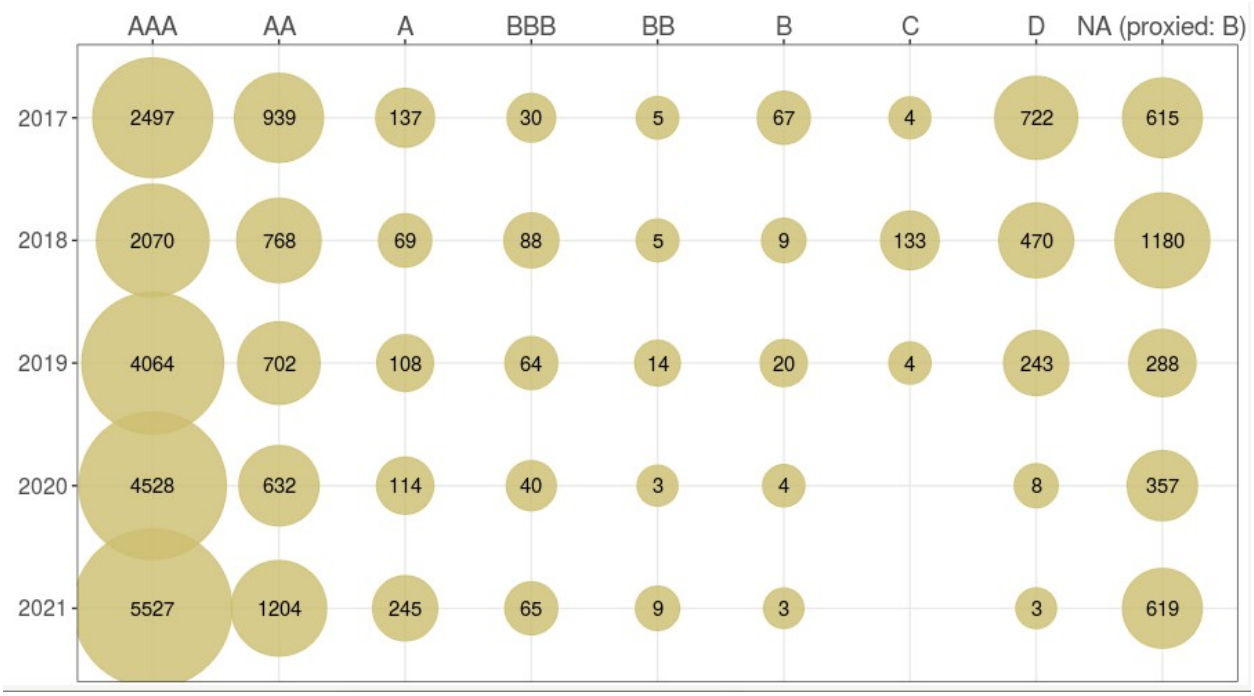
In order to get an idea about the extent of pricing anomalies we first classify the bonds into rating categories. Often, the same bond is rated by multiple rating agencies and the ratings can also differ. We take the highest rating given to every bond issuance. We also condense the 14 rating categories in the original dataset to roughly 7. This is because we are interested in the associated default probabilities and we get default probabilities for 7 rating categories (i.e. AAA, AA, A, BBB, BB, B, C). To do this, we consider for example AA+ as AA, BB+ as BB and so on. The +/- signs depict the outlook and we are only interested in the main rating.

Figure 1: Distribution of number of bond issuances by rating categories, FY2017-FY2021



Source: NSDL, authors' calculations

Figure 2: Distribution of volume of bond issuances by rating categories, FY2017-FY2021



Source: NSDL, authors' calculations

In Figure 1 we graphically present the distribution of the total number of bonds issued in every rating category across the years and in Figure 2 we show the volume of bond issuance (in Rupees billion) by rating categories. It is clear that both by number and by volume of issuances, the bulk ogf the entire bond issuance takes place in the top two rating categories AAA and AA. There is also a sizeable fraction of bonds in our dataset that are not rated by any rating agency. For these bonds (denoted as NA here) we assign the proxy rating of B.[12]

We next classify the bonds within each rating category as per their maturities – 10 years, 5 years, 3 years and 1 year. Using these classifications, we identify the best priced (i.e. bond with the lowest yield) and the worst priced (i.e. bond with the highest yield) bonds within each rating category and each maturity bucket for each month. We assume that the underlying interest rate structure is fairly stable over a month, and hence bonds issued within the same month could be considered to be within close proximity.

Across all the rating categories, only in the AAA bucket we could get data points in each month of the sample period. For other rating categories, there were many months when no bond was issued. This issue of lack of bond issuance becomes progressively bigger as we go down the rating categories. Hence, for the purpose of this section alone, we have focused on the pricing anomalies in the AAA bonds.

From the basics of bond pricing, we would expect that the bonds of identical maturity and credit ratings issued within close proximity of each other (within a month, for our analysis) should be priced very close to each other. Any wide price difference between the prices of bonds would, therefore, be an anomaly.

In Figure 3 below we present the price difference between the best priced and the worst priced AAA bonds issued within a month for the period of April 2018 to March 2021. In Table 2 we summarise the average pricing anomaly for bonds belonging to the 3 maturity buckets during this period.[13]

12 This is based on our conversations with market participants; also it is unlikely that unrated bonds would have a high rating because otherwise they would have been rated in any case. Going forward we plan to figure out their individual ratings in order to complete the data-set.

13 We analyse the anomalies for a shorter period for ease of calculations and subsequently we plan to look at the anomalies from FY2017 onward. s

Figure 3: Pricing anomaly in AAA bonds of varying maturities issued from April 2018 to March 2021

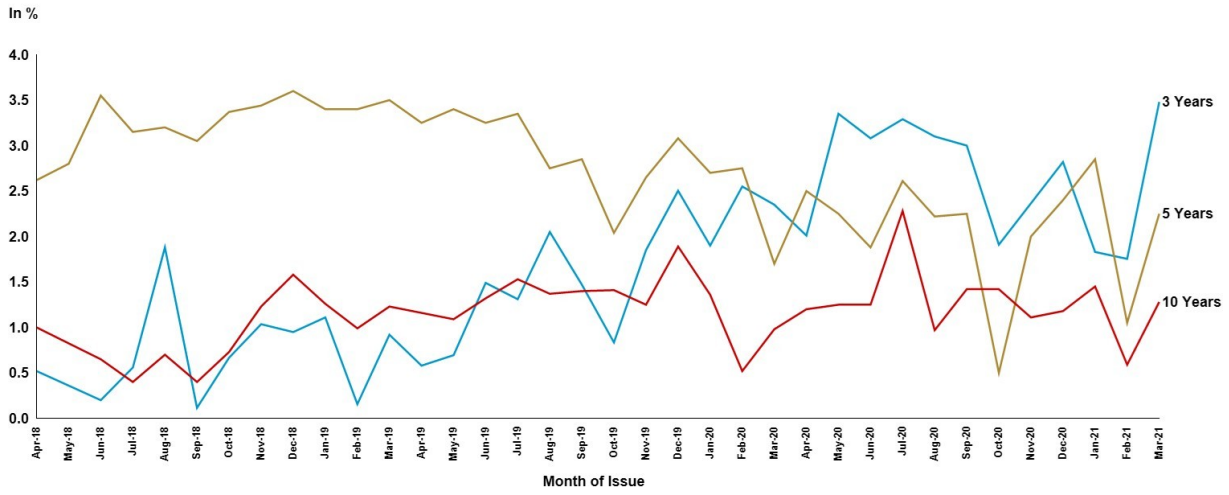


Table 2: Average pricing anomaly for bonds, 1, April 2018 – 31, March 2021

Maturity of bonds	Pricing difference between best priced and worst priced bonds
10 years	116 basis points
5 years	271 basis points
3 years	167 basis points

Source: NSDL, Authors' calculations

As we see from Table 2, these pricing anomalies are too large to be ignored. Clearly, the issuers and the investors in these bonds are considering factors other than credit risk and market risk to determine their pricing. Alternatively credit rating and maturity profiles of the bonds are not adequate measures of the credit and the market risk embodied in these bonds.

We look at two characteristics of the bond issuers, their sector and ownership (private versus public sector) to uncover any pattern in them. In Table 3 below we summarise the break up of sector and ownership for the best priced (lowest yield) and the worst priced bonds (highest yield bonds) for the 36 months of issuance.

Table 3: Frequency distribution of sector and ownership of the best and the worst priced bonds

Maturity	Best Priced (Lowest Yield) Bonds				Worst Priced (Lowest Yield) Bonds			
	Sector	No of Months	Ownership	No of Months	Sector	No of Months	Ownership	No of Months
10 years	Finance	25	PSU	28	Finance	30	Private	34
	Energy	4	Private	8	Utilities	1	PSU	2
	Utilities	5			Others	5		
	Others	2						
5 years	Finance	35	PSU	35	Finance	24	Private	35
	Utilities	1	Private	1	Utilities	9	PSU	1
					Others	3		
3 years	Finance	29	PSU	23	Finance	20	Private	34
	Utilities	5	Private	13	Utilities	4	PSU	2
	Others	2			Others	12		

Source: NSDL, Authors' calculations

From the data above, it is clear that best priced bonds are overwhelmingly issued by the public sector (government owned) entities while the worst priced ones are issued mostly by the private firms. Government ownership seems to be viewed as mitigating credit risk in the bond. It is important to note that none of these bonds carries explicit credit guarantee from the government. The data seems to suggest that the investors put a significant value on the 'implicit' guarantee from the government that characterises bonds issued by public sector enterprises.

Another interesting feature is that non-banking finance companies (NBFCs) are the best priced when government owned and worst priced when privately owned.[14] But this may also point to the fact that sectoral view is overwhelmed by ownership in the mind of the investors.

In the next section we delve deeper into this issue of mispricing by analytically examining the the determinants of credit spreads of these bonds which in turn would help establish the presence of pricing anomalies in a more robust manner.

14 All the finance firms issuing bonds are NBFCs in the sample.

2.2 Credit spreads of bonds

In order to be able to explain mispricing we need to look at the trends and patterns in the pricing of corporate bonds. To do this we calculate the credit spreads for each bond. Pricing anomalies essentially reflect variations in credit spreads.

We calculate the difference between the coupon rate of a corporate bond and the corresponding maturity GSec yield taking care to match the bonds by their date of issuance. For a corporate bond issued on date t, we use the corresponding maturity GSec yield from date t-1 (or further backward in case t-1 data is missing). We use GSec yields for 1Y, 3Y and 5Y maturities. For corporate bonds with maturity of 1-3 years we use the 1Y Gsec yield, for maturity of 3-5 years we use the 3Y Gsec yield and finally for maturity of greater than 5 years we use the 5Y Gsec yield.

In Table 4, we present the summary statistics for the credit spreads across all rating categories for our sample period. We show till rating category B because there are negligible issuances in categories after that.

For each of the 7 credit ratings we assign the corresponding default probabilities using the data disclosed by the three leading credit rating agencies – CRISIL, ICRA, and CARE. The same rating given by two different rating agencies can be associated with different default probabilities. For now, we take an average of the default probabilities across all rating agencies. Going forward we plan to assign the default probabilities for the specific agency that has given the highest rating to the relevant bond. For a bond issued in year t we use the default probability for year t-1.

Table 4: Descriptive statistics by rating categories for FY2017-FY2021, full sample

Year	**FY17**	**FY18**	**FY19**	**FY20**	**FY21**
AAA					
Credit spread (average)	1.350	1.540	0.970	1.340	1.510
Credit spread (sd)	0.550	0.760	1.150	0.890	1.020
Default probability (average)	0.000	0.000	0.000	0.330	0.400
AA					
Credit spread (average)	2.200	1.920	2.020	3.270	3.470
Credit spread (sd)	0.830	0.750	0.870	0.970	1.220

Default probability (average)	0.600	0.470	0.440	0.340	0.510
A					
Credit spread (average)	3.640	2.900	2.860	4.970	5.930
Credit spread (sd)	2.740	2.910	2.200	2.260	1.120
Default probability (average)	3.270	2.150	1.980	1.790	1.550
BBB					
Credit spread (average)	5.900	5.010	4.210	5.410	7.560
Credit spread (sd)	2.500	1.840	3.390	2.420	2.080
Default probability (average)	5.960	5.270	5.390	5.230	4.590
BB					
Credit spread (average)	7.600	5.460	5.060	5.590	7.630
Credit spread (sd)	1.420	1.750	2.330	0.890	1.420
Default probability (average)	11.380	10.780	10.950	10.140	9.380
B					
Credit spread (average)	3.230	2.500	5.930	3.320	4.720
Credit spread (sd)	3.190	1.940	4.340	1.830	1.510
Default probability (average)	18.240	17.480	17.300	16.130	16.170
NAs (B rating as proxy)					
Credit spread (average)	5.750	5.240	4.530	5.530	5.000
Credit spread (sd)	4.860	5.120	3.930	3.510	4.950
Default probability (average)	17.870	17.230	16.890	17.140	17.250

Source: NSDL and authors' calculations. We stop this sample at the B rating category because of very few issuances in categories C and D.

We see from Table 4, the spread is lowest for AAA rated bonds and increases as we go down the ratings curve as expected. It is interesting to note the fairly high standard deviation within each rating category. This standard deviation is an indicator of the pricing anomalies as it highlights the variation in credit spreads within the same rating category. In Tables 5 and 6 below we present similar statistics for bonds issued by PSU firms and finance firms respectively.

Table 5: Descriptive statistics by rating categories for FY2017-FY2021, PSU sample

Year	**FY17**	**FY18**	**FY19**	**FY20**	**FY21**
AAA					
Credit spread (average)	0.730	0.650	0.216	0.611	0.916
Credit spread (sd)	0.197	0.306	1.483	0.934	0.857
Default probability (average)	0.000	0.000	0.000	0.340	0.432
AA					
Credit spread (average)	1.884	2.061	1.571	2.488	3.003
Credit spread (sd)	0.886	0.807	0.449	0.519	0.640
Default probability (average)	0.600	0.480	0.450	0.380	0.586
A					
Credit spread (average)	2.440		3.069	3.426	
Credit spread (sd)	0.695		1.027	NA	
Default probability (average)	3.290		2.060	1.970	
NAs (B rating as proxy)					
Credit spread (average)	2.357		-7.109	-5.928	-0.171
Credit spread (sd)	NA		NA	NA	NA
Default probability (average)	18.240		17.300	17.940	18.540

Source: NSDL and authors' calculations. There are practically no issuances by PSU firms that are less than A rated.

Table 6: Descriptive statistics by rating categories for FY2017-FY2021, Finance sample

Year	**FY17**	**FY18**	**FY19**	**FY20**	**FY21**
AAA					
Credit spread (average)	1.210	1.020	1.050	1.410	1.460
Credit spread (sd)	0.410	0.380	1.060	0.870	1.000
Default probability (average)	0.000	0.000	0.000	0.330	0.400
AA					
Credit spread (average)	2.330	1.920	2.030	3.340	3.590
Credit spread (sd)	0.860	0.700	0.890	0.810	1.240
Default probability (average)	0.600	0.480	0.440	0.340	0.500
A					
Credit spread (average)	4.070	2.840	2.900	5.240	5.980
Credit spread (sd)	2.880	3.440	2.820	2.270	1.050
Default probability (average)	3.290	2.230	2.030	1.780	1.510
BBB					
Credit spread (average)	6.140	5.020	5.140	5.510	6.990
Credit spread (sd)	2.880	2.000	2.170	2.040	1.640
Default probability (average)	5.960	5.270	5.400	5.260	4.620
BB					
Credit spread (average)	7.410	5.270	5.100	5.660	5.170
Credit spread (sd)	NA	0.940	1.370	0.220	4.170
Default probability (average)	11.380	10.780	10.950	8.930	9.530

NAs (B rating as proxy)					
Credit spread (average)	3.440	2.490	2.780	4.720	6.320
Credit spread (sd)	1.790	5.180	3.470	2.160	2.890
Default probability (average)	18.240	17.480	17.080	17.590	17.200

Source: NSDL and authors' calculations. Here we stop at B category because there are very few issuances in rating categories after that.

It is important to note that on average the PSU credit spreads for all rating categories are lower than those for the overall sample and certainly lower for the sample of finance firms. The sample for finance firms includes both PSU and private finance firms and the credit spreads within the finance firms are much higher for the private firms than for the PSU firms. Overall, this points to the investors viewing government ownership positively and giving issuers under government ownership a clear pricing benefit. We can also interpret this pricing differential as a 'subsidy' arising from government ownership that these firms enjoy.

3. Understanding bond pricing

The data we put together shows that there exists systematic and sustained mispricing in the corporate bond market. Primary function of any market is price discovery and any anomaly in the price discovery can become a serious impediment in the development of the market. We next try to empirically establish the presence of such an anomaly.

In order to do this we explore the determinants of bond pricing. Specifically we look at credit spreads of these bonds and factors influencing the credit spreads. Mispricing exists when bonds of the same credit rating and maturity issued within close proximity of each other are differently priced. Another way of uncovering this from the data is to see if factors other than credit risk (captured by default probability) impact the credit spreads. In computing credit spreads, we already account for maturity of the bond by deducting the GSec yield of the corresponding maturity and we also take care of the date of issuance because we consider GSecs issued around the same time as the corporate bonds.

Hence, in an ideal situation when there is no mispricing, credit spreads should be determined solely by the default probability associated with the bond. We would expect that higher the default probabilities (or lower the credit ratings), the higher would be the credit spreads. We are therefore interested to see whether any other factor also influences the credit spreads because that would point towards potential mispricing.

To examine this, we use an ordinary least squares regression framework where our dependent variable is credit spreads for all bonds and the main explanatory variables are default probability, issue size, maturity period. We calculate the maturity period (in years) for every bond issued using the difference between the date of allotment and the date of redemption.[15] We also incorporate two dummy variables to capture PSU issuers and finance issuers. We present the results in Table 7 below.

Table 7: Determinants of credit spreads for the full sample, FY2017-FY2021

	Dep var: Credit spread				
	Full sample (1)	PSU (2)	Non-PSU (3)	Finance (4)	Non-finance (5)
Default probability	0.014***	-0.002	0.013***	-0.008**	0.037***
	(0.004)	(0.037)	(0.004)	(0.004)	(0.009)
Issue size	-0.003***	-0.0002	-0.004**	-0.004***	-0.003***
	(0.001)	(0.0003)	(0.002)	(0.0004)	(0.001)
Maturity period	0.0001***	0.0002***	-0.00000	0.0001***	0.00004
	(0.00002)	(0.00002)	(0.00002)	(0.00002)	(0.00003)
PSU	-2.086***			-1.841***	-2.559***
	(0.159)			(0.110)	(0.257)
Finance	-1.252***	-0.236*	-1.316***		
	(0.097)	(0.124)	(0.109)		
Constant	4.483***	1.023***	4.548***	3.362***	4.177***
	(0.098)	(0.170)	(0.110)	(0.089)	(0.140)
No of obs.	7455	662	6797	3325	4134
Adjusted R-sq	0.12	0.12	0.05	0.14	0.05

Note: *p<0.1; **p<0.05; ***p<0.01
PSU is a dummy variable that takes the value 1 for all bonds issued by government owned enterprises. Finance is a dummy variable that assumes the value 1 for all bonds issued by finance firms.

In column (1) of Table 7 we show the results for the full sample. We find that default probability is highly significant with the expected positive sign, implying that higher the default probability,

15 We make some adjustments to the maturity period. For some bonds issued till perpetuity the maturity period is quite large and for the sake of our analysis we assign a maturity period of 5 or 7 to these bonds.

greater the credit spread. However we find that other than default probability issue size is statistically significant with a negative sign implying that greater the issue size in the primary market lower will be the credit spread.

We also find that both the PSU and Finance dummy variables are statistically significant. This shows that credit spreads vary across issuances depending on what kind of firm issued the bond, in which sector, and what was the volume of issuance, even when credit risk and market risk are accounted for. In particular the negative coefficient of the PSU dummy implies that credit spreads of PSU bonds are lower i.e. the markets perceive PSU bond issuers to be relatively less risky.

To further investigate this, we separately run the regression for the PSU and non-PSU issuers. We show these results in columns (2) and (3). Interestingly we find that default probability does not seem relevant for the credit spreads of PSU bonds. This reiterates our finding from Table 3 that investors assign significant value on the 'implicit' guarantee from the government that characterises the bonds issued by the public sector enterprises.

In absence of such an 'implicit' guarantee we find that for the non-PSU bonds credit spreads are positively associated with default probabilities. While issue size does not influence the credit spreads of PSU bonds it is a significant determinant of credit spreads of non-PSU bonds.

We also run the regression separately for the Finance issuers in column (4). We find the negative sign of the default probability intriguing; this implies higher the default probability of the Finance bonds lower the credit spreads which is counterintuitive and demands futher investigation. However this could be an outcome of the feature that majority of the finance firms issuing these bonds are also PSU entities, and their ownership could be an overwhelming factor distorting the result. For the non-finance bonds, default probability has the expected positive sign.

We see that credit spreads are also impacted by the maturity period. The fairly consistent significance of maturity in determining the credit spread merits further exploration as well. It is generally positively correlated with credit spreads except in the case of non-PSU firms where it is negative but not statistically significant. This points to the fact longer maturity results in higher credit spreads. i.e. investors seem to be penalising longer maturity bonds more even if they carry the same credit risk. It could also be that some sort of 'liquidity premium' gets built into the bond pricing due to longer maturity.

In a nutshell our results suggest the following:

(i) Factors other than default probability significantly influence the credit spreads which is an indication of pricing anomaly;

(ii)Specifically, maturity positively impacts credit spread indicating that credit spreads go up with maturity;

(iii) Public sector ownership has negative correlation with credit spreads suggesting that government ownership gives a pricing benefit to these issuers. For the same rating the market seems to perceive lower risk in them compared to the privately owned issuers and default probability does not even seem to matter for these issuers.

(iv) Financial firms' result could be distorted by the overwhelming presence of PSU issuers in this sector.

4. Policy implications

Our analysis points to a subsidy that the government owned entities get when issuing bonds. Entities that without government ownership may have found it difficult to raise capital in the bond market enjoy a special privilege because of their ownership status even if there is no explicit guarantee. Given that the domestic capital pools investing in bonds are limited, any privilege enjoyed by the government owned entities comes at the cost of private sector issuers. In other words, this kind of a subsidy to PSUs can potentially lead to crowding out the private sector bond issuers. Overall, it results in misallocation of debt capital.

The findings of our study also raise questions about the utility of credit ratings of bonds. If credit ratings are not being valued by investors, as seems to be the case with PSU bonds for example, then one needs to question the usefulness and validity of these ratings. It is clear from our analysis that investors consider other factors also in pricing bonds.

Credit rating is a regulated activity and this issue should addressed by the regulators. It is important to consider if the regulators should compel the rating agencies to provide two separate ratings for the government owned issuers – one assuming government support and the other on a standalone basis without assuming any government support.

Finally, mispricing of bonds distorts the process of price discovery. Mispricing in primary issuances is likely to be carried over into the secondary market. It is difficult to assess this relationship between the primary and the secondary markets, as the secondary market is illiquid and does not provide reliable price data.

It is imperative for bond market development that this issue is closely investigated by the regulators and policymakers and necessary steps are taken to reduce the extent of pricing anomalies.

5. Conclusion and next steps

In this paper our objective is to document and explore the trends and patterns in the pricing anomalies that potentially exist in the Indian corporate bond market. Using a novel dataset that we collate by hand-collecting granular information about every corporate bond issued over the last five financial years, we find that there exists a sizeable magnitude of mispricing in the debt

market, specifically between bonds issued in the primary market by the government owned enterprises and the private sector corporations.

We undertake detailed empirical analysis of the determinants of corporate bond pricing in India in order to obtain a clearer understanding of the pricing anomalies. We calculate credit spreads of corporate bonds using GSec yields of corresponding maturity and issuance date. In absence of any pricing anomaly, these credit spreads should only be a function of the credit risk of the underlying bonds as captured in the credit ratings. The ratings reflect the default probabilities.

We find however that factors other than default probability such as maturity, issue size, ownership and sector of the issuer also seem to influence credit spreads. In other words, investors do not only take into account the credit risk and market risk while pricing corporate bonds in India and this points towards mispricing of bonds.

Going forward we aim to explore the role played by macroeconomic factors in influencing these pricing anomalies. For instance, we know anecdotally that in conditions of ample liquidity bond market credit spreads come down. We could, therefore, conjecture that the pricing anomalies i.e. the significance of factors other than default probabilities in determining credit spreads would also come down as liquidity in the system goes up and vice versa. In a liquidity constrained environment it is possible that investors provide even more 'subsidy' to the bonds issued by government owned enterprises and in the process penalise the private sector bonds even further. We plan to test the relationship between the determinants of credit spreads controlling for liquidity conditions.

Further, significant credit events could trigger bouts of risk aversion. Such events primarily include defaults by a major corporation, failure of a bank or any other scam in the securities markets (not just the bond market). Events like these raise the overall risk aversion and could, therefore, translate into higher pricing anomalies. We therefore plan to look into some of these major negative events as well in the securities markets.

Anomalies in pricing of bonds at the primary issuance stage are likely to carry forward to secondary markets in the respective securities and this in turn can create arbitrage opportunities. Significant and persistent pricing anomalies also imply that some risks in bonds are under or overpriced which may impact capital allocation in the bond market. For example, persisistent pricing subsidy to government owned entities in bond issuance could privilege them and result in these entities crowding out private issuers. Therefore, eliminating these anomalies will be an important step in developing a deeper, more liquid and better-functioning corporate bond market in India.

References

Anand, Vaibhav and Rajeswari Sengupta (2014a), “Corporate Debt Market in India: Issues and Challenges”, published in the India Development Report, 2014-15.

------- (2014b), “Corporate debt market in India: Lessons from the South African experience," Indira Gandhi Institute of Development Research, Mumbai Working Papers 2014-029, Indira Gandhi Institute of Development Research, Mumbai, India.

Banerji, S., Gangopadhyay, K., Patnaik, I., and Shah, A. (2012), “New thinking on corporate bond market in India”, NIPFP Working Paper No 2012-106.

J.E. Elton, M.J. Gruber, D. Agrawal, C. Mann (2001), “Explaining the rate spread on corporate bonds”**,** Journal of Finance, 56, pp. 247-277

Gabbi, Giampaolo and Andrea Sironi, (2005), “Which factors affect corporate bonds pricing? Empirical evidence from eurobonds primary market spreads”, The European Journal of Finance, 11:1, 59-74.

Paiva, Eduardo Vieira dos Santos, and José Roberto Ferreira Savoia, (2009), “Pricing corporate bonds in Brazil: 2000 to 2004,” Journal of Business Research, Volume 62, Issue 9.

Patil, R. H. (2005). Report of High Level Expert Committee on Corporate Bonds and Securitization. Ministry of Finance.

RBI (2019), “India’s Corporate Bond Market: Issues in Market Microstructure”, Reserve Bank of India Bulletin, Jan 10, 2019.

SEBI (2017), “Consultation Paper on Consolidation and re-issuance of debt securities issued under the SEBI (Issue and Listing of Debt Securities) Regulations, 2008”, Available at https://www.sebi.gov.in/reports/reports/feb-2017/consolidation-and-re-issuance-of-debt-securities-issued-under-the-sebi-issue-and-listing-of-debt-securities-regulations-2008_34120.html

SEBI (2018), “Expanding India’s Corporate Bond Market: Bonds of Growth-Assessing the Supply Demand Matrix”. Speech by Shri Ajay Tyagi, Chairman, SEBI at CRISIL’s 5th Annual Seminar on October 24, 2018. SEBI Bulletin, November 2018.

SEBI (2018a), “Consultation Paper Designing a Framework for Enhanced Market Borrowings by large Corporates”, Available at https://www.sebi.gov.in/reports/reports/jul-2018/consultation-paper-for-designing-a-framework-for-enhanced-market-borrowings-by-large-corporates_39641.html