A Study of Differences in Standard & Poor's and Moody's Corporate Credit Ratings

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I. INTRODUCTION

Since the recent credit crisis and the downgrade of United States sovereign credit rating, there has been a lot of focus on understanding the implications and relevance of credit ratings. Credit ratings are letter designations assigned by credit rating agencies which evaluate the credit worthiness of a debtor (a company in the case of corporate credit ratings) based on its ability to pay back debt and the likelihood of default. Standard & Poor's (S&P) and Moody's are the two biggest and most important Nationally Recognized Statistical Rating Organizations (NRSRO) and their ratings are widely used for both regulatory and investment purposes. While both agencies have equivalent rating grades (ranging from AAA to D for Standard & Poor's and Aaa to C for Moody's) and most investors/regulators/analysts treat these ratings as the same, there are indeed subtle differences in what the credit ratings for the two agencies measure. Whereas S&P ratings are the agency's opinion on the likelihood or probability of default by a corporate or sovereign, Moody's ratings are based on *expected losses*, reflecting both on the likelihood of default and expected financial losses in the event of default (Loss Given Default).

"*Long-term ratings are assigned to issuers or obligations with an original maturity of one year or more and reflect both on the likelihood of a default on contractually promised payments and the expected financial loss suffered in the event of default.*"[1] (www.moodys.com)

"*Some agencies incorporate recovery as a rating factor in evaluating the credit Rating issuers and issues quality of an issue, particularly in the case of non-investment-grade debt. Other agencies, such as Standard & Poor's, issue recovery ratings in addition to rating specific debt issues.*"[2] (www.understandingratings.com)

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1. "Rating Symbols and Definitions"
http://www.moodys.com/researchdocumentcontentpage.aspx?docid=PBC_79004
2. "Guide to Credit Rating Essentials"
http://img.en25.com/Web/StandardandPoors/SP_CreditRatingsGuide.pdf

The NRSROs rate bonds, loans and other shorter term debt issuances, as well as the issuing firm itself. This study will focus on analyzing whether the claimed differences in rating methodologies are actually reflected in the issuer corporate credit ratings for long term senior unsecured debt. A statistical comparison of credit ratings from the two agencies segmented by industry sectors has been analyzed to see whether there are any clear biases or differences between them. In case the different methodologies are being strictly followed, it would be expected that Moody's ratings should be different than S&P ratings for industry sectors with historically high recovery rates (low Loss Given Default) or low recovery rates (high Loss Given Default) in the event of default. On the other hand, no significant differences across industry sectors would indicate that the stated rating methodologies are not being followed. While the initial expectation would be that Moody's ratings should be higher for high recovery sectors and worse for low recovery sectors, other factors such as one agency being more or less conservative in its ratings, or having a higher or lower recovery expectation across all industries could significantly alter the results. In all cases though, clear differences in trends across sectors from the ratings comparison would indicate that the ratings from the two agencies are not equivalent and should actually not be treated equally.

II. DATA SELECTION

Current credit ratings from both Standard & Poor's and Moody's are readily available from various electronic data sources, like Bloomberg, Thomson Reuters and others, for both corporate and sovereign credits. Since features like covenants, security and embedded options in individual bond issuances can affect the credit ratings, only *issuer ratings* have been used to keep the rating comparison at the same seniority level across firms. For Moody's, this is the Senior

Unsecured Debt rating while for S&P, this is the Long Term Foreign Currency Issuer Credit rating. For this study, the dataset has been limited to only large cap US firms, as these are analyzed much more deeply and frequently by the rating agencies. Smaller firms may not have dedicated credit analysts covering the names and differences in ratings might be partially due to stale ratings than actual differences in rating methodologies.

To get a subset of firms to compare, the Russell 3000 index has been chosen. This index covers the largest 3000 US companies representing approximately 98% of the investable US equity market. The main concern here is that the universe of firms which are rated by both S&P and Moody's is much smaller than the universe of firms with publicly traded corporate debt issuances (which is not unexpected as the marginal benefit of getting rated by another agency is not high and the costs of getting rated, even though not substantial, is still significant). Only 728 of the three thousand firms in the index had credit ratings from both rating agencies as of December 15, 2012. The proportion is understandably higher for the S&P 500 index (355) given the higher trading volumes and importance of the names. This study has used historical ratings (as of December 15 for each year from 2006 to 2012) for the same set of firms to enlarge our set of data points considerably and refine our analysis. Clear trends and differences across an entire credit cycle would provide an even more compelling argument for any conclusion reached.

III. METHODOLOGY

Since letter ratings cannot be easily analyzed by statistical methods, numbered ranks from 0 to 20 have been assigned to each rating notch starting with AAA/Aaa assigned as 0. Accordingly, a higher number represents a lower rating and lower credit strength. The difference in ranks, or the rating gap, helps in measuring the number of notches that an issuer's ratings by

the two agencies differ from each other. For this paper, a positive rating gap represents a higher S&P rating (better credit quality) compared to Moody's rating. For example, if an issuer is rated B3 by Moody's (equivalent to B-) and B+ by S&P (equivalent to B1), the rating gap is +2. On the other hand, if an issuer is rated A1 by Moody's (equivalent to A+) and BBB+ by S&P (equivalent to Baa1), the rating gap is -3.

Table 1: Ranking chart for S&P and Moody's ratings

Investment Grade		
Moody's	**S&P**	**Rank**
Aaa	AAA	0
Aa1	AA+	1
Aa2	AA	2
Aa3	AA-	3
A1	A+	4
A2	A	5
A3	A-	6
Baa1	BBB+	7
Baa2	BBB	8
Baa3	BBB-	9

Non-investment Grade		
Moody's	**S&P**	**Rank**
Ba1	BB+	10
Ba2	BB	11
Ba3	BB-	12
B1	B+	13
B2	B	14
B3	B-	15
Caa1	CCC+	16
Caa2	CCC	17
Caa3	CCC-	18
Ca	CC	19
	C	19
C	D	20

Since the rating levels do not necessarily progress linearly, our ranking system is an imperfect measure but it is still useful to indicate the presence of trends. In addition, statistical tests designed for ordinal scale data are used to further confirm these trends. The first test used was an unpaired difference of means test (Welch's test) to test the null hypothesis that the average rating by the two agencies are equal. Rejection of the null hypothesis would indicate that the average ratings from S&P and Moody's do differ significantly from each other. This test does not assume any dependence among the distribution of S&P and Moody's ratings. But since we have ratings from the two agencies for the same set of firms, a paired test would be more relevant and powerful for our dependent dataset. Accordingly, a paired difference test (dependent

t-test) was also used to test the null hypothesis that the average ratings from both agencies do not differ significantly. Both tests assume a cardinal dataset and as such are not perfectly appropriate for use with our ranking system. The issue with ordinal datasets is that we know that AAA is better than AA+ but we don't know by how much it is better. Because of this, a non-parametric statistical test (Wilcoxon signed-rank test) was also used to test whether the median rating from the two agencies differ. Running the tests for the overall sample and for individual industry sectors helped us to find trends in differences in credit ratings. The same tests were then extended to a period running from December 15, 2006 to December 15, 2012 to check whether the observed trends persisted throughout the credit cycle or were a more remote temporary trend.

IV. RESULTS

Table 2: Summary Statistics for Moody's (M) and Standard & Poor's (S) ratings
This table shows the summary comparison of Moody's and S&P ratings by industry as of December 15, 2012

Industry	Average rating gap[1]	Average time gap[2]	Std Dev of rating gap	Average M rating	Average S rating	Std Dev of M rating	Std Dev of S rating	# of firms
Basic Materials	0.37	-0.20	0.66	9.27	8.90	2.75	2.56	51
Communications	0.26	-0.02	1.17	9.82	9.56	3.56	3.25	50
Consumer, Cyclical	0.74	0.53	1.19	10.86	10.12	3.58	3.06	109
Consumer, Non-cyclical	0.66	-0.27	1.18	9.48	8.82	3.71	3.31	138
Energy	0.69	-0.33	0.87	11.59	10.90	3.78	3.23	83
Financial	0.09	0.17	1.14	8.11	8.02	2.69	2.62	94
Industrial	0.63	-0.65	1.05	9.36	8.73	3.31	2.81	117
Technology	0.18	-0.23	1.00	8.46	8.28	3.64	3.06	39
Utilities	0.53	1.44	0.88	8.32	7.79	1.90	2.07	47
All Firms	**0.52**	**-0.03**	**1.09**	**9.61**	**9.10**	**3.50**	**3.09**	**728**

1. A positive number represents a higher/better S&P rating compared to Moody's rating
2. Difference between rating dates in years; e.g. +1.5 means Moody's assigned their current rating one and a half years before S&P assigned their current rating

Looking at the sample, it was clear that both overall and industry-wise S&P had a higher average rating than Moody's. For the overall sample, the average S&P rating was more than half a notch higher (better credit quality) than the average Moody's rating. One possible explanation would have been that one the rating agency has a lag in assigning ratings causing a trend towards higher ratings in case credit quality for all corporates was on average decreasing over the sample period. To make sure that this trend was not due to a mismatch of rating assignment dates, the rating dates were also compared between the two agencies. While for some sectors, Moody's had assigned ratings earlier on average than S&P, for other sectors the trend was the opposite. For most sectors, the timing gap was less than half a year. The only exceptions were Industrial (where S&P had assigned ratings 0.65 years earlier on average than Moody's) and Utilities (where Moody's had assigned rankings 1.44 years earlier on average than S&P). In both of these sectors the large timing gap is more due to outliers with almost a decade in timing gap. For the entire sample, the average timing gap was close to zero and would not have been a major factor in the observed trend.

The results of the three tests to see whether the differences were actually statistically significant are shown in Table 3. The p values indicate the probability of obtaining the observed test statistic assuming the null hypothesis is true. E.g. a Z score of 1.65 and p value of 5% is significant at the 0.05 level. Similarly, we can reject the null hypothesis with 99% confidence level for a p value of 1%.

Table 3: Tests scores and significance values for the statistical tests

This table shows the results of statistical tests for significant differences between Moody's and S&P ratings

	Unpaired difference of means test / Welch's test			Paired difference test / Dependent t-test			Wilcoxon signed-rank test for medians		
Industry	**t score**	**d.f.[1]**	**p value[2]**	**t score**	**d.f.**	**p value**	**W[3]**	**z score**	**p value**
Basic Materials	0.71	99	24.01%	4.02	50	0.01%	210	3.19	0.07%
Communications	0.38	97	35.18%	1.57	49	6.20%	125	1.50	6.74%
Consumer, Cyclical	1.65	211	5.04%	6.52	108	0.00%	1,825	5.45	0.00%
Consumer, Non-cyclical	1.56	270	6.03%	6.56	137	0.00%	2,925	5.51	0.00%
Energy	1.26	160	10.52%	7.20	82	0.00%	1,239	5.33	0.00%
Financial	0.22	186	41.32%	0.72	93	23.59%	178	0.69	24.60%
Industrial	1.58	226	5.81%	6.53	116	0.00%	1,938	5.67	0.00%
Technology	0.24	74	40.72%	1.12	38	13.39%	61	0.98	16.30%
Utilities	1.30	91	9.91%	4.14	46	0.01%	296	3.36	0.04%
All Firms	**3.00**	**1,432**	**0.14%**	**12.86**	**727**	**0.00%**	**73,436**	**13.53**	**0.00%**

For the overall sample, the average rating was lower for Moody's as compared to S&P at a significance level of 0.01 (for both the dependent t-test and the signed-rank test) showing that Moody' had more conservative ratings than S&P. Most of the industries also had statistically significant differences between Moody's and S&P. The only exceptions were the Communications, Financial and Technology sectors (where the difference was not statistically significant). These three sectors are traditionally lower recovery industries[4]. Due to the nature of these industries, they traditionally have a lower proportion of physical hard assets which can be sold to recover losses after default. Most of the value in these industries lie in soft and intangible assets which result in a lower recovery rate. Again the trend was observed in both the dependent t-test and the Wilcoxon signed-rank test.

1. Degrees of freedom
2. Probability of obtaining the observed test statistic assuming the null hypothesis is true
3. Test statistic equal to the absolute value of the sum of the signed ranks
4. References [3], [4], [5] & [6]

Table 4: Summary of historical data

This table shows the number of firms with ratings available from both agencies for the different years

	Average rating gap	Number of firms with data available						
Industry	**Dec-12**	**Dec-12**	**Dec-11**	**Dec-10**	**Dec-09**	**Dec-08**	**Dec-07**	**Dec-06**
Basic Materials	0.37	51	49	46	42	41	40	37
Communications	0.26	50	48	42	39	36	34	34
Consumer, Cyclical	0.74	109	101	96	89	83	83	79
Consumer, Non-cyclical	0.66	138	128	116	100	92	87	85
Energy	0.69	83	72	61	55	47	43	38
Financial	0.09	94	90	86	81	79	77	71
Industrial	0.63	117	111	104	94	91	89	83
Technology	0.18	39	32	26	20	19	17	15
Utilities	0.53	47	47	47	44	42	41	40
All Firms	**0.52**	**728**	**678**	**624**	**564**	**530**	**511**	**482**

Table 4 shows that there were 728 firms in our initial dataset. For this initial dataset, the historical ratings were taken for December 15 of 2006 to 2012 and the same tests were run for the different years. The number of firms, as time becomes more remote, was less due to some firms not having ratings earlier (by one or both the agencies). The results of the tests are shown in Table 5 and Table 6.

The trends observed as of December 2012 were also present in the historical ratings from 2006 to 2012. The overall sample had consistently significant differences and high test statistics showing in the last six years Moody's had consistently more conservative rankings. The higher recovery sectors continued to show statistically significant lower Moody's ratings. The only exception was the Energy sector for which December 2006 ratings were not significantly different. Communications, Financial and Technology sectors had non-significant differences in the ratings, except for 2006 and 2007 for Communications and 2007 for Financials sector when

they were significantly different. Apart from these instances, the trends were persistent throughout the years.

Table 5: Historical dependent t-test results

This table shows the t-test scores and p values for the different years

	Paired difference test / Dependent t-test scores						
Industry	**Dec-12**	**Dec-11**	**Dec-10**	**Dec-09**	**Dec-08**	**Dec-07**	**Dec-06**
Basic Materials	4.02	4.11	2.58	2.37	3.98	2.83	2.71
Communications	1.57	0.80	1.32	1.48	0.81	2.03	2.72
Consumer, Cyclical	6.52	6.59	7.26	6.34	4.96	5.82	4.18
Consumer, Non-cyclical	6.56	7.20	6.90	7.01	5.92	5.47	5.59
Energy	7.20	8.26	6.68	5.78	4.64	3.69	1.03
Financial	0.72	-0.42	-0.24	-0.47	-0.48	-2.03	-0.54
Industrial	6.53	6.42	5.46	5.81	5.43	5.63	5.80
Technology	1.12	-0.72	-1.27	0.00	0.25	-1.14	-0.62
Utilities	4.14	3.99	3.70	3.79	2.30	3.24	2.31
All Firms	**12.86**	**11.88**	**11.02**	**10.65**	**9.57**	**8.99**	**8.62**

	Paired difference test / Dependent t-test p-values						
Industry	**Dec-12**	**Dec-11**	**Dec-10**	**Dec-09**	**Dec-08**	**Dec-07**	**Dec-06**
Basic Materials	0.01%	0.01%	0.66%	1.12%	0.01%	0.37%	0.52%
Communications	6.20%	21.42%	9.63%	7.37%	21.10%	2.53%	0.52%
Consumer, Cyclical	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Consumer, Non-cyclical	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Energy	0.00%	0.00%	0.00%	0.00%	0.00%	0.03%	15.49%
Financial	23.59%	33.70%	40.37%	32.12%	31.53%	2.29%	29.49%
Industrial	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Technology	13.39%	23.73%	10.75%	50.00%	40.20%	13.47%	27.28%
Utilities	0.01%	0.01%	0.03%	0.02%	1.34%	0.12%	1.30%
All Firms	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**

Table 6: Historical Wilcoxon signed-rank test results

This table shows the z scores and p values for the different years

	Wilcoxon signed-rank test for medians z score						
Industry	**Dec-12**	**Dec-11**	**Dec-10**	**Dec-09**	**Dec-08**	**Dec-07**	**Dec-06**
Basic Materials	3.19	3.32	2.38	2.13	3.17	2.49	2.37
Communications	1.50	0.79	1.16	1.23	0.79	1.76	2.31
Consumer, Cyclical	5.45	5.36	5.73	5.15	4.21	4.73	3.67
Consumer, Non-cyclical	5.51	5.94	5.58	5.58	4.97	4.60	4.75
Energy	5.33	5.69	4.95	4.50	3.71	3.09	1.02
Financial	0.69	-0.53	-0.42	-0.73	-0.47	-1.90	-0.49
Industrial	5.67	5.34	4.65	4.89	4.59	4.72	4.81
Technology	0.98	-0.59	-1.12	-0.02	0.21	-1.06	-0.63
Utilities	3.36	3.30	3.07	3.09	2.23	2.73	1.98
All Firms	**11.26**	**10.39**	**9.83**	**9.55**	**8.52**	**7.95**	**7.62**

	Wilcoxon signed-rank test for medians p value						
Industry	**Dec-12**	**Dec-11**	**Dec-10**	**Dec-09**	**Dec-08**	**Dec-07**	**Dec-06**
Basic Materials	0.07%	0.04%	0.87%	1.66%	0.08%	0.63%	0.89%
Communications	6.74%	21.57%	12.36%	10.92%	21.37%	3.91%	1.04%
Consumer, Cyclical	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.01%
Consumer, Non-cyclical	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Energy	0.00%	0.00%	0.00%	0.00%	0.01%	0.10%	15.48%
Financial	24.60%	29.87%	33.80%	23.16%	31.78%	2.90%	31.18%
Industrial	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Technology	16.30%	27.66%	13.04%	49.11%	41.79%	14.54%	26.31%
Utilities	0.04%	0.05%	0.11%	0.10%	1.28%	0.32%	2.39%
All Firms	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**

The same trends were also observed in the historical signed rank tests. Apart from the four instances, both the overall sample and individual industries continued to show the same trends. Lower recovery sectors did not have a statistically significant difference in median ratings

while other sectors had a significant difference in median ratings with Moody's ratings being lower.

V. CONCLUSION

This paper analyzed the ratings from Moody's and S&P to study biases and trends between the two rating agencies. The results were both encouraging and surprising at the same time. The most important result was that Moody's ratings have been consistently lower than S&P ratings. The difference were not only statistically significant but were also present continuously throughout the last credit cycle. As suspected, there are clear biases in the ratings for different industry sectors which are apparent in the difference in average ratings. But what was contrary to expectation was that high recovery sectors, like industrials and utilities, show a lower Moody's ratings while low recovery sectors, like financials and technology, show almost converging ratings. Again factors like one agency being overall more lenient or conservative or having different rating policies for different industries may be the reason for this.

Overall, it appears that Moody's has a consistent bias towards a lower rating as compared to S&P. This trend is particularly distinct for a few industry sectors like Consumers and Industrials. While the gap appears to be small (within one notch), the observed differences could be very meaningful, particularly for the lower ranges of investment grade securities. A move into non-investment grade can have a very large impact on bond yields because of the ratings constraints for a large set of investors. Since the financial crisis of 2008-2009, a lot of firms have lower investment grade ratings, which makes the results even more important. It is therefore imperative for investors, regulators and analysts to note that the two ratings are not equivalent and should not be treated as the same.

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