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The Response of Bond Prices to Insurer Ratings Changes

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This paper examines the impact of insurer ratings changes on bond prices. Using insurer ratings from four major rating agencies and data covering the recent financial crisis period, we document that downgrades have a strong negative price impact on bond prices, especially when the downgrades are reinforced by multiple agencies. In contrast, the announcement-day impact of upgrades is found to be weak. Our evidence is consistent with the predictions of structural credit risk models.
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Introduction

News of rating changes on corporate debt issues is one of the most closely followed events in financial markets. The underlying mechanism through which asset prices are influenced is based on the information theory of financial markets. This theory posits that investors possess imperfect information about the companies in which they invest.[1] The presence of information asymmetries in the marketplace elevates the importance of external monitoring of rating agencies whose role is to uncover new information about the firm's performance and communicate this to outside investors.[2] Not surprisingly, therefore, the motivation of prior research on bond rating changes has been to determine whether rating agencies provide superior pricing-relevant information that investors cannot obtain from other publicly available sources. Recent studies have focused on the issue of whether changes in ratings convey information not already incorporated into prices from other sources.[3] The results from these empirical studies, in general, provide support for the influential role of ratings agencies on security prices.

The purpose of this study is to examine the impact of insurer rating changes on bond prices. Insurance companies provide an interesting case study for this analysis. This is because, unlike other firms, there are a multitude of industry participants—policyholders, investors, regulators, brokers/agents—who rely on insurer ratings for their decisions. One of the main objectives of insurer rating agencies is to provide an opinion on the insurer's insolvency risk, since this has implications for the firm's ability to meet its obligations

[1] E.g. Loss (1983); Loss and Seligman (2001).
[2] Doherty *et al.* (2012).
[3] See Hand *et al.* (1992); Dichev and Piotroski (2001); Hull *et al.* (2004).

to policyholders and its ability to raise capital in financial markets. The recent backdrop of the financial crisis has led insurance regulators worldwide to place renewed attention on the solvency and risk management of insurance companies.[4] Therefore, the ability of insurance firms to pay claims and generate a healthy return on investments is of concern to both policyholders and investors. As an additional factor, specific to insurance companies, consumers are often obligated to choose insurance coverage based on the company's ratings; and therefore, not surprisingly, the judgments of ratings agencies influence an insurer's competitive position. Finally, ratings can either strengthen or weaken the bargaining power of reinsurance firms seeking to contract with primary insurers.[5]

In this paper, we examine the impact of insurer rating changes on bond prices from the four major insurer rating agencies—A.M. Best, Fitch Ratings, Moody's Investors Service and Standard and Poor's (S&P). Insurer ratings have been traditionally used as measures of insolvency risk and financial quality. They differ from bond ratings in notable ways: there are no regulatory requirements to obtain insurance ratings; the insurer financial strength ratings assess the overall claims-paying ability to meet its ongoing insurance policy and contract obligations, as opposed to a bond rating that applies only to a particular debt issue; and there is some evidence of greater divergence of opinion among insurer ratings than bond ratings.[6]

The information provided by multiple insurer ratings resources has long been recognised as critically important by various market participants—insurance agents/brokers, consumers, investors, and regulators.[7] The market for insurance ratings was largely dominated by A.M. Best until the late 1980s when other agencies with a long history of rating corporate and government debt entered the insurance ratings market. Pottier and Sommer[6] examine determinants of insurer financial strength ratings and differences in ratings across various ratings agencies (A.M. Best, Moody's and S&P), while controlling for potential sample selection bias. Their study finds that *ex ante* uncertainty about a firm's insolvency risk (as proxied by leverage), size, capitalisation and investment exposure to speculative-grade bonds, are some variables that are significant in determining ratings. Importantly, the rating agencies are found to differ systematically in terms of the relative weight they place on various factors (Adams *et al.*[8] provide similar evidence in the U.K.). The authors note that the growing complexity of insurance businesses with multiple business lines as well as relative high levels of reinsurance are likely to be associated with ratings from multiple agencies.

The ratings differences across ratings agencies and their information content has been examined recently by Doherty *et al.*[2] They show that a new entrant's rating standards may be significantly different from those used by the incumbent agency and conclude that new

[4] The European Union's Solvency II Directive is an example of a recent regulatory initiative that carries both direct and indirect implications for the insurance industry. The Directive is intended to streamline the way insurance companies are supervised by recognising the economic reality of how the enterprise operates.

[5] Theis and Wolgast (2012).

[6] Pottier and Sommer (1999).

[7] See for example, Pottier and Sommer (1999); Doherty and Phillips (2002); Adams *et al.* (2003); Halek and Eckles (2010).

[8] Adams *et al.* (2003).

entrants have incentives to require higher standards relative to the incumbent rating agency in order for a firm to achieve a similar rating.

To the best of our knowledge, this is the first study that attempts to measure the response of bond prices to announcements of insurer ratings changes. Our emphasis on bonds stands in contrast with studies that examine equity price reaction. Structural default models predict that if the value of a firm's assets is an increasing function of equity prices, a deterioration in credit quality is expected to negatively impact both equity and debt claims.[9] In contrast, the asset substitution theory predicts that the response of shareholders to ratings information will be opposite to that of bondholders.[10] Specifically, in response to a downward revision of an issuer's risk, bondholders who are senior claimants benefit at the expense of shareholders who hold residual claims on the firm's cash flow. The empirical evidence by Goh and Ederington[11] partially support both these theories. They find that rating downgrades associated with deteriorating financial prospects convey new negative information to both sets of investors. However, downgrades related to increased financial leverage will result in wealth transfer from bondholders to stockholders.

An additional significant contribution of our study is that we use transaction-level daily bond prices in our empirical investigation. This feature can be contrasted with prior studies that draw their conclusions based either on equity market evidence alone or rely on relatively low-frequency non-transaction bond prices that may mask the true underlying price effects from rating changes.[12] One of the obvious difficulties with conducting bond research is that, unlike equity markets that disseminate continuous pre-trade and post-trade information, corporate bonds trade primarily over-the-counter (OTC) and, until recently, lacked a centralised system of collecting and reporting secondary market transactions information. For instance, May[13] attributes the mixed evidence in the bond market price response literature to the poor quality and availability of bond price data. Public dissemination of investment grade security prices began with the introduction of the *Trade Reporting and Compliance Engine* (TRACE) system in 1 July 2002,[14] and this coverage was later expanded in February 2005 to include almost all public transactions. The introduction of TRACE, therefore, provides researchers a new avenue for exploring the pricing behaviour of an important market segment that has largely escaped the kind of scrutiny that equities markets attract.

Presaging the results, we find that insurer downgrade events are strongly associated with negative excess returns on the day of the announcement. On the other hand, the announcement-day impact of upgrades on bond returns is muted and is not statistically significant. The results also reveal differential price responses among "single" events (i.e. rating downgrade by only one rating agency on the same day or in close time proximity for the same insurer), "multiple" events (i.e. rating downgrade by at least two agencies on the same day for the same insurer), and "sequential" events (i.e. rating downgrade from one agency followed by

[9] See Merton (1974) and Black and Cox (1976).
[10] See Kliger and Sarig (2000).
[11] Goh and Ederington (1993).
[12] See Hite and Warga (1997).
[13] May (2010).
[14] TRACE reporting initially applied to a group of only 498 bonds with issuance size of $1 billion or greater, and it required National Association of Securities Dealers (NASD) member to report all corporate bond transactions to the TRACE system within 75 minutes of the transaction.

a similar rating change from another agency in close time proximity for the same insurer). We find that investors are most sensitive to downgrades that are characterised as "multiple" or "sequential" events. Finally, over the entire sample period and across all ratings events, ratings changes by Fitch Ratings are found to elicit the largest market-adjusted price reaction.

The rest of the paper is structured as follows. The next section provides a brief review of the related literature. The subsequent two sections explain the data and the methodology, respectively. This is followed by a discussion of the empirical results, and the final section concludes the study.

Literature review

Several studies examine the impacts of bond ratings changes on security prices. Using Standard & Poor's (S&P) and Moody's ratings, Holthausen and Leftwich[15] and Hand *et al.*[16] show that daily stock and bond returns are sensitive to bond rating changes. Notably, they document an asymmetric reaction of security returns to downgrade and upgrade announcements. Bond downgrades are associated with significantly negative abnormal stock and excess bond returns, whereas bond upgrades are associated only weakly with stock and excess bond returns. Such asymmetric reaction reflects the asymmetric consequences a company faces in the event of a bond rating change: downgrade announcements can potentially have more severe consequences than upgrade announcements.[17] Dichev and Piotroski[18] extend the analysis to examine the long-run stock returns following bond ratings changes. They find substantial negative abnormal returns following downgrades, and this underperformance persists up to three years after the announcement. Similar to prior studies they find no reliable abnormal returns for stocks with upgrades. Wansley *et al.*[19] confirm the strong negative effect of downgrades (but not upgrades) on bond returns during the period just before and just after the announcement. Their study concludes that negative excess returns are positively correlated with the number of rating notches changed and with prior excess negative returns. Goh and Ederington[11] further suggest that only certain types of bond rating downgrades will negatively affect the stock price due to the non-homogeneous rationale underlying bond rating downgrades.

The *sui generis* nature of the insurance industry has provoked specific interest in evaluating the potential impact of insurer ratings changes. Singh and Power[20] examine the impact of insurer rating changes by A.M. Best on associated insurance company stock prices and find insignificant stock price reactions to both upgrades and downgrades announcements.[21] More recently, Halek and Eckles[22] examine insurer rating pronouncements by three

[15] Holthausen and Leftwich (1986).
[16] Hand *et al.* (1992).
[17] Epermanis and Harrington (2006).
[18] Dichev and Piotroski (2001).
[19] Wansley *et al.* (1992).
[20] Singh and Power (1992).
[21] This conclusion is drawn from early A.M. Best ratings (1980–1988) during which the A.M. Best ratings were arguably based primarily on publicly available information and introduced little new information to financial markets. Subsequently, beginning in the early 1990s, A.M. Best reformed its rating system and significantly improved the informational contents of its ratings.
[22] Halek and Eckles (2010).

credit agencies—A.M. Best, S&P and Moody's—for the period 1993 to 2003 on insurance companies' stocks. The authors document that insurer rating downgrades are associated with an approximately 7 per cent stock price drop; in contrast, insurer rating upgrades have a nugatory impact. Their findings are broadly consistent with the general stock market evidence relating to bond rating changes and are indicative of the predictive ability of insurer rating downgrades on insurer insolvency[23] and the pressure among insurers to maintain or improve their existing ratings.[24] The results from these studies imply that rating agencies have proprietary information regarding insurance companies and the insurance market is not strong-form efficient.

We seek to distinguish ourselves from the existing literature in the following ways. First, unlike previous insurance studies that consider only the stock price reaction, we examine the impact of insurer ratings changes on the company's bonds. Second, we examine more recent data for the period 2005 to 2010 and track insurer rating downgrades from all the major "Big Four" rating agencies—A.M. Best, Fitch Ratings, Moody's and S&P's. Notably, the sample period encompasses the financial crisis, a tumultuous period during which the ratio of negative rating changes to positive rating changes reached new highs. We expect that the heightened market uncertainty elevates the informational relevance of rating agencies to various interested parties including policyholders, investors, regulators, brokers/agents. Given the higher propensity of downgrades in our sample period and prior evidence associating higher information content with downgrades relative to upgrades, we expect rating downgrades to have a relatively larger impact than upgrades. Finally, we provide evidence on the differential price impact of "single" versus "multiple" ratings events on bond prices.

Sample description

We start with ratings announcements provided by the Big Four ratings agencies for all publicly trading insurance companies during the period of 2005–2010. We rely on the overall "group" rating for an insurer and carefully create a one-to-one correspondence between the insurance firm and its rated affiliated companies. This sample is narrowed further to identify companies that have at least one or more outstanding bonds with transaction information available in the Financial Industry Regulatory Authority's (FINRA) Trade Reporting and Compliance Engine (TRACE) database. This yields a study sample of 58 publicly traded insurance companies that are rated at least once by one of the four rating agencies during the sample period. A large portion of the sample is represented by property/casualty and life/health types of insurance companies, each accounting for about 25 per cent of the sample. The remaining companies comprise multi-line insurance, reinsurance, medical HMOs and financial guarantee insurance firms. *Bloomberg* is the source for the insurer ratings information, and bond prices are obtained from TRACE.[25]

A summary of the various credit rating events is reported in Table 1. There are total of 621 credit events in the study sample—260 from A.M. Best, 90 from Fitch Ratings, 104 from Moody's and the remaining 167 from S&P. Events are further categorised according to the

[23] Pottier (1998) and Pottier and Sommer (1999).
[24] Doherty and Phillips (2002).
[25] The ratings data is also compared with the SNL dataset for accuracy.

Table 1: Summary of the rating changes from all four agencies

	A.M.Best				*Fitch*				*Moody's*				*S&P*				*Combined*			
	DN	*NC*	*UP*	*TT*	*DN*	*NC*	*UP*	*TT*	*DN*	*NC*	*UP*	*TT*	*DN*	*NC*	*UP*	*TT*	*DN*	*NC*	*UP*	*TT*
2005	5	55	4	65	5	4	1	10	2	7	2	11	2	12	5	20	16	78	12	106
2006	7	47	3	57	1	2	4	7	1	3	3	7	5	14	11	30	14	66	21	101
2007	1	28	7	36	1	9	4	14	0	14	2	16	5	10	7	22	7	61	20	88
2008	12	33	1	46	8	13	0	21	11	18	0	29	16	14	4	34	47	78	5	130
2009	6	15	1	22	15	6	0	21	13	10	0	23	23	11	1	35	57	42	2	101
2010	5	22	8	35	2	15	0	17	4	13	1	18	9	14	4	27	20	64	13	97
Overall	36	200	24	260	32	49	9	90	31	65	8	104	60	75	32	167	161	389	73	623
Percent	14%	77%	9%	100%	36%	54%	10%	100%	30%	63%	8%	100%	36%	45%	19%	100%	26%	62%	12%	100%

Notes: DN: Bad news (downgrade ratings); NC: No news (stable ratings); UP: Good news (upgrade ratings); TT: Total.

Table 2: Bond data description

Year	*Number of Bonds*	*Number of Issuers*	*Average Number of Bonds per Company*	*Bonds with Less than 25% Trading Days*		*Bonds with between 25% and 50% Trading Days*		*Bonds with between 50% and 75% Trading Days*		*Bonds with more than 75% Trading Days*	
				Number	*Per*	*Number*	*Per*	*Number*	*Per*	*Number*	*Per*
2005	1,168	52	22.46	1,003	85.87%	78	6.68%	41	3.51%	46	3.94%
2006	1,318	54	24.41	1,127	85.51%	101	7.66%	45	3.41%	45	3.41%
2007	1,727	52	33.21	1,535	88.88%	106	6.14%	48	2.78%	38	2.20%
2008	1,962	50	39.24	1,756	89.50%	91	4.64%	61	3.11%	54	2.75%
2009	1,816	50	36.32	1,496	82.38%	138	7.60%	86	4.74%	96	5.29%
2010	1,589	55	28.89	1,196	75.27%	159	10.01%	96	6.04%	138	8.68%

type of rating change experienced on the announcement date: “Good news” corresponds to a ratings upgrade (UP), “Bad news” corresponds to a ratings downgrade (DN), and “No news” corresponds to “No change” (NC) in the ratings since the prior pronouncement. Table 1 shows that the majority of the events are “no news” events accounting for 62 per cent of all events across the different ratings agencies in the sample. There are 26 per cent “bad news” and 12 per cent “good news” events from the four rating agencies. Not surprisingly, we find that a substantial number of downgrades occur in 2008 and 2009, corresponding to the financial crisis when insurance companies were in the throes of severe liquidity and credit shocks. For instance, we find nearly two thirds of the S&P downgrades occur in 2008 and 2009.

Table 1 also provides additional insights about insurer ratings from different rating agencies. The majority of credit events (260) are associated with A.M. Best, which illustrates the dominant position of the rating agency in the insurer ratings market. A.M. Best has the widest coverage of insurance rating events, followed by S&P (167) and Moody’s (104). Fitch Ratings has the smallest rating events coverage (90) in the insurer financial strength ratings market. There is also substantial variation in the ratings movements across different insurers for the sample period. For instance, downgrades account for 14 per cent of A.M. Best rating events; whereas, they represent about 30 per cent for Moody’s, and 36 per cent for S&P and Fitch Ratings, respectively. In contrast, upgrade ratings are lower and range from 8 per cent accounts for Moody’s to 19 per cent for S&P. It is interesting to observe that while S&P, Moody’s and Fitch all have significant increases of rating events in 2008 and 2009, A.M. Best’s rating events appear to be more stable throughout the years.

Table 2 presents some descriptive information about bonds analysed in our sample. For example, the second column titled “Number of Bonds” indicates that there are totally 1,168 bonds which have at least one transaction in 2005 reported in the TRACE database. During our sample period, the average number of bonds per insurance company varies between 22.46 (in 2005) and 39.24 (in 2008). Interestingly, the period marking the financial crisis, 2007–2009, witnessed a relatively greater number of bond observations than the other years. It should be noted that although the TRACE dataset contains a large set of bonds issued by insurers, most of them are found to be not actively traded. The relative illiquidity of these bonds is illustrated by calculating the number of transaction days in the sample for each year.

A transaction day is defined as a day during which a bond has one or more transactions recorded in the TRACE database. Table 2 shows that a large majority of the bonds have fewer than 25 per cent transaction days, or trade less than 63 transaction days in a regular year with about 252 trading days. Only 2.20 per cent (year 2007) to 8.68 per cent (year 2010) of the bonds have reported transactions in more than 75 per cent of the trading days in a year.

Therefore, given the relative illiquidity of bond transactions it would be inappropriate to rely on the closing or last transaction price to calculate returns, as it may result in biased return estimates. Therefore, following the common approach in the literature[13] we calculate the daily value-weighted average prices using the par amounts of each transaction as weights when there are multiple transactions for a given bond on a given date.[26] The bond returns in our study are then the logarithm returns using the daily value-weighted average "clean" prices adjusted for the accrued interest since the last coupon payment.[27]

Do insurer ratings changes matter?

This section provides preliminary evidence of the impact of ratings changes on bond returns. It is important to note that when an insurer experiences significant financial relief or stress, it is likely to receive similar confirmatory rating changes from more than one agency on the same day (defined as "multiple" events) or in close time proximity (defined "sequential" events). The insurer ratings changes by more than one agency serve to reinforce the positive or negative information contained in the ratings and confirm the "good" or "bad" news to investors. Because of the special significance attached to insurer ratings changes by more than one agency, such events are held out for separate analysis.

In our sample we find that there are a total of eight multiple downgrade events, i.e. when a firm is downgraded by more than one rating agencies on the same day. In order to identify sequential events we use a 10-day window when a firm's ratings are changed by two or more different agencies. There are 22 sequential downgrade events. For example, on February 27, 2009, *Hartford Financial Services Group*, *Inc.* was downgraded by S&P. Subsequently, in a span of four days, this firm received another downgrade from A.M. Best on 3 March 2009. In this case, the second downgrade event is counted in the "sequential" downgrade group. Our sample does not yield any multiple or sequential upgrade events.

As alluded to earlier, some of the questions we raise are: Do rating events matter? Is the impact of single rating events different from multiple and sequential rating events? We provide some preliminary insights into these questions in Table 3 in the form of daily return statistics on the event day for all ratings events across the different agencies for the overall sample period (Panel A) and for single/multiple/sequential events separately (Panel B). Note, in conducting the analysis we construct a "clean" study sample by removing return observations that exhibit dramatic movements (outliers) of more than ±50 per cent. This results in the elimination of 3,024 daily observations, or about 0.91 per cent of all observations. This yields the full sample that includes both rating events and the remaining days in the sample period.

[26] A similar approach is used by *Bloomberg* to calculate bond index prices.
[27] See Bessembinder *et al.* (2009) and Ederington *et al.* (2012).

Table 3: Summary statistics of bond returns

Panel A: Overall sample, all events

Statistics	*Full Sample*	*A. M. Best Rated*			*Fitch Rated*			*Moody's Rated*			*S&P Rated*		
		DN	*NC*	*UP*	*DN*	*NC*	*UP*	*DN*	*NC*	*UP*	*DN*	*NC*	*UP*
Mean (%)	0.12	−3.28	0.68	−0.01	−4.99	2.52	−0.45	−2.65	−1.12	−0.18	−3.56	−0.88	−0.23
Std. Dev. (%)	4.51	10.44	5.92	1.9	12.88	11.86	1.3	12.02	9.27	0.82	10.86	14.94	3.20
Max (%)	50	21.38	48.5	6.36	24.65	48.51	2.65	43.29	46.83	1.55	31.03	48.51	15.39
Min (%)	−49.96	−47.97	−43.28	−3.3	−47.97	−49.05	−2.85	−48.21	−48.7	−1.52	−47.97	−49.05	−9.02
Skewness	−0.16	−2.3	2.83	2.02	−1.37	0.81	0.25	−1.42	−1.35	0.21	−1.74	−0.08	1.01
Kurtosis	36.16	6.02	29.66	5.72	1.87	6.06	1.59	4.11	9.41	0.33	4.34	2.26	7.69
Observation	325,687	377	686	29	252	601	16	476	619	15	486	649	74
Mean Difference Test													
Z-Statistics		−6.32***	2.48***	−0.37	−6.30***	4.96***	−1.75*	−5.03***	−3.33***	−1.42	−7.47***	−1.71*	−0.94

Panel B: Single event days, multiple bad news days and sequential bad news days

Statistics	*Single*													
	A. M. Best Rated			*Fitch Rated*			*Moody's Rated*			*S&P Rated*			*Dup*	*Seq*
	DN	*NC*	*UP*	*DN*	*NC*	*UP*	*DN*	*NC*	*UP*	*DN*	*NC*	*UP*	*DN*	*DN*
Mean (%)	0.05	−0.20	−0.03	0.41	−0.23	−0.71	−0.84	0.25	−0.31	−0.59	−1.09	−0.46	−9.96	−1.68
Std. Dev. (%)	4.65	2.80	1.93	7.14	2.05	1.08	11.64	4.57	0.59	7.24	5.81	2.66	15.88	8.28
Max (%)	21.38	11.58	6.36	24.65	7.30	0.64	43.29	46.83	0.51	29.88	31.71	6.00	19.30	31.03
Min (%)	−43.75	−35.39	−3.30	−27.48	−12.20	−2.85	−47.50	−22.21	−1.52	−26.39	−35.00	−9.02	−47.97	−45.16
Skewness	−3.36	−4.74	2.01	−0.59	−1.23	−1.06	−1.00	1.90	−0.87	−0.56	−0.83	−0.86	−0.82	−1.68
Kurtosis	43.06	53.06	5.54	6.67	5.78	0.39	4.91	28.61	1.26	5.11	9.25	1.78	−0.29	6.95
Observation	197	586	28	74	321	12	181	435	9	154	351	72	113	337
Mean Difference Test														
Z-Statistics	−0.21	−2.76***	−0.41	0.35	−3.05***	−2.66***	−1.11	0.59	−2.18***	−1.22	−3.90***	−1.85*	−6.75***	−3.99***

Notes: Single event days are the days when one firm is only downgraded by one agency and there is no other downgrade rating from the same or other agencies in the previous ten day period. Dup: Multiple downgrades by different agencies on the same day. Seq: Downgrades which occur within ten days of a previous downgrade by the same or other agencies. DN: Bad news (downgrade ratings); NC: No news (stable ratings); UP: Good news (upgrade ratings); *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

Examining Panel A (for all events), the full study sample (column "Full Sample") has a daily mean return of 0.12 per cent and a standard deviation of 4.51 per cent, with skewness and kurtosis of −0.16 and 36.16, respectively. Next, for each rating agency, we extract average returns for insurers on all event days so we may compare them with the full sample. Furthermore, returns for single event (column "Single") downgrades are reported separately in Panel B (for separate events). Finally, the last two columns of Panel B report return characteristics for "multiple" and "sequential" downgrade events. The mean difference Z-statistic tests the null hypothesis that the difference between the mean returns from downgrades of each testing sample and the full study sample is zero. The Z-statistic given by: $(\bar{r}_T - \bar{r}_F)/\sqrt{\frac{s_T^2}{n_T} + \frac{s_F^2}{n_F}}$, where $\bar{r}_T$ and $\bar{r}_F$ are means of returns in the testing sample and the full study sample, and S_T and S_F are the corresponding standard deviations.

Examining Panel A, we find negative mean returns uniformly across all downgrade days and ratings agencies: −3.28 per cent (A.M. Best), −4.99 per cent (Fitch), −2.65 per cent (Moody's) and −3.56 per cent (S&P). The corresponding standard deviations for downgrades range between 10.44 per cent and 12.88 per cent. In addition, the downgraded insurance firms display negative skewness (between −2.3 to −1.37) and relatively high kurtosis (between 4.11 and 6.02). Several additional insights are noted. First, the Z-statistic indicates that for each rating agency, the mean returns from downgrades are statistically different from (or less than) the mean returns of the full sample. Second, observing Panel B, we find returns from single downgrades are statistically indistinguishable from returns from the full sample. For example, take the case of insurance companies that are downgraded by S&P and tagged as single events. The average daily downgrade returns for these firms is −0.59 per cent, which is not statistically different from the full sample returns of 0.12 per cent. It is also worth pointing out that this group of single events exhibits more variability relating to skewness (−0.59 to −3.36) and kurtosis (4.91 to 43.06). Third, comparing the two panels, results highlight the importance of separating single event days from multiple and sequential event days. For example, the effect of single events on bonds issued by A.M. Best-downgraded insurers is 0.05 per cent (statistically insignificant) compared to −3.28 per cent (statistically significant at the 99 per cent level) for all downgrades by A.M. Best rating. This suggests that, perhaps, investors are not fully convinced by a rating change when it is issued by just one agency. The results for multiple and sequential downgrades are presented in the last two columns. By comparison, the average daily bond returns on multiple and sequential downgrade event days are −9.96 per cent and −1.68 per cent (both statistically significant at the 99 per cent level), respectively, and both are significantly different from the means of the full sample. Thus, there is strong evidence that investors are relatively more sensitive to multiple downgrades on the same day than single event bad news. Finally, looking at the sample of all downgrades, we find that rating downgrade announcements by Fitch Ratings (−4.99 per cent) and S&P (−3.56 per cent) are associated with larger negative bond returns on event days than A.M. Best or Moody's, and the difference between Fitch Ratings and other rating agencies are statistically significant at the 90 per cent level

It is somewhat surprising to find that ratings pronouncements from Fitch Ratings elicits the largest price response, when A.M. Best is the ratings agency that is most commonly associated with insurance firms. The recent study of Doherty *et al.*[2] on the effect of competition between credit rating agencies may shed some light on this finding. The authors posit that, for a given rating by an incumbent ratings agency, new ratings firms often require higher standards.[28] Therefore, it is possible that the larger price reaction to Fitch Ratings (a relatively late entrant to the insurer ratings market) is a reflection of the market's recognition of these differences.

In contrast, the results from evaluating "good news" and "no news" events are tenuous and seem to be contingent on the agency making the ratings pronouncement. For instance, the mean returns for "good news" events are between −0.23 per cent (S&P) and −0.01 per cent (A.M. Best), and between −0.88 per cent (S&P) and 2.52 per cent (Fitch) for "no news" event days, and notably they are not statistically different from the benchmark full sample. Interestingly, the return behaviour associated with "no news" is found to be both positive and negative based on the ratings agency making the announcement. It is also worth noting that we find bonds are more active on "bad news" days than on "good news" and "no news" days (results not reported). For example, there are on average 10.19 bonds with at least one transaction for the A.M. Best "bad news" event days, compared to the corresponding 1.20 and 3.43 bonds for the A.M. Best "good news" and "no news" event days. Similar patterns are evident for other rating agencies.

In summary, the results from Table 3 indicate that insurer rating downgrades do matter to bondholders, especially if the downgrades are reinforced by multiple agencies. We find no such strong and compelling evidence for upgrades. It is important to keep in mind that results reported in this section provide only preliminary insights into the price reaction function, and strong conclusions may be drawn only after conducting a more rigorous event study analysis. Specifically, the event study methodology treats insurer rating changes as exogenous events and evaluates their impact on bond prices, net of measurable risk factors, across a range of days surrounding the event day.

Results from the event study

This section uses the event study methodology to measure and test the bond price reaction to insurer rating downgrades announcements. Our benchmark for a normal market return is the single index market model in which we employ the interest rates from 5-year T-note futures as the market proxy.[29] Bessembinder *et al.*[30] and Ederington *et al.*[31] use mean return on rating/maturity matched portfolio corresponding to individual bond as the market proxy. We find that the selection of the market proxy does not qualitatively change the results.

To calculate abnormal returns, a market risk-adjusted expected return for each security is estimated with the following specification:

$$R_{i,t} = \alpha_i + \beta_i R_{m,t} + \varepsilon_{i,t}, \tag{1}$$

where t=−300, …., −46 days (estimation period), $R_{i,t}$ is the return on bond i at time t, and $R_{m,t}$ is the return on the market proxy at time t. There is no standard convention in the literature for assigning an estimation window; however, most of them range between

[28] See also Pottier and Sommer (1999, p. 632).
[29] The results are essentially unchanged when alternative models are considered that include stock market proxies and additional Fama-French factors.
[30] Bessembinder *et al.* (2009).
[31] Ederington *et al.* (2012).

250 and 260 days in the estimation period, which roughly corresponds to the number of trading days in a calendar year.[32] We adopt a 255-day estimation period. The 46-day count is approximately the number of trading days in two months. We construct the estimation window in this manner so as to minimise possible misspecification in estimating the regression parameters.[33]

Subsequently, estimates of the daily abnormal or excess returns ($\delta^*_{i,t}$) for bonds are generated by subtracting the coefficients obtained in the estimation period from the actual returns during the event period. That is,

$$\delta^*_{i,t} = R_{i,t} - (\hat{\alpha}_i + \hat{\beta}_i R_{m,t}), \tag{2}$$

where $\hat{\alpha}_i$ and $\hat{\beta}_i$ are the ordinary least squares (OLS) parameter estimates obtained from Equation (1). Any significant difference between the actual return and expected return is considered to be an abnormal, or market risk-adjusted excess, return.

Excess returns are calculated for each issuing firm; they are then averaged for each day and cumulated over the relevant number of days in the event interval to generate the cumulative abnormal returns (CARs).[34] The daily average CARs are reported for various event windows and for the event date (indicated as [0, 0]). Inferences about CARs are drawn by testing the null hypothesis that the average excess return equals zero. If the null hypothesis is rejected, we can support the claim that insurer rating downgrade events have a statistically significant effect on the insurer's bonds.

In order to draw meaningful inferences from the results, the event study is run in two steps. In the first step, we analyse the overall effects of "good news", "bad news" and "no news" rating events as reported in Tables 4 and 5. In addition, we hypothesise that the announcement effect associated with insurer ratings changes will be more pronounced for firms that are subject to multiple and sequential rating changes. In order to test this proposition, in the second step, we re-examine the event study on two separate disaggregated samples. In the first sample we *exclude* multiple and sequential downgrade events and focus only on single ratings events. This is reported in Tables 6 and 7. In the subsequent step, we analyse the price response for a smaller subset of insurers subject to multiple and sequential downgrade events as reported in Table 8.

A summary evaluation of the overall event study results indicates that insurer ratings downgrades, across all rating agencies, are associated with statistically significant and negative abnormal returns. In contrast, results reveal little or no evidence of abnormal returns on day 0 following upgrades. Further analysis suggests that the price reaction is substantially stronger for downgrade events that are reinforced by multiple agencies. However, the results of "good news" and "no news" are mixed among the four agencies.

Impact of all ratings events

Event studies related to bonds are complicated due to the fact that one firm may have multiple bonds outstanding. Thus, sample selection is very important. In this study, we use

[32] See Cowan and Sergeant (1996); MacKinlay (1997).

[33] We also analyse the data to make sure that the estimation period is not contaminated by unrelated events.

[34] For given N events, the average abnormal returns is calculated as: $\overline{\delta}^*_t = \frac{1}{N}\sum_{i=1}^{N}\delta^*_{i,t}$, where $\delta^*_{i,t}$ is obtained from Equation (1). CAR during a time period τ_1 to τ_2 is calculated as: $\overline{CAR}(\tau_1, \tau_2) = \sum_{t=\tau_1}^{\tau_2}\overline{\delta}^*_t$.

Table 4: Event study results for the aggregated sample: Active bonds and stocks

Event Time	*A.M. Best*			*Fitch*			*Moody's*			*Standard & Poor's*		
	$\overline{CAR}_{(\tau_1,\tau_2)}$	*Z-Stat*	N^+:N^-	$\overline{CAR}_{(\tau_1,\tau_2)}$	*Z-Stat*	N^+:N^-	$\overline{CAR}_{(\tau_1,\tau_2)}$	*Z-Stat*	N^+:N^-	$\overline{CAR}_{(\tau_1,\tau_2)}$	*Z-Stat*	N^+:N^-
Panel A: Ratings downgrades: Most active bonds												
[−5,−2]	−0.97%	−0.85	8:11	−1.61%	0.01	9:09	−0.56%	−1.57*	8:14	−1.66%	−1.76*	12:17
[−2,+2]	−5.37%	−7.99***	7:15**	−5.39%	−7.49***	7:13*	−5.11%	−11.06***	9:15	−2.82%	−7.45***	9:23****
[−1,+1]	−5.10%	−10.16***	7:15**	−4.51%	−6.84***	7:13*	−5.12%	−12.01***	7:17**	−1.32%	−6.07***	11:21**
[−1,−1]	−2.13%	−4.98***	9:9	−1.43%	0.99	4:10**	−1.45%	−8.85***	10:8	0.15%	−0.95	13:12
[0,0]	−2.11%	−3.95***	10:12	−1.32%	−3.26***	10:10	−1.18%	−0.69	9:14	1.04%	−0.36	20:12
[+1,+1]	−1.52%	−9.32***	7:15**	−2.74%	−9.07***	6:14**	−3.67%	−12.83***	4:15***	−3.05%	−10.36***	9:17**
[+2,+5]	1.59%	3.97***	15:7**	0.93%	3.47***	8:11	−1.91%	−1.69*	6:17**	1.53%	1.54*	14:15
Panel B: Ratings upgrades: Most active bonds												
[−5,−2]	0.62%	−0.75	4:8*	−1.11%	−2.35***	0:7***	−2.14%	−1.87**	2:3	−0.32%	−0.19	4:4
[−2,+2]	−0.20%	1.35*	7:7	−0.67%	−1.29*	2:5	−2.88%	−1.61*	1:4*	0.77%	0.29	5:5
[−1,+1]	0.24%	1.22	7:7	−0.01%	−0.17	4:3	−2.55%	−1.60*	1:4*	1.32%	1.05	6:4
[−1,−1]	0.19%	−1.59*	3:5	0.07%	0.37	2:5	−1.04%	−0.74	2:3	0.42%	1.61*	3:0**
[0,0]	0.15%	1.64*	7:7	0.18%	0.60	5:2	0.20%	1.57*	3:2	1.27%	0.79	5:5
[+1,+1]	−0.05%	1.23	3:4	−0.30%	−1.47*	0:6***	−2.14%	−4.22***	1:3	−0.12%	0.0	4:2
[+2,+5]	0.20%	0.84	6:7	−0.15%	−0.58	3:4	−0.69%	−0.49	2:3	−0.49%	−1.13	4:5
Panel C: Stable ratings: Most active bonds												
[−5,−2]	−1.00%	−3.35***	42:66**	−0.99%	−2.69***	20:9**	−0.97%	−2.53***	23:23	−0.13%	−2.75***	16:21
[−2,+2]	−0.31%	−0.56	51:64	−0.70%	−1.25	16:18	−1.65%	−2.24**	23:26	−1.42%	−5.69***	21:20

Table 4 *(continued)*

Event Time	*A.M. Best*			*Fitch*			*Moody's*			*Standard & Poor's*		
	$\overline{CAR}_{(\tau_1,\tau_2)}$	*Z-Stat*	N^+:N^-	$\overline{CAR}_{(\tau_1,\tau_2)}$	*Z-Stat*	N^+:N^-	$\overline{CAR}_{(\tau_1,\tau_2)}$	*Z-Stat*	N^+:N^-	$\overline{CAR}_{(\tau_1,\tau_2)}$	*Z-Stat*	N^+:N^-
[−1,+1]	−0.06%	0.39	48:59	−1.76%	−2.47***	12:22**	−1.30%	−0.80	22:27	−2.46%	−6.12***	18:23
[−1,−1]	−0.48%	−2.99***	34:44	−1.89%	−9.44***	10:15	−0.89%	−0.73	19:19	−2.37%	−7.78***	11:22**
[0,0]	0.26%	2.41***	53:62	−0.10%	3.83***	17:16	0.61%	1.82**	24:24	−0.09%	−3.03***	21:19
[+1,+1]	0.01%	−0.12	34:39	−0.31%	−1.41*	18:11	−1.60%	−3.34***	18:19	−0.60%	0.36	15:17
[+2,+5]	−0.88%	−2.46***	23:58	0.40%	−0.51	13:18	−0.31%	−1.36*	19:28	0.62%	−1.1	19:21
Panel D: Ratings Downgrades: Stocks												
[−5,−2]	−1.76%	−0.48	17:19	−4.17%	−5.89***	13:19	−0.98%	−3.59***	18:13	−3.66%	−4.28***	24:36*
[−2,+2]	−9.74%	−6.60***	13:23*	−9.84%	−7.29***	11:21**	−10.56%	−8.24***	14:17	−9.20%	−11.58***	23:37*
[−1,+1]	−8.03%	−9.14***	13:23*	−5.01%	−5.42***	12:20*	−7.15%	−7.16***	12:19	−5.67%	−6.66***	18:42***
[−1,−1]	−2.84%	−5.24***	16:20	−0.37%	1.70**	17:15	−1.19%	−4.17***	20:11**	−0.19%	5.30***	30:30
[0,0]	−4.49%	−16.62***	14:22	−2.51%	−6.73***	15:17	−1.93%	0.49	14:17	−3.27%	−11.59***	23:37*
[+1,+1]	1.03%	7.48***	16:20	−2.13%	−4.37***	12:20*	−4.04%	−8.74***	10:21**	−2.21%	−5.25***	23:37*
[+2,+5]	0.32%	2.90***	18:18	5.52%	7.18***	20:12*	0.63%	2.22**	19:12*	−0.35%	1.95**	28:32

This table reports the event study results for the aggregated sample with the most active bonds issued by the insurers to create a one-to-one match between bonds and firms. In order to compare these results with a previous study, the table also reports corresponding results from downgrade rating events on stocks.

Notes: The Z-Stat values for $\overline{CAR}_{(\tau_1,\tau_2)}$ are based on a two-tailed test that the cumulative abnormal average returns are significantly different from zero.

N^+: N^- are the numbers of positive vs negative cumulative abnormal returns. The one-tailed test indicates whether the proportions of positive and negative cumulative abnormal returns are significantly different. *, **, *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

two different samples to conduct the analysis. First, to be comparable with event studies on equities, we construct a one-to-one matching sample (one bond for each company-event)[35] by selecting the most active bonds issued by firms subject to rating events. The most active bond is defined as the bond having the greatest number of transaction days during the estimation window. Table 4 provides results on the aggregated one-to-one matching sample containing downgrade, upgrades and no ratings changes from the four rating agencies. Panel A contains the most active bonds issued by firms subject to rating downgrades. The results clearly show that the impact of downgrade events on abnormal returns is negative and statistically significant. Downgraded insurers experience significant negative bond price reaction across most event windows. The cumulative average abnormal returns during the three-day window surrounding the event day (indicated by [−1, +1]) for the one-to-one matching sample of rating downgrades are uniformly negative and statistically significant at the 1 per cent level across all four agencies. The CAR values in the window [−1, +1] vary between −1.32 per cent (S&P) and −12.01 per cent (Moody's), with a highly significant Patell Z-statistic. Furthermore, the number of bonds with positive abnormal returns is significantly lower than the number of bonds with negative abnormal returns. The evidence confirms the importance of ratings agencies in providing new and relevant information to the marketplace. An evaluation of the pre-announcement [−5,−2] window suggests that excess bond returns are also negative, but not significant at the 5 per cent level. Interestingly, the abnormal bond returns are significantly negative in the immediate post-announcement window [+1,+1], indicating the presence of a delayed market response to the news releases.

Panel B of Table 4 presents the results of insurer ratings upgrade events. These results offer an interesting contrast to ratings downgrade announcements. Specifically, for upgrades we find the day 0 average abnormal returns to be smaller in magnitude, carry a positive sign, and not statistically significant at the 5 per cent level. Similar to downgrades there is some evidence of sign reversal in the post-announcement event period. Most of the Z-stat values are not significant at the 5 per cent level. In summary, the results indicate that the impacts of ratings upgrades on bond prices are not as strong as the impacts of downgrades.

Panel C of Table 4 presents the results of stable rating events for bonds. Beginning with the pre-event window, the average abnormal returns are mostly negative and statistically significant. This suggests that news of no ratings changes is viewed negatively by investors. For example, during the [−5, −2] window, the CAR is −1.00 per cent for A.M. Best, −0.99 per cent for Fitch, −0.97 per cent for Moody's, −0.13 per cent for S&P and all are significant at the 1 per cent level. Interestingly, on day 0, the announcement day, the CAR values are positive for A.M. Best (0.26 per cent) and Moody's (0.61 per cent), but negative for Fitch (−0.10 per cent) and S&P (−0.09 per cent).

The results for bonds are qualitatively similar to the stock price reaction that has been documented by Halek and Eckles[22] for the period 1993–2003. In order to draw an appropriate comparison we replicate their study to match our study's sample and time period. Table 4, Panel D reports the event study results for stocks. Comparing the results in

[35] It is not a true "one-to-one" matching sample due to the lack of transactions of bonds. For example, of the total of 36 A.M. Best downgrade events, the event studies only contain 22 events. For the other 14 events, we are not able to find transactions at the event day.

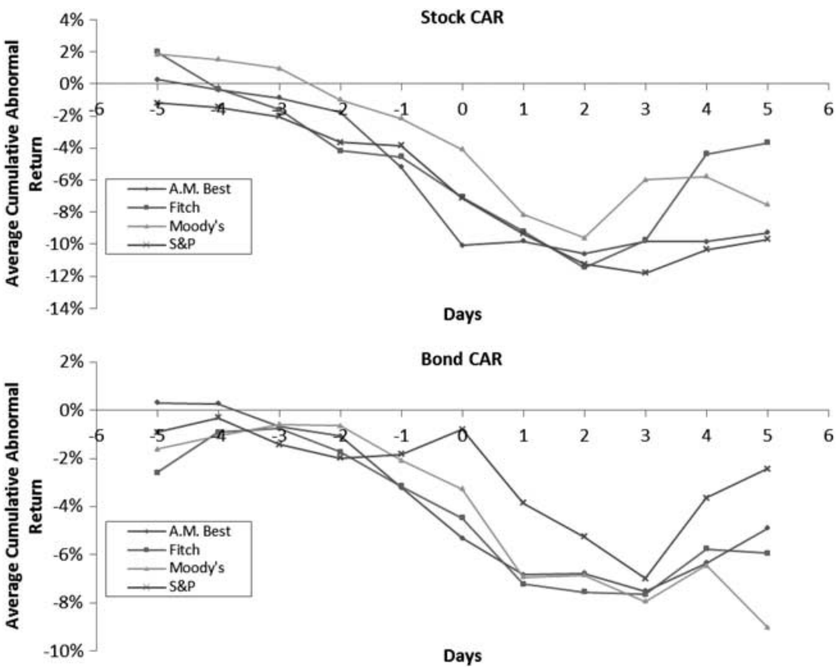

Figure 1. Cumulative abnormal return of bonds: Event window [–5,5].
Note: This graph presents the cumulative abnormal return of the most active bonds ("one to one" match issuer) in the event windows [–5,–5].

Panels A and D, we observe that both bonds and stocks respond to downgrade rating changes quite dramatically and in the same direction. Two important differences are evident. First, the day 0 excess returns are lower for bonds than stocks across all rating agencies. Second, there is some indication that stocks seem to anticipate the downgrade earlier than bonds, as evinced by the generally larger excess returns prior to day 0. Also, unlike Halek and Eckles,[22] our results do not show that ratings changes from A.M. Best generally yield stronger results in terms of CARs. For instance, CARs for stocks in the [–2, +2] windows are very similar across the four agencies (−9.74 per cent for A.M. Best, −9.84 per cent for Fitch, −10.56 per cent for Moody's and −9.20 per cent for S&P). Figure 1 shows the market model average cumulative abnormal returns of the downgrade events of both bond and stock from all four agencies. They look quite similar.

Although the most active bonds could be good representatives of the overall bond sample, we believe that a study that considers the average responses across all bonds for each insurer may provide additional value. Panels A, B and C of Table 5 provide results on the aggregated full sample containing downgrade, upgrades and no ratings changes from the four rating agencies.[36]

[36] The results reported use all bonds which have returns on day 0 to conduct the event study. The results of using the most active bonds (and one event is related to at most one bond) are also available upon request. The results show the same evidence.

Table 5: Event study results for the aggregated sample: All bonds

Event Time	*A.M. Best*			*Fitch*			*Moody's*			*Standard & Poor's*		
	$\overline{CAR}_{(\tau_1,\tau_2)}$	*Z-Stat*	$N^+:N^-$	$\overline{CAR}_{(\tau_1,\tau_2)}$	*Z-Stat*	$N^+:N^-$	$\overline{CAR}_{(\tau_1,\tau_2)}$	*Z-Stat*	$N^+:N^-$	$\overline{CAR}_{(\tau_1,\tau_2)}$	*Z-Stat*	$N^+:N^-$
Panel A: Ratings downgrades												
[−5,−2]	−1.71%	−3.21***	97:171***	−1.02%	−7.09***	72:92*	−3.20%	−22.63***	103:227***	−2.12%	−10.59***	118:191***
[−2,+2]	−5.34%	−25.84***	107:183***	−10.29%	−40.69***	55:135***	−5.65%	−28.70***	138:217***	−6.72%	−24.30***	92:246***
[−1,+1]	−8.16%	−65.96***	95:194***	−14.84%	−85.02***	45:144***	−7.62%	−59.27***	131:223***	−7.82%	−50.39***	106:231***
[−1,−1]	−1.43%	−15.24***	88:150***	−4.01%	−20.27***	38:104***	−1.20%	1.01	131:153	−1.23%	1.76**	108:151***
[0,0]	−4.73%	−54.35***	113:172***	−8.18%	−66.32***	66:119***	−3.58%	−41.66***	146:202***	−4.47%	−42.10***	126:207***
[+1,+1]	−2.89%	−41.29***	97:135***	−4.95%	−55.70***	56:90***	−4.02%	−61.42***	112:165***	−3.10%	−42.71***	94:173***
[+2,+5]	4.82%	60.24***	142:136	6.32%	64.68***	91:85	2.53%	46.17***	173:164	2.60%	49.79***	155:162
Panel B: Ratings upgrades												
[−5,−2]	0.31%	−6.93***	10:12	−2.97%	−6.38***	4:24***	−3.38%	−3.84***	4:17***	−2.55%	−3.61***	11:31***
[−2,+2]	0.38%	2.69***	13:12	−7.06%	−1.69**	6:29***	−3.63%	−2.54***	5:18***	−0.89%	−1.73**	23:31
[−1,+1]	0.27%	−4.49***	10:15*	−6.27%	0.56	12:23**	−2.05%	−1.31*	8:15**	−0.34%	−0.17	26:28
[−1,−1]	0.20%	0.8	7:8	−4.62%	2.95***	12:12	−1.89%	−1.30*	4:9*	−0.16%	−1.42*	12:11
[0,0]	0.29%	−0.67	12:13	−2.41%	−0.46	13:22**	−0.44%	1.31*	11:12	0.00%	1.01	29:25
[+1,+1]	−0.23%	−9.77***	7:8	−1.06%	−1.25	5:18***	−0.96%	−4.24***	3:10**	−0.57%	−1.44*	11:15
[+2,+5]	0.91%	3.92***	15:9	−0.26%	0.69	9:13	−0.69%	−2.17**	6:16***	−1.03%	−3.30***	19:30*
Panel C: Stable ratings												
[−5,−2]	−0.78%	−16.19***	224:295***	−3.90%	−41.26***	208:240*	−2.38%	−8.13***	157:222***	−6.55%	−56.92***	132:279***
[−2,+2]	−0.66%	−23.44***	266:334***	−1.51%	−8.93***	197:299***	−3.26%	−6.62***	181:245***	−8.92%	−60.98***	161:294***
[−1,+1]	−0.32%	−11.74***	277:323**	−0.12%	5.93***	218:277***	−2.46%	−2.91***	188:237***	−5.78%	−40.03***	167:286***
[−1,−1]	−0.45%	−23.32***	195:186	−2.68%	−45.13***	148:218***	−0.36%	−6.00***	151:156	−2.66%	−46.02***	138:222***
[0,0]	−0.02%	1.36*	279:314*	2.66%	49.56***	248:234	−1.86%	0.00	195:229**	−0.08%	30.82***	217:229
[+1,+1]	−0.03%	−5.04***	187:187	−0.94%	−13.03***	180:205	−0.46%	−0.00	152:163	−4.45%	−72.06***	123:243***
[+2,+5]	−0.88%	−32.47***	229:292***	0.76%	12.21***	218:249*	−2.31%	−5.72***	163:219***	0.76%	27.39***	204:223

This table reports the event study results for the aggregated sample involving all bonds issued by the insurers.

Notes: The Z-Stat values for $\overline{CAR}_{(\tau_1,\tau_2)}$ are based on a two-tailed test that the cumulative abnormal average returns are significantly different from zero.

N^+: N^- are the numbers of positive vs negative cumulative abnormal returns. The one-tailed test indicates whether the proportions of positive and negative cumulative abnormal returns are significantly different. *, **, *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

Table 6: Event study results for single ratings events: Most active bonds and stocks

Event Time	*A.M. Best*			*Fitch*			*Moody's*			*Standard & Poor's*		
	$\overline{CAR}(\tau_1,\tau_2)$	*Z-Stat*	N^+:N^-	$\overline{CAR}(\tau_1,\tau_2)$	*Z-Stat*	N^+:N^-	$\overline{CAR}(\tau_1,\tau_2)$	*Z-Stat*	N^+:N^-	$\overline{CAR}(\tau_1,\tau_2)$	*Z-Stat*	N^+:N^-
Panel A: Ratings downgrades: Most active bonds												
[−5,−2]	−0.02%	0.71	5:3	3.54%	3.58***	5:1*	−2.66%	−0.9	2:10**	−3.10%	−1.50*	4:8
[−2,+2]	−0.43%	−0.22	6:4	−1.13%	1.97**	4:3	−0.33%	−0.42	6:8	1.60%	−0.95	6:8
[−1,+1]	−0.56%	−1.17	5:5	−2.90%	1.02	3:4	0.00%	0.42	7:7	2.59%	−0.95	4:10*
[−1,−1]	−0.28%	−0.63	6:4	1.80%	8.65***	3:3	2.13%	−2.28**	8:2**	1.45%	0.61	6:3
[0,0]	0.15%	0.71	6:4	−3.67%	−5.74***	2:5*	−1.22%	1.68**	5:8	4.49%	1.27	9:5
[+1,+1]	−0.48%	−2.38***	3:6	−0.90%	−0.00	5:1*	−0.49%	0.84	3:8*	−3.30%	−3.61***	4:8
[+2,+5]	0.98%	1.26	8:2**	1.16%	1.77**	5:2	−4.30%	−3.31***	1:12***	3.52%	0.43	6:6
Panel B: Ratings upgrades: Most active bonds												
[−5,−2]	1.00%	−0.52	2:6**	−0.83%	−1.05	0:4**	−0.15%	−0.64	2:2	−0.94%	−0.31	1:3
[−2,+2]	−0.58%	0.26	5:5	−0.41%	−0.45	1:3	−0.31%	−0.26	1:3	1.23%	0.47	4:2
[−1,+1]	0.58%	1.46*	6:4	0.06%	0.24	3:1	−0.74%	−0.45	1:3	2.26%	1.39*	5:1**
[−1,−1]	1.10%	1.24	3:3	−0.04%	0.20	1:3	−0.34%	−0.11	2:2	0.52%	1.73**	2:0*
[0,0]	0.00%	1.01	5:5	0.21%	0.72	3:1	0.07%	1.81**	2:2	2.21%	1.15	4:2
[+1,+1]	−0.20%	0.29	2:2	−0.15%	−0.71	0:3**	−0.64%	−3.26***	1:2	−0.19%	0.02	2:2
[+2,+5]	0.17%	0.87	4:5	−0.57%	−1.31*	1:3	−0.02%	0.11	2:2	−0.79%	−0.91	3:2

Panel C: Stable ratings: Most active bonds												
[−5,−2]	−0.76%	−1.64**	30:45*	0.64%	1.38*	15:4***	−0.15%	1.05	12:11	1.50%	0.07	9:13
[−2,+2]	−0.13%	−0.17	36:45	−1.21%	0.19	13:8	−1.44%	−0.6	13:13	0.79%	0.52	13:11
[−1,+1]	−0.08%	−0.28	38:43	−1.66%	−0.21	9:12	−1.96%	−1.77**	12:14	−0.28%	0.2	13:11
[−1,−1]	−0.29%	−0.90	34:30	−0.29%	−1.25	6:10	−1.01%	1.51*	11:10	−0.48%	−0.94	8:11
[0,0]	0.00%	−0.19	34:47*	−2.20%	−1.34*	10:11	0.35%	−1.38*	10:15	0.40%	−0.0	12:12
[+1,+1]	0.16%	0.55	30:25	0.80%	2.14**	15:5**	−1.84%	−3.10***	11:10	−0.37%	1.62*	10:09
[+2,+5]	−0.39%	−0.68	35:40	0.52%	0.93	8:11	1.15%	0.85	10:16	1.36%	0.82	12:12
Panel D: Ratings downgrade: Stocks												
[−5,−2]	0.90%	0.34	9:10	−0.94%	−0.78	8:9	−2.90%	−4.25***	13:7*	−1.43%	0.83	15:19
[−2,+2]	0.89%	1.38*	11:8	−1.24%	0.21	8:9	−1.77%	0.90	12:8	−1.46%	−1.28*	17:17
[−1,+1]	−0.35%	0.12	9:10	0.88%	1.26	9:8	1.84%	5.29***	10:10	−2.14%	−2.25**	12:22*
[−1,−1]	−0.29%	0.73	12:7	1.30%	3.21***	10:7	0.93%	1.00	15:5***	0.43%	0.46	19:15
[0,0]	−0.94%	−1.70**	7:12	0.55%	0.13	9:8	0.82%	7.43***	9:11	−1.57%	−3.15***	15:19
[+1,+1]	0.89%	1.18	9:10	−0.96%	−1.14	6:11	0.09%	0.74	9:11	−1.01%	−1.20	15:19
[+2,+5]	0.23%	0.29	10:9	1.96%	3.19***	9:8	−1.71%	−0.17	13:7*	0.35%	0.66	15:19

This table reports event study results for single ratings events using the most active bonds issued by the insurers to create a one-to-one match between bonds and firms. In order to compare these results with a previous study the table also reports corresponding results from downgrades rating events on stocks.

Notes: The Z-Stat values for $\overline{CAR}_{(\tau_1,\tau_2)}$ are based on a two-tailed test that the cumulative abnormal average returns are significantly different from zero.

N^{+}: N^{-} are the numbers of positive vs negative cumulative abnormal returns. The one-tailed test indicates whether the proportions of positive and negative cumulative abnormal returns are significantly different. *, **, *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

Table 7: Event study results for single rating events: All bonds

Event Time	*A.M. Best*			*Fitch*			*Moody's*			*Standard & Poor's*		
	$\overline{CAR}_{(\tau_1,\tau_2)}$	*Z-Stat*	N^+:N^-	$\overline{CAR}_{(\tau_1,\tau_2)}$	*Z-Stat*	N^+:N^-	$\overline{CAR}_{(\tau_1,\tau_2)}$	*Z-Stat*	N^+:N^-	$\overline{CAR}_{(\tau_1,\tau_2)}$	*Z-Stat*	N^+:N^-
Panel A: Ratings downgrade												
[−5,−2]	−0.23%	0.48	51:75***	1.57%	6.68***	27:18	−3.37%	−6.01***	44:73***	−0.96%	−1.48*	20:29*
[−2,+2]	−1.32%	−1.60*	69:68	−2.86%	−2.54***	21:31**	−3.39%	2.31**	47:82***	−2.51%	−3.01***	15:40***
[−1,+1]	−1.70%	−3.50***	62:75*	−3.10%	−5.59***	18:34***	−2.44%	2.55***	52:77**	−0.52%	−2.67***	13:42***
[−1,−1]	−0.42%	−3.65***	48:61*	−1.53%	−0.27	11:29***	−2.50%	−11.55***	43:51	−0.70%	−1.90**	15:23*
[0,0]	−1.37%	−3.35***	65:72	−1.87%	−7.37***	24:28	−0.84%	10.52***	64:64	1.04%	0.43	26:29
[+1,+1]	0.00%	1.37*	59:49	−0.08%	−0.67	22:17	0.30%	1.47*	50:41	−1.80%	−5.04***	12:21*
[+2,+5]	0.06%	−0.90	56:75**	−0.94%	−0.47	22:28	−1.81%	−0.34	54:60	−0.87%	−1.46*	22:30
Panel B: Ratings upgrade												
[−5,−2]	0.37%	−7.63***	7:10	−0.85%	−2.08**	1:8**	−1.77%	−1.24	3:5	−1.68%	−2.43***	5:15**
[−2,+2]	0.36%	2.15**	11:9	−1.18%	−1.42*	2:8**	−2.63%	−0.62	1:7**	−0.24%	−0.96	18:13
[−1,+1]	0.51%	−4.76***	9:11	−0.35%	0.63	7:3*	−3.18%	−0.72	2:6*	0.46%	0.50	18:13
[−1,−1]	0.62%	2.37***	7:6	0.30%	0.71	4:4	−1.35%	−0.47	2:5	−0.12%	−0.76	6:6
[0,0]	0.33%	−1.14	10:10	−0.83%	−1.21	5:5	−1.54%	0.59	2:6*	0.71%	1.63*	19:12
[+1,+1]	−0.40%	−12.00***	5:6	0.30%	1.97**	4:4	−0.73%	−1.98**	2:3	−0.43%	−1.74**	5:10*
[+2,+5]	1.08%	4.07***	12:7	−0.50%	−0.40	3:5	1.97%	−0.09	4:4	−1.15%	−3.58***	10:17*
Panel C: Stable ratings												
[−5,−2]	−0.37%	−16.17***	143:204***	−0.55%	−0.80	114:115	−0.68%	−2.56***	67:92**	1.02%	−0.73	49:65*
[−2,+2]	−0.39%	−30.24***	174:213**	−2.04%	−6.97***	93:160***	−1.81%	−5.63***	83:98	0.44%	−0.92	55:72*
[−1,+1]	−0.28%	−20.35***	183:204	−1.51%	−6.15***	101:152***	−1.83%	−3.19***	86:95	−0.08%	−2.09**	60:67
[−1,−1]	0.09%	−25.77***	143:124	−0.24%	−4.66***	78:92	−1.17%	−5.29***	64:63	1.01%	−2.03**	50:48
[0,0]	−0.37%	−7.76***	179:208*	−0.89%	−2.83***	112:141**	−0.66%	−0.32	86:94	−0.83%	−1.11	57:70
[+1,+1]	0.06%	−4.42***	129:118	−0.63%	−3.91***	91:96	−0.48%	−0.99	66:66	−0.04%	−0.62	41:61**
[+2,+5]	−0.33%	−31.44***	161:188*	−0.60%	−1.70**	105:128*	−0.45%	−4.11***	73:85	−0.03%	−1.04	60:60

Notes: The Z-Stat values for $\overline{CAR}(\tau_1,\tau_2)$ are based on a two-tailed test that the cumulative abnormal average returns are significantly different from zero.
N^+: N^- are the numbers of positive vs negative cumulative abnormal returns. The one-tailed test indicates whether the proportions of positive and negative cumulative abnormal returns are significantly different.
*, **, *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

Table 8: Event study results for multiple and sequential downgrades

Event Time	*Multiple Downgrades*			*Sequential Downgrades*		
	$\overline{CAR}(\tau_1, \tau_2)$	*Z-Stat*	N^+:N^-	$\overline{CAR}(\tau_1, \tau_2)$	*Z-Stat*	N^+:N^-
Panel A: Most active bonds						
[−5,−2]	−1.89%	−2.16**	3:4	−2.46%	−2.86***	7:13*
[−2,+2]	−11.45%	−14.20***	1:6**	−18.34%	−33.83***	3:18***
[−1,+1]	−10.67%	−16.16***	1:6**	−14.93%	−33.14***	6:15**
[−1,−1]	−2.62%	−7.36***	2:4	−4.99%	−14.55***	5:11*
[0,0]	−2.71%	−4.88***	3:4	−2.45%	−6.98***	9:12
[+1,+1]	−6.67%	−16.55***	2:4	−9.11%	−35.91***	5:15**
[+2,+5]	6.27%	5.03***	4:3	6.70%	11.65***	12:9
Panel B: All bonds						
[−5,−2]	−2.62%	−14.87***	20:58***	−3.32%	−13.71***	79:149***
[−2,+2]	−12.29%	−27.69***	25:62***	−11.55%	−57.28***	74:179***
[−1,+1]	−23.37%	−90.67***	20:66***	−12.65%	−91.93***	72:180***
[−1,−1]	−2.45%	8.29***	23:50***	−3.31%	−20.61***	70:123***
[0,0]	−13.85%	−83.72***	20:62***	−6.45%	−70.30***	87:161***
[+1,+1]	−9.79%	−76.57***	17:54***	−4.63%	−63.03***	69:136***
[+2,+5]	16.86%	103.61***	57:29***	3.41%	54.34***	136:102**
Panel C: Stocks						
[−5,−2]	−5.36%	−5.52***	3:5	−3.82%	−0.93	9:13
[−2,+2]	−24.25%	−14.20***	1:7**	−15.05%	−7.94***	5:17***
[−1,+1]	−19.01%	−14.76***	2:6*	−12.20%	−10.61***	3:19***
[−1,−1]	−2.89%	−0.65	4:4	−3.97%	−8.65***	7:15*
[0,0]	−9.04%	−14.47***	3:5	−4.07%	−3.34***	5:17***
[+1,+1]	−7.08%	−10.43***	1:7**	−4.16%	−6.38***	11:11
[+2,+5]	4.05%	3.13***	4:4	4.92%	4.81***	14:8*

Notes: The Z-Stat values for $\overline{CAR}(\tau_1, \tau_2)$ are based on a two-tailed test that the cumulative abnormal average returns are significantly different from zero.
N^+: N^- are the numbers of positive vs negative cumulative abnormal returns. The one-tailed test indicates whether the proportions of positive and negative cumulative abnormal returns are significantly different.
*, **, *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

The results in Panel A clearly show that the impact of downgrade events on abnormal returns is negative and statistically significant. Downgraded insurers experience significant negative bond price reaction across all event windows. The day 0 excess returns for the full sample of rating downgrades are uniformly negative and statistically significant at the 1 per cent level. CAR values of the [−1,+1] window vary between −7.82 per cent (S&P) and −14.84 per cent (Fitch Ratings) and are highly significant. The magnitudes of CAR during this window are much larger than the CAR in Panel A of Table 4. This indicates that the less active bonds respond to downgrade events more dramatically due to the lack of liquidity. An evaluation of the pre-announcement [−5,−2] window suggests that excess bond returns are also negative during this period. This suggests that the negative ratings information about the insurer may have been anticipated by investors before the official downgrade announcement. The [+2,+5] abnormal returns are found to be even larger, suggesting that investors may be adjusting for market overreaction from the downgrade.[37] Overall, the evidence confirms the importance of ratings agencies in providing new and relevant information to the marketplace.

Panel B presents the results from ratings upgrades. Similar to the results in Table 4, upgrade events are not influential on bond returns even when all bonds are taken into consideration. The results of stable rating events for bonds are presented in Panel C. Interestingly, the results show some large negative CAR values for S&P, i.e. −6.55 per cent for [−5,−2], −8.92 per cent for [−2,+2]. The magnitudes of those numbers are larger than the corresponding values for downgrades (−2.12 per cent and −6.72 per cent). This seems counterintuitive. It might be possible that the abnormal return values might be impacted by other previous events. Therefore, in the next step, we study "single", "multiple" and "sequential" events separately.

Impact of ratings changes on single versus multiple and sequential events

Tables 6 and 7 present the results for "single" rating events for the one-to-one matching sample and full sample, respectively. The results in Panel A of Tables 6 and 7 show that, when "multiple" and "sequential" events are excluded and only single events are evaluated, the impact of "single" downgrade events on both the most active bonds and all bond samples is very weak. For the most active bond sample, the [−2, +2] window CAR values are not any more monotonically negative across the four agencies (−0.43 per cent, −1.13 per cent, −0.33 per cent and 1.60 per cent). The values are still negative and statistically significant at the 1 per cent level for A.M. Best and S&P on day +1. This indicates that bonds are more sensitive to A.M. Best and S&P ratings than to the other two agencies. The results for "good news" (Panel B of Tables 6 and 7) and "no news" (Panel C of Tables 6 and 7) are similar. The overall results suggest that much of the excess return behaviour in the sample seems to be driven by multiple and sequential events in the sample.

Finally, Table 8 reports the results of CARs for multiple and sequential downgrades. Note an examination of multiple or sequential events would require collapsing all the different rating agencies into one group. A combined review suggests that the magnitudes of the CARs are a lot higher when compared to single rating events. Panel A, B, and C reports the results of the one-on-one bond matching sample, all bonds sample and stocks, respectively. Examining multiple downgrades, the average excess return on day 0 for the seven most active bonds, the total of 82 bonds, and the eight stocks are −2.71 per cent, −13.85 per cent, and −9.04 per cent for multiple events. For sequential events, the values are −2.45 per cent, −6.45 per cent, and −4.07 per cent. For the [−1, +1] window, the CAR values are −10.67 per cent, −23.37 per cent, and −19.01 per cent for multiple downgrades. The values are −14.93 per cent, −12.65 per cent and −12.20 per cent for sequential downgrades. Those results show that most active bonds respond to multiple and sequential downgrades

[37] In order to examine the robustness of our results, we conduct a separate event study analysis for a narrower window that marks the financial crisis period, between September 2008 and December 2009. Results indicate that the negative price reaction to downgrades from different ratings agencies, in general, is more pronounced when compared with the overall sample. The event day price reaction to stable outlook ratings pronouncements is positive and statistically significant. There are no upgrades during this period. These results are available from the authors upon request.

similarly. However, for the all bond sample and stocks, the response to multiple downgrades is much stronger relative to sequential downgrades. The stock results for sequential downgrade are comparable to the reinforced bad news results documented by Halek and Eckles.[22]

Conclusions

Credit and default risk issues have received prominent publicity in recent years following several major financial stresses faced by insurance institutions such as American International Group (AIG). Ratings agencies play an important role in providing valuable credit and default-related information to investors and other stakeholders. Previous studies document that insurer rating downgrades are associated with higher information content relative to upgrades, but to our knowledge there are no studies that specifically examine insurer rating effects on bonds. We consider a recent time period, 2005–2010, that witnessed a large number of insurer rating changes, and take advantage of transaction price information on bonds to investigate the impact of insurer rating downgrades on bond returns.

Our study finds that insurer ratings downgrade events have significant negative impacts on the returns of bonds. The evidence is consistent with the predictions of structural credit risk models and points us away from a wealth transfer effect from bondholders to stockholders. We investigate ratings changes from the four major insurer ratings agencies, A.M. Best, Fitch Ratings, S&P and Moody's. In general, we find that insurer downgrades issuer have larger impact on bond prices than upgrades and stable ratings events. Furthermore, when we disaggregate the overall sample into single, multiple and sequential events we find that isolated ratings change events of any of the four agencies do not have clear impact on excess returns. The response of investors is found to be most sensitive to bad news that is characterised as "multiple" or "sequential" ratings events.

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