The Information Value of Bond Ratings

by

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Abstract

We examine whether bond ratings contain pricing relevant information, that is unavailable to investors from other sources, by focusing on investor reaction to rating changes that *were not accompanied by any economic fundamental event*—Moody's refinement of its rating system. This 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*.

We find that *rating information is valuable*: (1) Prior to the release of Moody's fine rating information, bond yield spreads were not perfectly correlated with the fine rating information Moody had but hadn't made public; (2) Following Moody's announcement of the fine ratings, bond prices adjusted to the new information; and (3) The prices of the stocks of the bond issuers also reacted to Moody's new information. In accordance with the observation that stock value is a *convex* function of the firm's value while bond value is a *concave* function of the firm's value, the stock price reaction was in the *opposite direction* to that of the bond prices. Lastly, the *total-firm value* was not significantly affected by the announcement of Moody's fine ratings. We interpret this to mean that information conveyed by rating changes about default risk is largely diversifiable.

THE INFORMATION VALUE OF BOND RATINGS

INTRODUCTION

Virtually all large ($50 million and over) corporate bond issues are rated by at least one rating agency. These ratings are costly: Ratings cost $20,000 for issues of up to $500 million and 0.5 basis points of issued amount for issues exceeding $500 million. The interesting fact is that, although bonds are rated *whether the issuer pays for the rating or not,* about 98% of the issuers choose to pay for the ratings of their bonds.

Why do corporations pay for ratings even though their issues would be rated even if they won't pay? By paying for ratings the firms get to incorporate inside information into the assigned ratings, without disclosing the actual information to the public at large. Much inside information cannot be made public since its release may benefit competitors, or may subject the insiders to lawsuits should their projections not materialize. On the other hand, private disclosure of inside information to raters allows the raters to assign ratings that incorporate this information without fully revealing it. Indeed, in the rating process corporations provide raters with detailed inside information (e.g., five-year forecasts and pro-forma statements, internal reports) in the form of written documents and presentations to raters.[1] Moreover, issuers who either subscribe to the annual rating review service, or issue *series* of rated bonds, or are interested in ensuring "appropriate" subsequent ratings for their issues, meet the raters annually and continue to provide them with inside information, which is also incorporated into the rating process.

However, even if issuers provide inside information to the raters, payment for ratings is justifiable only if the inside information incorporated into ratings is pricing relevant and if investors cannot obtain it from other sources. This issue is the focus of our paper. We try to provide answers to the following questions: Is some of the information incorporated into ratings truly unknown to investors? Is this information relevant for pricing corporate securities?

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[1] The importance corporations assign to ratings is apparent by the fact that presentations to raters are often attended by the firms' CEOs, CFOs, and other top executives.

Extensive research on whether bond rating information is valuable or not has produced mixed results. 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. We distinguish between two approaches to examine whether ratings information is valuable, each with its own merits and lacunas: studies that examine how the *level* of bond yields is related to rating information, and studies that examine price reactions to rating *changes*.

In the first approach, yield spreads of corporate bonds (i.e., the differences between corporate bond yields and the yields of equal-maturity, default-risk-free, bonds) are related to bond rating information. Specifically, West (1973), Liu and Thakor (1984), Ederington, Yawitz and Roberts (1984, 1987) and others, use accounting data (such as financial ratios) and issue characteristics (such as issue size) to explain the cross-section of corporate-bond yield spreads. Using these controls, they could test whether the inclusion of bond rating information has explanatory power beyond the power of the control variables alone. In general, these studies find that ratings have additional power in explaining the cross section of yield spreads. There is, however, an inherent difficulty with interpreting these results: It is not clear whether it is the rating information *per se* that is pricing relevant, or that rating information merely *proxies* omitted, publicly available, variables.

To overcome this difficulty, studies taking the second approach focus on rating *changes* and examine the reactions of bond and stock prices to announcements of such changes. The advantage of this approach is that each firm effectively serves as its own control, so control for all pricing-relevant factors is achieved. 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 the stock and bond price reaction to rating changes. Yet, the overall picture that emerges is of significant negative stock-price and bond-price reactions to rating downgrades, and weaker positive bond-price and stock-price reactions to upgrades. The difficulty with the interpretation of these results, however, is due to the fact that rating changes are triggered by economic events. Hence, it is not clear how much of the documented price reaction is due to the underlying economic event and how much is due to the new rating information *per se*.

In this study we employ a new approach to examine whether rating information is valuable. We also use each firm as its own control by examining price reactions to rating *changes*. But, unlike prior studies, we do not examine rating changes that are triggered by fundamental changes in the issuers' risks. Rather, we examine investor reaction to rating changes that *exclusively reflect rating information*—rating changes that occurred when Moody refined its ratings reporting method.

On April 26, 1982 Moody refined its rating report: Instead of reporting rating information by coarse rating classes, Moody began on that day to report ratings using a finer rating partition. Virtually all the fine ratings given by Moody on that day were based on the same information underlying the preceding coarse-ratings. The change in the way Moody reports its assessments of default risks

- *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 on that day.

The rating changes we examine are, therefore, merely refinements of the signals that Moody sends investors regarding its assessment of the default risks of the rated bonds. In fact, the refinement of Moody's rating reporting system is perfectly suited to examine the information value of bond ratings: The two reporting systems can be ordered by Blackwell's if-and-only-if theorem since the new reporting system provides information in a strictly finer way than the reporting system Moody used up to that date.

The advantages of our approach to examining the marginal information value of ratings do not come without a cost. Unlike prior studies that examine changes which took place on different days, the rating changes we examine are perfectly clustered in time—all of them were carried on the same day. Thus, our study suffers from the problem that afflicts any cross sectional study: It is possible that some common macro-economic factors affected the returns we examine. We try to overcome this difficulty by *comparing* bond price reactions within the cross section so that common factors are netted out. A second problem with our study is that we examine *fine* rating changes—the addition of modifiers to coarse rating categories. These are smaller rating changes than the changes of coarse rating classes previously examined. Since we analyze the impact of releasing relatively small pieces of rating information, the power of our tests is reduced.

We find that *rating information is valuable*. This is shown in three ways: First, prior to the release of Moody's fine rating information, bond yield spreads were not perfectly correlated with the fine rating information Moody subsequently revealed. This means that the fine rating information was potentially useful. Second, following Moody's announcement of the fine ratings, bond prices adjusted to the new information. The adjustment is evident both in the abnormal returns of the fine rated bonds and in the changes in their yield spreads. Third, the prices of the stocks issued by the bonds' issuers also reacted to Moody's new information. As asset-substitution theory suggests, the price reactions of the bonds and of the stocks are in *opposite directions*: Shareholders, as residual claimants, *lose* when investors revise downwards their assessment of the issuer's risk while bond holders, as holders of senior claims, *benefit* from such reduction in risk assessments. Lastly, for a subsample of issuers for which we have both price and quantity data (as detailed in Section IV), we compute the effect of Moody's announcement of fine rating information on the value of the *whole* firm—debt and equity weighted by their relative values in the capital structure of the issuing firm. We find no evidence that the default information provided by the fine ratings affects the value of the firm as a whole. This result supports our assertion that Moody's refinement of its rating reporting system was not accompanied by a fundamental change in the firms' systematic risks. Moreover, given that we do find separate effects on the values of shareholders' and debt holders' claims, we interpret this result to mean that the incremental information of bond ratings is largely about diversifiable risks: If rating information is largely diversifiable, it will not affect the value of the whole firm, but will affect the division of this value among claims of different seniority. Lastly, we find that the effect of the fine-rating information release on bond prices is monotonic in firm leverage—the more levered the firm is, the stronger is its bonds' price reaction to new rating information.

The remainder of the paper is organized as follows: In Section 1 we discuss bond ratings, the rating process, and the change in the rating reporting system introduced by Moody on April 26, 1982. In Section 2 we describe the method of our study. Section 3 provides a description of the data and Section 4 of the results. Section 5 concludes.

1. Bond Ratings and the Rating Process

Rating agencies attempt to assess the probability that an issuer will meet its debt service obligations (i.e., to assess the probability of default). The policy of Moody and Standard & Poor (S&P), the largest rating agencies in the US, is to rate all major issues that may interest their clients. The assessed relative creditworthiness is reported by assigning one of ten rating symbols. Ordered by descending credit quality (ascending default risk), these symbols for Moody and S&P, respectively, are:

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 rating reports is that they contain a limited number of categories. Hence, bonds that are in the same rating category are not claimed to be *absolutely* of the same quality, and an assigned rating cannot be *perfectly* inverted into a unique probability of default.

The rating process usually begins with the issuer or the issue's underwriter requesting to be rated. In case neither the issuer nor the underwriter approach the rater, the rater contacts the issuer after the new issue's registration with the SEC. After contact has been established, the rating agency assigns an analytical team that reviews public information and internal company files with relevant material. This is followed by meetings between the issuer and the rating team, in which the issuer presents the issue prospectus and answers the agency's questions. This presentation is accompanied with detailed data on past and projected performance. Additionally, to support these projections, the issuer usually provides the agency with internal reports prepared for its board of directors. In most cases, the issuer's CEO, CFO, and treasurer participate in the meeting. After analyzing the information, the rating agency is ready to assign a rating to the issue. At this stage S&P's and Moody's procedures differ from each other. S&P notifies the issuer of the proposed rating and waits for a response. The issuer may decide to accept the rating or to appeal for a rerating by providing S&P with additional supporting information. In case of an appeal, S&P's analysts discuss the new information relevance and vote on the rating. After this appeal procedure or after the issuer accepts the initial rating, the rating is formally notified to the issuer and is released to the public. Moody's policy is not to allow issuers to appeal for a rerating. Instead, the rating is simultaneously announced to the issuer and to the public. After the assigned rating is published, both agencies enter the rated issue into a surveillance system.

In recent years, major bond raters have begun to attach modifiers to some of their coarse rating categories. S&P and Fitch were the first rating agencies to attach modifiers. They divide their AA, A, BBB, BB and B rating categories into three sub-categories each, by adding modifiers in the form of plus and minus signs (+ / -). A few years later, Moody followed S&P and Fitch by attaching the digits 1, 2 and 3 to its Aa, A, Baa, Ba and B coarse categories. The most creditworthy sub-category within a given coarse category is denoted by a plus (+) modifier in S&P's and Fitch's systems and by the digit 1 in Moody's system. The following sub-category remains without a modifier assignment in S&P's and Fitch's systems and has the modifier 2 in Moody's system. A minus (-) sign or the digit 3, respectively, is attached to the ratings of the bonds in the least creditworthy sub-category.

Moody's adoption of rating modifiers was abrupt and without prior notice: On April 26, 1982, Moody came out with a special edition of its monthly publication—Moody's Bond Record—in which it announced the attachment of numerical modifiers to all the bonds it rated on that day. As opposed to the gradual approach that has been taken by Fitch and S&P in the implementation of their fine rating system, Moody attached all the modifiers at once: The special edition of Moody's Bond Record, dated April 26, modified its regular report (of March 31, 1982) by adding modifiers to the previously announced ratings. The regular report sent to Moody's subscribers on April 30, 1982 included the modifiers, as do all subsequent reports.

In the special issue of Moody's Bond Record, Moody emphasized 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." Thus, the special report that contained the fine ratings was based on the same rating procedures and information underlying the preceding report of March 1982, which reported only coarse ratings. Assessed default risks were merely reported in a finer way than the way used prior to that date.

To the best of our knowledge, Moody's attachment of modifiers was not preceded by any public announcement. The Wall Street Journal reported this event only in its April 27, 1982 issue, a day after the actual adoption of the fine rating system by Moody (see Exhibit 1).

2. METHOD OF STUDY

We examine the value of rating information by comparing bond and stock 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. (Obviously, both prices reflect investors' information as well.) Two key aspects of this comparison are to be noticed. First, the two reports are based on the same underlying information. They are only *reported* in different ways. Second, the two rating reporting systems can be ordered by Blackwell's Theorem: The system of reporting rating information without class modifiers is, by design, less informative than the rating system that includes these modifiers.

The time line underlying our analysis is as follows:

Pre-change period	April 26, 1982	Post-change period
Coarse ratings announced. Investors trade securities.	Fine ratings announced. (The event day)	Investors trade securities.

We examine whether rating information is redundant in two ways:

- by examining whether, *prior* to the release of the refined rating information, bond prices *demonstrated anticipation* of the information released on the event day, and
- by examining whether, *upon* the announcement of the refined ratings, prices *reacted* to the fine rating information.

To derive our testable hypotheses we rely on the analogy between equity and a call option on the assets of the firm with an exercise price equal to the face value of the firm's debt.[2] Under this analogy, the value of the firm's debt is the value of the firm's assets less the value of that call option on the firm's assets. The analogy highlights the fact that, for a given capital structure, debt holders bear the downside risk of the firm, while the shareholders are entitled to the upside potential. This asymmetry in the distribution of the outcome of the firm's operations means that debt holders' payoff is a concave function of the value of the firm's assets and that the shareholders' payoff is a convex function of this value.

We use the following notation:

F = the face value of the firm's debt,

V = the value of the firm's assets,

σ = the risk / volatility of the firm's asset return,

$C(V, F, \sigma, \cdot)$ = the value of a call option on V with exercise price F,

E = the value of the firm's equity, and

D = the value of the firm's debt.

Using this notation, the equity value is:

$$E = C(V, F, \sigma, \cdot) \tag{1}$$

and the value of the debt is given by:

$$D = V - C(V, F, \sigma, \cdot). \tag{2}$$

[2] The derivation of the testable hypotheses in this section relies on the model of Kliger (1997).

Both the investors and the rating agency are concerned with the risk of the firm's assets, which is measured in our setting by σ. *Ceteris paribus*, an increase in σ implies an *increase* in the value of the equity:

$$\frac{\partial E}{\partial \sigma} > 0 \tag{3}$$

and a *decrease* in the value of the debt:

$$\frac{\partial D}{\partial \sigma} < 0 . \tag{4}$$

Both the investors and the rating agency estimate σ. The rating agency signals its assessment of σ by announcing the rating it assigns to the bond. Investors set the prices of the stock and of the bond (or, equivalently, determine the bond's yield to maturity—YTM) to reflect their private information and the rating information. We denote the *assessed risk* of the firm by $\hat{\sigma}$.

To study the information value of ratings, we decompose $\hat{\sigma}$: Prior to the announcement of the fine rating, $\hat{\sigma}$ incorporates two components: The first component, denoted by σ^C, is the benchmark risk assessment—the risk assessed by investors based on the *coarse rating* and on their *private information*. The second component is an estimation risk component, denoted by σ^{Est}. This component is included in $\hat{\sigma}$ since σ^C is a *point estimate* of the firm's risk. Thus, prior to the announcement of the fine rating, the bond and stock prices reflect:

$$\hat{\sigma}_C = \sigma^C + \sigma_C^{Est} , \tag{5}$$

The announcement of the fine rating changes the assessed risk of the firm. An additional component of $\hat{\sigma}$, denoted by σ^F, is introduced: σ^F reflects the average risk of all bonds in the bond's *fine* rating sub-category. The assessed risk used for pricing the securities *after* the fine rating is announced reflects both the prior risk assessment, σ^C, and the new information, σ^F. Again, since σ^C and σ^F are *point estimates* of the firm's risk, $\hat{\sigma}$ also includes the estimation risk component, σ^{Est}. The estimation risk depends on the amount of information conveyed by the fine rating: The more information the fine rating conveys, the lower the post-announcement estimation risk. Thus, following the fine rating announcement the bond and stock prices reflect:

$$\hat{\sigma}_F = \alpha \cdot \sigma^C + (1-\alpha) \cdot \sigma^F + \sigma_F^{Est}. \tag{6}$$

Equations (5) and (6) highlight the fact that Moody's switch to the refined rating system has *two* potential effects on investors' risk-assessments: First, by providing more detailed information, it reduces the estimation risk ($\sigma_F^{Est} < \sigma_C^{Est}$). Second, since the fine-rating risk estimate (σ^F) may be different from investors' risk estimate prior to the release of the fine ratings (σ^C), the average post-announcement point estimate of the firm's risk (i.e., $\alpha\sigma^C+(1-\alpha)\sigma^F$) may differ from pre-announcement risk point estimate (σ^C). Using the notation "$\prec$" to denote better rating information (i.e., a rating that indicates lower risk), the switch to the fine system can bring the following changes in investors' risk assessment, $\hat{\sigma}$:

Relative rating information	Change of point estimate	Change of estimation risk	Resulting $\Delta\hat{\sigma}$
$\sigma^F \prec \sigma^C$	+	-	?
$\sigma^F \approx \sigma^C$	~	-	-
$\sigma^F \succ \sigma^C$	-	-	-

Using equations (3) and (4), these changes in the assessed risk correspond to the following changes in the bond and stock prices:

Relative rating information	$\Delta\hat{\sigma}$	ΔP^{bond}	ΔP^{stock}
$\sigma^F \prec \sigma^C$	?	?	?
$\sigma^F \approx \sigma^C$	-	+	-
$\sigma^F \succ \sigma^C$	-	+	-

A caveat is in order: The *ceteris paribus* assumption of the preceding analysis means, *inter alia*, that the information revealed by the switch to the fine rating system *does not affect the total value of the firm*. The reassessment of the firm's asset risk, however, need not pertain only to *diversifiable* risk. Rather, it may also impact investor assessment of the *systematic* risk. In case the change in the rating system modifies investors' assessment of the firm's *systematic* risk, the value of the *whole* firm—*V*— will change as well. In this case, the reaction of the stock and the bond prices to the change in the way the rating information is reported will be the sum of two effects: the effect of the change in the assessed risk and the effect of the change in the value of the firm. The indicated changes in the bond and the stock values in this case will be:

Relative rating information	$\Delta\hat{\sigma}$	ΔV	ΔP^{bond}	ΔP^{stock}
$\sigma^F \prec \sigma^C$	?	-	?	?
$\sigma^F \approx \sigma^C$	-	~	+	-
$\sigma^F \succ \sigma^C$	-	+	+	?

Thus, relative to the case where the value of the whole firm (*V*) does not change, in this case the price reaction of the stock is less likely to be negative when investors' lower their assessment of the firm's risk since the value of the whole firm rises following this risk reassessment. On the other hand, a concurrent change in the value of the firm reinforces the impact of the change in the assessed default risk on bond prices.

The above analysis implies that to examine the information content of ratings we should control for investors' assessment of firms' default risks prior to the announcement of the fine ratings. Such assessments, however, are not directly observable. Hence, we proxy them. To minimize the chance that our results are due to a selection of such a proxy, we use three proxies, based on three different benchmarks for investor expectations. The proxies we use are ordered by increasing levels of information investors are assumed to posses.

The first proxy for investor expectations is based on a *naïve benchmark*—it assumes that investors base their expectations of $\hat{\sigma}$ exclusively on Moody's coarse rating information. Under this naïve proxy we assume that when Moody reports only coarse ratings, investors consider all bonds within a coarse category to be of the same, average, risk. Since under 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 assigns modifier "1" $\Rightarrow$ $\sigma^F < \sigma^C$
- Moody assigns modifier"2" $\Rightarrow$ $\sigma^F = \sigma^C$
- Moody assigns modifier"3" $\Rightarrow$ $\sigma^F > \sigma^C$

The naïve benchmark does not incorporate any non-Moody's information that might have been available to investors at the time the rating reporting system was changed. However, at the same time that Moody still used *coarse* ratings, S&P used a *fine* rating system. S&P does not necessarily use the same rating criteria and information as Moody's. Still, since the objectives of S&P and Moody and their methods are similar, we use the rating modifiers assigned by S&P prior to Moody's adoption of the rating modifiers as a second benchmark for investors' assessments of issuers' default risks. We call this the *S&P benchmark*. Under the S&P benchmark we assume that investors form their risk assessments using only Moody's and S&P's rating information: If S&P assigns a "+" modifier[3] to an issue's rating, investors expect Moody to assign a "1" modifier to the issue. If S&P assigns a "-" modifier[4] to an issue's rating, investors expect Moody to assign a "3" modifier to the issue. Lastly, if S&P does not assign a modifier to an issue's rating, investors expect Moody to assign a "2" modifier to that issue. Accordingly, under the S&P benchmark the revision of investor expectations is:

[3] Or if S&P's *coarse* rating is better than the coarse rating assigned by Moody prior to April 26, 1982.
[4] Or if S&P's *coarse* rating that is worse than the coarse rating assigned by Moody prior to April 26, 1982.

♦ S&P assigns a "+" modifier and

$$\begin{cases} \text{Moody assigns modifier "1"} & \Rightarrow \sigma^F = \sigma^C \\ \text{Moody assigns modifier "2" or "3"} & \Rightarrow \sigma^F > \sigma^C \end{cases}$$

♦ S&P assigns no modifier and

$$\begin{cases} \text{Moody assigns modifier "1"} & \Rightarrow \sigma^F < \sigma^C \\ \text{Moody assigns modifier "2"} & \Rightarrow \sigma^F = \sigma^C \\ \text{Moody assigns modifier "3"} & \Rightarrow \sigma^F > \sigma^C \end{cases}$$

♦ S&P assigns a "-" modifier and

$$\begin{cases} \text{Moody assigns modifier "1" or "2"} & \Rightarrow \sigma^F < \sigma^C \\ \text{Moody assigns modifier "3"} & \Rightarrow \sigma^F = \sigma^C \end{cases}$$

The first two expectation proxies rely exclusively on rating information. Investors, however, possess additional information. To proxy for investor expectations as closely as possible, we use the *market benchmark*—a benchmark that relies on prices observed prior to the modifiers' announcement. This benchmark reflects all the information investors 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 rated bonds—the differences between the yields of the corporate bonds and the yields of equal-duration default-risk-free bonds.[5] Based on the yield spreads observed *prior* to Moody's change of its rating reporting system, we classify high-yield-spread bonds as bonds that were considered by investors, *prior to the change*, to be of relatively high default risks, and low-yield-spread bonds as bonds that were considered by investors to have relatively low default risks. Specifically, within coarse rating categories, we classify a bond as assessed by investors prior to Moody's change of rating system to have a *below-average* default risk if its yield spread is in the *lowest quartile* of

[5] We use both equal-duration AAA-rated corporate bonds and equal-duration 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.

yield spreads in its coarse rating. Similarly, we classify a bond as assessed by investors to have an *above-average* default risk if its yield spread is in the *highest quartile* of yield spreads in its coarse rating and bonds in the *inter-quartile range* are considered to be judged by investors as having an *average* default risk.[6] Using the market benchmark, the updating of the assessed risk is as follows:

- YS in 1st (lowest) quartile and

$$\begin{cases} \text{Moody assigns modifier "1"} & \Rightarrow \sigma^F = \sigma^C \\ \text{Moody assigns modifier "2" or "3"} & \Rightarrow \sigma^F > \sigma^C \end{cases}$$

- YS in 2nd or 3rd quartiles and

$$\begin{cases} \text{Moody assigns modifier "1"} & \Rightarrow \sigma^F < \sigma^C \\ \text{Moody assigns modifier "2"} & \Rightarrow \sigma^F = \sigma^C \\ \text{Moody assigns modifier "3"} & \Rightarrow \sigma^F > \sigma^C \end{cases}$$

- YS in 4th (highest) quartile and

$$\begin{cases} \text{Moody assigns modifier "1" or "2"} & \Rightarrow \sigma^F < \sigma^C \\ \text{Moody assigns modifier "3"} & \Rightarrow \sigma^F = \sigma^C \end{cases}$$

Since the market benchmark reflects more information than the S&P benchmark, which in turn reflects more information than the naïve benchmark, we expect the market benchmark to provide the best basis off which to measure the effect of the refinement of Moody's rating reporting system, and the naïve benchmark to be the worst proxy for investor expectations.

[6] We use yield-spread *quartiles* since roughly a quarter of the bonds in our sample received the "1" modifier, a quarter received the modifier "3," and the remaining half received the "2" modifier. We also carried 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. The results are virtually the same. Hence, we report only the quartile-based classification results.

3. Data

Corporate bond data are obtained from the Lehman Brothers Fixed Income Data Base (FIDB). This data base consists of monthly information on the bonds that comprise the Lehman Brothers Bond Indices.[7] 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 and government agency issues, Aaa-rated issues, and nine bonds that were coarse re-rated between March and May 1982. In our analysis we examine yield spreads of corporate bonds—the differences between the yields of corporate bonds and the yields of equal-duration default-risk-free bonds. Our data on default-risk-free bonds are restricted to bonds with durations between one and eight years. Thus, we similarly restrict our corporate bond sample to bonds with durations of at least one year and no more than eight years. Lastly, callable bonds are excluded as well except if they were priced below 90% of par, in which case they are considered as virtually non-callable.

After removing the foreign and government bonds and bonds with missing data, call provisions, and extreme durations, our sample consisted of 1375 bonds issued by 916 companies. To avoid including multiple observations with virtually identical information, we keep only one bond for each issuer—the one most recently issued. Table 1 describes the distribution of these bonds across the different coarse and fine rating categories.

As is evident from Table 1, the B rating category is different from the other coarse ratings in the distribution of its fine ratings: The bonds in this category are concentrated in the B1 fine-rating category. This is because the FIDB files report 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 raters (i.e., Moody, S&P and Fitch). Since the ratings of the various raters 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 were originally rated as investment grade whose default risks have recently increased. Accordingly,

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

Moody down rated these bonds but some other main rater has not done so (possibly due to lags in rating updates). Hence these are bonds that are likely to have experienced a change in their fundamental risk just prior to our test period. To avoid examining a biased sample and a sample which is likely to have been affected by a risk change concurrently with the refinement of the rating reporting system, we exclude the B-rated bonds from our sample. Our final sample consists of 812 bonds issued by 812 firms. 16.13% of these bonds were sub-rated with a "1" modifier, 60.84% were sub-rated with a "2" modifier, and 23.03% were sub-rated with a "3" modifier.

Table 2 describes the maturity and yield characteristics of our sample. Recall we restricted our sample to bonds of durations no less than one year and no more than eight years. This duration range corresponds to maturity bounds of one to about 63 years. The average duration in our sample is almost six years, and the average maturity is 14 years. The yield spreads are measured both with respect to equal-duration AAA-rated corporate bonds and to equal-duration Treasury bonds. Both measures of default-risk premiums are highly correlated and, as prior research has shown, both are correlated with the coarse ratings assigned by Moody. The advantage of measuring yield premiums off equal-duration AAA-rated corporate bonds is that these bonds are taxed as corporate bonds, the pricing of which we examine. Therefore, if there are tax-motivated security clienteles, the tax effect on the benchmark securities and on the securities examined is likely to be the same. On the other hand, the Treasury bonds, are more liquid assets than corporate bonds, so their yields may better reflect changing market conditions. We carry our tests using both benchmarks and obtain virtually identical results. Hence, we report only the results based on the AAA-rated corporate bond benchmark. We also find (as we report at the end of the following section), by restricting our tests to a subsample of bonds for which we have positive proof that liquidity is not an issue, that lack of liquidity hardly affects our results.

4. RESULTS

The first question we examine is whether the information released by the refinement of the rating information was known to investors *before* the fine ratings were announced. To do so we examine the yield spreads of our bond sample *prior* to the release of the fine rating information: If prior to Moody's announcement of the fine ratings the yield spreads of bonds in the same coarse rating were higher for those bonds that eventually received a "3" modifier than for those that eventually received a "2" modifier, which in turn were higher than the yield spreads of those bonds that eventually received a "1" modifier, the information revealed by announcing fine ratings is no news to investors.

In Figure 1 we plot the average yield spreads of bonds by fine rating categories. The average yield spreads plotted are as of March 1982, that is *before* the fine rating information was made public. The evident pattern in the figure is that the average yield spreads of *coarse* ratings monotonically decline with ratings: the average yield spread of the Aa category is the lowest, the average yield spread of the A category is the second lowest, etc. *Within* coarse ratings, however, there appears to be no such monotone order: The fine sub-rating "1" may have a lower or a higher average yield spread than the sub-ratings "2" or "3", etc. Thus, the figure suggests that the fine rating information may be valuable to investors.

To test whether the differences across fine ratings correspond to the information subsequently revealed to investors, we estimate for each coarse rating category the cross sectional regression

$$YS^{March} = Intercept + \alpha_1 \cdot I_{fine=1} + \alpha_3 \cdot I_{fine=3} + \varepsilon \tag{7}$$

where $I_{fine=1}$ is a dummy variable that takes the value one if the bond was fine rated in April with a "1" modifier and zero otherwise and $I_{fine=3}$ is a dummy variable that takes the value one if the bond was fine rated in April with a "3" modifier and zero otherwise. Within each coarse rating, the dummy variables capture the differential average yield premiums of the fine ratings. If investors possess the information underlying Moody's fine ratings *prior to its release by Moody* (and this information is pricing relevant), the coefficient of $I_{fine=1}$ should be negative and the coefficient of $I_{fine=3}$ should be positive. In Table 3 we report these estimates, as well as one-tail hetroskedasticity-consistent p-values. We also report a pooled regression where we allow for different coarse-rating intercepts and estimate common fine rating effects.

The conclusion based on the estimates reported in Table 3 is similar to the conclusion drawn from the visual portrait of the average yields plotted in Figure 1. The coefficient of $I_{fine=1}$ is negative in three of the four coarse rating classes and in the pooled regression, but is significantly different from zero at 95% confidence only for the Baa category and for the pooled sample and with 90% confidence for the A category. The coefficient of $I_{fine=3}$ is positive only in two of the four coarse ratings and in the pooled regression, but none of these coefficient estimates is significantly different from zero (at 90% confidence). Even the difference between the average yield spreads of the "1" and "3" rating modifiers (which is reported in the last column of Table 3) is significantly different from zero at 90% confidence only for the A rating.

It appears that prior to the fine ratings' announcement Moody's fine rating information was not perfectly correlated with the pricing of the rated corporate bonds. Thus, Moody's decision to report its rating information in a finer way than it did up to April 26, 1982 could potentially reveal to investors information they did not possess previously.

To examine whether Moody's rating information is indeed valuable, we examine investor *reaction* to the announcement of the fine ratings: If the fine rating information is either known to investors from other sources or is pricing irrelevant, the prices of the firm's debt and equity claims should not react to the announcement. On the other hand, if the fine ratings contain pricing-relevant information that investors cannot obtain otherwise, the prices of the firms' bonds and stocks should react as predicted in the preceding section. As detailed in that section, we have three proxies for investor assessments of the default risks of bonds *prior* to the release of Moody's fine rating information:

- A *naïve proxy* that 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* that 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* that infers the implicit Moody's modifier investors assign to a bond from the yield spread of the bond relative to all other bonds with the same coarse rating.

The three proxies of investor expectations are ordered by the assumed information underlying them: The naïve proxy assumes that investors assess default risks based only on Moody's rating information; The S&P proxy assumes that investors assess default risks based on Moody's and on S&P's rating information; The market-based proxy does not restrict the information on which investors base their risk assessments. Based on each one of these three proxies for investors default-risk assessments, we break down our sample into three subsets:

- Bonds where the actual modifiers announced by Moody on April 26, 1982 indicate *lower* default risks than investors assessed prior to the release of the fine rating information (called the "good news" sub-sample);
- Bonds where the actual modifiers announced by Moody on April 26, 1982 *conform* to the default risks that investors assessed prior to the release of the fine rating information (called the "no news" sub-sample); and
- Bonds where the actual modifiers announced by Moody on April 26, 1982 indicate *higher* default risks than investors assessed prior to the release of the fine rating information (called the "bad news" sub-sample).

For each of the bonds so classified we compute the abnormal returns following the announcement of the fine rating information. The abnormal return for each bond i, denoted by AR_i, is computed by calculating the difference between its actual return to its yield to maturity (per month) 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 ratings' announcement. To control for the concurrent changes in the term structure of interest rates, we estimate (using a cubic spline) for each month—March, April, and May, 1982—the default-risk-free term structure of interest rates from the yields of AAA-rated corporate bonds and their durations.[8] The portion of the abnormal return due to changes in the term structure is estimated as the change in the default-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).

The change in the default-risk-free term structure of interest rates may affect differently bonds of different ratings. In estimating the impact of the fine rating information release we allow for possibly differential effects of the change in the term structure on bond returns. Specifically, we estimate the information impact with a cross sectional regression in which we control for the concurrent changes in the term structure with rating-specific coefficients:

$$AR_i = \beta_0 + \sum_R \beta_R \cdot \Delta TS_i \cdot Dur_i \cdot I_R + \beta_{good} \cdot I_{good} + \beta_{bad} \cdot I_{bad} + \varepsilon_i \tag{8}$$

where

β_R are rating-specific (Aa through Ba) coefficients that measure the relative impact of the change in the term structure of interest rates on bonds of this 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.

Since the "good news" indicator means that the fine rating assigned to the bond by Moody is better than expected, the expected sign of the coefficient of the "good news" indicator (i.e., β_{good}) is positive. Similarly, we expect the coefficient of the "bad news" indicator (i.e., β_{bad}) to be negative.

In equation (8) we estimate the impact of the release of the fine rating information by comparing the *abnormal returns* of the fine-rated bonds following Moody's announcement of the fine ratings. An alternative approach is to examine the relative *change in the bonds' yield spreads* following the fine ratings announcement:

[8] We also carried our analysis using Treasury securities as the default-risk-free benchmark and obtained virtually identical results. Thus, the choice of a particular risk-free term structure does not appear to affect our conclusions.

$$\Delta YS_i = \gamma_0 + \sum_R \gamma_R \cdot \Delta TS_i \cdot I_R + \gamma_{good} \cdot I_{good} + \gamma_{bad} \cdot I_{bad} + \xi_i \tag{9}$$

The expected coefficients of the "good news" and "bad news" indicators in equation (9) are of the *opposite signs* of the expected signs of these coefficients in equation (8). This is because "good news" means a decline in the assessed default risk, which implies an *increase* in the price of the bond (i.e., a *positive* abnormal return) and a *decrease* in the bond's yield spread.

Moody announced the fine ratings in its publication dated April 26, 1982. Thus, given that the FIDB records month-end prices, we should examine investor reaction to the announcement by comparing March and April 1982 month-end bond prices. However, since the bond market may be less liquid than the stock market, it is possible that the effect of the fine rating announcement was not fully reflected in bond prices at the end of April 1982. Hence, we examine price and yield changes both through the end of April 1982 and through the end of May 1982. Note, however, that the price and yield data in the two-month window are affected by more post-announcement events than the data of the one-month window and are, therefore, noisier.

The estimated coefficients for regression equations (8) and (9) are reported in Tables 4 and 5, respectively. In the tables we also report test statistics for the difference between the "good news" and "bad news" coefficients. The first conclusion that emerges from the numbers reported in these tables is that, as expected, the naïve benchmark is a poorer proxy for investor expectations than the S&P-based benchmark, which in turn is a poorer proxy than the market-based proxy. This is manifested by the smaller and less significant coefficients estimated with the naïve benchmark than those estimated with the S&P-based benchmark. The market-based benchmark, which reflects all the information investors incorporated into bond prices prior to Moody's reporting of the fine ratings, indeed yields the largest and most significant coefficients of all three benchmarks.

The second conclusion is that investors consider the fine rating information released to be relevant for pricing the bonds. This is evident by observing the market-based expectation model results both in Table 4 and in Table 5. In Table 4 we see that the abnormal returns of the bonds following Moody's announcement of the fine rating information are positive when Moody announced better-than-expected fine ratings and are negative when it announced worse-than-expected fine ratings. In Table 5 we see that yield spreads declined if Moody announced better-than-expected fine ratings and increased when it announced worse-than-expected fine ratings. (All coefficients in Tables 4 and 5 are significant at less than 1% when the market-based benchmark is used.) Hence, investors consider rating information to be non-redundant and relevant for the assessment of default risk and for the determination of bond prices.

Because most corporate bonds are traded among dealers rather than in a central market, some of the bonds we examine may be relatively inactively traded. To examine whether our conclusion is potentially subject to problems due to stale prices, we also analyze a subsample of *actively traded* bonds based on a liquidity indicator included in the FIDB. The FIDB reports for each month-end bond price if it is a direct price quote (designated in the FIDB as "quotes") or if it is a price the trader determines relative to another benchmark bond (typically a Treasury bond with a similar maturity). The latter prices are called "matrix prices", since these prices are determined by a spread that traders specify for each bond above a matrix of benchmark yields. 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 respective yield premiums 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.

As the analysis in Section 2 suggests, the release of the fine rating information may also impact *stock* prices. We examine whether such an effect is present in the data by comparing the stock price reactions of issuers whose bonds Moody fine rated *worse* than expected to the stock price reactions of issuers whose bonds Moody fine rated *better* than expected. To be consistent with the analysis of the bond price reaction, we continue to call the case where Moody's fine rating was *lower* than investors expected "bad news" and the case where Moody's fine rating was *higher* than investors expected, "good news." Note, however, that stockholders (as holders of option-like securities) *benefit* from an upward reassessment of the firm's risk, which means that "good news" for bond holders are actually *bad* news for stockholders.

The indication of whether the fine rating information is considered "good news" or "bad news" by investors is given by the same three proxies for investor expectations we used to examine bond price reactions: 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 investors assign an implicit Moody's modifiers to bonds according to the rating modifiers they receive from S&P, and a market-based proxy that infers the implicit Moody's modifier investors assign to a bond from the yield premium of the bond relative to all other bonds with the same coarse ratings. We denote the difference between the average abnormal stock returns of "good news" and "bad news" issuers by ΔASR.

We calculate above-normal stock returns relative to three benchmarks for normal returns: the average return of the stock in the 80 through 10 trading days preceding Moody's announcement, the market rerun in the sample period, and the market model of returns. The market-model expected conditional return is estimated by $E(r_i \mid r_m) = \alpha_i + \beta_i \cdot r_m$, where 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.

Moody's special report in which it attached modifiers to coarse ratings is dated April 26, 1982. The attachment of the fine ratings was reported in The Wall Street Journal on April 27, 1982. The fine ratings were applied to the regular rating report Moody sent its subscribers on April 30, 1982 (and thereafter). Since we are not sure on which day investors actually received the fine ratings' report, the relevant period during which the fine rating information was incorporated into the issuers' stock prices is not precisely clear.[9] To ensure that the effect of Moody's announcement is indeed included in the abnormal returns we estimate, we report abnormal returns for two periods: the announcement day ("one day") and

[9] With the bond abnormal return data this is not a problem since we have only *monthly* observations.

the announcement week—the five trading days of April 26, 1982 through April 30, 1982 ("one week").[10] Over these two periods the market return (measured by the CRSP value weighted index) was -0.91% and -1.87%, respectively.

As mentioned in the introduction, our data are perfectly clustered in time: All announcements took place on the same day. This means that we need to account for the daily co-movements of stock prices. Hence, we calculate for each expectation model the covariance matrix of daily returns of the "good news" and "bad news" portfolios. Then, we calculate the standard errors of the coefficient estimates relative to these variance and covariance estimates (i.e., we boot-strap the statistics' distributions).

The estimated effect of Moody's announcement of the fine rating information on the prices of the stocks issued by the bonds' issuers is reported in Table 6. The estimated mean difference between the reaction to the announcement of "good news" and the reaction to the announcement of "bad news" is about one percent when investor reaction is measured over the week of the announcement (i.e., including the effect of the month-end publication) and one fifth of a percent when the effect is measured over the announcement day only. This difference is not statistically different from zero, while the effect over the whole announcement week is (with p-values that depend on the proxy for investor expectations). Whether measured over the announcement day or over the announcement week, the average stock price reaction of the issuers is as described in equation (3): The prices of the shares of issuers that Moody reported have lower default risk than expected *decline*, while those that Moody reported had higher risk than expected *rise*. This is direct evidence that there occurred a transfer of wealth between debt holders and shareholders when investors revised their assessments of issuers' default risk: from shareholders to bond holders if the revision was to a lower risk assessment and from bond holders to shareholders if the risk assessment was revised upwards. Thus, the effect of Moody's announcement of fine rating information on the issuers' stock prices confirms the conclusion drawn on the basis of the reaction of bond prices: Moody's fine rating information is important in that it helps investors better assess the default risks of issuers. This is also a

[10] Since we are not sure whether one week is indeed the appropriate time frame, we also calculate abnormal returns for 4 and 6 trading days. There is hardly any difference between the 4, 5, and 6 days' ΔASR's.

direct evidence of the differing interests that shareholders and bond holders have in the firm to which they provide capital under different contractual provisions.

So far we consider the *separate* effect of Moody's announcement on the prices of the rated bonds and on the prices issued by the bonds' stocks of the issuers. The hypothesized directions of these effects were derived under the assumption that default risk is largely diversifiable so that the revision of the assessment of a firm's default risk hardly affects the firm's total value. Now we test this assumption. To do so we need data about the capital structure of the firms whose bonds were fine rated. We obtain these data from the COMPUSTAT data base, which contains such data for a subsample of 198 issuers. Using COMPUSTAT's capital structure data, we compute the abnormal return for the whole firm by value-weighted averaging the abnormal returns of the firms' debt and equity. In figuring the abnormal return of the firms' debt securities we use the estimated abnormal returns for the *traded* (and fine rated) bonds to estimate the abnormal return on *all* of a firm's debt—traded or not.

In Table 7 we report the estimated abnormal changes in firm values following Moody's announcement of the fine ratings. Evidently, there is no clear effect of the announcement: The sign of the differences between estimated average abnormal changes in firm values depends on the method of measurement and is not significantly different from zero in the majority of the cases. Moreover, the difference of average abnormal returns is not monotonic: It is not the case that the better the news, the higher the average abnormal return (or vice versa).

While the lack of a significant effect on the value of the whole firm or the lack of monomtonicity of the effect may be due to data limitations that reduce the power of our tests, given the size of the sample we prefer to interpret the results reported in Table 7 as indicating that rating information about default risk is largely diversifiable. Accordingly, we interpret this result to mean that a change in investor assessment of default risk due to the rating information primarily leads to a wealth transfer among the holders of the firm securities. The impact of such a change on the overall value of the firm must be of a smaller magnitude as it is not detected in our sample. This result confirms our assumption that the refinement of Moody's rating reporting system was not accompanied by fundamental changes in firms' systematic risks. Moreover, the result suggests that bankruptcy costs are not a significant determinant of firm value: Otherwise the change in the assessed default risk would have materially affected firm value.

Using the subsample of 198 firms for which we have data about capital structures, we can also examine whether the value of the fine rating information depends on the leverage of the firm. We may expect that the higher the leverage of the firm, the more important the fine rating information. This is because at low leverage the firm's debt is almost risk free so risk sharing between the debt holders and the shareholders is minimal, while at high leverage levels debt holders bear relatively more of the firm's risk. Based on this intuition and the reactions predicted by equations (3) and (4), we expect leverage to be positively correlated with the reaction of bond prices to the announcement of "good news" and negatively correlated with the announcement effect of "bad news." The reverse is expected for stock price reactions.

We measure the relative importance of the fine rating information by the market reaction to the announcement: the reaction of bond prices, stock prices, and firm values. 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 8. The estimated coefficients for the reactions of the bond and the stock prices are all in the predicted direction. In the bond abnormal return regression, the coefficients of leverage, both for the "good news" and the "bad news" cases, are significantly different from zero (p-values are 2.2% and 9.1%, respectively). The rest of the coefficients 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. Yet, all the point estimates indicate that, as expected, the value of the rating information increases with the leverage of the firm.

5. CONCLUSIONS

Despite the fact that ratings and rating reports are costly, many investors purchase these reports and virtually all issuers pay to be rated. 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 underlying information to the public at large. Indeed, during the rating process (and often many years afterwards) issuers provide raters with forecasts and internal reports.

Is rating information indeed pricing relevant and useful? This question has been the subject of extensive research. Yet, no uniform answer has emerged from these studies. 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 investor reaction 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 began to report ratings using a finer rating classification than it previously used. Moody's change *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 on that day. The refinement of the signal that Moody sends investors regarding its assessment of default risks is, therefore, perfectly suited to be used in the examination of the information value of bond ratings: The coarse and fine rating reporting systems can be ordered by Blackwell's if-and-only-if theorem since the new reporting system reports the same information in a strictly finer way than was used up to that point in time. Moreover, the fine and coarse reports we compare are based on the same rating procedure and information.

Analyzing bond and stock prices observed before and after the change in Moody's rating system we find that *rating information is valuable*. This is shown in three ways. First, prior to the release of Moody's fine rating information, bond yield-spreads were not perfectly correlated with the fine rating information Moody had but hadn't made public. Second, following Moody's announcement of the fine rating information, 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 premiums. Third, the prices of the stocks of the bond issuers also reacted to Moody's new information. As asset-substitution theory suggests, we find that shareholders, as the residual claimants, *lose* when investors revise downwards their assessment of the risk of the issuer while bond holders, as holders of the senior claim, *benefit* from such reduction in risk assessments. The impact of the release of fine rating information appears to be greater for high leverage firms than for low leverage firms.

Lastly, we find that there is no clear effect of Moody's announcement of fine ratings on the value of the firm as a whole. Specifically, we find that changes in total-firm values following Moody's announcement are not systematically related to changes in investors' default risk assessment.

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EXHIBIT 1: THE WALL STREET JOURNAL REPORT*

Moody's Adds Numbers To Bond Rating System

By a **Wall Street Journal** *Staff Reporter*

NEW YORK - Moody's Investors Services Inc. has added numbers to its letter system of rating corporate bonds.

If the number one is added to letter rating, it means the bond ranked at the high end of the rating category. The number two denotes a mid-range ranking and the number three designates the low end of a rating category.

Five of Moody's nine corporate bond rating symbols are affected: Double-A, single-A, Baa, Ba and single B. About 1,200 companies have had their ratings modified, Moody's said.

Thomas J. McGuire, executive vice president of Moody's said the numbers are designed to provide investors with "a better assessment of corporate credit quality." In effect, Moody's increased the number of possible credit rating to 19 from nine, he said.

* The Wall Street Journal, April 27, 1982 (page 38, column 4).

Table 1:
The distribution of the corporate bond sample across rating categories

The table describes the distribution of the sample of most-recently issued corporate bonds taken out of the Fixed Income Data Base of the Fixed Income Research Program at the University of Wisconsin-Milwaukee School of Business Administration. Bonds are included in the sample if they are included in the data base's cross sections of March, April, and May 1982, if they were not rated in this period in more than one coarse rating class, if their durations are between one and eight years, and if they are not callable.

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

Table 2: Bond sample characteristics

The table describes the maturity structure of our sample of 812 corporate bonds and their yield premiums measured off equal-duration AAA-rated corporate bonds and off equal-duration Treasury bonds. Bonds are included in the sample if they are included in the Fixed Income Data Base of the Fixed Income Research Program at the University of Wisconsin-Milwaukee School of Business Administration cross sections of March, April, and May 1982, if they were not rated in this period in more than one coarse rating class, if their duration is between one and eight years, if they are not callable, and if they were rated Aa, A, Baa, or Ba in April 1982.

Rating Category		Average	Max	Min	Std Dev
Aa	Time to Maturity	14.55	55.29	1.09	8.05
	Duration	6.05	7.91	1.02	1.63
A	Time to Maturity	14.11	46.79	1.09	7.78
	Duration	5.89	7.98	1.05	1.53
Baa	Time to Maturity	14.27	62.80	1.09	7.61
	Duration	5.73	7.95	1.06	1.40
Ba	Time to Maturity	13.02	26.19	1.13	6.26
	Duration	5.41	7.43	1.08	1.26
Total	Time to Maturity	14.22	62.80	1.09	7.77
	Duration	5.87	7.98	1.02	1.53

Rating Category		Average	Max	Min	Std Dev
Aa	YS off Corporate	1.32	4.37	-1.10	0.76
	YS off Treasury	0.84	3.79	-1.66	0.79
A	YS off Corporate	1.70	6.38	-2.41	0.92
	YS off Treasury	1.22	5.81	-3.00	0.95
Baa	YS off Corporate	2.67	12.25	0.11	1.26
	YS off Treasury	2.18	11.66	-0.48	1.27
Ba	YS off Corporate	4.34	12.20	-1.98	1.55
	YS off Treasury	3.84	11.62	-2.57	1.55
Total	YS off Corporate	1.93	12.25	-2.41	1.22
	YS off Treasury	1.45	11.66	-3.00	1.23

Table 3:

Differences in yield spreads before the release of fine rating information

The table describes the yield spreads (measured off equal-duration AAA-rated corporate bonds) by fine rating sub-classes. The reported coefficients are of the regression equation

$$YS^{March} = Intercepts + \alpha_1 . I_{Fine=1} + \alpha_3 \cdot I_{Fine=3} + \varepsilon$$

where $I_{fine=1}$ denotes a dummy variable that takes the value one if the bonds was fine rated in April with a "1" modifier and zero otherwise and $I_{fine=3}$ denotes a dummy variable that takes the value one if the bonds was fine rated in April with a "3" modifier and zero otherwise. The regressions are estimated for each coarse rating separately and pooled with a separate intercept for each rating (i.e., a fixed-effects regression). Numbers in parentheses are one-tail hetroskedasticity-consistent p-values. NM means that the p-value is not meaningful since the estimated coefficient is of the opposite sign than expected.

Coarse Rating	α_1	α_3	α_3-α_1
Aa	0.172 (NM)	0.098 (0.177)	-0.074 (NM)
A	-0.182 (0.056)	0.135 (0.111)	0.317 (0.010)
Baa	-0.392 (0.021)	-0.201 (NM)	0.191 (0.226)
Ba	-0.300 (0.276)	-0.113 (NM)	0.186 (0.397)
Pooled	**-0.156** **(0.041)**	**0.047** **(0.280)**	**0.203** **(0.132)**

Table 4: The effect of the release of fine rating information on bond prices

The table describes the returns of bonds (above the return indicated by the concurrent change in the term structure of interest rates) following Moody's announcement of fine rating information. The reported coefficients are of the regression equation

$$AR_i = \beta_0 + \sum_R \beta_R \cdot \Delta TS_i \cdot I_R + \beta_{good} \cdot I_{good} + \beta_{bad} \cdot I_{bad} + \varepsilon_i$$

where β_0 is an intercept, β_R are rating specific (Aa through Ba) coefficients that measure the relative impact of the change in the term structure of interest rates on bonds in this rating, I_R are rating indicators, and I_{good} (I_{bad}) indicates that the bond's fine rating information is considered good (bad) news. The indication of whether the 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"), S&P-based proxy that assumes that investors assign an implicit Moody's modifiers to bonds according to the rating modifiers they receive from S&P, and a market-based benchmark that infers from the yield premium of a bond relative to all other bonds with the same coarse ratings the implicit Moody's modifier investors assign to the bond. Numbers in parentheses are one-tail hetroskedasticity-consistent p-values. NM means that the p-value is not meaningful since the estimated coefficient is of the opposite sign.

Expectation model	Period	Good news vs. no news	Bad news vs. no news	Good news vs. bad news
Naïve	Mar - Apr	-0.059 (NM)	-0.041 (0.385)	-0.018 (NM)
	Mar - May	0.277 (0.081)	0.147 (NM)	0.130 (0.301)
S&P-based	Mar - Apr	0.115 (0.201)	-0.139 (0.133)	0.253 (0.050)
	Mar - May	0.219 (0.147)	-0.005 (0.490)	0.224 (0.175)
Market-based	Mar - Apr	0.401 (0.000)	-1.294 (0.000)	1.694 (0.000)
	Mar - May	0.923 (0.000)	-2.631 (0.000)	3.554 (0.000)

Table 5:

The effect of the release of fine rating information on bond yield spreads

The table describes the changes in the yield spreads of bonds (above the change indicated by the concurrent change in the term structure of interest rates) following Moody's announcement of fine rating information. The reported coefficients are of the regression equation

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

where γ_R is an intercept, γ_R are rating specific (Aa through Ba) coefficients that measure the relative impact of the change in the term structure of interest rates on bonds in this rating, I_R are rating indicators, and I_{good} (I_{bad}) indicates that the bond's fine rating information is considered good (bad) news. The indication of whether the 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"), S&P-based proxy that assumes that investors assign an implicit Moody's modifiers to bonds according to the rating modifiers they receive from S&P, and a market-based benchmark that infers from the yield premium of a bond relative to all other bonds with the same coarse ratings the implicit Moody's modifier investors assign to the bond. Numbers in parentheses are one-tail hetroskedasticity-consistent p-values. NM means that the p-value is not meaningful since the estimated coefficient is of the opposite sign.

Expectation model	Period	Good news vs. no news	Bad news vs. no news	Good news vs. Bad news
Naïve	Mar - Apr	0.023 (NM)	0.014 (0.318)	0.009 (NM)
	Mar - May	0.013 (NM)	-0.016 (NM)	0.029 (NM)
S&P	Mar - Apr	-0.027 (0.162)	0.029 (0.140)	-0.056 (0.037)
	Mar - May	-0.017 (0.317)	-0.024 (NM)	0.007 (NM)
Market-based	Mar - Apr	-0.078 (0.000)	0.321 (0.000)	-0.399 (0.000)
	Mar - May	-0.138 (0.000)	0.495 (0.000)	-0.633 (0.000)

Table 6: The effect of the release of fine rating information on stock prices

The table describes the abnormal returns of stocks following Moody's adoption of a fine rating system on April 26, 1982. We report the difference between

(1) the average abnormal return of the stocks of issuers the fine rating assigned to their bonds by Moody was *higher* than investors expected, called "good news," and

(2) the average abnormal return of the stocks of issuers the fine rating assigned to their bonds by Moody was *lower* than investors expected, called "bad news."

The difference is denoted by ΔASR. The indication of whether the 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"), S&P-based proxy that assumes that investors assign an implicit Moody's modifiers to bonds according to the rating modifiers the bonds receive from S&P, and a market-based benchmark that infers from the yield premium of a bond relative to all other bonds with the same coarse ratings the implicit Moody's modifier investors assign to the bond. We examine stock return relative to three benchmarks: the average return of the stock in 80 through 10 days preceding Moody's announcement, relative to the concurrent market rerun, and 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. Numbers in parentheses are one-tail hetroskedasticity-consistent p-values.

Expectation model	Period	Mean-adjusted ΔASR	Market-adjusted ΔASR	Market-model-adjusted ΔASR
Naïve	one day	-0.132 (0.403)	-0.199 (0.355)	0.210 (0.292)
	one week	-1.136 (0.173)	-1.471 (0.111)	-0.515 (0.274)
S&P	one day	-0.055 (0.407)	-0.091 (0.350)	0.031 (0.446)
	one week	-1.322 (0.007)	-1.501 (0.003)	-1.178 (0.012)
Market-based	one day	-0.118 (0.364)	-0.183 (0.295)	-0.170 (0.306)
	one week	-0.833 (0.138)	-1.160 (0.065)	-0.933 (0.107)

Table 7: The effect of the release of fine rating information on firm value

The table describes the abnormal change in firm value following Moody's adoption of a fine rating system on April 26, 1982. We report the differences between the average abnormal changes in firm value of issuers the fine rating assigned to their bonds by Moody was *higher* than investors expected, called "good news," and issuers the fine rating assigned to their bonds by Moody was *lower* than investors expected, called "bad news."

The indication of whether the 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"), S&P-based proxy that assumes that investors assign an implicit Moody's modifiers to bonds according to the rating modifiers the bonds receive from S&P, and a market-based benchmark that infers from the yield premium of a bond relative to all other bonds with the same coarse ratings the implicit Moody's modifier investors assign to the bond.

We estimate the abnormal return of the stockholders relative to three benchmarks: the average return of the stock in 80 through 10 days preceding Moody's announcement, relative to the concurrent market rerun, and relative to the market model of returns. The market-model expected conditional return is estimated by $E(r_i \mid r_m) = \alpha_i + \beta_i \cdot r_m$, 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.

We estimate the abnormal returns of the bond holders (above the return indicated by the concurrent change in the term structure of interest rates) using the regression equation

$$AR_t = \sum_R \beta_R \cdot \Delta TS_t \cdot I_R + \beta_{good} \cdot I_{good} + \beta_{bad} \cdot I_{bad} + \varepsilon_t$$

where β_R are rating specific (Aa through Ba) coefficients that measure the relative impact of the change in the term structure of interest rates on bonds in this rating, I_R are rating indicators, and I_{good} (I_{bad}) indicates that the bond fine rating information is considered good (bad) news.

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. Numbers in parentheses are one-tail hetroskedasticity-consistent p-values. NM means that the p-value is not meaningful since the estimated coefficient is of the opposite sign.

Expectation model	Equity return period	"Good news" vs. "No news"	"Bad news" vs. "No news"	"Good news" vs. "Bad news"
Naïve	one day	-0.522% (0.015)	-0.086% (0.341)	-0.436% (0.051)
	one week	-1.188% (0.007)	-0.222% (0.323)	-0.966% (0.047)
S&P-based	one day	0.205% (0.256)	0.200% (0.150)	-0.005% (0.494)
	one week	-0.031% (0.476)	0.328% (0.269)	0.358% (0.293)
Market-based	one day	-0.048% (0.403)	-0.449% (0.154)	-0.400% (0.191)
	one week	0.042% (0.459)	-0.849% (0.163)	-0.891% (0.158)

Table 8: The relation between firm leverage and the effect of the release of fine rating information

The table describes the relations between the abnormal changes in bond, stock, and firm values following Moody's adoption of a fine rating system on April 26, 1982 and the leverage of the firm.

We estimate the abnormal return of the stockholders relative to 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 abnormal return of the bond holders relative to rating-specific effects of the changes in the term structure of interest rates:

$$R_i = \sum_R \beta_R \cdot \Delta TS_i \cdot I_R + \beta_{good} \cdot I_{good} + \beta_{bad} \cdot I_{bad} + \varepsilon_i$$

where β_R are rating specific (Aa through Ba) coefficients, I_R are rating indicators, and I_{good} (I_{bad}) 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:

$$AR^{Bond} = \beta_{good} \cdot I_{good} + \beta_{bad} \cdot I_{bad} + \varepsilon_i .$$

To calculate the effect of the announcement on the value of the firm, we weighted 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/firm value*. The positive or negative signs below each parameter indicate the hypothesized sign of the coefficients. Numbers in parentheses are one-tail hetroskedasticity-consistent p-values.

Reaction of:	**Debt price**	**Equity price**	**Firm value**
"Good news" leverage (α_1)	0.703 + (0.022)	-0.249 - (0.431)	0.001 ? (0.315)
"Bad news" leverage (α_3)	-1.739 - (0.091)	3.910 + (0.212)	0.006 ? (0.124)
Adjusted R^2	0.0119	-0.0052	-0.0069

Figure 1: Average yield spreads prior to the release of fine rating information