



The Notching Rule for Subordinated Debt and the Information Content of Debt Rating

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This paper provides new evidence regarding the information content of debt ratings. We show that noninvestment grade subordinated issues are consistently priced too high (the yield is too low), and the reverse is true for some investment grade bonds. We relate this empirical bias to a notching rule of thumb that is used in order to rate subordinated debt without expending additional resources for information production. We propose an explanation for these findings based upon a balance between an attempt to please the companies that pay the raters versus a concern for lawsuits and regulatory investigations should ratings be too optimistic.

This paper provides new evidence regarding the information content of debt ratings.¹ We complement previous research that focuses on default probabilities by implicitly analyzing recovery rates as we compare the yields on senior and subordinated bonds.

We find that noninvestment grade subordinated issues are consistently priced too high (the yield is too low), and the reverse is true for some investment grade bonds. We relate this empirical bias to a notching rule of thumb that agencies use in order to rate subordinated debt without expending additional resources for information production.

We propose an explanation for these findings based upon a balance between an attempt to please the companies that pay the raters versus a concern for lawsuits and regulatory investigations should ratings turn out to be too optimistic. Our findings may also contribute to the current policy debate regarding regulatory oversight of rating agencies, an issue that has gained prominence in the wake of the Enron scandal and the recent crunch in debt markets (Wiggins, 2004; *The Economist*, 2007).

Our work is closely related to the literature about the informational content of debt ratings and the literature suggesting that ratings are not perfect pricing operators. A number of papers find that bond ratings provide useful information to market participants (Weinstein, 1977; Ederington,

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¹See Cantor and Packer (1995) for uses of ratings in regulation. The idea surfaces periodically. For example, in June 1999 and January 2001, the Bank for International Settlements proposed to determine banks' minimal capital requirements using agency ratings. This issue has come up repeatedly during the 2008-2009 recession that some argue was precipitated by inflated ratings of various securities.

Yawitz, and Roberts, 1987; Hand, Holthusen, and Leftwich, 1992; Goh and Ederington, 1993; Ederington and Goh, 1998; Kliger and Sarig, 2000; Dichev and Piotroski, 2001). At the same time, other studies indicate that ratings may be imperfect pricing mechanisms (Ederington, Goh, and Nelson, 1996; Altman and Rijken, 2004; Hull, Predescu, and White, 2004; Norden and Weber, 2004; Livingston, Naranjo, and Zhou, 2007; Griffin and Tang, 2009; Harris, Opp, and Opp, 2010). Even studies that view ratings favorably document delays in rating changes and differences between upgrades and downgrades. Sufi (2009) analyzes the impact of bank loan ratings on the availability of capital. He finds that the introduction of ratings increases the supply of debt, in particular for firms that need such certification most, supporting the view that research by rating agencies may provide information not previously available to the market.

Our framework is consistent with this literature. We argue that rating agencies expend significant resources for rating senior bonds. However, they may not be equally diligent in rating subordinated bonds; thus, the informational content of bond ratings may vary across bond types.²

Also closely related to our work is a paper by John, Lynch, and Puri (2003) who find that secured debt has higher yields than unsecured debt, even after controlling for bond ratings. This is interpreted as rating agencies' failure to recognize agency problems between managers and bondholders. Unlike John, Lynch, and Puri (2003), we attribute the yield differential between senior and subordinated bonds to a cost-driven choice on the part of the rating agencies.³

The rest of the paper is organized as follows. We discuss the rating process with a focus on notching policy in Section I. In Section II, we describe the data. Section III presents the main results regarding yield differentials between senior and subordinated bonds using both S&P and Moody's ratings. Section IV provides evidence that the yield differential between senior and subordinated bonds can be attributed to the notching policy. Our conclusions are presented in Section V.

I. The Rating Process of Senior and Subordinated Bonds

Companies can choose the priority level of the debt they issue subject to covenants (Reisel, 2008). Naturally, priorities matter only if a firm is insolvent. If the firm pays all its obligations as scheduled, then the order of seniority is not important.⁴

Rating agencies such as Standard & Poor's Corporation (S&P) and Moody's Investors Service (Moody's) provide information about the quality of debt issues. "Quality" can have at least two interrelated meanings. First, it reflects the probability of default, which is related to or calculated by financial ratios such as debt/equity, interest coverage, current ratio, industry characteristics, management, variance in cash flows, etc.⁵ Second, quality should reflect the rate of recovery once default occurs. This latter characteristic is based on the language of the indenture agreements and on the amount of assets available to holders of the various classes of securities. The rate

²Rauh and Sufi (2008) analyze firms that are downgraded from investment grade to junk designation between 1995 and 2006. Rauh and Sufi (2008) indicate that such firms do not change their overall level of debt; however, the composition of their liabilities changes dramatically. In particular, downgraded firms tend to use more bank debt and less discretionary bank and nonbank (arm's length) debt financing. Also, the nature of the debt obligations changed as firms used more secured bank debt and more subordinated obligations.

³Our results may affect the conclusions of papers such as Baker, Greenwood, and Wurgler (2003) who suggest that credit spreads as well as other bond market conditions may be important for the timing of debt issues.

⁴For theory papers discussing seniority, see, for example, Diamond (1993) and Park (2000). A well-known empirical paper is Barclay and Smith (1995).

⁵See Altman (1968) and later for work that has become the industry standard in this area.

of recovery also depends on the marketability of the issuer's assets (Altman and Rijken, 2004). These distinctions will have interesting implications for the interpretation of our results.

We should note that if a company defaults on one issue, typically all of its debt becomes due immediately. Thus, the probability of default for all debt issues of a company is usually equal. Recovery rates, however, may differ across issues.

Based on a comprehensive sample of issues from 1978 to 2008, Altman and Karlin (2009) report that the median recovery rate for \$1 of senior unsecured bonds is \$0.4588 (mean \$0.3785); it is only \$0.3279 (mean \$0.3103) for senior subordinated bonds and somewhat lower for subordinated issues (Altman and Karlin, 2009).⁶ Altman and Eberhart (1994) also find that, on average, higher seniority is associated with higher payoffs in the case of bankruptcy. Thus, it certainly makes sense to rate subordinated issues slightly lower. The question is exactly how it should be done.

The focus of our paper is on the relative valuation of senior versus subordinated debt. In particular, we highlight the institutional practice known as "notching," adopted by both S&P and by Moody's. According to S&P, "Notching policy primarily intends to reflect the relative recovery prospects of different instruments issued by the same issuer" (S&P Corporation, 2001).

The S&P approach is to notch up secured debt from the company credit rating and notch down subordinated debt. The company credit rating, as stated by S&P, corresponds to senior unsecured obligations. Moody's also notches up secured debt. This upward notching is most likely to occur for bank debt of speculative grade companies.⁷

Moody's has typically rated subordinated debt at least one notch below senior debt. Prior to the numerical refinement of Moody's bond ratings in 1982, this meant that subordinated debt was rated at least three refined notches below senior debt. Since then, the differential has been narrowed to one refined notch for investment grade issues and up to three notches for issuers with speculative grade senior debt. Two notch downgrades are typical for junk bonds (Moody's Investors Service, 1999a).

Moody's suggests that its notching policy is intended to "result in expected loss rates of similarly rated securities that are roughly the same, regardless of whether the bonds are secured, unsecured, or subordinated claims on individual issues" (Moody's Investors Service, 2000). Expected loss rate is determined as a function of default probability and recovery rates. Yet, in the same publication, Moody's also suggests that absent any other information, subordinated debt is generally rated one notch below its senior unsecured rating.

A. Conceptual Framework

In this subsection, we present a conceptual framework that can help us understand the effect of a notching policy on bond yields, and lead to our empirical work.⁸ We begin by noting the obvious. Ratings are costly. There are costs associated with rating an issuer, and it is costly to rate each subsequent bond issue. Once a firm is rated, essentially leading to an estimate of the probability of default, the most significant remaining question for each bond issue is the probability of recovery

⁶Moody's and Fitch also provide statistics on recovery rates. Moody's reports that the average recovery for senior unsecured bonds is \$44.9 for each \$100 of investment, whereas for senior subordinated bonds it is \$39.1, and for subordinated bonds it is only \$32.0 (Moody's Investors Service, 2005a). The Fitch compilation suggests that the average recovery rates might be somewhat lower (about 35% for senior unsecured bonds and 17% for subordinated senior and junior bonds) (Fitch IBCA, 2001).

⁷Moody's provides statistics regarding the differences in ratings between senior unsecured bonds and bank debt. For 45% of the issuers, the differences in ratings are 0; for 37%, the bank debt is rated one notch higher; for 14%, two notches higher, and for 1%, three notches higher. Interestingly, in 2% of the cases, the senior unsecured bond is actually rated one notch higher (Moody's Investors Service, 1999b).

⁸Very few scholars model the rating process directly—Pagano and Volpin (2008) model the coarseness of ratings in the context of securitization.

in case of default (see Altman et al., 2005). Forecasting individual recovery rates is a very costly operation as recovery rates vary widely by firm, over time, and across seniority levels (Altman and Karlin, 2009).

Senior debt issues are most often assigned a company rating. In fact, as noted earlier, this is explicitly the policy of both major houses.⁹ As a result, rating senior debt does not require additional work. Alternatively, rating subordinated issues requires additional effort on the part of the agencies. There are several reasons why it may not make sense to expend much effort on these ratings. Anecdotal evidence suggests that the rating agencies are compensated the most for initial firm ratings. For example, Mortensen, in a *New York Times* article (2005), says: “. . . rating agencies typically receive the largest fees when they analyze an initial bond issue. After that, a nominal fee is levied, providing something of a disincentive to do in-depth, time consuming work.” Thus, a rating agency may find it optimal to expend most resources on company ratings and avoid additional spending by resorting to somewhat arbitrary techniques in order to capture the differences in recovery rates of bond issues with different seniority.¹⁰

This policy may be optimal for the rating agencies especially if the number of subordinated debt issues is relatively small and they are held by sophisticated institutional investors who do their own homework. Below we provide some evidence to support this view, documenting a relative scarcity of subordinated issues. Conversations with industry insiders suggest that sophisticated rather than uninformed investors tend to hold subordinated debt (although not much hard data exist on the identity of bond investors), whereas the large number and the size of senior issues require the participation of relatively uninformed investors who rely heavily on bond ratings. Fabozzi (2007), in his widely used textbook, suggests that while some large institutional investors and many investment banking firms have their own credit analysis departments, individual investors and institutional bond investors rely primarily on nationally recognized rating companies that perform credit analysis.

Therefore, our first hypothesis contrasts the idea that subordinated issues are somewhat arbitrarily rated by agencies with the suggestion that all issues, senior and subordinated, are rated properly. We propose

$$H1: \text{Yield}_{\text{notched}} = \text{Yield}_{\text{unnotched}}.$$

If we cannot reject this hypothesis, then we conclude that notched and nonnotched bonds are priced in a similar manner.

However, we can go further. If H1 is not supported (i.e., there are indeed systematic yield differentials between senior and subordinated debt), one can anticipate the direction of the bias. In general, there are two opposing forces that can bias raters' evaluations. Rated companies always prefer the best rating possible; they always push for overoptimism. The agencies are paid by the debt issuers and, therefore, may implicitly offer higher ratings to please the issuer. If rating agencies were to go in that direction, they should notch down subordinated issues as little as possible.

⁹This has not changed over time. Moody's (2005) suggests that: “. . . analysts first assign a senior unsecured debt rating to an issuer, and then determine (the other ratings) . . . in the speculative grade sector, the process is similar although the benchmark is the ‘senior implied’ rating.”

¹⁰One can argue that in principle, any costs of the ratings process can be shifted to the firm depending on demand price elasticities, the competitive makeup of the ratings industry, and other market conditions. However, the institutional reality of fixed fees does not allow this type of cost shifting. The role of fees has not received much rigorous analysis in spite of the attention in the press and in political circles. In one of the few papers on that issue, Butler and Rodgers (2003) show that high fees paid by companies tend to mitigate the effect of publicly observable variables on ratings. High fees are interpreted as indicating a closer relationship between the issuer and the rating agency, and the lesser use of public information is interpreted as reliance on “softer” information.

This idea is supported by a plethora of press accounts of companies and other agencies threatening lawsuits for “low” debt ratings. Woolley and Schroder in *Business Week* (1996) report that the Jefferson County, Colorado School District was threatening to sue Moody’s for “tortuous interference with contract, interference with prospective business relationships, and disparagement.” On the day of their bond offering, Moody’s put the district on credit watch. The district suspended the sale and bought insurance, which allegedly cost \$770,000.

Alternatively, should raters seem to be negligent, they may be subject to lawsuits or regulatory investigations. Some of the high-profile cases in which this aspect came to light were Enron and Viacom. Rating agencies had kept investment grade ratings on these companies’ debt up until their actual demise. This led to SEC investigations. Similar concerns had been raised during the subprime crisis, where AAA rated securities were classified as “toxic assets” in short notice. However, this is not a new problem. Walter Kreutzen, Executive vice president of the Santa Ana Transportation Agency in California, is quoted in the *New York Times* (November 24, 1995) as being concerned about a low rating of his agency due to “criticism Moody’s received for other ratings in Orange County, California, before the county’s bankruptcy filing.” Such a backlash will dictate overly conservative ratings.

We can speculate as to how the trade-offs should work for different types of bonds. “Being nice” appears to work consistently, while lawsuits and claims of negligence are generally triggered only in bankruptcy. Therefore, the greater the probability of bankruptcy, the more likely it is that conservative thinking will trump optimism and conservative ratings will prevail. Thus, we test to see whether one effect dominates at all times. Additionally, if biases move in different directions, we will propose a split along the lines of this argument. That said, we can propose H2:

H2: All bond ratings will be biased in the same direction. (equally rated senior and subordinated bonds).

$\text{Yield}_{\text{subordinated}} \leq \geq \text{Yield}_{\text{senior}}$ for all bonds in the sample.

If H2 can be rejected, then we can propose our final hypothesis, H3:

H3: $\text{Yield}_{\text{subordinated}} \leq \text{Yield}_{\text{senior}}$ for junk bonds.

$\text{Yield}_{\text{subordinated}} \geq \text{Yield}_{\text{senior}}$ for investment grade bonds.

Junk bonds (with a higher default probability) will tend to have a conservative rating, whereas investment grade debt will have a tendency to have more optimistic ratings. We will take these ideas to the data and test these three nested hypotheses.

II. Data Description

Our data come from the 2001 version of the Fixed Investment Securities Database (FISD). This database contains a wide range of information about corporate bond issues including the issuer, offering data, maturity data, coupon type, offering yield to maturity, seniority level, and ratings and bond characteristics such as convertibility, putability, and callability.

We consider fixed rate dollar denominated bonds issued by US firms for which yield data are available. We exclude puttable, convertible, and senior secured bonds.¹¹ This results in a sample

¹¹We focus on senior unsecured bonds rather than on the combination of senior unsecured and secured bonds. The reason is that secured bonds can be potentially notched up, introducing bias into the senior bond category. However, we repeat the analysis combining all senior debt: secured and unsecured. The results do not change significantly. Only results for senior versus subordinated debt are presented in this paper.

of 11,925 bonds. We also exclude bonds rated AAA, A+, and below CCC+ since there are very few subordinated bonds in these rating categories.¹² Further, we exclude bonds issued before 1992 due to poor coverage of subordinate bonds before 1992. This leaves us with 10,788 bonds. For the selected issues, we calculate spreads over the closest benchmark Treasury using maturity matching. The data on yields of government bonds and notes were obtained from Global Financial Data, Inc., which provided information on a daily basis for notes and bonds of 1, 2, 3, 5, 7, 10, 20, and 30 years to maturity.¹³ The data for 15-year and 25-year maturity government bonds were provided on a monthly basis. We match data on a daily basis for all maturities except 15 and 25 years. We exclude all issues with negative T-spreads.¹⁴ Additionally, we require that all bonds be rated by both S&P and Moody's. This procedure results in a sample of 9,457 bonds issued by 2,109 companies.

The Appendix provides summary statistics for various variables. The average coupon in our sample is 7.26% and the average spread over treasuries is 1.39%. The average offering amount is \$140.37 million in US dollars. Consistent with the conceptual framework, a majority of the bonds in our sample are senior (87.76%), 36.70% of the bonds are callable, and more than 50% of the sample bonds have medium maturity. The FISD data set does not contain all debt issues, but it is a large subset and there is no obvious bias in the distribution of seniority across issues.

Panel C of the Appendix indicates that most of our data are from the late 1990s. The average number of bond issues is 4.5 per company. Highly rated companies in our sample tend to have multiple issues of senior bonds. Panel D demonstrates that there are fewer highly rated subordinated bonds than senior bonds. The numbers of senior and subordinated bonds are somewhat comparable for low rating categories. Also, a majority (57.6%) of subordinated bonds are issued by industrial firms whereas most of the senior bonds (54%) are issued by financial institutions. However, there is no obvious industry clustering.

III. The Yield Differential between Senior and Subordinated Bonds within the Same Bond Rating Category

We proceed to test our hypotheses by comparing yields of senior and subordinated bonds for each S&P bond rating category. This is validated using regression analysis. Later in this section, we confirm that our results hold for Moody's ratings as well.

A. Means Comparisons

Means comparisons for the whole sample are presented in Panel A of Table I. The interesting finding is that the yields of senior unsecured and subordinated bonds within a bond rating category

¹²Only three subordinated bonds in the sample were rated AAA, one was rated AA+, and four were rated below CCC+.

¹³Global Financial Data, Inc. provides details as to how yields are calculated. "Yields on Treasury nominal securities at 'constant maturity' are interpolated by the US Treasury from the daily yield curve for noninflation indexed Treasury securities. This curve, which relates the yield on a security to its time to maturity, is based on the closing market bid yields on actively traded Treasury securities in the over-the-counter market. These market yields are calculated from composites of quotations obtained by the Federal Reserve Bank of New York."

¹⁴Although zero Treasury spreads may be possible for highly rated debt, they are very unlikely for low-rated bonds. Thus, negative T-bill-spreads are likely due to mistakes in the database. Only 56 bond issues had negative Treasury spreads. To account for possible data errors, we winsorized the results at 1%. There were no substantive changes in any regression.

Table I. Means Comparisons

This table compares Treasury spreads of senior and subordinated bonds for each Standard & Poor's bond rating category. The sample consists of corporate bonds issued from 1992 to 2001. The data come from the Fixed Income Securities Database (FISD). Yield spreads are in percentages. Rating is Standard & Poor's bond rating.

Panel A. Full Sample

Rating	Senior Unsecured		Subordinated		Yield Differential
	Mean	N	Mean	N	
AA	0.68	169	0.87	16	-0.19*
AA-	0.67	739	0.74	19	-0.07
A+	0.70	1,439	0.96	24	-0.26***
A	0.81	2,047	0.96	242	-0.15***
A-	0.98	620	0.90	100	0.08**
BBB+	1.12	727	1.03	36	0.09
BBB	1.22	765	1.29	15	-0.07
BBB-	1.46	429	1.86	21	-0.4*
BB+	2.34	101	2.39	78	-0.05
BB	1.68	817	n/a	0	n/a
BB-	3.32	83	3.45	33	-0.13
B+	4.29	136	3.67	86	0.62***
B	4.67	137	4.11	175	0.56***
B-	5.48	77	4.63	296	0.85***
CCC+	6.29	13	4.88	17	1.41***

(Continued)

Table I. Means Comparisons (Continued)

Panel B. Time Effect

Rating	1992-1996			1997-2001			Yield Differential
	Senior Unsecured		Subordinated	Senior Unsecured		Subordinated	
	Mean	N	Mean	Mean	N	N	
AA	0.54	94	0.67	0.84	75	0.96	-0.12
AA-	0.46	276	0.63	0.79	463	0.88	-0.09
A+	0.51	476	0.73	0.79	963	1.20	-0.41***
A	0.54	609	0.72	0.93	1,438	1.09	-0.16***
A-	0.66	181	0.81	1.11	439	1.00	0.11
BBB+	0.74	234	0.86	1.31	493	1.28	0.03
BBB	0.85	315	1.39	1.48	450	1.22	0.26
BBB-	1.12	146	1.10	1.64	283	2.71	-1.07***
BB+	2.09	20	2.26	2.40	81	3.15	-0.75
BB	1.38	215	n/a	1.79	602	n/a	n/a
BB-	2.93	28	3.21	3.52	55	3.54	-0.02
B+	4.01	29	3.73	4.36	107	3.65	0.71***
B	4.73	38	4.22	4.65	99	4.05	0.60***
B-	6.16	9	4.65	5.40	68	4.63	0.77***
CCC+	4.63	1	5.53	6.42	12	4.80	1.62***

***Significant at the 0.01 level.
 **Significant at the 0.05 level.
 *Significant at the 0.10 level.

are significantly and systematically different. This finding is inconsistent with Hypothesis 1 but is consistent with the idea of an arbitrary approach to rating subordinated bonds.

We find that senior debt trades at a higher yield than subordinated debt for low rating categories, namely, B+ and below. For example, the mean yield spread over treasuries of B+ senior bonds is 4.29% while the mean yield spread of B+ subordinated bonds is only 3.67%. The yield differential is even higher for B– and CCC+ rated bonds, 0.85% and 1.41%, respectively. We should note that often the yield of speculative rated subordinated bonds is high enough to be comparable to the yield of senior bonds of a higher rating category. Our results are confirmed using untabulated median calculations. These findings are consistent with the prediction that rating agencies assign conservative ratings (overnotching) to subordinated bonds issues by companies with a high probability of default (Hypothesis 3).

Also, consistent with our conceptual framework and Hypothesis 3, we find that within superior categories (A and above), yields of subordinated bonds are higher than yields of senior bonds. For example, AA rated senior bonds trade at a mean yield spread of 0.68%, whereas subordinated debt trades at a yield spread of 0.87%. Most of the differences between senior and subordinated issues are statistically significant. In other words, rating agencies tend to undernotch subordinated bonds of companies with a low probability of default.

The S&P approach to rating subordinated bonds seems to work well for the middle rating categories. For example, the mean yield spread of BBB senior bonds is 1.22% and the mean yield spread of BBB subordinated bonds is 1.29%. The yield differential is not statistically significant. We should note that this does not necessarily imply that rating agencies expend a lot of effort to rate subordinated bonds. It may also be that for bonds that are neither top notch nor very risky, the opposing forces of pleasing issuers and avoiding lawsuits may be approximately balanced.¹⁵

Next, we investigate whether or not our results are time specific or are driven by some bond categories such as callable or split rated bonds. Panel B of Table I indicates that the yield differentials we find are not limited to a specific time period. There is, however, some time variation. The negative results seem to be more widespread and stronger during the first half of the sample, while the positive results are more consistent and stronger in the second half of the sample. This suggests that rating agencies have become more conservative over time, perhaps because the expected cost of legal action has increased over the years.

Panel A of Table II presents results for callable and noncallable bonds. A majority of investment grade bonds are noncallable while a majority of junk bonds are callable. Similar to the full sample results, we find systematic differences in yields between senior and subordinated bonds within the same rating category. Consistent with Hypothesis 3, lower rated bonds exhibit positive yield differentials, although the results are statistically significant only for callable bonds. There are, however, very few noncallable low-rated bonds. Further, we continue to find evidence that rating agencies tend to undernotch subordinated bonds of high-quality companies. For example, A+ senior noncallable bonds trade at a mean yield spread to treasuries of 0.64%, whereas subordinated debt trades at a yield spread of 1.05%. Also, AA senior callable bonds trade at a mean yield spread of 0.76, while subordinated bonds trade at a mean yield spread of 1.00. The yield differentials are statistically significant at conventional levels. Additionally, we find some biases in the middle rating categories. For instance, BBB+ callable senior bonds have higher yields than subordinated bonds. Overall, the results in this table are consistent with Hypothesis 3.

¹⁵The absence of B rated subordinated bonds in our sample is consistent with fact that B rated debt is on the border of investment grade and noninvestment grade rating. As such, it is there that the agencies switch from a “one notch down policy” to a “two notches down” policy.

Table II. Means Comparisons: Effect of Call Provisions and Split Ratings

This table compares Treasury spreads of senior and subordinated bonds for each Standard & Poor's bond rating category. The sample consists of corporate bonds issued from 1992 to 2001. The data come from the Fixed Income Securities Database (FISD). Yield spreads are in percentages. Rating is Standard & Poor's bond rating. Standard & Poor's bond rating is defined as split when it is not equal to the corresponding Moody's rating. Standard & Poor's bond rating is defined as non-split when it is equal to the corresponding Moody's rating.

Panel A. Call Provision

Rating	Callable			Yield Differential			Noncallable			Yield Differential		
	Senior Unsecured		Subordinated	Senior Unsecured		Subordinated	Senior Unsecured		Subordinated	Senior Unsecured		Subordinated
	Mean	N	Mean	N	Mean	N	Mean	N	Mean	N	Mean	N
AA	0.76	39	1.00	11	-0.24*		0.65	130	0.57	5	0.08	
AA-	0.94	85	0.87	6	0.07		0.63	654	0.68	13	-0.05	
A+	1.06	206	0.76	7	0.3*		0.64	1,233	1.05	17	-0.41***	
A	1.24	500	1.01	164	0.23***		0.67	1,547	0.88	78	-0.21***	
A-	1.27	138	0.85	34	0.42***		0.89	482	0.92	66	-0.03	
BBB+	1.52	211	1.14	10	0.38***		0.96	516	0.99	26	-0.03	
BBB	1.64	266	1.65	4	-0.01		1.00	499	1.17	11	-0.17	
BBB-	1.71	183	n/a	0	n/a		1.28	246	1.87	21	-0.59***	
BB+	2.48	62	2.26	37	0.22		2.12	39	2.51	41	-0.39***	
BB	1.89	510	n/a	0	n/a		1.34	307	n/a	0	n/a	
BB-	3.62	59	3.67	31	-0.05		2.57	24	4.71	2	-2.14	
B+	4.33	128	3.67	84	0.66***		3.62	8	3.36	2	0.26	
B	4.70	128	4.12	171	0.58***		4.26	9	3.61	4	0.65	
B-	5.45	75	4.64	293	0.81***		6.70	2	3.86	3	2.84	
CCC+	6.05	12	4.88	17	1.17***		9.1	1	n/a	0	n/a	

(Continued)

Table II. Means Comparisons: Effect of Call Provisions and Split Ratings (Continued)

Panel B. Split Rating

Rating	Split Rating			Yield Differential			Nonsplit Rating			Yield Differential		
	Senior Unsecured		Subordinated	Senior Unsecured		Subordinated	Senior Unsecured		Subordinated	Senior Unsecured		Subordinated
	Mean	N	Mean	N	Mean	N	Mean	N	Mean	N	Mean	N
AA	0.66	133	0.81	14	-0.15		0.73	36	1.26	2	-0.53***	
AA-	0.68	308	0.69	14	-0.01		0.65	431	0.87	5	-0.22	
A+	0.72	767	1.27	5	-0.55***		0.67	672	0.88	19	-0.21**	
A	0.73	725	1.07	147	-0.34***		0.85	1,322	0.80	95	0.05	
A-	1.05	271	0.90	48	0.15**		0.89	349	0.90	52	-0.01	
BBB+	1.10	331	1.04	31	0.06		1.15	396	1.02	5	0.13	
BBB	1.14	425	1.41	10	-0.27		1.32	340	1.07	5	0.25	
BBB-	1.64	149	1.91	13	-0.27		1.37	280	1.80	8	-0.43	
BB+	2.49	46	2.39	78	0.10		2.21	55	n/a	0	n/a	
BB	1.62	739	N/a	0	n/a		2.27	78	n/a	0	n/a	
BB-	3.14	42	3.44	22	-0.30		3.50	41	3.46	11	0.04	
B+	4.49	94	3.80	54	0.69***		3.87	42	3.44	32	0.43*	
B	4.62	75	4.28	83	0.34*		4.73	62	3.96	92	0.77***	
B-	5.19	26	4.66	59	0.53*		5.63	51	4.63	237	1.00***	
CCC+	6.30	10	4.68	13	1.62***		6.23	3	5.55	4	0.68	

***Significant at the 0.01 level.

**Significant at the 0.05 level.

*Significant at the 0.10 level.

Results for split rated and nonsplit rated bonds are presented in Panel B of Table II. Livingston et al. (2006) suggest that split rated bonds behave differently from nonsplit rated bonds. We define bond ratings as split when the S&P rating is not equal to the corresponding Moody's rating. Panel B confirms that even when ratings are split, subordinated bonds of companies with a high probability of default are rated conservatively, (overnotched). There is also evidence that subordinated bonds of high-quality companies are undernotched. These results suggest that the arbitrary approach to rating subordinated bonds is not specific to S&P but may be employed by Moody's as well. We investigate Moody's rating policy in more detail later in the paper.

If notching is done accurately, there should be no systematic differences in yields between senior and subordinated bonds of the same rating category. However, our results thus far seem to point to systematic biases consistent with Hypothesis 3, namely, overnotching of speculative rated bonds and undernotching of investment rated bonds.

B. Regression Analysis

In this section, we employ multivariate analysis to investigate the impact of the notching policy on bond yields. We regress Treasury spreads on a seniority variable that is equal to one if the bond is senior and zero if the bonds are subordinated, as well as control variables including bond characteristics, bond ratings, and various macroeconomic variables. Following John, Lynch, and Puri (2003), we add two dummy variables. One takes the value of one if bond maturity is less than five years and zero otherwise; another takes the value of one if bond maturity is more than 15 years and zero otherwise.¹⁶ To capture cross-sectional differences in corporate bond liquidity, we add issue size. We also include indicator variables for callable bonds and split ratings.

To control for changes in macroeconomic conditions over time, we include the benchmark Treasury rate as well as differences between the 10- and two-year Treasury rates. The first variable portrays the level while the second describes the slope of the term structure of interest rates. Additionally, we include industry dummies.

Results of our regression analysis are presented in Table III. As expected, bond rating coefficients are highly significant and higher for lower rating categories. These results are consistent with findings reported in earlier studies (John, Lynch, and Puri, 2003) and with the means' comparison results of this paper. If notching were done correctly, then after controlling for bond ratings, we should not expect the seniority variable to be significant. We find, however, that the coefficient of the seniority variable is positive and highly statistically significant at the 1% level for the entire sample as well as for different time periods. On average, seniority increases the yield by 20 basis points after controlling for bond ratings. Consistent with the means results, the coefficient on the seniority variable is higher in the second half of the sample. The split variable is insignificant for the entire sample but increases yields for the earlier subperiod. In other words, it appears that split ratings increase the yield of bonds. This can be considered a risk factor; however, when we analyze Moody's ratings, we see that the split dummy is always negative, implying that S&P tends to systematically rate the split rated bonds differently than Moody's.

Our conceptual framework also predicts that the effect of notching policies may vary for different rating categories. This is suggested by the means' comparison results as well. Therefore, we repeat the analysis for each rating category. The results of this analysis are presented in Table IV.

The pattern we find is similar to the pattern observed in our univariate tables. Highly rated senior bonds have higher yields than similarly rated subordinated bonds. For example, the yield

¹⁶See Ravid (1996) for a survey of studies analyzing the effects of bond maturity structure.

Table III. Regression Analysis: The Effect of Bond Seniority Level after Controlling for Standard & Poor's Bond Ratings

This table presents results of the OLS regressions. The sample consists of corporate bonds issued from 1997 to 2001. Bond characteristics data come from the Fixed Income Securities Database (FISD). The dependent variable is the corporate bond offering yield spread in %. Senior is a dummy variable equal to one if the bond is senior and zero if the bond is subordinated. Regressions include Standard & Poor's bond ratings. Results are corrected for heteroskedasticity and clustering at the company level.

	All	1992-1996	1997-2001
Intercept	1.56	-0.14	2.10
Senior	0.20***	0.11***	0.30***
Split	0.03	0.03**	0.04
Callable	0.27***	0.16***	0.25***
Maturity < 5 years	-0.35***	-0.30***	-0.38***
Maturity > 15 years	0.12***	0.21***	0.11***
Ln (offering amount)	0.04***	0.03***	0.06***
Closest benchmark Treasury rate	-0.25***	0.01	-0.38***
10 year to 2-year Treasury yield	-0.23***	0.10***	-0.85***
Financial (relative to industrial)	0.13***	0.12***	0.18***
Utilities (relative to industrial)	-0.12***	-0.29***	-0.07*
A+	0.04	0.06**	0.08**
A	0.12***	0.09***	0.18***
A-	0.24***	0.19***	0.32***
BBB+	0.40***	0.29***	0.50***
BBB	0.49***	0.44***	0.61***
BBB-	0.70***	0.62***	0.84***
BB+	1.76***	1.75***	1.51***
BB	1.21***	1.40***	1.31***
BB-	2.50***	2.46***	2.63***
B+	3.13***	3.30***	3.24***
B	3.51***	3.84***	3.53***
B-	3.98***	4.34***	4.09***
CCC+	4.53***	4.69***	4.63***
Adj. R^2	0.79	0.88	0.78
No. of observations	9,457	3,084	6,373

***Significant at the 0.01 level.

**Significant at the 0.05 level.

*Significant at the 0.10 level.

of B+ senior bonds is 0.60% higher than the yield of equally rated subordinated bonds. The coefficients are highly statistically significant. There is also some evidence that high-rated senior bonds have lower yields than subordinated bonds. The yield of A+ senior bonds is 0.18% lower than the yield of equally rated subordinated bonds. The results, however, are not significant for other top-rated bonds.

We should note that other bond characteristic variables are statistically significant as well in determining bond yields. Maturity and callability significantly affect bond yields after controlling for bond ratings. These findings agree with Elton et al. (2001, 2004) who provide a thorough analysis decomposing corporate bond spreads. However, while rating agencies can argue that maturity or callability may affect yields, but not what happens upon default, seniority is intimately related to bankruptcy. As such, it should be properly represented in bond ratings.

Table IV. Regression Analysis: The Effect of Bond Seniority Level for Each Standard & Poor's Bond Rating Category

This table presents parameter estimates of the seniority variable from the OLS regressions for each Standard & Poor's bond rating category. The sample consists of corporate bonds issued from 1992 to 2001. Bond characteristics data come from the Fixed Income Securities Database (FISD). The dependent variable is the corporate bond offering yield spread in %. The Seniority variable is equal to one if the bond is senior and zero if the bond is subordinated. Each regression includes a set of bond characteristics and macroeconomic variables presented in Table V. Results are corrected for heteroskedasticity and clustering at the company level.

Rating	Parameter Estimate of Seniority Variable	N	Adjusted R ²
AA	0.02	185	0.13
AA-	0.00	758	0.35
A+	-0.19***	1,463	0.37
A	0.09***	2,289	0.42
A-	0.09	720	0.28
BBB+	0.02	763	0.39
BBB	-0.09	780	0.41
BBB-	-0.28	450	0.30
BB+	-0.33	179	0.25
BB	n/a	817	n/a
BB-	0.12	116	0.34
B+	0.60***	222	0.22
B	0.61***	312	0.15
B-	0.89***	373	0.17
CCC+	1.63***	30	0.41

***Significant at the 0.01 level.

C. The Effect of Seniority Provisions Controlling for Moody's Bond Ratings

To identify whether the positive/negative yield differentiation between senior and subordinated bonds is unique to S&P bond ratings, we repeat the analysis using Moody's ratings. If Moody's correctly assigns ratings based on bond characteristics, then investors may rely on Moody's rather than S&P in valuing bonds. Bongaerts, Cremers, and Goetzmann. (2009) explore the role of multiple ratings in detail—here our concern is with the question of whether or not one rating agency does a different job than the other. Table V repeats the analysis provided in Table III using Moody's ratings. The effect of the seniority dummy is still positive and significant, but the magnitude is smaller. This may indicate that Moody's notches bonds more accurately. We see that the split rating dummy is similar in magnitude and has the opposite sign from the seniority variable. As noted earlier, this may mean that bonds that are split rated are rated higher (lower yield) by Moody's, somewhat negating the seniority effect. However, the low magnitude may also be the outcome of the opposite effects of seniority for investment grade and junk bonds.

Indeed, the analysis in Table VI for each Moody's rating category presents a pattern similar to the pattern found in Table IV. In particular, the coefficient of the seniority level is positive and highly significant for low-rated bonds (Ba3 to Caa1), whereas it is negative and highly significant for the top-rated bonds (A1 and Aa3). It seems that both rating agencies tend to overrate subordinated bonds of companies with a low probability of default and underrate bonds of companies with a high probability of default, consistent with our conceptual framework.

Table V. Regression Analysis: The Effect of Bond Seniority Level after Controlling for Moody's Bond Ratings

This table presents the results of our OLS regressions. The sample consists of corporate bonds issued from 1992 to 2001. Bond characteristics data come from the Fixed Income Securities Database (FISD). The dependent variable is the corporate bond offering yield spread in %. Senior is a dummy variable equal to one if the bond is senior and zero if the bond is subordinated. The regression includes Moody's bond ratings. Results are corrected for heteroskedasticity and clustering at the company level.

	All	1992-1996	1997-2001
Intercept	1.38	-0.23	3.90
Senior	0.07***	0.08***	0.04*
Split	-0.07***	-0.05***	-0.06***
Callable	0.31***	0.23***	0.34***
Maturity < 5 years	-0.37***	-0.32***	-0.42
Maturity > 15 years	0.09***	0.18***	0.01***
Ln (offering amount)	0.08***	0.05***	0.07***
Closest benchmark Treasury rate	-0.25***	-0.01	-.37***
10 year to 2-year Treasury	-0.20***	0.14***	-0.78***
Financial (relative to industrial)	0.13***	0.13***	0.08**
Utilities (relative to industrial)	-0.34***	-0.47***	-0.16***
A1	-0.05	0.07**	-1.56***
A2	0.12***	0.12***	-1.60***
A3	0.22***	0.22***	-1.63***
Baa1	0.40***	0.44***	-1.47***
Baa2	0.47***	0.41***	-1.35***
Baa3	0.58***	0.60***	-1.23***
Ba1	1.10***	1.08***	-1.11***
Ba2	1.76***	1.82***	-0.97***
Ba3	1.71***	2.73***	-0.50***
B1	1.95***	1.89***	-0.08
B2	3.32***	3.88***	-0.19
B3	3.74***	4.06***	0.86***
Caa1	4.41***	0	1.52***
Caa2	5.26***	5.26***	2.05***
Adj. R^2	0.80	0.87	0.74
No. of observations	9,457	3,084	6,373

***Significant at the 0.01 level.

**Significant at the 0.05 level.

*Significant at the 0.10 level.

IV. An Analysis of Notching and Robustness Checks

In this section, we provide robustness checks and additional evidence to support the findings presented in the previous sections. First, we identify the notching pattern in our data. Next, we compare yields of senior and subordinated bonds of the same company. We expect to find higher yields for subordinated debt. The idea is to establish that the patterns within rating categories we have observed are indeed due to a notching policy and not to market mispricing. Finally, we compare the expected loss rates of senior and subordinated bonds within each bond rating category. We end this section with a discussion of an alternative low-cost notching policy.

Table VI. Regression Analysis: The Effect of Seniority Level for Each Moody's Bond Rating Category

This table presents parameter estimates of the seniority variable from the OLS regressions for each Moody's bond rating category. The sample consists of corporate bonds issued from 1992 to 2001. Bond characteristics data come from the Fixed Income Securities Database (FISD). The dependent variable is the corporate bond offering yield spread in %. The Seniority variable equals one if the bond is senior and zero if the bond is subordinated. Each regression includes a set of bond characteristics and macroeconomic variables presented in Table VII. Rating categories Aaa and Aa3 are not include due to a sample number of subordinated bonds. Results are corrected for heteroskedasticity and clustering at the company level. Parallel S&P rating is in parentheses.

Rating	Parameter Estimate of Seniority Variable	N	Adjusted R ²
Aa2 (AA)	-0.01	247	0.43
Aa3 (AA-)	-0.19***	768	0.41
A1 (A+)	-0.18***	1178	0.43
A2 (A)	0.22***	2039	0.42
A3 (A-)	0.05	930	0.38
Baa1 (BBB+)	-0.03	948	0.36
Baa2 (BBB)	0.03	665	0.39
Baa3 (BBB-)	-0.56***	487	0.36
Ba1 (BB+)	-0.12	164	0.32
Ba2 (BB)	-0.19	202	0.35
Ba3 (BB-)	0.26**	605	0.52
B1 (B+)	0.53***	359	0.81
B2 (B)	0.61***	318	0.16
B3 (B-)	0.62***	433	0.15
Caa1 (CCC+)	1.41***	26	0.65

***Significant at the 0.01 level.

**Significant at the 0.05 level.

A. Notching Pattern

To support our claim that the systematic yield differential between senior and subordinated bonds documented here is due to a notching policy, we demonstrate the level by which the subordinated bonds in our sample are notched down. We use two approaches to identifying this notching pattern. First, we rely on information available in the FISD. For each company in the database, we match senior and subordinated bonds to determine the differences in ratings. This approach to identifying notched bonds produces a substantial loss of observations. To complement this analysis, we use information provided by Compustat. We use the quarterly S&P Long-Term Domestic Issuer Credit Rating as our senior bond rating.¹⁷ S&P describes the association between company rating and senior bond rating, stating further that their policy is to notch subordinated debt down from the company rating (S&P Corporation, 2001).¹⁸

The results are presented in Table VII. Almost all of the subordinated bonds are notched down. Bonds rated BB+ and higher are usually rated one notch lower than senior bonds of the same

¹⁷Although some rating differentiation under this approach may be simply due to the rating changes within a quarter, we estimate that the bias is not sufficient to change the identified pattern.

¹⁸On September 1, 1998, S&P changed somewhat the definition of a company rating from a specific reference to senior debt to "overall credit worthiness." However, no specific changes in ratings seem to have taken place at that point.

Table VII. Notching Pattern for Each Standard & Poor's Bond Rating Category

The table below compares ratings of subordinated bonds to ratings of senior bonds of the same company. The procedure of identifying senior bond ratings of the same company is described in the text.

Rating	Number of Matched Subordinated Bonds	Number of Equally Rated Subordinated Bonds	Number of Lower Rated Subordinated Bonds		Number of Higher Subordinated Rated Bonds
			One Notch Down	Two or More Notches Down	
AA	16	1	15	0	0
AA-	15	1	13	1	0
A+	19	3	14	1	1
A	211	6	199	4	2
A-	83	2	79	2	0
BBB+	33	0	33	0	0
BBB	12	2	9	0	1
BBB-	14	2	11	1	0
BB+	73	0	12	0	61 ^a
BB	0	0	0	0	0
BB-	33	0	1	32	0
B+	69	0	3	66	0
B	106	0	3	102	1
B-	128	5	5	118	0
CCC+	11	0	2	9	0

^aThe results are driven by the issues of one company.

company, while BB– bonds and below are rated two notches down. In total, 82.7% of BB+ and higher rated bonds are notched down. Around 80.8% of these bonds are rated one notch down only. Alternatively, while 98.2% of the bonds rated BB– and below are notched down, a vast majority (94.2% of the total) are rated two notches down relative to senior bonds. It also seems that the absence of subordinated bonds in the BB rating category is attributed to the switch from a “one notch down” policy to a “two notches down” policy.¹⁹ The notching pattern in our database is consistent with the rating agencies’ descriptions of their notching patterns (see Section II).

The findings of this subsection indicate that a majority of subordinated bonds are notched down, consistent with the rating agencies’ claims. Bonds are notched in a very predictable way; namely, investment grade subordinated bonds are typically rated one notch down relative to the senior bonds, while speculative rated subordinated bonds are typically notched down twice.

B. Senior versus Subordinated Bond Yields Controlling for Company Ratings

In this subsection, we investigate how investors price differences in recovery rates of bond issues with identical probabilities of default. We compare yields of senior and subordinated bonds after controlling for company ratings rather than issue ratings. Company ratings essentially capture the probability of default but do not capture the differences in recovery rates of bond issues with various seniority provisions. Controlling for company ratings rather than for bond ratings allows one to see how the market prices the differences in recovery rates directly. The expected finding is that yields on subordinated bonds should be higher than yields of senior bonds of the same company. Such a finding will alleviate concerns that our earlier findings result from mispricing of issues by the market.

We merge our data with Compustat files using the issuer’s CUSIP number. We use quarterly data and are able to locate S&P Long-Term Domestic Issuer Credit Rating ratings for 6,398 bonds issued by 1,144 companies.

First, we regress Treasury spreads on the seniority variable controlling for other bond characteristics and company ratings. The results are presented in Panel A of Table VIII. As expected, we find that senior bonds have lower yields than subordinated bonds (negative yield differential) after controlling for company ratings. The coefficient of the seniority variable is -0.46% and is statistically significant at the 1% level. This result suggests that investors require higher yields on bonds with lower recovery rates. This is not surprising and confirms our proposal that the positive coefficient on seniority variable in Table III is due to the notching policy and not to investor mispricing of bonds. We demonstrate the same pattern using analysis within each company rating category (Panel B of Table VIII).²⁰

Overall, the results in this section suggest that the market indeed prices recovery rates and that the positive yield differential we document between senior and subordinated bonds is not due to market mispricing.

C. Expected Loss Rates

In this section, we calculate expected loss rates for senior and subordinated bonds of companies with the same probability of default using the rating agencies own data. We then mimic the

¹⁹In the BB+ category, quite a few subordinated bonds are rated higher than senior bonds. All the higher rated subordinated bonds are issued by one company, Kroger Co. In this case, we relied on company ratings from Compustat to determine the notching pattern. Therefore, there may be some timing issues. We also ran the analysis excluding bonds issued by Kroger Co. The results do not change. In the entire data set, there were only four other subordinated bonds rated higher than the senior issues: Continental Airlines (BBB), Chase Manhattan (A), Just for Feet Inc. (B) and Chiron Corp (BBB+).

²⁰The number of subordinated bonds for some rating categories is too small to allow for more refined groupings.

Table VIII. Regression Analysis: The Effect of Bond Seniority Level after Controlling for Standard & Poor's Company Ratings

This table presents results of the OLS regressions. The sample consists of corporate bonds issued from 1992 to 2001 with quarterly company ratings available on Compustat. Bond characteristics data come from the Fixed Income Securities Database (FISD). The dependent variable is the corporate bond offering yield spread in %. Senior is a dummy variable equal to one if the bond is senior and zero if the bond is subordinated. Quarterly company credit ratings are from Compustat. Results are corrected for clustering at the company level. Each regression in Panel B includes a set of bond characteristics and macroeconomic variables presented in Panel A.

Panel A. Effect of Seniority Level after Controlling for Standard & Poor's Company Ratings

Variable	Parameter Estimate
Intercept	1.99
Senior	-0.46***
Split	-0.06***
Callable	0.34***
Maturity < 5 years	-0.35***
Maturity > 15 years	0.02*
Ln (offering amount)	0.07***
Closest benchmark Treasury rate	-0.25***
10 year to 2-year Treasury	-0.21***
Financial (relative to industrial)	0.05**
Utilities (relative to industrial)	-0.41***
Company rating A	0.09*
Company rating BBB	0.43***
Company rating BB	1.62***
Company rating B	3.26***
Company rating CCC	5.01***
Adj. R^2	0.72
No. of observations	6,398

Panel B. Effect of Seniority Level within Standard & Poor's Company Rating Categories

Company Rating Group	Parameter Estimate of Seniority Variable	N	Adj. R^2
AA	0.06	671	0.20
A	-0.03	3,106	0.28
BBB	-0.78***	1,217	0.24
BB	-0.60***	1,162	0.56
B	0.06	239	0.00

***Significant at the 0.01 level.

**Significant at the 0.05 level.

*Significant at the 0.10 level.

notching policy to see whether it leads to similar expected loss rates of senior and subordinated bonds within the same bond rating category.

We use Moody's data on probability of default and recovery rates and consider 1-, 5-, 10-, and 20-year investment horizons (Table IX, Panel A). We calculate expected loss rates for each

Table IX. Expected Loss Rates for Senior and Subordinated Bonds

Panel A reports Moody's statistics on default and recovery rates for various company ratings and seniorities (Moody's Investors Service, 2005b). Panel B presents expected loss rates for various company ratings and seniorities. Expected loss rates are calculated as a function of default and recovery rates reported in Panel A.

Panel A. Moody's Default and Recovery Rates

Company Rating	Default Rates ^a				Recovery Rates ^b	
	1 Year	5 Years	10 Years	20 Years	Senior Subordinated Bonds	Senior Subordinated Bonds
Aaa	0	0.18	0.4	0.4	n/a	n/a
Aa1	0	0.15	0.25	1.48	40.2	n/a
Aa2	0	0.28	0.67	2.84	40.2	n/a
Aa3	0	0.18	0.33	2.59	40.2	n/a
A1	0	0.38	0.84	2.79	52.7	37
A2	0.03	0.68	1.69	4.77	52.7	37
A3	0.03	0.65	1.69	6.73	52.7	37
Baa1	0.17	1.46	2.31	6.19	46	37
Baa2	0.12	2.11	5.49	17.94	46	37
Baa3	0.41	3.6	7.2	15.7	46	37
Ba1	0.66	6.76	12.38	27	41.1	32
Ba2	0.62	8.82	14.66	37.44	41.1	32
Ba3	2.23	19.14	36.24	53.01	41.1	32
B1	3.03	25.27	47.43	60.7	33.7	8
B2	5.93	31.24	44.48	56.32	33.7	8
B3	10.77	43.55	62.32	70.02	33.7	8
Caa-C	22.24	60.4	78.81	81.46	18.2	8

Panel B. Expected Loss Rates

Company Rating	1 Year		5 Years		10 Years		20 Years	
	Senior	Subord.	Senior	Subord.	Senior	Subord.	Senior	Subord.
Aaa	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Aa1	0.00	n/a	0.09	n/a	0.15	n/a	0.89	n/a
Aa2	0.00	n/a	0.17	n/a	0.40	n/a	1.70	n/a
Aa3	0.00	n/a	0.11	n/a	0.20	n/a	1.55	n/a
A1	0.00	0.00	0.18	0.24	0.40	0.53	1.32	1.76
A2	0.01	0.02	0.32	0.43	0.80	1.06	2.26	3.01
A3	0.01	0.02	0.31	0.41	0.80	1.06	3.18	4.24
Baa1	0.09	0.11	0.79	0.92	1.25	1.46	3.34	3.90
Baa2	0.06	0.08	1.14	1.33	2.96	3.46	9.69	11.30
Baa3	0.22	0.26	1.94	2.27	3.89	4.54	8.48	9.89
Ba1	0.39	0.45	3.98	4.60	7.29	8.42	15.90	18.36
Ba2	0.37	0.42	5.19	6.00	8.63	9.97	22.05	25.46
Ba3	1.31	1.52	11.27	13.02	21.35	24.64	31.22	36.05
B1	2.01	2.79	16.75	23.25	31.45	43.64	40.24	55.84
B2	3.93	5.46	20.71	28.74	29.49	40.92	37.34	51.81
B3	7.14	9.91	28.87	40.07	41.32	57.33	46.42	64.42
Caa-C	18.19	20.46	49.41	55.57	64.47	72.51	66.63	74.94

^a Average issuer-weighted cumulative default rates, 1983-2004.

^b We use issue-weighted recovery rates based on initial issue rating, 1982-2003. Since speculative subordinated bonds are rated two notches down from company ratings and investment subordinated bonds are rated one notch down, we make appropriate adjustments to arrive at the company rating.

company rating category as a product of the probability of default and expected loss in case of default (Table IX, Panel B).²¹

Not surprisingly, expected loss rates within each company rating category are higher for subordinated bonds than for senior bonds. Consider, for example, bonds issued by Ba2 (BB using the S&P system) rated companies. For a 10-year investment horizon, the expected loss rate for senior bonds is 8.63%, while the expected loss rate for subordinated bonds is 9.97%, which is slightly higher. Let us assume now that we were to notch the subordinated bonds two notches down from the company rating to B1 (B+ using the S&P system). As a result, these subordinated bonds would be assigned the same bond rating category as senior bonds of a B1 (B+ using the S&P system) rated company. The expected loss rate for these senior bonds is 31.45% (vs. 9.97% for subordinated bonds), which is more than three times higher. This suggests that subordinated bonds are rated conservatively, consistent with our conceptual framework. Similar patterns can be calculated for different investment horizons. Two notches may be appropriate for some bonds, but, as we have seen, on average, this strategy may not work.

D. Is There a Better Notching Rule?

Consistent with the rating agencies' claim, this paper documents that a majority of investment grade subordinated bonds are rated one notch below senior bonds, while a majority of junk bonds are rated two notches down. Further, the results suggest that this notching rule does not work either for top-rated or for low-rated subordinated bonds. In this section, we try to see whether there is another, low-cost approach to rating subordinated debt that may result in lower biases.

Since junk subordinated bonds are rated too conservatively, for this category, a "one notch down" rule may work better. To consider this idea in somewhat more detail, we refer back to Table I. According to the rating agencies' policies, if a senior bond is rated B, the subordinated bond will be notched down to CCC+. The new suggested policy will increase this rating to B-. Therefore, instead of matching senior B- bonds with a yield differential of 5.48% to subordinated debt with a yield spread of 4.63% (Table I, Panel A), we will now match the 5.48% to 4.88%, lowering the difference between senior and subordinated debt from 0.85% to 0.60%. In this particular case, not notching at all may even work better. Similarly, a "one notch policy" will decrease the yield differential in the B category from 0.56% to 0.04% (almost zero) and in the B+ category from 0.62% to 0.18%.

Since top-rated bonds are rated too high, a "two notches down rule" may work better. In the A+ category, for example, this rule will decrease the yield differential from -0.26% to -0.04%. The new rule will not have much of an effect on the yield differentials for other top categories due to the small differences in yield for highly rated investment grade bonds. We may need even further notching. Overall, the results of this subsection suggest that the notching policy can perhaps be improved with little additional cost.

V. Conclusion

Bond issues of the same company may be assigned to different credit risk categories as they provide different levels of investment protection. Senior bonds can be regarded as a safer investment relative to its subordinated bonds as they may provide higher recovery rates in case of

²¹The Moody's statistics we use cover a slightly different period than our sample period. However, the purpose of the calculations in this subsection is only to illustrate the principle involved.

bankruptcy. To capture differences in recovery rates of bonds with similar probabilities of default, rating agencies have adopted a policy known as notching. In this paper, we demonstrate that this notching policy creates a systematic bias in bond ratings.

Specifically, we find that subordinated bonds with a high probability of default are rated conservatively. This results in positive yield differentials between senior and subordinated bonds for low rating categories. We also find some evidence that subordinated bonds with a low probability of default are rated too optimistically. This results in negative yield differentials for some top rating categories. Our findings are consistent with the argument that the rating process of subordinated bonds is a trade-off between the pressure to please the issuer and the expected costs of lawsuits and investigations should the rating prove to be too optimistic ex post. We conduct a number of additional tests to support our analysis. We find that the notching pattern in our data is consistent with the rating agencies' description of their notching methodology. Further, we find that the yield differentials between senior and subordinated bonds are not the result of market mispricing of debt. We also confirm that expected loss rates for low-rated, subordinated bonds are lower than the expected loss rates for identically rated senior bonds. Finally, our analysis suggests that the notching policy can be improved. ■

Appendix. Summary Statistics

The sample consists of corporate bonds issued from 1992 to 2001. The data come from the Fixed Income Securities Database (FISD).

Panel A. Frequencies for Continuous Variables

Variable	Mean	Median	Std. Dev.	Max.	Min.	N
Coupon (%)	7.26	7.00	1.47	17.00	0.00	9,457
T-spread (%)	1.39	0.91	1.32	10.97	0.00	9,457
Offering amount (\$ mill.)	140.37	68.40	206.246	1,200.00	0.22	9,457

Panel B. Frequencies for Dummy Variables

Senior	Callable	Maturity < 5	Maturity > 15	Financial	Utilities
8,299 (87.76%)	3,471 (36.70%)	2,951 (31.20%)	1,226 (12.96%)	4,957 (52.42%)	1,116 (11.80%)

Panel C. Bond Issues by Years

Year	N	%
1992	139	1.47
1993	317	3.35
1994	272	2.88
1995	1,118	11.82
1996	1,238	13.09
1997	1,522	16.09
1998	1,670	17.66
1999	1,676	17.72
2000	1,217	12.87
2001	288	3.05

(Continued)

Appendix. Summary Statistics (Continued)*Panel D. Number of Bond Issues and Companies for Each Standard & Poor's Bond Rating Category*

Rating	Senior Unsecured		Subordinated	
	N Bonds	N Companies	N Bonds	N Companies
AA	169	16	16	2
AA-	739	78	19	12
A+	1,439	169	24	13
A	2,047	213	242	27
A-	620	180	100	38
BBB+	727	193	36	24
BBB	765	227	15	15
BBB-	429	168	21	16
BB+	101	59	78	15
BB	817	63	0	0
BB-	83	63	33	28
B+	136	86	86	75
B	137	115	175	156
B-	77	69	296	282
CCC+	13	12	17	17

Panel E. Industry Characteristics of Senior and Subordinated Bonds

Industry	Senior Unsecured		Subordinated	
	N	%	N	%
Industrial	2,717	32.74	667	57.60
Financial	4,479	53.97	478	41.28
Utilities	1,103	13.29	13	1.12%

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