The price impact of rating announcements: which announcements matter?[1]

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Abstract

This paper examines the impact of different types of credit rating announcements on CDS spreads and equity prices. Rating agencies make multiple announcements, some of which are intended to reflect the latest information and others of which are intended to provide a stable signal of credit quality. We find that all types of rating announcements have a significant price impact, especially in CDS markets. The impact is greatest when an issuer is placed on review for a downgrade but is non-negligible for rating changes as well as outlooks. We also find that two ratings seem to be more informative than one. Even after a rating announcement by one rating agency, a similar announcement still has an impact on CDS and equity prices. Furthermore, our results indicate that the price impact of ratings derives not only from their information content but also from their endorsement value. Thus, rating announcements appear to have the largest impact on issuers at risk of being downgraded to speculative grade or upgraded to investment grade.

1. Introduction

When pronouncing on an issuer's creditworthiness, rating agencies face a trade-off between timeliness and volatility. Information material to assessing an issuer's creditworthiness arrives at a high frequency, and so credit ratings must be continually updated if they are to incorporate the latest information. Yet, such updating increases the volatility of credit ratings. Rating agencies attempt to balance these conflicting goals by making multiple announcements, some of which are intended to reflect the latest information and others of which are intended to provide a stable signal of credit quality. In this paper, we examine which, if any, of these different types of rating announcements contain pricing-relevant information. In particular, we examine the impact of various rating announcements on equity and credit default swap (CDS) prices.

Many studies have examined the price impact of rating announcements but few have distinguished between the different types of rating announcements. The data set we assemble is far larger than that examined in other studies, allowing us to better estimate the price impact of different announcements. In particular, the data set allows us to better control for events that might foreshadow a rating announcement, such as a similar announcement by another rating agency.

We find that all types of rating announcements – outlooks, reviews and rating changes – have a significant price impact. Investors appear to value both a timely signal of possible changes in creditworthiness as well as a stable signal of underlying creditworthiness. The impact is greatest in CDS markets when an issuer is placed on review for a downgrade and is non-negligible even when a rating announcement is preceded by a similar announcement. Notably, to our knowledge ours is the first study to find that changes in outlooks have a significant price impact. Furthermore, our results indicate that the price impact of ratings derives not only from their information content but also from their endorsement value. Thus, rating announcements appear to have the largest impact on issuers at risk of being downgraded to speculative grade or upgraded to investment grade.

The following section defines the various types of rating announcements. Section 3 outlines the reasons why ratings might be expected to have an impact on asset prices and reviews the existing literature. Section 4 discusses our sample and methodology. Section 5 presents the empirical results and section 6 concludes.

2. Types of rating announcements

Rating agencies provide investors with an opinion about an issuer's capacity to meet its financial obligations. This opinion is encapsulated in a credit rating.[1] A credit rating is not a precise measure of default risk but instead facilitates comparisons across issuers by means of standardised risk categories.

The largest international rating agencies are Standard & Poor's (S&P), Moody's Investors Service and Fitch Ratings. All three agencies rate a wide variety of issuers and structures in markets around the world. Each agency defines its own risk categories but the correspondence between the three agencies' ratings is well understood by market participants. Moody's top rating of Aaa is generally regarded as equivalent to AAA from either S&P or Fitch (Table 1). The threshold of investment-grade debt, below which investments are often labelled speculative in nature, corresponds to a rating of Baa3 from Moody's and BBB– from S&P and Fitch. Below B3 or B– rating agencies' risk categories differ in significant ways and so it is difficult to compare the lowest ratings. For example, Moody's lowest ratings reflect expected recovery values as well as default risk whereas S&P's and Fitch's lowest ratings reflect only default risk.

[1] Ratings are assigned to both issuers and specific debt issues, and the rating of specific issues may be higher or lower than that of the issuer depending on subordination, collateralisation, guarantees and other credit enhancements.

Credit ratings are intended to reflect an issuer's underlying or long-term creditworthiness. It is for this reason that rating agencies are often said to "rate through the cycle". Rating decisions are typically *not* influenced by events whose impact on credit quality is expected to be temporary, such as a slowdown in economic growth; whose impact is uncertain, such as a prospective merger; or whose impact might be reversible, such as a decline in profit margins. Therefore, rating changes are frequently driven by stale information. In a random sample of 30 downgrades over the 2001-04 period, we find that only 10% make reference to new developments; the remainder relate to longer-term financial trends or previously released information. Similarly, Weinstein (1977) finds that, in a sample of 100 rating changes by Moody's over the 1962-74 period, at least 65% of the announcements constitute a reaction to information that is already publicly available.

In contrast to credit ratings, debt and equity prices rapidly incorporate any information relevant to assessing a firm's operating and financial conditions – including information about temporary, uncertain and reversible events. When new information becomes available, investors revise their forecasts and prices move accordingly. Therefore, market prices are more timely indicators of changes in credit quality than credit ratings. Yet, owing to this continual updating, market prices are also more volatile indicators. There is a growing microstructure literature which links the volatility of returns to the frequency with which information arrives in the market (Ross (1989), Kalev et al (2004)).

To meet investors' demand for more timely indicators than credit ratings but less volatile indicators than market prices, in the 1980s rating agencies introduced two other types of rating announcements: outlooks and reviews.[2] Whereas a rating change signals a *fundamental* change in an issuer's creditworthiness, rating reviews and outlooks forewarn investors of *possible* changes in creditworthiness. More specifically, a rating outlook reflects a rating agency's prognosis regarding the likely direction of an issuer's credit quality over the medium term, usually over a two year horizon. An outlook is modified when a change in an issuer's risk profile has been observed but is not yet regarded as permanent enough to warrant a new credit rating. A positive outlook indicates that an issuer's rating is likely to be raised; a negative outlook indicates that it is likely to be lowered; a stable outlook indicates that the rating is unlikely to change; and a developing or evolving outlook indicates that the rating may be raised or lowered.

Reviews give a stronger indication than outlooks of future changes in ratings. When a rating is placed by S&P on "CreditWatch", by Moody's on a "Watchlist" or by Fitch on "RatingAlert", it indicates that there is a very high probability that the issuer will be downgraded or upgraded.[3] An issuer might be placed on review when a significant event has occurred, such as a merger, regulatory action or unexpected deterioration in profitability, but the impact of the event on an issuer's underlying creditworthiness is not yet clear. In a random sample of 30 negative reviews over the 2001-04 period, we find that 60% refer to a recent announcement by the company. Rating agencies typically aim to conclude a review within 90 days, after receiving additional information to clarify the impact of the event.

Credit ratings need not be on review to be changed. Agencies at times upgrade or downgrade issuers without any prior announcement of a review or a change in outlook. Similarly, a review or a change in outlook does not always lead to a change in rating. Issuers at times forestall a change in rating by taking actions to address rating agencies' concerns or by providing sufficient information to alleviate those concerns.

A typical sequence of rating announcements is illustrated in Graph 1. S&P changed its rating outlook on US insurance broker Aon to negative in August 2003 following an earnings report which indicated that Aon's profit margins were below those of its competitors. In October 2004 S&P downgraded Aon and placed the company's rating on review for another downgrade after regulators announced an investigation into its business practices. The review was concluded in March 2005 when Aon reached a settlement with regulators. Following the settlement, S&P left Aon's rating unchanged but Fitch downgraded the company.

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[2] Moody's started to rate bonds in 1909 but only began announcing reviews in 1985 (and did not consider reviews formal rating actions until 1991). Standard and Poor's introduced reviews in 1981 and outlooks in 1986.

[3] In addition to reviews for possible upgrades or downgrades, agencies sometimes place ratings on review when the direction of the change is uncertain ("evolving" or "developing").

3. Literature review

Credit rating agencies are widely perceived to exert a significant influence in financial markets. US Senator Joe Lieberman (2002) echoed the views of many market participants and observers when he opined that rating agencies "wield immense, quasi-government power to determine which companies within the corporate world are creditworthy and which are not." A sizeable literature on the price impact of rating announcements has emerged over the past three decades, and many of these studies provide empirical support for this perception.

Information content of rating announcements

The focus of much of the academic literature on credit ratings is on whether rating announcements contain pricing-relevant information. Rating agencies enjoy privileged access to information about issuers and consequently rating announcements potentially convey new information to market participants. Rating agencies gather information about issuers' operating and financial conditions from company reports and other public sources as well as through confidential discussions with issuers. Indeed, in the United States rating agencies are exempt from the Securities and Exchange Commission's fair disclosure regulation. Introduced in 2000, Regulation FD prohibits firms from making selective non-public disclosures to market participants but allows them to share non-public information with rating agencies.[4] Issuers might choose to communicate sensitive information to investors and creditors through confidential discussions with rating agencies rather than through full public disclosure so as to avoid disclosing details to, for example, their competitors (Griffin and Sanvicente (1982); Ederington, Yawitz and Roberts (1987)).

If rating announcements do convey new information, then negative announcements – downgrades, reviews for downgrade and negative outlook changes – should result in a widening of credit spreads. Similarly, positive announcements – upgrades, reviews for upgrade and positive outlook changes – should result in a tightening of credit spreads. The impact should be the same for both yield spreads between corporate and government bonds and credit default swap (CDS) prices, although differences in the liquidity of corporate bonds and CDSs might affect the speed of adjustment in the two markets.[5]

The potential impact of rating announcements on equity prices is more ambiguous and depends on the reason for the announcement (Goh and Ederington (1993)). Rating announcements motivated by changes in the issuer's financial prospects, such as prospective earnings growth, should have the same impact in equity markets as in corporate bond markets; negative announcements should cause equity prices to fall and positive announcements equity prices to rise. However, rating announcements motivated by changes in leverage should have opposite effects in equity and corporate bond markets. An increase in financial leverage transfers wealth from debt holders to equity holders by increasing the expected returns to equity holders and reducing the returns to debt holders. Therefore, negative announcements motivated by an increase in leverage should result in a rise in equity prices and positive announcements motivated by a decline in leverage a fall in equity prices. Most of the negative rating announcements during our sample period were motivated by changes in the issuer's financial prospects, and so we would expect negative announcements to lead to a fall in equity prices on average. However, those that were related to an increase in leverage might dampen the average announcement effect.

It is equally possible that rating announcements have no impact on credit spreads or equity prices. Notwithstanding rating agencies' privileged access, other factors might negate the informational value of rating announcements. First, some market participants, in particular banks and corporate insiders, also enjoy privileged access to information. Second, rating agencies might react with a lag to new information. As discussed in section 2, credit ratings could reflect stale or incomplete information.

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[4] Similarly, the code of conduct for rating agencies promulgated by the International Organisation of Securities Commissions recognises that issuers might share confidential information with rating agencies and recommends that rating agencies use such information only for purposes related to their rating activities.

[5] A credit default swap is in essence an insurance contract protecting against losses arising from a default. In a CDS contract, the buyer of credit protection pays to the seller of protection a periodic fee analogous to the spread between the yield on a defaultable security and the risk-free interest rate. In the event that the reference entity defaults, the buyer typically delivers to the seller debt owed by the reference entity in return for a lump sum equal to the face value of the debt.

Conflicts of interest could also dissuade rating agencies from acting upon pricing-relevant information in a timely manner. Rating agencies purport to provide investors with independent credit analysis. Yet, rating agencies have a financial incentive to act in the interest of issuers rather than investors because most of their revenues are generated from services sold to issuers. In particular, issuers pay for the assignment of credit ratings and decide which agencies to solicit for a rating. This financial arrangement could lead rating agencies to seek favour with issuers, for example by delaying the announcement of a downgrade. That being said, concern for their reputation provides rating agencies with a countervailing incentive to act in the interest of investors.

There is considerable evidence that rating announcements, in particular reviews for downgrade and downgrades, do in fact impart new information relevant to the formation of prices. Results from the earliest empirical studies were mixed. Whereas Katz (1974) finds that bond investors do not anticipate rating changes and react with a delay to the announcement of such changes, Weinstein (1977) finds no evidence of a reaction to rating changes. Later studies were more conclusive. Hand et al (1992) conclude that the announcement of a downgrade results in a statistically significant adjustment of corporate bond and equity prices. Kliger and Sarig (2000) find that corporate bond and equity prices react to Moody's refinement of its rating categories in April 1982, when it introduced numeric modifiers. Based on a sample of international bonds, Steiner and Heinke (2001) find that both downgrades and reviews for downgrade impact prices. Hull et al (2004) and Norden and Weber (2004) conclude that the reaction of credit default swap prices is most pronounced for reviews for downgrade. Ammer and Clinton (2004) examine the impact of credit ratings on the pricing of asset-backed securities and find a significant negative reaction to downgrades.

Notably, with the exception of Katz (1974) and Kliger and Sarig (2000), in none of the aforementioned studies are rating upgrades or reviews for upgrade found to have a significant impact on prices. Furthermore, even while finding that negative announcements have an impact, most of the recent studies conclude that market participants anticipate rating announcements; most of the price adjustment takes place long before any announcement by a rating agency. Covitz and Harrison (2003) estimate that approximately 75% of the change in bond spreads occurs in the six months prior to a rating downgrade.

A few studies find that rating announcements have different effects in equity and credit markets. Goh and Ederington (1993) were the first to test whether the reaction of equity prices depends upon the reason for the rating announcement. They find that equity prices fall in response to downgrades motivated by a deterioration in the issuer's financial prospects but do not react to downgrades motivated by an increase in leverage. Kliger and Sarig (2000) conclude 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 and equity prices fall when Moody's announces better-than-expected ratings.

Information content of second ratings

A second question closely related to the previous question is whether two credit ratings are more informative than one. Or more generally, whether two rating announcements are more informative than one. Rating changes are often (but not always) preceded by other rating announcements which may foreshadow the new rating. If a series of rating announcements is motivated by the same information, then only the first announcement should convey pricing-relevant information.

A rating change may be foreshadowed by another announcement by the same agency. As previously mentioned, reviews typically result in a rating change within a few weeks. Alternatively, a rating change by one agency may be foreshadowed by another agency's rating announcement. Rating agencies often do not act at the same time. In a sample of over 2600 downgrades by the three largest rating agencies in the period between January 2004 and March 2005, 5% were preceded within 60 business days by a rating announcement by the same agency and 25% by an announcement by a different agency (Table 2).

One of the few previous studies to control for different rating announcements both within and across the three major agencies is Norden and Weber (2004). They find that reviews for downgrade by Moody's and S&P are associated with significant abnormal movements in equity and credit default swap prices, whereas actual downgrades are not. Hull et al (2004) obtain a similar result, although they examine only rating announcements by Moody's. Norden and Weber (2004) also find that the reaction of equity and credit default swap prices to rating announcements is more pronounced if no other rating announcements were made during the preceding 12 months.

In contrast to these studies, Cantor et al (1997) find that in the case of split ratings – where Moody's and S&P assign different ratings – both ratings affect corporate bond spreads. More than 50% of all credit ratings differ by at least one notch. For example, in March 2005, Moody's rated Aon one notch below S&P and Fitch: Baa2 versus BBB+ (Graph 1).

Endorsement value of rating announcements

Even if rating announcements convey no new information about the creditworthiness of issuers, institutional and regulatory constraints may still cause them to have an impact on asset prices. Market participants and regulatory authorities frequently delegate the monitoring of credit risk to rating agencies. Investors may be restricted from acting upon their own risk assessments – and so restricted from buying or selling securities – until a rating agency has pronounced on an issuer's creditworthiness. Quite apart from their information content, therefore, rating announcements might impact credit spreads because of their endorsement value.

Many mutual funds, pension funds and other institutional investors are restricted by mandate from holding debt securities rated below a pre-defined threshold. Furthermore, many regulations and statutes restrict regulated institutions from investing in lower rated debt. In the United States, eight federal statutes, 47 federal regulations and over 100 state laws and regulations make reference to credit ratings (US Senate (2002, p 102)). Finally, many financial contracts link payment conditions to credit ratings. For example, some debt contracts specify that a downgrade entitles creditors to demand immediate repayment and other contracts that a downgrade triggers a higher coupon.

The most commonly referenced threshold is BBB–, the lowest investment-grade credit rating. Since the 1980s market participants and regulatory authorities have increasingly made use of thresholds other than BBB– (Cantor and Packer (1994)). Nevertheless, the distinction between investment-grade and speculative-grade ratings remains the most significant, especially for defining permissible investments.

Institutions affected by institutional or regulatory constraints are often required to sell securities that are downgraded to below the threshold. Therefore, if rating announcements have endorsement value, then the announcement of a downgrade from investment grade to speculative grade, or of a review for downgrade to speculative grade, should have a larger price impact than other downgrades. Indeed, if the announcement of a downgrade from investment grade to speculative grade results in forced sales, then prices might overshoot their new equilibrium level at the time of the announcement and rebound in the days that follow. The constraints typically relate to debt instruments and so the impact should be more noticeable for credit spreads than for equity prices.

There is some evidence that the endorsement value of rating announcements is significant. The dislocation in the US commercial paper market in early 2001 and the sell-off in credit markets in mid-2002 provide anecdotal evidence; at the time, investors shifted out of securities perceived to be susceptible to being downgraded to speculative grade (BIS (2001, 2003)).Steiner and Heinke (2001) find that downgrades from investment grade to speculative grade elicit a larger widening of credit spreads. Hand et al (1992) find that the reaction of investment-grade bonds to rating downgrades is larger than that of speculative-grade bonds. Kliger and Sarig (2000) suggest that the impact of rating announcements appears to be greater for firms with high leverage (which are typically rated speculative grade) than for firms with low leverage (which are typically rated investment grade).

4. Sample and methodology

To test the various hypotheses outlined above, we collected daily data on CDS spreads, equity prices and rating announcements covering the period from 1 January 2001 to 31 March 2005. Our sample is substantially larger than samples used in previous studies. The raw sample includes almost 800 issuers and more than 6000 rating announcements.

Data

A matched sample was constructed by selecting issuers for which both equity prices and CDS spreads were available. Data on equity prices were obtained from Datastream and are daily closing prices for common stocks. Data on CDS spreads were obtained from Markit, a London-based distributor of credit

pricing data. Markit provides a composite CDS price, which is calculated as the daily average of quotes contributed by more than 20 dealers.

Even though the composite CDS price is based on indicative quotes, rigorous cleaning of the data helps to ensure that the composite price closely reflects transaction prices. Markit eliminates stale quotes and outliers, rejecting on average 45% of the data submitted. Furthermore, Markit constructs composite prices only when at least three dealers contribute quotes. Finally, we include in the sample only the most liquid CDS contracts. Dealers update quotes for five-year maturities more frequently than those for other maturities, and so we restrict our sample to five-year contracts.[6] In addition, we include only those issuers for which there are at least five price changes in a given six-month period.

Nevertheless, owing to a lack of liquidity CDS prices are not available for some issuers on some days. To close gaps in time series, we assume that price changes are driven by the arrival of new information. Therefore, we hold composite CDS prices constant until a new price is provided by Markit. This differs from Hull et al (2004) and Norden and Weber (2004), who close gaps by linearly interpolating between CDS quotes. We do not interpolate across announcement days. The sample includes only issuers for which equity prices and CDS spreads are available for at least two of the three days surrounding a rating announcement and, moreover, for which prices are not constant, ie not stale. Consequently, price changes in the interval [0,+1] are calculated only from observed data.

For each issuer, data on rating announcements were obtained from Bloomberg. All types of announcements – rating changes, reviews and outlooks – were considered. Furthermore, announcements by all three of the major rating agencies – Moody's, S&P and Fitch – were retrieved. Announcements relating to the most senior credit rating available were selected, usually the long-term issuer rating.

To isolate the impact of different types of announcements, we exclude all contemporaneous rating announcements. If on any given day an agency makes two rating announcements concerning the same company, then both announcements are excluded from the sample. Rating agencies often change a firm's rating outlook at the same time as they change its rating. Therefore, failure to control for contemporaneous announcements can bias the results.

It is also important to control for other events that might impact prices on the day of a rating announcement. Identifying all events surrounding the rating announcements in our sample would be very time consuming. Instead, we construct a proxy for other events by counting the number of rating announcements in a 10-day window around any given announcement. If there is evidence of clustering (ie if the sum of announcements is greater than one), then we assume that the rating announcement is driven by other information and exclude the announcement from our sample. Each firm in our sample is rated by 1.9 agencies on average, and so significant events are likely to elicit a response from more than one agency. The clustering of rating announcements is an imperfect proxy for other events. In a sample of 30 events that led to rating announcements, only 50% resulted in a rating announcement by two or more agencies. Nevertheless, it is an improvement over most other studies.

The final sample comprises 439 issuers and 2014 related rating announcements. Financial institutions make up 18% of the issuers and non-financial corporations the remaining 82%. US issuers account for 56% of the total, followed by European issuers at 26% and Japanese issuers at 18%. The distribution of rating announcements is shown in Table 2. Negative announcements account for 74% of all rating announcements, reflecting the deterioration in credit quality between 2001 and 2003. Downgrades account for 43% of the negative announcements, reviews 24% and outlook changes 33%. Even after controlling for contemporaneous announcements and clustering, nearly 40% of the negative announcements were preceded within 60 business days by other rating announcements.

[6] Dealers contribute to Markit quotes for 10 different maturities, ranging from 6 months to 30 years. In 2001, contracts with a five year maturity accounted for 20% of all dealer quotes, followed by contracts with a three-year maturity at 18%. By 2004, these proportions had fallen to 16% and 14%, respectively, owing to the rapid growth of trading in other maturities.

Event window

The event window is set equal to four months, starting 60 business days before a rating announcement and ending 20 business days after an announcement. Sixty business days was selected as the preceding period because rating agencies seek to act upon material information within three months (Keenan et al (2000)). Over the sample period, the average period between a review for downgrade and a downgrade was 32 business days.

The event window is subdivided into four time intervals: 60 to 21 business days before a rating announcement; 20 to one day before an announcement; the day of an announcement and the following day; and two to 20 days after an announcement. If a rating announcement is fully anticipated, then equity prices and CDS spreads should adjust prior to the announcement, in either the [-60,-21] or [-20,-1] intervals. If a rating announcement has informational or endorsement value, then it should have a discernible price impact in the [0,+1] interval. The impact of the announcement is tested over a two day interval because the announcement might have been made after markets closed for the day.[7] In the case of less liquid names, the full impact of a rating announcement might be delayed to the [+2,+20] interval.

Calculation of daily returns

To examine the price impact of rating announcements, we focus on daily holding period returns for a buy-and-hold investment:

$$R_{i,t}^{M} = \frac{P_{i,t}^{M}}{P_{i,t-1}^{M}} - 1 \qquad (1)$$

where $R_{i,t}^{M}$ = return for issuer *i* on day *t* in market *M*

$P_{i,t}^{M}$ = market value of 1 unit of issuer *i* on day *t* in market *M*

The market *M* refers to either the equity market *E* or the CDS market *C*. The calculation of equity returns $R_{i,t}^{E}$ is straightforward. The calculation of CDS returns $R_{i,t}^{C}$ is more complicated because the market value of a CDS contract $P_{i,t}^{C}$ depends upon an uncertain stream of premia. The buyer of a CDS contract pays to the seller regular (usually quarterly) payments until the maturity of the contract or until a credit event occurs, whichever is sooner. $P_{i,t}^{C}$ represents the expected present value of these payments:

$$P_{i,t}^{C} = S_{i,t} \cdot RPV01_{i,t} \qquad (2)$$

where $S_{i,t}$ = CDS spread for issuer *i* on day *t*

$RPV01_{i,t}$ = present value on day *t* of a 1 basis point stream of premia which terminates at maturity or default, whichever occurs first

The calculation of $RPV01_{i,t}$ requires a CDS pricing model. In particular, the probability of the reference entity surviving to each payment date must be modelled. There are several different approaches for modelling this probability. For purposes of pricing, reduced-form models, such as that developed by Hull and White (2000), are the most widely used. In these models, $RPV01_{i,t}$ is negatively correlated with CDS spreads (from which default probabilities are derived), risk-free interest rates and recovery rates (ie the amount that creditors expect to receive in settlement of their claims on a defaulting borrower, usually stated as a percentage of the debt's par value).

To simplify the calculation of CDS returns $R_{i,t}^{C}$ and skirt controversies regarding the appropriate pricing model, we assume that $RPV01_{i,t-1} = RPV01_{i,t}$. Substituting into equation (1) gives the following:

[7] Neither the CDS prices nor the rating announcements are time stamped. It is in principle possible – but in practice highly unlikely – for an announcement in Tokyo on day 0 to have an impact on prices in New York on day -1.

$$R^C_{i,t} = \frac{P^C_{i,t}}{P^C_{i,t-1}} - 1 = \frac{S_{i,t} \cdot RPV01_{i,t}}{S_{i,t-1} \cdot RPV01_{i,t-1}} - 1$$

$$= \frac{S_{i,t}}{S_{i,t-1}} - 1 \qquad (3)$$

For a one day horizon, this assumption seems reasonable. Based on a simple CDS pricing model developed by O'Kane and Turnbull (2003), we calculated the average daily change in $RPV01_{i,t}$ to be close to zero for our sample of issuers over the sample period.[8] On days when CDS spreads, interest rates or recovery rates are unusually volatile, equation (3) results in biased estimates of returns. However, providing that CDS spreads are at least as volatile as interest and recovery rates, the impact of $RPV01_{i,t} / RPV01_{i,t-1}$ on $R^C_{i,t}$ is dwarfed by the impact of $S^C_{i,t} / S^C_{i,t-1}$. In other words, $R^C_{i,t}$ is much more sensitive to changes in CDS spreads than to changes in interest or recovery rates. Therefore, while equation (3) tends to overestimate returns, on most days the bias is not significant.[9]

Our methodology for calculating CDS returns differs from Hull et al (2004) and Norden and Weber (2004). They focus on absolute changes in CDS spreads, calculated as daily differences in basis points:

$$\Delta CDS_{i,t} = S_{i,t} - S_{i,t-1} \qquad (4)$$

One disadvantage of their methodology is that it does not facilitate a comparison of returns across markets. Furthermore, it does not adjust for differences in the level of spreads across issuers. Based on equation (4), issuers trading at higher spreads, such as those rated below investment grade, will by construction have more volatile spreads than issuers trading at lower spreads, such as those rated investment grade. This makes it difficult to pool observations. Nevertheless, to test the rigorousness of our results, we replicate their methodology.

Calculation of abnormal returns

Following the literature on event studies, we calculate abnormal price changes to control for possible market-wide systematic factors that could move all prices simultaneously. We adjust equity and CDS returns using the market model:

$$AR^M_{i,t} = R^M_{i,t} - \alpha^M_i - \beta^M_i R^M_{k,t}$$

where $AR^M_{i,t}$ = abnormal return for issuer *i* on day *t* in market *M*

$R^M_{i,t}$ = actual return for issuer *i* on day *t* in market *M*

$R^M_{k,t}$ = actual return for the index *k* on day *t* in market *M*

The parameters α^M_i and β^M_i are estimated over a six-month period preceding each event window. The market index *k* used to adjust returns corresponds to the nationality of the issuer. Separate indices are constructed for US, Japanese, euro area, UK, Swedish, Swiss and Norwegian issuers. The market index *k* should ideally comprise the universe of issuers in a given market. For all equity markets except the euro area, *k* refers to Datastream Total Market indices. For the euro area equity market, the DJ

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[8] The model makes a number of simplifying assumptions. For example, it assumes that the hazard rate process is deterministic. According to O'Kane and Turnbull (2003), the pricing impact of these assumptions is insignificant, smaller than the typical bid-ask spread. For ease of implementation, we follow O'Kane et al (2003) and further simplify the model by assuming that the term structure of interest rates and credit spreads is flat and ignoring the effect of accrued premia. Recovery rates were retrieved from Markit; each dealer who contributes a quote to Markit also contributes an estimate of the recovery rate. Risk-free interest rates were proxied using 5-year government spot rates.

[9] Another source of bias – albeit an insignificant source at very short time intervals – is the use of at-market prices in place of off-market prices. In equation (3), $S_{i,t-1}$ represents the price of a CDS contract with an original maturity of *T* years and $S_{i,t}$ the price of the same contract one period later. Off-market prices are not available from Markit and so we approximate $S_{i,t}$ using at-market prices. The price difference between contracts with a remaining maturity of five years less a day and contracts with an original maturity of five years is negligible.

Euro STOXX is used. For CDS markets, broad indices were launched only towards the end of our sample period.[10] Consequently, we construct an index based on CDS prices in our sample. The index return on a given day is set equal to the median CDS return for the relevant sample of issuers.

To replicate the methodology of Hull et al (2004) and Norden and Weber (2004), we also calculate abnormal CDS spread changes:

$$ASC_{i,t} = \Delta CDS_{i,t} - \left(IND_{g,t} - IND_{g,t-1}\right)$$

where $ASC_{i,t}$ = abnormal CDS spread change for issuer i on day t

$IND_{w,t}$ = market index corresponding to the issuer's rating category g on day t

Four market indices $IND_{g,t}$ are constructed, corresponding to the whole letter rating categories AA, A, BBB, BB. Ratings by different agencies are mapped into these categories according to the schematic presented in Table 1.[11] The value of the index on a given day is set equal to the median spread for the relevant rating category.[12]

Rating-based indices partially adjust for differences in the level of spreads across issuers. The variance of $ASC_{i,t}$ is similar for issuers in a given rating category, although heteroscedasticity is still a problem because of the pronounced skewness of spreads. A shortcoming of rating-based indices as a control for systematic factors is that they combine issuers of many different nationalities and so assume that any macroeconomic shocks are global in nature. By contrast, nationality-based indices allow common shocks to differ across countries (or monetary areas).

Test statistics

We employ three different tests to examine the impact of rating announcements on equity and CDS prices. The first is a standardised cross-sectional *t*-test. Specifically, we test whether the mean of abnormal changes in equity and CDS prices is significantly different from zero after controlling for event-induced changes in variance. Abnormal changes are assumed to be independent and distributed Student's t with n–1 degrees of freedom, where n denotes the number of observations. For CDS prices we use a one-tailed test and for equity prices a two-tailed test.[13]

Rating announcements potentially lead to a change in both the mean and variance of equity and CDS prices. The change in variance is due to a possible change in the firm's perceived risk. Brown and Warner (1980) note that when the variance induced by an event is underestimated, the test statistic results in the rejection of the null hypothesis more frequently than it should, even when the average abnormal performance is zero. One remedy to this problem is to ignore the estimation period residual variance and use instead the cross-sectional variance in the event window itself to form the test statistic. With this approach the *t*-test is obtained by dividing the average event window residual by its contemporaneous cross-sectional standard error.[14]

However, if the event window residuals for different firms are drawn from different distributions, this cross-sectional *t*-test is misspecified. Boehmer et al (1991) propose a procedure to address this problem. They standardise the abnormal returns of the event window by the standard deviation of the

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[10] The first sets of CDS indices, known as Trac-x and iBoxx, appeared in 2003. Competing indices were merged in 2004 to form two new sets of indices under the names DJ CDX for North American and emerging market issuers and DJ iTraxx for European and Asian issuers.

[11] For issuers with split ratings, an average rating is calculated, as suggested by Cantor et al (1997). Changes in CDS spreads after a rating downgrade or upgrade are adjusted by the market index corresponding to the new rating category.

[12] Hull et al (2004) and Norden and Weber (2004) base their index on the mean spread rather than the median. The distribution of credit spreads tends to be highly positively skewed and so the mean of the distribution can be heavily influenced by one or two extreme observations; therefore, the median provides a more accurate measure of central tendency.

[13] As discussed in section 3, negative rating announcements motivated by a deterioration in the issuer's financial prospects should cause equity prices to fall, whereas negative announcements motivated by an increase in leverage should cause equity prices to rise.

[14] The event window standard deviation is usually larger than the estimation period standard deviation.

estimation period (adjusted for forecast error) and then apply the cross-sectional *t*-test to the standardised abnormal returns. The test statistic is found by dividing the average abnormal return in event window by its contemporaneous cross-sectional standard error.

For event days, the standardised abnormal return is obtained as follows:

$$SR_{i,t}^{M} = \frac{AR_{i,t}^{M}}{\hat{s}_i^{M}\sqrt{1+\frac{1}{T}+\frac{\left(R_{k,t}^{M}-\hat{R}_k^{M}\right)}{\sum_{p=1}^{T}\left(R_{k,p}^{M}-\hat{R}_k^{M}\right)}}}$$

where $SR_{i,t}^{M}$ = standardised abnormal return for issuer *i* on event day *t* in market *M*

$\hat{s}_i^{M}$ = standard deviation of abnormal returns for issuer *i* during the estimation period

$\hat{R}_k^{M}$ = average return for index *k* in market *M* during the estimation period

T = number of days *p* in the estimation period

The standardised cross-sectional test statistic incorporates variance information from both the estimation period and the event window and is defined as follows:

$$t_{n-1}^{M} = \frac{\frac{1}{n}\sum_{i=1}^{n} SR_{i,t}^{M}}{\sqrt{\frac{1}{n(n-1)}\sum_{i=1}^{n}\left(SR_{i,t}^{M}-\frac{1}{n}\sum_{i=1}^{n} SR_{i,t}^{M}\right)^{2}}}$$

Boehmer et al (1991) perform various simulations and find that this test statistics yields better inferences when there is a simultaneous increase in the mean and the variance of the abnormal returns at the time of the event.

The second test used is the sign test. The advantage of this test is that it is free of specification assumptions concerning the distribution of returns. The sign test requires that abnormal returns be independent across firms. The test statistic J^{M} is calculated as follows:

$$J^{M} = \left(\frac{n^{+}}{n}-0.5\right)\frac{n^{1/2}}{0.5}$$

where n^{+} = number of positive abnormal returns in the sample

The null hypothesis is that the proportion of positive abnormal returns in the sample is equal to the proportion of negative abnormal returns, which is equal to 0.5.[15] 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. One problem with this test is that it assumes an equal proportion of positive and negative abnormal returns, whereas abnormal returns are usually skewed.

To address the possible misspecification induced by the skewness of abnormal returns, we employ a third test based on the bootstrap technique described by Efron and Tibshirani (1993). The bootstrap test is refers to the *t*-statistic: $t = \sqrt{n}(\bar{s}-\mu_0)/\bar{\sigma}$, 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). To carry out the bootstrapping, we define $\tilde{s}_i = s_i - \bar{s}$ for $i = 1,\ldots,n$. The values $\tilde{s}_1,\tilde{s}_2,\ldots,\tilde{s}_n$ correspond to the null distribution, ie the distribution defined by the null hypothesis of the test. We sample 1000 times with replacement and calculate $t^{B} = \sqrt{n}\left(\bar{s}^{B}/\hat{\sigma}^{B}\right)$, where $\bar{s}^{B}$ and $\hat{\sigma}^{B}$ are the bootstrapped sample mean and standard deviation. By comparing *t* with the desired

[15] The sign test is a special case of the binomial case in which two possible outcomes have equal probabilities.

percentile of this distribution, we can reject or accept the null hypothesis at the specified confidence level.

5. Empirical results

Our test results are summarised in Tables 3 through 7.

Information content of negative rating announcements

Table 3 reports abnormal changes in equity and CDS prices around negative rating announcements. To control for foreshadowed announcements, the various samples shown exclude rating announcements which were preceded by another rating announcement within 60 days. We find that negative reviews have the greatest price impact. The results for other types of negative rating announcements are more mixed but on balance they suggest that downgrades and negative outlook changes also have a significant, albeit smaller, impact on equity and CDS prices.

Downgrades result in a 0.2% decline in abnormal equity returns AR^E during the announcement window [0,+1] and a similarly sized increase in abnormal CDS returns AR^C. The impact on equity prices is significant at the 1% level in all three tests. However, the results for CDS prices are less convincing. According on the *t*-test, the null hypotheses $AR^C = 0$ and $ASC = 0$ cannot be rejected at reasonable significance levels. By contrast, the sign test and, for AR^C, booststrap test suggest that the estimates are highly significant.

Negative reviews lead to a 0.5% decline in AR^E and a 0.9% increase in AR^C. According to the *t*-test, these estimates are significant at the 10% and 1% levels, respectively. For AR^C, the other tests confirm this result. Moreover, negative reviews also have a highly significant impact on abnormal CDS spread changes *ASC*. However, based on the sign and bootstrap tests, negative reviews have no impact on AR^E.

Finally, a negative outlook change has a negligible impact on AR^E but results in a 0.2% increase in AR^C. The impact on CDS prices is significant at the 5% level or lower according to both the *t*- and bootstrap tests. The results for *ASC* are weaker than those for AR^C. To our knowledge, ours is the first study to find that the negative outlooks have a significant price impact. This finding is backed up by anecdotal evidence which indicates that market participants do pay attention to outlook changes (see below).

Market participants appear to anticipate downgrades and negative reviews. In particular, there is evidence of significant abnormal performance in both equity and CDS markets in the [-20,-1] interval. Prior to a downgrade, equity prices decline by 0.2% on average and CDS prices rise by 0.8%. Prior to a negative review, equity prices decline by 0.6% and CDS prices rise by 0.8%. The information prompting the announcement of a downgrade or review likely becomes available to market participants during the [-20,-1] interval. Market participants evidently react to signs of a deterioration in an issuer's creditworthiness before rating agencies react. CDS prices continue to increase even after the announcement of a review, in the [+2,+20] interval.

By contrast, there is little evidence of abnormal performance prior to a negative outlook change. The estimates for CDS returns in the [-60,-21] and [-20,-2] intervals are insignificant according to both the *t*- and bootstrap tests. Equity returns outperform in the [-60,-21] and [+2,+20] intervals, *increasing* in price.

Information content of positive rating announcements

Table 4 reports abnormal changes in equity and CDS prices around positive rating announcements. As in Table 3, the samples shown exclude rating announcements which were preceded by another rating announcement within 60 days. Positive announcements have no impact on equity prices. However, they do lead to significant declines in CDS prices – a result not found in most previous studies, perhaps because of their much smaller samples.

Upgrades and positive reviews both result in a 0.4% decline in CDS prices. Positive outlook changes result in a 0.2% decline in CDS prices. According to the *t*-test, these estimates are highly significant.

The other tests generally confirm these results. To a lesser extent, so too do the results for abnormal spread changes *ASC*.

Investors do not appear to anticipate positive rating announcements. There is some evidence of a decline in CDS prices in the [-20,-1] interval prior to an upgrade and the [-60,-21] interval prior to a positive outlook change. In general, however, the estimates are insignificant. Evidence of anticipation is stronger in equity markets, with equity prices declining prior to the announcement of a review for upgrade but increasing prior to the announcement of a change to a positive outlook.

It is puzzling why positive rating announcements have a significant impact in CDS markets but no impact in equity markets. One possible explanation is that rating agencies may react with a longer lag to positive news. Bond and CDS investors are more sensitive to negative news than to positive news, owing to the highly skewed distribution of returns on credit instruments. Rating agencies may have a similarly asymmetric reaction function, setting higher standards for an upgrade than a downgrade. Anecdotally this seems to be the case. Over the 1986-2004 period, upgrades of US corporations by Moody's exceeded downgrades only 21% of the time, and upgrades as a percentage of all rating actions ranged from a low of 17% (in 2002) to a high of only 61% (in 1996).

Information content of second ratings

Table 5 addresses the question of whether two credit ratings are more informative than one. Evidently they are. Unlike Tables 3 and 4, Table 5 refers to rating announcements preceded by other rating announcements within 60 days. As when there were no preceding announcements, negative reviews have the greatest impact on equity and CDS prices. Downgrades and negative outlook changes have a smaller but still significant impact.

Equity prices decline by 0.3% on average in response to a downgrade foreshadowed by another rating announcement, and CDS prices increase by a similar magnitude. Equity prices decline by 1.0% in response to a negative review foreshadowed by another rating announcement, and CDS prices increase by 0.6%. Finally, equity prices do not react to a negative outlook change, but CDS prices increase by 0.4%. Most of these estimates are significant at the 1% level according to both the *t*- and booststrap tests. The sign test, however, only shows significance for negative reviews.

Our previous findings, in Tables 3 and 4, suggest that there should be evidence of abnormal performance in the intervals [-60,-21] or [-20,-2], at the time of the preceding downgrade, review or outlook change. As expected, in most samples AR^E and AR^C are significantly different from zero during these intervals.

Endorsement value of rating announcements

The final question is whether the impact of rating announcements is driven by their informational value or their endorsement value. Tables 6 and 7 report the impact of rating announcements across whole letter rating categories. Ratings announcements both preceded and not preceded by other rating announcements within 60 days are included. While only the results of the *t*-test are reported in the tables, the results of the bootstrap test are similar. If the endorsement value of rating announcements is significant, then we would expect negative rating announcements to have the largest impact on issuers at risk of being downgraded to speculative grade, ie issuers rated BBB, or upgraded to investment grade, ie issuers rated BB. This does seem to be the case.

In CDS markets, downgrades have a significant price impact only for BBB-rated issuers; the impact on AA-, A- and BB-rated issuers is insignificant. The impact on CDS prices is most pronounced for BBB-rated issuers placed on review for a downgrade. A negative reviews leads to a 1.3% increase in CDS prices for BBB-rated issuers, compared to a 0.3% increase following a downgrade. A negative review also results in a significant increase in CDS prices for A-rated issuers, but by much less than for BBB-rated issuers: 0.5% compared to 1.3%. Similarly, a negative outlook change leads to a 0.5% increase in CDS prices for BBB-rated issuers but only a 0.1% increase for A-rated issuers (and no significant increase for AA- and BB-rated issuers).

Results for positive rating announcements are also consistent with the endorsement value hypothesis. The impact of positive rating announcements is largest for BB-rated issuers. Upgrades lead to a 0.6% decline in CDS prices for BB-rated issuers, compared to a 0.3% decline for BBB-rated issuers. For positive reviews and positive outlook changes, the price impact on BB-rated issuers is likewise about

twice as large as that on BBB-rated issuers. Positive rating announcements have no significant price impact on AA- and A- rated issuers.

CDS prices might be expected to rebound in the interval [+2,+20] if a rating announcement resulted in a forced sale of securities. This does not seem to have occurred, however. CDS prices continue to rise following negative reviews, while there is little evidence of abnormal performance following other types of rating announcements. Following positive reviews and positive outlook changes, CDS prices continue to fall.

In equity markets, negative rating announcements have a negligible impact on AA- and BB-rated issuers. The price impact of downgrades is similar in magnitude for both A- and BBB-rated issuers, while the impact of negative reviews is actually larger for A-rated issuers. Only in the case of negative outlook changes does the impact on BBB-rated issuers stand out. Positive rating announcements have no impact on equity prices.

6. Conclusions

To summarise, there is evidence that all types of negative rating announcements – outlooks, reviews and rating changes – have a significant impact on equity and CDS prices. Even announcements that are anticipated by earlier movements in prices have a non-negligible impact. This impact is most pronounced for negative reviews. Moreover, we find that positive rating announcements also have a significant impact; however, only on CDS prices. Equity prices are little affected by positive announcements, perhaps owing to asymmetries in the reaction of rating agencies to positive and negative news.

Considering that reviews and outlooks are more timely indicators of changes in credit quality than downgrades, it is surprising that all types of announcements seem to contain pricing-relevant information. Investors appear to value both a timely signal of possible changes in creditworthiness as well as a stable signal of underlying creditworthiness. This is consistent with informal feedback from investors. Mahoney and Laserson (2002, p 3) of Moody's find that investors "are strongly opposed to volatile ratings". Yet, at the same time investors "use and appreciate the rating review and rating outlook signalling process; they derive substantial information from them, and they desire that issuers be given an opportunity to act on correctable conditions that could otherwise lead to credit deterioration."

The results are similar regardless of whether rating announcements are preceded by other rating announcements. This confirms that investors value both the timely signal embodied by reviews and outlooks and the stable signal embodied by downgrades. It also suggests that two ratings are more informative than one; an announcement preceded by a similar announcement by a different rating agency contains pricing-relevant information.

Finally, the impact of negative rating announcements is greatest for issuers at risk of being downgraded to speculative grade. Moreover, the impact of positive rating announcements is greatest for issuers just below the investment grade. This suggests that the market influence of rating agencies is amplified by the existence of rating-based thresholds. While our results indicate that the endorsement value of rating announcements is significant, they do not allow us to quantify the relative importance of the information content of ratings and their endorsement value. Further research into this question could advance the debate on the need for greater regulatory oversight of rating agencies. To the extent that the influence of rating agencies derives largely from their endorsement value, then the impact of rating announcements could be lessened by promoting the integration of the investment grade and high yield debt markets. For example, a change in the credit risk management practices of institutional investors to give more emphasis to internal credit assessments and less to agencies' assessments would reduce the costs associated with a loss of investment grade status.

Another avenue for further research is to expand the sample to include corporate bonds. A comparison of the speed and size of price moves in CDS and corporate bond markets in response to rating announcements could provide insights into the linkages between these two markets.

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Table 1

Comparison of agencies' credit ratings

Long-term issuer ratings

Credit quality		Standard and Poor's[1]	Fitch[2]	Moody's[3]	Annual default rate[4]
Investment-grade debt	Highest quality	AAA	AAA	Aaa	0.00
	Very strong payment capacity	AA + AA AA –	AA + AA AA –	Aa 1 Aa 2 Aa 3	0.00
	Strong payment capacity	A + A A –	A + A A –	A 1 A 2 A 3	0.02
	Adequate payment capacity	BBB + BBB BBB –	BBB + BBB BBB –	Baa 1 Baa 2 Baa 3	0.19
Speculative-grade debt	Payment capacity is vulnerable to adverse conditions	BB + BB BB –	BB + BB BB –	Ba 1 Ba 2 Ba 3	1.22
	Payment capacity is likely to be impaired by adverse conditions	B + B B –	B + B B –	B 1 B 2 B 3	5.81
	Payment capacity is dependent upon sustained favourable conditions	CCC + CCC CCC – CC	CCC + CCC CCC – CC C	Caa 1 Caa 2 Caa 3	22.43
	In or near default	SD D	DDD DD D	Ca C	

[1] Issuer ratings or long-term obligation ratings. [2] Long-term issuer ratings. [3] International long-term ratings. [4] Moody's 1-year global default rate by whole letter rating, as a percentage of rated issuers; 1970-2004 average.

Sources: Company websites; Cantor and Packer (1994)

Table 2

Distribution of rating announcements

Number of rating announcements during the sample period

	Negative announcements				Positive announcements			
	Down-grade	**Review**	**Outlook change**	**Total**	**Up-grade**	**Review**	**Outlook change**	**Total**
Raw sample								
Total	2 614	1 385	968	4 967	673	289	433	1 395
By rating agency:								
Moody's	1 551	654	323	2 528	272	195	142	609
Standard & Poor's	706	576	452	1 734	276	67	180	523
Fitch	357	155	193	705	125	27	111	263
Not preceded by an announcement[1]	1 841	866	510	3 217	452	235	314	1 001
Preceded by an announcement[1,2]	773	519	458	1 750	221	54	119	394
Rating change	363	269	250	882	114	20	39	173
Review	518	287	188	993	116	19	24	159
Outlook change	127	50	166	343	33	20	71	124
Same agency	143	67	96	306	61	4	14	79
Different agency[3]	630	452	362	1 444	160	50	105	315
Final sample								
Total	643	360	484	1 487	185	110	232	527
Not preceded by an announcement[1]	425	223	256	904	100	76	156	332
Preceded by an announcement[1,2]	218	137	228	583	85	34	76	195

[1] Preceded by another rating announcement during the 60 business days prior to the rating announcement. [2] Some announcements were preceded by more than one rating announcement and so the total may differ from the sum of the preceding announcements. [3] Preceded by a rating announcement by a different rating agency.

Sources: Bloomberg.

Table 3

Impact of negative rating announcements on equity and CDS prices

Abnormal changes in prices around announcements
not preceded by other rating announcements

		Business days before or after the announcement			
		[–60, –21]	**[–20, –1]**	**[0, +1]**	**[+2, +20]**
Rating downgrade (*n* = 425)					
Equity prices daily change in per cent	AR^E	0.093	-0.224	-0.172	0.059
	t-test		*	***	
	Sign test		***	***	
	Bootstrap		*	***	
CDS prices daily change in per cent	AR^C	-0.232	0.843	0.161	-0.341
	t-test		***		
	Sign test	*	***	***	***
	Bootstrap		***	**	
CDS prices change in basis points	*ASC*	-1.122	3.124	0.576	5.891
	t-test				*
	Sign test		**	***	***
	Bootstrap				**
Negative review (*n* = 223)					
Equity prices daily change in per cent	AR^E	-0.722	-0.592	-0.523	-0.055
	t-test	**	**	*	
	Sign test				
	Bootstrap				
CDS prices daily change in per cent	AR^C	0.175	0.804	0.889	0.721
	t-test		**	***	***
	Sign test			***	
	Bootstrap		***	***	***
CDS prices change in basis points	*ASC*	3.139	7.501	7.798	24.490
	t-test		*	***	***
	Sign test	***	***	***	***
	Bootstrap		*	***	***
Negative outlook change (*n* = 256)					
Equity prices daily change in per cent	AR^E	0.426	-0.052	-0.024	0.407
	t-test	*			***
	Sign test	**			
	Bootstrap	**			***
CDS prices daily change in per cent	AR^C	-0.533	0.272	0.173	0.146
	t-test			**	
	Sign test	***	*		**
	Bootstrap			***	
CDS prices change in basis points	*ASC*	-9.916	-3.437	1.310	3.053
	t-test			*	*
	Sign test	*			
	Bootstrap				**

* indicates significance at the 10% level; ** indicates significance at the 5% level; *** indicates significance at the 1% level.

Table 4

Impact of positive rating announcements on equity and CDS prices

Abnormal changes in prices around announcements
not preceded by other rating announcements

		Business days before or after the announcement			
		[–60, –21]	**[–20, –1]**	**[0, +1]**	**[+2, +20]**
Rating upgrade (*n* = 100)					
Equity prices daily change in per cent	AR^E	-0.397	0.176	-0.197	-0.562
	t-test				*
	Sign test			*	
	Bootstrap				*
CDS prices daily change in per cent	AR^C	0.100	-0.505	-0.412	0.384
	t-test		*	***	
	Sign test			**	
	Bootstrap		**	***	
CDS prices change in basis points	*ASC*	-2.896	-5.789	0.044	-3.176
	t-test		**		
	Sign test			**	
	Bootstrap		**		*
Positive review (*n* = 76)					
Equity prices daily change in per cent	AR^E	-0.552	-0.442	0.155	-0.662
	t-test		*		**
	Sign test	*	**		**
	Bootstrap		**	*	**
CDS prices daily change in per cent	AR^C	-0.814	0.750	-0.438	-0.624
	t-test			***	**
	Sign test	*	*	*	***
	Bootstrap			***	***
CDS prices change in basis points	*ASC*	1.592	-1.945	-3.801	0.958
	t-test			***	
	Sign test				
	Bootstrap			***	
Positive outlook change (*n* = 156)					
Equity prices daily change in per cent	AR^E	0.631	0.295	-0.042	0.050
	t-test	*			
	Sign test		**		
	Bootstrap	**	*		
CDS prices daily change in per cent	AR^C	-0.915	-0.183	-0.188	-0.829
	t-test	**		***	***
	Sign test		**	***	**
	Bootstrap				
CDS prices change in basis points	*ASC*	-0.230	2.346	-0.705	-4.479
	t-test				**
	Sign test			**	*
	Bootstrap				***

* indicates significance at the 10% level; ** indicates significance at the 5% level; *** indicates significance at the 1% level.

Table 5

Impact of second rating announcements on equity and CDS prices

Abnormal changes in prices around announcements
preceded by other rating announcements

		Business days before or after the announcement			
		[–60, –21]	**[–20, –1]**	**[0, +1]**	**[+2, +20]**
Downgrade preceded by another announcement (*n* = 218)					
Equity prices daily change in per cent	AR^E	-1.131	-0.096	-0.258	0.649
	t-test	***		**	***
	Sign test				***
	Bootstrap	**		**	***
CDS prices daily change in per cent	AR^C	0.551	0.409	0.333	-0.285
	t-test	**	**	***	
	Sign test				***
	Bootstrap	***	**	***	
Negative review preceded by another announcement (*n* = 137)					
Equity prices daily change in per cent	AR^E	-0.249	-0.736	-1.027	0.265
	t-test		**	***	
	Sign test			***	*
	Bootstrap		**	***	
CDS prices daily change in per cent	AR^C	0.876	0.773	0.591	0.836
	t-test	***	***	***	***
	Sign test			***	
	Bootstrap	***	***	***	***
Negative outlook change preceded by another announcement (*n* = 228)					
Equity prices daily change in per cent	AR^E	0.153	-0.325	-0.090	0.779
	t-test		*		***
	Sign test				***
	Bootstrap		*	*	***
CDS prices daily change in per cent	AR^C	1.392	0.215	0.352	-0.429
	t-test	**		***	
	Sign test		***		**
	Bootstrap	***		***	

* indicates significance at the 10% level; ** indicates significance at the 5% level; *** indicates significance at the 1% level.

Table 6

Impact of negative rating announcements on equity and CDS prices

Abnormal changes in prices around announcements

		(n)	**Business days before or after the announcement**			
			[–60, –21]	**[–20, –1]**	**[0, +1]**	**[+2, +20]**
Downgrade						
Equity prices daily change in per cent	AA	(35)	-0.292	0.217	-0.013	-0.412
	A	(203)	-0.315	-0.112	-0.186**	0.568***
	BBB	(285)	-0.514	-0.154	-0.248***	0.154
	BB	(78)	0.104	-0.528	-0.190	0.202
CDS prices daily change in per cent	AA	(35)	0.161	0.301*	-0.159	-0.129
	A	(203)	0.039	0.605***	0.320	-0.420
	BBB	(285)	0.134	0.639***	0.296***	-0.166
	BB	(78)	-0.238	1.694	-0.097	-0.800
Negative review						
Equity prices daily change in per cent	AA	(20)	2.352**	0.560	-0.032	0.148
	A	(124)	-1.099**	-1.436***	-1.178**	-0.165
	BBB	(157)	-0.504	-0.437*	-0.556**	0.189
	BB	(39)	-0.381	-0.101	0.054	0.308
CDS prices daily change in per cent	AA	(20)	0.809**	0.116	0.023	0.376
	A	(124)	1.029***	1.881***	0.528***	0.885***
	BBB	(157)	0.307	0.112	1.265***	0.817***
	BB	(39)	0.049	0.593**	0.092	0.558*
Negative outlook change						
Equity prices daily change in per cent	AA	(18)	1.463	0.331	0.311*	0.704
	A	(137)	0.473*	-0.249	-0.049	0.568***
	BBB	(187)	0.165	-0.009	-0.214**	0.713***
	BB	(81)	0.656**	-0.217	0.117	0.551*
CDS prices daily change in per cent	AA	(18)	-0.470	0.879	0.065	-0.434
	A	(137)	-0.445	-0.062	0.131**	-0.243
	BBB	(187)	0.240	0.785*	0.545***	0.121
	BB	(81)	2.993*	-1.236	-0.041	-0.277

* indicates significance at the 10% level; ** indicates significance at the 5% level; *** indicates significance at the 1% level.

Table 7

Impact of positive rating announcements on equity and CDS prices

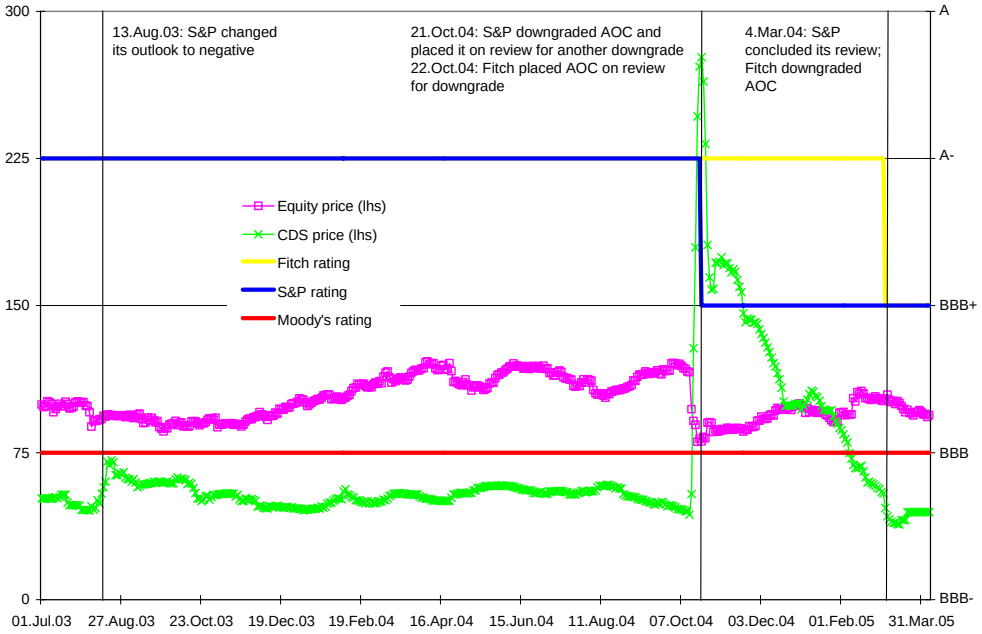
Abnormal changes in prices around announcements

		(n)	**Business days before or after the announcement**			
			[–60, –21]	**[–20, –1]**	**[0, +1]**	**[+2, +20]**
Upgrade						
Equity prices daily change in per cent	AA	(7)	-3.16***	-0.421	-0.244	-1.262
	A	(19)	-1.140*	-0.785	0.177	-0.716
	BBB	(73)	0.146	0.012	-0.147	-0.285
	BB	(58)	-1.035**	0.702***	-0.096	0.365
CDS prices daily change in per cent	AA	(7)	-0.597	0.000	0.016	-0.386
	A	(19)	-0.027	-0.373	0.030	-0.424
	BBB	(73)	-0.643	-0.580*	-0.288**	0.427
	BB	(58)	-0.253	-1.274**	-0.624***	-0.133
Positive review						
Equity prices daily change in per cent	AA	(0)	. . .	. . .	. . .	. . .
	A	(14)	-0.391	-0.430	-0.041	-1.539*
	BBB	(49)	-0.298	-0.311	0.255	-0.390
	BB	(34)	-0.503	-0.374	-0.011	-0.893***
CDS prices daily change in per cent	AA	(0)	. . .	. . .	. . .	. . .
	A	(14)	-0.347	1.055	0.019	-0.137
	BBB	(49)	-1.633*	0.473	-0.449**	-0.811*
	BB	(34)	0.356	-0.913	-0.691**	-1.173**
Positive outlook change						
Equity prices daily change in per cent	AA	(4)	-0.993	0.599	-1.611	-0.196
	A	(25)	0.960	0.543	-0.223	0.914
	BBB	(107)	-0.085	0.398	-0.030	-0.714***
	BB	(50)	-0.229	-0.340	0.078	0.343
CDS prices daily change in per cent	AA	(4)	0.952	0.455	0.016	0.199
	A	(25)	-0.319	-0.177	0.080	-1.314**
	BBB	(107)	-1.645***	-0.561*	-0.225***	-0.572**
	BB	(50)	-0.581	-0.829**	-0.394***	-1.310**

* indicates significance at the 10% level; ** indicates significance at the 5% level; *** indicates significance at the 1% level.

Graph 1

Rating announcements concerning Aon Corporation



[1] Prices are indexed to 31.Dec.04 = 100. [2] Senior unsecured debt rating. [3] Long-term local issuer rating.

Sources: Bloomberg; Markit.