The Information Value of Bond Ratings

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ABSTRACT

We test whether bond ratings contain pricing-relevant information by examining security price reactions to Moody's refinement of its rating system, which was not accompanied by any fundamental change in issuers' risks, was not preceded by any announcement, and was carried simultaneously for all bonds. We find that rating information does not affect firm value, but that debt value increases (decreases) and equity value falls (rises) when Moody's announces better- (worse-) than-expected ratings. We also find that when Moody's announces better- (worse-) than-expected ratings, the volatilities implied by prices of options on the fine-rated issuers' shares decline (rise).

VIRTUALLY ALL LARGE CORPORATE BOND ISSUES are rated by at least one rating agency. These ratings are costly: $25,000 for issues of up to $500 million and half a basis point of the issued amount for issues exceeding $500 million. Interestingly, although bonds are rated whether the issuer pays for the rating or not, about 98 percent of the issuers choose to pay to have their bonds rated.

Why do corporations pay for ratings? Perhaps to gain better ratings. However, this is inconsistent with raters' income being so crucially dependent on their reputation. Alternatively, paying for ratings may allow firms to incorporate inside information into the assigned ratings without disclosing specific details to the public at large. Publicly revealing inside information might benefit competitors or subject insiders to lawsuits should the projections not materialize, whereas rating agencies can incorporate privately disclosed information into the ratings that they assign without fully revealing it. Indeed, during the rating process, corporations provide raters with detailed inside information (e.g., five-year forecasts and pro-forma statements, internal reports).[1]

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[1] Initially, issuers did not pay for ratings; only investors did. Under this arrangement, as rating information was quickly incorporated into bond prices, nonpaying investors were able to free ride the rating process (cf. Wakeman (1981)).

In this paper we examine whether ratings indeed contain pricing-relevant information that investors cannot obtain from other sources. Prior research on whether bond-rating information is valuable has produced mixed results. This may be due to the way the question has been approached. There are two ways to examine whether rating information is valuable: to examine whether bond yields are related to rating information and to examine price reactions to rating changes. Using the first approach, West (1973), Liu and Thakor (1984), Ederington, Yawitz, and Roberts (1984, 1987) and others relate yield spreads (i.e., the differences between corporate bond yields and the yields of equal-maturity, default-risk-free bonds) to ratings, controlling for firm and issue characteristics. In general, these studies find that ratings help explain cross-sectional differences in yield spreads. It is not clear, however, whether the rating information is pricing relevant per se or merely proxies for omitted, publicly available variables that affect yield spreads.

To overcome this difficulty, studies taking the second approach examine the reactions of bond and stock prices to announcements of rating *changes*. The advantage of this approach is that each firm serves as its own control, which means that all pricing-relevant factors are controlled for. Grier and Katz (1976), Hettenhouse and Sartoris (1976), Weinstein (1977), Griffin and Sanvicente (1982), Ingram, Brooks, and Copeland (1983), Hand, Holthausen, and Leftwich (1992), Goh and Ederington (1993) and others report mixed results on security-price reactions to rating changes. Such findings cause Wakeman (1981) to argue that rating changes, which lag rather than lead security-price changes, merely provide "a single, easily communicated code that incorporates all the major ingredients of the bond's risk" (p. 24). Moreover, because rating changes are triggered by economic events, it is not clear how much of the price reaction to rating changes is due to the rating announcement and how much is due to the triggering economic event itself.

In this study, we employ a new approach to examining whether rating information is valuable. We also focus on rating *changes* and, hence, use each firm as its own control. However, unlike prior studies of rating changes, we do not examine rating changes that are triggered by fundamental changes in the issuers' risks. Rather, we examine price reactions to rating changes that *exclusively reflect rating information*—rating changes that occurred when Moody's refined its rating reports.

Up to April 26, 1982, Moody's reported ratings by coarse rating classes; from that day on, it began reporting ratings using a finer rating partition, by attaching numerical modifiers to some of its coarse rating categories. Moody's statements accompanying the change indicate that the fine ratings it assigned on that day are based on the *same information* that underlay the preceding (coarse) ratings. Moreover, the refinement

- was not accompanied by any fundamental change in the issuers' risks,
- was not preceded by any announcement, and

- was carried simultaneously for all bonds that were followed by Moody's on that day.

The rating changes we examine are, therefore, merely refinements of the signal that Moody's sends investors regarding its assessment of default risks. In fact, the refinement of Moody's rating reporting system is perfectly suited to examining the information value of bond ratings as the new reporting system simply provides information in a strictly finer partition than before.[2]

The release of new rating information may affect both the value of the firm as a whole and its division between stockholders and bondholders. We find that rating information is relevant for the division of firm value but do not find that it impacts the value of the firm as a whole.

We show the value of rating information for the division of firm value in three ways. First, we find that *bond* prices adjust to the new information provided by Moody's fine ratings. Second, we find that the *stock* prices of the bonds' issuers also react to Moody's new information. As asset-substitution theory suggests, the bond- and stock-price reactions are in opposite directions: shareholders, as residual claimants, *lose* when investors revise downward their assessment of the issuer's risk, whereas bond holders, as holders of senior claims, *benefit* from such a revision. Third, we find that, following Moody's announcement of better- (worse-) than-expected fine ratings, the volatilities implied by the prices of *options* on the stocks of the fine-rated firms decline (rise).

We estimate the relevance of rating information for the valuation of the firm as a whole for a subsample of firms for which we have both price and quantity data to weigh the effects on debt and equity by their relative values. We find no evidence that new rating information affects firm value. We interpret this to mean that bankruptcy costs are small and that the incremental information of bond ratings is largely about diversifiable risks. This is because if bankruptcy costs are significant or if default risk is systematic, rating information that affects debt and equity values will also affect firm value.

Lastly, we find that the effect of the fine-rating information on bond prices is monotonic in firm leverage: the more levered the firm is, the stronger is its bond-price reaction to new rating information.

The remainder of the paper is organized as follows. In Section I we discuss bond ratings, the rating process, and the change in the rating reporting system introduced by Moody's on April 26, 1982. In Section II we describe the method of our study. Section III provides a description of the data and Section IV the results. Section V concludes.

[2] There are two disadvantages to our approach. First, the rating changes we examine were all carried out on the same day, which, as in any cross-sectional study, means that it is possible that some common macroeconomic factors affected all the returns we examine. Second, we examine fine-rating changes in which relatively little rating information is released, which reduces the power of our tests.

I. Bond Ratings and the Rating Process

Rating agencies attempt to assess the probability that an issuer will meet its debt service obligations. The policy of Moody's and S&P, the largest U.S. rating agencies, is to rate all issues that may interest their clients. The assessed creditworthiness is reported by assigning one of the following 10 symbols:

Moody's: Aaa, Aa, A, Baa, Ba, B, Caa, Ca, C, and D;

S&P: AAA, AA, A, BBB, BB, B, CCC, CC, C, and D.

A key feature of ratings is that they contain a limited number of categories. Hence, equally rated bonds are not claimed to be of identical quality and ratings cannot be inverted into unique default probabilities.

The rating process usually begins with the issuer requesting to be rated. Alternatively, the agency may contact the issuer after the new issue's registration with the SEC. Next, the rating agency reviews public information and internal company files and assesses projected performance. When ready to assign a rating to the issue, S&P and Moody's differ in their procedures. S&P notifies the issuer of the proposed rating and allows the issuer to request a higher rating based on additional information. Moody's policy is to simultaneously announce a final rating to the issuer and to the public. After the assigned rating is announced, both agencies add the issue to their surveillance system.

In recent years, rating agencies have begun to attach modifiers to some of their coarse ratings. In 1973, two rating agencies, S&P and Fitch, gradually began to refine their ratings by dividing them into three subratings: a plus (minus) sign modifies the most (least) creditworthy subrating; no modifier is attached to the middle subrating. Moody's refined its ratings in a special edition of its monthly *Bond Record*, issued on April 26, 1982, announcing the attachment of numerical modifiers to its ratings. Moody's rating modifiers are "1" for the best subrating, "2" for the middle subrating, and "3" for the worst subrating. As opposed to the Fitch and S&P gradual refinement, Moody's attached *all* the modifiers at once: the special edition of Moody's *Bond Record* refined its regular report of March 31, 1982 by adding modifiers to all previously announced ratings. The regular report sent to Moody's subscribers on April 30, 1982 included the rating modifiers, as do all subsequent reports.

In the special issue, Moody's emphasizes that "the numerical modifiers are only refinements of the defined categories. The relative positions of all of Moody's corporate bond rating symbols, and their definitions, remain unchanged as do all procedures for bond rating" (p. I). Thus, the special report is based on the same rating procedures and information as the preceding regular, coarse report of March 1982. Assessed default risks are merely reported in a finer way than previously.

To the best of our knowledge, Moody's attachment of modifiers was not preceded by any public announcement. The *Wall Street Journal* reported the event only in its April 27, 1982 issue, a day after Moody's announced the fine ratings.

II. Methodology

We examine the value of rating information by comparing security prices formed on the basis of Moody's coarse rating report of March 30, 1982 to prices formed on the basis of the fine report of April 26, 1982.[3] Two important aspects of this comparison are to be noted. First, the two reports are based on the same underlying information, which is merely *reported* in different ways. Second, the two reporting systems can be ordered by Blackwell's (1953) Theorem: the system of reporting rating information without class modifiers is, by design, less informative than the reporting system that includes these modifiers. Because no firm-level event triggered the refinement of Moody's rating, the announcement causes investors to reassess default risks only if the fine ratings contain information that they cannot obtain otherwise.

A revision in assessed default risks may affect the value of the whole firm as well as the division of this value between stockholders and bondholders. Specifically, if default risk is systematic, new rating information that affects investors' assessments of it will change the firm's cost of capital and, consequently, its value. Alternatively, if there are significant bankruptcy costs, a change in assessed default risks will affect the firm's expected cash flows and, consequently, its value. Lastly, because bond value declines when default risk increases, holding the value of the firm constant, an increase in assessed default risks will lower debt value and increase equity value. The reverse is true for a decline in assessed default risk following Moody's announcement of fine ratings.[4]

To examine the information content of ratings we should control for investors' pre-announcement assessments of default risks. Such assessments, however, are not directly observable. Hence, we proxy for them. To minimize the chance that our results are due to the selection of a particular proxy, we use three proxies, each based on a different benchmark for investor expectations.

The first proxy for investor expectations is based on a *naïve benchmark*: it assumes that investors base their expectations of default risks exclusively on Moody's coarse rating information. Under the naïve proxy, we assume that when Moody's reports only coarse ratings, investors consider all bonds within a coarse category to be of the same average risk. Because under

[3] Obviously, both prices reflect investors' information as well.

[4] This effect essentially captures the call-option nature of stockholders' claim.

the naïve benchmark investors expect all bonds to receive a modifier 2 in the fine-rating report, the *change* in investors' risk assessments following the attachment of the modifiers is:

- Moody's assigns modifier 1 $\Rightarrow \sigma^F < \sigma^C$
- Moody's assigns modifier 2 $\Rightarrow \sigma^F = \sigma^C$
- Moody's assigns modifier 3 $\Rightarrow \sigma^F > \sigma^C$

where σ^C (σ^F) denotes investors' assessment of default risk based on the coarse (fine) reporting system.

The naïve benchmark does not incorporate any non-Moody's information that might have been available to investors when Moody's refined its rating system. However, because S&P began using a fine rating system while Moody's was still using coarse ratings, we can use the S&P rating modifiers as a second benchmark for investors' pre-announcement assessments of default risks. We call this the *S&P benchmark*. Under this benchmark, we assume that investors form their pre-announcement risk assessments using Moody's and S&P rating information. If S&P assigns a "+" ("−") modifier to an issue's rating,[5] investors expect Moody's to assign a 1 (3) modifier. If S&P does not assign a modifier to an issue's rating, investors expect Moody's to assign a 2 modifier. Accordingly, under the S&P benchmark the revision of investor expectations is:

- S&P assigns a "+" modifier and
  Moody's assigns modifier 1 $\Rightarrow \sigma^F = \sigma^C$
  Moody's assigns modifier 2 or 3 $\Rightarrow \sigma^F > \sigma^C$
- S&P assigns no modifier and
  Moody's assigns modifier 1 $\Rightarrow \sigma^F < \sigma^C$
  Moody's assigns modifier 2 $\Rightarrow \sigma^F = \sigma^C$
  Moody's assigns modifier 3 $\Rightarrow \sigma^F > \sigma^C$
- S&P assigns a "−" modifier and
  Moody's assigns modifier 1 or 2 $\Rightarrow \sigma^F < \sigma^C$
  Moody's assigns modifier 3 $\Rightarrow \sigma^F = \sigma^C$

Both the Naïve and S&P expectation proxies are based exclusively on rating information. Investors, however, may possess additional information. Thus, we also use a *market benchmark* that relies on prices observed just prior to the modifiers' announcement. This benchmark reflects all the information incorporated into bond prices prior to Moody's release of the fine-rating information. The market proxy for investors' assessments of the bonds' relative default risks is based on the yield spreads of the bonds—the differences between the yields of the corporate bonds and the yields of default-risk-free

[5] Or if S&P's coarse rating is better (worse for "−" modifiers) than the coarse rating assigned by Moody's prior to April 26, 1982.

bonds of the same duration.[6] Specifically, within each coarse rating, we classify a bond as assessed by investors prior to Moody's announcement to have a below- (above-) average default risk if its yield spread is in the lowest (highest) quartile of yield spreads in its coarse rating. We consider bonds in the interquartile range to be judged by investors as having an average default risk.[7] Using the market benchmark, the updating of the assessed risk is as follows:

- YS in first (lowest) quartile and
  Moody's assigns modifier 1 $\Rightarrow \sigma^F = \sigma^C$
  Moody's assigns modifier 2 or 3 $\Rightarrow \sigma^F > \sigma^C$
- YS in second or third quartiles and
  Moody's assigns modifier 1 $\Rightarrow \sigma^F < \sigma^C$
  Moody's assigns modifier 2 $\Rightarrow \sigma^F = \sigma^C$
  Moody's assigns modifier 3 $\Rightarrow \sigma^F > \sigma^C$
- YS in fourth (highest) quartile and
  Moody's assigns modifier 1 or 2 $\Rightarrow \sigma^F < \sigma^C$
  Moody's assigns modifier 3 $\Rightarrow \sigma^F = \sigma^C$

Note that market prices potentially reflect more information than do S&P ratings. Hence, the market benchmark potentially provides a better basis to measure the effect of the refinement of Moody's rating system. On the other hand, pre-announcement yield spreads may reflect more than just default-risk information (e.g., sinking fund provisions, collateral, and liquidation value). This may make the market benchmark a noisy proxy for investors' pre-announcement default-risk assessments.

III. Data

Corporate bond data are obtained from the Lehman Brothers Fixed Income Data Base (FIDB), which consists of monthly information on the bonds that comprise the Lehman Brothers Bond Indices.[8] A firm is included in our sample if at least one bond it has issued appears in the FIDB cross-section files of March, April, and May 1982. We exclude foreign issues, Aaa-rated issues (which are not fine rated), and nine bonds that were coarse rerated between March and May 1982. Because we examine yield spreads of corporate bonds and because our data on default-free bonds are restricted to

[6] We use both AAA-rated corporate bonds and Treasury bonds to measure the default-risk-free benchmark yields. There is virtually no difference between the results obtained under either benchmark. Hence, we report only the AAA-rated corporate bond benchmark results.

[7] We use yield-spread quartiles because roughly a quarter of the bonds in our sample received the 1 modifier, a quarter received the 3 modifier, and the remaining half received the 2 modifier. We also carry our analysis classifying the bonds into above-average or below-average default risk based on the actual percentage distribution of modifiers within each coarse rating category. As the results are virtually the same, we report only the quartile-based classification results.

[8] For a description of the FIDB, see Warga (1997).

Table I

The Distribution of the Corporate Bond Sample Across Rating Categories

The table describes the distribution of a sample of 916 corporate bond issues, rated Aa–B, that appear in the Lehman Brothers Fixed Income Data Base in the cross sections of March, April, and May 1982. We restrict the sample to bonds with durations of at least one year and no more than eight years. We exclude bonds that were coarse rerated between March and May 1982. Callable bonds are excluded as well, unless they were priced below 90 percent of par. Last, for each issuing firm, the most recently issued bond is chosen. "1," "2," and "3" refer to fine rating modifiers within coarse rating categories in the April 26, 1982 Moody's rating report. 1 is the best fine rating, 2 is the intermediate fine rating, and 3 is the worst fine rating.

Coarse Rating	1	2	3	Total
Aa	30	117	55	202
	14.9%	57.9%	27.2%	22.1%
A	62	232	92	386
	16.1%	60.1%	23.8%	42.1%
Baa	27	110	27	164
	16.5%	67.0%	16.5%	17.9%
Ba	12	35	13	60
	20.0%	58.3%	21.7%	6.5%
B	94	7	3	104
	90.4%	6.7%	2.9%	11.4%
Total	225	501	190	916
	24.6%	54.7%	20.7%	100%

bonds with durations between one and eight years, we similarly restrict our corporate bond sample. Lastly, callable bonds are excluded as well, except for those with a price below 90 percent of par, in which case they are considered as virtually noncallable.[9] After filtering the data, there remain 1,375 bonds issued by 916 companies. To avoid including multiple observations with virtually identical information, we keep only the most recently issued bonds. Table I describes the distribution of these bonds across the rating categories.

As is evident from Table I, the bonds in the B rating category are concentrated in the B1 fine-rating category. This is because the FIDB reports only data on bonds that make up the Lehman Brothers Bond Indices, which include only debt issues rated "investment grade" by at least one of the three main rating agencies. Because the ratings of the various agencies are correlated, very few bonds with Moody's B2 and B3 categories appear in our sample. Furthermore, virtually all these bonds are "fallen angels"—bonds that are originally rated as investment grade but are downgraded following an increase in their default risk. To avoid examining a biased sample and a sample that is likely to have been affected by a risk change concurrently

[9] We also carry out the analysis excluding an additional 151 callable bonds priced above 80 percent of par and obtain virtually identical results. Using a much smaller subsample of 127 noncallable bonds, we obtain similar but less significant estimates.

Table II

Bond Sample Characteristics

The table describes the maturity and duration structures of our sample of 812 corporate bonds and their yield spreads (YS), measured off equal-duration AAA-rated corporate bonds and off equal-duration Treasury bonds. Bonds are included in the sample if they appear in the Lehman Brothers Fixed Income Data Base cross sections of March, April, and May 1982 and were rated Aa, A, Baa, or Ba by Moody's in April 1982. We exclude bonds that were coarse rerated between March and May 1982. The sample is restricted to bonds with durations between one year and eight years. Callable bonds are excluded as well, unless they were priced below 90 percent of par. For each issuing firm, the most recently issued bond is chosen.

Rating Category		Average	Max.	Min.	Std. Dev.
	Panel A: Maturity and Duration				
Aa (N = 202)	Time to maturity	15.41	37.98	1.08	9.30
	Duration	5.76	7.89	1.05	1.71
A (N = 386)	Time to maturity	15.31	46.79	1.08	8.61
	Duration	5.82	7.78	1.05	1.44
Baa (N = 164)	Time to maturity	14.04	28.52	1.59	7.69
	Duration	5.53	7.95	1.50	1.34
Ba (N = 60)	Time to maturity	13.37	26.19	1.12	6.18
	Duration	5.41	6.84	1.08	1.15
Total (N = 812)	Time to maturity	14.93	46.79	1.08	8.47
	Duration	5.72	7.95	1.05	1.48
	Panel B: Yield Spreads				
Aa (N = 202)	YS off corporate	1.49	4.37	−1.10	0.75
	YS off Treasury	1.01	3.79	−1.66	0.77
A (N = 386)	YS off corporate	1.88	5.17	−2.41	0.89
	YS off Treasury	1.39	4.60	−3.00	0.90
Baa (N = 164)	YS off corporate	2.91	5.77	0.33	0.98
	YS off Treasury	2.42	5.23	−0.14	0.98
Ba (N = 60)	YS off corporate	3.65	6.49	−1.98	1.44
	YS off Treasury	3.15	5.95	−2.57	1.44
Total (N = 812)	YS off corporate	2.12	6.49	−2.41	1.13
	YS off Treasury	1.63	5.95	−3.00	1.14

with the refinement of the rating system, we exclude the B-rated bonds from our sample.[10] Thus, our final sample consists of 812 bonds issued by 812 firms. On April 26, 1982, 16.13 percent of these bonds are subrated with a 1 modifier, 60.84 percent are subrated with a 2 modifier, and 23.03 percent are subrated with a 3 modifier.

Table II describes the maturity and yield characteristics of our sample. Recall that we restrict our sample to bonds with durations of no less than one year and no more than eight years. This duration range corresponds to a maturity range of one to about 47 years. The average sample duration is

[10] Including the B-rated bonds in our sample hardly changes the results.

almost six years and the average maturity is 15 years. Bond-yield spreads are measured off equal-duration AAA-rated corporate bonds and off equal-duration Treasury bonds. The correlation coefficient between these two yield spreads is 0.9997 and, as prior research has shown (e.g., Altman (1989)), both are correlated with the coarse ratings assigned by Moody's. The advantage of measuring yield spreads off AAA-rated corporate bonds is that they are taxed as the corporate bonds that we examine, thus obviating any tax-motivated bias. On the other hand, Treasury bonds are more liquid assets than corporate bonds, so their yields may better reflect changing market conditions. As tests using both benchmarks yield virtually identical results, we report only the results based on the corporate bond benchmark.

Note that some of the yield spreads are negative, which means that the reported yields of some bonds rated below AAA are lower than the yields of equal-duration AAA-rated bonds. We interpret these negative yield spreads to be part of the noise in our data (e.g., due to imperfect synchroneity of prices). However, so long as this price noise is not correlated with the fine-rating information Moody's revealed on April 26, 1982, it lowers the power of our tests but does not bias our estimates.

IV. Results

As explained above, we examine the reactions of security prices to the announcement of the fine ratings using three proxies for investor pre-announcement assessments of default risk:

- a *naïve proxy*, which assumes that under the coarse rating system investors consider all bonds as implicitly fine rated with the average Moody's modifier (2);
- an *S&P-based proxy*, which assumes that investors assign implicit Moody's modifiers to bonds according to the rating modifiers they receive from S&P; and
- a *market-based proxy*, which infers the implicit Moody's modifier that investors assign to a bond from the yield spread of the bond relative to all other bonds with the same coarse rating.

Based on each one of these three proxies, we break down our sample into three subsets:

- a "good news" subset of bonds for which the actual modifiers announced by Moody's on April 26, 1982 indicate *lower* default risks than investors assessed prior to the announcement;
- a "no news" subset of bonds for which the actual modifiers announced by Moody's on April 26, 1982 *conform* to the default risks that investors assessed prior to announcement; and
- a "bad news" subset of bonds for which the actual modifiers announced by Moody's on April 26, 1982 indicate *higher* default risks than investors assessed prior to the announcement.

We compute the abnormal return for bond i, denoted by AR_i, by calculating the difference between its actual return to its yield to maturity at the beginning of the month. This abnormal return may be due to changes in the term structure of interest rates and to the effect of the fine rating announcement. To control for the concurrent changes in the term structure, we use a cubic spline to estimate the risk-free term structure from the yields of AAA-rated corporate bonds and their durations for each month—March, April, and May 1982.[11] The portion of the abnormal return due to changes in the term structure is estimated as the change in the risk-free yield for the bond's duration (denoted ΔTS_i) times the bond's modified Macaulay's duration at the beginning of the month (denoted Dur_i).

In estimating the impact of the fine-rating announcement, we allow for a rating-dependent impact of changes in the term structure on bond returns. Specifically, we estimate the information impact of Moody's announcement with the following cross-sectional regression:

$$AR_i = \beta_0 + \sum_R \beta_R \cdot \Delta TS_i \cdot Dur_i \cdot I_{R,i} + \beta_{good} \cdot I_{good,i} + \beta_{bad} \cdot I_{bad,i} + \epsilon_i \tag{1}$$

where β_R are rating-specific coefficients that measure the impact of term-structure changes on bonds of this coarse rating, I_R are coarse rating (Aa through Ba) indicators, and I_{good} (I_{bad}) indicates that the bond's fine-rating information is considered good (bad) news. Because the good news (bad news) indicator means that Moody's fine rating is better (worse) than expected, the expected sign of the coefficient β_{good} (β_{bad}) is positive (negative).

In equation (1), we estimate the impact of Moody's refinement of its ratings by comparing the abnormal returns of the fine-rated bonds following the announcement.[12] An alternative approach is to examine the relative changes in the bonds' yield spreads following the fine-rating announcement:

$$\Delta YS_i = \gamma_0 + \sum_R \gamma_R \cdot \Delta TS_i \cdot I_{R,i} + \gamma_{good} \cdot I_{good,i} + \gamma_{bad} \cdot I_{bad,i} + \xi_i \tag{2}$$

Note that, unlike equation (1), the difference in the price reactions of the good news and bad news subsamples estimated with equation (2) does not depend on the manner in which the term structure changes. Specifically, in equation (1) we adjust the price reactions of bonds by the duration-adjusted concurrent change in the term structure. This is a linear approximation of the reaction of bond prices to concurrent changes in the term structure, which implicitly assumes that the term structure shifted in a parallel manner. This assumption is not needed for equation (2).

[11] We obtain virtually identical results when we use Treasury securities as the default-risk-free benchmark.

[12] We also estimate the information impact of the refinement using raw returns and obtain similar results.

The expected signs of the coefficients of the good news and bad news indicators in equation (2) are opposite to the signs of the corresponding coefficients in equation (1). This is because good news means a *decline* in the assessed default risk, which implies an *increase* in the bond price (i.e., a *positive* abnormal return) and a *decrease* in the bond's yield spread.

We examine bond price reactions to Moody's announcement on April 26, 1982 by comparing March and April 1982 month-end prices. However, because some bonds may be inactively traded, it is possible that the effect of the fine-rating announcement is not fully reflected in bond prices by the end of April 1982. Hence, we also examine price and yield changes through the end of May 1982. Note, however, that the price and yield data in the two-month window are probably affected by more post-announcement events than the data of the one-month window and are, therefore, noisier.

The estimated coefficients for regression equations (1) and (2) are reported in Tables III and IV, respectively. We focus on the comparison of the good news and bad news coefficients, which are reported in the last column of these tables. This comparison provides the most powerful test of the impact of Moody's release of fine-rating information because the information revealed by the announcement about these bond groups is most different.

Table III reports the abnormal bond returns following Moody's announcement of fine ratings. As expected, the comparison of the good news and bad news bond returns provides the sharpest results. Specifically, we find that the announcement of better-than-expected fine ratings is associated with positive abnormal returns that are larger than the returns of bonds with worse-than-expected fine ratings. The announcement of worse-than-expected fine ratings is associated with lower abnormal returns than the no news group in the one-month window but no clear results are obtained for the two-month window, probably because the two-month return data are noisier than the one-month return data. The standard errors of the estimated announcement effects are smaller with the S&P-based and market-based proxies for investor pre-announcement assessments of default risks than with the naïve proxy (which exclusively reflects Moody's coarse rating information). This suggests that, prior to Moody's refinement, S&P's fine ratings and yield spreads contained more information than Moody's coarse ratings alone.

A similar picture, with signs appropriately adjusted, emerges from Table IV, which depicts the changes in yield spreads following Moody's announcement. Because in both tables we compare post-announcement prices to pre-announcement prices *of the same bonds*, each bond serves as its own, unique control. In estimating the results reported in Table IV, however, we do not implicitly assume a parallel shift in the term structure of interest rates as we do in Table III. Thus, the results reported in Table IV are more robust than those reported in Table III. Yet, the picture that emerges from the two tables is the same. To wit, both the abnormal bond returns (reported in Table III) and the changes in yield spreads (reported in Table IV) following Moody's announcement indicate that Moody's fine-rating information is neither redundant nor known to investors from other sources.

Table III

The Effect of Moody's Fine-rating Announcement on Bond Returns

The table describes bond abnormal returns (above the return indicated by the concurrent change in the term structure of interest rates) of our sample of 812 corporate bonds following Moody's initial announcement of fine ratings. The reported coefficients are of the regression equation

$$AR_i = \beta_0 + \sum_R \beta_R \cdot \Delta TS_i \cdot Dur_i \cdot I_{R,i} + \beta_{good} \cdot I_{good,i} + \beta_{bad} \cdot I_{bad,i} + \epsilon_i,$$

where AR_i denotes the ith bond's abnormal return, defined as the difference between its raw return to its monthly yield to maturity at the beginning of the month, β_0 is an intercept, β_R are rating specific (Aa through Ba) coefficients that measure rating-specific effects of changes in the term structure, ΔTS_i denotes the change in the default-risk-free yield for the bond's duration, Dur_i is the bond's modified Macaulay's duration. $I_{R,i}$ are rating indicators, β_{good} (β_{bad}) is a coefficient that measures the relative impact of good (bad) news on the bond's abnormal return, and $I_{good,i}$ ($I_{bad,i}$) indicates that the bond's fine-rating information is considered good (bad) news. The indication of whether a fine rating is good or bad news is given by three proxies for investor expectations: a naïve proxy that assumes that under the coarse rating system investors consider all bonds to be implicitly fine rated with the average Moody's modifier (2), an S&P-based proxy that assumes that the implicit Moody's modifier investors assign to a bond is according to the S&P rating modifier, and a market-based proxy that infers the implicit Moody's modifier that investors assign to a bond from the bond's yield spread relative to all other bonds with the same coarse rating. Abnormal returns are expressed in percentage points. Numbers in parentheses are one-tail heteroskedasticity-consistent p-values. NM means that the p-value is not meaningful because the estimated coefficient is opposite in sign to the expected.

Expectation Model	Period	Good News versus No News	Bad News versus No News	Good News versus Bad News
Naïve	Mar–Apr	0.054	−0.039	0.093
		(0.346)	(0.388)	(0.288)
	Mar–May	0.407	0.155	0.252
		(0.022)	(NM)	(0.163)
S&P-based	Mar–Apr	0.224	−0.092	0.316
		(0.054)	(0.231)	(0.021)
	Mar–May	0.315	0.029	0.286
		(0.075)	(NM)	(0.122)
Market-based	Mar–Apr	0.404	−1.315	1.719
		(0.000)	(0.000)	(0.000)
	Mar–May	0.903	−2.695	3.598
		(0.000)	(0.000)	(0.000)

Because most corporate bonds are traded among dealers rather than in a central market, trading in some of the sample bonds may be relatively inactive. To examine whether our conclusion is potentially subject to problems due to stale prices, we also analyze a subsample of actively traded bonds selected on the basis of a liquidity indicator included in the FIDB. The FIDB reports for each month-end bond price whether it is a direct price "quote," which reflects active trading in the bond in that month, or if it is a "matrix"

Table IV

The Effect of Moody's Fine-rating Announcement on Bond Yields

The table describes the changes in bond-yield spreads (above the change indicated by the concurrent change in the term structure of interest rates) of our sample of 812 corporate bonds following Moody's initial announcement of fine ratings. The reported coefficients are of the regression equation

$$\Delta YS_i = \gamma_0 + \sum_R \gamma_R \cdot \Delta TS_i \cdot I_{R,i} + \gamma_{good} \cdot I_{good,i} + \gamma_{bad} \cdot I_{bad,i} + \xi_i,$$

where ΔYS_i denotes the change in the bond's yield spread, γ_0 is the intercept, γ_R are rating-specific (Aa through Ba) coefficients that measure the rating-specific impact of the change in the term structure, ΔTS_i denotes the change in the default-risk-free yield for the bond's duration, I_R are coarse-rating indicators, γ_{good} and γ_{bad} are coefficients that measure the relative impact of good and bad news on the bond's yield spread, respectively, and $I_{good,i}$ and $I_{bad,i}$ indicate that the fine rating is considered good or bad news, respectively. The indication of whether a fine rating is good or bad news is given by three proxies for investor expectations: a naïve proxy that assumes that under the coarse rating system investors consider all bonds to be implicitly fine rated with the average Moody's modifier (2), an S&P-based proxy that assumes that the implicit Moody's modifier investors assign to the bond is inferred according to the S&P rating modifier, and a market-based proxy that infers the implicit Moody's modifier that investors assign to the bond from the bond's yield spread relative to all other bonds with the same coarse rating. Yield changes are expressed in percentage points. Numbers in parentheses are one-tail heteroskedasticity-consistent p-values. NM means that the p-value is not meaningful because the estimated coefficient is opposite in sign to the expected.

Expectation Model	Period	Good News versus No News	Bad News versus No News	Good News versus Bad News
Naïve	Mar–Apr	−0.018	0.013	−0.031
		(0.264)	(0.330)	(0.188)
	Mar–May	−0.054	−0.016	−0.038
		(0.060)	(NM)	(0.203)
S&P-based	Mar–Apr	−0.049	0.022	−0.071
		(0.037)	(0.214)	(0.013)
	Mar–May	−0.034	−0.027	−0.007
		(0.174)	(NM)	(0.431)
Market-based	Mar–Apr	−0.090	0.319	−0.409
		(0.000)	(0.000)	(0.000)
	Mar–May	−0.134	0.501	−0.635
		(0.000)	(0.000)	(0.000)

price that the trader determines relative to another benchmark bond (typically a Treasury bond with a similar maturity). To examine whether lack of liquidity potentially affects our results, we redo the analysis with a subsample of 490 bonds for which the March, April, and May 1982 month-end prices are quotes. The distribution of these bonds across the fine ratings and their yield spreads are similar to those of the total sample. More importantly, the abnormal returns and yield changes following Moody's announcement are virtually the same as those obtained for the full sample. Thus, stale prices do not appear to impact our results.

Because the release of the fine-rating information may also impact stock prices, we now compare the stock-price reactions of issuers whose bonds were fine rated worse than expected to the stock-price reactions of issuers whose bonds were fine rated better than expected. To be consistent with the analysis of bond-price reactions, we continue to call the cases where Moody's fine ratings are *lower* than expected bad news and where they are *higher* than expected, good news. However, stockholders, as holders of option-like securities, *benefit* from an upward reassessment of the firm's risk, which means that good news for bondholders is actually *bad* news for stockholders. The classification of fine ratings as good news or bad news is based on the same proxies for investor expectations that we use to examine bond price reactions: the naïve proxy, the S&P-based proxy, and the market-based proxy. We denote the difference between the average abnormal stock returns of good news and bad news issuers by ΔASR.

We calculate abnormal stock returns relative to three benchmarks. The first benchmark is the average return of the stock in the 80 through 10 trading days preceding Moody's announcement. This benchmark yields "mean-adjusted returns." The second benchmark is the return on the portfolio of same-size firms, where size portfolios are based on the 10 CRSP NYSE/AMEX/Nasdaq size-portfolio allocations at the end of 1981. This benchmark yields "size-adjusted returns." The third benchmark is the market-model expected conditional return that is estimated by $E(r_i|r_m) = \alpha_i + \beta_i \cdot r_m$. The individual stock return parameters—α_i and β_i—are estimated over the period of 80 to 10 trading days prior to the announcement day. This yields the "market-model-adjusted returns."[13]

News of Moody's April 26, 1982, fine-rating report appeared in the *Wall Street Journal* on April 27, 1982. It is not likely that investors actually received the report on the day it was issued. Hence, to ensure that our abnormal stock-return estimate reflects the effect of Moody's announcement, we examine abnormal returns for the announcement week—the five trading days of April 26, 1982 through April 30, 1982 ("one week").[14] Although we focus on the one week abnormal returns, for the sake of completeness we also report the announcement day's abnormal return ("one day"). The market return (measured by the CRSP value-weighted index) was -0.91 percent on the announcement day and -1.87 percent in the announcement week.

As mentioned in the introduction, because our data are perfectly clustered in time, we need to account for the daily comovements of stock prices. Hence, for each expectation model, we calculate the covariance matrix of daily re-

[13] Using the market return as the benchmark (i.e., assuming that all alphas are zero and all betas are one) yields similar results, which are not reported to conserve space.

[14] We also calculate abnormal returns for four and six trading days. There is hardly any difference between the resulting ΔASRs.

turns of the good news and bad news portfolios, and use it to compute the standard errors of the coefficient estimates (i.e., we bootstrap the statistics' distributions). This process is equivalent to estimating ΔASR as the return to a portfolio formed by holding long shares of the firms that Moody's fine-rated better than expected and shorting the shares of firms that were fine-rated worse than expected. Obviously, if the fine-rating information is indeed price-relevant news, investors could not have formed these portfolios prior to the announcement. On the other hand, if the fine-rating information was either known or not relevant for pricing, the portfolio should earn a zero excess return.

The estimated effect of Moody's announcement of the fine ratings on stock prices is reported in Table V. In the one week window, the difference between the stock-price reactions of the good news and bad news portfolios is negative. When the naïve and S&P benchmarks are used, the difference exceeds one percent and is significantly different from zero at commonly used confidence levels. When the market benchmark is used, the difference is about half a percent and is insignificantly different from zero. (As expected, the average reaction is not significantly different from zero when the effect is measured over the announcement day only.) Overall, the documented reactions of stock prices are consistent with a transfer of wealth between bondholders and stockholders taking place when investors revise their assessments of default risks. The transfer is from stockholders to bondholders (bondholders to stockholders) if the revision is to a lower (higher) risk assessment. This is also consistent with the estimated bond-price reaction, jointly suggesting that Moody's fine-rating information is pricing relevant and not redundant, in that it helps investors better assess firms' default risks.

Note that the naïve and the S&P-based proxies for investors' pre-announcement default-risk assessment yield lower standard errors than the market-based proxy does. On the other hand, in the bond-price reaction tables (i.e., Tables III and IV) the S&P-based and the market-based proxies yield the most accurate estimates. Thus, the proxy for investor pre-announcement assessments of default risk that is based on the pre-announcement S&P fine ratings appears to be the "least noisy" proxy for the information investors had prior to Moody's announcement. Indeed, the S&P-based proxy also does the best job of analyzing the option-price reaction to the announcement, as reported below.

The hypothesized directions of the *separate* effects of Moody's announcement on stock and bond prices are derived under the assumption that the reassessment of a firm's default risk hardly affects its *total* value. Now we test this assumption. Using COMPUSTAT data on the capital structure of a subsample of 180 firms whose bonds were fine rated, the abnormal return for the whole firm is computed as a value-weighted average of the abnormal returns of the firms' debt and equity. The abnormal return of *all* debt—traded or not—is proxied by the abnormal returns on the firm's *traded* bonds. Note that this estimate may overstate the overall debt reaction to Moody's

Table V

The Effect of Moody's Fine-rating Announcement on Stock Prices

The table describes the abnormal returns of 386 stocks following Moody's adoption of the fine-rating system on April 26, 1982. We report the difference between the abnormal stock returns (ΔASR) of issuers whose bonds were assigned fine ratings that were *better* than expected, called "good news," and *worse* than expected, called "bad news." The indication of whether a fine rating is good or bad news is given by three proxies for investor expectations: a naïve proxy that assumes that under the coarse rating system investors consider all bonds to be implicitly fine rated with the average Moody's modifier (2), an S&P-based proxy that assumes that the implicit Moody's modifiers that investors assign to the bond is according to the S&P rating modifier, and a market-based proxy that infers the implicit Moody's modifier investors assign to the bond from the bond's yield spread relative to all other bonds with the same coarse rating. We examine stock return relative to three benchmarks: the average return of the stock in 80 through 10 days preceding Moody's announcement, the concurrent return of the equal-size-decile portfolio, and the market model of returns. The market-model expected conditional return is estimated by $E(r_i|r_m) = \alpha_i + \beta_i \cdot r_m$, where the individual stock return parameters—α_i and β_i—are estimated over 80 to 10 trading days prior to the announcement day. The reported abnormal returns are for two event periods: the announcement day and the announcement week. Numbers in parentheses are one-tail heteroskedasticity-consistent p-values. NM means that the p-value is not meaningful because the estimated coefficient is opposite in sign to the expected.

Expectation Model	Period	Mean-adjusted ΔASR	Size-adjusted ΔASR	Market-model-adjusted ΔASR
Naïve	One day	−0.073	−0.054	0.088
		(0.423)	(0.441)	(NM)
	One week	−1.847	−1.636	−1.557
		(0.016)	(0.023)	(0.020)
S&P-based	One day	−0.034	−0.052	0.063
		(0.444)	(0.420)	(NM)
	One week	−1.422	−1.491	−1.264
		(0.005)	(0.006)	(0.008)
Market-based	One day	0.013	−0.002	−0.150
		(NM)	(0.497)	(0.321)
	One week	−0.372	−0.656	−0.684
		(0.311)	(0.202)	(0.172)

announcement, as the most recently issued bond is probably the longest bond outstanding. Hence, the price of the most recently issued bond is likely to be the one most affected by a change in assessed default risks.

In Table VI, we report the estimated abnormal changes in total firm values following Moody's announcement. The results show no clear effect of the announcement: the sign of the difference between the estimated abnormal changes in firm value depends on the method of measurement and, using accepted significance levels, is never significantly different from zero. Moreover, the differences in abnormal returns are not monotonic: it is not the case that the better (worse) the news, the higher (lower) the abnormal return.

Table VI

The Effect of Moody's Fine-rating Announcement on Firm Values

The table describes the abnormal change in firm values for 180 firms whose bonds were fine rated as part of Moody's adoption of a fine-rating system on April 26, 1982. We report the differences between the abnormal changes in the values of firms with *better*-than expected fine ratings, called "good news," and firms with *worse*-than-expected fine ratings, called "bad news." The indication of whether an announced fine rating is good or bad news is given by three proxies for investor expectations. The proxies are: a naïve proxy that assumes that under the coarse rating system investors consider all bonds to be implicitly fine rated with the average Moody's modifier (2), an S&P-based proxy that assumes that the implicit Moody's modifiers that investors assign to the bond is according to the S&P rating modifier, and a market-based proxy that infers the implicit Moody's modifier investors assign to the bond from the bond's yield spread relative to all other bonds with the same coarse rating. We estimate the abnormal stock returns relative to the market model of returns. The market-model expected conditional return is estimated by $E(r_i|r_m) = \alpha_i + \beta_i \cdot r_m$, where the individual stock return parameters—α_i and β_i—are estimated over 80 to 10 trading days prior to the announcement day. The reported abnormal returns are for two event periods: the announcement day and the announcement week. The abnormal bond return is the sum of the fine rating effect and the residual in the regression

$$AR_i = \beta_0 + \sum_R \beta_R \cdot \Delta TS_i \cdot Dur_i \cdot I_{R,i} + \beta_{good} \cdot I_{good,i} + \beta_{bad} \cdot I_{bad,i} + \epsilon_i,$$

where ΔTS_i denotes the change in the default-risk-free yield for the bond's duration, Dur_i is the bond's modified Macaulay's duration, I_R are coarse-rating indicators, and $I_{good,i}$ and $I_{bad,i}$ indicate that the fine ratings are considered good news or bad news, respectively. Stock and bond weights are based on the market value of the stocks on March 31, 1982 and the book value of the debt at the end of the fiscal quarter preceding April 26, 1982. Numbers in parentheses are one-tail heteroskedasticity-consistent p-values. NM means that the p-value is not meaningful because the estimated coefficient is opposite in sign to the expected.

Expectation Model	Equity Return Period	Good News versus No News	Bad News versus No News	Good News versus Bad News
Naïve	One day	−0.276	−0.105	−0.171
		(NM)	(0.311)	(NM)
	One week	−0.876	−0.248	−0.628
		(NM)	(0.308)	(NM)
S&P-based	One day	0.094	0.050	0.044
		(0.387)	(NM)	(0.450)
	One week	−0.348	0.043	−0.391
		(NM)	(NM)	(NM)
Market-based	One day	0.008	−0.497	0.505
		(0.485)	(0.129)	(0.138)
	One week	0.015	−0.993	1.008
		(0.486)	(0.124)	(0.133)

The difference between significant bond- and stock-price reactions and the lack of a significant effect on firm value may be due to differences in sample sizes. To wit, we estimate whole-firm effects with only 180 firms whereas we have 386 (812) firms with stock (bond) price data. One hundred eighty firms, however, is a nontrivial sample size, so we prefer to interpret these results as an indication that new default-risk information has little effect on firm value. This interpretation is consistent with our assumption that the refinement of Moody's rating system was not accompanied by fundamental changes in firms' systematic risks. It also suggests that bankruptcy costs are not a significant determinant of firm value: had this been the case, a change in the assessed default risk would have materially affected firm value.

The estimated impact of Moody's announcement on security and firm values indicates that the information revealed in the announcement affected risk assessments. To examine the changes in the risk assessments following Moody's announcement directly, we examine the volatilities implied by the prices of options on the shares of the bond issuers.[15] At the end of April 1982, 118 firms whose bonds were fine rated by Moody's had options traded on their shares. To compute implied volatilities before and after the announcement, we use stock and option closing prices on the five trading days preceding the announcement and the five trading days following it. We use call options with expiration dates closest to three months and exercise prices that are just out of the money.[16] The three-month T-bill rate is used for the risk-free interest rate and actual dividend information—ex-dates, payment dates, and amounts—is used to adjust stock prices for dividend payments until the options' expirations.

We estimate the impact of the announcement of better-than-expected (good news) and worse-than-expected (bad news) ratings on implied volatilities using the following regression equation:

$$\Delta IV_i = \omega_0 + \omega_{good} \cdot I_{good,i} + \omega_{bad} \cdot I_{bad,i} + \epsilon_i \tag{3}$$

where ΔIV_i denotes the percentage change in implied volatility of option i and $I_{good,i}$ and $I_{bad,i}$ indicate that the bond's fine-rating information is considered good news or bad news, respectively. If Moody's announcement of a better-than-expected fine rating lowers investors' assessment of firm risk, we expect that the announcement will lower the stock's implied volatility, that is, we expect $\omega_{good} < 0$. We expect the reverse for an announcement of a fine rating that is worse than investors expected.

In Table VII, we report the estimated impact of Moody's fine-rating announcement on implied volatilities, focusing on the comparison of the good news and bad news coefficients, which are reported in the last column of the table. The difference between the change in implied volatilities of firms with better-than-expected fine ratings and worse-than-expected fine ratings is significant. As for the stock-price reactions, the S&P proxy yields the most

[15] We thank René Stulz, the editor, for suggesting this test.

[16] These options are typically the most heavily traded options, which minimizes nonsynchroneity in prices. Additionally, the effect of possible early exercise (due to dividend payment) on estimated implied volatilities is negligible for these options.

Table VII

The Effect of Moody's Fine-rating Announcement on Implied Volatilities

The table describes the effect of Moody's announcement of fine ratings on April 26, 1982, on stock volatilities implied by 118 option prices. Implied volatilities are estimated over five days preceding and following the announcement. The options we use are call options with expiration dates closest to three months and exercise prices that are just out of the money. In computing the implied volatilities, we use the three-month T-bill rate as the risk-free interest rate and use divided information—ex-dates, payment dates, and amounts—to adjust the stock prices for the dividend payments until the options' expiration. The indication of whether fine-rating information is considered good news or bad news by investors is given by three proxies for investor expectations: a naïve proxy that assumes that under the coarse rating system investors consider all bonds to be implicitly fine rated with the average Moody's modifier (2), an S&P-based proxy that assumes that the implicit Moody's modifiers that investors assign to the bond is according to the S&P rating modifier, and a market-based proxy that infers the implicit Moody's modifier investors assign to the bond from the bond's yield spread relative to all other bonds with the same coarse rating. We estimate the impact of good news and bad news on implied volatilities using the following regression equation:

$$\Delta IV_i = \omega_0 + \omega_{good} \cdot I_{good,i} + \omega_{bad} \cdot I_{bad,i} + \epsilon_i,$$

where ΔIV_i denotes the percentage change in implied volatility of option i and $I_{good,i}$ and $I_{bad,i}$ indicate that the bond's fine-rating information is considered good news or bad news, respectively. Numbers in parentheses are one-tail heteroskedasticity-consistent p-values. NM means that the p-value is not meaningful because the estimated coefficient is opposite in sign to the expected.

Expectation Model	Better-than-expected versus Expected Fine Ratings	Worse-than-expected versus Expected Fine Ratings	Better-than-expected versus Worse-than-expected Fine Ratings
Naïve	−3.223	1.768	5.991
	(0.104)	(0.283)	(0.070)
S&P-based	−4.699	0.515	5.214
	(0.018)	(0.433)	(0.045)
Market-based	0.996	2.515	1.519
	(NM)	(0.267)	(0.369)

accurate coefficient estimates. These results suggest that implied volatilities change following the announcement of fine ratings. We can interpret these results in two ways. First, we may conclude that the release of better-than-expected fine ratings lowers investors' assessments of firm volatility. Second, if the announcement of better-than-expected fine ratings lowers investor assessment of default probability in a way that leaves total firm value unaffected, the announcement will lower the firm's leverage, which will entail a commensurate decline in the firm's stock volatility. Under both interpretations, the results of Table VII provide another indication, based on option prices, that fine-rating information is valuable.

Last, using the subsample of 180 firms for which we have data about capital structure, we can also examine whether the value of the fine-rating information depends on the leverage of the firm. Because high-leverage bondholders bear more of the firm's risk whereas low-leverage debt is almost risk free, we expect leverage to be positively (negatively) correlated with bond-price reaction to the announcement of good news (bad news.) The reverse is expected for stock-price reactions.[17]

We measure the relative importance of rating information by the price reactions to Moody's announcement. We regress these reactions on the leverage of the firm, where leverage is measured by the ratio of debt to debt plus equity. Debt value is measured by its book value at the end of the fiscal quarter preceding April 26, 1982 and equity value is measured by its market value on March 31, 1982.

The regression estimates are reported in Table VIII. The estimated coefficients for the reactions of the bond and the stock prices are in the predicted direction. In the bond abnormal return regression, the coefficients of leverage, for both the good news and the bad news cases, are significantly different from zero. The stock-price coefficients, however, are insignificantly different from zero. This may reflect the smaller number of observations in the subsample used for this test, which reduces the power of the tests. Although the stock-price reaction is not significantly different from zero, the bond-price reaction suggests that the value of rating information increases with the leverage of the firm.

V. Conclusions

Despite the fact that ratings and rating reports are costly, virtually all issuers pay to be rated and many investors purchase these reports. The accepted rationale for why rating information is valuable is that issuers disclose inside information to raters, who assign ratings that reflect this information without fully disclosing the specific underlying details to the public at large.

Is rating information indeed pricing relevant and useful? This question has been the subject of extensive research, but no uniform answer has emerged. The lack of a clear assessment of the incremental value of rating information is possibly due to the way the question has been approached to date. In this study, we propose a new approach to examine whether rating information is valuable: we examine security-price reactions to rating changes that *exclusively reflect rating information*. We do so by examining bond and stock prices around April 26, 1982, the day on which Moody's began to report ratings with a finer rating classification than it had previously used. This refinement was not accompanied by any fundamental change in the issuers' risks, was not preceded by any announcement, and was carried out simultaneously

[17] Note, however, that if the price reactions we document are not solely due to reassessments of default risks, they may also be correlated with leverage.

Table VIII

The Relation between Firm Leverage and the Effects of the Release of Fine-rating Information

The table describes the relations between the abnormal changes in bond, stock, and firm values of 180 firms following Moody's adoption of a fine-rating system on April 26, 1982 and the leverage of the firm. We estimate the stock abnormal return with the market model of returns. The market-model expected conditional return is estimated by

$$E(r_i | r_m) = \alpha_i + \beta_i \cdot r_m$$

where the individual stock return parameters—α_i and β_i—are estimated over 80 to 10 trading days prior to the announcement day. The abnormal returns are for the announcement week. We estimate the bonds' abnormal returns relative to rating-specific effects of changes in the term structure:

$$R_i = \beta_0 + \sum_R \beta_R \cdot \Delta TS_i \cdot Dur_i \cdot I_{R,i} + \beta_{good} \cdot I_{good,i} + \beta_{bad} \cdot I_{bad,i} + \epsilon_i,$$

where β_R are rating-specific (Aa through Ba) coefficients, ΔTS_i denotes the change in the default-risk-free yield for the bond's duration, Dur_i is the bond's modified Macaulay's duration, I_R are coarse-rating indicators, and $I_{good,i}$ ($I_{bad,i}$) indicates that the bond fine-rating information is considered good (bad) news. The abnormal returns are calculated as the sum of the fine-rating effects and the regression residuals in April 1982:

$$AR_i = \beta_{good} \cdot I_{good,i} + \beta_{bad} \cdot I_{bad,i} + \epsilon_i.$$

To calculate the effect of the announcement on the value of the firm, we average the abnormal returns of the bonds and the stocks. Weights for the stock and bond abnormal returns are based on the total market value of the stocks of the issuers on March 31, 1982 and the book value of the debt at the end of the fiscal quarter preceding April 26, 1982. The estimated regression is of abnormal bond, stock, or firm value changes and leverage, where leverage effects are separately estimated for good news and for bad news:

$$AR_k = \alpha_0 + \alpha_1 \cdot \left[\frac{D^{Book}}{D^{Book} + E^{Market}} \right] \cdot I_{good} + \alpha_3 \cdot \left[\frac{D^{Book}}{D^{Book} + E^{Market}} \right] \cdot I_{bad},$$

where k = bond, stock, or firm value, D^{Book} is the book value of the firm's debt at the end of its last fiscal quarter preceding April 26, 1982, and E^{Market} is the market value of the firm's stock on March 31, 1982. The positive or negative signs below each parameter indicate the hypothesized sign of the coefficients. Numbers in parentheses are one-tail heteroskedasticity-consistent p-values.

	Debt Price	Equity Price	Firm Value
Good news leverage	0.791	−1.959	0.001
(α_1)	+	−	?
	(0.033)	(0.130)	(0.160)
Bad news leverage	−1.776	3.228	0.005
(α_3)	−	+	?
	(0.087)	(0.249)	(0.186)
Number of observations	812	386	180
Adjusted R^2	0.011	0.008	0.012

for all bonds that were followed by Moody's on that day. The refinement of the signal that Moody's sends investors regarding its assessment of default risks is, therefore, perfectly suited for examining the information value of bond ratings. This is because the coarse and fine rating systems can be ordered by Blackwell's (1953) if-and-only-if theorem: the new system provides information in a strictly finer partition than the coarse system Moody's used up to that date. Moreover, the fine and coarse reports we compare are based on the same rating procedure and information.

Analyzing bond, stock, and option prices observed before and after the change in Moody's rating system, we find that rating information is valuable. First, following Moody's announcement of the fine ratings, bond prices adjusted to the new information. This adjustment is evident both in the abnormal returns of the fine-rated bonds and in the changes in their yield spreads. Second, the prices of the stocks of the fine-rated firms also reacted to Moody's new information. Consistent with the asset-substitution theory, we find that shareholders, as the residual claimants, lose when investors revise their risk assessments downward, whereas bondholders, as holders of the senior claim, benefit from such reductions in risk assessments. Third, we show that when Moody's announces better- (worse-) than-expected fine ratings, the volatilities implied by the prices of options on the stocks of the fine-rated firms decline (rise). We do not find that Moody's announcement affected total-firm values. We interpret the last result as suggesting that rating information is largely about diversifiable default risk, although it could simply be due to the smaller sample available for this test. Last, the impact of the release of fine-rating information appears to be greater for high-leverage firms than for low-leverage firms.

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