Theory and Evidence

How do the different types of rating announcements affect equity prices?

by

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ABSTRACT

This paper examines the impact of the three different types of credit rating announcements (i.e. ratings, reviews and outlooks) on equity prices. Our findings suggest that all three types of rating announcements have a significant price impact for both upward and downward changes along the credit rating scale. After defining the different impact components of these announcements—an endorsement factor and a "soft information" factor—we propose a simple theoretical approach which allows us to estimate the magnitude of each of these two components. We then investigate whether the announcements' impacts depend on several other factors, including whether or not a review or outlook preceded a rating change, whether or not a rating change is combined with a review or outlook that is not stable, the size of the rating change, and the rating itself.

I) Introduction

The turmoil that has affected the stock prices of companies such as Ford and GM over the last few years has only reinforced the commonly-held notion that rating agencies wield power well beyond that of any other private institutions. Yet, many academics hold that it is not at all certain that the agencies infuse the markets with any new information and that the agencies actually lag the capital markets in reflecting a company's default risk. With ever-increasing calls for greater regulation of these agencies, the question of how much impact ratings truly have on debt and equity prices beckons greater investigation. This introductory section explores the recent regulatory issues that have affected the industry and broadly describes the various types of rating announcements. Section II provides a theoretical background with hypotheses and a literature review. Section III discusses our sample and methodology. Section IV presents the empirical results, and section V concludes.

Regulation and legal issues

Indeed, much controversy surrounds the use of SEC-determined NRSROs[1] (nationally recognized statistical rating organizations). Moody's 2006 Annual Report explains that the SEC first applied the NRSRO designation in 1975 to companies whose credit ratings could be used by broker-dealers for purposes of determining their net capital requirements. Since that time, Congress (including in certain mortgage-related

[1] "The proposed definition of the term NRSRO is an entity that: (i) issues publicly available credit ratings that are current assessments of the creditworthiness of obligors with respect to specific securities or money market instruments; (ii) is generally accepted in the financial markets as an issuer of credible and reliable ratings, including ratings for a particular industry or geographic segment, by the predominant users of securities ratings; and (iii) uses systematic procedures designed to ensure credible and reliable ratings, manage potential conflicts of interest, and prevent the misuse of nonpublic information, and has sufficient financial resources to ensure compliance with those procedures." (SEC (2005, p. 20)).

legislation), the SEC (including in certain of its regulations under the Securities Act of 1933, as amended, the Securities Exchange Act of 1934, as amended and the Investment Company Act of 1940, as amended) and other governmental and private bodies have used the ratings of NRSROs to distinguish between, among other things, investment grade and non-investment grade securities.

Rating agencies have "what is effectively a regulation-induced oligopoly which may limit the discipline that reputational considerations and competition provide" (Butler and Rodgers (2003)), though this issue has somewhat been addressed via the addition of A.M. Best and Dominion Bond Rating Service Limited to the previous NRSRO trio of Moody's, Standard & Poors (S&P), and Fitch. Moody's came under considerable fire in 1996 for having assigned unsolicited ratings to mortgage-backed, asset-backed, and municipal bonds that were substantially lower than ratings solicited from competing agencies. In the case of "Jefferson County School District vs. Moody's Investors Services, Inc.", the Tenth Circuit Court of Appeals ultimately maintained that bond ratings constituted free speech opinions protected by the First Amendment, and that rating agencies were not liable for damages even if their ratings were punitive retributions against issuers that had not hired them.

Rating agencies nevertheless continue to be the focus of much debate. In February 2005, the United States Senate Committee on Banking, Housing, and Urban Affairs conducted a hearing entitled "Examining the Role of Credit Rating Agencies in the Capital Markets" in order to investigate the control of potential conflicts of interest affecting the agencies, as well as the degree of competition in the credit ratings industry. One month later, the

SEC disclosed that it might pursue a voluntary compliance and oversight framework for rating agencies that are designated as NRSROs, or that it could seek legislative authority for formal oversight of NRSROs. Aside from formally defining the NRSRO appellation, no significant actions have been taken as of the writing of this paper (although various solutions have been offered, such as U.S. House Representative Michael Fitzpatrick's (R-PA) introduction of the "Credit Rating Agency Duopoly Relief Act of 2005," which essentially calls for greater disclosure and transparency from the agencies). Internationally, similar developments have occurred, including the Technical Committee of the International Organization of Securities Commissions' publishing of the Code of Conduct Fundamentals for Credit Rating Agencies (the "IOSCO Code").

Highly publicized investigations such as that relating to Enron have fuelled these on-going investigations. A paper by Covitz and Harrison (2003) analyzes the anticipation of credit-rating downgrades and finds no evidence that rating agencies act in the interest of issuers; yet, their study does not account for potentially biased rating levels, and one may wonder if the agencies will ever truly be immune to conflicts of interest so long as their revenues are derived from the companies they monitor.

Factors affecting ratings

Bond ratings began modestly with the introduction of Moody's services in 1909, but they quickly became an integral component of the financial landscape. The capital markets have slowly gained corporate-financing market share away from banks, especially over the last three or four decades, via the emergence of such innovations as the junk bond market. Along with this development, the need for a benchmark measure of risk has also

grown. The major bond rating agencies today also include Standard and Poors (S&P) and Fitch Investor Services, as well as Duff and Phelps. While all bond ratings address a company's creditworthiness in some way or another, it is interesting to note that there exist minor differences between bond ratings. For instance, S&P only concerns itself with the likelihood of default, whereas Moody's incorporates information regarding both default probability and the financial loss suffered in the event of a default into its ratings. The latter agency has recently suggested supplementing its current expected-loss (EL) based security ratings and corporate family ratings (CFRs) with loss-given-default (LGDs) ratings on speculative-grade loans, bonds, and preferred stocks, as well as probability-of-default ratings (PDRs) on speculative-grade corporate families. The suggested Basel II framework reinforces the need to desegregate the components of credit risk, as it conceptualizes credit risk as composed of "probability of default, loss given default, exposure at default, and effective maturity" (De Bodard, E, Rowan, M, Stumpp, P, and Staples, D (2006)).

In more specific terms, corporate ratings are issued regarding a company's loans, bonds, preferred stock, shelf registrations, and bank deposits, as well as on the issuers themselves and on their corporate families. These ratings are often broken down into short-term ratings (with an original maturity not exceeding thirteen months), medium-term note ratings, and long-term obligation ratings (fixed-income obligations with an original maturity of at least one year). A variety of additional rating types also exist, such as ratings on credit default swaps. Banks, hedge funds and insurance companies are amongst the special cases that are each rated according to a different methodology and

scale. Generally speaking, the different components of the rating scale are defined as follows at Moody's and S&P[2]:

Moody's	S&P	
Aaa	AAA	Debt rated Aaa and AAA has the highest rating. Capacity to pay interest and principal is extremely strong.
Aa	AA	Debt rated Aa and AA has a very strong capacity to pay interest and repay principal. Together with the highest rating, this group comprises the high-grade bond class.
A	A	Debt rated A has a strong capacity to pay interest and repay principal; however, it is somewhat more susceptible to adverse changes in circumstances and economic conditions.
Baa	BBB	Debt rated Baa and BBB is regarded as having an adequate capacity to pay interest and repay principal. Whereas it normally exhibits adequate protection parameters, adverse economic conditions or changing circumstances are more likely to lead to a weakened capacity to pay interest and repay principal for debt in this category than in higher-rated categories. These bonds are medium-grade obligations.
Ba B Caa Ca	BB B CCC CC	Debt rated in these categories is regarded, on balance, as predominantly speculative. Ba and BB indicate the lowest degree of speculation, and Ca and CC the highest. Although such debt is likely to have some quality and protective characteristics, these are outweighed by large uncertainties or major risk exposure to adverse conditions.
C	C	At Moody's, debt rated C are the lowest rated class of bond and are typically in default, with little prospect for recovery of principal and interest. At S&P, this rating may be used to cover a situation where a bankruptcy petition has been filed or similar action has been taken, but payments on this obligation are being continued.
	D	Debt rated D is in default, and payment of interest and/or repayment of principal is in arrears.

Moody's appends numerical modifiers 1, 2, and 3 to each generic rating classification from Aa through Caa. The modifier 1 indicates that the obligation ranks in the higher end of its generic rating category; the modifier 2 indicates a mid-range ranking; and the modifier 3 indicates a ranking in the lower end of that generic rating category. Likewise,

[2] From various editions of Standard & Poor's Bond Guide and Moody's Bond Guide.

S&P ratings from ‘AA’ to ‘CCC’ may be modified by the addition of a plus or minus sign to show relative standing within the major rating categories.

The agencies take into consideration the nature and provisions of the obligations, as well as their potential status in the event of bankruptcy. All bond ratings attempt to measure a company’s probability of default (at least in part), a continuous variable that changes as new information arrives. By their very nature, changes are to be expected more frequently among bonds of lower ratings than among bonds of higher ratings. Ratings are not designed to measure the risk of interest rate changes due to factors such as shifts in expectations of inflation, and the agencies state that they only take a rating action that is unlikely to be reversed shortly thereafter. The reasoning behind this is that they prefer to “avoid unnecessarily increasing uncertainty in the marketplace” (Keenan, Fons and Carty (1998)).

Reviews and outlooks

Thus, for a long time the agencies faced a tradeoff between volatility and timeliness. In order to address this problem, they introduced two other types of ratings announcements in the 1980s—outlooks and reviews—which allowed for a more timely reflection of the latest information without foregoing the stable signal of credit quality provided by the actual ratings. These have gained much traction since their inception, as the following news article excerpt will attest:

> “In the secondary market, widely held euro bonds of U.S. car giants were about five basis points wider on the day, still stinging after a weak credit rating outlook for the world's largest automaker GM. ‘The

> market just feels heavy. We were doing well until Moody's came out with their negative outlook on GM Monday,' said a bond trader in London"
>
> (Reuters News, 15 February 2005).

Rating reviews are formal rating actions undertaken by a rating committee within an agency. They have well-defined beginnings and conclusions, although the length of the review period may vary. The agencies usually prefer to conclude rating reviews within 90 days; Hamilton and Cantor (2005) find that "the average lengths of rating reviews are very close to their ex-ante target of 90 days." They also calculate that the proportion of Moody's-rated obligations that are on review has averaged about 10% of all rated issues. During the course of a rating review, the agency solicits information from the issuer in order to understand plans either for addressing the problem, or for taking advantage of the opportunities that have inspired the review. At Moody's, ratings may be put on "Watchlist" (this is referred to as "CreditWatch" at S&P) for possible "upgrade," "downgrade," or, more rarely, with "direction uncertain." A credit is removed from the "Watchlist" when the rating is upgraded, downgraded or confirmed.

Rating outlooks are designed to convey an agency's perspective on forces that might prompt a rating change over the next 12 to 18 months, and are weaker signals than the formal rating reviews. They are intended to keep investors abreast of analysts' perspectives on the possible direction, if any, of subtle current or anticipated changes in an issuer's creditworthiness. For Moody's, these are expressed as "positive," "negative," "stable" or "developing" (i.e. contingent on an event).

Reviews and outlooks are therefore more focused on warning investors of possible changes, while the ratings indicate fundamental transformations in an issuer's creditworthiness. The two newer types of announcements also differ in their time horizons, with outlooks anticipating changes up to two years later (i.e. over the medium-term), and reviews suggesting a high likelihood of a rating change within the next three months (i.e. the short-term).

II) Theoretical Background

Much literature is available regarding the impact of rating announcements. The majority of these academic papers have addressed the issue of whether or not ratings truly are pricing-relevant to the capital markets, a question which also bears much in common with the subject of capital markets efficiency.

On the one hand, some argue that the debt and equity markets instantaneously price all publicly available data, that the agencies have access to little supplemental information, and that the agencies therefore lag the markets in processing the information. Weinstein (1977) estimates that at least 65% of announcements from a sample of 100 rating changes over the 1962-74 period were caused by already publicly available information. If anything, one might expect this ratio to have increased over the last few decades. A paper by Micu, Remolona, and Wolldridge (2005) suggests that only 10% of ratings changes from a set of 30 downgrades from the 2001-2004 period actually made reference to new developments. Simple models have been designed that are capable of closely mimicking the agencies' ratings based on accounting and other publicly available information (e.g.

Kaplan and Urwitz (1979)). Many other models also measure default probabilities, including the Z-score (Altman, 1968) and O-score (Ohlson, 1980) models. The agencies themselves admit that ratings are predominantly based on publicly-available financial ratios such as interest coverage ratios, pretax returns on permanent capital, income-to-debt ratios, income-to-sales ratios and debt-to-capital ratios (S&P website). It could be argued that the agencies are also simply low-cost sources of information for many a financial player, though the availability of metrics such as the Altman Z-score on Bloomberg terminals and other distribution means mitigates the importance of this argument.

On the other hand, it is often contended that the agencies are privy to some non-public information resulting from discussions with management, visits to company premises, and company forecasts of accounting data. It is true that, in the case of solicited ratings, rating agencies collect information from the company itself (among other sources), and that the company is given the opportunity to present additional information to the agency if it disagrees with an agency's preliminary, non-publicly-disclosed rating. A company might hypothetically choose to divulge certain information to an agency in order to reduce its cost of capital without releasing sensitive data to competitors, for example. Butler and Rodgers (2003) look at solicited and unsolicited ratings to study the significance of agencies' personal interaction with issuers. They conclude that when relationships exist, agencies rely less on publicly available "hard information," and are better able to assess "soft information" about issuers.

Hypotheses

The impact value of a rating announcement may be decomposed into two elements: an informational value and an endorsement value. The former refers only to the "soft," non-publicly available information discussed in the preceding paragraph; in accordance with semi-strong efficient market hypotheses, publicly available "hard" information would already have been discounted by the markets prior to the announcement. The latter component, the endorsement effect, relates to institutional and regulatory constraints imposed on many investors. Market participants and overseers often delegate the monitoring of credit risk to rating agencies. As a result, many investors may be restricted from acting upon their own risk assessments when an issue is downgraded below a certain threshold. This implies that a rating announcement need not even have any informational value for it to impact the markets. In our research we have not come across any laws or mandates restricting equity holdings based on an issuer's debt ratings; however, a reduction in the number of investors able to hold a company's bonds (because of rating-related restrictions) should increase the cost of debt—and hence the company's weighted average cost of capital—thereby reducing the net present value of future cash flows to the firm (and to equity holders).

Approximately 95% of corporate bonds are held by institutional investors (United States Senate (2002, p. 100)), and many sophisticated private parties tend to use credit ratings in agreements, such as merger or loan agreements, as conditions or triggers for certain rights or obligations. For instance, a contract might stipulate that payments be accelerated if a company's ratings should fall below a specified grade (e.g. Enron had several such contracts). In the 1930's, the Federal Reserve and Office of the Comptroller also began

using bond ratings to assess the safety of the portfolio investment of member banks and national banks (e.g. the prohibition from investing in non-investment grade bonds). Further ratings-based laws and regulations were later added both on the federal and state level. In 1975, the SEC further increased the importance of credit ratings by implementing a so-called "haircut" rule, whereby broker-dealers had to take large discounts on below investment-grade bonds when calculating their assets for the purposes of net capital requirements; this rule also introduced the need to use NRSRO's, as was earlier discussed. As of 2002, "at least eight federal statutes and 47 federal regulations, along with over 100 state laws and regulations, reference NRSRO ratings as a benchmark" (US Senate (2002, p. 102)). It is worth recalling that credit ratings refer to relative default risks rather than absolute, and that regulation based on these ratings could therefore become problematic if the overall credit environment as a whole should ever significantly deteriorate.

Because most laws, statures, and mandates use the BBB- to BB+ level as a threshold, the endorsement value of a bond rating will be expected to have the greatest impact when transitioning from investment-grade to non-investment-grade status. In fact, we do not believe an upward movement[3] in ratings, reviews or outlooks should have any instantaneous endorsement value at all, as it would likely take time for investors to decide whether or not they would like to hold issues once they are actually permitted to do so. In terms of soft information impact, we would expect this component to be the same as for

3We define outlook changes from "negative" to "stable," and from "stable" to "positive" as "upward outlook changes;" outlook changes from "positive" to "stable," and form "stable" to "negative" as "downward outlook changes;" review changes from "Watchlist for downgrade" to "not on Watchlist," and from "not on Watchlist" to "on Watchilist for upgrade" as "upward review changes;" review changes from "Watchlist for upgrade" to "not on Watchlist," and from "not on Watchlist" to "on Watchlist for downgrade" as "downward review changes."

negative announcements, although it is possible for positive announcements to have a lower impact on the basis of loss aversion. As was first postulated by Kahneman and Tversky (1979) in the context of utility theory, loss aversion refers to the economically irrational behavioral tendency for people to strongly prefer avoiding losses than acquiring gains.

Because outlooks and reviews may each be perceived to communicate a probability of a rating change (since outlooks and reviews, in and of themselves, are not used in regulation as far as we can tell), one might also expect downgrades to have a larger endorsement impact than downward reviews, which, in turn, would have a larger endorsement impact than downward outlooks. It could be argued that rating-changes from investment grade to non-investment grade are the only announcements that should carry any endorsement value at all since they are the only ones with any legal implications. Yet, we would argue that negative outlook and review announcements act as signals of a change in the probability of a rating downgrade—the endorsement value of which has already been justified—and therefore should be discounted at the time of the probability-change (i.e. the time of the announcement). There is no reason why the soft information value component of a rating would have a varying impact from one rating-type to the next, however.

The predictive equation for the impact of a rating change may now be set as:

$$\left|ADER_{it}\right| = \alpha + \beta_1\beta_3 DOU_{it} + \beta_2\beta_3 DRE_{it} + \beta_3 DRA_{it} + \varepsilon \qquad \text{(Equation 1)}$$

where:

$\left|ADER_{it}\right|$ = Absolute value of the average daily excess return (i.e. reaction of equity prices);

α = Equity reaction due to the rating change's soft information component,

DOU_{it} = Dummy variable for downward outlook changes (=1 if the rating type is a downward outlook change, =0 otherwise);

DRE_{it} = Dummy variable for downward review changes;

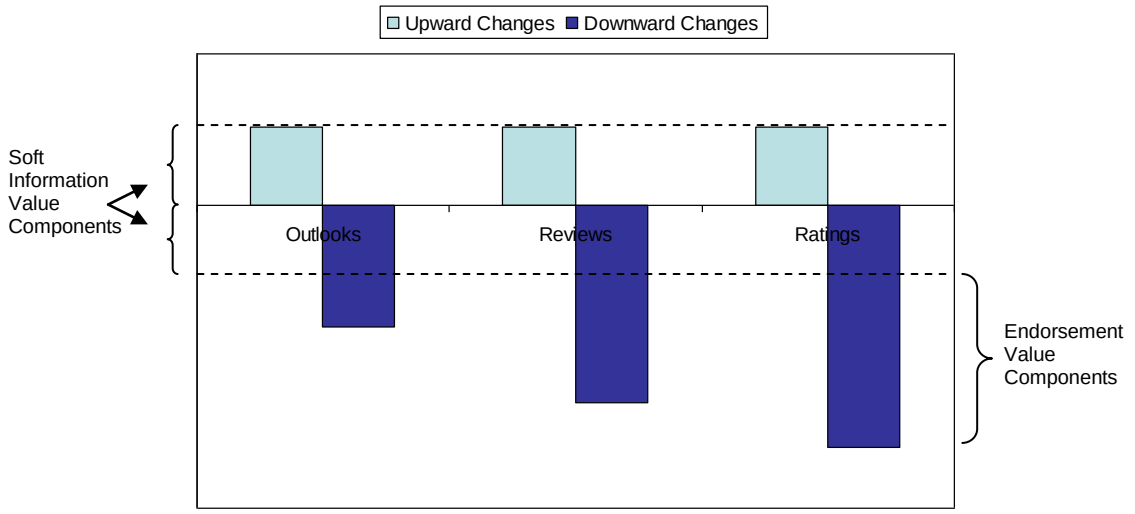
DRA_{it} = Dummy variable for downward actual rating changes;

ε = Error term.

For example, the predicted equity-reaction to a downward outlook change would simply be:

$$\left|ADER_{it}\right| = \alpha + \beta_1\beta_3 + \varepsilon \qquad \text{(Equation 2)}$$

Note that upward changes in ratings, reviews, or outlooks are all expected to have an impact equal to the impact of the soft information component α. Schematically, the equation 1 model this may be viewed as:



In Equation 1, β_3 may be interpreted as the estimated endorsement impact of a downward actual rating change; in this context:

- β_1 becomes the probability that a downward outlook change will lead to a downgrade;
- β_2 becomes the probability that a downward review change will lead to a downgrade.

Equation 1 is simplistic in that it ignores any interaction between the independent random variables. For instance, a rating change would likely have less of an impact if it had already been preceded by a review for the simple reason that the endorsement value of the rating change would have already been partially discounted by the probability of a rating change (implied by the review in and of itself). The model also ignores rating change momentum (i.e. there is a higher chance of a rating downgrade(upgrade) if an issuer has recently been downgraded(upgraded) in the recent past), as well as the interactions between the ratings of different agencies. Lastly, the equation does not take

time into consideration. While there are numerous flaws to this model, it still is a useful aid for conceptualizing the different components that comprise the rating announcement impact.

Literature review

Academicians have unveiled much empirical evidence regarding the two main schools of thought (i.e. ratings have an impact on the capital markets vs. ratings lag the capital markets). Looking at monthly stock data, Pinches and Singleton (1978) show that the information content of a rating change had been fully discounted by the investment community long before the rating was changed by the rating agency. The authors also looked at the lag between the moment when abnormal returns could be observed and the actual rating change, a period which could last up to fifteen months (depending on situational factors). Griffin and Sanvicente (1982) also look at monthly stock data and find that rating downgrades convey information to common stockholders.

Many studies have also been conducted regarding bond price/yields reactions. While Weinstein (1977) (monthly bond returns), and Wakeman (1978) (monthly stock and weekly bond returns) found little price reaction at the time of the rating changes, Katz (monthly changes in bond yields), Grier and Katz (1976) (average monthly bond prices) and Ingram, Brooks and Copeland (1983) (monthly changes in municipal bond yields) all observe abnormal returns in bond yields/prices following the announcements. It must be noted that these are all based on relatively long time frames.

Focusing on daily data, Hand, Holthausen and Leftwich (1992) show that abnormal stock and bond returns do occur for both reviews and rating updates (though some

inconsistencies appear in their results). Kliger and Sarig (2000) examine security price reactions to Moody's refinement of its rating system; they find that rating announcements cause bond and equity prices to move in opposite directions and so do not impact the value of the firm; debt prices rise (fall) and equity price fall (rise) when Moody's announces better (lower)-than-expected ratings. Steiner and Heinke (2001) look at international capital markets and conclude that "significant bond price reactions are observed for announcements of downgrades and negative watchlistings while upgrading and positive watchlistings do not cause announcement effect." In what concerns researchers' findings regarding equity price reactions to rating announcements, past evidence suggests that rating downgrades negatively affect stock prices (slightly), whereas upgrades have no significant impact. More recent papers have also demonstrated a relationship between credit default swaps and ratings changes (e.g. Norden and Weber (2004) or Hull, Predescu, and White (2003)).

Thus, much attention has been focused on measuring the effect of rating announcements on the capital markets, but few have distinguished between the different type of announcements—outlooks, reviews, and actual rating changes. The previously mentioned paper by Micu et al (2005) suggests that all three types have meaningful impacts on stock prices and CDS spreads; however, there are several reasons why these results need be qualified.

The first problem concerns the reason for a rating announcement. A paper by Goh and Ederington (1993) examined the reaction of stock returns to rating changes, and highlighted the fact that not all downgrades result in negative stock responses. In their

words, their results show that "downgrades associated with deteriorating financial prospects convey new negative information to the capital markets, but that downgrades due to changes in firms' leverage do not." The reason for this is simple enough: while negative earnings news will unambiguously be interpreted as bad news by equity holders, an increase in financial leverage will not necessarily be viewed as such. This concept is perhaps best summarized by Hothausen and Leftwich's (1986) paper, in which the authors explain that, if equity holders are seen as holding an option on the value of the firm with an exercise price equal to the par value of the firm's debt, then an increase in the variance of the firm's cash flows would redistribute wealth from bondholders to stockholders. It is worth noting that this would certainly be true under the Miller and Mogliani (1963) school of thought regarding capital structure, but that is now widely accepted that leverage only has a favorable impact on equity up to a certain point (i.e. optimal leverage) due to financial distress costs. It is also important to notice that a deterioration in a firm's financial prospects, as perceived by a rating agency, constitutes information that is unexpected by the capital markets (i.e. the soft information value component); however, rating downgrades responding to capital structure modifications are generally based on previously known information. Consistent with the intuition, Goh and Ederington observe a negative equity market reaction to the first group of downgrades in question, but no reaction to the second. This would also explain why the previously mentioned paper by Kilger and Sarig shows that equity prices fall when ratings are unexpectedly improved. Micu et al admit that their results might underestimate the impacts of the different announcement types on stock prices for this reason.

Goh and Ederington's results may at first appear to pose an inconsistency insofar as the previously-set Equation 1 is concerned. The model is presented here for a downgrade (simplified for null dummy variables):

$$ADER_{it} = \alpha + \beta_3 DRA_{it} + \varepsilon \qquad \text{(Equation 3)}$$

The authors' interpretation of their results would suggest that capital-structure-related rating changes neither offer informational value (i.e. $\alpha = 0$) nor cause a reaction in equity prices (i.e. ADER = 0). Under Equation (2), this could only be true for $\beta_3 = 0$; however, this would imply that downward rating announcements never have any impact on equity, a hypothesis that is contradicted by Goh and Ederington's results showing that earnings-related ratings changes do have a significant effect on stock prices.

We suggest an alternative explanation consistent with Equation 2: capital-structure-related changes generally have a positive(negative) informational effect for rating downgrades(upgrades) which nullifies their endorsement effect. For example, a downgrade (i.e. negative endorsement effect) due to increased leverage might communicate the agency's belief that leverage will increase in the future (i.e. a positive informational effect according to findings by Masulis (1983)).

We now return to the problematic issues regarding Micu et al's study, for there is another matter that probably results in a large overestimation of equity reactions, especially insofar as reviews are concerned. Micu et al attempt to control for events that might impact prices on the day of a ratings announcement by excluding rating-related changes if there are more than one in a 10-day window around any given announcement. The

authors themselves recognize that this is an imperfect proxy: in a sample of 30 events that led to rating announcements, only 50% of these resulted in rating announcements by two or more agencies. In the course of this here study, it became apparent that most rating-related announcements are motivated by events within a three-day period preceding the announcement (especially reviews), and that the ADER's are much more significant when this is the case. This is a very likely explanation as to why Micu et al find such large impacts for downward reviews. It is clearly extremely difficult, if not impossible, to account for all events that might affect prices on the day of an announcement. Nevertheless, our results will suggest that this "cleaning" of the data produces more intuitive results.

III) Sample and methodology

Data

To test the various hypotheses outlined above, this study began by looking at seventeen hundred randomly selected firms from the Russell 3000 index (as of 12/27/2005). It could be argued that the Russell 3000 index, which represents approximately 98% of the US equity market, reflects a slight upward bias (because it represents the more successful firms), but there is no apparent reason why this should in any way affect reactions to rating announcements. Moody's rating announcements for the randomly selected companies were manually searched via the Moody's website for the period January 2004 - March 2006. Many of the companies were not rated by Moody's, either because they carried no debt or because the companies had not solicited ratings (and Moody's had not taken the initiative to award unsolicited ratings). The 2004-2006 period in question was

generally market by an improving credit environment, which explains why upward credit changes outnumber downward credit changes in the subset by over 60%. For the year 2005, the upgrade-downgrade ratio was 1.73, far above the historical annual average of 0.67 (Moody's press release, 2 February 2006).

Several potentially meaningful factors were omitted in the preliminary tests of this study. Ratings-changes that jumped one level and rating-changes that jumped more than one level were indiscriminately lumped into "downward rating changes" or "upward rating changes" due to a lack of data. Oftentimes, Moody's also changes the outlook or the review at the same time as a rating change, but this was also not accounted for in our first empirical analysis due to a scarcity of announcements. The effect of cumulative ratings from different agencies (Micu et al's results suggests a minor impact) was ignored, though this is somewhat mitigated by the fact that "Moody's is more likely than S&P to be the first agency to initiate a rating change (39.3% versus 25% of the time)" (Rodgers, 2003). Outlooks and reviews with direction "uncertain" or "developing" were also ignored. Debt ratings on the senior-most issues were generally used, usually the senior unsecured rating or the long-term issuer rating.

The data was then "cleaned" by eliminating all announcements that contained important events within three days preceding the announcement date, and one day after the announcement date. This was accomplished thanks to Bloomberg company news, for which there is ample data in the 2004-2006 period. While what qualified as "important events" may be considered a subjective matter, eliminations generally concerned objective factors such as earnings releases, earnings restatements, mergers, acquisitions,

divestitures of assets/subsidiaries, important legal matters, company announcements regarding future earnings, etc… The Moody's news release for each announcement was also inspected for any mention of important events that may have arisen in the three prior days. Various studies have shown that certain events are followed by a price drift for up to three months following the said event (e.g. Rendleman, Jones, and Latrane (1982) for earnings announcements, but this could be a result of subsequent releases such as rating-related announcements. The magnitude of this potential lag-effect is almost trivial after a few days according to the evidence anyway.

Announcements that were principally capital-structure motivated were also eliminated from the sub-set in order to account for Goh and Ederington's findings, as articulated earlier. These included debt issues, recapitalizations, debt-financed acquisitions, refinancings, modifications to covenants and other debt-related contractual agreements, etc… Admittedly, distinguishing between capital-structure-related changes and other types is not an entirely straightforward and objective matter. This categorization was predominantly based on the summary sentence that introduces all of Moody's announcement releases, a sentence which typically reads: "The rating change was caused by…," or "was prompted by…," or "is due to…." The latter portions of the Moody's write-up often seek to mitigate the rating-change decision, but it is usually easy to discern that these attenuating factors are of lesser importance. We usually erred on the conservative side and did not include rating announcements for which the primary reason was unclear, such as for this International Game Technology review for upgrade:

> "The review for upgrade is prompted by the company's improved debt protection measures resulting from debt repayment and higher earnings and cash flow, as well as a favorable demand outlook for the company's gaming products" (Moody's, 20 May 2004).

Thus, a considerable effort was undertaken in order to obtain a subset of cash-flow-related announcements made in relatively stable trading environments. Out of roughly one thousand announcements that were found for the initial set of seventeen hundred Russell 3000 firms during the selected time-period, only 326 were ultimately used in this study.

The event time window was set to twenty-two days, beginning twenty days before the announcement (the closing price on the twenty-first day preceding the announcement was used) and ending one day after the announcement, in order to accommodate for the possibility that the announcements were made after the close of the trading day. This time window was subdivided into two time intervals:

1. the twenty days preceding the announcement;
2. the day of the announcement and the following day.

If an announcement had a soft information or endorsement value, then it should have been discernable in the second time interval; alternatively, the bulk of this impact would likely have been captured in the first time interval if the equity market had anticipated the rating change. Equity prices and S&P 500 index values were downloaded from

Bloomberg for the closing prices (P) at t_{-21} (t_0 being the announcement date), t_{-1}, and t_{+1}. The average daily returns (ADR) for both intervals were calculated as:

$$ADR_{it} = [(P_{i,t1}/ P_{i,t2})^{[1/(t1-t2)]}]-1 \quad \text{Equation (4)}$$

Average daily excess returns (ADER) were then computed based on a variant of the CAPM model:

$$ADER_{it} = ADR_{it} - \beta_{im}ADR_{mt} \quad \text{Equation (5)}$$

where:

ADR_{it} = average daily return for stock price i;

β_{im} = beta for stock i; Bloomberg's raw beta calculation uses two years of weekly returns and the local market index (the S&P500 index for this entire data set);

ADR_{mt} = average daily return for the S&P500 index.

Statistical tests[4]

The first statistical test we employed was a standardized one-tailed cross-sectional t-test, in which we tested whether the mean of abnormal changes in equity prices was significantly different from zero. Abnormal changes were assumed to be independent and distributed Student's t with n-1 degrees of freedom, where "n" denotes the number of observations. It need be mentioned that this statistical test could potentially be flawed when the announcements induce a change in both the mean and variance of equity prices. Brown and Warner (1980) explain that the test statistic can result in the rejection of the null hypothesis more frequently than is warranted if the variance of an event is

[4] This section of the thesis was heavily influenced by the Micu et al paper.

underestimated, as would be the case if the announcements produced a temporary change in the firm's perceived risk. While there are several ways of dealing with this heteroskedastic[5] issue (e.g. Boehmer et al (1991)), we did not directly adjust this statistical t-test due to insufficient data (the alternative approaches would have involved measuring the standard deviation of abnormal returns for each issuer and for the market during each estimation period, but we only had the closing prices at the start and finish of these time intervals).

Next, we also conducted a Fisher sign test, which is free of specification assumptions concerning the distribution of returns. This statistical test requires that abnormal returns be independent across firms. The test statistic J^M is calculated as follows:

$$J^M = [(n^+ / n) - 0.5] * (n^{1/2} / 0.5) \qquad \text{Equation (6)}$$

where n^+ = number of positive(negative) excess returns in the sample, depending on whether an upward(downward) change is being studied. The null hypothesis is that the proportion of positive(negative) abnormal returns in the sample is equal to the proportion of abnormal returns of opposite sign, implying a probability of 0.5 under the special binomial case in which two possible outcomes have equal probabilities. For a defined confidence level α, the null hypothesis is rejected if $J^M > \Phi^{-1}(\alpha)$, where Φ is the cumulative normal distribution function. Unfortunately, the test's underlying assumption is somewhat problematic in that abnormal returns are usually skewed, as it soon became evident in our results.

[5] "The error term is homoskedastic if the variance of its conditional distribution given a predictor is constant and does not depend on [that predictor]; otherwise the error term is heteroskedastic." (Stock and Watson, p. 124)

Thus, a third test based on the bootstrap technique described by Efron and Tibshirani (1993) was employed in order address the potential skewness of abnormal returns. The conventional t-statistic was used as the reference statistic here:

$$t = \sqrt{n}(\bar{s} - \mu_0) / \bar{\sigma}$$

where $\bar{s}$ and $\bar{\sigma}$ are the sample mean and variance, respectively, of the abnormal returns and μ_0 denotes the mean of the test under the null hypothesis (in our case equal to zero). For i = 1, …, n, we define:

$$\tilde{s}_i = s_i - \bar{s}$$

The values $\tilde{s}_1, \tilde{s}_2, \ldots, \tilde{s}_n$ correspond to the distribution defined by the null hypothesis of the test. We sample one thousand times with replacement and calculate:

$$t^B = \sqrt{n}\left(\bar{s}^B / \hat{\sigma}^B\right)$$

in which we now refer to the bootstrapped sample mean and standard deviation. We accept or reject the null hypothesis (i.e. s = 0) by comparing t with the desired percentile of the distribution at the specified confidence level.

IV) Results

The following table summarizes our preliminary findings:

		Positive Change		Negative Change	
		[-21;-1]	[0; 1]	[-21;-1]	[0; 1]
Outlooks	ADER (%)	0.08	0.17	-0.19	-0.27
	t-test	**	**	*	**
	Sign test	**			*
	Bootstrap	**	**	**	**
Reviews	ADER (%)	0.09	0.23	-0.13	-0.37
	t-test	*	*	**	**
	Sign test				
	Bootstrap	*	*	**	**
Ratings	ADER (%)	0.05	0.19	-0.01	-0.45
	t-test	*	**		***
	Sign test				**
	Bootstrap	*	*		***

Our results suggest that all three announcement types have equity price impacts of mild statistical significance or higher for both positive and negative changes. This implies that the announcements were not entirely anticipated by the markets, though the data for the [-21;-1] time frame does suggest a certain degree of expectancy. The general weakness of the sign test results reflects the skewness of the data, as is to be expected with abnormal returns. Downgrades clearly have a stronger impact that upgrades, consistent with prior findings; however, this is the first study, to our knowledge, where favorable rating announcements are also found to have an effect on stock prices. It also appears that our extensive efforts to "clean" the data result in some theoretically-appealing results, as will now be demonstrated.

We now reintroduce Equation 1:

$$\left| ADER_{it} \right| = \alpha + \beta_1\beta_3 DOU_{it} + \beta_2\beta_3 DRE_{it} + \beta_3 DRA_{it} + \varepsilon \qquad \text{Equation (1)}$$

which simplifies to:

Downward outlook changes: $\left| ADER_{it} \right| = \alpha + \beta_1\beta_3 + \varepsilon$ Equation (7)

Downward review changes: $\left| ADER_{it} \right| = \alpha + \beta_2\beta_3 + \varepsilon$ Equation (8)

Downgrades: $\left| ADER_{it} \right| = \alpha + \beta_3 + \varepsilon$ Equation (9)

Having obtained estimates for the average daily excess returns (i.e. $ADER_{it}$) for the different announcement types, we now turn to the probabilities of a rating downgrade given a downward outlook or review (i.e. β_1 and β_2). The following table reflects the findings of Moody's study conducted by Hamilton and Cantor (2005):

Investment Grade			Speculative Grade			All Rated		
Outlook	Dwngrd	Upgrd	Outlook	Dwngrd	Upgrd	Outlook	Dwngrd	Upgrd
DNG	58.8%	0.3%	DNG	66.0%	1.0%	DNG	60.9%	0.5%
NEG	12.9%	1.9%	NEG	29.9%	7.5%	NEG	20.1%	4.3%
STA	5.8%	6.4%	STA	23.7%	10.1%	STA	13.5%	8.0%
POS	3.3%	22.1%	POS	9.5%	28.8%	POS	6.7%	25.8%
UPG	0.3%	56.4%	UPG	1.1%	73.6%	UPG	0.6%	62.6%

where:

DNG = Review for downgrade

NEG = Negative outlook

STA = Stable outlook (and not on review)

POS = Positive outlook

UPG = Review for upgrade

We substitute these probabilities into Equations 7, 8 and 9:

Downward outlooks: $0.27 = \alpha + .201\ \beta_3$ Equation (7)

Downward reviews: $0.37 = \alpha + 0.609\ \beta_3$ Equation (8)

Downward ratings: $0.45 = \alpha + \beta_3$ Equation (9)

This allows us to solve for α and β_3 in the three pairs of equations [Equation 7, Equation 8], [Equation 7, Equation 9] and [Equation 8, Equation 9]:

[Equation (7), Equation (8)]: $\{\alpha = 0.22, \beta_3 = 0.24\}$

[Equation (7), Equation (9)]: $\{\alpha = 0.23, \beta_3 = 0.22\}$

[Equation (8), Equation (9)]: $\{\alpha = 0.24, \beta_3 = 0.21\}$

Averaging these three solutions provides us with our final estimates:
$\{\alpha = 0.23, \beta_3 = 0.22\}$. It follows that the endorsement value components of a downward outlook is roughly 0.04 (= 0.201*0.22), while that of a downward review is about 0.13 (= 0.609*0.22).

We now to turn to positive changes, for which the ADER's stand at:

Positive outlooks: 0.17%

Positive reviews: 0.23%

Upgrades: 0.19%

We recall our hypothesis whereby equity reactions to positive changes would not have any endorsement components; in other words, the equity reactions would simply be equal to the soft information impact. A simple average of the three above values provides us with an α estimate of 0.20 for positive announcements, which is not statistically different

from the α estimate derived from the negative announcements (0.22). Our findings clearly suggest that the overall difference in reactions to positive announcements and negative announcements is almost entirely driven by the endorsement factor, as we had earlier hypothesized. The following table summarizes our estimates:

	Outlooks		Reviews		Ratings	
	Downward	Upward	Downward	Upgrade	Upgrade	Downgrade
Soft Information Component	0.23%	0.17%	0.23%	0.23%	0.23%	0.19%
Endorsement Component	0.04%	0.00%	0.13%	0.00%	0.22%	0.00%

We must emphasize that our estimates are based on a very simple model, and that the above values are oftentimes driven by a few observations. These findings also do not account for several potentially significant factors. Based on prior findings, we would expect the rating level to be of significance, for example. The following table presents the number of observations ("Number") and the equity reactions ("Mean," in percentage terms) during the announcement window [-1,+1], broken down by investment grade (IG) and non-investment grade (NG) issues:

		Downward Outlooks	Upward Outlooks	Downward Reviews	Upward Reviews
IG	Number	17	39	16	25
	Mean	-0.09	0.20	-0.06	0.26
NG	Number	11	37	15	28
	Mean	-0.57	0.13	-0.69	0.20

Our results show that downward outlooks/reviews for non-investment grade issues cause a much greater equity reaction than those for investment grade issues. It is intuitive that

negative rating announcements would matter more for issues with poor credit ratings. Surprisingly, it seems that equity reactions for positive changes to investment grade issues appear slightly less significant than those to non-investment grade issues, though the difference is not statistically significant. We now turn our attention to actual rating changes:

	Downgrades			Upgrades		
	Intra-IG	Intra-NG	IG to NG	Intra-IG	Intra-NG	NG to IG
Number	23	29	8	16	50	11
Mean	-0.54	-0.33	-0.63	-0.06	0.21	0.44

Consistent with prior studies, we find that transitions between the investment grade and non-investment threshold have a larger effect than intra-IG or intra-NG changes.

The next issue on which we focus is also related to actual rating changes. Up to this point, we have indiscriminately treated one-level rating changes (e.g. Ba1 to Ba2) and multi-level rating changes (e.g. Ba1 to Ba3). We will refer to this as the "size" of the rating change. The following table summarizes our results:

Downgrades			Upgrades		
Size of Change	Number	Mean	Size of Change	Number	Mean
1	46	-0.16	1	63	0.06
2	12	-1.25	2	11	0.70
3	2	-2.34	3	3	1.04

Our findings reflect a positive relationship between the equity reaction and the size of the change, as was expected. Adjusting our preliminary findings (regarding the impact of the different announcement types) for the size of the change yields smaller equity reactions to actual rating changes, though the results remain statistically significant.

The distinction between rating changes that were preceded by reviews or outlooks, and those that were not (heron referred to as "unpreceded") has also been ignored in our prior calculations. We account for this here:

Downgrades			Upgrades		
Preceded by:	Number	Mean	Preceded by:	Number	Mean
"Unpreceded"	9	0.60	"Unpreceded"	21	0.38
Outlooks	6	-1.24	Outlooks	26	0.09
Reviews	45	-0.56	Reviews	30	0.13

We had expected to find a larger equity reaction for "unpreceded" rating changes than for rating changes combined with outlooks or reviews. Our results show that this hypothesis holds true for rating upgrades, but that it completely falls apart for rating downgrades. It is surprising to note that the four rating downgrades with the greatest *positive* equity reactions were all amongst the nine observations for "unpreceded" downgrades; we suspect that the markets may have expected a harsher announcement than that which Moody's made for those four observations. For example, it is possible that the markets may have expected the agency to lower an issue's rating from a Baa1 to a Baa3, but that Moody's instead only lowered the rating to a Baa2. Alternatively, we also remark that most of the "unpreceded" downgrades were "pure" downgrades, meaning that they were accompanied by a stable outlook. Many rating changes are often combined with a negative/positive outlook or with a review for further downgrade/upgrade. This could potentially explain the above results if outlooks were more often combined with new outlook/review directions than "unpreceded" downgrades, for example. We remark that only one out of the six downgrades preceded by an outlook was a "pure" downgrade,

whereas over half of the "unpreceded" downgrades were. We account for this and obtain the following results:

Downgrades			Upgrades		
Combined with:	Number	Mean	Combined with:	Number	Mean
Nothing	29	-0.55	Nothing	60	0.23
Outlooks	21	-0.52	Outlooks	17	0.04
Reviews	10	-0.03	Reviews	0	NA

The data does not reflect the relationship we had expected, which is that rating changes combined with outlooks or reviews would be followed by greater equity reactions. It is possible that rating changes combined with outlooks/reviews often occur when the markets expect a multi-level rating change; this would be the case if Moody's instead opted for a more incremental transition (i.e. a one-level rating change combined with a review/outlook). Because of the obvious inter-linkages between all of the different factors we have highlighted, we now attempt a regression of ADER's for downgrades based on what precedes a rating (i.e. "unpreceded" vs. "outlook" vs. "review"), on what the rating is combined with (i.e. "stable" vs. "negative/positive outlook" vs. "review for further downgrade/upgrade"), on the size of the rating change, and on the level of the rating change (i.e. "IG" vs. "NG" vs. "IG to NG" or "NG to IG"). We obtain the following regression analysis:

ADER = - 0.00131 + 0.00600 Prec - 0.0106 Size + 0.00304 Comb + 0.00053 Level

Predictor	Coef	StDev	T
Constant	-0.0013	0.0049	-0.27
Prec	0.006	0.0016	3.69
Size	-0.0106	0.0026	-4.10
Comb	0.003	0.0018	1.71
Level	0.0005	0.002	0.27

S = 0.01000 R-Sq = 38.5% R-Sq(adj) = 34.0% F-statistic = 8.61

We find that three of the predictors are statistically significant. A downgrade preceded by an outlook or review is found to be less significant than an "unpreceded" downgrade, as we had anticipated. The size of the downgrade is positively related to the magnitude of the reaction, which also is consistent with the intuition. A downgrade combined with an outlook or review is followed by less of an equity reaction than a "pure" downgrade; we had earlier hypothesized that this could potentially be due to Moody's use of these combinations as an alternative to direct, large multi-level downgrades. Surprisingly, we do not find the level of the downgrade (i.e. "IG" vs. "NG" vs. "IG to NG" or "NG to IG") to have any statistical significance here. It is possible that this could result from omitted variable bias (e.g. we do not consider ratings from other agencies) or from the multicolinearity issues that were outlined earlier. Running the same test on upgrades, we obtain the following results:

ADER = - 0.0105 +0.000538 Prec + 0.00559 Size + 0.00281 Level - 0.00231 Comb

Predictor	Coef	StDev	T
Constant	-0.0105	0.0047	-2.26
Prec	0.0005	0.0009	0.58
Size	0.0056	0.0022	2.55
Comb	-0.0023	0.0026	-0.89
Level	0.0028	0.0018	1.55

S = 0.009345 R-Sq = 12.6% R-Sq(adj) = 7.7% F-statistic = 2.59

The predictive power of these four independent variables is much less significant for upgrades, with size being the only variable of any clear statistical significance. The positive coefficient on the "Prec" independent variable is counterintuitive (though this is the predictor with the least statistical significance), but the signs of the coefficients on

"Comb" and "Level" are in line with expectations. It is not very surprising to find a lack of predictability for upgrades, as this study's findings and prior papers have both found much lesser equity reactions to upgrades than to downgrades, implying that even a minor amount of noise can "drown" potential relationships between the variables.

V) Conclusions

There is evidence that all three types of rating announcements—ratings, reviews and outlooks—have a significant impact on equity prices for both positive and negative changes. Using a simple model, we find evidence supporting our hypothesis that the soft information component of the equity reaction is relatively constant in all six cases, while the endorsement component only appears for negative announcements. We find further evidence supporting our hypothesis that the magnitude of the endorsement component is a function of the announcement type, and, more specifically, on the implied probability of an actual rating downgrade. Using these theoretical assumptions, we estimate the varying magnitudes of the soft information and endorsement components of the equity reactions, for all six announcement classes.

As a secondary focus, we also consider several additional factors which might affect the impact of announcements. For reviews and outlooks, we find that downward outlooks/reviews for non-investment grade issues cause a much greater equity reaction than those for investment grade issues. We find no such relationship for positive changes.

For actual rating changes, we find that the size of the rating change is always of significant importance. Downgrades preceded by outlooks/reviews appear to be less

significant than “unpreceded” downgrades, but this does not seem to affect rating upgrades. Downgrades combined with outlooks/reviews are followed by less of an equity reaction than “pure” downgrades, but this again does not have any noticeable influence on equity reactions to upgrades. Surprisingly, we find no evidence that the actual rating level matters for downgrades or upgrades.

Another avenue for further research would be to expand the sample to include corporate bonds or CDS markets, using the same filtering process as in this study. A comparison of reactions in either of these to those in the equity market could provide insight into the linkages between these markets.

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