

# Does CDS trading impact the information content of the rating review process?\*

by

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# **Does CDS trading impact the information content of the rating review process?**

## **Abstract**

We investigate whether and how the informational content of credit rating review announcements has changed for firms that are subject to credit default swap (CDS) trading. Based on 1,520 rating review processes from the period 2004-2015, we examine the CDS spread dynamics between the start and end of the rating review conditional on the review outcome, which can be a rating change or a rating confirmation. First, CDS spreads during the review period widen if the review results in a downgrade, but they tighten if the review results in a confirmation. Second, CDS spreads change only little after 75% of the time under review has passed. Our results provide evidence that the informational content by rating review announcement has been weakened for firms that are subject to CDS trading. Instead, the CDS spreads contain information that is useful for market monitoring.

# 1. Introduction

Credit rating agencies (CRAs) play an important role in financial markets as their credit ratings and changes to these ratings can significantly affect a firm’s cost of debt and its ability to access debt markets. Particularly rating downgrades have a significant negative impact on firms’ stock prices (e.g. [Goh and Ederington, 1993](#); [Holthausen and Leftwich, 1986](#); [Jorion, Liu and Shi, 2005](#); [Dichev and Piotroski, 2001](#)), while rating upgrades appear to have little to no effect (e.g. [Bannier and Hirsch, 2010](#); [Dichev and Piotroski, 2001](#)). Moreover, many debt contracts include rating covenants and several regulatory mechanisms are explicitly tied to credit ratings, underlining the importance that credit ratings play for companies.

Nonetheless, there is an ongoing debate on the information value of credit ratings and whether rating announcements actually provide new information to financial markets (e.g. [Chava, Ganduri and Ornathanalai, 2016](#); [Norden, 2017](#)). In a frictionless market, any information regarding the financial situation of a firm should be immediately reflected in a firm’s valuation. Yet, CRAs’ ratings may still provide new information to market participants in case they have information on a firm’s finances that are not generally available to the public or if they possess superior credit valuation models that cannot be easily replicated. Particularly the credit rating review process<sup>1</sup> may offer valuable new insights to market participants, as the analysts of the CRAs collect additional information during the review period, which usually involves some form of direct interaction with the firm’s management in order to obtain a better understanding of the firm’s true financial situation ([Boot, Milbourn and Schmeits, 2006](#); [Bannier and Hirsch, 2010](#); [Chung, Frost and Kim, 2012](#)). Thereby, CRAs potentially take on a monitoring type role, particularly for rating reviews for downgrade, in which firms may adjust their risk exposure in a timely manner or face a rating downgrade and the ensuing reaction by equity and debt investors ([Boot et al., 2006](#)). In this way, CRAs may contribute significant new information and benefits to market participants and engage in a form of monitoring, potentially alleviating uncertainty and concerns with respect to the

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<sup>1</sup>Standard & Poor’s (S&P), Moody’s Investor Service (Moody’s), and Fitch Ratings (Fitch) use different terminologies to describe the rating review process: S&P places a firm on “CreditWatch”, while Moody’s places a firm’s rating on “Watchlist”, and Fitch on “Rating Watch”.

financial situation of a firm (Driss, Massoud and Roberts, 2017).

Against the background of the rise of credit default swap (CDS) trading, however, credit ratings may become less relevant (Chava et al., 2016), as CDS offer a market-based alternative to credit ratings that inform investors in a timely fashion about changes in a firm's credit risk. There is ample evidence that CDS markets anticipate rating changes, at least to a certain degree, particularly rating downgrades (e.g. Hull, Predescu and White, 2004; Norden and Weber, 2004; Galil and Soffer, 2011; Finnerty, Miller and Chen, 2013; Norden, 2017). As a consequence, if CDS trade on a firm's debt, capital market reactions to rating announcements are much more subdued, because CDS trading overcomes market frictions with respect to the availability of information on a firm's creditworthiness (Chava et al., 2016). Simultaneously, the CDS market may be a preferred channel for informed trading and therefore information may flow from the CDS to the equity market (Acharya and Johnson, 2007).

The influence of CDS trading on the rating review process, and therefore the monitoring of CRAs, however, is not clear. There is some evidence that the CDS market reaction to rating review for downgrade announcements is more pronounced than for rating downgrades, while rating reviews for upgrade have at best a limited impact on CDS spreads (e.g. Hull et al., 2004; Norden and Weber, 2004; Galil and Soffer, 2011; Finnerty et al., 2013). Moreover, CDS spreads show no significant reaction to rating change announcements following a rating review (Kiesel and Kolaric, 2017), suggesting that the CDS market participants incorporate all relevant information prior to the CRA's final decision on the rating review. Similar observations are obtained for equity markets (Banner and Hirsch, 2010; Chung et al., 2012; Holthausen and Leftwich, 1986; Wansley and Clauretje, 1985).

This paper sets out to investigate the impact of CDS trading on the information content of the rating review process by using a comprehensive sample of more than 1,500 rating review announcements and their ultimate outcome from S&P, Moody's, and Fitch. We thereby contribute to the growing literature on the importance of CDS trading vis-à-vis credit ratings (e.g. Norden and Weber, 2004; Galil and Soffer, 2011; Chava et al., 2016; Norden, 2017; Kiesel and Kolaric, 2017) and the information contained within CDS spread

changes and the CRA's rating review process. Rating reviews, in this context, can be seen as a tool for CRAs to convey new information to market participants on the financial situation of a firm in a timely fashion without directly resorting to a rating change. However, for firms with CDS trading on their debt, this function may be less relevant, as their CDS spread potentially already incorporate this information.

This article contributes to prior research on the importance of CRAs in light of CDS trading for capital market participants in multiple ways. First, we examine the CDS spread reaction prior to rating review announcements, the actual review announcements, and their subsequent rating decisions of the CRA, either through a rating change or affirmation. Equity investors appear to differentiate between rating review announcements that lead to a subsequent rating change and those that affirm the prior rating (e.g. [Bannier and Hirsch, 2010](#); [Chung et al., 2012](#); [Holthausen and Leftwich, 1986](#); [Wansley and Clauretje, 1985](#)). Prior research on CDS spreads largely neglected to make this distinction (e.g. [Galil and Soffer, 2011](#); [Hull et al., 2004](#); [Norden and Weber, 2004](#)), thereby not allowing for a comprehensive view of the rating review process for CDS markets. By extending this line of research to the CDS market, we offer valuable insights with regard to the information content of the initial rating review announcements and the interaction of credit rating announcements and debt capital market reactions.

Second, we investigate the CDS spread dynamics between the announcement of a rating review and the subsequent rating decision. This analysis allows us to observe whether capital markets are able to anticipate the outcome of a rating review process prior to the CRA making its official announcement. We are thereby able to provide first evidence on the information processing by CDS markets during the review process.

Third, by investigating the credit rating review process in its entirety, we draw conclusions with respect to the monitoring role of CDS markets compared to CRAs. [Boot et al. \(2006\)](#) argue that CRAs use the rating review process as a tool to influence the risk taking behavior of firms. Yet, in light of the importance and visibility of the CDS market this may no longer be the case, as for firms with CDS trading on their debt the CDS market may potentially take on this role and thereby exert a form of market monitoring. In this case, CRAs may

no longer have a meaningful monitoring role and information may be processed in the CDS market prior to CRAs making their review announcements. This would be in line with the notion that CRAs act as information certifiers rather than information suppliers and may explain the anticipation effect observed in the literature.

The results of our empirical analyses show that information regarding the outcome of a review is already reflected in the CDS spreads of a firm. CDS spreads for firms that are downgraded following a rating review for downgrade widen by more than 95 basis points (bps) during the review period, while the CDS spreads for firms whose rating is affirmed tighten by approximately  $-51$  bps. The largest part of this widening and tightening occurs during the days immediately surrounding the review announcement. Furthermore, CDS spreads for firms on rating review for downgrade experience little additional changes after approximately 75% of the time that the firm spends on review. CRAs' decisions on the review announcements therefore add little new information and the subsequent rating decision can be seen as a certification of the information already contained within CDS spread moves.<sup>2</sup> Moreover, it appears that CDS markets are able to anticipate the ultimate outcome of the rating review process, particularly for rating reviews for downgrade, suggesting that the actual review announcements contain only limited new information. For example, the CDS spreads of firms whose review announcements concludes with a rating downgrade widen on average by 38 bps during the 30 days prior to the review announcement, while for firms with a subsequent rating affirmation, CDS spreads only move by 14 bps.

We find strong evidence that for firms with CDS trading on their debt, CRA monitoring plays a subordinate role, as the CDS market takes on a monitoring type of role.<sup>3</sup> Overall, our results indicate that CDS trading and the observed changes in CDS spreads have the potential to act as a substitute to credit ratings and that CDS markets are an effective, market-based monitoring tool.<sup>4</sup>

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<sup>2</sup>The results for reviews for upgrade show that a significant tightening of CDS spreads is only observed immediately surrounding the review for upgrade announcement. During the review process, in contrast, CDS spreads show little to no movements, irrespective of whether the review for upgrades results in an affirmation of the prior rating or an upgrade.

<sup>3</sup>For firms without CDS trading on their debt, however, CRA monitoring through the rating review process may still offer benefits to the debt holders of the firm.

<sup>4</sup>CRAs already use CDS spreads to supplement their ratings to a certain extent. For example, Moody's offers

The rest of the paper is structured as follows. Section 2 introduces the data set and offers the descriptive statistics. Section 3 examines the CDS spread reactions to rating review announcements and analyzes the CDS spread changes during the rating review process. In addition, the determinants of rating changes and their effect on the observed CDS spread changes are investigated. Section 4 assesses how the rating review process potentially affects the capital structure decisions of firms, while Section 5 offers a brief analysis of the stock market reaction to rating review announcements and the subsequent stock return development during the rating review process. Section 6 concludes the paper.

## 2. Data

Our analysis is based on an international sample of U.S. and European listed firms with available CDS spread data and long-term issuer ratings by S&P, Moody's and/or Fitch. The CDS data is retrieved from Thomson Reuters Composite EOD<sup>5</sup> and covers the time period from January 2004 to December 2015. In line with the prior research (e.g. Finnerty et al., 2013; Galil and Soffer, 2011; Norden and Weber, 2004) we use the five year senior CDS mid spread. For several reasons, we exclude all banks, financial services, and insurance companies (SIC 6000-6999). First, these firms generally possess a capital structure that differs from firms in all other industries. Second, they played a leading role in the recent global financial crisis and their CDS spreads were among the most severely affected by the crisis. Finally, rating announcements for financial institutions frequently follow sovereign rating announcements<sup>6</sup> thereby leading to a clustering of events. Therefore, including their CDS spreads would lead to a distortion of our results. In total, we were able to obtain CDS data for 530 firms via Thomson Reuters, 527 of which had a long-term issuer rating from at least one of the three CRAs. This selection procedure implies that we use the CDS data for all non-financial U.S. and European firms available through Thomson Reuters EOD, giving

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market implied ratings, which converts prices from the CDS, bond, and equity markets into a rating, while Fitch offers a CDS implied rating model for corporate and financial firms, and S&P offers CDS market derived signals.

<sup>5</sup>Mayordomo, Peña and Schwartz (2014) show that this database is a viable source for CDS data and that the data is of similar quality as the one provided by Markit or CMA.

<sup>6</sup> See e.g. Moody's announcement of a review for European bank ratings: <https://www.moody.com/research/Moodys-Reviews-Ratings-for-European-Banks-PR-237914>

us the largest possible sample for our analysis. In a next step, we collected the press releases for each rating announcement from the respective website of the CRA.<sup>7</sup>

In total, we were able to identify 6,338 unique firm specific rating review announcements and rating changes by the three CRAs between 2004 and 2015: 2,380 downgrades and 1,680 upgrades, and 1,794 reviews for downgrade and 484 reviews for upgrade. Figure 1 shows the total number of rating reviews for downgrade and rating downgrades during our investigation period. Most rating downgrades are observed for the fourth quarter of 2008 and the first quarter of 2009, the height of the recent financial crisis. Prior to the crisis, rating reviews for downgrade and rating downgrades occurred at almost the same frequency. During the crisis, however, downgrades clearly dominated and following the financial crisis reviews for downgrade and downgrades again occurred with approximately the same frequency, but there are overall fewer observations than prior to the crisis. Upgrades and rating reviews for upgrade, on the other hand, have their fewest observations during the financial crisis, their numbers only increasing following the crisis. Generally, upgrades take place more frequently than reviews for upgrade (see Figure 1).

[Place Figure 1 about here]

As the focus of this paper lies on the rating review process and its ultimate outcome, we concentrate our analysis on rating reviews only. Therefore, our starting sample contains all 2,278 firm specific rating review announcements. The rating change following a rating review has to be a downgrade for firms placed on rating review for downgrade and an upgrade for firms placed on rating review for upgrade. In case the CRA affirms the rating, we treat this announcement as a rating affirmation of the company's initial rating. We applied multiple criteria to arrive at our final sample: First, we omitted all rating reviews that have not been completed as of December 31, 2015. In a second step, we excluded all rating reviews that occurred in combination with a rating change. Next, we dropped all events for which CDS data is not available in sufficient quality during the review period or not available on either the day of the review announcement or the day of the conclusion of the rating review.

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<sup>7</sup>For S&P we retrieved some of the relevant announcements from the Alacra website (<http://www.alacrastore.com>).

This is done to ensure that our sample consists only of review announcements for which we have a subsequent decision and vice versa. Next, we apply the same selection criteria to the stock data for each firm. This leaves us with a final sample of 1,520 observations for our analysis: 782 (312) rating reviews for downgrade (upgrade) with a subsequent rating downgrade (upgrade) and 388 (38) rating reviews for downgrade (upgrade) with a subsequent rating affirmation. The final data set therefore presents approximately 67% of our initial sample of all rating reviews. Table 1 provides an overview of the sample selection procedure.

[Place Table 1 approximately here]

Table 2 offers descriptive statistics of our final sample. The stock data and balance sheet data are obtained from Datastream and Worldscope, respectively. We divide our variables into event-specific variables, review content variables, and firm-specific variables. With regard to event-specific variables, we observe that firms spend on average more time on review for downgrade, approximately 84 trading days, while the decision for firms placed on review for upgrade is usually made within 71 trading days. Furthermore, the rating intensity, as measured by the overall number of rating announcements made by the three CRAs during the 30 days prior to the review announcement, also differs. Reviews for downgrade have a higher rating intensity with roughly 75 other announcements prior the event, while reviews for upgrade have 65 announcements. Approximately one quarter of the reviews for downgrade are observed during the financial crisis starting in late 2007 and ending in mid-2009, while only about 7.1% of reviews for upgrade occurred during this time period. Approximately 40.2% of all reviews for downgrade occur following the financial crisis, while the majority of reviews for upgrade (55.3%) take place in the wake of the crisis. The remaining rating announcements are recorded for the pre-crisis time period between January 2004 and November 2007.

We additionally introduce several review content variables. Agarwal, Chen and Zhang (2016) and Löffler, Norden and Rieber (2016) show that the tone of rating action reports has a significant impact on the subsequent stock market reaction. Consequently, both studies conclude that the words used in rating reports are a good indicator for the subsequent rating

decision. Therefore, in order to analyze whether the content of the review announcement has an impact on the ultimate outcome of the rating review, we measure its linguistic tone. We follow the methodology of Agarwal et al. (2016) and Löffler et al. (2016) and measure the negative and positive tone of the credit rating report through a content analysis in which the negative and positive tones are defined as the percentage of negative and positive words relative to the total number of words.<sup>8</sup> In line with expectations, the ratio of negative words is higher for reviews for downgrade and the ratio of positive words is higher for reviews for upgrade (see Table 2).

Furthermore, following Goh and Ederington (1993), Bannier and Hirsch (2010), and Imbierowicz and Wahrenburg (2013), we also examine the reason behind a rating review. We categorize the review announcements into one of four categories: firm-driven, external, M&A, and other reasons. We identify the reason for a rating review by the CRA using a key word search in the corresponding press release. We use 56 keywords that are frequently mentioned as a reason and sort them in order of appearance in the press release of the CRA.<sup>9</sup> In line with Imbierowicz and Wahrenburg (2013), we attribute the event to the first keyword mentioned in the text if more than one keyword appeared in the press release. In a last step, the keywords are allocated to one of our four categories. In case the press release did not explicitly include one of the keywords, we manually matched it to the closest category. Goh and Ederington (1993) use improvement or deterioration in the firm's earnings and actions or decisions that result in a change in the firm's leverage as their main categories, which are part of our firm driven reasons. We categorize rating reviews due to M&A activity in a separate category, as M&As can affect the operating performance and capital structure of a firm in multiple ways and CRAs regularly evaluate the impact of the transaction on the creditworthiness of the acquiring and target firm. External reasons, on the other hand, relate to new macroeconomic or other market information, as well as adjustments to the rating methodology used by the CRA, which are all outside of the direct control of the firm. These reasons can include rating reviews as a result of weak market demand, sovereign rating

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<sup>8</sup>Positive and negative words are defined in accordance with the Loughran and McDonald (2011) dictionary.

<sup>9</sup>See the Table A.1 in the Appendix for the full list of keywords.

changes, or the introduction of new regulations.

Table 2 also shows the distribution of the different reasons for rating reviews divided by reviews for downgrade and upgrade. M&A is the most frequent reason for rating reviews for downgrade, with 510 events, followed by firm driven reasons with 414 events. External reasons and other reasons only play a minor role. For reviews for upgrade, firm driven reasons are by far the most important with 207 events, which presents approximately 60% of all reviews for upgrade in our sample. The distribution of the reasoning behind review announcements already suggests that reviews for downgrade may follow a different rationale than reviews for upgrade. We explore how the different reasons and the tone of a rating review announcement affects the probability of a rating change in our empirical analysis.

[Place Table 2 approximately here]

We also analyze a set of firm-specific variables. The total assets for firms placed on review for downgrade are on average much larger than for those placed on review for upgrade, but driven by a few large corporations. The median, on the other hand, is almost equal with approximately 14.9 billion U.S. dollars (USD). The average total debt for firms placed on review for downgrade is also larger than for firms placed on review for upgrade, but the debt ratio for firms placed on review for upgrade is generally higher than for those placed on review for downgrade. The same observation can be made for the interest ratio. CDS spreads widen prior to reviews for downgrade and tighten prior to reviews for upgrade. The stock volatility during the year prior to the review announcement is similar for reviews for downgrade and reviews for upgrade. The majority of reviews for downgrade are observed for investment grade (IG) rated firms, while for reviews for upgrade slightly more events relate to non-investment grade (NIG) rated firms. In addition, we observe more reviews for downgrade and upgrade for U.S. than for European companies.

### 3. CDS spread reactions and the rating review process

#### 3.1. Short-term CDS spread reactions to rating review and review decision announcements

In a first step, we examine the short-term effects of rating review announcements and the announcement of the review decision by the CRA, divided into rating changes and rating affirmations. Considering the equity market findings of [Wansley and Clauretje \(1985\)](#), we expect that the CDS market is able to distinguish, at least to a certain extent, between review announcements that will result in a rating change and those that will result in an affirmation. If this is the case, CDS market participants potentially incorporate new information with respect to the creditworthiness and financial situation of a company prior to the official announcement of the CRA. Therefore, the review announcement may follow large changes in the CDS spreads of a firm, as it takes CRAs longer to process the information than CDS market participants. As a consequence, the announcement of a rating change following a review announcement should not lead to any meaningful CDS market reaction, as this information was likely incorporated into the CDS spreads during the rating review period. Also, as the majority of reviews in our sample lead to an actual rating change, particularly for reviews for upgrades. It is therefore reasonable to assume that market participants are more likely to expect a rating change than a rating affirmation.

In order to measure the short-term impact of rating review announcements and their outcome, we employ a similar empirical set up as [Hull et al. \(2004\)](#), [Jorion and Zhang \(2007\)](#), and [Finnerty et al. \(2013\)](#). The observed CDS spread changes are adjusted by changes of a CDS spread index of the same rating class as the company's initial rating:

$$(1) \quad ASC_{it} = (CDS_{it} - CDS_{it-1}) - (I_t - I_{t-1}),$$

where  $ASC_{it}$  is the abnormal CDS spread change of firm  $i$  on day  $t$ ,  $CDS_{it}$  is the observed CDS spread for firm  $i$  on day  $t$ , and  $I_t$  is the relevant CDS spread index for the rating class

on day  $t$ . Daily CDS spread index levels correspond to the equally weighted cross-sectional mean of all CDS spreads for each of the six letter rating classes AAA/AA, A, BBB, BB, B, CCC and below.<sup>10</sup> The cumulative adjusted CDS spread changes (CASCs) are calculated by adding daily abnormal spread changes. We use the cross-sectional parametric  $t$ -test as well as the nonparametric Wilcoxon signed-rank test to test whether the CASCs differ significantly from zero.

Table 3 shows the mean CASCs of the announcement effects for the rating review announcement and the announcement of the rating review decision, divided into reviews for downgrade and reviews for upgrade and their ultimate outcome. Review for downgrade announcements generally result in a highly significant widening of CDS spreads with a mean CASC of up to 17.10 bps during the  $[-2; +2]$  day event window. This reaction is in line with those observed in the literature (e.g. Galil and Soffer, 2011; Norden and Weber, 2004; Norden, 2017). Furthermore, the results also show that rating reviews for upgrade are associated with a significant tightening of CDS spreads. The mean CASC during the  $[-2; +2]$  day event window is  $-13.56$  bps and highly significant. This is in line with the findings of Imbierowicz and Wahrenburg (2013) and Galil and Soffer (2011), who also show that rating reviews for upgrade lead to a significant tightening of CDS spreads.

The abnormal CDS spread changes surrounding reviews for downgrade that lead to a subsequent downgrade are positive and highly significant. The mean CASC during  $[-2; +2]$  day event window is 21.57 bps. The downgrade announcement itself, on the other hand, leads to no discernable market reaction any longer. CDS spreads also widen for review for downgrade announcements that do not lead to a rating change. The mean CASC is still significant, but lower with 8.07 bps during the  $[-2; +2]$  day event window. The announcement of a rating affirmation following a review for downgrade results in a significant tightening of CDS spreads, with a mean CASC of  $-3.74$  bps during the  $[-1; +1]$  day event window. It therefore appears as if CDS market participants can distinguish between rating reviews that result in a rating change and those that do not. Nonetheless, the affirmation leads to a significant reduction in spread levels.

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<sup>10</sup>Due to the small sample size of AAA and AA rated companies, these two classes are combined into one.

[Place Table 3 approximately here]

Reviews for upgrade lead to a significant tightening of CDS spreads, regardless whether the upgrade actually occurs or not with a mean CASC of  $-12.12$  bps and  $-25.41$  bps, respectively, during the  $[-2; +2]$  day event window. Yet, neither the actual upgrade announcement nor the affirmation announcement result in significant spread changes. There is a tendency for CDS spreads to tighten following an upgrade and to widen following a rating affirmation, but the significance is weak at best. It is also noteworthy that the tightening of CDS spreads is higher for rating reviews for upgrade which do not lead to a rating change. But since the sample size is comparatively small with only 38 observations, this result may only serve as preliminary evidence that offers some general tendencies.

Overall, CDS market participants appear to be able to differentiate on the day of the review announcement between rating reviews for downgrade that result in a rating downgrade and those that do not. The widening in the CDS spreads is more pronounced for those reviews that eventually result in a downgrade. Yet, a small but still significant tightening can still be observed if the outcome of a rating review for downgrade is an affirmation, indicating that market participants needed to readjust their initial assessment in light of the actual decision by the CRA on the rating review. Nonetheless, as CDS markets appear to anticipate the outcome of the rating review process, this still suggests that they are able to incorporate new information more quickly than the CRAs. In order to be better able to interpret the short-term market reactions, we analyze the CDS spread changes during the time period a rating is under review in the following section. This allows us to observe whether CDS market participants already incorporate all relevant information prior to the decision of the CRA with respect to the rating review.

### 3.2. CDS spread dynamics during the rating review process

During the time period a rating is under review, the CRA can potentially influence companies' risk choices and thereby take on a monitoring type role (Boot et al., 2006; Driss et al., 2017). The analysis in the previous section, however, suggests that CDS market participants

may be able to anticipate the outcome of a rating review, particularly for rating reviews for downgrade. This suggests that the CDS market potentially has a better understanding of the financial situation of the company and is therefore able to adjust to changes in a firm's creditworthiness in a more timely manner. Nevertheless, they are also likely to make significant reevaluations of their initial assessments prior to the CRA's official decision while the rating is still under review in case their initial assessment was inappropriate. In order to analyze whether CDS market participants adjust their initial expectations of the outcome of the rating review, we examine the CDS spread changes during the entire time period a firm's rating is under review.

The duration from the rating review announcement to the final rating decision varies across our sample and may depend on the reason of the review placement and the amount of time the CRA needs to obtain and analyze the relevant information.<sup>11</sup> Because the time interval between rating review announcements and their conclusion varies for each event, we apply the empirical approach developed by [Malmendier, Opp and Saidi \(2016\)](#). We standardize the review period to a relative time period, i.e. between  $t_R = 0\%$  and  $t_R = 100\%$ . We use linear interpolation for the CDS spreads between the event specific event windows  $T_i$ , beginning on the day of the review announcement (R) and ending on the final rating decision day (D). For example, if the CRA needs 50 days, i.e.  $T_i = 50$ , to reach a decision on the rating review, the standardized CASC after  $t_R = 10\%$  relative time,  $\widehat{CASC}_i(10\%)$ , is equal to the CASC after  $50 \times 10\% = 5$  trading days, i.e.,  $CASC_i(t_R T_i)$ . If the time period the rating is under review is not an integer number,  $\widehat{CASC}_i$  is calculated via linear interpolation as suggested by [Malmendier et al. \(2016\)](#) between the actual trading days using:

$$(2) \quad \widehat{CASC}_i(t_R) = (1 - w_{(i,t_R)}) \times CASC_i(\lfloor t_R T_i \rfloor) + w_{(i,t_R)} \times CASC_i(\lfloor t_R T_i \rfloor + 1),$$

where  $\widehat{CASC}_i$  is the standardized CASC of firm  $i$ ,  $\lfloor t_R T_i \rfloor$  refers to the floor function,  $w_{(i,t_R)} =$

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<sup>11</sup>S&P states that the rating decision is usually reached within 90 days of placing a rating under formal review. Moody's asserts that the majority of reviews are concluded within 30 to 90 days, while Fitch does not make any specific statement with respect to the time period for their review procedure.

$t_R T_i - \lfloor t_R T_i \rfloor$ ,  $t_R$  is the relative time and  $T_i$  are the trading days between the initial review announcement and the final rating decision. Therefore, for example, a rating review with a subsequent rating decision 40 days after the initial review announcement,  $T_i = 40$  days and  $t_R = 8\%$  (i.e. 3.2 days), then  $w_{(i,t_R)} = 40 \times 8\% - \lfloor 40 \times 8\% \rfloor = 0.2$ , so that the standardized CASC after 8% relative time has passed is given by  $\widehat{CASC}_i(8\%) = 0.8 \times CASC_i(3) + 0.2 \times CASC_i(4)$ . In order to test whether the standardized CASC between the review announcement and the final rating decision differs significantly from zero, we use the parametric  $t$ -test and the nonparametric Wilcoxon signed-rank test.

Table 4 shows the CDS spread dynamics during the review process and the period immediately prior to the review announcement, divided into reviews for downgrade and reviews for upgrade and the outcome of the rating review, either through a rating change or affirmation. For the entire sample of reviews for downgrade only an insignificant widening of CDS spreads can be observed during the period  $[\widehat{R}; \widehat{D}]$  from the day of the review announcement to the final rating decision. For the event windows  $[R - \widehat{D} + 1]$  and  $[R - \widehat{D} + 2]$  starting one and two days prior to the review announcement and ending one and two days following the decision of the rating review, respectively, the widening is significant and up to 65.36 bps. Dividing the sample into reviews for downgrade with a subsequent rating change and those with a subsequent rating affirmation offers further substantial insights. Reviews for downgrade resulting in a rating change lead to a highly significant spread widening of 95.07 bps during the  $[\widehat{R}; \widehat{D}]$  event window and 123.73 bps during the  $[R - \widehat{D} + 2]$  event window. In contrast, a significant tightening of CDS spreads can be observed for reviews that result in an affirmation of the initial rating. The tightening amounts to  $-50.58$  bps during the  $[\widehat{R}; \widehat{D}]$  event window and amounts to  $-52.29$  bps during the  $[R - \widehat{D} + 2]$  event window. In addition, the results for the  $[R - 30; R - 3]$  day event window show that CDS spreads widen significantly in the period prior to the review announcements. Particularly for reviews that results in a rating downgrade, a significant widening of 37.71 bps can be observed during this time period, suggesting that CDS market participants become aware of a potential deterioration in the financial situation and the creditworthiness of a firm prior to the CRA' rating announcement and immediately reflect this information in the CDS spread

of the respective firm.

[Place Table 4 approximately here]

Figure 2 Panel A offers a graphical representation of the CDS spread changes during the time a firm's rating is under review for downgrade. The chart illustrates the significant widening in the CDS spreads during the event window  $[\widehat{R}; \widehat{D}]$  for rating reviews that result in a downgrade. After approximately 75% of the time a rating is under review CDS spreads stabilize, indicating that it takes market participants some time to fully incorporate the information with regard to the creditworthiness of a firm. Still, they incorporate all information prior to the CRAs making their official decision on the review process.

Reviews that result in an affirmation of the initial rating, in contrast, lead to a tightening of CDS spreads. CDS spreads are stable until approximately 50% of the time a rating is under review has passed, at which point they experience a significant tightening until the CRA reaches a decision on the rating review. Market participants therefore incorporate the information with respect to the financial situation of the firm much more quickly than CRAs. In addition, this also suggests that firms potentially react to a potential deterioration of their financial position and as CDS markets stabilize, the firm's financial and risk position have become more sustainable. This indicates that CDS markets can be regarded as a tool to enforce market-discipline on firms as the consequences of a worsening of the creditworthiness have an immediate impact on the firm's refinancing capabilities. Furthermore, the CDS spread movements during the time period prior to the review announcement suggest that CDS markets strongly anticipate the ultimate outcome of the rating review process, as CDS spreads widen significantly for those firms that eventually receive a rating downgrade following the rating review. This can be interpreted as CRAs acting as information certifiers rather than information providers.

[Place Figure 2 approximately here]

Table 4 also shows the CDS spread changes during the review process for reviews for upgrade and the time period immediately preceding the review announcement, again divided

by the outcome of the rating review, either through a rating change or affirmation. For the entire sample of reviews for upgrade a tightening of CDS spreads of  $-3.63$  bps can be observed during the period  $[\widehat{R}; \widehat{D}]$ , but this tightening is only significant according to the Wilcoxon signed-rank test. During the  $[\widehat{R} - 2; \widehat{D} + 2]$  event window, the tightening amounts to a significant  $-29.31$  bps. Dividing the sample into reviews for upgrade with a subsequent rating change and those with a subsequent rating affirmation again provides additional insights. For rating reviews for upgrade leading to a rating upgrade, a tightening of  $-5.54$  bps can be observed during the  $[\widehat{R}; \widehat{D}]$  event window, significant according to the Wilcoxon signed-rank test. During the  $[\widehat{R} - 2; \widehat{D} + 2]$  event window, a highly significant tightening of  $-31.33$  bps can be observed. Reviews that result in an affirmation, on the other hand, lead to an insignificant widening of CDS spreads of  $12.02$  bps during the  $[\widehat{R}; \widehat{D}]$  event window. The difference in the CDS spread changes between reviews that result in a rating change and those that do not is again only significant according to the Wilcoxon rank-sum test for the event windows  $[\widehat{R}; \widehat{D}]$  and  $[\widehat{R} - 1; \widehat{D} + 1]$ . Furthermore, in contrast to the results for reviews for downgrade, there appears to be almost no change in the CDS spreads during the  $[R - 30; R - 3]$  day event window, suggesting that CDS markets cannot properly anticipate rating reviews for upgrade.

Figure 2 Panel B illustrates the CDS spread dynamics during the entire period a firm's rating is under review for upgrade. Reviews that lead to a rating change have a very stable progression following the review announcement until approximately 50% of the time to the final rating decision has passed. At this point, a further CDS spread tightening can be observed, which then quickly stabilizes again at a lower level. This may indicate that market participants already incorporated all relevant information into the CDS spread and the rating upgrade just provides a certification of this information. For reviews for upgrade resulting in an affirmation, however, a significant widening of CDS spreads can be observed starting after approximately 50% of the time a rating has been under review for upgrade. This increase almost entirely reverses the initial drop in the CDS levels witnessed during the short-term event windows (see also Table 3) so that the net change in the CDS spread level until the CRA affirms the initial rating is almost zero. It therefore appears as if market participants

put a firm's rating on a probational upgrade. After approximately 50% of the time, they observe whether the firm's financial situation improved sufficiently, which leads to a further drop in the CDS spread levels and the review resulting in a rating upgrade. In contrast, a reversal of the initial tightening of CDS spreads is observed, likely because the firms' creditworthiness did not improve as expected, which then results in a rating affirmation.

Overall, CDS markets appear to take on a monitoring type of role with review for downgrade announcements being seen as an additional information that is then quickly reflected in the CDS market prior to the decision of the CRA with respect to the outcome of the rating review. Reviews for downgrade that result in a rating downgrade lead to a significant widening of CDS spreads during the entire time the rating is on review, whereas ratings that are later affirmed lead to a permanent reduction in CDS spread levels. This may be interpreted as a sign of successful market-based monitoring by the CDS market, which leads to firms making lasting changes to their financial and risk positions. For reviews for upgrade, on the other hand, the monitoring effect appears less pronounced. The initial tightening of CDS spreads following the announcement of a rating review for upgrade is reversed in case of a rating affirmation, while firms that receive a rating upgrade experience a reduction in their CDS spread levels. In this case, CRAs potentially take on an information certification role as well, as these changes occur prior to the CRA officially announcing the outcome of the review process. At the same time, it should be noted that the CDS spread changes of a firm during the time its rating is under review may also be influenced by the decision of the CRA with regard to the outcome of the review. In this case, it may be that CRAs engage in a form of monitoring as suggested by [Boot et al. \(2006\)](#).

### **3.3. The determinants of rating changes and their effect on CDS spread changes**

In this section, we first investigate which variables potentially influence the CRAs decisions' to change or affirm the rating of a firm following the review process. In a next step, we analyze whether the same variables also influence the CDS spread changes during the rating is under review.

In order to assess which variables increase or decrease the likelihood of a rating change,

we estimate a probit regression model of the following form:

(3)

$$\begin{aligned}
 Pr(\text{rating change} = 1) = & f(\gamma_0 + \gamma_1 \text{REVIEWDAYS} + \gamma_2 \text{CLUSTER} \\
 & + \gamma_3 \text{RATINGINTENSITY} + \gamma_4 \text{CRISIS} + \gamma_5 \text{POST CRISIS} + \gamma_6 \text{S\&P} \\
 & + \gamma_7 \text{FITCH} + \gamma_8 \text{NEG TONE} + \gamma_9 \text{POS TONE} + \gamma_{10} \text{M\&A} + \gamma_{11} \text{EXTERNAL} \\
 & + \gamma_{12} \text{OTHER} + \gamma_{13} \text{CDS RUNUP} + \gamma_{14} \text{RATING} + \gamma_{15} \text{TA} + \gamma_{16} \text{DEBT} \\
 & + \gamma_{17} \text{INTEREST} + \gamma_{18} \text{Vol} + \gamma_{19} \text{IG} + \gamma_{20} \text{EU} + \text{INDUSTRY FIXED EFFECTS}),
 \end{aligned}$$

where the dependent variable is 1 if the outcome of a rating review is a change in the firm's rating and 0 if the rating is affirmed. The independent variables are divided into event-specific variables, review content variables, and firm-specific variables. The event-specific variables include *REVIEWDAYS*, defined as the logarithm of the number of trading days between the rating review announcement and the final rating decision, *CLUSTER*, which is defined as 1, if another CRA had a press release for the firm during the time a firm's rating is under review and 0 otherwise, *RATINGINTENSITY*, defined as the logarithm of the sum of other credit rating press releases during the 30 days prior to the rating review announcement, *CRISIS*, defined as 1, if the event occurred between December 2007 to June 2009 (see also [National Bureau of Economic Research, \(2010\)](#)), *POST CRISIS*, defined as 1 if the event occurred following the financial crisis, and *S&P* and *FITCH*, both defined as 1, if the review announcement is made by S&P or Fitch, respectively, and 0 otherwise. The review content specific variables include *NEG TONE* and *POS TONE*, which are defined as the ratios of negative and positive words to the total number of words in the press release following the classification of [Loughran and McDonald \(2011\)](#).<sup>12</sup> The review reasons are split into *M&A*, *EXTERNAL*, and *OTHER*, each defined as 1, if the reason of the review announcement can be attributed to *M&A* announcements, changes in market or macroeconomic conditions, or other reasons that cannot be attributed to any of the other

<sup>12</sup>As a robustness test, an alternative aggregation of words as proposed by [Henry \(2008\)](#) is considered. The results are similar to those shown here using the [Loughran and McDonald \(2011\)](#) dictionary (see Tables A.2 and A.3 in the Appendix).

categories, respectively, and 0 otherwise. Firm-specific variables are *CDS RUNUP*, defined as the CASC during the  $[R - 30; R - 3]$  day event window prior to the review announcement, *RATING*, defined as the firm's rating on the day of the review announcement on a 17 step numerical scale (AAA/Aaa=17, AA+/Aa1=16, . . . , CCC+/Caa1 and lower=1), *TA*, defined as the logarithm of the total assets of the firm in million USD in the year prior to the review announcement, *DEBT*, defined as the ratio of total debt to total assets in the year prior to the review announcement, *INTEREST*, which is the ratio of interest payments to total assets in the year prior to the review announcement, and *VOL*, defined as the stock return volatility during the year prior to the review announcement. *IG*, is defined as 1, if the event firm has a long-term issuer rating of BBB- (S&P and Fitch) or Baa3 (Moody's) or above, and 0 otherwise, and *EU* is defined as 1, if the firm's headquarter is in the EU, and 0 otherwise. Model 1 includes only variables that are known prior to the review announcement (ex-ante) and Model 2 additionally includes the variables *CLUSTER* and *REVIEWDAYS*, which are only known after the conclusion of the review process (ex-post).

The results of the probit regression models are presented in Table 5. Reviews for downgrade by S&P and Fitch are less likely to lead to a downgrade than reviews by Moody's, as the negative and significant coefficients for *S&P* and *FITCH* suggest. Whether the rating review was announced during the recent financial crisis or afterward does not influence the likelihood of a rating change by the CRA compared to the time period prior to the crisis, indicating that our results are not influenced by different time periods. A larger number of negative words in the CRAs rating review announcement significantly increases the probability that the CRA will downgrade the firm following the review for downgrade, as documented by the significant positive coefficient for *NEG TONE*. This is in line with the results of Agarwal et al. (2016) and strongly suggests that a more negative announcement by the CRA is already a good indication for a subsequent rating change. Furthermore, compared to firm driven reasons, a rating is less likely to be changed if the review is the result of M&A activity or other reasons, as indicated by the highly significant negative signs for the coefficients of *M&A* and *OTHER*. A widening of the CDS spreads prior to the review announcement, on the other hand, is associated with an increased probability of a

rating downgrade following the review announcement, as the significant and positive coefficient for the variable *CDS RUNUP* indicates. This provides further evidence that CDS market participants are able to anticipate the ultimate outcome of the rating review. In addition, a higher rating prior to the review announcement likewise significantly increases the probability of a downgrade, as the highly significant coefficient for *RATING* suggests. The coefficients of the remaining variables lack in significance. Including the two ex-post variables *REVIEWDAYS* and *CLUSTER* in Model 2 offers additional insights. The longer a rating is under review for downgrade, the less likely a rating change will occur, as documented by the highly significant and negative coefficient for *REVIEWDAYS*. In contrast, the positive coefficient for *CLUSTER* suggests that competing announcements by other CRAs during the review process increase the likelihood of a rating change. With the exception of the coefficient for *NEG TONE*, whose significance slightly decreases, the other variables maintain their level of significance as in the regression without the ex-post variables (Model 1).

[Place Table 5 approximately here]

Upgrades following a review for upgrade announcement are less likely to occur as a result of M&A activity, as the negative coefficient for *M&A* suggests. Furthermore, there is some weak evidence that IG rated firms and firms with higher interest payments relative to total assets have a lower probability of a rating upgrade, as the negative coefficients for *IG* and *INTEREST* indicate. The other variables lack significance. In particular, a positive tone of the rating review announcement does not appear to influence the likelihood of a rating upgrade. Adding the two ex-post variables shows that the longer a firm spends on review for upgrade, the less likely it will receive a rating upgrade, as the negative coefficient for *REVIEWDAYS* documents. The significance of the coefficients of the variables *M&A* and *IG* remains, but is somewhat weaker, while the remaining variables are still insignificant.

Overall, the factors increasing the likelihood of a downgrade and upgrade following a rating review appear to differ to a certain extent. Nevertheless, if a firm is put on rating review for downgrade or upgrade as a result of M&A activity a rating change is less likely to occur. Furthermore, the longer a firm's rating is placed on review, the less likely its

rating will be changed. Multiple CRAs making negative rating announcements increase the probability of a rating downgrade, while positive rating announcements by other CRAs do not have an effect on the likelihood of a rating upgrade. Most importantly, for reviews for downgrade the CDS spread changes prior to the review announcement and the tone have a significant influence on the probability of a subsequent rating downgrade. The more CDS spreads widen and the more negative the tone of the press release of the rating review, the more likely a downgrade will actually take place. This can be interpreted as evidence that CDS market participants are able to anticipate the ultimate outcome of a rating review and that the CRAs' announcements reflect this to a certain degree. In the next step, we will analyze whether the variables of the probit regressions potentially drive the CDS spread changes during the time a firm's rating is under review.

In order to test which drivers influence the CDS spread changes during the time a rating is under review, we use the following ordinary least squares (OLS) regression model:

$$\begin{aligned}
 \widehat{CASC}_{i,[R-2;D+2]} &= \beta_0 + \beta_1 SURPRISE_i + \beta_2 + REVIEWDAYS_i \\
 &+ \beta_3 CLUSTER_i + \beta_4 RATINGINTENSITY_i + \beta_5 CRISIS_i + \beta_6 POST CRISIS_i \\
 &+ \beta_7 S\&P_i + \beta_8 FITCH_i + \beta_9 NEG TONE_i + \beta_{10} POS TONE_i + \beta_{11} M\&A_i \\
 (4) \quad &+ \beta_{12} EXTERNAL_i + \beta_{13} OTHER_i + \beta_{14} CDS RUNUP_i + \beta_{15} RATING_i + \beta_{16} TA_i \\
 &+ \beta_{17} DEBT_i + \beta_{18} INTEREST_i + \beta_{19} VOL_i + \beta_{20} IG_i + \beta_{21} EU_i \\
 &+ INDUSTRY FIXED EFFECTS + \epsilon_i,
 \end{aligned}$$

using the same variables as in the probit regressions but adding the event specific variable *SURPRISE*. *SURPRISE* is defined, similar to [Billett, Garfinkel and O'Neal \(1998\)](#), as the difference between the outcome of the rating review (change=1, affirmation=0) and the within sample fitted probability of a rating change estimated from Model 1 of the probit regression in Table [5](#) for reviews for downgrade and upgrade. The within sample fitted probability of a rating change includes only those variables that are available to market participants prior to the conclusion of the rating review (i.e. we exclusively use ex-ante

variables). The rationale behind this variable is that unanticipated rating changes will likely have a stronger effect on CDS markets than those that market participants deemed probable. A higher deviation from the initial probability for a rating change suggests that the market's ex-ante prediction of a rating change was not appropriate. For reviews for downgrade a positive sign of the regression coefficient for *SURPRISE* would imply that market participants undertake more severe upward adjustments in case a downgrade occurs that had a low initial probability. At the same time, if the rating is affirmed even though a downgrade was expected, this would lead to a tightening in the CDS spreads and a positive sign of the coefficient. For reviews for upgrade, on the other hand, the coefficient should be negative, indicating further tightening in CDS spreads in case an upgrade occurs against prior expectations and a widening in case the rating is affirmed instead of upgraded. In case the anticipated outcome does not occur, CDS market participants would need to make adjustments to their initial expectations. This, in turn, would indicate that CRA provide at least some new information to market participants and do not merely act as information certifiers.

The results of the OLS regressions for the time period a rating is under review are presented in Table 6. For rating reviews for downgrade, the highly significant coefficient for *SURPRISE* indicates that CDS spreads will widen more severely in case of an unexpected rating downgrade and experience a tightening in case of an unexpected rating affirmation indicating that CRAs still offer some new information and may therefore also be perceived as having a certain monitoring role in the market. Nonetheless, CDS market participants appear to be able to anticipate the ultimate outcome of the rating review process and may thereby affect the ultimate decision of the CRA. In addition, the coefficient for *CRISIS* is also significant, indicating that rating reviews for downgrade resulted in a more pronounced widening of CDS spreads during the recent financial crisis than before or afterward. Contrary to our expectations, the reasons and other firm-specific variables fail to explain the observed CDS spread changes during the time a firm's rating is on review for downgrade. Moreover, neither the tone of a the press release of the review for downgrade announcement nor the CDS spread changes prior to the review announcement influence the CDS spread changes

during the time a rating is under review. This indicates that the tone of the press release is most likely evaluated by market participants at the time of the review announcements. Adding the two ex-post variables *REVIEWDAYS* and *CLUSTER* improves the overall estimation of the regression model but only the coefficient for *REVIEWDAYS* is significant. The negative sign indicates that a longer time under review is associated with a reduction in the CDS spread levels. The coefficients for *CRISIS* and *SURPRISE* remain significant while the other variables stay insignificant.

[Place Table 6 approximately here]

The regressions for the CDS spread changes during the time a rating is on review for upgrade appears well defined. Contrary to our expectations, the coefficient for *SURPRISE* is not significant. However, the coefficients for the variables *CRISIS* and *POST CRISIS* are significant, indicating that reviews for upgrade lead to a significant tightening of CDS spreads during and following the recent financial crisis compared to the pre-crisis period. Furthermore, the coefficient for *POS TONE* is also negative and significant. This may indicate that CDS market participants do not adjust their expectations for reviews for upgrade as quickly as for review for downgrades or that it takes them longer to process the information provided by CRAs in case of a rating review for upgrade. The remaining review content variables lack significance. The coefficient for *VOL* is significant and positive, suggesting that a higher stock price volatility is associated with a widening of CDS spreads. Adding the two ex-post variables shows that the time a firm's rating is under review is not associated with any significant changes in its CDS spreads, and neither is a clustering of positive rating announcements. The coefficient for *POS TONE* remains negative and significant and the coefficient for *NEG TONE* becomes weakly significant, the positive sign indicating a widening of CDS spreads if the tone of the review announcement was relatively negative. The level of significance of the other variables remains the same.

Overall, we find that the CDS spread changes during the rating review process can be partially explained. For reviews for downgrade, particularly unanticipated rating changes or affirmations have a strong impact on the observed CDS spread changes, as does the time a

rating is under review and the recent financial crisis. This suggests that market participants adjust their expectations following new information provided by CRAs. However, as can be seen in Figure 2 Panel A this takes place prior to the actual decision of the CRA on the rating review. If a firm is not able to properly adjust its risk position, CDS spreads widen more, suggesting that CDS markets are able to exert a form of market discipline on these firms by way of increasing the firm's refinancing and funding costs. On the other hand, if the firm successfully adjusts its financial and risk positions so that they do not deteriorate any further, a drop in CDS spread levels can be observed, indicating that CDS markets appreciate the efforts of the firm to shore up its positions. This can be interpreted as evidence that CDS markets not only anticipate rating downgrades based on rating reviews for downgrade, but also that markets, at least to a certain extent, are able to enforce market discipline on firms and thereby take on a monitoring type of role. Yet, the significance of the coefficient for *SURPRISE* also indicates that CRAs still provide some new information to credit market participants.

For reviews for upgrade this relationship does not appear to be particularly pronounced, suggesting that CRAs provide at least some new information to market participants, which is then immediately reflected in the CDS spread of that firm. However, if the rating review for upgrade announcements by the CRA are more positively worded, this leads to significant tightening of CDS spreads during the time a rating is under review. Therefore, a positive wording appears to signal CDS market participants that the credit quality of the firm will likely improve even further. Market participants then appear to process this information directly upon the announcement, with little further adjustments during the review process (see Figure 2 Panel B).

#### 4. Capital structure decisions and the rating review process

The prior literature provides strong evidence that ratings play a crucial role in firms' financing and capital structure decisions (e.g. Kisgen, 2006, 2009; Graham and Harvey, 2001). Kisgen (2009), for example, documents that firms target credit ratings rather than leverage levels

and that rating changes therefore have important implications for companies. Furthermore, [Kisgen \(2006\)](#) shows that firms that are close to a rating change issue relatively less debt than equity, indicating that a firm's management takes the potential costs (and benefits) of a rating change into consideration when making decisions regarding the firm's capital structure. This is also in line with survey evidence from [Graham and Harvey \(2001\)](#), who show that chief financial officers frequently use credit ratings as a guide for their debt financing decisions.

In this context, [Tang \(2009\)](#) finds that better credit ratings are associated with better capital market access, primarily reflected in lower borrowing costs and the ability to issue more debt. This evidence indicates that firms will make adjustments to their capital structure if they are faced with an impending rating change, in particular if the rating change is a downgrade. This, in turn, is in line with [Boot et al. \(2006\)](#), who argue that the firm and the CRA enter into an implicit contract, in which the review announcement allows firms to adapt their risk exposure prior to the decision on the rating review and thereby to avoid a rating change. Especially in case of an imminent rating downgrade, the review process may induce firms to adjust their capital structure in order to address the concerns raised by the CRA in its review for downgrade report. However, as [Chava et al. \(2016\)](#) suggest, CDS potentially offer a market-based alternative to credit ratings that more quickly reflect any changes in the creditworthiness of a firm. In this way, they potentially exert a more efficient and immediate form of market discipline on those firms, as firms' refinancing and funding costs change more quickly.

We analyze two frequently used financial metrics, the leverage ratio and the interest coverage ratio, to test whether the changes in these two ratios differ between firms whose rating is changed and those whose rating is affirmed. We use quarterly data and compare the firms' ratios in the quarter prior to the rating review announcement and the quarter following the decision of the rating review.<sup>13</sup> In accordance with the prior sections, we define leverage as the total debt divided by total assets. A decrease in a firm's leverage can be seen as a reduction in the firm's financial risk, while an increase may be associated with increased

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<sup>13</sup>The results also hold when using the same ratios two quarters prior to the rating review announcement and two quarters following the conclusion of the rating review process.

firm risk. The interest coverage ratio is defined as EBIT divided by interest expense. This ratio is often used as an indication of how easily a company is able to pay its interest expenses on outstanding debt, with a higher ratio implying that a firm can more easily repay its debt obligations.

The results of the comparisons of the two ratios in the quarter prior to the rating review announcement and in the quarter following the conclusion of the rating review process are presented in Table 7. Table 7 Panel A shows the changes in a firm's leverage. The leverage ratio increases for both, reviews for downgrade with a subsequent rating downgrade and for reviews for downgrade with a subsequent rating affirmation. Yet, the increase observed for those rating reviews that result in a downgrade is significantly higher than for the reviews that concluded with an affirmation of the initial rating. This can be seen as evidence that firms that were able to stop, or at least slow down, the deterioration in their leverage position do not experience a rating downgrade. The steep increase in the leverage for firms that are downgraded, however, supports the view that their financial position is deteriorating and that they are not able to stop the downward trend.

CDS market participants realize this prior to the CRAs making their official review announcements, which is reflected in the widening of CDS spreads for these firms during the period prior to the review announcement. The CRAs' decisions in this case appear to merely follow the expectations of the CDS market participants and thereby certify the information already contained in the CDS spreads. Therefore, the monitoring appears to take place primarily through CDS markets with CRAs providing limited new information with their decision on the rating review. For reviews for upgrade, we observe a reduction in the leverage ratio, in line with our expectations, but the difference in the reduction between those reviews that result in an upgrade and those that result in a rating affirmation is not significant.

[Place Table 7 approximately here]

Table 7 Panel B shows the changes in the interest coverage ratio. In line with our expectations, the interest coverage ratio decreases for firms that are placed on review for

downgrade. Yet, we again observe that the decrease is less pronounced for firms that receive a rating affirmation following the rating review. This difference in the decreases is significant according to the Wilcoxon rank sum test. This can be seen as further evidence that the monitoring by CDS markets works well and those firms that receive an affirmation of their initial rating are able to avoid a further deterioration in their interest coverage ratio, either by increasing their operating performance or decreasing their debt payments by lowering their overall debt levels. As expected, for reviews for upgrade that eventually result in a rating upgrade, we observe a small increase in the interest coverage ratio, but this increase is not significant and neither is the difference to rating reviews for upgrade that concluded with a rating affirmation. Therefore, as with the leverage ratio, for reviews for upgrade we fail to observe any meaningful effects of the rating review procedure. CDS markets already incorporated this outcome into the firm's CDS spread prior to the decision of the CRA on the rating review.

Overall, we find evidence to support the assumption that CDS markets can engage in successful market-based monitoring of firms with respect to their credit risk. The changes observed in the leverage and interest coverage ratios between the quarter prior to the review announcement and the quarter following the outcome of the rating review underline this assumption. It therefore appears reasonable to assume that CRAs are acting as information certifiers of the information already included in the CDS spreads of a firm. For reviews for upgrade, however, this relationship only holds to a limited degree. Yet, we cannot completely rule out that the CDS spread changes are not influenced by the CRAs' decisions on the rating reviews, but the analysis of the leverage and interest coverage ratios suggest that firms actually do react to changes in their CDS spread levels and attempt to shore up their financial and risk positions. This is underlined by the fact that CRAs started to use CDS-implied rating<sup>14</sup>

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<sup>14</sup>All three major CRAs offer some form of market implied ratings, that are based on the CDS spreads of a firm (see e.g. <http://www.moodyanalytics.com/Products-and-Solutions/Credit-Research-Risk-Measurement/Quantitative-Insight/Market-Implied-Ratings> for Moody's).

## 5. Stock market reactions and the rating review process

The vast majority of prior research focuses on the equity market reaction to rating downgrades and upgrades and regularly documents a negative stock price reaction to rating downgrades (e.g. [Banner and Hirsch, 2010](#); [Goh and Ederington, 1993](#); [Holthausen and Leftwich, 1986](#)). In contrast to rating downgrades, the findings on the reaction to rating upgrades are not conclusive. [Holthausen and Leftwich \(1986\)](#), [Goh and Ederington \(1993\)](#), and [Imbierowicz and Wahrenburg \(2013\)](#) find no significant equity market reaction to rating upgrades, while [Jorion et al. \(2005\)](#) report weak positive reactions for stock and bond markets. Stockholders are, however, not only affected by rating changes, but also by rating review announcements already (e.g. [Banner and Hirsch, 2010](#); [Chung et al., 2012](#); [Norden and Weber, 2004](#)). Yet, only few studies focus on the outcome of the rating review process, either through a rating change or affirmation. [Wansley and Clauretje \(1985\)](#) document significant equity market reactions only in those cases where a review for downgrade or upgrade is eventually followed by an actual rating change. [Holthausen and Leftwich \(1986\)](#) show that the resolution of a rating review, either through the affirmation of the initial rating or through a rating upgrade, does not lead to significant market reactions, while a downgrade following a rating review leads to negative stock market reactions.

We analyze the relationship between CRA review announcements and stock returns using the standard market model event study. The abnormal returns (ARs) of stock  $j$  at time  $t$  are calculated by:

$$(5) \quad AR_{jt} = R_{jt} - (\hat{\alpha}_j - \hat{\beta}_j R_{mt}),$$

where  $R_{jt}$  is the return of stock  $j$  on day  $t$ ,  $R_{mt}$  is the Datastream value-weighted national total return index of the home country of the event firm  $i$ ,  $\hat{\alpha}_j$  and  $\hat{\beta}_j$  are the regression estimates from an OLS regression using a 252-trading-day (one year) estimation period that ends three trading days prior to the announcement by the CRA ( $t = 0$ ). The cumulative ARs (CARs) are calculated by adding daily ARs.

In line with the analysis in Section [3.2](#), we use the approach by [Malmendier et al.](#)

(2016) to standardize the review period to a relative time period, i.e. between  $t_R = 0\%$  and  $t_R = 100\%$ , and employ linear interpolation for the CARs between the event specific event windows  $T_i$ , beginning at the day of the review announcement (R) and ending on the final rating decision day (D). In case the number of days is not an integer number, the CARs are linearly interpolated in a similar fashion as the CASC:

$$(6) \quad \widehat{CAR}_j(t_R) = (1 - w_{(j,t_R)}) \times CAR_j(\lfloor t_R T_j \rfloor) + w_{(j,t_R)} \times CAR_j(\lfloor t_R T_j \rfloor + 1).$$

In order to test whether the standardized CARs between the review announcement and the final rating decision differ significantly from zero, we use the parametric  $t$ -test and the nonparametric Wilcoxon signed-rank.

Table 8 presents the stock returns during the review process and the time period immediately preceding the review announcement, divided into reviews for downgrade and reviews for upgrade and the outcome of the rating review, either through a rating change or affirmation. For the whole sample of reviews for downgrade, no discernable stock return patterns emerge, neither during the time a firm's rating is under review, the event window  $[\widehat{R}; \widehat{D}]$ , nor during the event windows  $[\widehat{R} - 1; \widehat{D} + 1]$  and  $[\widehat{R} - 2; \widehat{D} + 2]$ , respectively. There is a weak trend towards reviews for downgrade that result in a downgrade performing worse than reviews for downgrade that result in a rating affirmation, but the results lack significance and do not differ significantly from each other. During the period prior to the review announcement, the  $[R - 30; R - 3]$  day event window, no significant stock market reactions can be observed.

Figure 3 Panel A presents the stock returns during the time a firm's rating is under review for downgrade. The graph shows that equity market participants appear to be able to differentiate between the ultimate outcomes of the rating review process directly on the day of the review announcement. Reviews for downgrade that result in a rating affirmation are associated with stock price increases, while reviews for downgrade that end in a rating downgrade are associated with stock price declines. The stock returns following the announcement are relatively stable during the entire review period. It may therefore be the case that stock market participants take the CDS spread changes prior to the review announcement into

consideration and react accordingly. For reviews for downgrade that result in a downgrade, a significant widening of CDS spreads is observed prior to the review announcement, while this is not the case for the CDS spreads of firms whose rating was eventually affirmed (see Figure 2 Panel A). In this case, it appears as if CDS markets lead equity markets, but equity markets adjust more quickly once the rating review was announced.

[Place Table 8 approximately here]

Table 8 also shows the results for the stock returns during the review for upgrade process. For the full sample of 350 reviews, a significant reduction in the stock price can be observed during all three event windows and particularly during the  $[\widehat{R}; \widehat{D}]$  event window where the ACAR reaches  $-3.65\%$ . Reviews for upgrade that result in an upgrade have a significant negative ACAR during the  $[\widehat{R}; \widehat{D}]$  event window of  $-3.65\%$ . Reviews that result in a rating affirmation suffer similar losses, as the ACAR equals  $-3.71\%$  during the  $[\widehat{R}; \widehat{D}]$  event window. Moreover, the difference tests document that rating reviews that result in a rating affirmation do not have a significantly worse stock return than those that result in an upgrade. During the  $[R-30; R-3]$  day event window again no significant stock market reactions are observed.

Figure 3 Panel B charts the stock return during the time a firm's rating is under review for upgrade. The figure shows that there are positive short-term reactions to rating reviews for upgrade that result in a rating upgrade. These positive reactions are in line with those observed in the literature (e.g. Chung et al., 2012; Imbierowicz and Wahrenburg, 2013). This initial positive reaction, however, is later reversed. Rating reviews for upgrade that result in an affirmation of the original rating are associated with steep declines in the stock prices during the entire review period with a further decline on the review decision date. In this case, the stock price revaluation appears to be permanent. Nonetheless, it should be noted that the sample size is relatively small and that the results need therefore to be interpreted with care. The short-term equity market reaction surrounding the conclusion of a review process generally lacks significance, which is again in line with the results documented in the literature (e.g. Chung et al., 2012; Holthausen and Leftwich, 1986). Even though the short-term equity reactions to rating reviews are positive, our results suggest that reviews

for upgrade, as a whole, are negative for stock holders. This underlines the importance of looking beyond the short-term announcement effects and analyzing the rating review process as a whole, which the literature so far largely neglected to do.

[Place Figure 3 about here]

## 6. Conclusion

We analyze the CDS spread dynamics between the rating review announcement and the subsequent rating decision of the CRA in order to examine whether credit ratings become less informative for firms with CDS trading on their debt. The analysis is based on a comprehensive sample of 782 rating reviews for downgrade and 388 rating reviews for upgrade and their ultimate outcome, either through a rating change or affirmation.

Our results show that rating reviews for downgrade that result in a downgrade are associated with a widening of CDS spreads during the entire time a firm's rating is under review. In contrast, if the rating is affirmed instead of downgraded, CDS spreads tighten significantly. We also find that the CDS spread for firms whose rating is on review for downgrade experience almost no changes after approximately 75% of the time the rating is under review. Moreover, CDS spreads already significantly widen during the 30 days prior to the rating review announcement, indicating that the CDS market is able to anticipate the final decision of the CRA review process. This can be interpreted as evidence that the decisions of the CRAs add little new information to market participants for firms with CDS trading on their debt. In contrast, for review for upgrade announcements, our results suggest that CDS market participants are not properly able to distinguish between those firms whose rating will be affirmed and those whose rating will be upgraded. However, in case the outcome of the review process is a rating affirmation of the original rating, the CDS widen again after approximately 50% of the time the rating is under review for upgrade, suggesting that CDS markets reflect that there will only be limited improvement in the creditworthiness and financial situation of the firm. Furthermore, we examine whether the stock market anticipates

the outcome of the rating review process. Our results show that the stock market is not able to correctly anticipate the rating outcome and it appears that the CDS market leads the equity market in credit risk related information. This finding is in line with [Acharya and Johnson \(2007\)](#) and [Norden and Weber \(2004\)](#).

Overall, our results provide further insights of the monitoring role of CRAs. [Boot et al. \(2006\)](#) argue that CRAs take on a monitoring role and use rating reviews for downgrade as a tool to influence a firms' risk position. In case a firm is not able to change its risk position, it faces a downgrade and the ensuing reaction by equity and debt investors. However, our results indicate that the introduction of CDS trading on a firm's debt changes this dynamic and that the information content of rating reviews and rating changes is reflected in the CDS spread of a firm prior to the announcements of the CRAs. Therefore, monitoring by CRAs plays a subordinated role for firms with CDS trading on their debt, as the CDS markets enforce market discipline immediately on firms that are reflected in the firm's CDS spread changes and therefore their refinancing and funding opportunities. We therefore provide evidence to the notion that CDS markets can serve as an effective, market-based monitoring tool.

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Table 1: Sample selection procedure.

This table shows the sample selection procedure for rating reviews for downgrade with a subsequent downgrade or affirmation and for rating reviews for upgrade with a subsequent upgrade or affirmation. The final sample is used for the empirical analyses throughout the paper.

	Reviews for downgrade and subsequent downgrade	Reviews for downgrade and subsequent affirmation	Reviews for upgrade and subsequent upgrade	Reviews for upgrade and subsequent affirmation	Total
Initial sample		1,794		484	2,278
Less no final rating decision		-75		-33	-108
Announcements with decision	1,137	582	400	51	2,170
Less combined rating review and rating change	-168	-103	-9	-1	-281
Less insufficient CDS data	-168	-87	-70	-5	-330
Less insufficient stock data	-19	-4	-9	-7	-39
Final sample	782	388	312	38	1,520

Table 2: Descriptive sample statistics, divided into reviews for downgrade and reviews for upgrade.

This table shows the descriptive sample statistic of our final sample of 1,520 review announcements, divided into event-specific variables, review content variables, and firm-specific variables. *Days under review* are the number of trading days between the rating review announcement and the final rating decision. *Rating intensity* is defined as the sum of credit rating press releases during the 30 days prior to the rating review announcement based on our database of 6,338 rating announcements. *Crisis* are the number of events that occurred during the recent financial crisis and is defined as the time period from December 2007 to June 2009 (see also [National Bureau of Economic Research 2010]), while *Pre-crisis* and *Post-crisis* are dummy variables defined as 1, if the event occurred prior to December 2007 or since July 2009, respectively. *Negative tone* and *Positive tone* are the ratios of negative and positive words, as defined by the [Loughran and McDonald 2011] dictionary, to the number of total words in the rating review announcement by the CRA. *Firm driven reasons* are attributed to operating performance (e.g. sales decline, firm strategy) and capital structure (e.g. capital increase, bond issue) of the firm, *external reasons* are attributed to changes in market and macroeconomic conditions (e.g. market turmoil, oil price increase), *M&A reasons* are review announcements related to merger and acquisition activity, and *other reasons* are reasons not attributable to any of the other categories (e.g. arrest of the CEO). *Total assets* are the total assets of the firm in million USD in the year prior to the review announcement (WC02999). Total debt represents all interest-bearing and capitalized lease obligations as the sum of long- and short-term debt in million USD in the year prior to the review announcement (WC03255). *Interest payments* denotes the service charge for the use of capital before the reduction for interest capitalized in million USD in the year prior to the review announcement (WC01251). *Debt ratio* is the total debt in the year prior to the review announcement divided by the total assets in the year prior to the review announcement. *Interest ratio* is the interest payments in the year prior to the review announcement divided by total assets in the year prior to the review announcement. *CDS runup* is the cumulative abnormal CDS spread change during the [-30;-3] event window prior to the review announcement. *Stock volatility* is the stock return volatility during the 252 trading days (one year) prior to the review announcement. *Investment grade* represents firms that have a long-term issuer rating of BBB- (S&P and Fitch) or Baa3 (Moody's) or above, while *non-investment grade* rated firms have a rating of BB+ (S&P and Fitch) or Ba1 (Moody's) or lower. *EU* includes all firms whose headquarter is in the EU, while *U.S.* includes all firms whose headquarter is in the U.S.

	n	Mean	Median	Standard deviation	25% quantile	75% quantile
<i>Panel A: Reviews for downgrade</i>						
<u>Event-specific variables</u>						
<i>Days under review</i>	1,170	83.70	65	75.53	35.00	101.00
<i>Rating intensity</i>	1,170	74.89	72	25.19	56.00	88.00
<i>Pre-Crisis</i>	423	0.362	0	0.481	0	1
<i>Crisis</i>	276	0.236	0	0.425	0	0
<i>Post-Crisis</i>	471	0.403	0	0.491	0	1
<u>Review content variables</u>						
<i>Negative tone</i>	1,170	1.796	1.600	1.287	0.826	2.439
<i>Positive tone</i>	1,170	0.690	0.657	0.640	0	0.964
<i>Firm driven reasons</i>	413	0.353	0	0.478	0	1
<i>External reasons</i>	185	0.158	0	0.365	0	0
<i>M&amp;A reasons</i>	510	0.436	0	0.496	0	1
<i>Other reasons</i>	62	0.053	0	0.224	0	0
<u>Firm-specific variables</u>						
<i>Total assets</i>	1,170	38,902	14,993	66,612	7,329	37,832
<i>Total debt</i>	1,170	12,606	4,274	29,991	2,044	10,412
<i>Interest payment</i>	1,170	570	245	1,060	105	565
<i>Debt ratio</i>	1,170	31.53%	28.49%	16.87%	20.03%	40.43%
<i>Interest ratio</i>	1,170	1.79%	1.55%	1.29%	1.02%	2.22%
<i>CDS runup</i>	1,170	29.71	6.28	180.08	-2.59	30.76
<i>Stock volatility</i>	1,170	2.18%	1.79%	1.34%	1.35%	2.52%
<i>Investment grade</i>	919	0.785	1	0.411	1	1
<i>Non-investment grade</i>	251	0.215	0	0.411	0	0
<i>EU</i>	413	0.353	0	0.478	0	1
<i>U.S.</i>	757	0.647	1	0.478	0	1
<i>Panel B: Reviews for upgrade</i>						
<u>Event specific variables</u>						
<i>Days under review</i>	350	70.89	56	64.60	30.00	82.00
<i>Rating intensity</i>	350	65.00	64	17.98	51.00	77.00
<i>Pre-Crisis</i>	131	0.374	0	0.485	0	1
<i>Crisis</i>	25	0.071	0	0.258	0	0
<i>Post-Crisis</i>	194	0.554	1	0.498	0	1
<u>Review content variables</u>						
<i>Negative tone</i>	350	0.549	0.361	0.641	0	0.826
<i>Positive tone</i>	350	1.994	1.681	1.367	0.885	2.551
<i>Firm driven reasons</i>	206	0.589	1	0.493	0	1
<i>External reasons</i>	34	0.097	0	0.297	0	0
<i>M&amp;A reasons</i>	81	0.231	0	0.422	0	0
<i>Other reasons</i>	29	0.014	0	0.119	0	0
<u>Firm specific variables</u>						
<i>Total assets</i>	350	25,603	14,985	33,723	6,893	29,068
<i>Total debt</i>	350	9,088	4,726	16,247	1,927	8,740
<i>Interest payment</i>	350	522	294	895	129	577
<i>Debt ratio</i>	350	37.98%	32.83%	28.00%	21.97%	46.31%
<i>Interest ratio</i>	350	2.56%	1.99%	2.26%	1.23%	3.16%
<i>CDS runup</i>	350	-23.27	-3.78	74.78	-23.41	4.41
<i>Stock volatility</i>	350	2.21%	1.76%	1.47%	1.31%	2.59%
<i>Investment grade</i>	171	0.489	0	0.501	0	1
<i>Non-investment grade</i>	179	0.511	1	0.501	0	1
<i>EU</i>	64	0.183	0	0.387	0	0
<i>U.S.</i>	286	0.817	1	0.387	1	1

Table 3: CDS market reactions to rating review and rating decision announcements.

This table shows the results of the short-term CDS market reaction for the entire sample of 1,520 rating review announcements and their subsequent outcome, divided into reviews for downgrade and upgrade and the outcome of the rating review, either through a rating change or affirmation of the initial rating. The short-term event windows  $[-1; +1]$  and  $[-2; +2]$  as well as the announcement day  $[0; 0]$  are shown to capture the market reaction to the beginning and the end of the rating review process. The mean and median CASC are shown in bps and tested for significance using the parametric  $t$ -test and the nonparametric Wilcoxon signed-rank test (SIGN). \*\*\*, \*\*, \* indicate statistical significance at the 1%, 5%, and 10% level, respectively.

Event window	Mean CASC	Median CASC	$t$ -test (t-value)	SIGN (Z-score)	Mean CASC	Median CASC	$t$ -test (t-value)	SIGN (Z-score)
<b>Reviews for downgrade (n=1,170)</b>				<b>Reviews for upgrade (n=350)</b>				
[0; 0]	3.767	0.393	4.198***	-7.511***	-1.484	-0.222	-2.002**	-3.607***
[-1; +1]	14.528	2.306	6.744***	-13.987***	-9.604	-1.109	-4.799***	-6.708***
[-2; +2]	17.091	3.866	7.481***	-14.079***	-13.561	-1.995	-5.765***	-7.272***
<b>Reviews for downgrade with subsequent downgrade</b>				<b>Reviews for upgrade with subsequent upgrade</b>				
<i>Review for downgrade announcements (n=782)</i>				<i>Review for upgrade announcements (n=312)</i>				
[0; 0]	4.480	0.424	3.721***	-6.547***	-0.370	-0.210	-0.587	-3.094***
[-1; +1]	18.257	2.406	5.954***	-11.867***	-8.053	-1.070	-3.898***	-5.900***
[-2; +2]	21.568	3.729	7.008***	-11.739***	-12.118	-1.786	-4.852***	-6.442***
<i>Downgrade announcements (n=782)</i>				<i>Upgrade announcements (n=312)</i>				
[0; 0]	0.389	0.052	0.447	-1.819*	0.444	0.089	0.506	-0.066
[-1; +1]	0.078	0.092	0.045	-1.899*	-0.310	-0.339	-0.222	-1.943*
[-2; +2]	0.016	0.177	0.008	-1.150	0.312	-0.403	0.300	-1.092
<b>Reviews for downgrade with subsequent rating affirmation</b>				<b>Reviews for upgrade with subsequent rating affirmation</b>				
<i>Review for downgrade announcements (n=388)</i>				<i>Review for upgrade announcements (n=38)</i>				
[0; 0]	2.332	0.330	1.948*	-3.751***	-10.625	-0.480	-2.245**	-1.994**
[-1; +1]	7.012	2.023	3.592***	-7.415***	-22.337	-1.333	-3.206***	-3.328***
[-2; +2]	8.068	3.961	2.736***	-7.661***	-25.406	-2.384	-3.750***	-3.488***
<i>Affirmation announcements (n=388)</i>				<i>Affirmation announcements (n=38)</i>				
[0; 0]	-2.305	-0.112	-2.137**	-3.166***	0.130	0.016	0.132	-0.065
[-1; +1]	-3.736	-0.745	-3.115***	-5.012***	4.413	-0.103	1.772*	-0.486
[-2; +2]	-3.652	-0.647	-2.482**	-3.846***	6.375	-0.029	1.902*	-0.819

Table 4: CDS spread dynamics throughout the rating review process.

This table shows the results of the CDS spread changes for the entire sample of 1,520 rating reviews throughout the time period a rating is on review and the time period preceding the review announcement, divided into reviews for downgrade and upgrade and the outcome of the rating review, either through a rating change or affirmation of the initial rating. The CASC are standardized following the approach of Malmendier et al. (2016) between the day of the review announcement ( $R$ ) and the final rating decision day ( $D$ ). The event windows  $[R - 1; \widehat{D} + 1]$  and  $[R - 2; \widehat{D} + 2]$  starting one and two days prior to the review announcement and ending one and two days following the decision of the rating review, respectively, are shown as well as the event window  $[\widehat{R}; \widehat{D}]$  covering only the review period. In addition, the CASC during the  $[R - 30; R - 3]$  day event window is shown to test whether CDS spread change prior to the review announcement. The mean and median CASC are shown in bps and tested for significance using the parametric  $t$ -test and the nonparametric Wilcoxon signed-rank test (SIGN). The equality of means and medians of the reviews leading to a rating change and those who lead to an affirmation of a rating are tested for statistical significance using the two sample  $t$ -test and the Wilcoxon rank-sum test (SIGN). \*\*\*, \*\*, \* indicate statistical significance at the 1%, 5%, and 10% level, respectively.

Event window	Mean CASC	Median CASC	$t$ -test (t-value)	SIGN (Z-score)	Mean CASC	Median CASC	$t$ -test (t-value)	SIGN (Z-score)
	<i>Reviews for downgrade (n=1,170)</i>				<i>Reviews for upgrade (n=350)</i>			
$[R - 30; R - 3]$	29.71	6.28	5.644***	-13.478***	-23.27	-3.78	-6.350***	-5.821***
$[\widehat{R}; \widehat{D}]$	46.77	-0.94	1.728*	-0.252	-3.63	-3.16	-0.276	-3.595***
$[R - 1; \widehat{D} + 1]$	60.06	3.35	2.148**	-3.941***	-20.40	-8.97	-1.531	-5.825***
$[R - 2; \widehat{D} + 2]$	65.36	4.58	2.280**	-4.869***	-29.31	-12.40	-2.128**	-6.354***
	<i>Reviews for downgrade with subsequent downgrade (n=782)</i>				<i>Reviews for upgrade with subsequent upgrade (n=312)</i>			
$[R - 30; R - 3]$	37.71	6.79	6.672***	-11.603***	-22.74	-3.80	-5.262	-5.851***
$[\widehat{R}; \widehat{D}]$	95.07	3.13	2.416**	-4.084***	-5.54	-5.89	-0.377	-4.086***
$[R - 1; \widehat{D} + 1]$	114.62	8.22	2.826***	-6.999***	-22.34	-10.85	-1.503	-5.948***
$[R - 2; \widehat{D} + 2]$	123.73	9.65	2.985***	-7.534***	-31.33	-13.16	-2.038**	-6.288***
	<i>Reviews for downgrade with subsequent rating affirmation (n=388)</i>				<i>Reviews for upgrade with subsequent rating affirmation (n=38)</i>			
$[R - 30; R - 3]$	13.59	5.26	1.233	-6.910***	-27.61	-3.70	-2.776***	-2.502**
$[\widehat{R}; \widehat{D}]$	-50.58	-8.31	-2.756***	-5.987***	12.02	1.87	1.139	-1.298
$[R - 1; \widehat{D} + 1]$	-49.91	-4.26	-2.543**	-3.748***	-4.44	-0.32	-0.343	-0.283
$[R - 2; \widehat{D} + 2]$	-52.29	-4.26	-2.492**	-2.902***	-12.79	-0.21	-0.971	-0.921
	<i>Difference between reviews for downgrade with subsequent downgrade (n=782) and reviews for downgrade with subsequent rating affirmation (n=388)</i>				<i>Difference between reviews for upgrade with subsequent upgrade (n=312) and reviews for upgrade with subsequent rating affirmation (n=38)</i>			
$[R - 30; R - 3]$	24.12	1.53	2.160**	-2.030**	4.87	-0.10	0.378	-0.268
$[\widehat{R}; \widehat{D}]$	145.65	11.43	2.539**	-6.919***	-17.56	-7.76	-0.415	-2.354**
$[R - 1; \widehat{D} + 1]$	164.54	12.48	2.778***	-7.221***	-17.90	-10.53	-0.417	-1.949*
$[R - 2; \widehat{D} + 2]$	176.02	13.90	2.901***	-6.982***	-18.54	-12.95	-0.418	-1.622

Table 5: Probit regression results.

This table shows the results of the probit regression for the 1,170 reviews for downgrade and the 350 reviews for upgrade. The dependent variable is defined as 1, if a rating change occurred and 0 if the rating was affirmed. The independent variables are divided into event-specific variables, review content variables, and firm-specific variables. Event-specific variables are: *REVIEWDAYS*, defined as the logarithm of the number of trading days between the rating review announcement and the final rating decision, *CLUSTER*, defined as 1 if another CRA had a press release during the time a firm's rating is under review and 0 otherwise. *RATINGINTENSITY* is defined as the logarithm of the sum of credit rating press releases during the 30 days prior to the rating review announcement based on our database of 6,338 rating announcements. *CRISIS* is defined as 1, if the event occurred between December 2007 to June 2009 and *POST CRISIS* is defined as 1, if the event occurred since July 2009 (see also [National Bureau of Economic Research, 2010]). *S&P* and *FITCH* are defined as 1, if the review announcement is made by S&P or Fitch, respectively, and 0 otherwise. Review content variables are: *NEG TONE* and *POS TONE*, which are the ratios of negative and positive words, as defined by the [Loughran and McDonald, 2011] dictionary, to the number of total words in the rating review announcement by the CRA, *M&A*, *EXTERNAL*, and *OTHER*, each defined as 1, if the review reason can be attributed to merger or acquisition announcements, changes in market or macroeconomic conditions (e.g. market turmoil, oil price increase), or other reasons, which are not attributable to any of the other categories (e.g. arrest of the CEO), respectively, and 0 otherwise. Firm-specific variables are: *RATING*, defined as the firm's rating on the day of the review announcement on a 17 step numerical scale (AAA/Aaa=17, AA+/Aa1=16, ..., CCC+/Ca1 and lower=1). *TA* is the logarithm of the total assets of the firm in million USD in the year prior to the review announcement (WC02999). *DEBT* is the ratio of total debt in the year prior to the review announcement (WC03255) divided by the total assets in the year prior to the review announcement (WC02999). *INTEREST* is the ratio of interest payments in the year prior to the review announcement (WC01251) divided by total assets in the year prior to the review announcement (WC02999). *CDS RUNUP* is the CASC during the  $[R - 30; R - 3]$  day event window prior to the review announcement. *VOL* is the stock return volatility during the 252 trading days (one year) prior to the review announcement. *IG* is defined as 1, if the event firm has a long-term issuer rating of BBB- (S&P and Fitch) or Baa3 (Moody's) or above and 0 otherwise. *EU* is defined as 1, if the firm's headquarter is in the *EU* and 0 otherwise. Model 1 includes only variables that are known prior to the review announcement (ex-ante) and Model 2 additionally includes the variables *CLUSTER* and *REVIEWDAYS* which are only known after the conclusion of the review process (ex-post). dy/dx measures the marginal effects of changes in the levels of the independent variables. The robust standard errors are clustered on the firm level and given in parentheses. \*\*\*, \*\*, \* indicate statistical significance at the 1%, 5%, and 10% level, respectively.

	Reviews for downgrade				Review for upgrade			
	Model 1		Model 2		Model 1		Model 2	
	Coefficient	dy/dx	Coefficient	dy/dx	Coefficient	dy/dx	Coefficient	dy/dx
<u>Event-specific variables</u>								
<i>REVIEWDAYS</i>			-0.253***	-0.077***			-0.408**	-0.063**
			(0.060)	(0.018)			(0.162)	(0.025)
<i>CLUSTER</i>			0.470***	0.144***			0.301	0.046
			(0.092)	(0.026)			(0.249)	(0.038)
<i>RATINGINTENSITY</i>	0.090	0.029	0.101	0.031	0.074	0.012	0.057	0.009
	(0.187)	(0.060)	(0.186)	(0.057)	(0.459)	(0.073)	(0.488)	(0.075)
<i>CRISIS</i>	0.069	0.022	0.106	0.033	0.071	0.011	0.334	0.051
	(0.165)	(0.053)	(0.166)	(0.051)	(0.309)	(0.049)	(0.317)	(0.049)
<i>POST CRISIS</i>	-0.009	-0.003	0.039	0.012	0.228	0.036	0.300	0.046
	(0.131)	(0.042)	(0.129)	(0.040)	(0.301)	(0.048)	(0.318)	(0.049)
<i>S&amp;P</i>	-0.400***	-0.127***	-0.347***	-0.106***	0.101	0.016	0.008	0.001
	(0.091)	(0.028)	(0.092)	(0.028)	(0.227)	(0.036)	(0.230)	(0.035)
<i>FITCH</i>	-0.437***	-0.139***	-0.440***	-0.135***	0.005	0.001	-0.035	-0.005
	(0.104)	(0.033)	(0.107)	(0.032)	(0.339)	(0.054)	(0.329)	(0.050)
<u>Review content variables</u>								
<i>NEG TONE</i>	0.083**	0.026**	0.070*	0.022*	0.237	0.038	0.248	0.038
	(0.042)	(0.013)	(0.043)	(0.013)	(0.168)	(0.027)	(0.166)	(0.025)
<i>POS TONE</i>	0.034	0.011	0.018	0.006	0.107	0.017	0.120	0.018
	(0.067)	(0.021)	(0.068)	(0.021)	(0.102)	(0.016)	(0.105)	(0.016)
<i>M&amp;A</i>	-0.619***	-0.197***	-0.643***	-0.197***	-0.930***	-0.148***	-0.629*	-0.096*
	(0.102)	(0.031)	(0.107)	(0.031)	(0.302)	(0.048)	(0.327)	(0.050)
<i>EXTERNAL</i>	0.173	0.055	0.184	0.056	-0.299	-0.048	-0.209	-0.032
	(0.138)	(0.044)	(0.137)	(0.042)	(0.351)	(0.056)	(0.361)	(0.055)
<i>OTHER</i>	-0.599***	-0.191***	-0.667***	-0.204***	-1.031*	-0.164*	-1.139*	-0.174*
	(0.179)	(0.056)	(0.186)	(0.056)	(0.544)	(0.087)	(0.603)	(0.093)
<u>Firm-specific variables</u>								
<i>CDS RUNUP</i>	0.046**	0.015**	0.042**	0.013**	-0.043	-0.007	-0.057	-0.009
	(0.020)	(0.006)	(0.020)	(0.006)	(0.148)	(0.024)	(0.154)	(0.024)
<i>RATING</i>	0.111***	0.035***	0.124***	0.038***	-0.051	-0.008	-0.058	-0.009
	(0.035)	(0.011)	(0.036)	(0.011)	(0.075)	(0.012)	(0.075)	(0.012)
<i>TA</i>	-0.093	-0.030	-0.088	-0.027	-0.140	-0.022	-0.130	-0.020
	(0.060)	(0.019)	(0.056)	(0.017)	(0.097)	(0.015)	(0.098)	(0.015)
<i>DEBT</i>	0.017	0.005	-0.160	-0.049	0.719	0.115	0.798	0.122
	(0.449)	(0.143)	(0.443)	(0.136)	(0.719)	(0.114)	(0.788)	(0.122)
<i>INTEREST</i>	0.017	0.005	0.034	0.010	-0.156	-0.025	-0.162	-0.025
	(0.070)	(0.022)	(0.070)	(0.021)	(0.097)	(0.015)	(0.107)	(0.017)
<i>VOL</i>	0.030	0.009	0.002	0.001	-0.074	-0.012	-0.085	-0.013
	(0.055)	(0.018)	(0.055)	(0.017)	(0.091)	(0.014)	(0.094)	(0.014)
<i>IG</i>	0.185	0.059	0.145	0.044	-0.582*	-0.093*	-0.491	-0.075
	(0.186)	(0.059)	(0.196)	(0.060)	(0.353)	(0.056)	(0.340)	(0.051)
<i>EU</i>	-0.067	0.019	-0.051	-0.016	-0.150	-0.024	-0.193	-0.030
	(0.123)	(0.039)	(0.121)	(0.037)	(0.263)	(0.042)	(0.266)	(0.041)
<i>INTERCEPT</i>	0.640		1.262		4.020		5.455*	
	(1.143)		(1.153)		(2.878)		(3.042)	
<i>INDUSTRY FIXED EFFECTS</i>		YES		YES		YES		YES
N		1,170		1,170		350		350
Log Likelihood		-657.94		-634.34		-102.05		-97.58
Wald $\chi^2$		136.81***		163.83***		41.07***		54.23***

Table 6: OLS regression results for the duration of the rating review process.

This table shows the results of the OLS regression for the 1,170 reviews for downgrade and the 350 reviews for upgrade. The dependent variable is the  $CASC_i$  of firm  $i$  for the  $[R; D]$  event window (see also Section III.B.2). The independent variables are divided into event-specific variables, review content variables, and firm-specific variables. Event-specific variables are: *SURPRISE*, defined as the difference between the outcome of rating review (change=1, affirmation=0) and the within sample fitted probability of a rating change estimated from Model 1 of the probit regression in Table 5 for reviews for downgrade and upgrade. *REVIEWDAYS* is defined as the logarithm of the number of trading days between the rating review announcement and the final rating decision. *CLUSTER* is defined as 1, if another CRA had a press release during the time a firm's rating is under review and 0 otherwise. *RATINGINTENSITY* is defined as the logarithm of the sum of credit rating press releases during the 30 days prior to the rating review announcement based on our database of 6,338 rating announcements. *CRISIS* is defined as 1, if the event occurred between December 2007 to June 2009 and *POST CRISIS* is defined as 1, if the event occurred since July 2009 (see also National Bureau of Economic Research [2010]). *S&P* and *FITCH* are defined as 1, if the review announcement is made by S&P or Fitch, respectively, and 0 otherwise. Review content variables are: *NEG TONE* and *POS TONE*, which are the ratios of negative and positive words, as defined by the Loughran and McDonald [2011] dictionary, to the number of total words in the rating review announcement by the CRA, *M&A*, *EXTERNAL*, and *OTHER*, each defined as 1, if the review reason can be attributed to merger or acquisition announcements, changes in market or macroeconomic conditions (e.g. market turmoil, oil price increase), or other reasons, which are not attributable to any of the other categories (e.g. arrest of the CEO), respectively, and 0 otherwise. Firm-specific variables are: *RATING*, defined as the firm's rating on the day of the review announcement on a 17 step numerical scale (AAA/Aaa=17, AA+/Aa1=16, . . . , CCC+/Caa1 and lower=1). *TA* is the logarithm of the total assets of the firm in million USD in the year prior to the review announcement (WC02999). *DEBT* is the ratio of total debt in the year prior to the review announcement (WC03255) divided by the total assets in the year prior to the review announcement (WC01251) divided by total assets in the year prior to the review announcement (WC02999). *INTEREST* is the ratio of interest payments in the year prior to the review announcement (WC01251) divided by total assets in the year prior to the review announcement (WC02999). *CDS RUNUP* is the CASC during the  $[R - 30; R - 3]$  day event window prior to the review announcement. *VOL* is the stock return volatility during the 252 trading days (one year) prior to the review announcement. *IG* is defined as 1, if the event firm has a long-term issuer rating of BBB- (S&P and Fitch) or Baa3 (Moody's) or above and 0 otherwise. *EU* is defined as 1, if the firm's headquarter is in the EU and 0 otherwise. The robust standard errors are clustered on the firm level and given in parentheses. \*\*\*, \*\*, \* indicate statistical significance at the 1%, 5%, and 10% level, respectively.

	Reviews for downgrade		Review for upgrade	
	Model 1	Model 2	Model 1	Model 2
<u>Event-specific variables</u>				
<i>SURPRISE</i>	154.800*** (43.697)	126.996*** (39.291)	-21.618 (26.698)	-23.751 (28.042)
<i>REVIEWDAYS</i>		-108.454*** (39.406)		-15.996 (18.799)
<i>CLUSTER</i>		29.801 (56.597)		-51.076 (32.798)
<i>RATINGINTENSITY</i>	-71.821 (102.035)	-63.756 (100.995)	-78.961 (60.637)	-86.550 (62.571)
<i>CRISIS</i>	169.903* (97.320)	178.109* (99.531)	-84.545** (40.912)	-84.033** (38.355)
<i>POST CRISIS</i>	7.300 (65.102)	17.618 (66.332)	-59.198* (32.981)	-67.941** (33.052)
<i>S&amp;P</i>	-94.304** (41.118)	-79.644** (39.109)	41.937 (30.060)	34.468 (29.427)
<i>FITCH</i>	-28.450 (70.816)	1.963 (73.696)	2.857 (33.651)	5.188 (33.337)
<u>Review content variables</u>				
<i>NEG TONE</i>	-15.354 (29.523)	-19.313 (29.937)	21.602 (13.681)	28.271* (15.074)
<i>POS TONE</i>	-15.828 (34.012)	-25.094 (34.270)	-28.968** (11.643)	-26.875** (11.411)
<i>M&amp;A</i>	-77.330 (64.489)	-48.808 (62.026)	-22.172 (34.569)	6.998 (37.190)
<i>EXTERNAL</i>	53.757 (120.098)	55.092 (118.993)	-3.779 (52.107)	-3.876 (52.508)
<i>OTHER</i>	-53.354 (73.961)	-49.362 (73.534)	32.499 (37.481)	17.661 (35.634)
<u>Firm-specific variables</u>				
<i>CDS RUNUP</i>	96.007 (73.059)	92.655 (72.139)	40.441 (54.668)	33.458 (54.350)
<i>RATING</i>	-10.890 (18.982)	-9.975 (19.006)	16.017 (9.734)	15.644 (9.563)
<i>TA</i>	20.815 (39.660)	29.717 (39.257)	-12.336 (15.296)	-10.772 (14.989)
<i>DEBT</i>	112.721 (505.555)	42.021 (504.257)	-85.375 (198.135)	-55.303 (187.400)
<i>INTEREST</i>	36.494 (115.204)	42.280 (115.705)	21.782 (30.295)	18.815 (29.031)
<i>VOL</i>	-53.591 (59.086)	-62.503 (59.522)	73.839** (32.413)	76.037** (30.901)
<i>IG</i>	-117.903 (136.134)	-126.923 (137.545)	36.713 (34.309)	37.067 (34.360)
<i>EU</i>	33.465 (74.624)	26.558 (73.360)	18.905 (21.339)	17.589 (22.543)
<i>INTERCEPT</i>	314.892 (447.841)	573.453 (422.004)	349.435 (403.599)	420.088 (414.804)
<i>INDUSTRY FIXED EFFECTS</i>	YES	YES	YES	YES
N	1,170	1,170	350	350
Adjusted R <sup>2</sup>	0.062	0.072	0.153	0.160
F-test	1.78**	1.69**	1.68**	1.63**

Table 7: Changes in firms' leverage and interest coverage ratios.

This table shows the mean and median leverage and interest coverage ratios one quarter prior to rating review announcement ("Before review") and one quarter following the conclusion of the rating review ("After review"). *Leverage* is the ratio of the total debt (WC03255A) divided by total assets (WC02999A) in the quarter prior to the review announcement and the quarter following the conclusion of the rating review, respectively. *Interest coverage ratio* is defined as the EBIT (WC18191A) divided by interest expenses on debt (WC01251A) in the quarter prior to the review announcement and the quarter following the conclusion of the rating review, respectively. The equality of means and medians of the reviews leading to a rating change and those who lead to an affirmation of a rating are tested for statistical significance using the two sample *t*-test and the Wilcoxon rank-sum test (SIGN). \*\*\*, \*\*, \* indicate statistical significance at the 1%, 5%, and 10% level, respectively.

		Before review		After review		Difference	
	n	Mean	Median	Mean	Median	Mean	Median
<i>Panel A: Leverage</i>							
Reviews for downgrade							
with subsequent downgrade	672	31.71	29.72	34.98	33.34	3.27	1.58
Reviews for downgrade							
with subsequent affirmation	341	33.12	28.41	34.47	30.22	1.35	0.80
Reviews for upgrade							
with subsequent upgrade	291	35.15	31.07	33.22	30.51	-1.93	-1.21
Reviews for upgrade							
with subsequent affirmation	30	41.85	39.06	39.51	38.52	-2.34	-0.94
<u><i>Difference between the difference in changes and affirmations</i></u>				<i>t</i> -test	SIGN		
		Mean	Median	( <i>t</i> -value)	( <i>Z</i> -score)		
Reviews for downgrade		1.92	0.78	3.46***	-3.57***		
Reviews for upgrade		0.41	-0.27	0.27	-0.19		
<i>Panel B: Interest coverage ratio</i>							
Reviews for downgrade							
with subsequent downgrade	663	9.21	4.06	3.159	2.65	-6.05	-1.20
Reviews for downgrade							
with subsequent affirmation	326	8.49	4.86	5.71	4.20	-2.77	-0.34
Reviews for upgrade							
with subsequent upgrade	277	8.47	4.30	8.72	4.62	0.24	0.14
Reviews for upgrade							
with subsequent affirmation	29	7.03	3.34	7.01	2.87	-0.02	-0.21
<u><i>Difference between the difference in changes and affirmations</i></u>				<i>t</i> -test	SIGN		
		Mean	Median	( <i>t</i> -value)	( <i>Z</i> -score)		
Reviews for downgrade		-3.28	-0.87	-0.79	-2.13**		
Reviews for upgrade		0.26	0.36	0.11	0.80		

Table 8: Stock return development throughout the rating review process.

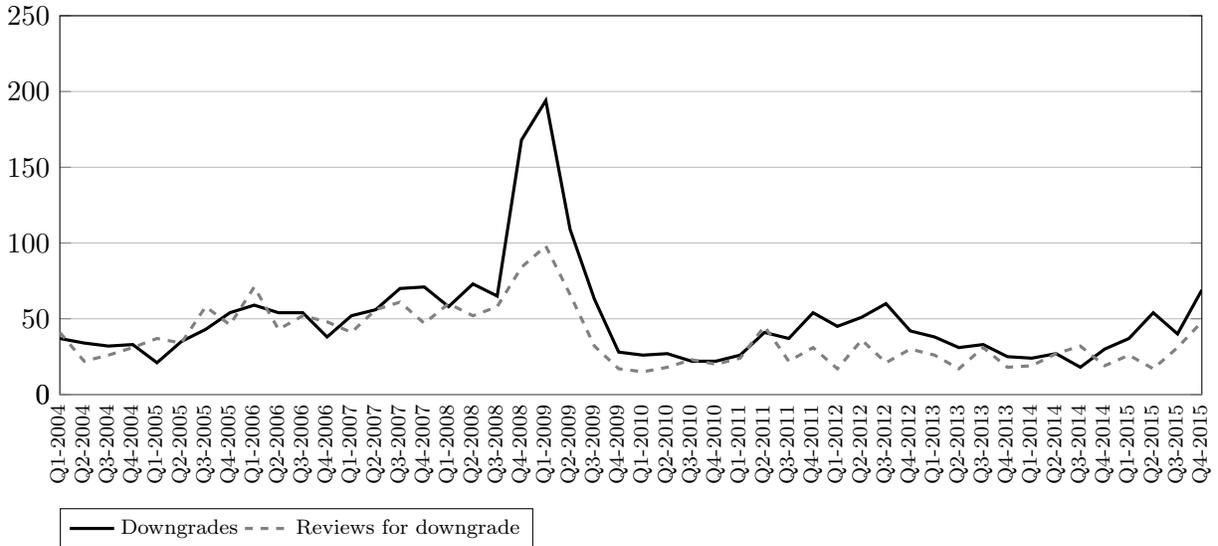
This table shows the results of the stock returns for the entire sample of 1,520 rating reviews throughout the time period a rating is on review and the time period preceding the review announcement, divided into reviews for downgrade and upgrade and the outcome of the rating review, either through a rating change or affirmation of the initial rating. The CAR are standardized following the approach of [Malmendier et al. \(2016\)](#) between the day of the review announcement ( $R$ ) and the final rating decision day ( $D$ ). The event windows  $[R - 1; \widehat{D} + 1]$  and  $[R - 2; \widehat{D} + 2]$  starting one and two days prior to the review announcement and ending one and two days following the decision of the rating review, respectively, are shown as well as the event window  $[\widehat{R}; \widehat{D}]$  covering only the review period. In addition, the ACAR during the  $[R - 30; R - 3]$  day event window is shown to test whether stock prices change prior to the review announcement. The ACAR and median CAR are shown in percent and tested for significance using the parametric  $t$ -test and the nonparametric Wilcoxon signed-rank test (SIGN). The equality of means and medians of the reviews leading to a rating change and those who lead to an affirmation of a rating are tested for statistical significance using the two sample  $t$ -test and the Wilcoxon rank-sum test (SIGN). \*\*\*, \*\*, \* indicate statistical significance at the 1%, 5%, and 10% level, respectively.

Event window	Median ACAR	Median CAR	$t$ -test (t-value)	SIGN (Z-score)	Median ACAR	Median CAR	$t$ -test (t-value)	SIGN (Z-score)
	<i>Reviews for downgrade (n=1,170)</i>				<i>Reviews for upgrade (n=350)</i>			
$[R - 30; R - 3]$	-0.09%	-0.57%	-0.232	-1.124	0.96%	0.53%	1.619	-1.483
$[\widehat{R}; \widehat{D}]$	0.10%	-0.35%	0.165	-0.441	-3.62%	-1.48%	-4.774***	-3.699***
$[R - 1; \widehat{D} + 1]$	0.53%	0.19%	0.859	-0.916	-2.91%	-1.09%	-3.878***	-2.634***
$[R - 2; \widehat{D} + 2]$	0.36%	0.12%	0.567	-1.075	-2.35%	-0.88%	-3.185***	-2.209**
	<i>Reviews for downgrade with subsequent downgrade (n=782)</i>				<i>Reviews for upgrade with subsequent upgrade (n=312)</i>			
$[R - 30; R - 3]$	-0.36%	-0.67%	-0.784	-1.571	0.74%	0.16%	1.169	-1.055
$[\widehat{R}; \widehat{D}]$	-0.02%	-0.34%	-0.029	-0.469	-3.61%	-1.45%	-4.401***	-3.372***
$[R - 1; \widehat{D} + 1]$	0.25%	0.06%	0.336	-0.247	-2.86%	-0.76%	-3.528***	-2.062**
$[R - 2; \widehat{D} + 2]$	-0.02%	-0.11%	-0.023	-0.381	-2.36%	-0.48%	-2.978***	-1.753*
	<i>Reviews for downgrade with subsequent rating affirmation (n=388)</i>				<i>Reviews for upgrade with subsequent rating affirmation (n=38)</i>			
$[R - 30; R - 3]$	0.47%	-0.38%	0.728	-0.309	2.75%	1.54%	1.700*	-1.864*
$[\widehat{R}; \widehat{D}]$	0.34%	-0.47%	0.301	-0.078	-3.71%	-2.07%	-1.968*	-1.632
$[R - 1; \widehat{D} + 1]$	1.09%	0.61%	0.981	-1.222	-3.24%	-4.01%	-1.788*	-2.168**
$[R - 2; \widehat{D} + 2]$	1.11%	1.58%	0.997	-1.254	-2.29%	-1.95%	-1.135	-1.777*
	<i>Difference between reviews for downgrade with subsequent downgrade (n=782) and reviews for downgrade with subsequent rating affirmation (n=388)</i>				<i>Difference between reviews for upgrade with subsequent upgrade (n=312) and reviews for upgrade with subsequent rating affirmation (n=38)</i>			
$[R - 30; R - 3]$	-0.83%	-0.28%	-1.042	-1.194	-2.01%	-1.38%	-1.052	-0.859
$[\widehat{R}; \widehat{D}]$	-0.36%	0.12%	-0.283	-0.136	0.11%	0.62%	0.043	-0.403
$[R - 1; \widehat{D} + 1]$	-0.85%	-0.55%	-0.649	-0.783	0.38%	3.25%	0.157	-1.223
$[R - 2; \widehat{D} + 2]$	-1.13%	-1.69%	-0.845	-0.723	-0.06%	1.47%	-0.026	-0.904

Figure 1: Total number of rating announcements.

This figure shows the total number of rating announcements during the investigation period from 1st January 2004 to 31st December 2015 on a quarterly basis. Panel A displays the total number of reviews for downgrade and rating downgrades for each quarter, while Panel B displays the total number of reviews for upgrade and rating upgrades for each quarter. The data is based on 6,338 rating announcements that were collected for the 527 sample firms during the investigation period.

Panel A: Review for downgrade and rating downgrade announcements



Panel B: Review for upgrade and rating upgrade announcements

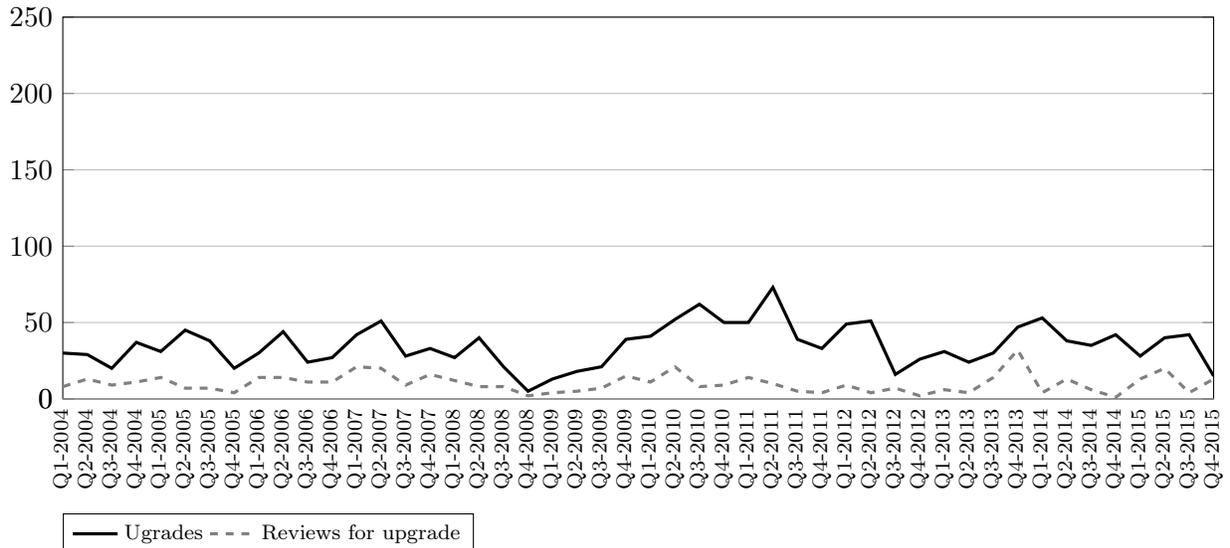


Figure 2: CDS spread dynamics during the rating review process.

This figure shows the results of the CDS spread changes for the entire sample of 1,520 rating reviews throughout the time period a rating is on review and the time period preceding the review announcement, divided into reviews for downgrade and upgrade and the outcome of rating review, either through a rating change or affirmation of the initial rating. The CASC are standardized following the approach of [Malmendier et al. \(2016\)](#) between the day of the review announcement (R) and the final rating decision day (D). The graphical illustration shows the mean CASC development during the  $[R - 30; \widehat{D} + 2]$  event window, starting 30 days prior to the review announcement and ending two days following the decision of the rating review. Downgrade and upgrade show the mean CASC development for rating reviews that resulted in a downgrade and upgrade, while affirmation shows the mean CASC development for rating reviews that concluded with an affirmation of the initial rating. The shaded area signifies the 5% and 95% confidence intervals.

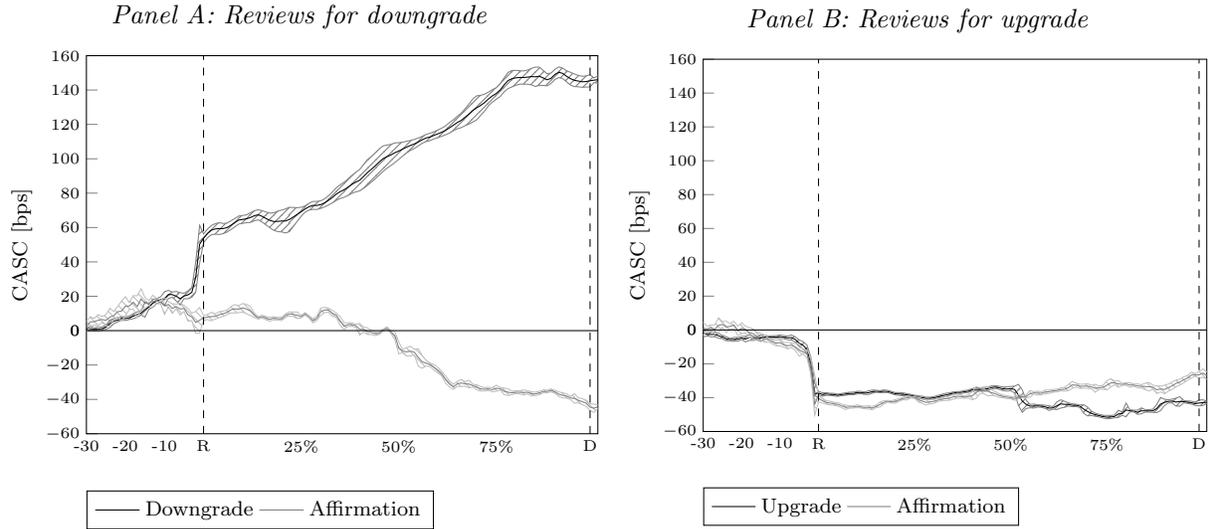
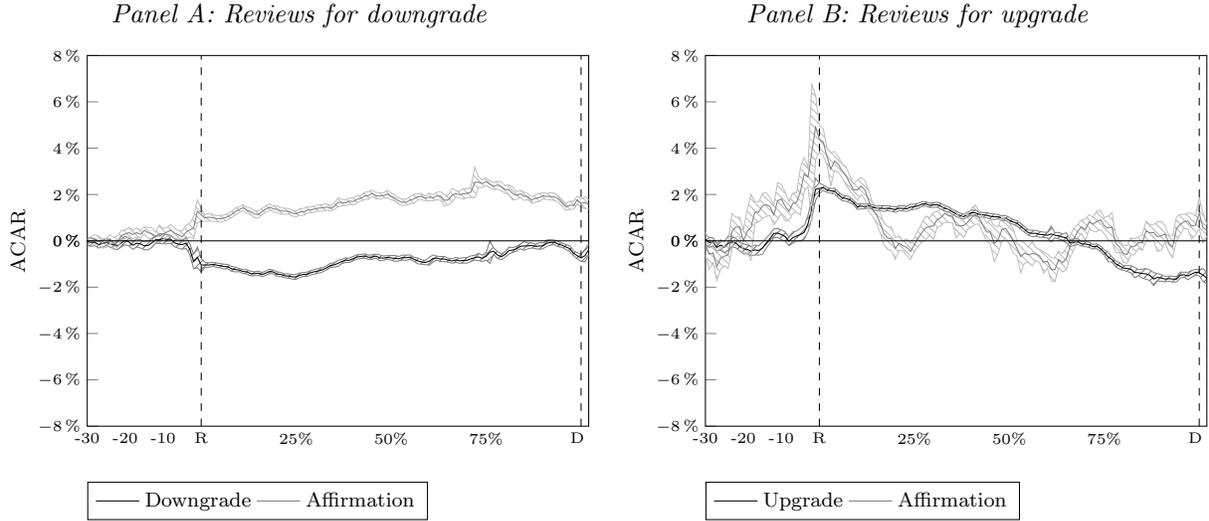


Figure 3: Stock return development throughout the rating review process.

This figure shows the results of the stock returns for the entire sample of 1,520 rating reviews throughout the time period a rating is on review and the time period preceding the review announcement, divided into reviews for downgrade and upgrade and the outcome of rating review, either through a rating change or affirmation of the initial rating. The CAR are standardized following the approach of [Malmendier et al. \(2016\)](#) between the day of the review announcement (R) and the final rating decision day (D). The graphical illustration shows the ACAR development during the  $[R - 30; D + 2]$  event window, starting 30 days prior to the review announcement and ending two days following the decision of the rating review. Downgrade and upgrade show the ACAR development for rating reviews that resulted in a downgrade and upgrade, while affirmation shows the ACAR development for rating reviews that concluded with an affirmation of the initial rating. The shaded area signifies the 5% and 95% confidence intervals.



*NOT FOR PUBLICATION*

**Does CDS trading impact  
the information content of the rating review process?**

Appendix

Table A.1: List of keywords.

This table shows the keywords subdivided into our four reason categories “External reasons”, “Firm driven reasons”, “M&A”, and “Other”. We categorize the review announcements into one of these four categories. To achieve this, we identify the reason for a rating review by a CRA using a key word search in the corresponding press release. We use 56 keywords that are frequently mentioned as a reason and sort them in order of appearance in the press release. If more than one keyword appeared in a press release, the event is attributed to the first keyword, as we assume that the most important reason is mentioned first. Finally, the keywords are allocated to each category. In case the press release did not explicitly include one of the keywords, we manually matched the reason to the closest category.

<i>External reasons</i>		<i>Firm driven reasons</i>		<i>M&amp;A</i>	<i>Other</i>
Crisis	Business profile	Activities	Cost structure	Acquisition	Lawsuit
Downturn	Competition	Advertising	Share	Deal	CEO retirement
Economic conditions	Competitiveness	Business Portfolio	repurchase	Diversification	Resignation of
Economy	Customers	Business Risk	Earnings	Integration	Jury verdict
Environment	Growth	Cash flow	Efficiency	Merger	Internal review
Global	Industry	Demand	Financial metrics	Transaction	
Government	Market position	Operating performance	Financial structure	Divestment	
Macroeconomic	Market share	Production	Leverage		
Regulatory	Price pressure	Products	Liquidity		
	Volumes	Profitability	Profit Margin		
		Revenue	Recent losses		
		Sales	Restructuring		
			Revenues		

Appendix

In order to test the robustness of our results with regard to the tone of the rating review announcement by a CRA, we use the alternative dictionary of positive and negative words as proposed by Henry (2008). We recalculated Tables 5 and 6 of the paper. Overall, the results are similar to those in the main paper using the Loughran and McDonald (2011) dictionary. Tables [A.2](#) and [A.3](#) correspond to Tables 5 and 6 of the paper, respectively.

# Appendix

Table A.2: Probit regression results using the Henry (2008) database.

This table shows the results of the probit regression for the 1,170 reviews for downgrade and the 350 reviews for upgrade. The dependent variable is defined as 1, if a rating change occurred and 0 otherwise. The independent variables are divided into event-specific variables, review content variables, and firm-specific variables. Event-specific variables are: *REVIEWDAYS*, defined as the logarithm of the number of trading days between the rating review announcement and the final rating decision. *CLUSTER*, defined as 1 if another CRA had a press release during the time a firm's rating is under review and 0 otherwise. *RATINGINTENSITY*, defined as the logarithm of the sum of credit rating press releases during the 30 days prior to the rating review announcement based on our database of 6,338 rating announcements. *CRISIS* is defined as 1, if the event occurred between December 2007 to June 2009 and *POST CRISIS* is defined as 1, if the event occurred since July 2009 (see also National Bureau of Economic Research, 2010). *S&P* and *FITCH* are defined as 1, if the review announcement is made by S&P or Fitch, respectively, and 0 otherwise. Review content variables are: *NEG TONE<sub>Henry</sub>* and *POS TONE<sub>Henry</sub>*, which are the ratios of negative and positive words, as defined by the Henry (2008) dictionary, to the number of total words in the rating review announcement by the CRA, *M&A*, *EXTERNAL*, and *OTHER*, each defined as 1, if the review reason can be attributed to merger or acquisition announcements, changes in market or macroeconomic conditions (e.g. market turmoil, oil price increase), or other reasons, which are not attributable to any of the other categories (e.g. arrest of the CEO), respectively, and 0 otherwise. Firm specific-variables are: *CDS RUNUP*, defined as the CASC during the  $[R - 30; R - 3]$  day event window prior to the review announcement, *RATING*, defined as the firm's rating on the day of the review announcement on a 17 step numerical scale (AAA/Aaa=17, AA+/Aa1=16, ..., CCC+/Caal and lower=1). *TA* is the logarithm of the total assets of the firm in million USD in the year prior to the review announcement (WC02999). *DEBT* is the ratio of total debt in the year prior to the review announcement (WC03255) divided by the total assets in the year prior to the review announcement (WC02999). *INTEREST* is the ratio of interest payments in the year prior to the review announcement (WC01251) divided by total assets in the year prior to the review announcement (WC02999). *CDS RUNUP* is the CASC during the  $[R - 30; R - 3]$  day event window prior to the review announcement. *VOL* is the stock return volatility during the 252 trading days (one year) prior to the review announcement. *IG* is defined as 1, if the event firm has a long-term issuer rating of BBB- (S&P and Fitch) or Baa3 (Moody's) or above and 0 otherwise. *EU* is defined as 1, if the firm's headquarter is in the *EU* and 0 otherwise. Model 1 includes only variables that are known prior to the review announcement (ex-ante) and Model 2 additionally includes the variables *CLUSTER* and *REVIEWDAYS* which are only known after the conclusion of the review process (ex-post). *dy/dx* measures the marginal effects of changes in the levels of the independent variables. The robust standard errors are clustered on the firm level and given in parentheses. \*\*\*, \*\*, \* indicate statistical significance at the 1%, 5%, and 10% level, respectively.

	Reviews for downgrade				Review for upgrade			
	Model 1		Model 2		Model 1		Model 2	
	Coefficient	dy/dx	Coefficient	dy/dx	Coefficient	dy/dx	Coefficient	dy/dx
<b>Event-specific variables</b>								
<i>REVIEWDAYS</i>			-0.255*** (0.060)	-0.078*** (0.018)			-0.385** (0.157)	-0.060** (0.025)
<i>CLUSTER</i>			0.474*** (0.091)	0.145*** (0.026)			0.355 (0.251)	0.055 (0.038)
<i>RATINGINTENSITY</i>	0.089 (0.189)	0.028 (0.060)	0.103 (0.187)	0.031 (0.057)	-0.005 (0.460)	-0.001 (0.074)	-0.030 (0.498)	-0.005 (0.077)
<i>CRISIS</i>	0.047 (0.165)	0.015 (0.052)	0.083 (0.166)	0.025 (0.051)	0.024 (0.298)	0.004 (0.048)	0.286 (0.305)	0.044 (0.048)
<i>POST CRISIS</i>	-0.039 (0.134)	-0.012 (0.042)	0.009 (0.132)	0.003 (0.040)	0.212 (0.292)	0.034 (0.047)	0.305 (0.310)	0.047 (0.048)
<i>S&amp;P</i>	-0.433*** (0.088)	-0.138*** (0.027)	-0.386*** (0.087)	-0.118*** (0.026)	0.112 (0.196)	0.018 (0.032)	0.029 (0.199)	0.004 (0.031)
<i>FITCH</i>	-0.382*** (0.102)	-0.121*** (0.032)	-0.396*** (0.107)	-0.121*** (0.032)	0.096 (0.323)	0.015 (0.052)	0.072 (0.310)	0.011 (0.048)
<b>Review content variables</b>								
<i>NEG TONE<sub>HENRY</sub></i>	0.122** (0.048)	0.039** (0.015)	0.118** (0.049)	0.036** (0.015)	-0.026 (0.145)	-0.004 (0.023)	-0.052 (0.145)	-0.008 (0.022)
<i>POS TONE<sub>HENRY</sub></i>	0.008 (0.048)	0.003 (0.015)	0.014 (0.049)	0.004 (0.015)	0.087 (0.091)	0.014 (0.015)	0.094 (0.096)	0.015 (0.015)
<i>M&amp;A</i>	-0.638*** (0.102)	-0.203*** (0.031)	-0.651*** (0.104)	-0.199*** (0.030)	-0.882*** (0.296)	-0.142*** (0.047)	-0.625* (0.320)	-0.097** (0.049)
<i>EXTERNAL</i>	0.162 (0.137)	0.052 (0.043)	0.173 (0.137)	0.053 (0.042)	-0.283 (0.362)	-0.046 (0.058)	-0.203 (0.372)	-0.031 (0.058)
<i>OTHER</i>	-0.603*** (0.179)	-0.192*** (0.056)	-0.669*** (0.185)	-0.204*** (0.055)	-0.801 (0.542)	-0.129 (0.087)	-0.893 (0.605)	-0.138 (0.094)
<b>Firm-specific variables</b>								
<i>CDS RUNUP</i>	0.047** (0.020)	0.015** (0.006)	0.042** (0.020)	0.013** (0.006)	-0.035 (0.145)	-0.006 (0.023)	-0.039 (0.153)	-0.006 (0.024)
<i>RATING</i>	0.110*** (0.035)	0.035*** (0.011)	0.124*** (0.036)	0.038*** (0.011)	-0.035 (0.075)	-0.006 (0.012)	-0.040 (0.075)	-0.006 (0.012)
<i>TA</i>	-0.089 (0.060)	-0.028 (0.019)	-0.084 (0.057)	-0.026 (0.017)	-0.147 (0.102)	-0.024 (0.016)	-0.136 (0.104)	-0.021 (0.016)
<i>DEBT</i>	0.005 (0.448)	0.002 (0.142)	-0.172 (0.439)	-0.053 (0.134)	0.657 (0.726)	0.106 (0.116)	0.681 (0.796)	0.105 (0.124)
<i>INTEREST</i>	0.014 (0.070)	0.005 (0.022)	0.032 (0.069)	0.010 (0.021)	-0.154 (0.099)	-0.025 (0.016)	-0.155 (0.109)	-0.024 (0.017)
<i>VOL</i>	0.036 (0.057)	0.011 (0.018)	0.007 (0.057)	0.002 (0.017)	-0.047 (0.093)	-0.008 (0.015)	-0.063 (0.099)	-0.010 (0.015)
<i>IG</i>	0.162 (0.187)	0.051 (0.059)	0.121 (0.197)	0.037 (0.060)	-0.640* (0.351)	-0.103* (0.057)	-0.568* (0.335)	-0.088* (0.052)
<i>EU</i>	-0.073 (0.124)	-0.023 (0.039)	-0.058 (0.121)	-0.018 (0.037)	-0.166 (0.258)	-0.027 (0.042)	-0.220 (0.263)	-0.034 (0.041)
<i>INTERCEPT</i>	0.604 (1.150)		1.182 (1.149)		4.557 (2.934)		5.960* (3.153)	
<i>INDUSTRY FIXED EFFECTS</i>		YES		YES		YES		YES
N		1,170		1,170		350		350
Log Likelihood		-657.05		-633.03		-103.05		-98.69
Wald $\chi^2$		134.73***		164.41***		34.98**		45.35***

Table A.3: OLS regression results for the duration of the rating review process using the Henry (2008) database.

This table shows the results of the OLS regression for the 1,170 reviews for downgrade and the 350 reviews for upgrade. The dependent variable is the  $CASC_i$  of firm  $i$  for the  $[R; D]$  event window (see also Section 3.2.). The independent variables are divided into event-specific variables, review content variables, and firm-specific variables. Event-specific variables are: *SURPRISE*, defined as the difference between the outcome of rating review (change=1, affirmation=0) and the within sample fitted probability of a rating change estimated from Model 1 of the probit regression in Table A.2 for reviews for downgrade and upgrade. *REVIEWDAYS* is defined as the logarithm of the number of trading days between the rating review announcement and the final rating decision. *CLUSTER* is defined as 1, if another CRA had a press release during the time a firm's rating is under review and 0 otherwise. *RATINGINTENSITY* is defined as the logarithm of the sum of credit rating press releases during the 30 days prior to the rating review announcement based on our database of 6,338 rating announcements. *CRISIS* is defined as 1, if the event occurred between December 2007 to June 2009 and *POST CRISIS* is defined as 1, if the event occurred since July 2009 (see also National Bureau of Economic Research, 2010). *S&P* and *FITCH* are defined as 1, if the review announcement is made by S&P or Fitch, respectively, and 0 otherwise. Review content variables are: *NEG TONE<sub>Henry</sub>* and *POS TONE<sub>Henry</sub>*, which are the ratios of negative and positive words, as defined by the Henry (2008) dictionary, to the number of total words in the rating review announcement by the CRA, *M&A*, *EXTERNAL*, and *OTHER*, each defined as 1, if the review reason can be attributed to merger or acquisition announcements, changes in market or macroeconomic conditions (e.g. market turmoil, oil price increase), or other reasons, which are not attributable to any of the other categories (e.g. arrest of the CEO), respectively, and 0 otherwise. Firm-specific variables are: *CDS RUNUP*, defined as the CASC during the  $[R - 30; R - 3]$  day event window prior to the review announcement, *RATING*, defined as the firm's rating on the day of the review announcement on a 17 step numerical scale (AAA/Aaa=17, AA+/Aa1=16, . . . , CCC+/Caal and lower=1). *TA* is the logarithm of the total assets of the firm in million USD in the year prior to the review announcement (WC02999). *DEBT* is the ratio of total debt in the year prior to the review announcement (WC03255) divided by the total assets in the year prior to the review announcement (WC02999). *INTEREST* is the ratio of interest payments in the year prior to the review announcement (WC01251) divided by total assets in the year prior to the review announcement (WC02999). *VOL* is the stock return volatility during the 252 trading days (one year) prior to the review announcement. *IG* is defined as 1, if the event firm has a long-term issuer rating of BBB- (S&P and Fitch) or Baa3 (Moody's) or above and 0 otherwise. *EU* is defined as 1, if the firm's headquarter is in the EU and 0 otherwise. The robust standard errors are clustered on the firm level and given in parentheses. \*\*\*, \*\*, \* indicate statistical significance at the 1%, 5%, and 10% level, respectively.

	Reviews for downgrade		Review for upgrade	
	Model 1	Model 2	Model 1	Model 2
<u>Event-specific variables</u>				
<i>SURPRISE</i>	151.837*** (42.642)	124.291*** (38.282)	-17.683 (27.943)	-18.010 (29.742)
<i>REVIEWDAYS</i>		-107.019*** (38.651)		-12.607 (18.521)
<i>CLUSTER</i>		26.337 (56.177)		-45.337 (32.015)
<i>RATINGINTENSITY</i>	-75.988 (101.960)	-67.803 (100.976)	-76.973 (61.771)	-85.326 (63.919)
<i>CRISIS</i>	167.404* (97.160)	175.723* (99.300)	-74.536* (40.345)	-76.054** (37.522)
<i>POST CRISIS</i>	0.679 (61.920)	10.537 (63.256)	-64.465* (34.182)	-72.766** (34.613)
<i>S&amp;P</i>	-106.033** (50.108)	-90.607* (47.174)	10.961 (35.628)	5.852 (36.030)
<i>FITCH</i>	-39.311 (78.463)	-12.615 (81.460)	-9.726 (33.480)	-5.608 (32.871)
<u>Review content variables</u>				
<i>NEG TONE<sub>HENRY</sub></i>	4.930 (28.737)	2.186 (28.216)	-7.553 (18.404)	-3.570 (18.756)
<i>POS TONE<sub>HENRY</sub></i>	-25.568 (17.353)	-29.328 (18.142)	-31.026*** (11.745)	18.756** (11.359)
<i>M&amp;A</i>	-64.209 (55.243)	-32.899 (52.796)	-17.814 (34.778)	8.356 (37.004)
<i>EXTERNAL</i>	51.175 (121.989)	52.632 (120.841)	-15.451 (56.816)	-14.087 (56.638)
<i>OTHER</i>	-55.550 (74.184)	-51.276 (73.684)	45.190 (42.121)	40.373 (40.901)
<u>Firm-specific variables</u>				
<i>CDS RUNUP</i>	95.370 (72.866)	92.096 (72.033)	41.332 (54.508)	35.451 (54.198)
<i>RATING</i>	-9.896 (19.271)	-8.722 (19.337)	15.590 (9.682)	15.294 (9.549)
<i>TA</i>	21.728 (39.294)	30.680 (38.916)	-14.485 (16.062)	-12.812 (15.721)
<i>DEBT</i>	105.935 (500.817)	34.864 (499.958)	-73.976 (196.441)	-48.165 (185.616)
<i>INTEREST</i>	38.249 (114.529)	44.590 (115.124)	20.085 (29.881)	17.528 (28.680)
<i>VOL</i>	-57.718 (58.940)	-66.865 (59.451)	72.724** (32.383)	75.522** (31.118)
<i>IG</i>	-116.508 (137.676)	-124.945 (138.943)	36.385 (35.705)	36.391 (35.788)
<i>EU</i>	36.796 (75.058)	29.550 (73.741)	13.644 (22.406)	12.881 (23.540)
<i>INTERCEPT</i>	309.908 (449.123)	556.105 (419.750)	426.737 (429.469)	481.464 (437.791)
<i>INDUSTRY FIXED EFFECTS</i>	YES	YES	YES	YES
N	1,170	1,170	350	350
Adjusted R <sup>2</sup>	0.062	0.071	0.156	0.160
F-test	1.83**	1.75**	1.72**	1.65**

In order to test the robustness of our results with regard to the changes in the firm's leverage and in its interest coverage ratio before and after the credit rating review, we compare the firm's leverage and the interest coverage ratio two quarters before the rating review announcement with the firm's leverage and the interest coverage ratio two quarters after the final rating decision. We recalculated Table 7 of the paper. Overall, the results are similar to those in the main paper. Table [A.4](#) correspond to Table 7 of the paper.

# Appendix

Table A.4: Changes in firms' leverage and interest coverage ratios.

This table shows the mean and median leverage and interest coverage ratios two quarters prior to rating review announcement ("Before review") and two quarters following the conclusion of the rating review ("After review"). *Leverage* is the ratio of the total debt (WC03255A) divided by total assets (WC02999A) in the quarter prior to the review announcement and the quarter following the conclusion of the rating review, respectively. *Interest coverage ratio* is defined as the EBIT (WC18191A) divided by interest expenses on debt (WC01251A) two quarters prior to the review announcement and the second quarter following the conclusion of the rating review, respectively. The equality of means and medians of the reviews leading to a rating change and those who lead to an affirmation of a rating are tested for statistical significance using the two sample *t*-test and the Wilcoxon rank-sum test (SIGN). \*\*\*, \*\*, \* indicate statistical significance at the 1%, 5%, and 10% level, respectively.

		Before review		After review		Difference	
	n	Mean	Median	Mean	Median	Mean	Median
<i>Panel A: Leverage</i>							
Reviews for downgrade							
with subsequent downgrade	661	30.88	28.63	34.68	32.61	3.81	2.17
Reviews for downgrade							
with subsequent affirmation	335	32.47	28.81	34.60	30.00	2.13	1.09
Reviews for upgrade							
with subsequent upgrade	277	35.94	31.48	32.95	31.20	-2.99	-1.92
Reviews for upgrade							
with subsequent affirmation	31	42.43	37.20	38.54	37.65	-3.89	-1.67
<i>Difference between the difference in affirmations and changes</i>							
		Mean	Median	<i>t</i> -test (t-value)	SIGN (Z-score)		
Reviews for downgrade		1.68	1.08	2.55**	-2.67**		
Reviews for upgrade		0.89	-0.25	0.49	-0.35		
<i>Panel B: Interest coverage ratio</i>							
Reviews for downgrade							
with subsequent downgrade	640	6.88	4.55	4.75	3.13	-2.13	-1.45
Reviews for downgrade							
with subsequent affirmation	325	7.50	4.49	5.56	3.98	-1.94	-0.32
Reviews for upgrade							
with subsequent upgrade	266	8.19	3.79	9.82	5.04	1.63	0.94
Reviews for upgrade							
with subsequent affirmation	30	6.58	3.06	6.22	3.38	-0.35	0.28
<i>Difference between the difference in affirmations and changes</i>							
		Mean	Median	<i>t</i> -test (t-value)	SIGN (Z-score)		
Reviews for downgrade		-0.19	-1.13	-0.12	-3.85***		
Reviews for upgrade		1.99	0.66	0.66	-1.49		

In order to test the robustness of our results with regard to the sample selection procedure, we construct a conditional sample by dropping all events with competing rating announcements by another CRA. As we examine the rating announcements of all three major CRAs and it may be possible that the announcements of the CRAs happen in close sequence. We repeat our calculations for the CDS spread development for the time period the rating is under review and again illustrate the mean CASC development during that time using the conditional sample, thereby eliminating potential confounding events by other rating agencies. Tables [A.5](#) and [A.6](#), as well as Figure [A.1](#) present the results for the conditional sample analyses.

# Appendix

Table A.5: Sample selection procedure for the conditional sample.

This table shows the sample selection procedure for the conditional sample of rating reviews for downgrade with a subsequent downgrade and affirmation and for rating reviews for upgrade with a subsequent upgrade and affirmation. The final sample used for the empirical analyses is further reduced by dropping all observations with competing announcements during the  $[-2; +2]$  day event window surrounding the review announcement day or the review decision day.

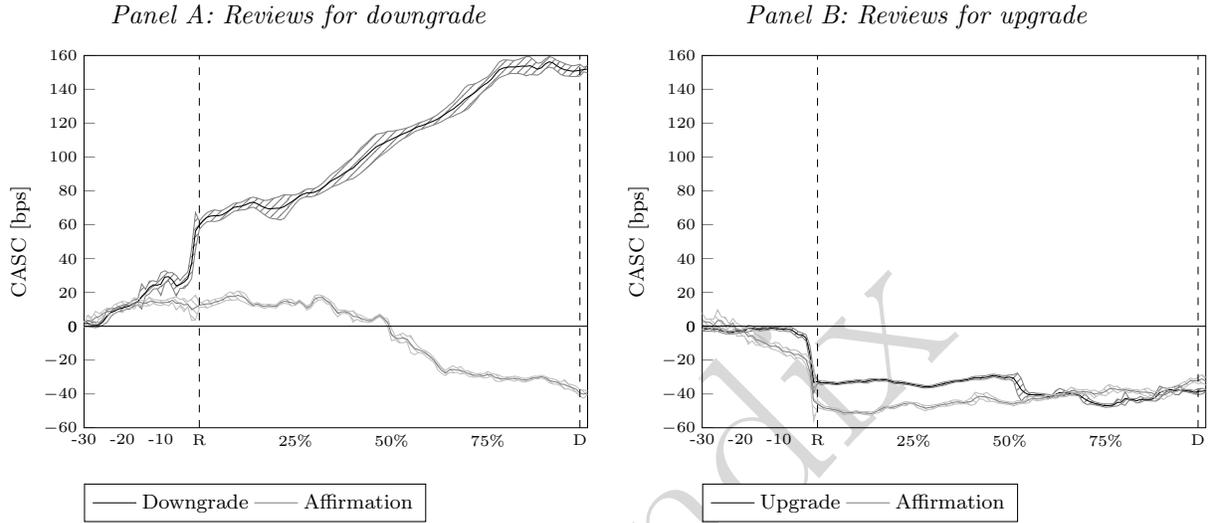
	Reviews for downgrade and subsequent downgrade	Reviews for downgrade and subsequent affirmation	Reviews for upgrade and subsequent upgrade	Reviews for upgrade and subsequent affirmation	Total
Final (unconditional) sample	782	388	312	38	1,520
Less competing announcements during the $[-2; +2]$ day event window	-333	-164	-59	-12	-568
Conditional sample	450	224	253	26	953

Appendix

Table A.6: CDS spread changes of the conditional sample throughout the rating review process. This table shows the results of the CDS spread development for the conditional sample of 953 rating reviews throughout the time period a rating is on review, divided into reviews for downgrade and upgrade and the outcome of rating review, either through a rating change or affirmation of the initial rating. The CASC are standardized following the approach of Malmendier et al. (2016) between the day of the review announcement (R) and the final rating decision day (D). The event windows  $[R - 1; \widehat{D} + 1]$  and  $[R - 2; \widehat{D} + 2]$  starting one and two days prior to the review announcement and ending one and two days following the decision of the rating review, respectively, are shown as well as the event window  $[\widehat{R}; \widehat{D}]$  covering only the review period. In addition, the CASC during the  $[R - 30; R - 3]$  day event window is shown to test whether CDS spread change prior to the review announcement. The mean and median CASC are shown in bps and tested for significance using the parametric  $t$ -test and the nonparametric Wilcoxon signed-rank test (SIGN). The equality of means and medians of the reviews leading to a rating change and those who lead to an affirmation of a rating are tested for statistical significance using the two sample  $t$ -test and the Wilcoxon rank-sum test (SIGN). \*\*\*, \*\*, \* indicate statistical significance at the 1%, 5%, and 10% level, respectively.

Event window	Mean CASC	Median CASC	$t$ -test (t-value)	SIGN (Z-score)	Mean CASC	Median CASC	$t$ -test (t-value)	SIGN (Z-score)
	<i>Reviews for downgrade (n=674)</i>				<i>Reviews for upgrade (n=279)</i>			
$[R - 30; R - 3]$	23.15	3.17	4.311***	-6.675***	-8.07	-1.52	-1.925*	-3.126***
$[\widehat{R}; \widehat{D}]$	66.27	0.04	1.527	-1.035	-9.52	-3.65	-0.813	-3.599***
$[R - 1; \widehat{D} + 1]$	79.50	4.55	1.774*	-3.216***	-21.40	-8.89	-1.753*	-5.299***
$[R - 2; \widehat{D} + 2]$	87.61	5.56	1.912*	-3.880***	-26.77	-12.47	-2.114**	-5.774***
	<i>Reviews for downgrade with subsequent downgrade (n=450)</i>				<i>Reviews for upgrade with subsequent upgrade (n=253)</i>			
$[R - 30; R - 3]$	28.22	3.57	4.113***	-5.912***	-6.87	-1.49	-1.519	-2.723***
$[\widehat{R}; \widehat{D}]$	129.49	5.17	2.015**	-3.807***	-11.87	-5.87	-0.926	-3.970***
$[R - 1; \widehat{D} + 1]$	145.66	9.10	2.195**	-5.160***	-23.84	-10.35	-1.785*	-5.398***
$[R - 2; \widehat{D} + 2]$	155.60	10.08	2.296**	-5.328***	-28.72	-13.13	-2.073**	-5.752***
	<i>Reviews for downgrade with subsequent rating affirmation (n=224)</i>				<i>Reviews for upgrade with subsequent rating affirmation (n=26)</i>			
$[R - 30; R - 3]$	12.99	2.74	1.542	-3.232***	-19.74	-4.47	-2.125**	-1.816*
$[\widehat{R}; \widehat{D}]$	-60.73	-6.55	-4.187***	-3.597***	13.33	1.87	0.896	-1.054
$[R - 1; \widehat{D} + 1]$	-53.39	-2.62	-2.246***	-3.051**	2.33	-0.32	0.143	-0.394
$[R - 2; \widehat{D} + 2]$	-48.98	-1.00	-1.254**	-2.554	-7.83	-0.21	-0.460	-0.800
	<i>Difference between reviews for downgrade with subsequent downgrade (n=450) and reviews for downgrade with subsequent rating affirmation (n=224)</i>				<i>Difference between reviews for upgrade with subsequent upgrade (n=254) and reviews for upgrade with subsequent rating affirmation (n=26)</i>			
$[\widehat{R}; \widehat{D}]$	15.23	0.83	1.336	-1.325	12.87	2.98	0.892	-0.870
$[\widehat{R}; \widehat{D}]$	190.22	11.72	2.070**	-5.398***	-25.20	-7.74	-0.625	-1.879*
$[R - 1; \widehat{D} + 1]$	199.05	11.72	2.097**	-5.059***	-26.16	-10.03	-0.622	-1.569
$[R - 2; \widehat{D} + 2]$	204.58	11.08	2.108**	-4.501***	-20.88	-12.92	-0.479	-1.289

Figure A.1: CDS spread dynamics of the conditional sample throughout the rating review process. This figure shows the results of the CDS spread development for the conditional sample of 953 rating reviews throughout the time period a rating is on review and the time period preceding the review announcement, divided into reviews for downgrade and upgrade and the outcome of rating review, either through a rating change or affirmation of the initial rating. The CASC are standardized following the approach of Malmendier et al. (2016) between the day of the review announcement (R) and the final rating decision day (D). The graphical illustration shows the mean CASC development during the  $[R - 2; D + 2]$  event window, starting two days prior to the review announcement and ending two days following the decision of the rating review. Downgrade and upgrade show the mean CASC development for rating reviews that resulted in a downgrade and upgrade, while affirmation shows the mean CASC development for rating reviews that concluded with an affirmation of the initial rating. The shaded area signifies the 5% and 95% confidence intervals.



Appendix

Table A.7: List of firms.

This table shows all 527 firms that are a member of a benchmark at least once during the investigation period. The table also shows the firm's country of origin, its four-digit standard industrial classification (SIC) code, and whether a firm has a rating by S&P, Moody's, or Fitch, or multiple ratings. If a company changed its name during the investigation period, the most recent name is recorded.

#	Company Name	Country	SIC code	S&P rating	Moody's rating	Fitch rating
1	3M Company	United States	3841	Yes	Yes	No
2	Abbott Laboratories	United States	2834	Yes	Yes	Yes
3	Accor SA	France	7011	Yes	No	Yes
4	Advanced Micro Devices Inc	United States	3674	Yes	Yes	Yes
5	AGCO Corporation	United States	3523	Yes	Yes	No
6	Agilent Technologies Inc	United States	3825	Yes	Yes	Yes
7	Air Products and Chemicals Inc	United States	2813	Yes	Yes	No
8	AK Steel Holding Corporation	United States	3312	Yes	Yes	No
9	Akzo Nobel NV	Netherlands	2819	Yes	Yes	Yes
10	Alcatel Lucent SA	France	3661	Yes	Yes	Yes
11	Alcoa Inc	United States	3334	Yes	Yes	Yes
12	Allegheny Technologies Inc	United States	3317	Yes	Yes	No
13	Allergan Inc	United States	2834	Yes	Yes	Yes
14	Alliant Energy Corporation	United States	4931	Yes	Yes	No
15	Alphabet Inc	United States	7375	Yes	Yes	No
16	Alstom SA	France	3511	Yes	Yes	No
17	Altria Group Inc	United States	2111	Yes	Yes	Yes
18	Amazon.com Inc	United States	5961	Yes	Yes	No
19	Ameren Corporation	United States	4931	Yes	Yes	Yes
20	American Airlines Group Inc	United States	4512	Yes	Yes	Yes
21	American Axle & Manufacturing Holdings Inc	United States	3714	Yes	Yes	Yes
22	American Electric Power Company Inc	United States	4911	Yes	Yes	Yes
23	American Greetings Corporation Inc	United States	4922	Yes	Yes	No
24	American Tower Corporation	United States	4821	Yes	Yes	Yes
25	AmerisourceBergen Corporation	United States	5122	Yes	Yes	Yes
26	Amkor Technology Inc	United States	3674	Yes	Yes	No
27	Anadarko Petroleum Corporation	United States	1311	Yes	Yes	Yes
28	Anglo American PLC	United Kingdom	1011	Yes	Yes	Yes
29	Apache Corporation	United States	1311	Yes	Yes	Yes
30	Applied Materials Inc	United States	3674	Yes	Yes	No
31	Arcelormittal SA	Luxembourg	3312	Yes	Yes	Yes
32	Archer Daniels Midland Company	United States	2041	Yes	Yes	Yes
33	Arrow Electronics Inc	United States	5065	Yes	Yes	Yes
34	Ashland Inc	United States	2821	Yes	Yes	No
35	Astrazeneca PLC	United Kingdom	2834	Yes	Yes	Yes
36	AT&T Inc	United States	4813	Yes	Yes	Yes
37	Atlantia SpA	Italy	4231	Yes	Yes	Yes
38	Atlas Copco AB	Sweden	3563	Yes	Yes	Yes
39	AutoNation Inc	United States	5511	Yes	Yes	Yes
40	Autozone Inc	United States	5531	Yes	Yes	Yes
41	Avery Dennison Corporation	United States	2672	Yes	Yes	No
42	Avis Budget Group Inc	United States	7514	Yes	Yes	Yes
43	Avnet Inc	United States	5065	Yes	Yes	Yes
44	Avon Products Inc	United States	2844	Yes	Yes	Yes
45	BAE Systems PLC	United Kingdom	3721	Yes	Yes	Yes
46	Baker Hughes Inc	United States	3533	Yes	Yes	No
47	Ball Corporation	United States	3411	Yes	Yes	Yes
48	BASF SE	Germany	2851	Yes	Yes	Yes
49	Baxter International Inc	United States	3841	Yes	Yes	Yes
50	Bayer	Germany	2834	Yes	Yes	Yes
51	Bayerische Motoren Werke AG	Germany	3711	Yes	Yes	No
52	Beam Inc	United States	2085	Yes	Yes	Yes
53	Beazer Homes USA Inc	United States	1531	Yes	Yes	Yes
54	Becton, Dickinson and Company	United States	3841	Yes	Yes	No
55	Belo Corporation	United States	4833	Yes	Yes	Yes
56	Bemis Company Inc	United States	2671	Yes	Yes	No
57	Best Buy Company Inc	United States	5731	Yes	Yes	Yes
58	Boeing Company	United States	3721	Yes	Yes	Yes
59	Bon-Ton Stores Inc	United States	5311	Yes	Yes	Yes

60	BorgWarner Inc	United States	3714	Yes	Yes	Yes
61	Boston Scientific Corporation	United States	3841	Yes	Yes	Yes
62	Bouygues SA	France	1611	Yes	Yes	Yes
63	Boyd Gaming Corporation	United States	7011	Yes	Yes	Yes
64	BP PLC	United Kingdom	2911	Yes	Yes	Yes
65	Briggs & Stratton Corporation	United States	3519	Yes	Yes	No
66	Bristol-Myers Squibb Company	United States	2834	Yes	Yes	Yes
67	British American Tobacco PLC	United Kingdom	2111	Yes	Yes	Yes
68	British Energy Group	United Kingdom	4911	Yes	Yes	Yes
69	Brunswick Corporation	United States	3519	Yes	Yes	No
70	Buckeye Partners LP	United States	4613	Yes	Yes	Yes
71	CA Inc	United States	7372	Yes	Yes	Yes
72	Cable & Wireless LTD	United Kingdom	4812	Yes	Yes	No
73	Cablevision Systems Corporation	United States	4841	Yes	Yes	Yes
74	Cabot Corporation	United States	2895	Yes	Yes	No
75	Cadbury PLC	United Kingdom	2064	Yes	Yes	Yes
76	Calatlantic Group Inc	United States	1531	Yes	Yes	Yes
77	Cameron International Corporation	United States	3533	Yes	Yes	No
78	Campbell Soup Company	United States	2032	Yes	Yes	Yes
79	Cap Gemini	France	7371	Yes	No	No
80	Cardinal Health Inc	United States	5122	Yes	Yes	Yes
81	Carlsberg Breweries A/S	Denmark	2082	No	Yes	Yes
82	Carnival PLC	United Kingdom	4481	Yes	Yes	Yes
83	Carpenter Technology Corporation	United States	3312	Yes	Yes	No
84	Carrefour SA	France	5411	Yes	Yes	Yes
85	Casino Guichard-Perrachon SA	France	5411	No	No	Yes
86	Caterpillar Inc	United States	3531	Yes	Yes	Yes
87	CBS Corporation	United States	4833	Yes	Yes	Yes
88	CenterPoint Energy Inc	United States	4911	Yes	Yes	Yes
89	Centrica PLC	United Kingdom	4924	Yes	Yes	Yes
90	Centrus Energy Corporation	United States	4911	Yes	Yes	No
91	CenturyLink Inc	United States	4813	Yes	Yes	Yes
92	Chesapeake Energy Corporation	United States	1311	Yes	Yes	Yes
93	Chevron Corporation	United States	2911	Yes	Yes	Yes
94	Chiquita Brands International Inc	United States	0179	Yes	Yes	No
95	Cincinnati Bell Inc	United States	4813	Yes	Yes	Yes
96	Cintas Corporation	United States	7213	Yes	No	No
97	Cisco Systems Inc	United States	3661	Yes	Yes	No
98	CMS Energy Corporation	United States	4931	Yes	Yes	Yes
99	Coca-Cola Enterprises Inc	United States	2086	Yes	Yes	Yes
100	Colgate-Palmolive Company	United States	2844	Yes	Yes	Yes
101	Comcast Corporation	United States	4813	Yes	Yes	Yes
102	Commercial Metals Company	United States	3312	Yes	Yes	Yes
103	Community Health Systems Inc	United States	8062	Yes	Yes	Yes
104	Compagnie de Saint Gobain SA	France	5039	Yes	Yes	Yes
105	Compass Group PLC	United Kingdom	5812	Yes	Yes	Yes
106	Computer Sciences Corporation	United States	7373	Yes	Yes	Yes
107	ConAgra Foods Inc	United States	2038	Yes	Yes	Yes
108	Consolidated Edison Inc	United States	4931	Yes	Yes	Yes
109	Constellation Brands Inc	United States	2080	Yes	Yes	Yes
110	Continental AG	Germany	3011	Yes	Yes	Yes
111	Convergys Corporation	United States	7373	Yes	Yes	Yes
112	Con-way Inc	United States	4213	Yes	Yes	Yes
113	Cooper Tire & Rubber Company	United States	3011	Yes	Yes	No
114	Corning Inc	United States	3357	Yes	Yes	Yes
115	Costco Wholesale Corporation	United States	5331	Yes	Yes	Yes
116	Crane Company	United States	3492	Yes	Yes	No
117	CRH PLC	Ireland	3241	Yes	Yes	Yes
118	Crown Castle International Corporation	United States	4899	Yes	Yes	Yes
119	CSX Corporation	United States	4011	Yes	Yes	Yes
120	Cummins Inc	United States	3519	Yes	Yes	Yes
121	CVS Health Corporation	United States	5912	Yes	Yes	Yes
122	Cytec Industries Inc	United States	2821	Yes	Yes	No
123	D.R. Horton Inc	United States	1531	Yes	Yes	Yes
124	Daily Mail and General Trust PLC	United Kingdom	2711	Yes	No	Yes
125	Daimler AG	Germany	3711	Yes	Yes	Yes
126	Danaher Corporation	United States	3823	Yes	Yes	No

127	Danone SA	France	2023	Yes	Yes	No
128	Darden Restaurants Inc	United States	5812	Yes	Yes	Yes
129	Deere & Company	United States	3523	Yes	Yes	Yes
130	Dell Inc	United States	3571	Yes	Yes	Yes
131	Delphi Automotive PLC	United States	3714	Yes	Yes	Yes
132	Delta Air Lines Inc	United States	4512	Yes	Yes	Yes
133	Deluxe Corporation	United States	2761	Yes	Yes	No
134	Denbury Resources Inc	United States	1311	Yes	Yes	No
135	Deutsche Lufthansa AG	Germany	4512	Yes	Yes	No
136	Deutsche Post AG	Germany	4311	Yes	Yes	Yes
137	Deutsche Telekom AG	Germany	4812	Yes	Yes	Yes
138	Devon Energy Corporation	United States	1311	Yes	Yes	Yes
139	Diageo PLC	United Kingdom	2085	Yes	Yes	Yes
140	Diamond Offshore Drilling Inc	United States	1381	Yes	Yes	No
141	Dillard's Inc	United States	5311	Yes	Yes	Yes
142	Dixons Retail PLC	United Kingdom	5734	No	Yes	Yes
143	Dole Food Company Inc	United States	0179	Yes	Yes	Yes
144	Dollar General Corporation	United States	5331	Yes	Yes	Yes
145	Dominion Resources Inc	United States	4911	Yes	Yes	Yes
146	Domtar Corporation	United States	2621	Yes	Yes	No
147	Dover Corporation	United States	3491	Yes	No	Yes
148	Dow Chemical Company	United States	2821	Yes	Yes	Yes
149	Dr Pepper Snapple Group Inc	United States	2080	Yes	Yes	No
150	DTE Energy Company	United States	4911	Yes	Yes	Yes
151	Duke Energy Corporation	United States	4931	Yes	Yes	Yes
152	Dune Energy Inc	United States	1389	Yes	Yes	No
153	E. I. du Pont de Nemours and Company	United States	2821	Yes	Yes	Yes
154	E.ON SE	Germany	4911	Yes	Yes	Yes
155	Eastman Chemical Company	United States	2821	Yes	Yes	Yes
156	Eastman Kodak Company	United States	3861	Yes	Yes	Yes
157	Eaton Corporation PLC	United States	3613	Yes	Yes	Yes
158	eBay Inc	United States	7389	Yes	Yes	Yes
159	Edison S.p.A.	Italy	4911	Yes	Yes	No
160	EDP Energias de Portugal SA	Portugal	4911	Yes	Yes	Yes
161	Electricite de France SA	France	4911	Yes	Yes	Yes
162	Electrolux AB	Sweden	3631	Yes	Yes	Yes
163	Eli Lilly and Company	United States	2834	Yes	Yes	Yes
164	Elisa Oyj	Finland	4813	Yes	Yes	No
165	EMC Corporation	United States	3572	Yes	Yes	No
166	Emerson Electric Company	United States	3823	Yes	Yes	No
167	Enbridge Energy Partners LP	United States	4612	Yes	Yes	No
168	EnBW Energie Baden-Wrttemberg AG	Germany	4911	Yes	Yes	Yes
169	Endesa SA	Spain	4911	Yes	Yes	Yes
170	ENEL SpA	Italy	4911	Yes	Yes	Yes
171	Energy Transfer Partners LP	United States	4922	Yes	Yes	Yes
172	Engie SA	France	4911	Yes	Yes	No
173	ENI SpA	Italy	1311	Yes	Yes	Yes
174	Ensc0 PLC	United States	1381	Yes	Yes	No
175	Entergy Corporation	United States	4911	Yes	Yes	Yes
176	Enterprise Products Partners LP	United States	4922	Yes	Yes	No
177	EOG Resources Inc	United States	1311	Yes	Yes	No
178	Equifax Inc	United States	7323	Yes	Yes	No
179	Eversource Energy	United States	4911	Yes	Yes	Yes
180	Evonik Industries AG	Germany	2821	Yes	Yes	No
181	Exelon Corporation	United States	4931	Yes	Yes	Yes
182	Expedia Inc	United States	4724	Yes	Yes	Yes
183	Express Scripts Holding Company	United States	5912	Yes	Yes	Yes
184	Exxon Mobil Corporation	United States	2911	Yes	Yes	Yes
185	FedEx Corporation	United States	4513	Yes	Yes	Yes
186	Ferro Corporation	United States	2851	Yes	Yes	No
187	Fiat Chrysler Automobiles NV	Italy	3711	Yes	Yes	Yes
188	Finmeccania SpA	Italy	3721	Yes	Yes	Yes
189	FirstEnergy Corporation	United States	4911	Yes	Yes	Yes
190	Fiserv Inc	United States	7374	Yes	Yes	No
191	Fluor Corporation	United States	8711	Yes	Yes	Yes
192	FMC Corporation	United States	2879	Yes	Yes	No
193	Ford Motor Company	United States	3711	Yes	Yes	Yes

194	Fortum Oyj	Finland	4911	Yes	Yes	Yes
195	Freeport-McMoRan Inc.	United States	1021	Yes	Yes	Yes
196	Freescale Semiconductor Inc	United States	3674	Yes	Yes	Yes
197	Fresenius SE & Co KGaA	Germany	8092	Yes	Yes	Yes
198	Frontier Communications Corporation	United States	4813	Yes	Yes	Yes
199	Gas Natural SDG SA	Spain	4924	Yes	Yes	Yes
200	General Dynamics Corporation	United States	3812	Yes	Yes	Yes
201	General Electric Company	United States	3511	Yes	Yes	No
202	General Mills Inc	United States	2043	Yes	Yes	Yes
203	Georgia Power Company	United States	4911	Yes	Yes	Yes
204	GKN Holdings PLC	United Kingdom	3714	Yes	Yes	Yes
205	Graphic Packaging Holding Company	United States	2657	Yes	No	Yes
206	H&R Block Inc	United States	7291	Yes	Yes	Yes
207	H. J. Heinz Company	United States	2035	Yes	Yes	Yes
208	Halliburton Company	United States	1389	Yes	Yes	Yes
209	Harris Corporation	United States	3812	Yes	Yes	Yes
210	Hasbro Inc	United States	3944	Yes	Yes	Yes
211	HCA Holdings Inc	United States	8062	Yes	Yes	Yes
212	Health Management Associates Inc	United States	8062	Yes	Yes	Yes
213	Health Net Inc	United States	8629	Yes	Yes	Yes
214	HealthSouth Corporation	United States	8069	Yes	Yes	No
215	HeidelbergCement AG	Germany	3241	Yes	Yes	Yes
216	Heineken NV	Netherlands	2082	Yes	Yes	No
217	Hellenic Telecommunications Organization SA	Greece	4812	Yes	Yes	Yes
218	Henkel AG & Co KGaA	Germany	2891	Yes	Yes	Yes
219	Hertz Global Holdings Inc	United States	7514	Yes	No	Yes
220	Hess Corporation	United States	2911	Yes	Yes	Yes
221	Hillshire Brands Company	United States	2013	Yes	Yes	Yes
222	Hilton Worldwide Holdings Inc	United States	7011	Yes	No	Yes
223	Home Depot Inc	United States	5211	Yes	Yes	Yes
224	Honeywell International Inc	United States	3714	Yes	Yes	Yes
225	Hospira Inc	United States	2834	Yes	Yes	No
226	Houghton Mifflin Harcourt Publishing Company	United States	8299	Yes	Yes	Yes
227	Hovnanian Enterprises Inc	United States	1531	Yes	Yes	Yes
228	HP Inc	United States	3571	Yes	Yes	Yes
229	Huntsman Corporation	United States	2821	Yes	Yes	No
230	Iberdrola SA	Spain	4911	Yes	Yes	Yes
231	Illinois Tool Works Inc	United States	3714	Yes	Yes	No
232	Imperial Tobacco Group PLC	United Kingdom	2111	Yes	Yes	Yes
233	Ingersoll-Rand PLC	United States	3822	Yes	Yes	Yes
234	Integrus Energy Group Inc	United States	4931	Yes	Yes	Yes
235	Intel Corporation	United States	3674	Yes	Yes	Yes
236	International Business Machines Corporation	United States	7373	Yes	Yes	Yes
237	International Game Technology PLC	United States	7999	Yes	Yes	No
238	International Paper Company	United States	2621	Yes	Yes	Yes
239	Intuit Inc	United States	7372	Yes	Yes	No
240	Invensys PLC	United Kingdom	3823	Yes	Yes	Yes
241	Iron Mountain Inc	United States	7374	Yes	Yes	No
242	Isle of Capri CasiNos Inc	United States	7999	Yes	Yes	No
243	ITT Corporation	United States	3561	Yes	Yes	Yes
244	ITV PLC	United Kingdom	4833	Yes	Yes	Yes
245	J. C. Penney Company Inc	United States	5311	Yes	Yes	Yes
246	Jabil Circuit Inc	United States	3672	Yes	Yes	Yes
247	JetBlue Airways Corporation	United States	4512	Yes	Yes	Yes
248	Johnson & Johnson	United States	2834	Yes	Yes	Yes
249	Johnson Controls Inc	United States	3691	Yes	Yes	Yes
250	Joy Global Inc	United States	3532	Yes	Yes	No
251	Kabel Deutschland Holding AG	Germany	4841	Yes	Yes	Yes
252	Kate Spade & Company	United States	3911	Yes	Yes	No
253	KB Home	United States	1531	Yes	Yes	Yes
254	Kellogg Company	United States	2043	Yes	Yes	Yes
255	Kering SA	France	5621	Yes	No	No
256	Kimberly-Clark Corporation	United States	2676	Yes	Yes	Yes
257	Kinder Morgan Energy Partners LP	United States	4922	Yes	Yes	Yes
258	Kinder Morgan Inc	United States	4922	Yes	Yes	Yes
259	Kingfisher PLC	United Kingdom	5211	Yes	Yes	Yes
260	Kohl's Corporation	United States	5311	Yes	Yes	Yes

261	Koninklijke Ahold NV	Netherlands	5411	Yes	Yes	Yes
262	Koninklijke DSM NV	Netherlands	2869	Yes	Yes	Yes
263	Koninklijke KPN NV	Netherlands	4813	Yes	Yes	Yes
264	Koninklijke Philips NV	Netherlands	3845	Yes	Yes	Yes
265	Kraft Foods Group Inc	United States	2045	Yes	Yes	Yes
266	L Brands Inc	United States	5621	Yes	Yes	Yes
267	Ladbroke PLC	United Kingdom	7999	Yes	Yes	Yes
268	Lafarge SA	France	3241	Yes	Yes	Yes
269	L'Air Liquide SA	France	2813	Yes	No	Yes
270	Lanxess AG	Germany	2821	Yes	Yes	Yes
271	Leggett & Platt Inc	United States	2512	Yes	Yes	No
272	Lennar Corporation	United States	1531	Yes	Yes	Yes
273	Level 3 Communications Inc	United States	4813	Yes	Yes	Yes
274	Lexmark International Inc	United States	3577	Yes	Yes	Yes
275	Liberty Interactive QVC Group	United States	4899	Yes	Yes	No
276	Linde AG	Germany	2813	Yes	Yes	No
277	Lockheed Martin Corporation	United States	3721	Yes	Yes	Yes
278	Lorillard Inc	United States	2111	Yes	Yes	Yes
279	Louisiana-Pacific Corporation	United States	2493	Yes	Yes	No
280	Lowe's Companies Inc	United States	5211	Yes	Yes	Yes
281	LSI Corporation	United States	3674	Yes	No	No
282	LVMH Moet Hennessy Louis Vuitton SA	France	2337	Yes	No	Yes
283	M.D.C. Holdings Inc	United States	1531	Yes	Yes	Yes
284	Macy's Inc	United States	5311	Yes	Yes	Yes
285	Magellan Midstream Partners LP	United States	4612	Yes	Yes	No
286	ManpowerGroup	United States	7363	Yes	Yes	No
287	Marathon Oil Corporation	United States	2911	Yes	Yes	Yes
288	Marks and Spencer Group PLC	United Kingdom	5311	Yes	Yes	Yes
289	Marriott International Inc	United States	7011	Yes	Yes	Yes
290	Martin Marietta Materials Inc	United States	1422	Yes	Yes	Yes
291	Masco Corporation	United States	2434	Yes	Yes	Yes
292	Mattel Inc	United States	3942	Yes	Yes	Yes
293	McClatchy Company	United States	2711	Yes	Yes	Yes
294	McDonald's Corporation	United States	5812	Yes	Yes	Yes
295	McKesson Corporation	United States	5122	Yes	Yes	Yes
296	Medtronic PLC	United States	3845	Yes	Yes	No
297	Meli Hotels International SA	Spain	7011	Yes	Yes	Yes
298	Merck & Co Inc	United States	2834	Yes	Yes	Yes
299	Meritage Homes Corporation	United States	1531	Yes	Yes	Yes
300	Metro AG	Germany	5411	Yes	Yes	Yes
301	Mets Board Oyj	Finland	2657	Yes	Yes	No
302	Metso Oyj	Finland	3532	Yes	Yes	No
303	MGM Resorts International	United States	7011	Yes	Yes	Yes
304	Micron Technology Inc	United States	3674	Yes	Yes	No
305	Microsoft Corporation	United States	7372	Yes	Yes	Yes
306	Mohawk Industries Inc	United States	2273	Yes	Yes	Yes
307	Molson Coors Brewing Company	United States	2082	Yes	Yes	Yes
308	Monsanto Company	United States	2879	Yes	Yes	Yes
309	Motorola Solutions Inc	United States	3663	Yes	Yes	Yes
310	Murphy Oil Corporation	United States	2911	Yes	Yes	Yes
311	Mylan Inc	United States	2834	Yes	Yes	Yes
312	Nabors Industries Ltd	United States	1381	Yes	Yes	Yes
313	National Grid Electricity Transmission PLC	United Kingdom	4911	Yes	Yes	Yes
314	Navistar International Corporation	United States	3711	Yes	Yes	Yes
315	New York Times Company	United States	2711	Yes	Yes	No
316	Newell Rubbermaid Inc	United States	3089	Yes	Yes	Yes
317	Newfield Exploration Company	United States	1311	Yes	Yes	Yes
318	Newmont Mining Corporation	United States	1041	Yes	Yes	No
319	Next PLC	United Kingdom	5621	Yes	Yes	Yes
320	NextEra Energy Inc	United States	4911	Yes	Yes	Yes
321	NII Holdings Inc	United States	4812	Yes	Yes	No
322	Nike Inc	United States	3021	Yes	Yes	No
323	NiSource Inc	United States	4931	Yes	Yes	Yes
324	Noble Energy Inc	United States	1311	Yes	Yes	No
325	Nokia Corporation	Finland	3663	Yes	Yes	Yes
326	Nordstrom Inc	United States	5651	Yes	Yes	Yes
327	Norfolk Southern Corporation	United States	4011	Yes	Yes	Yes

328	Northrop Grumman Corporation	United States	3812	Yes	Yes	Yes
329	NRG Energy Inc	United States	4911	Yes	Yes	Yes
330	Nucor Corporation	United States	3312	Yes	Yes	No
331	NVR Inc	United States	1531	Yes	Yes	Yes
332	NXP Semiconductors NV	Netherlands	3674	Yes	Yes	No
333	Occidental Petroleum Corporation	United States	1311	Yes	Yes	Yes
334	Office Depot Inc	United States	5943	Yes	Yes	No
335	Olin Corporation	United States	2812	Yes	Yes	No
336	Omnicom Group Inc	United States	7311	Yes	Yes	Yes
337	Oneok Inc	United States	4923	Yes	Yes	No
338	Oracle Corporation	United States	7372	Yes	Yes	Yes
339	Orange SA	France	4813	Yes	Yes	Yes
340	Orbital ATK Inc	United States	3483	Yes	Yes	Yes
341	Owens Corning	United States	2952	Yes	Yes	Yes
342	Owens-IlliNois Inc	United States	3221	Yes	Yes	Yes
343	P. H. Glatfelter Company	United States	2621	Yes	Yes	No
344	Pacific Gas and Electric Company	United States	4931	Yes	Yes	Yes
345	Packaging Corporation of America	United States	2653	Yes	Yes	No
346	Parker Drilling Company	United States	1381	Yes	Yes	No
347	Parker Hannifin Corporation	United States	3492	Yes	Yes	Yes
348	Peabody Energy Corporation	United States	1221	Yes	Yes	Yes
349	Pearson PLC	United Kingdom	2731	Yes	Yes	Yes
350	Penn National Gaming Inc	United States	7011	Yes	Yes	No
351	Pentair PLC	United States	3491	Yes	Yes	No
352	Pepeco Holdings Inc	United States	4931	Yes	Yes	Yes
353	PerkinElmer Inc	United States	3826	Yes	Yes	Yes
354	PerNod Ricard SA	France	2085	Yes	Yes	Yes
355	Peugeot SA	France	3711	Yes	Yes	Yes
356	Pfizer Inc	United States	2834	Yes	Yes	Yes
357	Pharol SGPS SA	Portugal	4812	Yes	Yes	Yes
358	Pioneer Natural Resources Company	United States	1311	Yes	Yes	Yes
359	Pitney Bowes Inc	United States	3579	Yes	Yes	Yes
360	Plains All American Pipeline LP	United States	4612	Yes	Yes	No
361	PolyOne Corporation	United States	2821	Yes	Yes	Yes
362	PostNL NV	Netherlands	4215	Yes	Yes	No
363	PPG Industries Inc	United States	2851	Yes	Yes	Yes
364	PPL Corporation	United States	4911	Yes	Yes	Yes
365	Praxair Inc	United States	5169	Yes	Yes	No
366	Procter & Gamble Company	United States	2841	Yes	Yes	Yes
367	ProSiebenSat.1 Media SE	Germany	4833	No	Yes	Yes
368	Proximus NV	Belgium	4813	Yes	Yes	No
369	Publicis Groupe SA	France	7313	Yes	Yes	No
370	PulteGroup Inc	United States	1531	Yes	Yes	Yes
371	R.R. Donnelley & Sons Company	United States	2759	Yes	Yes	Yes
372	RadioShack Corporation	United States	5731	Yes	Yes	Yes
373	Range Resources Corporation	United States	1311	Yes	Yes	No
374	Raytheon Company	United States	3812	Yes	Yes	Yes
375	Reliance Steel and Aluminum Company	United States	5051	Yes	Yes	Yes
376	RELX PLC	United Kingdom	2741	Yes	Yes	Yes
377	Renault SA	France	3711	Yes	Yes	Yes
378	Rentokil Initial PLC	United Kingdom	7349	Yes	No	No
379	Repsol SA	Spain	2911	Yes	Yes	Yes
380	Republic Services Inc	United States	4953	Yes	Yes	Yes
381	Rexam PLC	United Kingdom	3411	Yes	Yes	No
382	Rexel SA	France	5063	Yes	Yes	Yes
383	Reynolds American Inc	United States	2111	Yes	Yes	Yes
384	Rio Tinto PLC	United Kingdom	1011	Yes	Yes	Yes
385	Rite Aid Corporation	United States	5912	Yes	Yes	Yes
386	RockTenn Company	United States	2657	Yes	Yes	No
387	Rockwell Automation Inc	United States	3829	Yes	Yes	Yes
388	Rolls-Royce Group plc	United Kingdom	3724	Yes	Yes	Yes
389	Royal Dutch Shell PLC	United Kingdom	1311	Yes	Yes	Yes
390	RPM International Inc	United States	2851	Yes	Yes	Yes
391	RWE AG	Germany	4911	Yes	Yes	Yes
392	Ryder System Inc	United States	7519	Yes	Yes	Yes
393	Ryland Group Inc	United States	1531	Yes	Yes	Yes
394	Sabine Oil & Gas Corporation	United States	1311	Yes	Yes	No

395	Sabmiller PLC	United Kingdom	2082	Yes	Yes	Yes
396	Safeway Inc	United States	5411	Yes	Yes	Yes
397	Sainsbury	United Kingdom	5411	Yes	Yes	Yes
398	SanDisk Corporation	United States	3572	Yes	No	No
399	Scana Corporation	United States	4931	Yes	Yes	Yes
400	Scania AB	Sweden	3715	Yes	No	No
401	Schneider Electric SA	France	3643	Yes	Yes	Yes
402	Scholastic Corporation	United States	2731	Yes	Yes	No
403	Scottish and Southern Energy PLC	United Kingdom	4911	Yes	Yes	Yes
404	Seagate Technology PLC	United States	3572	Yes	No	Yes
405	Sealed Air Corporation	United States	2673	Yes	Yes	No
406	Seat Pagine Gialle SpA	Italy	2741	Yes	Yes	Yes
407	Sempra Energy	United States	4932	Yes	Yes	Yes
408	Sensient TechNologies Corporation	United States	2819	Yes	Yes	No
409	Service Corporation International	United States	7261	Yes	Yes	No
410	SES SA	Luxembourg	4899	Yes	Yes	Yes
411	Severn Trent PLC	United Kingdom	4941	Yes	Yes	No
412	Sherwin-Williams Company	United States	5200	Yes	Yes	Yes
413	Siemens AG	Germany	3612	Yes	Yes	Yes
414	Sinclair Broadcast Group Inc	United States	4833	Yes	Yes	No
415	SKY PLC	United Kingdom	4833	Yes	Yes	Yes
416	Smiths Group PLC	United Kingdom	3568	Yes	Yes	No
417	Smurfit Kappa Group PLC	Ireland	2653	Yes	Yes	Yes
418	Snap-On Inc	United States	3423	Yes	Yes	Yes
419	Solvay SA	Belgium	2821	Yes	Yes	Yes
420	SoNoco Products Company	United States	2655	Yes	Yes	No
421	Southern Copper Corporation	United States	1021	Yes	Yes	Yes
422	Southwest Airlines Company	United States	4512	Yes	Yes	Yes
423	Sprint Corporation	United States	4812	Yes	Yes	Yes
424	SPX Corporation	United States	3541	Yes	Yes	Yes
425	Stagecoach Group PLC	United Kingdom	4011	Yes	Yes	Yes
426	Stanley Black & Decker Inc	United States	3546	Yes	Yes	Yes
427	Staples Inc	United States	5943	Yes	Yes	Yes
428	Starwood Hotels & Resorts Worldwide Inc	United States	7011	Yes	Yes	Yes
429	Steel Dynamics Inc	United States	3312	Yes	Yes	No
430	STMicroelectronics NV	Netherlands	3674	Yes	Yes	Yes
431	Stoneridge Inc	United States	3714	Yes	Yes	No
432	Stora Enso Oyj	Finland	2621	Yes	Yes	Yes
433	Suedzucker Mannheim Ochsenfurt AG	Germany	2063	Yes	Yes	Yes
434	SuperValu Inc	United States	5411	Yes	Yes	Yes
435	Svenska Cellulosa AB	Sweden	2676	Yes	Yes	No
436	Svenska Kullagerfabriken AB	Sweden	3562	Yes	Yes	No
437	Swedish Match AB	Sweden	2131	Yes	Yes	No
438	Sysco Corporation	United States	5140	Yes	Yes	No
439	Target Corp	United States	5331	Yes	Yes	Yes
440	Tate & Lyle PLC	United Kingdom	2046	Yes	Yes	Yes
441	TDC A/S	Denmark	4813	Yes	Yes	Yes
442	Technip SA	France	1623	Yes	No	No
443	TECO Energy Inc	United States	4911	Yes	Yes	Yes
444	TEGNA Inc.	United States	7311	Yes	Yes	No
445	Telecom Italia SpA	Italy	4899	Yes	Yes	Yes
446	Telefnica SA	Spain	4813	Yes	Yes	Yes
447	Telekom Austria AG	Austria	4813	Yes	Yes	No
448	TeliaSonera AB	Sweden	4812	Yes	Yes	Yes
449	Tenet Healthcare Corporation	United States	8062	Yes	Yes	Yes
450	Tesco PLC	United Kingdom	5411	Yes	Yes	Yes
451	Tesoro Corporation	United States	2911	Yes	Yes	Yes
452	Texas Instruments Inc	United States	3674	Yes	Yes	Yes
453	Textron Inc	United States	3721	Yes	Yes	Yes
454	TF1 Group SA	France	4833	Yes	No	No
455	Thales SA	France	3761	Yes	Yes	Yes
456	The AES Corporation	United States	4911	Yes	Yes	Yes
457	The Clorox Company	United States	2842	Yes	Yes	Yes
458	The Coca-Cola Company	United States	2080	Yes	Yes	Yes
459	The Cooper Companies Inc	United States	3851	Yes	Yes	No
460	The Este Lauder Companies Inc	United States	2844	Yes	Yes	No
461	The Gap Inc	United States	5651	Yes	Yes	Yes

462	The Goodyear Tire & Rubber Company	United States	3011	Yes	Yes	Yes
463	The Hershey Company	United States	2066	Yes	Yes	No
464	The Interpublic Group of Companies Inc	United States	7311	Yes	Yes	Yes
465	The Jones Group Inc	United States	2339	Yes	Yes	No
466	The Kroger Company	United States	5411	Yes	Yes	Yes
467	The Mosaic Company	United States	2874	Yes	Yes	Yes
468	The Pep Boys: Manny, Moe & Jack	United States	5531	Yes	Yes	No
469	The Timken Company	United States	3562	Yes	Yes	Yes
470	The Walt Disney Company	United States	4833	Yes	Yes	Yes
471	ThyssenKrupp AG	Germany	5051	Yes	Yes	Yes
472	Time Warner Cable Inc	United States	4841	Yes	Yes	Yes
473	Time Warner Inc	United States	7812	Yes	Yes	Yes
474	TJX Companies Inc	United States	5651	Yes	Yes	No
475	Toll Brothers Inc	United States	1531	Yes	Yes	Yes
476	Total SA	France	2911	Yes	Yes	Yes
477	Transocean Ltd	United States	1381	Yes	Yes	Yes
478	TRW Automotive Holdings Corporation	United States	3714	Yes	Yes	Yes
479	TUI AG	Germany	4725	Yes	Yes	No
480	Tyson Foods Inc	United States	2015	Yes	Yes	Yes
481	Unilever PLC	United Kingdom	2844	Yes	Yes	No
482	Union Pacific Corporation	United States	4011	Yes	Yes	No
483	Unisys Corporation	United States	7373	Yes	Yes	Yes
484	United Continental Holdings Inc	United States	4512	Yes	Yes	Yes
485	United Parcel Service Inc	United States	4215	Yes	Yes	No
486	United Rentals Inc	United States	7359	Yes	Yes	Yes
487	United States Cellular Corporation	United States	4812	Yes	Yes	Yes
488	United States Steel Corporation	United States	3312	Yes	Yes	Yes
489	United Technologies Corporation	United States	3724	Yes	Yes	Yes
490	United Utilities PLC	United Kingdom	4941	Yes	Yes	Yes
491	Universal Health Services Inc	United States	8062	Yes	Yes	Yes
492	UPM-Kymmene Oyj	Finland	2621	Yes	Yes	Yes
493	USG Corporation	United States	3275	Yes	Yes	Yes
494	Valeo SA	France	3714	Yes	Yes	No
495	Valero Energy Corporation	United States	2911	Yes	Yes	Yes
496	Veolia Environnement SA	France	4952	Yes	Yes	Yes
497	Verizon Communications Inc	United States	4813	Yes	Yes	Yes
498	VF Corporation	United States	2325	Yes	Yes	No
499	Viacom Inc	United States	4841	Yes	Yes	Yes
500	Viad Corporation	United States	7389	No	No	Yes
501	Vinci SA	France	1611	Yes	Yes	Yes
502	Vivendi SA	France	7812	Yes	Yes	Yes
503	Vodafone Group PLC	United Kingdom	4812	Yes	Yes	Yes
504	Volkswagen AG	Germany	3711	Yes	Yes	Yes
505	Volvo Personvagnar AB	Sweden	3715	Yes	Yes	Yes
506	Walgreens Boots Alliance Inc	United States	5912	Yes	Yes	No
507	Wal-Mart Stores Inc	United States	5331	Yes	Yes	Yes
508	Weatherford International PLC	United States	1381	Yes	No	Yes
509	WEC Energy Group Inc	United States	4931	Yes	Yes	Yes
510	Wendel SA	France	8734	Yes	No	No
511	Westar Energy Inc	United States	4931	Yes	Yes	Yes
512	Weyerhaeuser Company	United States	2421	Yes	Yes	Yes
513	Whirlpool Corporation	United States	3633	Yes	Yes	Yes
514	Williams Companies Inc	United States	4922	Yes	Yes	Yes
515	Williams Partners LP	United States	4922	Yes	Yes	Yes
516	Wolters Kluwer NV	Netherlands	2741	Yes	Yes	Yes
517	Worthington Industries Inc	United States	3312	Yes	Yes	No
518	WPP PLC	United Kingdom	7311	Yes	No	Yes
519	Wyndham Worldwide Corporation	United States	7011	Yes	Yes	Yes
520	Wynn Resorts Ltd	United States	7011	Yes	Yes	Yes
521	Xcel Energy Inc	United States	4931	Yes	Yes	Yes
522	Xerox Corporation	United States	7389	Yes	Yes	Yes
523	Xstrata Ltd	United Kingdom	1021	Yes	Yes	No
524	Yahoo Inc	United States	7373	Yes	No	No
525	YRC Worldwide Inc	United States	4213	Yes	Yes	Yes
526	Yum! Brands Inc	United States	5812	Yes	Yes	Yes
527	Zimmer Biomet Holdings Inc	United States	3842	Yes	Yes	No