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Regulating a highly concentrated industry: Implications from Dodd-Frank

Alexander Rieber*

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Abstract

Using an international sample of more than 65,000 rating actions by Fitch, Moody's and S&P, we analyze the effect of the Dodd-Frank Act on credit ratings. We document that (i) rating report content changes significantly after Dodd-Frank and (ii) show, by exploiting within firm-quarter variation, that ratings significantly improve after Dodd-Frank. While ratings are more accurate, updated more frequently, and reflect firm fundamentals more closely, there is no evidence for a decrease in rating stability after Dodd-Frank. Firms, especially constrained firms, benefit and issue more debt after rating agencies' first post Dodd-Frank rating action. For European firms, effects are generally weaker than for U.S. firms.

JEL-Classification Codes: G01; G14; G24; G28

Keywords: Dodd-Frank, Regulation, Cosine Similarity, Credit Rating, Credit Rating Report, Natural Experiment

1 Introduction

Credit rating agencies (CRAs) were heavily blamed for issuing inflated ratings before the financial crisis of 2007/2008, especially in the market for structured products. As a consequence the US government proposed new rules to regulate the credit rating industry. These rules were enacted on July 21st, 2010, as Dodd-Frank Wall Street Reform and Consumer

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Protection Act (Dodd-Frank), see Dodd-Frank (2010). Dodd-Frank significantly increases the liability of CRAs for their rating actions and lifts their exemption from Regulation Fair Disclosure (Reg FD)¹. Furthermore, Section 932 of the Dodd-Frank Act amends Section 15E of the Securities Exchange Act of 1934 and requires CRAs to provide a rating report. The SEC prescribes the format of rating reports with the final rules released on August 27th, 2014, which are effective since June 15th, 2015.

As the rating industry is highly concentrated, S&P and Moody’s form a quasi duopoly controlling about 80% of the market², it is particularly difficult to predict the consequences of the regulatory intervention. However, for policy makers and market participants, it is very important to know whether the Dodd-Frank Act results in welfare gains or losses. From an economic perspective, there are two likely reactions of CRAs to Dodd-Frank. According to the reputation hypothesis (see e.g., Morris (2001) , Goel and Thakor (2011)), one expects CRAs to lower their ratings after Dodd-Frank, as they are more concerned about losing their reputation or getting even sued for providing overly optimistic ratings. In contrast, the disciplining hypothesis predicts that CRAs change their rating process and rely more on fundamental information in their assessment of the creditworthiness of issuers.

We employ a comprehensive sample of more than 65,000 rating actions by Fitch, Moody’s and S&P to analyze the effect of the Dodd-Frank Act on credit ratings. Our sample consists of the rating actions and accompanying reports of all publicly traded US and European firms that have at least one rating action between 1995 and 2016. To assess whether the Dodd-Frank Act has a significant impact on CRAs, we determine the content similarity between the last rating report before Dodd-Frank and the first report after Dodd-Frank using textual analysis methods. In our sample, the average cosine similarity between two consecutive rating reports for one firm by the same CRA is about 0.65, indicating a large overlap of content. However, when we compare the first report after Dodd-Frank to its predecessor we find that their similarity is significantly lower. More precisely, their cosine similarity drops by nine percentage points, suggesting that Dodd-Frank has a significant impact on CRAs. After the first post-Dodd-Frank report, cosine similarity returns to its original level, indicating that CRAs adopted the new regulation immediately. For European firms, we do not find a significant change in textual similarity for the first report after Dodd-Frank. As the Dodd-Frank Act regulates rating agencies and, thus, all of their rating actions, this result is surprising. However, it is consistent with the idea that the enforceability of the

¹For details on this change see Section 939B of the Dodd-Frank Act

²S&P and Moody’s control approximately 80% of the international market and Fitch accounts for another 15%, see e.g. <https://www.reuters.com/article/uscorpbonds-ratings/big-three-in-credit-ratings-still-dominate-business-idUSL2N17U1L4>.

Dodd-Frank Act in Europe may be weaker than in the U.S.

Motivated by these findings, we analyze the change in rating levels after Dodd-Frank. As a first step, we rely on a post-Dodd-Frank dummy variable, which equals one for all firm quarters after the third quarter 2010. Like Dimitrov, Palia, and Tang (2015), we find that rating levels are lower after Dodd-Frank. However, this finding may be caused by any market or macro-economic factor. To address this concern, we take advantage of our comprehensive dataset containing rating actions from all three major CRAs, which allows us to introduce firm and time fixed effects to control for unobserved firm characteristics and time trends. More precisely, we exploit variation in the first and second report by a CRA on a firm after the Dodd-Frank Act. As suggested by the analysis on textual similarity the first post-Dodd Frank rating action best reflects the consequences of the new regulation. When using this fixed effect regression specification, ratings after Dodd-Frank are actually higher, not lower. This result is further corroborated by a regression specification that includes combined firm \times time fixed effects. Exploiting only within firm-year-quarter variation, we still find a significant improvement in the average credit rating after Dodd-Frank. This result is inconsistent with the reputation hypothesis that ratings should get lower after Dodd-Frank.

As there is no significant change in the content of credit rating reports on European firms after the Dodd-Frank Act, we expected to find no or only a weak change in credit ratings. In line with these expectations the coefficients of the first and second post-Dodd-Frank rating action indicate rating improvements but are insignificant in some specifications.

To test whether the rating improvements are consistent with the disciplining hypothesis we analyze rating accuracy, timeliness of rating actions, and the relation to firm fundamentals. We find that the accuracy ratio increases by about six percentage points after Dodd-Frank. This finding holds for one-, two-, and three-year horizons as well as for all rating agencies. For European firms, results are inconclusive as the accuracy ratio of S&P improves significantly, while the one from Fitch drops significantly.

Ratings do not only become more accurate but also the time between two rating actions decreases by about 100 days. This effect is not only highly statistically significant but also economically sizable. We also observe a decrease in the time between rating actions for European firms after Dodd-Frank. However, the effect is insignificant in some specifications and economically weaker with an average decrease of about 60 days.

Next, we analyze the relation between rating levels and firm fundamentals. As CRAs are no longer exempt from Reg FD after Dodd-Frank, we expect that their ratings are linked more closely to firm fundamentals, because CRAs can no longer obtain private information

from the rated firms. The results confirm this hypothesis. The component of ratings that is not explained by the firm’s market and accounting information decreases significantly after Dodd-Frank. We further decompose the unexplained part of the rating into overly pessimistic and overly optimistic ratings. We find that especially excess optimism, i.e. ratings that are better than predicted by firm fundamentals, decrease after Dodd-Frank. This finding supports the reputation hypothesis, as there is less rating inflation after Dodd-Frank. It is also corroborated in our sample of European firms, for which we also observe a closer relation between firm fundamentals and rating actions.

Cantor and Mann (2007) suggest that improvements in rating accuracy and in the timeliness of ratings come at the cost of decreased rating stability. To test this idea, we analyze large rating changes (three or more notches) and rating reversals. Interestingly, we do not find any evidence of an increased rating volatility after Dodd-Frank. This result is consistent with the disciplining hypothesis. Dodd-Frank makes the CRAs invest more in due diligence, improve their methodology, and better monitor the performance of their credit analysts.

Given these positive consequences of the Dodd-Frank Act, we expect to find positive effects in the real economy as well. More precisely, we expect firms to rely more on debt financing as their credit ratings, on average, improve and debt financing becomes cheaper due to the more accurate and timelier information provision by CRAs. The empirical results confirm this idea as firms issue more debt after their first post-Dodd-Frank rating actions. The increase in debt issuance is more pronounced for non-investment grade firms, indicating that the Dodd-Frank Act was especially beneficial for financially constrained firms.

We contribute to the previous literature in several ways. First, we document that the implementation of the Dodd-Frank Act by CRAs happens quickly and is not a gradual process. Second, our dataset covers a long pre- and post-Dodd-Frank period. The long sample period is particularly valuable as Jankowitsch, Ottonello, and Subrahmanyam (2016) show that a short pre-Dodd-Frank period may lead to biased results due to the financial crisis. Furthermore, covering six post-Dodd-Frank years allows us to identify potential long-term effects. Third, we rely on a comprehensive set of fixed effects to clearly identify the effect of the Dodd-Frank Act on CRAs. In contrast to previous papers (e.g., Dimitrov, Palia, and Tang (2015), Jankowitsch, Ottonello, and Subrahmanyam (2016)), we show that the Dodd-Frank Act has overall positive effects on US firms. Fourth, we document, that the Dodd-Frank Act has not only an effect on US firms, but also spillover effects on European firms. This result is highly relevant for European regulators, as it shows that US regulation has international effects. Thus, European regulators may need to establish their own regulatory framework.

2 Literature

Our paper builds on an extensive literature about credit ratings, especially concerned with their informativeness, timeliness and the market reaction to credit rating actions.

The objectives of CRAs are twofold. On the one hand investors demand accurate ratings, reflecting the actual creditworthiness of firms. On the other hand investors value stable ratings, not fluctuating with the business cycle. For example Löffler (2004), Altman and Rijken (2006) and Cantor and Mann (2007) deal with the different objectives of CRAs and their "through-the-cycle" approach to balance rating accuracy and stability. The CRAs themselves also validate their rating system, e. g. Moody's tracks its rating accuracy by the accuracy ratio, which represents the area under the cumulative accuracy profiles, compared to an optimal rating system, described in Cantor and Mann (2003).

Because of these different objective, CRAs issue their rating decisions with care. Various studies show that their impact is not limited to the credit market, but transmit to the equity market as well, for example Holthausen and Leftwich (1986), Hand, Holthausen et al. (1992), Goh and Ederington (1993) or Ederington and Goh (1998). Dichev and Piotroski (2001) show that the market reacts asymmetric to rating actions, with a higher reaction to downgrades than upgrades.

Blume, Lim, and MacKinlay (1998), Alp (2013) and Baghai, Servaes, and Tamayo (2014) document that credit ratings become more conservative over time. The consequences of this increased conservatism are, for example lower net debt issues and higher costs of debt capital (Baghai, Servaes, and Tamayo, 2014), which is consistent with Kisgen (2006), Kisgen (2009) and Kisgen and Strahan (2010), showing that credit ratings have an impact on the capital structure of rated firms. However, Jorion, Shi, and Zhang (2009) argues that there is no increase in conservatism, i. e. tighter rating standards over time. He attributes the downward trend in credit ratings primarily to changes in accounting quality.

Besides changes in accounting quality also changes within the CRAs themselves or changes in the regulatory environment could lead to changes in credit ratings. Bonsall (2014) examines the introduction of the issuer-pays model in the 1970s as a source of variation from within the CRAs. He documents more accurate and timely ratings compared to the investor-pays model for Moody's and S&P. The exemption from Regulation Fair Disclosure (Regulation FD) in 2000 is, among others, a good example of regulatory changes impacting CRAs. After Regulation FD CRAs had informational advantages above other market participants, such that ratings were based on a superior information set (Jorion, Liu, and Shi, 2005). Shortly after Regulation FD the Sarbanes-Oxley act (SOX) in 2002 increased the

reporting requirements for publicly traded companies in the US. Cheng and Neamtiu (2009) use the SOX as a quasi-experiment and document an increase in accuracy and timeliness after the introduction of SOX. However they cannot rule out that this increase was due to better economic conditions after the SOX.

The study most closely related to ours is Dimitrov, Palia, and Tang (2015). They are the first to use the Dodd-Frank Wall Street Reform and Consumer Protection Act (Dodd-Frank) in 2010 as a quasi-experiment to assess the effects of regulatory pressure on CRAs. According to Dimitrov, Palia, and Tang (2015) the Dodd-Frank regulation does neither improve accuracy nor informativeness of credit ratings, which was intended by the US government. The opposite happened, i. e. less informative ratings after Dodd-Frank, which Dimitrov, Palia, and Tang (2015) ascribe to reputation concerns of CRAs. However, Jankowitsch, Ottonello, and Subrahmanyam (2016) highlight, that results of Dimitrov, Palia, and Tang (2015) could be biased by business cycle effects. For example Jankowitsch, Ottonello, and Subrahmanyam (2016) compared the period between 2003 and 2007 to the period after Dodd-Frank and conclude that ratings after the Dodd-Frank regulation are more informative than before 2007. In our analysis we take up their criticism and eliminate business cycle and firm effects. To achieve this we abstract from comparing whole time periods against each other, but use the within variation of the first and second rating action after Dodd-Frank for each firm. Nissim (2017) on the other hand supports the findings of Dimitrov, Palia, and Tang (2015). Modeling synthetic ratings and evaluating these ratings against firm credit ratings of S&P he finds that the incremental information of credit ratings above synthetic ratings has declined substantially after the Dodd-Frank regulation. He suggests this being due to the lift of the exemption of Regulation FD after Dodd-Frank, withdrawing the informational advantages of CRAs above other market participants. The model of Opp, Opp, and Harris (2013) also supports the findings of Dimitrov, Palia, and Tang (2015), however in their model the increased conservatism and reputation concerns after Dodd-Frank could lead to an increase or decrease in informativeness, depending on the complexity of rated assets.

3 Data and methodology

3.1 Databases

Our major analysis deals with credit ratings, which we obtain directly from each CRA. We use senior issuer ratings available through Moody’s Default and Recovery Database, Fitch Connect and S&P Capital-IQ. These databases provide us with daily information of changes in ratings, watch-listings and outlooks, as well as rating affirmations. The advantages to use CRA databases directly rather than Thomson CreditViews is: (i) We can analyze senior issuer ratings instead of bond ratings, such that we analyze aggregate effects on the firm level rather than the bond level. (ii) We can analyze European firms, regardless of their cross-listing.

For our analysis we use the time period between January 1995 until May 2016. The reason is the availability of an additional data-source: Rating reports, which are issued along rating actions. We download the publicly available rating reports from Moody’s³ and Fitch⁴ websites.

We restrict our sample to firms where we could match the CRA-database-ID to a GvKey from Compustat North America or Compustat Global. We consider only US-American and EU-European firms and exclude sovereigns from our sample. We further exclude financial firms⁵ from our sample, following Dimitrov, Palia, and Tang (2015). Fitch Connect and Moody’s Default and Recovery Database do not include GvKeys directly, however Fitch Connect provides us with individual Legal Entity Identifier (LEI) and CUSIPs. The LEI is a 20-digit alphanumeric code used to uniquely identify an issuer⁶. US-firms with missing LEI are matched based on their CUSIP. Moody’s Default and Recovery Database provides us with CUSIP and ticker information for all firms. For US-firms we use a CUSIP match and for international firms we match firms based on their ticker. However, a match based on ticker information is error-prone, so we check each ticker match manually and verify it. If this is not possible we drop the match.

Accounting information is from Compustat North America and Compustat Global. We use quarterly accounting information from Compustat North America and annual information

³For Moody’s we download all reports labeled "rating action"-reports between 1995-2016 from www.moody.com.

⁴Fitch provides us with rating reports labeled "rating action commentary" and "non-rating action commentary". Here we obtained all reports between 1997-2016 from www.fitchratings.com.

⁵We exclude financial firms according to the definition of Fama-French 12 Industries. This is all firms with sic codes 6000 - 6700.

⁶S&P provides us with a LEI-GvKey match for all US and international firms.

from Compustat Global in our estimations. As the information on several important variables is missing in the quarterly version of Compustat Global we choose to use the annual database.

Daily stock market information is from CRSP (for US firms) and Datastream (for European firms), matched by permno (CRSP) or by ISIN (Datastream). We adjust Datastream information according to Ince and Porter (2006), i.e. use the return index and exclude all returns until the first non-zero return if a firm got delisted. We follow Griffin, Kelly, and Nardari (2010) by excluding returns where the actual return $r_t > 100\%$ or the return on the previous day $r_{t-1} > 100\%$ and $r_t \times r_{t-1} < 20\%$. Next we exclude all returns where the actual return $r_t > 200\%$. We further require a stock to trade on its primary exchange and use industry code and name filters to identify and exclude mutual and index funds, investment trusts, Real Estate Investment Trusts (REITS), American Depositary Receipts (ADRs) and non-common equity by rules suggested in Griffin, Kelly, and Nardari (2010). We also require firms to have at least 60 trading days. For all European firms we take the market capitalization in thousands of US-Dollars to accommodate CRSP values.

To study the market reaction to rating actions we estimate abnormal returns using the Carhart 4-Factor model (Carhart, 1997) to measure normal performance.⁷ For the Carhart 4-Factor model we choose an estimation window of 200 working days, where the window is [-242, -42] working days before the event. Löffler, Norden, and Rieber (2018) document an anticipation before negative events, such that we use a sufficiently large lag before the event. Further we require at least 60 observations in our estimation window.

Our final sample consists of 65,296 observations on 7,638 firms of which 3,707 have stock market information.

Based on this data we construct a quarterly panel of long-term senior issuer ratings by CRA. We aggregate the data by GvKey and quarter and use the rating of the most recent rating action at the end of each firm-quarter as the quarterly rating. We merge quarterly accounting data for US firms and annual accounting data for European firms to our database. We lag this accounting data by 4 month to ensure the information is available for all market participants at the time of investigation.

For our empirical analysis we transfer the alphanumeric ratings from S&P, Fitch and Moodys to a numeric scale, following Fracassi, Petry, and Tate (2016). In Appendix A1 we detail the conversion. In our analysis of the Dodd-Frank regulation on ratings we rely on the comparison of ratings across agencies, comparable to Fracassi, Petry, and Tate (2016). We

⁷We use the market, HML, SMB and Momentum (UMD) factors provided on Kenneth French's website, for the US and Europe, respectively.

observe multiple CRAs in 51% of all firm-quarters and in 51% thereof we observe split ratings.⁸

(Insert Table 1 here)

In table 1 we detail our sample for US and European firms. The majority of our observations are from S&P with nearly 57% in the US and 54% in the European sample. For the European sample we have a lower market share of Moody's compared to the US sample, however this could be due to the matching and the unavailability of other identifiers than ticker information. On first sight ratings by Fitch seem to be much better than the ones by Moody's or S&P, however if we restrict our sample to firm-quarters where all three CRAs rate a firm they do not differ markedly, but the pattern persists.⁹ Ratings of European firms are better than US firms, however we have a much smaller number of observations for this group. The days until next rating is comparable between US and European firms with an average of roughly one year. Ratings in our sample are relatively stable, as indicated by a low share of large changes and rating reversals in the next year (LChange and Reversal). This is true for US and European firms and confirms the findings of Cantor and Mann (2003). US and European firms are comparable for our other measures as well, but European firms exhibit a lower market beta.

3.2 Rating reports and cosine similarity

S&P, Moody's and Fitch, all provide a rating report together with their rating, outlook or watch-listing change. We download the publicly available reports from Fitch and Moody's websites. In our estimation we use these reports and measure their pairwise similarity over time, i.e. how similar is the actual report compared to the previous report of the same firm? If Dodd-Frank has an impact on CRAs we expect a drop in similarity for the first report after Dodd-Frank. To make sure we do not measure noise by our similarity measure we take several steps to clean the downloaded rating report from redundant or non-firm

⁸Fracassi, Petry, and Tate (2016) finds multiple rating agencies in 42% of all firm-quarters and 51% to have split ratings for a database on bond ratings. Livingston and Zhou (2010) find split ratings for 49% of all bond issues. However Bongaerts, Cremers, and Goetzmann (2012) find only 37% split ratings, based on a sample of Moody's and S&P.

⁹S&P rates firms where all three CRAs are present (for US and European firms) on average with 8.63, Moody's with 8.73 and Fitch with 8.42, such that Moody's is the most restrictive and Fitch the most lenient, the difference being significant.

specific information:

(i) We exclude disclaimers, i.e. regulatory disclosures of the rating agency as they are the same over all reports and do not exhibit firm-rating relevant information. (ii) We exclude preambles, i.e. editors notes or overviews. These are often one-liners with a wrap up comparable to the headline of the report. (iii) We delete enumerations of rating actions undertaken. An enumeration like "Travelers Insurance Company—insurance financial strength rating at A2." is barely a restatement of the rating action and does not include the rationale behind the action. (iv) Additionally we exclude general information about the firm, e.g. "Citigroup is a multinational banking company headquartered in New York with assets of approximately 1 trillion dollar as of September 30, 2001." To further account for analyst specific effects we download the rating analysts that are published together with the rating report¹⁰. We consider only English reports.

There are some days for which we have more than one report per firm. In this case we need to determine which report is relevant for the specific day. We do this in four steps:

(i) Check if one report has less than 10 words; if so they only direct to the main report and we exclude them. (ii) Compare the headlines of these reports; if they are identical we keep only the last version of the report. (iii) Check if one of the reports is a methodology change; if so we exclude the whole day from our sample. (iv) For the remaining days with more than one report we take a conservative approach and drop the whole day, as we cannot perfectly determine which report is responsible for the market reaction on this specific day. We delete all reports dealing with changes in rating methodology because these reports are not firm specific and influence a whole sector. To identify methodology changes we analyze the headline of each report for certain keywords.¹¹

On the resulting reports we calculate the pairwise cosine similarity between the actual report and its preceding one. By this approach we build on a recent strand of the literature using cosine similarity, e.g. Hanley and Hoberg (2010), Hoberg and Phillips (2016) or Manconi, Rizzo, and Spalt (2016).¹² To assess the impact of Dodd-Frank the similarity of reports could give us a first insight to the mechanisms underlying the regulation and how CRAs implement this regulation. We calculate the pairwise cosine similarity following Hanley and Hoberg (2010):

To get an numerical representation of the words in each report we use stemming to get

¹⁰The impact of rating analysts on ratings is huge and therefore we would expect the writing style of analysts to influence the reports and its similarity to the previous one (Fracassi, Petry, and Tate, 2016).

¹¹We provide the keywords used in Appendix A5.

¹²An overview of the literature on textual analysis and similarity measures used in finance and economics can be found in Loughran and McDonald (2016) and Gentzkow, Kelly, and Taddy (2017), respectively.

all root words in a report and compute the term frequency of each word, excluding stop words.¹³ That is, we calculate how often a root word occurs in a report over the total number of words in the respective report. Afterwards we measure the importance of each report by calculating the inverse document frequency as the natural logarithm of the number of all reports over the number of reports including the specific root word. By multiplying the term frequency with the inverse document frequency we arrive at a numerical representation of each document i , which is a vector including all root words used in this document.¹⁴ We measure the similarity of each report to its preceding one as the dot-product of the word vectors, normalized by their length.

$$(1) \quad \text{CosineSimilarity}_{i,j} = \frac{\text{words}_i \times \text{words}_j}{\|\text{words}_i\| \|\text{words}_j\|}$$

The similarity of two documents is bounded between 0 and 1; where the cosine similarity approaches 1 the more similar the two documents are. In Figure 2 we plot the average cosine similarity for our sample, separately for US and European firms. In column one we only consider firms where the interval between consecutive reports, on which the cosine similarity is calculated, is at most one year (*Cosine 365*); in column two we require the interval between consecutive reports to be at most two years (*Cosine 730*). As expected we observe a drop in the average similarity for reports of US firms after the Dodd-Frank regulation, indicating that CRAs changed something in their reporting after the regulation. Different than expected we do not observe such a drop for European firms. Because Dodd-Frank targets CRAs directly and not US firms, we expected that CRAs change their reporting internationally, but the effect seems to be limited to US firms. This finding suggests that we might exploit European firms as a control group in our further analysis, because they seem not to be directly affected by the Dodd-Frank act.

(Insert Figure 1 here)

This first descriptive evidence motivates us to have a deeper look into the mechanisms underlying the Dodd-Frank act and shows, that CRAs do not gradually adapt to the Dodd-Frank regulation but rather implement it on the first action after the regulation for each

¹³Stop words are for example: in, the, at, or, and.

¹⁴This approach is known as tf-idf and is used e.g. by Loughran and McDonald (2011).

firm. To make sure the drop in similarity after the Dodd-Frank regulation is not driven by other factors, we regress the cosine similarity on different explanatory variables. In line with Fracassi, Petry, and Tate (2016) we expect analysts to have a major influence on the similarity of reports, e. g. based on their writing style. Thus we include a dummy variable which is one if there was a change for the lead analyst or the second analyst compared to the previous report. There are analyst changes in 65/73 % of all reports written by Moody's or Fitch for US/European firms. Further we include dummy variables for *Positive action*, which is one for actions that become positive compared to the previous rating action. For example if the previous report was a "negative" or "stable" outlook/watch-listing and the actual report is "watch for upgrade", "outlook positive" or "upgrades" we set the *Positive action* dummy to one. We define *Negative action* respectively but here we control for changes to negative.¹⁵ The rational behind these variables is that both, a negative and a positive action might result in a lower similarity of reports. Further we include *Delta(Lastreport)*, measuring the time between the actual and the previous report.

(Insert Tabel 2 here)

Our main variables of interest are *1st act. post D-F* and *2nd act. post D-F*, the first and second rating action after the Dodd-Frank regulation. The *1st act. post D-F* has a significant and negative coefficient for US firms and no effect on European firms. Comparable to figure 1 this indicates that Dodd-Frank primarily affects US firms, even though it regulates CRAs, and not the firms they rate, or the country these firms are located in. The economic significance of *1st act. post D-F* is comparable to a change in analysts.¹⁶ Given this sizable influence the Dodd-Frank act has arguably a significant effect on the reporting of CRAs. These results confirm our impression from figure 1 and encourage us to use the *1st act. post D-F* and *2nd act. post D-F* throughout our empirical analysis to examine the effect of Dodd-Frank on CRAs.

¹⁵For a detailed description on the construction of the variables see the variable appendix A1.

¹⁶If we change the *Analyst Change* variable to include only changes of the lead analyst we get comparable estimates with a coefficient of -0.075 and t-statistics of -10.44, when we re-estimate column (1) in table 2, i. e. Cosine 365 for US firms.

4 Results

4.1 How do ratings react to the Dodd-Frank regulation?

Dimitrov, Palia, and Tang (2015) are the first to examine the effects of Dodd-Frank on CRAs. Their analysis, as well as the analysis by Jankowitsch, Ottonello, and Subrahmanyam (2016), uses a dummy variable, indicating the period after Dodd-Frank.¹⁷ Unfortunately both studies cannot completely rule out that their results are driven by business cycle effects. We want to enhance their analysis and introduce time and firm fixed effects in our model. By introducing firm fixed effects we further meet the possibility that our results could be driven by changes in credit quality of firms after the Dodd-Frank act or a different sample composition.¹⁸ In the analysis of document similarity we measure an immediate reaction in the first action after the Dodd-Frank act. In table 3 we show the number of first and second rating actions after Dodd-Frank.

(Insert Table 3 here)

We can use this immediate reaction and exploit the variation in the first action after Dodd-Frank per firm, such that we have a unique setup to test the impact of the Dodd-Frank regulation, eliminating concerns about confounding business cycle effect or other omitted variables.

In a first setup we estimate the following regression, basically replicating the analysis of Dimitrov, Palia, and Tang (2015) with a firm-quarter panel:

$$(2) \quad rating_{ijt} = \delta I_{t \geq DF} + \beta X_{jt} + \gamma_i + \epsilon_{ijt}$$

Where $rating_{ijt}$ is the rating of firm j in quarter t of CRA i . We include γ_i , which are CRA fixed effects and a Vector X_{jt} including firm fundamentals. The dummy variable $I_{t \geq DF}$ is one for all rating actions after the 21st July 2010, zero otherwise.

In the next step we substitute the dummy variable for the *Period post D-F* ($I_{t \geq DF}$) with dummy variables for the first and second report after Dodd-Frank (*1st act. post D-F* and

¹⁷Jankowitsch, Ottonello, and Subrahmanyam (2016) use multiple periods: Before the financial crisis, during the crisis and after Dodd-Frank.

¹⁸Dimitrov, Palia, and Tang (2015) also mention that possibility and argue that balance sheets improve after the Dodd-Frank regulation. They found that CRAs are more conservative after the Dodd-Frank regulation and that average ratings are lower, such that an improved balance sheet would only work against their results.

2nd act. post D-F) and subsequently include firm fixed effect ρ_j and year-quarter fixed effects λ_t into our regression:

$$(3) \quad \begin{aligned} rating_{ijt} = & \delta_1 I_{1st \text{ action}|t \geq DF} + \delta_2 I_{2nd \text{ action}|t \geq DF} \\ & + \beta X_{jt} + \gamma_i + \lambda_t + \rho_j + \epsilon_{ijt} \end{aligned}$$

In a last step we enhance our analysis by introducing firm \times year-quarter fixed effects:

$$(4) \quad rating_{ijt} = \delta_1 I_{1st \text{ action}|t \geq DF} + \delta_2 I_{2nd \text{ action}|t \geq DF} + \gamma_i + \theta_{jt} + \epsilon_{ijt}$$

Where θ_{jt} are firm \times year-quarter fixed effects and γ_i are CRA fixed effects. The dummy variable $I_{1st \text{ action}|t \geq DF}$ is one for the first rating action after Dodd-Frank and $I_{2nd \text{ action}|t \geq DF}$ is one if the action is the second rating action after Dodd-Frank. If both, the first and second action after Dodd-Frank are within the same quarter for firm j , than both dummy variables are one for that firm-quarter. Our setting is comparable to the one by Fracassi, Petry, and Tate (2016) with multiple CRA ratings by firm. By eliminating the time series variation within firm, using firm \times year-quarter fixed effects the only source of variation is in the cross section when multiple CRAs cover one firm at the same time. As our $I_{1st \text{ action}|t \geq DF}$ varies by CRA and firm we can exploit this variation. With this approach we compare actions by different agencies within the same quarter for the same firm. The advantage of this approach is, that there is no need to include time varying fundamental information about the firm, because these quarterly accounting data are captured by our fixed effects. We further include CRA fixed effects to make sure our effects are not driven by differences in the average rating of each CRA. In our setup we refrain from using ordered response regressions, like ordered logit / probit, even though the difference between rating categories is not of the same size for each category, which we implicitly assume by using OLS. Ordered logit/probit models do not have this underlying assumption, but they are estimated by maximum likelihood. For maximum likelihood estimations with many fixed effects we would have to deal with the incidental parameters problem. That is, our parameter estimates would be inconsistent, see e.g. Lancaster (2000). Therefore we use the fixed effects estimator following Gormley and Matsa (2014) and Correia (2016) and cluster our standard errors by firm and quarter, according to Petersen (2009) and Cameron, Gelbach, and Miller (2011).

Table 3 and 4 present the coefficients of our main regression, where column (1) and (2) are the corresponding results to regression 2, column (3) - (5) are based on regression 3

and column (6) and (7) represent coefficients from regression 4. Our baseline regression is comparable to the one of Dimitrov, Palia, and Tang (2015) and includes a dummy for the period after Dodd-Frank.

(Insert Table 4 here)

If we control for several firm fundamentals, which are used in the literature to estimate rating levels¹⁹, we get a significantly positive effect of Dodd-Frank on ratings. Recall that higher values indicate worse ratings. Thus we can replicate the findings of Dimitrov, Palia, and Tang (2015) for US and also European firms. If we substitute the *Period post D-F* dummy by the event dummies in column (3) and add the individual effects of *1st act. post D-F* and *2nd act. post D-F* up, the size of the effect is comparable to use the *Period post D-F* dummy. This result further confirms our previous analysis that we can capture the effect of Dodd-Frank on ratings with our event dummies. All market and accounting control variables have the expected sign and magnitude and are in line with previous studies, for example Alp (2013). When controlling for firm fixed effects in column (4) our coefficients are highly significant and positive. However, when we control for time fixed effects the picture changes. Now the effect becomes highly significantly negative. According to our transformation of the rating scale this means ratings are significantly better after Dodd-Frank. The economic effect of our results are best judged by comparing it to other papers in the credit rating literature. For example Becker and Milbourn (2011) study the effect of an increase in competition through an additional market participant, approximated by Fitch market share. In their analysis a one standard deviation increase in Fitch market share predicts average ratings to increase by 0.11 notches, including year fixed effects, firm fixed effects and firm controls.²⁰ In our analysis column (5) also exploits this specification and we control additionally for rating agency fixed effects. If we look at the combination of *1st act. post D-F* and *2nd act. post D-F* the effect of the Dodd-Frank regulation on firm credit ratings of US firms is 0.14 in absolute terms, which is comparable to the effect of a one standard deviation increase in Fitch market share.²¹ The effect is sizable given our extensive controls. Further if we examine the specification of regression 4 the effect

¹⁹See e. g. Blume, Lim, and MacKinlay (1998) or Alp (2013).

²⁰In Table 4 of Becker and Milbourn (2011) they report an OLS coefficient of 0.784 and the standard deviation of Fitch market share (Table 3) is 0.142.

²¹For European firms the effect is bigger with 0.22, however not significant. Further it might be due to the use of annual accounting data for European firms, because in the specification in column (7) the effect is comparable to the one for US firms.

is persistent. In column (6) the number of observations drop because we do not always observe two CRAs at the same time covering the same firm, for all firms that have control variables available. In column (7) we relax our previous specification and include all firms that are in our database, regardless if they have all the required control variables or not. Here we exploit the full database where at least two CRAs rate the same firm at the same quarter. Our results still persist and are highly significant. Besides a very high R^2 , which we would expect when including many fixed effects in columns (6) and (7), we also observe an increase for our adjusted R^2 , which indicates that we add relevant information to our model.

In this section we show that Dodd-Frank has an effect on ratings, but other than Dimitrov, Palia, and Tang (2015) suggest, it is positive. This is true for US and European firms, however for European firms the *2nd act. post D-F* has a much greater influence, indicating that the regulation was implemented by CRAs for European firms as well, but with a time lag.

Rating levels are important for investors, especially for regulatory constraint investors like insurance companies or pension funds. But investors are also concerned about the timeliness, accuracy and stability of ratings. We address these points in the next sections.

4.2 Effects of the Dodd-Frank regulation on the timeliness of ratings

Given the high regulatory pressure after the Dodd-Frank regulation, it is important for CRAs to issue timely rating/outlook/watch-list changes. Since it is easier to sue CRAs for their rating actions after Dodd-Frank, we assume that CRAs try to incorporate all their available information immediately into their ratings, outlooks and watch-listings. This implies that the first rating actions after Dodd-Frank were issued shortly after each other. Cheng and Neamtiu (2009) consider only earlier downgrades before a default as being more timely. We, on the other hand, consider outlook and watch-list changes as well because (i) defaults are rare events to judge timeliness, (ii) besides faster downgrades, a more timely change of outlooks and watch-listings is ultimately a result of a better information processing.

We estimate the following equation to study the timeliness of ratings after the Dodd-Frank act in general. We rely on the specification from equation 2 and include firm fixed effects (ρ_j) as well, defined in equation 5. We use the variables and definitions from the previous section.

$$(5) \quad \Delta(TNext)_{ijt} = \delta I_{t \geq DF} + \beta X_{jt} + \gamma_i + \rho_j + \epsilon_{ijt}$$

In Table 5 on the following page we present the results. This table is based on the event-time database with daily data. $\Delta(TNext)_{ijt}$ is the time until the next rating action for each firm j rated by CRA i at time t ; the time interval is measured in days. In column (1) we estimate the specification of equation 5, in column (2) we use the specification of equation 3, but with $\Delta(TNext)$ as dependent variable. And Columns (3) and (4) are estimated using equation 4, with $\Delta(TNext)$ and its natural logarithm as the dependent variable. For brevity we do not report the coefficients of control variables.²² Due to our setup we measure timeliness on two different dimensions. With the *Period post D-F* dummy we analyze if there is a general tendency to issue more timely ratings after Dodd-Frank. With the *1st act. post D-F* and *2nd act. post D-F* dummies we subsequently analyze the frequency on which these reports are issued after Dodd-Frank. If we have a general tendency after Dodd-Frank to issue more timely ratings we would expect more frequent ratings after Dodd-Frank, something we can test with our setup, including firm \times time fixed effects. For the US we have a high and significantly negative effect of the Dodd-Frank regulation on the time between rating actions. This effect is persistent in all specifications and does not result from a skewed distribution of the timing because we can still observe a high and significant effect using the natural logarithm of $\Delta(TNext)_{ijt}$.

(Insert Table 5 here)

The economic significance is meaningful, given that the average rating action comes 358 days after the actual one, and the median is 234 days, we observe the rating actions after the Dodd-Frank act coming roughly 100 days earlier compared to before Dodd-Frank. Even after controlling for year-quarter fixed effects the actions follow earlier after on another after the Dodd-Frank regulation. When we include year-quarter fixed effects for European firms we do observe a marginally significant increase in the timeliness of rating actions. This marginal effect is not surprising given that the Dodd-Frank act is a US regulation not designed for European firms. However, if we consider column (2) there are effects for European firms after controlling for several fixed effects and control variables. Therefore we should keep in mind that there could be some spillover effect from the US regulation

²²These tables can be obtained from the authors upon request.

leading to more timely ratings for European firms as well. A crucial question after analyzing the ratings and their timeliness is: Are the higher and more timely ratings a result of more accurate ratings or are ratings after Dodd-Frank only driven by the market and rely too much on the market perception? Therefore we analyze quality of ratings, i. e. their accuracy before and after Dodd-Frank in the next section.

4.3 Consequences for rating accuracy

In the previous sections we show that ratings are higher and more timely after Dodd-Frank, but from a policy perspective it is important that ratings are more accurate, reflecting the actual credit quality of a firm. We use the cumulative accuracy profile to visually analyze the accuracy of the rating system before and after Dodd-Frank as well as the accuracy ratio to test if the differences in accuracy are statistically significant for various horizons.

(Insert Figure 2 here)

Figure 2 shows the one-year horizon cumulative accuracy profile, separately for each CRA and also for all CRAs pooled together. The cumulative accuracy profile is a measure for the relative accuracy of a rating system and plots the share of issuers with a rating of X or lower against the share of defaulters²³ with a rating of X or lower. The more northwestern the curve the higher is the discriminatory power of the rating system. In the optimal rating system defaults occur only in the lowest rating category. Graphically these are the coordinates [0,1]. If two curves do not intersect the one that is more northwestern is strictly better than the other. In figure 2 this is the case for all ratings after the Dodd-Frank regulation, no matter which CRA we are looking at. Based on these figures we conclude that the rating accuracy is strictly better after Dodd-Frank. In figure 2 we present the cumulative accuracy profiles only for US firms and only for a one-year horizon. To assess the impact of Dodd-Frank on the rating accuracy for US and EU-European firms and for different time horizons we calculate a numerical representation of the cumulative accuracy profile, the accuracy ratio, for each CRA in table 6.²⁴ We calculate the accuracy ratio as the area under the cumulative accuracy profile. Therefore we pool all observations for each rating cohort and generate one "massive" cumulative accuracy profile. Based on this cumulative accuracy profile we calculate the accuracy ratio for various horizons, where the one-year horizon indicates if firm

²³Defaults that occur within a specified time period after the actual rating action, in our case one year.

²⁴If we translate the optimal rating into the accuracy profile the best possible value is 1.

j is defaulted at the end of the following year ($t+1$). Second-year horizon and three-year horizon are defined accordingly, following Cantor and Mann (2003).

(Insert Table 6 here)

After Dodd-Frank we observe a strong increase in the accuracy ratio, which is significant for all horizons and CRAs for US rated firms. These findings support our interpretation of figure 2. Because rating agencies apply a "through-the-cycle" assessment of the credit quality of rated firms, we interpret the significant increase in the accuracy ratio as an indication that rating agencies really make better assessments of credit quality after Dodd-Frank. If, on the other hand, there were unexpected defaults within e.g. the financial crisis the higher accuracy ratio after the Dodd-Frank regulation could just be a mechanical effect and a representation of better economic conditions. Therefore we use EU-European firms as a counterfactual, where we also have these better economic conditions after Dodd-Frank. Here we have a mixed picture where some differences are significant and positive (S&P for longer horizons), some are negative (Fitch) and many are insignificant.²⁵ We interpret these mixed results for EU-European firms as an indication that there is no (global) business cycle effect, which we fail to capture with our time split at Dodd-Frank. Instead, our results indicate that the Dodd-Frank act has led to an improved rating accuracy for US rated firms.

4.4 Do CRAs value information differently than before to achieve a higher accuracy?

Our previous results suggest that rating accuracy increased after Dodd-Frank, however we want to understand where this increase comes from. CRAs have less exclusive information compared to the time before Dodd-Frank, because they had an exemption from regulation FD and therefore they had access to non-public information within the firms they rated. Moreover the introduction of Dodd-Frank was accompanied by a higher responsibility of CRAs for the ratings they issue. It is easier to sue a CRA now compared to before the Dodd-Frank regulation because the rating is not classified as a pure opinion any more.

²⁵For ratings of EU-European firms by Fitch we have a very low number of defaults in our sample, with only 4/33 firms defaulted before/after Dodd Frank. This might be the reason why we observe such high accuracy ratios for European firms rated by Fitch, especially before Dodd-Frank.

Based on this assessment CRAs might rely more on fundamental analysis for their decisions after Dodd-Frank.

To test this formally we run a two stage regression where we estimate the first stage in our event-level database as a slight modification of equation 2:

$$(6) \quad rating_{ijt} = \alpha + \beta X_{jt} + \epsilon_{ijt}$$

Where $rating_{ijt}$ is the senior issuer rating of firm j at day t by CRA i . X_{jt} is a matrix of fundamental, time varying variables, including: Interest coverage, operating margin, long term debt leverage, total debt leverage, Tobin's Q, retained earnings, capital expenditures, cash balances, tangibility, research and development, dividend payer status, size, market beta and idiosyncratic volatility. We do not include any fixed effects in here because we want to capture the effect of firm fundamentals on ratings.²⁶

We use the residuals of equation 6 (ϵ_{ijt}) and interpret them as the part of the rating that is not explained by fundamental information. We build a dummy variable *Excess Optimism* which is one for all negative values of this residual²⁷. In the second stage we use the absolute value of the residuals from the first stage and regress it on our *1st act. post D-F* and *2nd act. post D-F*. If CRAs rely more on fundamental accounting and market based information after Dodd-Frank we expect the absolute residuals to decrease. This is exactly what we observe, using the *Period post D-F* dummy as well as when controlling for firm and time fixed effects. This decrease mainly comes from the fact that the *Excess Optimism* is decreasing, which is consistent with the hypothesis that CRAs fear to be sued for their ratings such that overly optimistic ratings decreased after the Dodd-Frank regulation. The essence from this analysis in combination with the results on ratings from table 4 is, that the observed higher ratings are not due to overly optimistic or inflated ratings after Dodd-Frank. The higher ratings come from an orientation towards firm fundamentals and overly optimistic ratings are rather decreasing, which was intended by the regulator.

(Insert Table 7 here)

²⁶Results on this first stage regression are in Appendix A3.

²⁷Recall the coding of our rating variable, where lower values indicate better ratings.

4.5 Consequences for rating stability

From e.g. Cantor and Mann (2007) we know that CRAs value rating accuracy, but also rating stability. They have to evaluate the trade-off between these two and often refrain from using more market based information to achieve a higher accuracy at the expense of stable ratings. Cantor and Mann (2007) illustrates this trade-off as an efficient frontier where CRAs can only achieve a higher accuracy by relinquishing stability. In figure 3 we illustrate this trade-off based on Cantor and Mann (2007). Cheng and Neamtiu (2009) extend this picture and show that CRAs might enhance their frontier²⁸ by improving the whole rating process. The essence of Cheng and Neamtiu (2009) is, that such an improvement of the frontier happened after the Sarbanes-Oxley Act in 2002.

Following Cantor and Mann (2003) we use Large Changes (*LChanges*) and rating reversals (*Reversal*) in the year following the actual action as measures of rating stability. A large change is defined as a rating change of three or more notches within the next year after the actual rating action. This could happen through one big rating change or through a gradual change within the following year. For rating reversals we need to observe a reversal of the actual rating action within the next year, which is rare in our database²⁹. This is consistent with the results of Cantor and Mann (2003), observing a reversal in 0.4% to 1.2% of all cases in the period from 1983 to 2002 and large changes in 1.5% to 7.5% of all cases in the same time period, measured monthly.

(Insert Figure 3 here)

If rating accuracy and stability could only be improved by relinquishing the other we would expect to find an increase in large changes and rating reversals, especially for US firms where we have a high and significant gain in accuracy and timeliness after the Dodd-Frank regulation.

In table 8 we use our baseline specifications of equation 5 in column (1) and (4). For column (2) and (5) we use the specification of equation 3 and for column (3) and (6) we use our most stringent specification of equation 4 with our dummy variables for large changes (*LChanges*) and rating reversal (*Reversal*) as dependent variables.

²⁸They show the timeliness-accuracy frontier, which is analogous to figure 3.

²⁹In 1.18 % / 0.84 % of all actions (US/European firms) we have a rating reversal in the following year.

(Insert Table 8 here)

Our results indicate that the stability of ratings does not suffer from the higher accuracy achieved by CRAs after Dodd-Frank, especially when we look at our results with time and firm fixed effects for US firms. These results are in line with Cheng and Neamtiu (2009) claiming that regulatory pressure and better credit analysis could lead to better ratings in both dimensions. The Dodd-Frank regulation had this effect on CRAs, pushing the frontier between rating accuracy and stability to the northeast which is ultimately good for investors and the CRAs themselves.³⁰ For European firms we see an increase of large changes, indicating that ratings are less stable after the Dodd-Frank act, such that CRAs might have implemented the changes of Dodd-Frank also for European firms, but could not achieve the positive effects they managed to achieve for US firms.

4.6 Real consequences for rated firms

In this section we study the real effects of the Dodd-Frank act on rated firms, given the changes we document for CRAs. Because we can observe more positive ratings after the Dodd-Frank act we expect an increase in the debt level for rated firms. These firms can issue new debt favorable conditions, compared to the situation before Dodd-Frank. Therefore we hypothesize that firms have higher net debt levels after their first reports after Dodd-Frank. To test our hypothesis we estimate equation 7 in table 8 Panel A,B and C and use the first and second action after Dodd-Frank to predict the net debt level, scaled by total assets, in one to four quarters ($x \in [1, 2, 3, 4]$) with the following regression:

$$(7) \quad \begin{aligned} net \ debt \ level_{i,t+x} = & \delta_1 I_{1st \ action|t \geq DF} + \delta_2 I_{2nd \ action|t \geq DF} \\ & + \beta Z_{jt} + \gamma_i + \lambda_t + \rho_j + \epsilon_{ijt} \end{aligned}$$

We include a vector of control variables (Z_{jt}) from Baghai, Servaes, and Tamayo (2014) to account for market based and accounting information and display the results in table 8.³¹ We include rating agency fixed effects γ_i , firm fixed effects ρ_j and year-quarter fixed effects λ_t .

(Insert Table 9 here)

³⁰In figure 3 we would end up around point N' as there is a gain in accuracy without a loss of rating stability.

³¹For a detailed variable description see the Variable Appendix.

The results for US firms in table 9 Panel A show an increase of the net debt level over the following quarters. This increase is high and significant for the third and fourth quarter after the *1st act. post D-F*. It is also increasing for the *2nd act. post D-F* and significant for the prediction of the fourth quarter after the second action. The effect is also economically meaningful. If we take the coefficient from column (4) the net debt level increases by 2.1 % of total assets. Given the average net debt level by total assets in our sample period is 34.7%, this implies an increase in the net debt level of 6%. If we look at the combined effect of the first and second action after Dodd-Frank we have an increase of the net debt level of total assets by 10%.³² In table 9 Panel B we examine European firms cross listed in the US and in table 9 Panel C we study European firms that are not cross-listed. For the European firms that are not cross listed we do not have quarterly data, such that we predict the net debt level in one and two years.

For both specifications we find positive coefficients, however they are not significant, indicating that there is no effect of the refinancing possibilities for European firms.

4.7 Which firms profit most from the Dodd-Frank regulation?

The real effects in terms of higher net debt levels and therefore a better access to external financing are sizable for US firms. But it is not clear which firms profit most from the Dodd-Frank regulation, the constrained or the unconstrained firms? To tackle this question we split our sample into firms where the last available rating before Dodd-Frank was investment-grade, and firms with non-investment-grade ratings before Dodd-Frank. We re-estimate equation 7 to predict quarters t+3 and t+4, split into investment-grade and non-investment-grade. In table 10 on the next page we present the results.

(Insert Table 10 here)

For investment-grade firms we do not observe a significant effect in the net debt level, however we observe a sizable effect for non-investment-grade firms, indicating that firms that were financially constrained before the Dodd-Frank act profit the most from it. Our previous findings that CRAs tend to use more fundamental information about the firm³³

³² $\frac{0.021+0.015}{0.347}$

³³ Recall table 7 where we find a decrease in the residual of ratings that could not be explained by firm fundamentals.

is especially important for firms that are below the investment-grade boundary to access external financing.

4.8 Market reaction to the Dodd-Frank regulation

Finally we examine how the market reacts to rating actions after Dodd-Frank. If CRAs rely stronger on firm fundamentals in their rating process and thereby increase rating accuracy, it is unclear which reaction we expect from market participants. Institutional investors rely on ratings for their investment decisions, i.e. many are required to sell a stock if it falls below a certain rating threshold. We do not expect these investors to react very sensitive to a higher rating accuracy, achieved through more fundamentally based rating decisions. On the other hand investors that do not rely on these thresholds can evaluate their own rating models based on fundamental information; and after Dodd-Frank they have the same information set as CRAs.³⁴ For these investors we expect a weaker reaction to rating actions as the informational gain from rating actions is lower compared to before Dodd-Frank. To assess the impact of Dodd-Frank on the equity market we estimate the following model:

$$(8) \quad \begin{aligned} abs(CAR_{-1,1})_{jt} = & \delta_1 I_{1st\ action|t \geq DF} + \delta_2 I_{2nd\ action|t \geq DF} \\ & + \beta M_{jt} + \gamma_i + \rho_j + \lambda_t + \epsilon_{jt} \end{aligned}$$

Where M_{jt} is a vector of equity market specific control variables. All results are displayed in table 11.³⁵ We include rating agency fixed effects γ_i and firm fixed effects ρ_j for specifications (2)-(4) and (6)-(8). In specification (4) and (8) we additionally include year-quarter fixed effects λ_t . In specification (1)-(2) and (5)-(6) we include a Dodd-Frank period dummy variable instead of the first and second rating action after Dodd-Frank. We use the absolute cumulative abnormal return in the event period because downgrades or other negative rating actions usually result in negative event returns. If we use the absolute value of these event returns we can test our hypothesis if the market reaction towards rating actions gets smaller after Dodd-Frank, controlling for negative and positive rating actions.

(Insert Table 11 here)

The sign and significance of our control variables are as expected; we have a higher market

³⁴Recall Dodd-Frank lift the exemption from Reg FD for CRAs, such that they have no superior information set any more.

³⁵For a detailed variable description see the Variable Appendix.

reaction for more volatile firms, lower rated firms, firms where the actual rating action is negative compared to the previous action and events where we have a high return before the event.

For US and European firms we observe a significantly lower market reaction towards rating actions after Dodd-Frank. However, if we control for time and firm fixed effects this effect disappears. For the market Dodd-Frank does not seem to be very important. One explanation could be that our setup is not appropriate to find a market reaction. To circumvent this possibility we condition our sample on downgrades and re-run our estimations, because from the literature, e.g. Hand, Holthausen et al. (1992) or Dichev and Piotroski (2001), we know that mainly negative rating actions, especially downgrades, exhibit a significant market effect. But there is still no significant effect on the first and second action after Dodd Frank.

5 Robustness

Our baseline specification using firm \times year-quarter fixed effects eliminates all variation within time per firm. And by using the dummy *1st act. post D-F* we exploit the cross sectional variation across CRAs. But one could argue that our variable *1st act. post D-F* is biased because there are some firms with very late *1st act. post D-F*, i.e. there are still some observations in 2015 declared as the first report after Dodd-Frank. Therefore we re-estimate equation 3 and 4 and split our *1st act. post D-F* and *2nd act. post D-F* into three parts, where the first part *1st act. post D-F -y1* is one, if the rating action was within the first year after Dodd-Frank. *1st act. post D-F -y2* is one when the rating action was in the second year after Dodd-Frank and *1st act. post D-F -y3* is one for all rating actions that are made more than two years after the Dodd-Frank regulation. We split the *2nd act. post D-F* accordingly, but we start here by including all reports issued within two years after Dodd-Frank because CRAs need more time to issue two reports.

The results are in table III.D. For US firms the *1st act. post D-F* written directly in the first year after Dodd-Frank has a big and significant effect, and reports written more than two years after Dodd-Frank as well. For the *2nd act. post D-F* we measure high and significant effects for reports that are written more than two years after the Dodd-Frank regulation. This indicates that there is a reaction to the rating actions after Dodd-Frank throughout the sample. This hints that our results are not driven by "outliers in time". Therefore we

conclude that the effect for reports after Dodd-Frank is persistent for US firms over time and justifies our quasi-experimental setup. For European firms the effect of Dodd-Frank on rating levels is driven by late actions. A possible explanation could be that Dodd-Frank was incorporated for US firms first, because the US government demanded a quick reaction and successively adapted for European firms later on.

We do the same analysis using our timeliness measure $\Delta(TNext)$ and include our split *1st act. post D-F* and *2nd act. post D-F* variables. We present the results in table III.E.

The results are consistent with table 5 and also with our interpretation of table III.D. Actions after *1st act. post D-F* are always more timely in all periods after the Dodd-Frank regulation, however we do not see a consistent increase for the *2nd act. post D-F*. For European firms we observe predominantly negative coefficients, indicating more timely ratings after Dodd-Frank, but this higher timeliness is most often not significant, which mirrors our results from table 5.

6 Conclusion

Based on a comprehensive dataset of more than 65,000 rating actions from Fitch, Moody's, and S&P, and their accompanying rating reports, we analyze the effect of the Dodd-Frank Act on CRAs. Using textual analysis methods, we show that CRAs adapt their rating methodology directly in their first report after Dodd-Frank. Based on this finding, we use the first rating action after Dodd-Frank to analyze the effect of the new regulation on rating agencies.

We find that ratings improve and become more accurate after Dodd-Frank. As we include interacted firm and year-quarter fixed effects, we are able to control for unobservable time-varying firm-specific effects. Results from previous studies, documenting a negative effect of Dodd-Frank on ratings (e.g. Dimitrov, Palia, and Tang (2015)), are likely driven by macro-economic effects and time trends. While we can replicate these results, we show that after controlling for time fixed effects there is a robust and significant positive relation, i.e. ratings improve after Dodd-Frank.

Furthermore, we show that ratings tend to rely more on firm fundamentals after Dodd-Frank. This result is consistent with CRAs trying to reduce the higher litigation risk after the introduction of Dodd-Frank. The removal of the exemption from Reg FD may also explain this result, as CRAs no longer have access to private information. Due to this situation CRAs predominantly rely on public information to derive their ratings. While the

time between rating actions decreases and the accuracy increases significantly after Dodd-Frank, we do not find evidence for increased rating volatility.

All in all our results suggest that the Dodd-Frank Act has positive effects for firms and investors as ratings of US firms become more accurate, more objective, and are updated more timely. This finding is new and contradicts the predominant opinion in the literature that the Dodd-Frank Act has negative consequences. To analyze the effect of a regulatory intervention, like the Dodd-Frank Act, we argue that it is crucial to account for confounding business cycle or firm effects.

For European firms we generally find weaker effects. On the one hand, this result suggests that also European firms benefit from Dodd-Frank. On the other hand, a spillover effect from US regulation to European firms that are not cross-listed in the US underlines the need for the European regulator to carefully review the international regulation and to implement its own regulation to avoid unwanted spillovers in the future.

7 Appendix

7.1 A1: Variable Appendix

Table 1: Variable description

This table briefly defines the main variables used in the empirical analysis. The data sources are:

- (i) CRSP: Center for Research in Security Prices
- (ii) CS: Compustat North America (quarterly database)
- (iii) CS Global: Compustat Global (annual database)
- (iv) DS: Datastream
- (v) KF: Kenneth French’s Data Library
- (vi) Moodys: Moody’s Default and Recovery Database
- (vii) SP: Standard and Poor’s Capital IQ
- (viii) Fitch: Fitch Connect
- (ix) Moodys Web: Moody’s webpage: www.moodys.com
- (x) Fitch Web: Fitch webpage: www.fitchratings.com
- (xi) EST: Estimated by the authors

Panel A: Main dependent variables

Variable name	Description	Source
Abs(CAR[-1,1])	Absolute cumulative abnormal return from one day before the event up to one day after the event. CARs are calculated using the Carhart-4-Factor model with an estimation window from 242 until 42 days before the event, requiring 60 non-missing observations. The estimation is based on daily returns.	CRSP, DS, KF, EST
Accuracy Ratio	Area under the cumulative accuracy profile divided by the 45-degree line to the maximum possible area above the 45-degree line.	Fitch, SP, Moodys, EST
Cosine Similarity	Calculated for each report in comparison to the previous report. We form two word vectors out of these reports and calculate the cosine similarity as the dot product of these two word vectors, normalized by their vector lengths. The cosine similarity is bounded between 0 and 1.	Moodys Web, Fitch Web, EST
$\Delta(\text{TNext})$	Time difference (in days) between the current date and the subsequent rating date in $t+1$.	Moodys, Fitch, SP, EST
LChange	Dummy variable equal to one if the rating difference between the current rating and the rating in one year is greater or equal to three notches.	Fitch, Moodys, SP, EST
Net debt level	Net debt = Debt in current liabilities (dlc/dlcq) plus long-term debt (dltt/dlittq) minus cash and short-term investments (che/cheq) for the (annual/quarterly) CS database. Net debt is scaled by assets total (at/atq).	CS, CS Global, EST

Panel A: Main dependent variables continued

Variable name	Description	Source
Rating	The firm credit rating coded numerically with a range from 1 to 21. Table A2 shows the mapping from the alphanumeric rating to the numeric scale.	Moody's, SP, Fitch
Reversal	Dummy variable equal to one if the actual rating action is reversed in the subsequent rating action and this subsequent action occurs within a year.	Moody's, Fitch, SP, EST

Panel B: Main independent variables

Variable name	Description	Source
Excess optimism	Negative residuals of a regression of ratings on interest coverage, operating margin, long term debt, total debt, market capitalization, retained earnings, capital expenditures, cash balances, tangibles, research and development, idiosyncratic volatility, market beta, Tobin's Q and an indicator if the firm was a dividend payer in the last year. For US firms we use quarterly data, for European firm annual data.	Moody's, Fitch, SP, CS, CS Global
Period post D-F	Dummy variable equal to one for all rating actions after the Dodd-Frank regulation on 21st July 2010, zero otherwise.	EST
1st act. post D-F	Dummy variable equal to one for the first rating action after the Dodd-Frank regulation on 21st July 2010, on firm level, zero otherwise.	Moody's, Fitch, SP, EST
2nd act. post D-F	Dummy variable equal to one for the second rating action after the Dodd-Frank regulation on 21st July 2010, on firm level, zero otherwise.	Moody's, Fitch, SP, EST
1st act. post D-F - y(1/2/3)	Use the dummy variable <i>1st act. post D-F</i> and form three dummy variables (y1 - y3) according to the timing of the 1st action. y1: Actions until 21st July 2011 have the value of one, zero otherwise, y2: Actions between 21st July 2011 and 21st July 2012 have a value of one, zero otherwise and y3: Actions after 21 July 2012 have a value of one, zero otherwise.	Moody's, Fitch, SP, EST
2nd act. post D-F - y(2/3/4)	Use the dummy variable <i>2nd act. post D-F</i> and form three dummy variables (y2 - y4) according to the timing of the 2nd action. y2: Actions until 21st July 2012 have the value of one, zero otherwise, y3: Actions between 21st July 2012 and 21st July 2013 have the value of one, zero otherwise and y4: Actions after 21 July 2013 have the value of one, zero otherwise.	Moody's, Fitch, SP, EST

Panel C: Other control variables

Variable name	Description	Source
Analyst change	Dummy equal to one if the lead analyst or the second analyst on the report changed compared to the preceding report.	Moodys Web, Fitch Web, EST
Abs(CAR[-42,-2])	Absolute cumulative abnormal return before the event (42 until 2 days before the event) calculated using the Carhart-4-Factor model with an estimation window of -242 until -42 days before the event. The estimation is based on daily returns.	CRSP, DS, KF, EST
Capex	Capital expenditures (capx/capxy) to total assets (at/atq) for the (annual/quarterly) CS database. We winsorize the variable at the 1% and 99% level.	CS, CS Global
CAR[-1,1]	Cumulative abnormal return around the event (one day before the event up to one day after the event) calculated using the Carhart-4-Factor model with an estimation window of -242 until -42 days before the event. The estimation is based on daily returns.	CRSP, DS, KF, EST
Carryforwards	Tax loss carry forward (tlcf) to total assets (at/atq). We winsorize the variable at the 1% and 99% level.	CS, CS Global
Cash balances	Cash and short-term investments (che/cheq) to total assets (at/atq).	CS, CS Global
Δ (Last report)	Time since the last rating report in months.	Moodys Web, Fitch Web, EST
Dividend payer	Dummy equal to one if the firm has positive dividends per share (dvpsx_f/dvpsxq) in this fiscal year.	CS, CS Global
Idio. vola	Estimated as the standard deviation of the residual in the Carhart-4-Factor model. The estimation is based on daily returns. We use the natural logarithm of the idiosyncratic volatility in our estimations.	CRSP, KF, EST
Interest coverage	Operating income after depreciation (oiadp/oiadpq) plus interest expense (xint/xintq) divided by interest expense (xint/xintq). We set negative values to zero and values greater than 100 to 100.	CS, CS Global
LT Debt	Long-term debt (dltt/dlttq) to assets total (at/atq). We winsorize the variable at the 1% and 99% level.	CS, CS Global
Market beta	Market model beta calculated using the Carhart-4-Factor model with an estimation window of -242 until -42 days before the event. The estimation is based on daily returns.	CRSP, DS, KF, EST

Panel C: Other control variables continued

Variable name	Description	Source
Negative Action	Dummy variable equal to 1 if the previous rating action was positive or neutral and the actual rating action is a 'downgrade', 'watch for downgrade' or 'outlook negative'	Moody's, Fitch, SP, EST
Operating Margin	Operating income before depreciation (oibdp/oibdpq) to sales (sale/saleq) for the (annual/quarterly) CS database. We winsorize the variable at the 1% and 99% level.	CS, CS Global
Past Return	Return of in the previous 12 month, by firm.	CRSP, DS
Positive Action	Dummy variable equal to 1 if the previous rating action was negative or neutral and the actual rating action is an 'upgrade', 'watch for upgrade' or 'outlook positive'	Moody's, Fitch, SP, EST
Retained Earnings	Retained Earnings (re/req) to total assets (at/atq). We winsorize the variable at the 1% and 99% level.	CS, CS Global
R&D	Research and development expenses (xrd/xrdq) scaled by total assets (at/atq). We replace missing research and development expenses by zero. We winsorize the variable at the 1% and 99% level.	CS, CS Global
Ln(Market Cap.)	Natural logarithm of the market capitalization. Market capitalization is mv from Datastream and price (prc) times shares outstanding (shrout) for CRSP.	CRSP, DS, EST
Tangibles	Property, plant, and equipment (ppent/ppentq) to total assets (at/atq).	CS, CS Global
Taxshield	Investment tax credits (itcb) to total assets (at/atq). We winsorize the variable at the 1% and 99% level.	CS, CS Global
Tobin's Q	Assets total (at/atq) minus book equity plus market equity, everything divided by assets total (at/atq). Market equity is price (prc) time shares outstanding (shrout) and book equity is stackholder's equity (seq/ seqq) minus preferred stock plus balance-sheet deferred taxes and investment tax credit (txditc/txditcq). If (txditc/txditcq) is missing it is set to zero. If (seq/seqq) is not available we replace it by common equity (ceq/ceqq) plus preferred stock par value (pstk/pstkq), or total assets (at/atq) minus total liabilities (lt/ltq). Preferred stock is preferred stock redemption value (pstk/pstkqr) or preferred stock liquidation value (pstk) or preferred stock par value (pstk/pstkq). We winsorize the variable at the 1% and 99% level.	CS, CS Global, CRSP, DS
Total debt	Long-term debt (dltt/dlttq) plus short-term debt (dlc/dlcq) scaled by assets total (at/atq). We winsorize the variable at the 1% and 99% level.	CS, CS Global

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Table 1: Descriptive statistics for the sample between 1995 - 2016

Panel A: US Firms

	Obs.	Mean	Std. Dev.	P25	P50	P75
Moodys share (in %)	65296	32.729	46.923	0.000	0.000	100.000
Fitch share (in %)	65296	10.589	30.770	0.000	0.000	0.000
SP share (in %)	65296	56.682	49.552	0.000	100.000	100.000
Rating Moodys	21371	12.562	4.130	9.000	13.000	16.000
Rating Fitch	6914	8.972	3.188	7.000	9.000	10.000
Rating SP	37011	11.693	3.870	9.000	12.000	14.000
$\Delta(TNext)$	62923	358.268	421.377	97.000	234.000	444.000
LChange (in %)	65296	7.105	25.690	0.000	0.000	0.000
Reversal (in %)	65296	1.181	10.802	0.000	0.000	0.000
Net debt level	45747	0.347	0.300	0.190	0.321	0.464
Cosine similarity (in %)	21617	65.026	21.771	53.272	70.113	81.658
Positive action (in %)	65296	14.012	34.711	0.000	0.000	0.000
Negative action (in %)	65296	17.736	38.198	0.000	0.000	0.000
CAR[-1,1] (in %)	31633	-0.414	13.305	-2.884	-0.130	2.458
CAR[-42,-2] (in %)	31680	-1.936	24.548	-10.027	-0.262	8.462
Ln(Idio. vola)	31709	-3.845	0.571	-4.253	-3.882	-3.477
Market beta	31709	1.067	0.513	0.757	1.023	1.335
Ln(Market Cap.)	33607	7.466	1.902	6.275	7.553	8.769

Panel B: European Firms

	Obs.	Mean	Std. Dev.	P25	P50	P75
Moodys share (in %)	12330	23.520	42.414	0.000	0.000	0.000
Fitch share (in %)	12330	21.809	41.296	0.000	0.000	0.000
SP share (in %)	12330	54.672	49.783	0.000	100.000	100.000
Rating Moodys	2900	10.643	4.335	7.000	10.000	14.000
Rating Fitch	2689	7.929	3.117	6.000	8.000	9.000
Rating SP	6741	9.945	3.948	7.000	9.000	13.000
$\Delta(TNext)$	11740	324.296	390.260	95.000	213.500	386.000
LChange (in %)	12330	5.904	23.571	0.000	0.000	0.000
Reversal (in %)	12330	0.835	9.102	0.000	0.000	0.000
Net debt level	3388	0.236	0.210	0.108	0.228	0.356
Cosine similarity (in %)	4728	59.375	25.971	39.027	67.224	80.352
Positive action (in %)	12330	12.320	32.867	0.000	0.000	0.000
Negative action (in %)	12330	18.581	38.897	0.000	0.000	0.000
CAR[-1,1] (in %)	7747	-0.366	7.724	-2.055	-0.049	1.999
CAR[-42,-2] (in %)	7745	-0.507	16.832	-6.945	0.673	7.494
Ln(Idio. vola)	7747	-4.074	0.497	-4.421	-4.109	-3.774
Market beta	7752	0.525	0.435	0.237	0.472	0.750
Ln(Market Cap.)	7703	7.841	2.435	6.357	8.391	9.607

Notes: This table presents descriptive statistics for the sample period 1995 - 2016 for all CRAs. *Moodys/SP/Fitch* denote the percentage of the agency's rating actions relative to all actions for the respective CRA. *Rating Moodys/SP/Fitch* is the numerically transformed rating of the respective CRA. *Days until next action* are the days before the subsequent rating action by the respective CRA takes place. *LChange* is equal to 1 if there is a rating change of three or more notches in the following year. *Reversal* is the percentage of ratings which are reversed in the following year. *Net debt* is the net debt level scaled by assets total. *Cosine Similarity* is the cosine similarity of the current and previous reports with missing values if there was no preceding report in the previous 365 days. *Positive action* is a dummy variable equal to 1 if the preceding rating action is negative or neutral and the current rating action is an 'upgrade', 'watch for upgrade' or 'outlook positive'. *Negative action* is a dummy variable equal to 1 if the preceding rating action is positive or neutral and the current rating action is a 'downgrade', 'watch for downgrade' or 'outlook negative'. CAR[-1,1] is the cumulative abnormal return of the Carhart 4-factor model around the event. CAR[-42,-2] is the cumulative abnormal return from 42 to 2 days before the event, calculated using the Carhart 4-factor model. *Idio. vola* is the idiosyncratic volatility calculated based on the Carhart 4-factor model. *Market beta* is the market beta of the Carhart 4-factor model regression. *Ln(Market Cap.)* is the logarithm of the market capitalization. All variables are described in more detail in the Variable Appendix.

Table 2: Cosine Similarity – First and second report after Dodd-Frank

	US Firms		European Firms	
	(1) Cosine 365	(2) Cosine 730	(3) Cosine 365	(4) Cosine 730
1st act. post DF	-0.091** (-2.12)	-0.058* (-1.89)	0.027 (0.51)	-0.035 (-0.92)
2nd act. post DF	-0.003 (-0.21)	0.016 (1.24)	0.060* (1.98)	0.061** (2.52)
Positive action	-0.017** (-2.47)	-0.009* (-1.79)	-0.012 (-0.70)	-0.019 (-1.35)
Negative action	-0.033*** (-5.17)	-0.031*** (-6.99)	-0.025* (-1.98)	-0.023** (-2.03)
Analyst change	-0.078*** (-10.97)	-0.086*** (-14.51)	-0.106*** (-8.61)	-0.108*** (-11.14)
$\Delta(\text{Last report})$	0.001 (1.37)	0.001** (2.35)	0.002** (2.24)	0.003*** (3.55)
Rating agency FE	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Year-Quarter FE	Yes	Yes	Yes	Yes
Observations	15254	25463	3585	4641
Overall R ²	0.30	0.31	0.45	0.43
Adjusted R ²	0.19	0.22	0.36	0.36

Notes: This table shows regressions of cosine similarity on post Dodd-Frank dummies and control variables. Cosine similarity is measured by comparing the text of the current report to the preceding report. Columns (1) and (3) ((2) and (4)) require the time difference between reports to be smaller than 365 (730) days. The sample includes rating reports by Fitch and Moody's. Columns (1) and (2) ((3) and (4)) include US (European) firms. *Positive action* (*Negative action*) is a dummy variable equal to 1 if the previous rating action is negative or neutral (positive or neutral) and the current action is an 'upgrade', 'watch for upgrade' or 'outlook positive' ('downgrade', 'watch for downgrade' or 'outlook negative'). *Analyst change* is a dummy variable equal to 1 if the lead analyst or the second analyst change from the preceding to the current report. $\Delta(\text{Last report})$ is the time since the last report (in months). *1st act. post D-F* (*2nd act. post D-F*) is equal to 1 if the report is the first (second) report about a firm by a CRA after July 21, 2010. All variables are described in more detail in the Variable Appendix. Standard errors are double-clustered by firm and year-quarter. *t*-statistics are provided in parentheses.

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 3: Number of Observations for the 1st and 2nd rating action after Dodd-Frank

Panel A: US Firms

	All		Fitch		Moody's		SP	
	1st p. D-F	2nd p. D-F	1st p. D-F	2nd p. D-F	1st p. D-F	2nd p. D-F	1st p. D-F	2nd p. D-F
2010Q3	417	24	99	3	96	7	222	14
2010Q4	404	92	89	15	77	28	238	49
2011Q1	292	119	74	31	63	28	155	60
2011Q2	330	195	96	30	55	43	179	122
2011Q3	124	218	12	98	25	23	87	97
2011Q4	79	194		61	13	43	66	90
2012Q1	58	191		53	21	42	37	96
2012Q2	56	191		75	12	29	44	87
2012Q3	41	86		3	10	23	31	60
2012Q4	37	73			7	20	30	53
2013Q1	44	68			23	39	21	29
2013Q2	57	68			17	30	40	38
2013Q3	35	65			17	28	18	37
2013Q4	44	66			12	8	32	58
2014Q1	21	46			2	26	19	20
2014Q2	21	46			4	7	17	39
2014Q3	19	40			6	16	13	24
2014Q4	13	26			4	5	9	21
2015Q1	15	38			3	10	12	28
2015Q2	11	26			4	6	7	20
2015Q3	6	32			3	8	3	24
2015Q4	10	30				7	10	23
2016Q1	16	32			1	7	15	25
2016Q2	14	14			1	3	13	11
Total	2164	1980	370	369	476	486	1318	1125

Panel B: European Firms

	All		Fitch		Moody's		SP	
	1st p. D-F	2nd p. D-F	1st p. D-F	2nd p. D-F	1st p. D-F	2nd p. D-F	1st p. D-F	2nd p. D-F
2010Q3	107	2	30	1	19		58	1
2010Q4	113	21	37	4	10	1	66	16
2011Q1	61	46	25	8	5	11	31	27
2011Q2	65	59	25	20	4	8	36	31
2011Q3	33	50	14	24	2	3	17	23
2011Q4	23	64		36	1	5	22	23
2012Q1	6	38		11		6	6	21
2012Q2	13	39		12		4	13	23
2012Q3	9	19		9		2	9	8
2012Q4	10	20	1			2	9	18
2013Q1	7	11			5	5	2	6
2013Q2	6	13			2	4	4	9
2013Q3	4	12			3	6	1	6
2013Q4	3	17				4	3	13
2014Q1	6	4			1	1	5	3
2014Q2	1	11				4	1	7
2014Q3	2	6				2	2	4
2014Q4	1	9				3	1	6
2015Q1	2	3				2	2	1
2015Q2	3	6			1	1	2	5
2015Q3	1	4				1	1	3
2015Q4		3				1		2
2016Q1	2	2				1	2	1
2016Q2		1						1
Total	478	460	132	125	53	77	293	258

Notes: This table displays the number of observations where the post Dodd-Frank dummies *1st p. D-F* and *2nd p. D-F* equal one. *1st act. post D-F* (*2nd act. post D-F*) is equal to 1 if the report is the first (second) report about a firm by a CRA after July 21, 2010. Panel A (B) includes rating actions of US (European) firms between 2010Q3 and 2016Q2.

Table 4: Rating Level Regressions

Panel A: US Firms

	Firm credit rating						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Period post DF	0.376*** (3.67)	1.053*** (9.49)					
1st act. post DF			0.486*** (5.44)	0.237*** (4.88)	-0.057** (-2.40)	-0.095*** (-8.33)	-0.059*** (-2.66)
2nd act. post DF			0.538*** (6.04)	0.221*** (4.33)	-0.085** (-2.60)	-0.088** (-2.52)	-0.066** (-2.33)
Interest coverage		-0.018*** (-5.12)	-0.017*** (-4.92)	-0.004** (-2.32)	-0.008*** (-4.67)		
Dividend payer		-2.017*** (-19.26)	-2.022*** (-19.04)	-0.857*** (-8.15)	-0.955*** (-11.33)		
Cash balances		4.355*** (9.85)	4.843*** (11.05)	2.384*** (5.94)	0.794** (2.56)		
Tangibles		0.096 (0.42)	0.040 (0.17)	-1.542*** (-3.28)	-0.917** (-2.49)		
Ln(Market Cap.)		-0.902*** (-27.17)	-0.837*** (-24.53)	-0.512*** (-11.16)	-0.955*** (-20.81)		
Return[t-4, t]		0.029** (2.22)	0.029** (2.13)	0.017* (1.78)	0.017* (1.80)		
Operating Margin		-0.542** (-2.43)	-0.409* (-1.82)	-0.877*** (-5.41)	-0.505*** (-3.49)		
LT debt		2.882*** (5.64)	3.362*** (6.12)	0.871** (2.20)	0.331 (1.16)		
Total debt		-1.759*** (-3.28)	-2.051*** (-3.62)	-0.062 (-0.14)	0.540 (1.61)		
Tobin's Q		-0.143** (-2.45)	-0.215*** (-3.70)	-0.104** (-2.29)	0.239*** (5.83)		
Retained earnings		-1.690*** (-12.20)	-1.760*** (-12.52)	-1.521*** (-8.23)	-0.805*** (-4.81)		
Capex		1.939* (1.66)	1.841 (1.43)	-2.803*** (-3.93)	-1.746*** (-4.28)		
R&D		-23.215*** (-3.80)	-26.178*** (-4.24)	-3.554 (-1.11)	-6.527*** (-3.29)		
Rating agency FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	No	No	No	Yes	Yes	No	No
Year-Quarter FE	No	No	No	No	Yes	No	No
Firm x Year-Quarter FE	No	No	No	No	No	Yes	Yes
Observations	108225	108225	108225	108225	108225	92377	214761
Overall R ²	0.05	0.69	0.68	0.88	0.91	0.97	0.97
Within R ²				0.28	0.36	0.24	0.18
Adjusted R ²	0.05	0.69	0.68	0.88	0.90	0.95	0.94

Table 4 – continued: Rating Level Regressions

Panel B: European Firms

	Firm credit rating						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Period post D-F	1.531*** (8.27)	1.914*** (9.48)					
1st act. post D-F			0.615*** (3.20)	0.203*** (2.78)	-0.076 (-1.21)	-0.008 (-1.63)	-0.036*** (-3.16)
2nd act. post D-F			0.574*** (3.22)	0.215*** (3.43)	-0.142*** (-3.18)	-0.047 (-1.61)	-0.074* (-1.87)
Interest coverage (y)		-0.021*** (-2.88)	-0.018** (-2.39)	-0.007* (-1.72)	-0.010*** (-3.00)		
Dividend payer (y)		-1.854*** (-5.32)	-1.646*** (-4.58)	-0.532*** (-3.04)	-0.802*** (-4.45)		
Cash balances (y)		2.146* (1.67)	3.005** (2.07)	-1.058 (-1.42)	-0.659 (-1.16)		
Tangibles (y)		-0.799 (-1.24)	-1.090 (-1.63)	-4.391*** (-7.01)	-1.615*** (-3.08)		
Ln(Market Cap.)		-0.407*** (-7.44)	-0.335*** (-5.93)	-0.012 (-0.26)	-0.189*** (-3.77)		
Return[t-4, t]		0.308** (2.36)	0.270** (2.36)	0.166*** (4.04)	0.208*** (3.83)		
Operating Margin (y)		-3.510*** (-5.07)	-3.684*** (-5.05)	-3.582*** (-5.22)	-2.756*** (-5.11)		
LT debt (y)		1.011 (0.66)	2.750* (1.74)	0.384 (0.57)	-0.711 (-1.63)		
Total debt (y)		2.862** (1.98)	2.093 (1.35)	2.913*** (4.01)	3.396*** (6.64)		
Tobin's Q (y)		0.222 (1.15)	0.081 (0.40)	-0.236* (-1.95)	-0.243* (-1.83)		
Retained earnings (y)		-1.204** (-2.38)	-0.907* (-1.67)	-1.145*** (-4.08)	-1.315*** (-4.63)		
Capex (y)		1.964 (0.65)	0.574 (0.18)	-6.500*** (-4.96)	-2.639* (-1.94)		
R&D (y)		-11.927*** (-2.91)	-14.608*** (-3.34)	-1.681 (-0.44)	-1.042 (-0.27)		
Rating agency FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	No	No	No	Yes	Yes	No	No
Year-Quarter FE	No	No	No	No	Yes	No	No
Firm x Year-Quarter FE	No	No	No	No	No	Yes	Yes
Observations	32352	32352	32352	32352	32352	23721	30461
Overall R ²	0.06	0.34	0.27	0.87	0.90	0.98	0.98
Within R ²				0.23	0.22	0.07	0.09
Adjusted R ²	0.06	0.34	0.27	0.87	0.89	0.96	0.96

Notes: This table shows regressions of quarterly firm credit ratings on post Dodd-Frank dummies and control variables. In Panel A (B), we include credit ratings by S&P, Moody's and Fitch on U.S. (European) firms during the period from 1995 to 2016. In columns (1) and (2), we use *Period post D-F*, which is equal to 1 for all ratings after July 21, 2010. In columns (3) to (7), we include *1st act. post D-F* and *2nd act. post D-F*. *1st act. post D-F* (*2nd act. post D-F*) is equal to 1 if the report is the first (second) report about a firm by a CRA after July 21, 2010. Columns (4) and (5) include firm fixed effects. Column (5) additionally includes year-quarter fixed effects. Columns (6) and (7) include interacted firm x year-quarter fixed effects. Rating agency fixed effects are always included. All variables are described in more detail in the Variable Appendix. Standard errors are double-clustered by firm and year-quarter. *t*-statistics are provided in parentheses.

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 5: Time until next rating action

Panel A: US Firms

	(1) $\Delta(\text{TNext})$	(2) $\Delta(\text{TNext})$	(3) $\Delta(\text{TNext})$	(4) $\ln(\Delta(\text{TNext}))$
Period post D-F	-92.182*** (-4.38)			
1st act. post D-F		-111.721*** (-4.69)	-102.565*** (-2.68)	-0.677*** (-4.77)
2nd act. post D-F		-42.641*** (-3.78)	-15.010 (-0.76)	-0.155 (-1.39)
Firm controls	Yes	Yes	No	No
Rating agency FE	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	No	No
Year-Quarter FE	No	Yes	No	No
Firm x Year-Quarter FE	No	No	Yes	Yes
Observations	21919	21919	27404	27404
Overall R ²	0.18	0.22	0.57	0.52
Adjusted R ²	0.10	0.14	0.24	0.15

Panel B: European Firms

	(1) $\Delta(\text{TNext})$	(2) $\Delta(\text{TNext})$	(3) $\Delta(\text{TNext})$	(4) $\ln(\Delta(\text{TNext}))$
Period post D-F	-77.048*** (-3.81)			
1st act. post D-F		-68.139** (-2.02)	-62.280 (-0.91)	-0.572 (-1.63)
2nd act. post D-F		-28.367 (-1.29)	-8.737 (-0.45)	-0.184 (-1.66)
Firm controls	Yes	Yes	No	No
Rating agency FE	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	No	No
Year-Quarter FE	No	Yes	No	No
Firm x Year-Quarter FE	No	No	Yes	Yes
Observations	7009	7009	4656	4656
Overall R ²	0.17	0.21	0.55	0.51
Adjusted R ²	0.11	0.14	0.21	0.14

Notes: This table shows regressions of the time between two rating actions on post Dodd-Frank dummies and control variables. Panel A (B) includes all rating actions of US (European) firms between 1995 and 2016. In columns (1) to (3) ((4)), the dependent variable is the absolute (log) number of days until the subsequent rating action. *Period post D-F* is a dummy equal to 1 for all ratings after the July 21, 2010. *1st act. post D-F* (*2nd act. post D-F*) is equal to 1 if the report is the first (second) report about a firm by a CRA after July 21, 2010. *Firm controls* include: operating margin, long-term debt, total debt, Tobin's Q, retained earnings, capital expenditures, cash balances, tangibles, R&D, $\ln(\text{market cap})$, idiosyncratic volatility, interest coverage, market beta, and an indicator if the firm paid a dividend in the previous year. Columns (1) and (2) include firm fixed effects. Column (2) also includes year-quarter fixed effects. Columns (3) and (4) include interacted firm x year-quarter fixed effects. Rating agency fixed effects are always included. All variables are described in more detail in the Variable Appendix. Standard errors are double-clustered by firm and year-quarter. *t*-statistics are provided in parentheses.

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 6: Accuracy ratios before and after Dodd-Frank

	US Firms				No. Cohorts				European Firms				No. Cohorts	
	Before Dodd	After Dodd	Diff.	p-value	Before Dodd	After Dodd	Diff.	p-value	Before Dodd	After Dodd	Diff.	p-value	Before Dodd	After Dodd
	All CRAs													
One-year horizon	0.839	0.898	0.060	0.000	246585	83371	0.932	0.932	0.932	0.932	0.000	0.998	36123	17822
Two-year horizon	0.765	0.845	0.080	0.000	246585	83371	0.873	0.893	0.893	0.873	0.020	0.126	36123	17822
Three-year horizon	0.728	0.816	0.088	0.000	246585	83371	0.844	0.872	0.872	0.844	0.028	0.038	36123	17822
	Moody's													
One-year horizon	0.801	0.886	0.085	0.000	109263	33359	0.923	0.918	0.918	0.923	-0.005	0.746	11794	5848
Two-year horizon	0.728	0.828	0.100	0.000	109263	33359	0.862	0.861	0.861	0.862	-0.001	0.967	11794	5848
Three-year horizon	0.695	0.799	0.105	0.000	109263	33359	0.834	0.830	0.830	0.834	-0.005	0.843	11794	5848
	S&P													
One-year horizon	0.850	0.902	0.052	0.000	113528	36338	0.907	0.944	0.944	0.907	0.037	0.127	18251	7857
Two-year horizon	0.757	0.835	0.078	0.000	113528	36338	0.831	0.910	0.910	0.831	0.079	0.000	18251	7857
Three-year horizon	0.704	0.795	0.092	0.000	113528	36338	0.796	0.892	0.892	0.796	0.096	0.000	18251	7857
	Fitch													
One-year horizon	0.931	0.979	0.049	0.005	23794	13674	0.995	0.944	0.944	0.995	-0.052	0.004	6078	4117
Two-year horizon	0.857	0.960	0.103	0.000	23794	13674	0.994	0.907	0.907	0.994	-0.086	0.000	6078	4117
Three-year horizon	0.813	0.944	0.130	0.000	23794	13674	0.993	0.906	0.906	0.993	-0.088	0.000	6078	4117

Notes: This table shows the average accuracy ratio for the one-year-ahead, two-year-ahead, and three-year-ahead horizon. We calculate the cumulative accuracy profile using the pooled cohort approach, following Cantor and Mann (2003). We aggregate ratings across all quarterly cohorts. The average accuracy ratio is calculated separately for the period before (*Before*) and after (*After*) the Dodd-Frank Act. No. Cohorts displays the number of the quarterly cohorts before (*Before*) and after (*After*) the Dodd-Frank Act, on which the accuracy ratio is calculated on.

Table 7: Rating levels and firm fundamentals before and after Dodd-Frank

	Abs(Residuals) of Rating Level Regression – Second Stage					
	US			EU		
	(1)	(2)	(3)	(4)	(5)	(6)
Period post D-F	-0.183*** (-3.56)			-0.444*** (-4.28)		
1st act. post D-F		-0.197*** (-3.41)	-0.118** (-2.04)		-0.235*** (-2.71)	-0.025 (-0.25)
2nd act. post D-F		-0.123** (-2.42)	-0.050 (-0.81)		-0.213*** (-3.37)	-0.048 (-0.43)
Excess Optimism			-0.158*** (-4.12)			
1st act. post D-F × Excess Optimism			-0.193** (-2.36)			
2nd act. post D-F × Excess Optimism			-0.185* (-1.86)			
Excess Optimism						-0.115 (-1.55)
1st act. post D-F × Excess Optimism						-0.410** (-2.27)
2nd act. post D-F × Excess Optimism						-0.322 (-1.56)
Rating agency FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Year-Quarter FE	No	Yes	Yes	No	Yes	Yes
Observations	22771	22771	22771	7382	7382	7382
Overall R ²	0.34	0.36	0.36	0.41	0.49	0.49
Adjusted R ²	0.28	0.29	0.29	0.37	0.44	0.45

Notes: This table shows regressions of absolute rating residuals on post Dodd-Frank dummies and control variables. Rating residuals are the residuals from a first stage regression of rating levels on operating margin, long-term debt, total debt, Tobin's Q, retained earnings, capital expenditures, cash balances, tangibles, R&D, ln(market cap), idiosyncratic volatility, interest coverage, market beta, and an indicator if the firm paid a dividend in the previous year. *Period post D-F* is a dummy equal to 1 for all ratings after the July 21, 2010. *1st act. post D-F* (*2nd act. post D-F*) is equal to 1 if the report is the first (second) report about a firm by a CRA after July 21, 2010. *Excess optimism* is a dummy equal to 1 if the residual of the first stage is negative indicating a rating better than predicted by firm fundamentals. Columns (1) to (3) ((4) to (6)) include rating actions on U.S. (European) firms between 1995 and 2016. Rating agency fixed effects and firm fixed effects are always included. Columns (2), (3), (5), and (6) additionally include year-quarter fixed effects. All variables are described in more detail in the Variable Appendix. Standard errors are double-clustered by firm and year-quarter. *t*-statistics are provided in parentheses.

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 8: Rating volatility before and after Dodd-Frank

Panel A: US Firms

	(1) LChange	(2) LChange	(3) LChange	(4) Reversal	(5) Reversal	(6) Reversal
Period post D-F	-0.009 (-1.16)			0.004** (2.09)		
1st act. post D-F		0.008 (0.81)	0.017 (1.25)		-0.003 (-0.61)	-0.001 (-0.09)
2nd act. post D-F		-0.011 (-1.56)	-0.003 (-0.35)		-0.005 (-1.45)	0.006 (0.77)
Firm controls	Yes	Yes	No	Yes	Yes	No
Rating agency FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	No	Yes	Yes	No
Year-Quarter FE	No	Yes	No	No	Yes	No
Firm x Year-Quarter FE	No	No	Yes	No	No	Yes
Observations	22771	22771	28646	22771	22771	28646
Overall R ²	0.22	0.23	0.65	0.11	0.12	0.52
Adjusted R ²	0.15	0.16	0.38	0.02	0.03	0.15

Panel B: European Firms

	(1) LChange	(2) LChange	(3) LChange	(4) Reversal	(5) Reversal	(6) Reversal
Period post D-F	-0.013 (-1.01)			0.011*** (2.86)		
1st act. post D-F		0.016 (0.84)	0.046* (1.78)		-0.007* (-1.74)	-0.010* (-1.84)
2nd act. post D-F		0.001 (0.11)	0.034*** (2.72)		0.000 (0.02)	-0.016 (-1.53)
Firm controls	Yes	Yes	No	Yes	Yes	No
Rating agency FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	No	Yes	Yes	No
Year-Quarter FE	No	Yes	No	No	Yes	No
Firm x Year-Quarter FE	No	No	Yes	No	No	Yes
Observations	7382	7382	4886	7382	7382	4886
Overall R ²	0.21	0.24	0.67	0.12	0.13	0.49
Adjusted R ²	0.15	0.17	0.42	0.05	0.05	0.11

Notes: This table shows regressions of rating volatility on post Dodd-Frank dummies and control variables. Panel A (B) analyzes rating changes of US (European) firms between 1995 and 2016. In columns (1) to (3) ((4) to (6)), the dependent variable is *LChange* (*Reversal*). *LChange* is a dummy equal to 1 if there is a large rating change (≥ 3 notches) in the next year. *Reversal* is a dummy equal to 1 if the current rating action is reversed by the subsequent rating action within the next year. *Period post D-F* is a dummy equal to 1 for all ratings after the July 21, 2010. *1st act. post D-F* (*2nd act. post D-F*) is equal to 1 if the report is the first (second) report about a firm by a CRA after July 21, 2010. *Firm controls* include: operating margin, long-term debt, total debt, Tobin's Q, retained earnings, capital expenditures, cash balances, tangibles, R&D, ln(market cap), idiosyncratic volatility, market beta, interest coverage, and an indicator if the firm paid a dividend in the previous year. All variables are described in more detail in the Variable Appendix. Standard errors are double-clustered by firm and year-quarter. *t*-statistics are provided in parentheses.

Table 9: Net debt levels after rating actions

Panel A: US Firms

	Net debt level			
	(1) ln t+1	(2) ln t+2	(3) ln t+3	(4) ln t+4
1st act. post D-F	0.011 (1.03)	0.011 (0.99)	0.014* (1.69)	0.017** (1.99)
2nd act. post D-F	0.011 (1.51)	0.010 (1.24)	0.010 (1.44)	0.013* (1.84)
Rating	-0.003 (-1.54)	-0.002 (-0.93)	-0.003 (-1.52)	-0.004** (-2.09)
CAR[-1,1]	-0.027 (-1.37)	-0.001 (-0.07)	-0.001 (-0.06)	0.010 (0.71)
Tangibles	0.201*** (9.48)	0.161*** (6.78)	0.126*** (4.55)	0.104*** (3.42)
Ln(Market cap.)	-0.011*** (-4.01)	-0.022*** (-5.22)	-0.016*** (-3.33)	-0.008 (-1.64)
Operating Margin	-0.023*** (-2.79)	-0.039*** (-2.94)	-0.050** (-2.56)	-0.050** (-2.31)
Tobin's Q	-0.010 (-0.71)	-0.001 (-0.10)	-0.010 (-1.28)	-0.013 (-1.66)
Taxshield	-2.398*** (-5.73)	-2.434*** (-4.60)	-2.220*** (-3.64)	-2.122*** (-3.14)
Carryforwards	0.007 (0.53)	0.006 (0.36)	0.020 (0.85)	0.014 (0.55)
R&D	-0.113 (-0.33)	-0.373 (-0.96)	-0.338 (-0.84)	-0.158 (-0.40)
Book Leverage	0.991*** (22.97)	0.790*** (17.16)	0.656*** (16.23)	0.581*** (14.39)
Rating agency FE	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Year-Quarter FE	Yes	Yes	Yes	Yes
Observations	24314	23638	22971	22734
Overall R ²	0.89	0.82	0.77	0.75
Adjusted R ²	0.87	0.80	0.75	0.73

Table 9 – continued: Net debt levels after rating actions

Panel B: European Firms – Cross listed

	Net debt level			
	(1)	(2)	(3)	(4)
	In t+1	In t+2	In t+3	In t+4
1st act. post D-F	-0.002 (-0.25)	0.002 (0.14)	0.008 (0.75)	0.001 (0.11)
2nd act. post D-F	0.002 (0.52)	0.014* (1.85)	0.009 (1.17)	0.008 (0.92)
Firm controls	Yes	Yes	Yes	Yes
Rating agency FE	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Year-Quarter FE	Yes	Yes	Yes	Yes
Observations	2362	2361	2326	2353
Overall R ²	0.91	0.86	0.85	0.83
Adjusted R ²	0.90	0.85	0.83	0.81

Table 9 – continued: Net debt levels after rating actions

Panel C: European Firms – Not cross listed

	Net debt level	
	(1)	(2)
	In t+1	In t+2
1st act. post DF	0.004 (0.62)	0.001 (0.35)
2nd act. post DF	-0.003 (-0.42)	-0.003 (-0.84)
Firm controls	Yes	Yes
Rating agency FE	Yes	Yes
Firm FE	Yes	Yes
year	Yes	Yes
Observations	7285	6836
Overall R ²	0.84	0.81
Adjusted R ²	0.83	0.80

Notes: This table shows regressions of future net debt levels on post Dodd-Frank dummies and controls. Panel A (B and C) includes rating actions of US (European) firms between 1995 and 2016. In columns (1) ((2), (3), (4)) of Panels A and B, we predict the net debt level one (two, three, four) quarters after the rating action. Quarterly net debt level are only available for European firms that are cross-listed in the US. In Panel C, we predict the net debt level one and two years after the rating action in columns (1) and (2), respectively. Panel C includes all European firms. *1st act. post D-F* (*2nd act. post D-F*) is equal to 1 if the report is the first (second) report about a firm by a CRA after July 21, 2010. *Firm Controls* include credit rating, cumulative abnormal return around the event, ln(market cap.), tangibles, operating margin, Tobin's Q, tax shield, carryforwards, R&D expenses, and book leverage. Rating agency fixed effects, firm fixed effects, and year-quarter fixed effects are always included. All variables are described in more detail in the Variable Appendix. Standard errors are double-clustered by firm and year-quarter. *t*-statistics are provided in parentheses.

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 10: Net debt level after rating actions for investment grade and non-investment grade US firms

	Investment grade		Non-investment grade	
	(1)	(2)	(3)	(4)
	In t+3	In t+4	In t+3	In t+4
1st act. post D-F	-0.003 (-0.50)	-0.005 (-0.70)	0.027* (1.86)	0.033** (2.30)
2nd act. post D-F	-0.003 (-0.60)	-0.002 (-0.32)	0.016 (1.36)	0.022** (2.10)
Firm controls	Yes	Yes	Yes	Yes
Rating agency FE	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Year-Quarter FE	Yes	Yes	Yes	Yes
Observations	8898	8813	14073	13921
Overall R ²	0.83	0.81	0.75	0.72
Adjusted R ²	0.81	0.80	0.72	0.69

Notes: This table shows regressions of future net debt levels on post Dodd-Frank dummies and controls for investment grade and non-investment grade firms. Columns (1) and (2) ((3) and (4)) include rating actions of US investment grade (non-investment grade) firms between 1995 and 2016. In columns (1) and (3) ((2) and (4)), we predict the net debt level three (four) quarters after the rating action. *1st act. post D-F* (*2nd act. post D-F*) is equal to 1 if the report is the first (second) report about a firm by a CRA after July 21, 2010. *Firm Controls* include credit rating, cumulative abnormal return around the event, ln(market cap.), tangibles, operating margin, Tobin's Q, tax shield, carryforwards, R&D expenses, and book leverage. Rating agency fixed effects, firm fixed effects, and year-quarter fixed effects are always included. All variables are described in more detail in the Variable Appendix. Standard errors are double-clustered by firm and year-quarter. *t*-statistics are provided in parentheses.

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

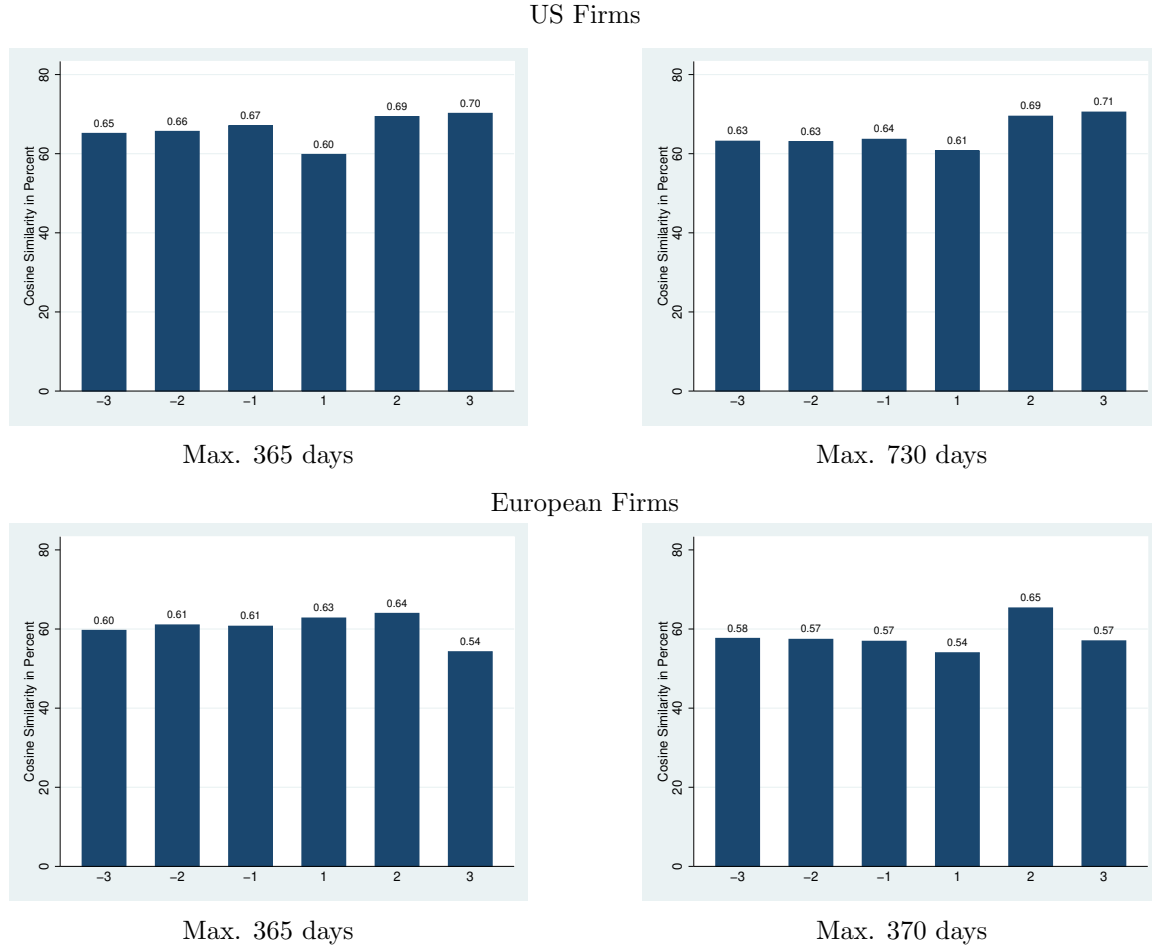
Table 11: Absolute market reaction to rating actions

	Absolute CAR[-1,1]							
	US				EU			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Period post D-F	-0.007*** (-3.83)	0.001 (0.28)			-0.013*** (-4.23)	-0.012*** (-3.94)		
1st act. post D-F			-0.001 (-0.60)	0.003 (0.97)			-0.007** (-2.38)	0.000 (0.15)
2nd act. post D-F			0.002 (0.86)	0.005* (1.93)			-0.006*** (-2.66)	-0.000 (-0.16)
Ln(Idio. vola)	0.030*** (11.19)	0.028*** (8.74)	0.028*** (8.84)	0.022*** (6.78)	0.016** (2.20)	0.011 (1.50)	0.014** (2.11)	0.003 (0.28)
Market beta	-0.003 (-1.36)	-0.001 (-0.35)	-0.001 (-0.34)	0.001 (0.24)	0.002 (0.59)	0.006 (1.45)	0.003 (0.82)	0.006 (1.44)
Abs(CAR[-42,-2])	0.102*** (8.21)	0.077*** (6.74)	0.077*** (6.73)	0.066*** (5.83)	0.097*** (5.83)	0.070*** (4.65)	0.072*** (4.64)	0.051*** (3.65)
Rating	0.002*** (5.52)	0.005*** (7.39)	0.005*** (7.72)	0.005*** (8.01)	0.002*** (3.36)	0.004*** (3.76)	0.003*** (3.19)	0.005*** (4.38)
Negative action	0.016*** (9.78)	0.020*** (14.03)	0.020*** (14.09)	0.018*** (11.06)	0.010*** (4.18)	0.012*** (5.17)	0.012*** (5.31)	0.011*** (5.02)
Positive action	0.000 (0.09)	0.000 (0.09)	0.000 (0.14)	0.002 (1.04)	-0.005** (-2.00)	-0.005* (-1.94)	-0.005* (-1.90)	-0.004 (-1.57)
Rating agency FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	No	Yes	Yes	Yes	No	Yes	Yes	Yes
Year-Quarter FE	No	No	No	Yes	No	No	No	Yes
Observations	31606	31434	31434	31434	7740	7689	7689	7689
Overall R ²	0.10	0.25	0.25	0.26	0.13	0.25	0.25	0.28
Adjusted R ²	0.10	0.19	0.19	0.20	0.13	0.19	0.19	0.22

Notes: This table shows regressions of absolute abnormal returns around rating actions on post Dodd-Frank dummies and control variables. Columns (1) to (4) ((5) to (8)) include rating actions on US (European) firms between 1995 and 2016. The dependent variable is the absolute cumulative abnormal return from one day before to one day after the announcement of the rating action. *Period post D-F* is a dummy equal to 1 for all ratings after the July 21, 2010. *1st act. post D-F* (*2nd act. post D-F*) is equal to 1 if the report is the first (second) report about a firm by a CRA after July 21, 2010. *Positive action* (*Negative action*) is equal to 1 if the previous rating action was negative or neutral (positive or neutral) and the current rating action is an 'upgrade', 'watch for upgrade' or 'outlook positive' ('downgrade', 'watch for downgrade' or 'outlook negative'). *CAR[-42,-2]* is the cumulative abnormal return from 42 until 2 days before the announcement of the rating action, calculated using the Carhart 4-factor model. *Idio. vola* is the idiosyncratic volatility calculated as standard deviation of residuals from the Carhart 4-factor model. *Market beta* is the market beta in the Carhart 4-factor model. Columns (2) to (4) and (6) to (8) include firm fixed effects. Columns (4) and (8) additionally include year-quarter fixed effects. Rating agency fixed effects are always included. All variables are described in more detail in the Variable Appendix. Standard errors are double-clustered by firm and year-quarter. *t*-statistics are provided in parentheses.

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

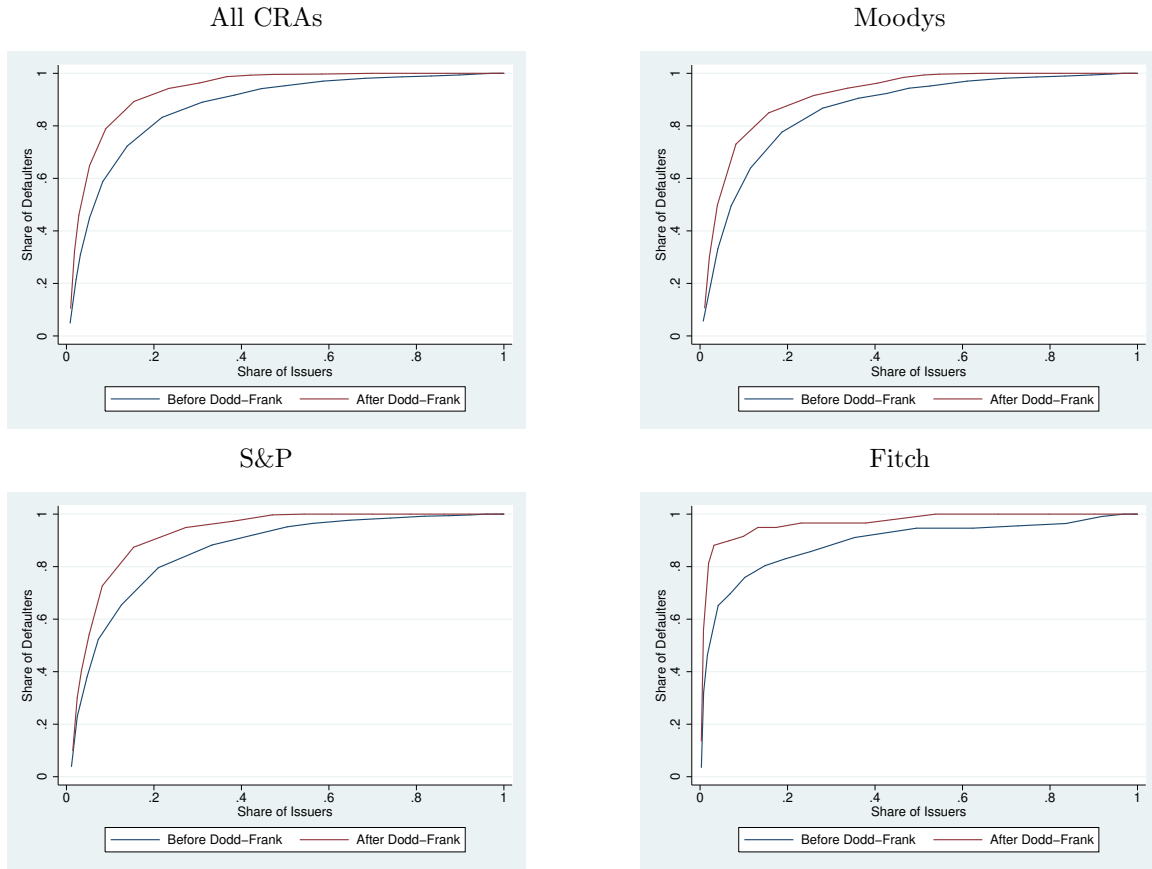
Figure 1: Cosine Similarity calculated on reports being a maximum of one/two years ago



Note: This figure displays the average cosine similarity of a rating report to its preceding report for the pre and post Dodd-Frank period. The vertical axis shows the cosine similarity in percent. The horizontal axis indicates the last three reports before (-3 to -1) and the first three reports after (1 to 3) the Dodd-Frank Act. The sample includes rating reports on US and European firms by Fitch and Moody's. The upper (lower) graphs show results for US (European) firms. *Max. 365 days* (*Max. 730 days*) includes only reports where the time difference to the preceding report is smaller than 365 (730) days.

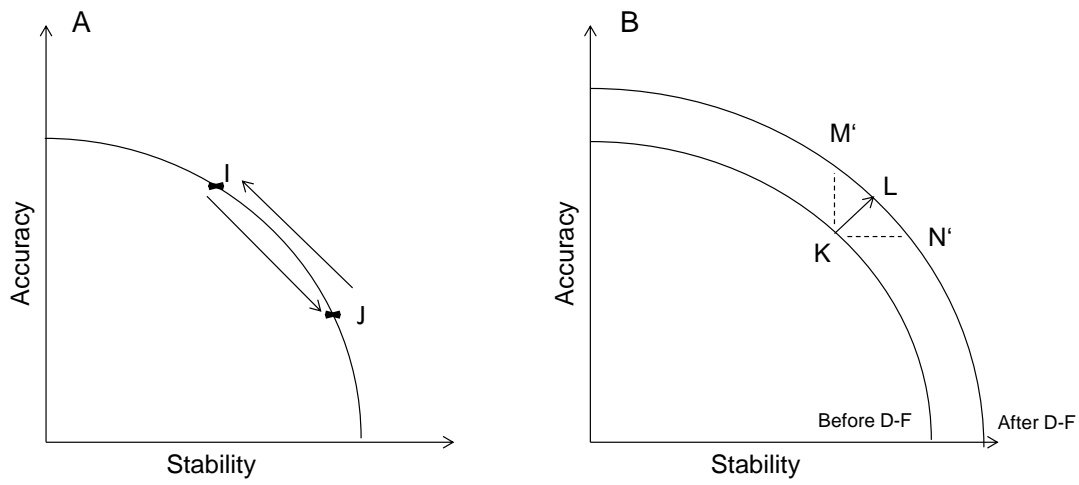
Figure 2: CAP-Curves with a one-year horizon for the different CRAs

US Firms



Note: The figures show one-year cumulative accuracy profiles for all CRAs pooled and for each CRA separately. We construct the cumulative accuracy profile by plotting the share of defaulters within a one-year horizon, accounted for by firms with the same or lower rating, against the share of all firms in that rating category or below. We aggregate ratings for all quarterly cohorts and calculate the cumulative accuracy profiles thereafter.

Figure 3: Rating Accuracy and Stability Trade-off



Note: Figure A presents the trade-off between rating accuracy and rating stability along an existing frontier, based on Cantor and Mann (2007) and Cheng and Neamtiu (2009). Figure B presents an improve in accuracy without the loss of stability due to an expanded frontier.

Table A2: Conversion of alphanumeric rating to numerical scale

Numerical Conversion	Alphanumeric Credit Rating		
	Standard and Poor's	Moody's	Fitch
1	AAA	Aaa	AAA
2	AA+	Aa1	AA+
3	AA	Aa2	AA
4	AA-	Aa3	AA-
5	A+	A1	A+
6	A	A2	A
7	A-	A3	A-
8	BBB+	Baa1	BBB+
9	BBB	Baa2	BBB
10	BBB-	Baa3	BBB-
11	BB+	Ba1	BB+
12	BB	Ba2	BB
13	BB-	Ba3	BB-
14	B+	B1	B+
15	B	B2	B
16	B-	B3	B-
17	CCC+	Caa1	CCC+
18	CCC	Caa2	CCC
19	CCC-	Caa3	CCC-
20	CC,C	Ca	CC,C
21	D	C	D,DD,DDD

Notes: This table displays the conversion of the alphanumeric rating to a numerical scale, separately for each rating agency.

Table A3: Results on the first stage of table 6

Panel A: US Firms

	Firm credit rating	
	(1) US Firms	(2) European Firms
Interest coverage	-0.010*** (-3.37)	2.302* (1.81)
Cash balances	4.058*** (9.15)	-0.932 (-1.55)
Tangibility	0.219 (0.91)	-0.306*** (-5.39)
Dividend payer	-1.633*** (-15.31)	1.233*** (5.30)
Ln(Market Cap.)	-0.722*** (-17.64)	2.480*** (7.71)
Market beta	0.274*** (4.26)	-1.287*** (-3.78)
Idio. vola	1.010*** (7.09)	1.728 (1.22)
Operating Margin	-0.459*** (-3.11)	2.893** (2.23)
Tobin's Q	-0.267*** (-4.33)	-2.537*** (-3.89)
R&D	-22.602*** (-3.28)	0.227 (1.42)
Retained earnings	-1.390*** (-10.76)	-14.076*** (-4.03)
Capex	0.820 (0.58)	-0.206 (-0.41)
LT debt	2.480*** (4.55)	-2.609 (-0.95)
Total debt	-1.182** (-2.03)	-0.008 (-1.05)
Constant	21.541*** (44.69)	22.007*** (15.93)
Observations	22966	7433
Overall R ²	0.67	0.44
Adjusted R ²	0.67	0.44

Notes: This table presents the regression results of the first stage estimation from table 6. Quarterly accounting data is used for the US sample and yearly accounting data for the European sample.

Table A4: Rating Level Regression – Split according to the timing of the 1st and 2nd action after DF

	Firm credit rating					
	US Firms			European Firms		
	(1)	(2)	(3)	(4)	(5)	(6)
1st act. post D-F - y1	-0.066** (-2.11)	-0.110*** (-6.33)	-0.042 (-1.33)	-0.048 (-0.90)	-0.044 (-1.02)	-0.039 (-1.03)
1st act. post D-F - y2	0.009 (0.11)	0.076 (0.96)	-0.051 (-1.05)	0.241 (1.65)	0.116 (0.79)	-0.015 (-0.46)
1st act. post D-F - y3	-0.082** (-2.21)	-0.184*** (-3.75)	-0.092 (-1.53)	-0.488*** (-3.10)	-0.082 (-0.81)	-0.042 (-0.41)
2nd act. post D-F - y2	-0.044 (-0.91)	-0.068 (-1.29)	0.004 (0.12)	-0.094 (-0.73)	-0.103* (-1.97)	-0.099* (-1.78)
2nd act. post D-F - y3	-0.069* (-1.80)	-0.057** (-2.07)	-0.164*** (-3.50)	0.080 (0.26)	0.426** (2.35)	0.122 (0.97)
2nd act. post D-F - y4	-0.179*** (-2.75)	-0.144 (-1.45)	-0.181** (-2.63)	-0.301* (-1.87)	-0.048 (-0.74)	-0.141 (-1.51)
Rating agency FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm controls	Yes	No	No	Yes	No	No
Firm FE	Yes	No	No	Yes	No	No
Year-Quarter FE	Yes	No	No	Yes	No	No
Firm x Year-Quarter FE	No	Yes	Yes	No	Yes	Yes
Observations	108225	92377	214761	14867	12426	30461
Overall R ²	0.91	0.97	0.97	0.87	0.98	0.98
Within R ²	0.36	0.24	0.18	0.27	0.03	0.09
Adjusted R ²	0.90	0.95	0.94	0.87	0.96	0.96

Notes: This table presents the coefficient estimates from a ordinary least squares (OLS) specification. The dependent variable is the firm credit rating by S&P, Moodys or Fitch, respectively. The sample period is from 1995 until 2016. We re-estimate column (5 - 7) from Table 3 and split our *1st act. post D-F* variable into three variables according to the time period the action is undertaken. For all actions in the first year after the Dodd-Frank regulation we generate the dummy *1st act. post D-F - y1* for all action that are undertaken in the second year after Dodd-Frank we generate the dummy *1st act. post D-F - y2*. All other actions are in *1st act. post D-F - y3*. For *2nd act. post D-F - y(2/3/4)* we generate a dummy if the report is issued in the (2/3/>3) years after the Dodd-Frank regulation. **Firm Controls** include the following control variables: operating margin, long-term debt, total debt, Tobin's Q, retained earnings, capital expenditures, cash balances, tangibles, R&D, ln(market cap), interest coverage, and an indicator if the firm paid a dividend in the previous year. Detailed information on the construction of all variables can be found in the Variable Appendix. Standard errors are clustered by firm and year-quarter. *t*-statistics are provided in parentheses.

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table A5: Time until next rating – Differentiate when report was written

	US Firms			European Firms		
	(1) $\Delta(\text{TNext})$	(2) $\Delta(\text{TNext})$	(3) $\ln(\Delta(\text{TNext}))$	(4) $\Delta(\text{TNext})$	(5) $\Delta(\text{TNext})$	(6) $\ln(\Delta(\text{TNext}))$
1st act. post D-F - y1	-80.660** (-2.34)	-143.075* (-1.74)	-1.124*** (-4.44)	-40.521 (-1.16)	-187.040 (-1.63)	-1.229** (-1.99)
1st act. post D-F - y2	-26.519 (-0.74)	-40.846 (-0.85)	-0.555*** (-2.75)	5.841 (0.12)	168.335** (2.51)	0.001 (0.01)
1st act. post D-F - y3	-181.040*** (-5.20)	-100.172** (-2.26)	-0.485** (-2.41)	-146.953* (-1.84)	-48.499 (-0.52)	-0.139 (-0.25)
2nd act. post D-F - y2	-14.813 (-0.92)	-36.420 (-0.87)	-0.466** (-2.37)	4.176 (0.20)	-9.524 (-0.24)	-0.332 (-1.36)
2nd act. post D-F - y3	-20.486 (-1.23)	-6.178 (-0.17)	-0.119 (-0.91)	0.373 (0.01)	-44.445 (-0.69)	0.052 (0.21)
2nd act. post D-F - y4	-75.701*** (-3.16)	10.341 (0.65)	0.218** (2.62)	-105.892*** (-3.20)	-42.165 (-1.27)	-0.283 (-1.28)
Firm Controls	Yes	No	No	Yes	No	No
Rating agency FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	No	No	Yes	No	No
Year-Quarter FE	Yes	No	No	Yes	No	No
Firm x Year-Quarter FE	No	Yes	Yes	No	Yes	Yes
Observations	21919	27404	27404	7009	4656	4656
Overall R ²	0.22	0.57	0.52	0.21	0.55	0.51
Adjusted R ²	0.14	0.24	0.15	0.14	0.21	0.14

Notes: This table presents results for the time until the next action by a CRA. We re-estimate column (2 - 4) from Table 4 and split our *1st act. post D-F* variable into three variables according to the time period the action is undertaken. For all actions in the first year after the Dodd-Frank regulation we generate the dummy *1st act. post D-F - y1* for all action that are undertaken in the second year after Dodd-Frank we generate the dummy *1st act. post D-F - y2*. All other actions are in *1st act. post D-F - y3*. For *2nd act. post D-F - y(2/3/4)* we generate a dummy if the report is issued in the (2/3/>3) years after the Dodd-Frank regulation. *Firm controls* include the following control variables: operating margin, interest coverage, long-term debt, total debt, Tobin's Q, retained earnings, capital expenditures, cash balances, tangibles, R&D, $\ln(\text{market cap})$, idiosyncratic volatility, market beta, and an indicator if the firm paid a dividend in the previous year. Details on the construction of these variables can be found in the Variable Appendix. Standard errors are clustered by firm and year-quarter. *t*-statistics are provided in parentheses.

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.