Are Ratings Agencies Influential?

The Effect of Rating Agencies on CDS Spreads

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Abstract

This paper examines Moody's rating changes and the movement of credit default swaps spreads 11 days before and 60 days after the ratings announcement. We look to see how credit rating agencies influence the CDS market and whether this influence changed after the 2008 financial crisis. With a sample size of 26 ratings changes before the crisis and 28 ratings changes after the crisis, we find that the credit ratings agencies still provide information to the market that the public uses to make decisions. Using the bootstrap method, we create a distribution to determine the critical t-value compare it to the initial sample size t-statistic.

I. Introduction

In this paper, we will take an empirical look at how influential credit rating agencies are based on CDS data and whether this influence decreases after the credit crises due to the shift in the credibility of rating agencies and large uncertainties in the market. This study is based on a working paper by Kiff, Nowak and Schumacher titled, "Are Rating Agencies Powerful? An Investigation into the Impact and Accuracy of Sovereign Ratings" (2012), and applies the methodology from this study to large corporates from the S&P 500 using Moody's ratings. As credit ratings reveal the credit quality of an institution to uninformed investors, we look to decipher how powerful these ratings are in providing information to the public and whether the public acts on this information by looking at CDS spreads of large corporate bonds.

Although a decrease in credit rating of an institution is perceived to increase the cost of insuring that institution's loans, recent credit watches or downgrades seem to have little long-lasting effects on the profitability of a corporation. Vink and Fabozzi (2009) found that although credit ratings have a significant influence on spreads, investors consider alternative factors that are not considered when assigning a credit rating. However, other literature, such as "The Effect of Credit Ratings on CDS Spreads" by Daniels and Jensen (2005), found that the CDS market reacts significantly to changes in credit ratings.

What this paper contributes is a more recent look at the role of credit ratings. In light of the federal and state governments' lawsuit against McGraw Hill's Standard & Poor's Rating Services accusing the rating agency of faulty formulas and misleading ratings, this

paper stands to determine whether the change in ratings influenced CDS spreads and whether it was more effective before or after the economic crises. This has not been looked at very closely in other studies. This lawsuit, as well as the events and legislation that follow it, should reveal the impact of credit rating agencies, and the results of the study should hopefully incorporate and address such irregularities. As of late March, there were seventeen lawsuits filed against Standard & Poor's Rating Services claiming that the ratings agency mislead the public before and after the financial crises. The United States filed a lawsuit against S&P for not adhering to its criterion in rating mortgage bonds during the financial crises on February 4th, 2013. This lawsuit acts as an official affirmation that puts the value of the rating agencies into question. The justice department claims that S&P incorrectly rated collateralized debt obligations, accusing the ratings agency that it was pursuing profits instead of informing investors. The Guardian stated in February, 2013,

> "European and US regulators have yet to solve the problem of biased credit rating opinions. Moody's downgrade of the UK's credit rating and the recent US lawsuit against S&P remind us that credit ratings remain both consequential and controversial. More importantly, they are a byproduct of a broken industry hamstrung by obsolete regulation."

S&P stretched its formula, according to University of Texas finance professor John M. Griffin, and increased the number of CDOs that were given AAA ratings. As S&P increased the size of the highest rated CDOs beyond its own formula, issuers of the CDOs paid investors less than they should have in returns on each bond. In 2007, S&P had increased the AAA portions of CDO investments 18.2 percent more than it has specified in public model. With the exception of two securities, Moody's Ratings

Services assigned the same ratings to CDOs. Given these accusations, credit rating agencies are facing a credibility issue.

Supported by recent literature and the aforementioned paper, we hypothesize that the credit ratings changes are still relevant and informative sources of information and that the impact of rating agency information will cause a statistically significant change in CDS spreads. The data reviewed in this study was collected for dates ranging from January, 2004 to December, 2013 and includes observations from fifty-eight randomly chosen companies from the S&P 500 using the Moody's website and DataStream. Due to the amount of research done in the past on this subject, we separated our data on whether the ratings announcement occurred before or after the financial crises. With the more recent data relative to past studies, we can use the data to put a different spin on the informational value of credit rating agencies and make a statistical comparison of the effect of credit rating agencies before and after the end of 2007.

II. Literature Review

In Kiff, Nowak and Schumacher (2012), the authors examined the role of credit rating agencies from an informational point of view and whether they influenced the CDS market of sovereign ratings. As mentioned above, this paper had a large influence in both the proposed topic and methodology of this study. Ultimately the authors found that rating agencies are valid informational sources, and upgrades and downgrades in and out of investment grade categories significantly impacted the CDS market. Despite finding that rating changes may not impact the market at all, the change to noninvestment grade

or junk bonds is actually significant. After analyzing Moody's ratings of 72 sovereigns and their respective CDS spreads, the authors found that, within each group of advanced economies and emerging markets, a two notch downgrade would lead to a spread widening twice as large as one that would occur with a one notch downgrade. Furthermore, predicted changes in spread for advanced economies and emerging markets in the expected direction was 45 and 51 percent, respectively. For outlook changes, the proportion of expected directional change increased to 67 and 63 percent implying that they may hold more information than an actual downgrade.

A study by Micu, Remolona and Wooldridge (2004), "The price impact of rating announcements: evidence from the credit default swap market," produced similar results and found that rating downgrades have a highly significant impact on CDS spreads, even when preceded by other rating events. They also found that the impact is largest for A- and BBB-rated entities, possibly reflecting investors' aversion to issuers at risk of becoming fallen angels. The announcement of a negative review also has a highly significant impact on adjusted CDS spreads (as strong as actual downgrades).

For our study, we propose a similar study to Kiff, Nowak and Schumacher's paper, replacing sovereign CDS with corporate CDS. The two studies mentioned above are representative of a large portion of the literature on the subject, suggesting that credit rating agencies do in fact add informational value to the market and have a significant effect on pricing in the market. However, as previously mentioned, our study looks to

take a heavily researched subject and make it more relevant by taking a closer look at the effects of the financial crises on the credibility of rating agencies.

Another piece of literature that is relevant to our study completed by Hull, Mirela, and White (2005) speaks to "The relationship between credit default swap spreads, bond yields and credit rating announcements." This mainly focused on the relationship between CDS spreads and bond yields and benchmarked them against risk-free rates. However, a second more relevant application looked at the relationship between the CDS market and credit rating announcements, focusing on the causal relationships between the two variables. Using five-year quotes from 1998 to 2002 and corporations rated by Moody's, the authors carried out two tests. The first test looked at whether credit spreads widen before and after rating events. The results of this test found that at the 1% significance level, the spread increased well in advance of a downgrade event while there were no significant changes to the spread 10 business days before the event. This implies that CDS markets anticipate negative credit events but no significant results for positive events. In a second test, they looked at the effect of credit spread levels and credit spread changes on ratings announcements and found that they are helpful in estimating the probability of negative credit rating changes. However, as exhibited by the dates of data collection, this study could potentially be outdated. Although this study poses some concern for our study that looks at the effect of a rating change announcement, our paper will add an interesting and more current interpretation of the informational implications of rating changes on CDS spreads and be able to verify the current validity of Hull et. al's study.

An additional study by John R. M. Hand, Robert W. Holthausen, Richard W. Leftwich (1992), called "The Effect of Bond Rating Agency Announcements on Bond and Stock Prices," also found results that prove the importance of our study in resolving the issue of if rating agencies are in fact providing relevant and new information in the market at this time. This study measured excess bond and stock returns and their reactions to additions to the S&P Credit Watch List as well as rating changes announced by Moody's and S&P. In addition, this study analyzed the differences between bond price and stock return reactions that were a direct result of the addition or ratings announcement or of a ratings change. For additions to the Credit Watch List that were unexpected, a negative average excess bond return of 1.39% is attributed to indicated downgrades and a positive average excess bond return of 2.25% is attributed to indicated upgrades. For the sample of actual rating changes, less solid results exist due to several inconsistencies. There was negative average excess bond and stock returns for downgrades, but weaker positive average excess bond and stock returns for upgrades. The actual rating downgrades by Moody's and S&P resulted in higher excess bond returns for below investment grade bonds versus investment grade bonds or higher. However, for actual upgrades, the evidence is weak where both mean and median announcement effects are around .35% and there are negligible differences between returns of investment grade and noninvestment grade bonds. This data once again suggests that a warning or outlook change for a rating may be more influential than the actual rating change itself. Our study looks to study the effects of rating changes once again with more current data to see if the actual rating change has developed an effect on prices in the market as time as passed.

III. Data

Note on CDS spreads

Credit default swaps are agreements between the purchaser and seller where the buyer of the swap makes payments to the seller until the maturity date of the swap. The purchaser usually wants to minimize the risk of default of the fixed income product. The seller of the swap is obligated to pay off what is owed to the buyer in case the issuer of the security defaults on their payments. Credit default swaps are traded over the counter and prices are denoted in spreads. The spread of a CDS is the annual amount the buyer must pay the seller over the length of the contract, expressed as a percentage of the notional amount. The payments are made on a quarterly basis and continue until either the contract defaults or the underlying obligor defaults.

R**atings and CDS data**

Out of the S&P 500, we were able to collect data on rating changes and CDS spreads from fifty-eight different corporations that experienced a Moody's downgrade since 2004 from a random sample of two hundred large corporates. Included in the data collection was the date of the rating change, the original rating, the new rating, the CDS spread 11 days prior to the rating change, and the CDS spread 60 days after the rating change. Out of the fifty-eight, fifty-four rating event data points ere used for the purpose of this study. We eliminated the bottom and top five percent of data because they were determined to be outliers after analyzing descriptive statistics and looking at the mean and median of the data. Therefore, the twenty-six ratings events occurred before January 1st, 2008 and

twenty-eight rating events took place after January 1st, 2008. Ratings data were retrieved from Moody's ratings service and CDS data were obtained from 10-year senior debt of the respective corporations from DataStream. The spreads were recorded eleven days before and sixty days after the Moody's ratings announcement date.

Understandably, CDS spreads of financial corporations will have a different reaction to a Moody's downgrade given the nature of the economic crisis. These spreads may react stronger to a downgrade especially amidst investor fears and speculation during the turbulence of 2008. Three corporations from the post-crisis dataset are financial corporations; JP Morgan, XL Capital Ltd, and Prudential Financial Inc. Only Prudential Financial Inc. had a large enough worrisome spread change of -652.715. Fortunately, this observation is dropped in the initial filtering of our dataset. Changes in the results are negligible after removing two other financial firms.

Another concern with our data involves the change of some ratings from investment grade to junk bonds. This is essentially a downgrade from Baa3 to Ba1 or lower. Out of our data points, seven occur in the pre-crisis set and two occur in the post-crisis set. Since the significance of such a downgrade would most likely be captured in the CDS spread and possibly intensify the change, we may be subjected to upwardly biased data; however, due to the limited number of these types of downgrades, we think that our findings will be robust to this potential bias.

IV. Methodology

In order to test whether spread changes were conditional on these Moody's ratings events, we mimicked the methodology of Hull et al. (2004) by using the bootstrap technique adapted from Efron and Tibshirani (1993). First, however we calculated the t-statistic of the sample and compared it to the t-distribution. We took the change in spread before and after the ratings announcement as $s_1, s_2, \ldots, s_n$ where the average spread change was $\bar{s}$ and the standard deviation of $s_1, s_2, \ldots, s_n$ was $\hat{\sigma}$. To test whether the mean spread change was greater than zero, we subtracted $\bar{s}$ from s_n. Therefore, our null hypothesis was that $\bar{s}$ equals zero and is not different from the mean of zero. Our alternative hypothesis was that $\bar{s}$ is significantly different than zero based on a sample distribution. We hoped to reject the null hypothesis with a significant enough of a t-statistic $t = \sqrt{n}\left(\frac{\bar{s}}{\hat{\sigma}}\right)$ distribution of $\tilde{s}_i = s_i - \bar{s}$ for i=1… n. With the understanding that our data may not follow a t-distribution, we used the bootstrap method to create our own distribution and measure our initial t-value against this new distribution. To do this, we sampled n times with replacement from the null distribution and calculated the t-statistic and repeated this 1000 times. The resulting distribution gave us a more realistic distribution for t. By comparing the t-statistic with the appropriate percentile of this distribution, we could see the likelihood of achieving such a t-value and whether the changes in the spread were statistically significant.

V. Results & Findings

For the pre-crisis data, the calculated t-value was -.3457. After comparing this statistic to the bootstrap distribution, this value fell into the 30^{th} percentile. Given this, the changes

in the spread were not statistically significant given the change in ratings. Even more, the direction of the change was opposite of what was anticipated; however, we did not find this sign to be indicative due to the lack of significance of the test. Post-crisis, the t-value was 1.29123 and significant in the 10^{th} percentile. This result indicated that this change in spread only had less than a 10% chance of occurring, suggesting that Moody's downgrades had influence over the spread movement, using an alpha of 0.1. Please refer to Exhibit 1 for descriptive statistics of the change in spread. Overall, the t-value of the complete set was -.1024, which fell between the 50^{th} and 25^{th} percentile of the bootstrap distribution.

Exhibit 1: Descriptive statistics, $\bar{S}$

$\bar{S}$	Number of Observations	Mean	Standard Deviation
Whole Sample	54	-1.89	135.16
Pre-crisis	26	-13.06	192.67
Post-crisis	28	8.49	35.42

Exhibit 2: t-statistics and p-values

Pre-Crisis		Post-Crisis		Overall	
t	p-value	t	p-value	t	p-value
-.3457	.3	1.29	.1	-.1024	.4

V.I Interpretations: Pre-Crisis

Considering the t-value presented about for the pre-crisis data set, we concluded that the null hypothesis failed to be rejected. This means that the CDS spread changes did not

change in a significant way, considering the rating action. There are a variety of potential causes for these results. Firstly, this could indicate that symmetric information actually does exist in this market, and rating agencies do not provide extra information that the market has not already accounted for in the CDS spread change; however, completely symmetric information in any market that involves this much information and incentives to keep information proprietary and private seems unlikely.

Another possible cause for these results is that the credit risk was already known to the market and was already priced into the CDS spreads outside of the date range of our data. This could be the case if press releases, news, outlooks, warnings, or other informational releases affected the spreads before the rating change dates. This type of early information has been shown to affect the information absorption in the market by some of the previous literature mentioned above, meaning that it could be a viable cause for not seeing the absorption of information into the market during our spread change date range; however, if this were the case, this does not mean that rating agencies are not useful, but merely that other information either form outside the agency or from within the agency beat the actual rating change action to the market. A potential flaw to this interpretation is the fact that we did not observe any of these potential informational outlets outside of the specific downgrade rating action, so we cannot make a statistically significant claim about these events. Additionally, without having this data, we cannot be sure how many of the rating events were preceded by other information. Nevertheless, due to previous literature and the commonality of rating warnings and outlooks prior to actual rating

changes, one could comfortably attribute outside information as at least a partial cause for the insignificant result in our pre-crisis data.

On a similar note, another cause for the observed results could be that we could not observe the CDS spread change because it happened far before rating change and before the 11 day threshold represented in our data. Once again, this seems unlikely due to the fact that most previous literature has supported this time range and because the study that we based our methodology off of used this time range to find significant results. Therefore, it would be difficult to assume that any change in CDS spreads due to the downgrade action happened prior to the 11 day starting mark or after the 60 day end mark that we chose.

In addition, the results in the pre-crisis data could be attributed to a causality issue. This would suggest that rating changes might not only cause CDS spreads to change, but also CDS spread changes could cause a rating action to occur. However, this would only be true on the assumption that the market knows information before rating agencies, therefore, causing the rating agencies to base rating downgrades off of the market. Although this may happen in some certain random instances, the idea of this happening on average across hundreds of firms seems highly unlikely due to the private nature of companies mentioned earlier and their incentive to keep valued information private from the market and competitors.

Additionally, CDS spreads could be a poor proxy for information absorption from market, which could then cause an insignificant result due to a measurement issue. If CDS spreads do not actually measure the market understanding the information released by the rating agencies, then the changes in CDS spreads would not reflect any rating action changes, whether positive or negative. However, we do not think that this is the case due to support in this area from previous studies. Many studies have statistically found CDS spreads to be a proper proxy for this information absorption and have also found results for this type of study by using CDS spreads.

Finally, the findings could be a result of our limited sample size. Furthermore, the study may not have been able to replicate the market on average due to the limited available data, which ultimately forced insignificant results; however, the reason why our results are most likely robust to a potential sample size problem will be discussed in full in the Limitations Section.

Contrarily, the results from our data could cause some doubt due to the fact that they are contradictory to previous literature. Although this is not cause to deem our results as useless or incorrect, this does urge us to do further studies or repeat this study with a different random sample for robustness. Additionally, the results may seem questionable due to the fact that it contradicts the theory that rating agencies were highly trusted before the financial crisis, due to the fact that there was no reason not to trust them beforehand and their reputation had not yet been tarnished by the crisis or lawsuits that followed

2008. Once again, this urges us to pursue additional studies in order to attempt to replicate our findings before making final conclusions.

V.II Interpretations: Post-Crisis

The statistically significant t-value produced from the post-crisis data means that the null hypothesis could be rejected for the alternative hypothesis; this means that rating agencies provided relevant information to the market to produce significant changes in CDS spreads after the financial crisis.

One potential interpretation for these results is that rating agencies procured information about companies that was not obvious to the market and was appropriately captured within the dates of the CDS spread collection. This would be a practical reasoning considering that asymmetric information would likely exist in this market due to the proprietary nature of the information as well as the sheer mass of information that is available or necessary to be learned.

Further support for the post-crisis results are that the market may be more sensitive to any negative information about market after the crisis, producing more drastic adjustments and causing more significant changes in spreads. In order words, the market may have become most risk-averse following the crisis and would, thereby, see any downgrade event as a far more negative event that it was when they were in a risk-neutral position before the crisis. Additionally, due to the accusation of agencies padding ratings before the crisis, the public may have seen a downgrade to a company as a highly negative

situation if the rating agencies were still padding the ratings at all. This could then cause the market to be more sensitive to downgrades and produce CDS spread changes that were outside the norm or status quo (no rating change) when a downgrade occurred.

Additionally, companies may have had to become more transparent to rating agencies due to new regulations after the crisis, which could lead the public to think that rating agencies became more value due to the additional information gained from said transparency. If companies were legally obligated to reveal much more information than before the crisis, and the public was aware of this forced transparency to rating agencies, then this could explain the change from an insignificant change in CDS spreads to a significant change in CDS spreads after the financial crisis. Due to the fact that these legal obligations were documented in the news, one could assume that this reasoning could be a partial factor for the significant results in the post-crisis data.

Further support for these results are the fact that ratings themselves, instead of providing information, are also used to provide a benchmark in contracts and to incentivize firms to act in the best interest of shareholders and not take on excessive risk. Therefore, in this case, a downgrade could have large negative implications about a firm's incentives and performance. If a firm is properly incentivized to perform and to not get downgraded but is still downgraded, then the negative consequences of this downgrade could be far greater than a different rating action before these contracts were in place. Considering that these contracts became highly prevalent after the financial crisis, this could be another potential reason for the significant results in the post-crisis data.

Contrarily, some concerns involving our results are potential selection issues with downgraded companies. Since the only companies that were used in this study were companies that experienced a downgrade, we may have been more likely to see firms that were already viewed negatively by the market due to their inclination to experience a downgrade. However, our study's robustness to this potential selection issue will be further discussed in the Limitations Section below.

VI. Limitations

When taking the results of this study into account, one must also consider the limitations to our study, which were as follows: small sample size, limited available data, a lack of controls, and potential for selection issues.

VI.I Sample Size

When conducting this study, a fairly limited sample size of company data was used. After eliminating outliers, as mentioned above, 26 observations were used for the pre-crisis hypothesis testing and 28 results were used for the post-crisis hypothesis testing. In any study, one prefers the largest sample size possible in order to predict a value that is most accurate to the true population; therefore, when the size of the sample (n) gets closer to the true population size (N), the distribution of observations in the sample gets closer and closer to the true distribution of the population. Typically, a study like this should have at least 30 observations for pre-crisis and post-crisis, but ideally, a much greater sample size in order to make sure that the distribution of samples is an accurate

representation of all of the companies in the market with rating changes during those time periods; however, due to the lack of availability of data as well as time constrictions, this study did not reach the ideal sample size.

Nonetheless, the results in this study should still be thoughtfully considered due to the methodology that we undertook to try to combat the small sample size. Instead of assuming a standard t-distribution, something that many studies may do with larger sample sizes, we used the bootstrap method mentioned above to essentially build a distribution and measure the probability of our results against that distribution. Since the distribution of results was created by drawing samples from our data with replacement one thousand times, the bootstrapping method hopefully built a distribution that more accurately reflected the true underlying distribution of our model, alleviating the problem of an unknown distribution caused from a small sample size.

In addition, we used a t-test in this study to further combat the small sample size problem. A t-test is built for sample sizes that are less than 30 (the accepted number of samples necessary to produce a normal distribution or use a z test), therefore, we hoped that the t-test would further allow for accuracy within the constraints of our sample.

VI.II Limited Available Data

When completing this study, our data collection methods were restricted to the available databases within the Washington University in St. Louis campus. Therefore, the only way that we were able to collect that data points that we needed was by searching

Moody's website for the rating changes and rating change dates and searching DataStream for the corresponding CDS spreads. Due to our source constriction, we were limited to collecting data for the companies that had available data on Moody's *and* DataStream. The reason why this may be problematic is because the version of DataStream that was available to us only had CDS spreads with a history of 10 years and did not include many companies that were originally in our randomly selected group of companies. Therefore, our data may have been susceptible to a bias in that it only includes companies that fit the necessary description to be included in the DataStream database; however, we did not see any sort of clear pattern as to the type of company that was listed on the database. Furthermore, we did find companies of many sizes and various industries; therefore, we believe that any bias due to the selection within the database is fairly minimal in the context of this study.

VI.III Lack of Controls

Due to the nature of the type of test that we decided to run in this study, we were unable to control for possible covariates or confounding variables in this study. Although this test was the standard practice for this type of study in previous literature, we believe that the accuracy of the results could have been increased if the test could have included some mechanism for controlling for outside factors. The following factors were our biggest concern in terms of not being able to control for their variation: the exact type of rating change in terms of the previous rating letters and post rating letters, the case of a downgrade from investment grade to junk bonds, and industry of the company of observation.

Not controlling for the type of rating change could be a potential problem in our study if the rating scale is not in an exact linear distribution; if this were the case, then a downgrade from an Aaa to and Aa1, for example, could be very different to the market than a drop from Aa1 to Aa2. By not taking into account the exact rating change in terms of the letter ratings, we may be making an assumption and fitting a strict linear model to our results that is not actually representative of the reality of a rating change to the market.

Although this study does not incorporate the downgrades from investment grade to junk, we did have a number of data points that crossed this threshold. In the pre-crisis sample, seven securities had bond downgrade from investment grade to junk bonds. In the post-crises sample, only two securities were downgraded from investment grade to junk bonds. As past studies have suggested that a downgrade from investment grade to junk bonds has more of an impact on the market than any other type of downgrade. This is concerning, firstly, because of the previous point in that it could indicate that the rating scale is not distributed across a linear model and different rating downgrades could have systematically different impacts on the market. Secondly, this is concerning if our sample has an uneven distribution of investment grade to junk bonds downgrades to any other kind of downgrade. If we had predominately downgrades that went from investment grade to junk bonds, then our data might be upwardly biased because those types of downgrades have a far greater impact on the market. If the opposite were the case and we did not include any investment grade to junk bond downgrades, then our data

might not show the true impact of all types of downgrades on CDS spreads and could be downwardly biased. Ideally, we would have liked to have an even distribution of all types of rating changes and then do an additional test with just investment grade to junk bond downgrades; however, due to limited available data, as mentioned above, as well as time constraints, this was not a feasible option for this particular study.

Finally, we would have also liked to control for the type of industry each observation was in, especially considering the potential sampling bias created from the availability of data on DataStream. One might think that the nature of change and volatility of a CDS spread could depend on the industry that the company operates in; for example, a web company may procure a far greater reaction in terms of CDS spreads to a downgrade than a retail firm (this example is not founded in any data, but is merely used to demonstrate a potential issue). Furthermore, considering that we are looking at CDS spreads after the financial crisis, one may speculate that a downgrade to a financial firm could produce a change in a CDS spread due to the market's wariness of financial firms because of said crisis. Therefore, controlling for the type of industry could have allowed us to more accurately gauge the informational value of rating agencies by allowing us to solely look at the effect of a rating change on CDS spreads and taking out any co-variation that could be absorbed in that effect if not controlled for. However, considering that we only sampled two financial firms in this study as mentioned previously, we think that our results are fairly robust to this potential selection issue.

VI.IV Selection Issues

Additionally, our study may be subject to selection issues despite our random selection method. Although we randomly selected 64 companies out of 200 companies, we only selected companies with downgrades. In doing so, we may have encountered a sample selection problem where the riskier companies were the ones that had readily available information on downgrades and could have more volatile CDS spreads. This could be the case if downgrades from rating agencies were uncommon or there was a low probability of a downgrade to the majority of companies being rated. However, considering the fact that companies are constantly under review and are all subject to the same economy that could drive profitability and stability within the company, downgrades may happen to enough companies that the companies that are getting downgraded are not any riskier over time and overall as a company than companies without rating changes, but simply riskier in that select period. This is also supported by the fact that many companies that we observed downgrades for also had many upgrades in different time periods. Furthermore, firms that have CDS traded on their bonds tend to only be larger firms which are typically less risky.

In addition, the type of companies that are more likely to downgrade before and after the crisis might be different and this likelihood could be represented in our sample. For example, we may have been able to find more data on finance companies because they may have been more likely to suffer from a downgrade post crisis, but they may also have been more likely to produce a more skeptical reaction from the market due to the financial crisis in terms of the CDS spread and volatility of that spread. The selection

issue could, thereby, be worsened by an interaction with an industry effect. Therefore, the type of company that we were able to find data on could have affected our results and may not have been representative of the market. However, companies in the pre-crisis group and post-crisis group seem to represent a similar variety of industries, hopefully making our results robust to this type of selection bias.

VII. Future Studies

Some ideas for future studies in this subject area are to repeat this study with a larger sample size, attempt the difference-in-difference method instead of a bootstrap t-test method to get a new perspective on the results and verify the latter method, and changing the focus from differences in effects of rating changes in the pre-crisis period and post-crisis period to differences in the effects of rating changes before and after the recent S&P lawsuit.

VII.I Increase Sample Size

Repeating this study with a larger sample size could make the results robust to the limitations mentioned above and would make the results easier to generalize to a larger amount of companies.

VII.II Difference-in-Difference Method

Instead of the bootstrap and t-test method, it might be interesting to attempt a difference-in-difference analysis in order to test for statistical significant differences in treated vs. control group, while being able to control for covariates. The treatment group would be

the companies with a rating change and the control group would be companies that did not experience a rating change in that given time period. The dependent variable would be the change in CDS spread, and the independent variables could include rating change, dummy variables for the industry of the company, the rating change in terms of the letter values, and dummy variable for whether the event happened in the pre-crisis period or post-crisis period. This study could be a way to navigate around the lack of controls limitation mentioned earlier due to the bootstrap t-test method and could be a way to verify the current, accepted research on this topic with a new method. In addition, a difference-in-difference model would be a good way to look across an event like a crisis, which is an supplement that our paper added to the current research, more thoroughly and compare the results in a more statistically significant way.

VII.III New Event: S&P Lawsuit

Instead of looking at effects of rating changes and potential differences in those effects in the pre-crisis and post-crisis periods, one could create a more recent study that is more relevant to today's view on rating agencies by looking at the same type of data in our study but with a time period of before and after the S&P lawsuit. Ultimately, this would allow the researcher to discover if a publicized lawsuit would have an effect on the informational value of rating agencies.

VIII. Conclusion

After considering the results to this study, as well as the possible limitations, one can safely assume that rating agencies do provide information to the market, but there may

also be other sources that the public looks to for information. Additionally, this study suggests that rating agencies may have become more influential after the financial crisis. This could be due to tighter regulations on rating agencies because of the blame placed on them for their part in the financial crisis. This implication could also be due to the increased transparency required from companies to rating agencies that was a result of the crisis. However, the various limitations in our study require follow up studies as a necessary step to add robustness and assurance to the findings of this study. Overall, this study indicates that asymmetric information is always going to exist in most markets, but rating agencies are one effective means of mitigating this problem.

As mentioned earlier, this study is especially interesting considering the recent S&P lawsuit that has been unveiled by the United States government. This lawsuit emphasized the misaligned incentives that caused rating agencies to inaccurately bump up ratings of CDOs; seeing that this information has been officially broadcasted to the public through this law suit, it will be interesting to see the implications of this law suit to the future of rating agencies. This lawsuit further demonstrates the dynamic aspect of rating agencies, considering their dependence on reputation and public acceptance, and how the effect of rating agencies on CDS spreads may change over time as various events occur in the market.

Appendix 1

Pre-crisis ratings dates and changes

Name	Moody's Rating Date	Moody's Prior Rating	Moody's Current Rating
BOSTON SCIENTIFIC CORP	4/21/2006	Baa1	Baa3
CITIGROUP INC	11/5/2007	Aa1	Aa2
COMPUTER SCIENCES CORP	6/28/2007	A3	Baa1
CONSTELLATION BRANDS	3/1/2007	Ba2	Ba3
CONSTELLATION ENERGY GRP INC	7/11/2006	A3	Baa2
COOPER TIRE & RUBBER CO	8/3/2006	Ba3	B2
DANA HOLDING CORP	3/2/2006	B3	Caa3
DELTA AIR LINES INC	2/17/2004	B1	B3
DOMINION RESOURCES INC	3/29/2006	Baa1	Baa2
ELECTRONIC DATA SYSTEMS CORP	7/15/2004	Baa3	Ba1
GENERAL GROWTH PPTYS INC	11/23/2004	Baa3	Ba1
JONES GROUP INC	9/27/2007	Baa3	Ba1
NEW YORK TIMES CO -CL A	5/25/2006	A2	Baa1
ORACLE CORP	3/21/2007	A2	A3
OWENS-ILLINOIS INC	2/19/2004	B1	B2
PIONEER NATURAL RESOURCES CO	1/6/2006	Baa3	Ba1
ROHM AND HAAS CO	8/17/2007	A3	Baa1
SABRE HOLDINGS CORP -CL A	4/6/2007	Baa3	Caa1
SEARS HOLDINGS CORP	11/16/2005	Baa2	Ba2
TENET HEALTHCARE CORP	11/2/2005	B2	B3
WILLIAMS COS INC	11/15/2007	Baa2	Baa3
INTERPUBLIC GROUP OF COS	4/5/2006	Ba1	Ba3
UNITEDHEALTH GROUP INC	10/17/2006	A2	A3
XL Capital LTd	11/22/2005	A2	A3
CENTEX CORP	10/11/2007	Baa2	Ba1
KIMBERLY-CLARK CORP	10/30/2006	Aa2	Aa3
KERR-MCGEE CORP	4/14/2005	Baa3	Ba3
BOSTON SCIENTIFIC CORP	7/24/2007	Baa3	Ba2
PEPCO HOLDINGS INC	7/11/2006	Baa2	Baa3
TECO ENERGY INC	2/10/2004	Ba1	Ba2

Appendix 2

Post-crisis ratings date and changes

Name	Moodys date	Moodys Prior Rating	Moody's Current Rating
RADIOSHACK CORP	7/25/2012	B1	B3
WELLS FARGO & CO	3/25/2009	Aa3	A1
WEATHERFORD INTERNATIONAL	10/14/2010	Baa1	Baa2
RADIOSHACK CORP	7/25/2012	B1	B3
MGIC INVESTMENT CORP/WI	3/20/2008	A1	A2
CONSOL ENERGY INC	3/22/2010	Ba2	Ba3
ASHLAND INC	11/14/2008	Ba1	Ba2
UNIVISION COMMUNICATIONS INC	8/11/2008	B1	B2
BRUNSWICK CORP	2/20/2012	Ba3	B1
CONSOL ENERGY INC	3/22/2010	Ba2	Ba3
KINDER MORGAN INC	4/14/2008	Ba1	Ba2
DELL INC	2/5/2013	A2	Baa1
BELLSOUTH CORP	1/29/2013	A2	A3
LOUISIANA-PACIFIC CORP	2/27/2008	Baa3	Ba2
MBIA INC	11/19/2012	B3	Caa2
EASTMAN KODAK CO	1/5/2012	Caa2	Caa3
JPMORGAN CHASE & CO	1/15/2009	Aa2	Aa3
VULCAN MATERIALS CO	11/13/2008	A2	Baa2
PITNEY BOWES INC	4/23/2012	A2	Baa1
UNITEDHEALTH GROUP INC	1/9/2008	A3	Baa1
XL Capital LTd	2/1/2008	A3	Baa1
DEAN FOODS CO	12/18/2007	Ba3	B1
BORGWARNER INC	3/18/2009	Baa3	Ba1
TEXTRON INC	1/20/2009	Baa1	Baa2
PRUDENTIAL FINANCIAL INC	3/18/2009	A3	Baa2
KELLOGG CO	2/15/2012	A3	Baa1
DANA HOLDING CORP	12/18/2008	B2	Caa1
DANA HOLDING CORP	6/5/2009	Caa1	Caa2

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