TWO ESSAYS ON THE INFORMATION VALUE OF INSURER RATING CHANGES

by

YILIN CHEN

(Under the Direction of Steven W. Pottier)

ABSTRACT

My dissertation has two essays on the information value of insurer rating changes. The first essay conducts the event studies of rating changes for public insurers. Using a carefully designed benchmark portfolio model, I find that the market has a significant short-run negative response to downgrades, but no significant response to upgrades, consistent with the asymmetric response evidence in the existing literature. I also find a post-event drift during the 3-month period following the downgrades but not the upgrades, and a pre-event market adjustment during the 30-day and 12-month period prior to rating changes for both downgrades and upgrades. These results are consistent with the incomplete market response hypothesis and rating change anticipation hypothesis. Using the subsample analysis, I test 12 relevant hypotheses, and find that both short and long run market response to downgrades are stronger for small insurers, low-credit-quality insurers, and for subsequent downgrades, mono-line firm downgrades, and threshold downgrades. The second essay employs the Granger-causality to study the causality relationships among insurer rating changes, stock returns and insurer performances measured by return on equity. I find that excess stock returns are generally good predictors of future firm performance, while rating changes are not. Furthermore, rating changes can be predicted by past excess stock returns and risk adjusted return on equity.

INDEX WORDS: Insurer Rating, Event Study, Granger-causality, Risk Adjusted ROE

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A Dissertation Submitted to the Graduate Faculty of The University of Georgia in Partial Fulfillment of the Requirements for the Degree

DOCTOR OF PHILOSOPHY

ATHENS, GEORGIA

2011

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August 2011

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An Event Study of Insurer Rating Changes

1. Introduction

In this study, we conduct event studies of rating changes for public insurers, and use the financial strength rating issued by A.M. Best Company, Inc. (Best) in our analysis. In contrast to bond rating, the Best's financial strength rating is related to the firm as a whole rather than a specific security issuance, and it is the summary gauge of firm risk that can be used by consumers, investors, and creditors. Like credit rating agencies, Best claims to receive proprietary information from company managers concerning business plans and in-depth information on asset and liability portfolios to determine insurer financial strength ratings (Best, 2007). In addition, rating is a potential means of communicating inside information without disclosing details that would be valuable to competitors. Existing research recognizes that the principal role of credit rating agencies is to reduce the level of *ex ante* uncertainty or informational asymmetry about firm's economic value and likelihood of financial distress[1].

An insurer's financial strength rating is an opinion on the insurer's ability to meet its obligations to policyholders, and as such, is focused on insolvency risk. Academic researchers have used insurer financial ratings as measures of insolvency risk and financial quality[2]. Insurers with higher ratings are able to charge higher premiums because policyholders perceive that they

[1] Ramakrishnan and Thakor, 1984; Millon and Thakor, 1985; Cantor and Packer, 1997
[2] Cummins and Danzon, 1997

have lower insolvency risk[3]. Equity market participants must, in general, rely on publicly-available information to gauge their expectations about future earnings, cash flows, and market risks[4].

Insurer rating agencies have been under closer regulatory scrutiny since the insolvency of several high rated insurers, starting around 1990[5]. The regulation fair disclosure (Reg FD) implemented by the United States Securities and Exchange Commission (SEC) in year 2000 prohibits the disclosure of material non-public information to stock analysts, but allows such disclosure to rating agencies[6]. Also, there is evidence that both property-casualty and life-health insurer standards have increased during the 1990s[7]. The importance of financial strength ratings, the regulatory changes, and the changing rating standards partly motivate this study.

The extant finance literature tests the information content of rating changes by examining the stock market response to rating changes. A number of hypotheses emerge from this literature. Goh and Ederington (1999) hypothesize that the market reaction to rating downgrades depends on whether the rating is a surprise or whether the rating is important. First, if the stock market does not reflect information related to rating change prior to such change, such as negative cumulative abnormal returns (CAR) before announcement of a downgrade, but significantly responds to the rating change news, it would provide evidence supporting the informational value of the rating change. Second, if the stock market does show signs of incorporating relevant information prior to the actual rating changes, but does not respond significantly to the rating change news, it would imply that the rating agency information is of little informational value, since rating changes may simply reflect prior publicly-available information that has been

[3] Sommer, 1996; Cummins and Sommer, 1996
[4] See Nofsinger (2001)
[5] Doherty and Phillips (2002); Pottier and Sommer (2003)
[6] See SEC final rule, File No. S7-31-99, http://www.sec.gov/rules/final/33-7881.htm
[7] Doherty and Phillips (2002); Pottier and Sommer (2003)

impounded in stock prices. Alternatively, this may imply possible information leakage of the upcoming rating news. Thirdly, if the stock market incorporates information related to rating changes in earlier periods, and also actively responds to the news of rating changes, it may imply that the rating agency uses a mixture of both prior public information and the additional value-added proprietary information which may be important to the market investors. Another plausible explanation would be that the stock market may react to the rating change news itself, rather than reacting to the proprietary information contained in the rating change, as the rating decision resolves uncertainty regarding the rating implications of prior public information.

The existing event study research on the insurer rating changes in the insurance literature is limited. Halek and Eckles (2010) study the short-term daily market responses to rating changes using the one-factor market model, and document asymmetric reaction of stock prices to rating changes in the way that downgrades drop share prices by around 7% during the 20-day (-10, +10) period surrounding the rating downgrades[8], but upgrades have little significant effect. They study event windows limited to the 10 days before and 10 days after the rating changes. We expand the time horizon to 30 days before and 30 days after the changes in the short run, and 12 months before and 12 months after the rating changes in the long run. We aim to address how the market reflects information related to rating changes in a relatively long time horizon, such as stock market behavior pre and post the rating change (i.e., market drift).

Kothari and Warner (2007) point out that existing event study literature generally agrees that short-run methods relatively have low trouble than long-run methods. Interestingly, Ahern (2009) suggests that short-term models may also exhibit statistically significant biases, if the researcher uses data that are non-representative of the overall market – such as the public insurer data used in this paper. He finds out that characteristic-based benchmark model, such as the one

[8] See Halek and Eckles (2010) Table 2.

using the matched size-return portfolio of control stocks, displays the least bias of all models even in the short run. Due to the nature of our study, that is, longer event windows, we believe that a more carefully specified benchmark portfolio model would mitigate the mean bias problem. We also empirically test the soundness of our model along with other common event-study models.

We first use the full rating change sample to test the three hypothesis (H1 – new information hypothesis, H1.1 – incomplete market response hypothesis, and H1.2 – rating change anticipation hypothesis) by studying the post-event short and long-run abnormal returns and pre-event abnormal returns. Among these three hypotheses, prior insurance literature (Halek and Eckles, 2010) has addressed issues only related to H1. Furthermore, we expand Halek and Eckles (2010) by partitioning our full sample into subsamples based on 1) threshold vs. non-threshold rating change, 2) one-level vs. multiple-level rating changes, 3) firm size, 4) market-to-book ratios, 5) pre-event credit quality, 6) property-casualty vs. life-health firm rating change, 7) mono-line vs. multi-line firm rating change, 8) pre- vs. post-regulation-FD rating change, 9) subsequent vs. initial rating change, and, and test the additional 9 related hypotheses. Among all the above 9 partitions and hypotheses, only 1) threshold rating and 2) multiple-level rating factors have been formally studied and hypothesized by Halek and Eckles (2010) and Eckles and Halek (2011, working paper) in the insurance literature. These authors also use 3) firm size in their regression analysis, but only as controls and do not have formal related hypothesis nor direct comparisons of abnormal returns between small and large firms. We summarize our major findings as the following.

We find that model selection in event studies is not only important in the long-run study using monthly returns, but also may start to matter in the short-run study if the chosen event

period exceeds 7 days. We show that the benchmark portfolio method that adjusts for size, market-to-book, and industry factors has the least bias towards finding abnormal returns, and thus is both intuitively and empirically sound for this study. This method could also be useful for future event study research of public insurers. Using this method, we find that downgraded firms experience statistically significant -13.03% of mean abnormal returns during the event month, and a significant -8.67% abnormal returns in the 3-day (-1d, +1d) event period. We also find evidence of a significant mean reversion trend of +2.89% during the 8-day (+3d, +10d) period following the downgrade and that trend is significant in almost all of our subsamples. We show a post-downgrade drift with abnormal returns of -6.19% on average during the 3-month period following the downgrade. Upgrade firms experience only +1.53% of the mean abnormal returns during the event month, and we find no reliable evidence of short-term market responses using the daily data and the market drift following the upgrade. We also find evidence of significant negative (positive) abnormal returns for insurers that are downgraded (upgraded) during the 30-day and 12-month period prior to rating changes, suggesting at least some public information consistent with the rating action has been incorporated in market prices prior to rating change events. In the 12 months prior to downgrade, insurers on average experience significant negative abnormal returns of -40.06%. For upgrades, the corresponding abnormal return is positive 10.32% on average. Our subsample comparisons based on different partitions of the full sample yield several important findings.

The stock market response to downgrades and upgrades is greater in absolute value for small insurers, and significantly different from that of large insurers for rating downgrades. We also find that in the short run, the market responds more negatively to subsequent downgrades than to initial downgrades, while a subsequent downgrade is defined as a downgrade that follows

the previous one within the 12-month period, and an initial downgrade is otherwise. In addition, the negative market drift during the 12-month period following the downgrade is more pronounced for subsequent downgrades than for initial downgrades. We also find that the market response is stronger for the mono-line (pure property-casualty or pure life-health) than for the multi-line firm rating changes, for both downgrades and upgrades. Our evidence also shows that the market responds more strongly to threshold downgrades than to non-threshold downgrades, which is consistent with the finding of Halek and Eckles (2010). In addition, we find that the market response is stronger for multiple-level downgrades than to one-level downgrades. We further conduct cross-sectional regression analysis to address the determinants of abnormal returns to rating changes, and show that the results are generally consistent with the findings from the subsample comparisons.

The remainder of this paper is organized into the following six sections. Section 2 provides a review of related finance and insurance literature. Section 3 discusses our sample selection method and provides the sample descriptions. Section 4 presents descriptions and performance comparisons of the 10 selected event study models. Section 5 presents the hypotheses and the related event study results using our selected method. Section 6 presents regression analysis as a robustness check to our subsample comparisons, and Section 7 concludes this study.

2. Literature review

2.1 Rating changes

Halek and Eckles (2010) examine the short-run stock market response to changes in insurer financial strength ratings for a sample of 232 publicly traded insurers from 1993 to 2003. Their

analysis includes 110 rating downgrades and 85 rating upgrades by A.M. Best Company. They use one-factor market model and find a significant negative stock market response to rating downgrades, which is substantially higher when the rating downgrades drop below the "A-" threshold. They do not find any significant response to Best rating upgrade announcements.

The finance literature is replete with studies of the stock market response to bond rating changes and the general findings of this body of work serves as a useful background. Numerous studies find that stock prices react significantly and negatively to bond rating downgrade announcements (Holthausen and Leftwich, 1986; Hand, Holthausen and Leftwich, 1992; Goh and Ederington, 1993 and 1999). Furthermore, Holthausen and Leftwich (1986) and Hand et al. (1992) find that downgrades from investment to speculative grade ratings are associated with larger reactions than downgrades in general. Studies of bond rating changes generally do not find a significant market response to upgrades. Nayar and Rozeff (1994) study both the initial ratings and the rating changes of commercial papers, and find that superior initial ratings generate positive abnormal returns in the equity market, which suggest that rating agencies help the market sort firms by their future prospects, and thus play a certification role which is independent of bank letters of credit. They also find that commercial paper rating downgrades have negative information content while upgrades have no equity price effects, and that severe downgrade, where the new lower rating implies exit from the commercial paper market, has a major impact on stock returns. Goh and Ederington (1999) hypothesize that the market reaction to rating downgrades depends on possibly two competing factors. First, it may depend on whether the rating is a surprise. All other things equal, the market should only react to surprise downgrades. These authors state that if rating downgrades follow periods of negative stock returns, then at least some downgrades are predictable. Therefore, this "surprise" hypothesis

implies that the magnitude of the market response to downgrades should be negatively correlated with pre-downgrade returns. Alternatively, the market response may depend on the importance of the information. If pre-downgrade negative abnormal returns are large, the investors may view such downgrade news important to the shareholders, and will respond more strongly to it than non-important news. This "importance" hypothesis implies that the magnitude of the market response to downgrades should be negatively correlated with pre-downgrade returns. They find evidence supporting the "importance" hypothesis, and also find that the market reacts more strongly to rating downgrades from the investment to the speculative category, and within the speculative grades, than to rating downgrades within the investment grade. Consistent with Holthausen and Leftwich (1986), Goh and Ederington (1999) observe significant negative abnormal returns prior to downgrades and significant positive abnormal returns prior to upgrades. The market reaction in the announcement period to downgrades is more negative, the more negative the pre-announcement cumulative abnormal returns, even after controlling for rating levels. They do not find any significant differences between single-rating-level and multi-rating-level downgrades. Kliger and Sarig (2000) study one exclusive event on April 26, 1982 when Moody's began reporting ratings using a finer rating partition, and thus "pricing-relevant" factors are controlled for, since there is no economic event behind the change. They find that better-than-expected announcements increase debt value and decrease stock value, but overall there is no change on firm value. Similarly, they also document that worse-than-expected announcements decrease debt value but increase stock value increase, and overall no change for firm value. More recently, Jorion, Liu, and Shi (2005) take a similar approach by studying one exclusive event on October 23, 2000 when regulation fair disclosure (Reg FD) was implemented by SEC that prohibits firms from disclosing non-public information to favored investment

professionals, but allows disclosure of such information to credit rating agencies. They find that informational effect of rating changes is much bigger in the post-Reg-FD period. While most of the prior studies focus on short-run stock returns, Dichev and Piotroski (2001) study the long-run stock returns following bond rating changes. They use size, market-to-book matched benchmark portfolios to calculate the 3-month, 6-month, 12-month the cumulative abnormal return (CAR) following the Moody's bond rating changes between year 1970 and 1997, and find negative abnormal returns about 10-14 percent in the 12-month period following the downgrades, but no reliable abnormal returns following upgrades. When constructing the benchmark portfolios, they exclude firms with rating changes in a particular month from their corresponding benchmark portfolios for that month. We generally follow their approach in constructing our benchmark portfolios with additional industry factor adjustments, since our sample consists of all publicly-traded firms in the insurance industry.

2.2 Event study methodology

The finance literature has a well developed stream of papers addressing the event study methodologies. While conducting the short-run daily estimation, the model specification is generally considered to be less of a concern. Brown and Warner (1985) find that in a short estimation period, the model using ordinary least squares (OLS) with a market index generates well-specified estimation results, and the even simpler method using market-adjusted returns also produces no significant mean bias. However, more recently, Ahern (2009) suggests that short-term models may also exhibit statistically significant biases, especially if the researcher uses data that are non-representative of the overall market – such as the public insurer data used in this paper. While Brown and Warner (1985) use data from randomly selected securities, Ahern (2009)

draws samples non-randomly and compares among eight prediction models, including the market model and Fama French 3-factor and 4-factor models, to determine which method has the least mean bias. He points out that "if a test does not perform well for a one-day event window, it will only perform worse for longer-run studies." He finds out that characteristic-based benchmark model, such as the one using the matched size-return portfolio of control stocks, displays the least bias of all models.

While short-run methods may relatively have low trouble, inferences from long-run tests require extreme caution (Kothari and Warner, 2007). Numerous methodology papers in the finance literature on the estimation of long-run abnormal returns have improved such methods over time. Ball et al. (1995) document that many popular asset-pricing models are mis-specified, and may cause problems when using them to measure long-run stock price performance. Barber and Lyon (1997) and Lyon et al. (1999) provide a complete discussion of the inference problems in tests on long-term returns. Their tests show that inferences are less problematic for average or cumulative monthly abnormal returns (CAR) than for buy-and-hold abnormal returns (BHAR). They conclude that the calculations of buy-and-hold returns produce positive skewness, and therefore significantly negative BHAR biases may arise if using simple models such as the "real return over the market return" model. They provide solutions to this and find that the model misspecification will be greatly alleviated by matching sample firms to control firms of similar sizes and book-to-market ratios. Though the improved BHAR methods produce inferences no more reliable than the CAR method, they favor BHAR since they are close to real investors' experiences. Though here the real investors' experience explanation seems to be the only advantage of BHAR over CAR, the CAR method may be used to answer a slightly different question – that is, do firms experiencing the event persistently have abnormal returns over time

(months/years)? In particular, if the researcher intends to draw inferences from the comparisons of two groups of firms, real investors' experience is then less of a concern, and therefore the CAR method should have more advantage than the BHAR method.

Fama (1998) points out the "bad" model problems are more acute with BHAR which compounds the expected returns, and argues that cumulative or average abnormal returns (CAR/AAR) should be used, rather than BHAR. He also points out that average monthly return avoids the problem of extreme skewness produced by compounding monthly returns to get long-term BHAR. Fama (1998) also supports the calendar-time approach, for example, by calculating monthly excess return on the portfolio that contains all firms that have an event during the studied long-term window, using a cross-sectional calendar-time regression. This method addresses the bad-model and cross-sectional dependence problem, and the estimator is better approximated by the normal distribution. This calendar-time approach is favored by Mitchell and Stafford (2000). They also show severe flaw of a preferred method of calculating long-run return anomaly, which is the calculation of multi-year BHAR via bootstrapping procedure. However, Loughran and Ritter (2000) argue that using the calendar-time approach does not reflect investors' experience and has low power in abnormal return detection, and is thus biased toward finding results consistent with market efficiency, since it under-weighs the managers' timing decisions. They state that "tests that weigh firms equally should have more power than tests that weigh each time period equally" (page 363).

3. Sample selection

3.1 Sample selection

In this study, we obtain A.M. Best Company, Inc. (Best)'s financial strength ratings for all property-casualty and life-health insurers assigned a letter rating of "A++" to "D" from *Best's Key Rating Guide* and *Best's Insurance Reports* during the period of year 1996-2006. The letter ratings and their descriptions are show in Appendix 1. Since our scope of analysis is on the publicly-traded insurers' rating news, we use *Standard and Poor's Compustat* to initially identify public insurers during our sample period, based on SIC codes in the range of 6311–6411[9]. Additionally, we use *SNL Insurance Quarterly* for the period of 1998 to 2005 to identify more public insurers with SIC codes outside of that range.

These identified public insurers are then matched with insurers that receive a financial strength rating from Best. In general, the group or pooled rating of the insurance operating entities is matched with the publicly-traded insurer.[10] In the case of multi-line insurers, that is, insurers with subsidiaries both in the life-health and in the property-casualty sectors, two rating matches, one for the group in each sector of the insurance industry, may occur. When group or pooled ratings are unavailable, the rating of the "lead company," as identified by Best, is used as a match for the publicly-traded entity.[11] This approach allows us to include rating changes in both sectors for multi-line insurer and thereby maximizes the number of identifiable rating change events that can be included in our analysis. The *Compustat* and *SNL* database yields 510 securities of public insurers, but matching these data with available Best's ratings reduces the

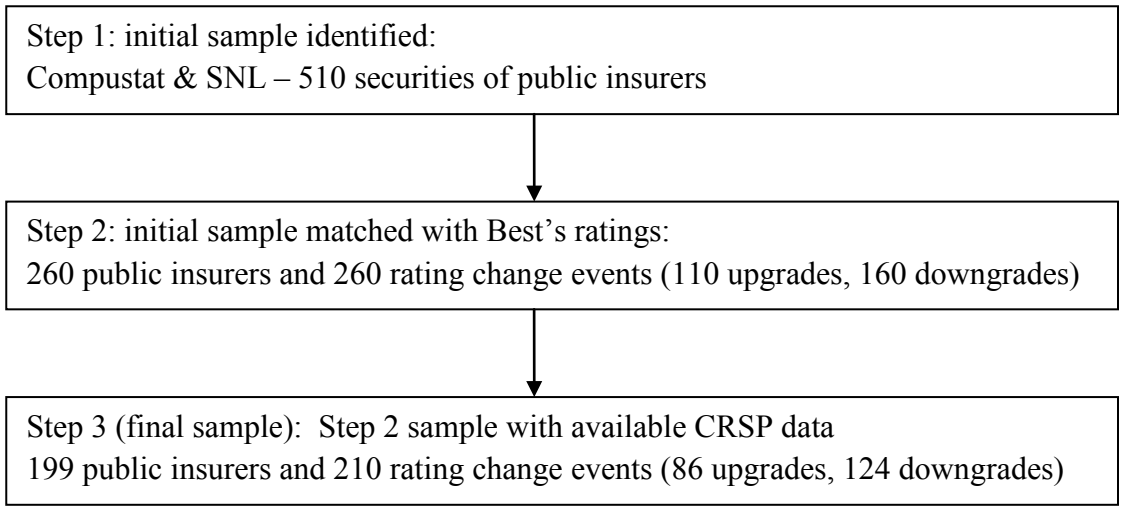
[9] 6311- life insurance; 6321- accident and health insurance; 6324- hospital and medical service plans; 6331- fire, marine and casualty insurance; 6351- surety insurance; 6361- title insurance; 6399- insurance carriers; 6411- insurance agents, brokers and services

[10] Our approach is similar to Halek and Eckles (2010) who rely on the "group" rating for an insurer, or use the rating of one company if that company is the lone company for the group.

[11] Several studies in the banking literature use supervisory ratings of lead banks to examine banking holding company market response to changes in these rating (Hirschhorn, 1987; Simon and Cross, 1991; Berger and Davis, 1998).

initial sample to 260 public insurers, and among those 260 insurers, we initially identify 270 rating change news (110 upgrades and 160 downgrades) during our sample period of year 1996-2006.

We further require that the insurers in our sample have available stock return data during the rating news period, thus we exclude insurers with no available CRSP (the Center for Research in Stock Prices) monthly and daily return data. Our final sample includes 199 unique publicly-traded insurers and 210 rating change events (86 upgrades and 124 downgrades) during the year 1996–2006. Among those 199 firms, 104 are property-casualty (PC) firms, 57 are life-health (LH) firms, and 38 are multi-line insurers[12]. The following graph briefly summarizes our sample generating process.



[12] A PC insurer is defined as an insurer with only the property-casualty line found in Best during the most recent year of that firm's sample observations; an LH insurer is defined as an insurer with only the life-health line found in Best during the most recent year of that firm's sample observations; a multi-line insurer is defined as an insurer with both property-casualty and the life-health lines found in Best during the most recent year of that firm's sample observations.

3.2 Description of sample and rating changes

Table 1 shows the sample description. In Panel A, the statistics suggest that firms with rating changes are smaller than other firms with no rating changes. Downgrade firms are valued by market investors at a price even lower than the book value on average, while upgrade firms are on average valued by more than 40 per cent higher than the book value. Panel B presents the time distribution of rating change events, as well as the relative proportions of downgrades during each year. The number of threshold rating change events of each year is also included in this panel. We use both "A-" and "B+" thresholds in this paper. As shown in the Appendix, the "B+" rating is the division between "secure" and "vulnerable" ratings according to Best, and as such, appears to be the dividing line between investment grade and speculative grade. As pointed out by Halek and Eckles (2010), there is also evidence suggesting that consumers and institutional investors often use the "A-" Best rating as the benchmark for high financial quality (Doherty and Phillips, 2002; Sclafane, 2000; Kosnett, 1999). Panel B suggests that upgrade events are more evenly distributed throughout the sample period than downgrade events, as downgrades happen more frequently in year of 2001-2003. Panel C presents the size and market-to-book distribution of rating upgrade and downgrade firms. "Size" is defined as the market value of equity, and in this panel, "Size 1" refers to the lowest quartile of all public insurers, "Size 4" refers to the highest quartile and so forth. "MB 1" refers to the lowest quartile of market-to-book ratio of all public insurers within the same size quartile, while "MB 4" refers to the highest quartile. Detailed description of the assignment of size/MB portfolio is described in Section 4.1. Panel C shows that while upgrades are more evenly distributed, downgrades are more likely to happen in small firms with low market-to-book ratios.

Table 2 presents the information on the detailed types of rating changes in our sample. The sample consists of 37 multiple-level rating changes (11 upgrades and 26 downgrades), and predominantly of the 173 one-level (75 upgrades and 98 downgrades) rating changes, out of the total 210 changes (86 upgrades and 124 downgrades).

4. Event study estimation model

4.1 Model descriptions

Since we aim to find the abnormal returns up to 12 months before and 12 months after the rate change events, the choice of model specifications is important in achieving unbiased estimations of abnormal stock returns. Our sample is concentrated in the insurance industry thus not random, so model specification may be important even in the short-run study, as suggested by Ahern (2009). We use a characteristic based benchmark portfolio model that uses both monthly and daily stock returns. The benchmark portfolios are carefully designed to adjust size, market-to-book, and industry factors and are rebalanced monthly. We also use cumulative abnormal returns (*CAR*) in calculating both daily and monthly returns. This approach follows Dichev and Piotroski (2001) and additionally adjusts for the industry factor, and is also intuitively plausible based on the event study methodology research in the previous finance literature discussed above in Section 2. The formation of benchmark portfolios is explained in detail below.

For each calendar month during our sample period, we form 16 (4×4) equally weighted portfolios of all the identified public insurers with available stock return data, based on their size and market-to-book ratio[13]. First, we divide the monthly cross sections into size quartiles, based on the market capitalization, which is calculated by multiplying the closing prices from the

[13] These public insurers also include firms that are not rated by Best, but are identified by Compustat & SNL Quarterly with available CRSP return data.

previous month with the number of shares outstanding at the end of the previous month. Within each size quartile, we form 4 market-to-book portfolios. Book values equal to the last reported quarterly book value in *Compustat*, or the last reported quarterly book value in *SNL Quarterly* if *Compustat* does not have the quarterly book value data, or the last reported annual book value in *Compustat*, if quarterly data is not available in both *Compustat* and *SNL Quarterly*. Market values equal to the closing prices times the number of shares outstanding at the end of the previous month. Based on the size and market-to-book quartile cutoffs, each month we assign firms into one of the 16 (4×4) benchmark portfolios and calculate the equal-weighted returns. If a firm has any rating change events in a month, we exclude that firm from the benchmark portfolio for that month. This procedure produces 16 (4×4) monthly-rebalanced benchmark portfolio returns for each month during our sample period of year 1996-2006.

In order to empirically test the soundness of our model, inspired by Brown and Warner (1995) and Ahern (2009), we estimate and compare 10 models, including our model (Model 9 below). Empirically speaking, a sound model is the one that generates little mean bias from zero if we use random event dates. We do not use the rating "no news"[14] event dates, concerning that rating "no news" events may contain some information value to the market investors. We describe each of the 10 models below.

1) Actual return model:

$$BHAR_{i,T} = \prod_{t=1}^{T}\left(1 + R_{i,t}\right) - 1$$

where $BHAR_{i,T}$ is the buy-and-hold "abnormal" return for insurer i during event window T, and $R_{i,t}$ is the stock return of insurer i in month or day t.

[14] Rating "no news" events are those rating news events without any rating changes.

2) One-factor market model using pre-event estimation period (MM-PRE)[15]:

$$AR_{i,t} = R_{i,t} - \left(\hat{\alpha}_i + \hat{\beta}_i R_{M,t}\right)$$

$$CAR_{i,T} = \sum_{t=1}^{T} AR_{i,t}$$

where estimation period is (-72m, -13m) 60-month period or (-265d, -11d) 255-day period, and $AR_{i,t}$ is the abnormal return for insurer *i* during month or day *t*, and $R_{i,t}$ is the stock return of insurer *i* in month or day *t*. $R_{M,t}$ is the CRSP equal-weighted index and $\hat{\alpha}$ and $\hat{\beta}$ are OLS parameter estimates using the pre-event estimation period. $CAR_{i,t}$ is the cumulative abnormal return for insurer *i* in during the event window *T*.

3) One-factor market model using post-event estimation period (MM-POST):

The same as the above Model 2 (MM-PRE) except that $\hat{\alpha}$ and $\hat{\beta}$ are OLS parameter estimates using the post-event (+13m, +72m) 60-month estimation period or (+11d, +265d) 255-day estimation period[16].

4) Fama-French 4-factor model[17] using pre-event estimation period (FF4F-PRE):

$$AR_{i,t} = R_{i,t} - \left(\hat{\alpha}_i + \hat{\beta}_{1i} R_{M,t} + \hat{\beta}_{2i} SMB_t + \hat{\beta}_{3i} HML_t + \hat{\beta}_{4i} UMD_t\right)$$

$$CAR_{i,T} = \sum_{t=1}^{T} AR_{i,t}$$

where estimation period is (-72m, -13m) 60-month period or (-265d, -11d) 255-day period, and $AR_{i,t}$ is the abnormal return for insurer *i* during month or day *t*, and $R_{i,t}$ is the stock return of

[15] One-factor market model is usually used in the finance literature in testing short-run abnormal returns. Halek and Eckles (2010), and Canton and Goh (2003) use pre-event estimation period under the one-factor model.
[16] See Ederington and Goh (1998, 1999) that use post-event estimation period under the one-factor model.
[17] See Fama and French (1993), Carhart (1997)

insurer *i* in month or day *t*. $R_{M,t}$ is the CRSP equal-weighted index; *SMB* (Small Minus Big) is a mimicking portfolio to capture risk related to size; *HML* (High Minus Low) is a mimicking portfolio to capture risk associated with book-to-market characteristics; *UMD* (Up Minus Down) is a mimicking portfolio to capture risk associated with prior returns by subtracting a portfolio of low prior return firms from a portfolio of high prior return firms where prior returns are measured over the months *t*-12 to *t*-2. The Fama-French four factors are available directly from the *Eventus* software through *WRDS* (Wharton Research Data Services). $\hat{\alpha}$, $\hat{\beta}_1$, $\hat{\beta}_2$, $\hat{\beta}_3$ and $\hat{\beta}_4$ are OLS parameter estimates using the pre-event estimation period. $CAR_{i,T}$ is the cumulative abnormal return for insurer *i* in during the event window *T*.

5) Fama-French 4-factor model using post-event estimation period (FF4F-POST):

The same as the above Model 4 (FF4F-PRE) except that $\hat{\alpha}$, $\hat{\beta}_1$, $\hat{\beta}_2$, $\hat{\beta}_3$ and $\hat{\beta}_4$ are OLS parameter estimates using the post-event (+13m, +72m) 60-month estimation period or (+11d, +265d) 255-day estimation period.

6) Market adjusted return model (MAR):

$$AR_{i,t} = R_{i,t} - R_{M,t}$$

$$CAR_{i,T} = \sum_{t=1}^{T} AR_{i,t}$$

where $AR_{i,t}$ is the abnormal return for insurer *i* during month or day *t*, and $R_{i,t}$ is the stock return of insurer *i* in month or day *t*. $R_{M,t}$ is the CRSP equal-weighted index. $CAR_{i,T}$ is the cumulative abnormal return for insurer *i* in during the event window *T*.

7) Industry adjusted model (Industry-Adj)[18]:

$$AR_{i,t} = R_{i,t} - R_{ins-index,t}$$

$$CAR_{i,T} = \sum_{t=1}^{T} AR_{i,t}$$

where $AR_{i,t}$ is the abnormal return for insurer *i* during month or day *t*, and $R_{i,t}$ is the stock return of insurer *i* in month or day *t*. $R_{ins\text{-}index,t}$ is the average return in month or day *t* of all public insurers identified by *Compustat* and *SNL* database, regardless whether such insurer obtained a Best rating. $CAR_{i,T}$ is the cumulative abnormal return for insurer *i* in during the event window *T*.

8) Size adjusted model (Size-Adj)[19]:

$$AR_{i,t} = R_{i,t} - R_{M(i-decile),t}$$

$$CAR_{i,T} = \sum_{t=1}^{T} AR_{i,t}$$

where $AR_{i,t}$ is the abnormal return for insurer *i* during month or day *t*, and $R_{i,t}$ is the stock return of insurer *i* in month or day *t*. $R_{M(i\text{-}decile),t}$ is the average return in month or day *t* of firm *i*'s size-decile portfolio returns based on rankings of the market capitalization of the entire CRSP universe of NYSE, Nasdaq, and AMEX stocks. $CAR_{i,T}$ is the cumulative abnormal return for insurer *i* in during the event window *T*.

[18] Womack (1996) uses industry-adjusted benchmark to calculate 3-month, 6-month, and 12-month CAR.
[19] Womack (1996) also uses the size-adjusted approach to calculate 3-month, 6-month, and 12-month CAR.

9) Industry-size and industry-market-to-book adjusted benchmark portfolios with monthly rebalancing (Our_Benchmark)[20]:

$$AR_{i,t} = R_{i,t} - R_{benchmark-i,t}$$

$$CAR_{i,T} = \sum_{t=1}^{T} AR_{i,t}$$

where $AR_{i,t}$ is the abnormal return for insurer *i* during month or day *t*, and $R_{i,t}$ is the stock return of insurer *i* in month or day *t*. $R_{benchmark\text{-}i,t}$ is the equal-weighted monthly or daily return of the monthly-rebalanced benchmark portfolio (based on size and market-to-book ratio and industry-adjusted) where firm *i* is assigned to during that month. $CAR_{i,T}$ is the cumulative abnormal return for insurer *i* in during the event window *T*. The formation of benchmark portfolios is explained in Section 4.1.

10) Calendar-month model using Fama-French 4 factors (Calendar-Month)[21]:

$$R_{pt} - R_{ft} = \hat{\alpha}_p + \hat{\beta}_{1p}(R_{Mt} - R_{ft}) + \hat{\beta}_{2p} SMB_t + \hat{\beta}_{3p} HML_t + \hat{\beta}_{4p} UMD_t + e_{pt}$$

where $\hat{\alpha}_p$ is the average abnormal return on the portfolio of the event firms over the *T*-month post-event period (typically $T \geq 12$); R_{pt} is the equal-weighted return for calendar month *t* for the portfolio of event firms that experienced the event within the previous *T* months; R_{ft} is the risk-free interest rate; R_{Mt} is the return on the CRSP equal-weighted market portfolio; *SMB* (Small Minus Big) is a mimicking portfolio to capture risk related to size; *HML* (High Minus Low) is a mimicking portfolio to capture risk associated with book-to-market characteristics; *UMD* (Up

[20] Dichev and Piotroski (2001) use size, market-to-book matched portfolios to calculate the 3-month, 6-month, 12-month CAR after the bond rating changes. Since our study uses public insurer data, we also adjust the industry factor. Hirshleifer et. Al (2009) also uses size/market-to-book matched portfolios to calculate the quarterly CAR following earnings announcements.

[21] The calendar-month model is used in the finance literature to test the long-run abnormal returns over 1-year period. See Boehme and Sorescu (2002), Byun and Rozeff (2003), George and Hwang (2007).

Minus Down) is a mimicking portfolio to capture risk associated with prior returns by subtracting a portfolio of low prior return firms from a portfolio of high prior return firms where prior returns are measured over the months *t*-12 to *t*-2. $\hat{\beta}_{1p}$, $\hat{\beta}_{2p}$, $\hat{\beta}_{3p}$ and $\hat{\beta}_{4p}$ are OLS parameter estimates associated with the 4 factors.

4.2 Model performances

We use *Eventus* software in *WRDS* to estimate the above 10 models. Table 3 presents the empirical model performance results – the mean abnormal returns of random event dates for the specified event windows, using the CRSP monthly data. For each insurer, we use a computer-generated random date for each calendar year when the insurer does not have any rating changes. This random date selection method reduces the noise of corporate events in our randomly selected dates, and assures that the event month or event day does not correspond with a rating change.

Model 1 (Actual Returns) uses the mean buy-and-hold returns, while Model 2-9 use the mean cumulative abnormal return (CAR) as the measurement. The calendar-month model (Model 10) presents the average monthly abnormal returns during the event windows that cover at least 12 months, since the calendar-time approach is generally considered as a method to measure returns of 1 year or more (Fama 1998). In Table 3, all models in Panel A (except the actual returns model) require an estimation period, which may use pre-event or post-event observations for modeling "normal returns". The models in Panel B do not require estimation period for "normal returns". Except the calendar-month model, all models in Panel B use benchmark portfolios designed in different ways.

Assuming that the random dates do not contain significant information perceived by the market investors, an ideal model would be the one that shows no statistically significant deviation from zero for all event windows. That is to say, we need to empirically determine which model has the least mean bias[22]. First, the results in Panel A of Table 3 show that the abnormal returns are sensitive to the estimation period chosen, especially when the event window gets large. Models using pre-event estimation period (Model 2 and 4) generates more statistically negative mean CARs during all studied event windows, than the models using post-event estimation period (Model 3 and 5). Additionally, if pre-event estimation period is used, Fama-French 4-factor model (Model 4) does not appear to be superior to the market 1-factor model (Model 2), in terms of the economic magnitude and the number of statistically significant mean biases. If post-event estimation period is used, Fama-French 4-factor model (Model 5) does appear to have smaller mean biases than the market 1-factor model (Model 3) in most event windows. Overall, for our sample, a model dependent on the selection of estimation period may be problematic when we use monthly return data.

Second, the results in Panel B of Table 3 show that among the models that use benchmark portfolios (Model 6-9), Model 9 appears to have the least amount of statistically significant mean biases. This is not surprising since the benchmark portfolios in Model 9 use more control dimensions than other benchmark portfolio models, and it involves generating 16 (4×4) size and market-to-book monthly rebalanced portfolios within the industry. Furthermore, the 3-month event window (+1m, +3m) has insignificant -0.22% mean CAR for random dates under Model 9, compared to the mean quarterly CAR of -0.96% calculated for bank holding companies using the one-factor market model in Berger, Davies, and Flannery (2000). Calendar-month approach (Model 10) also appears to exhibit no significant mean bias for the event

[22] See Brown and Warner (1985) and Ahern (2009).

window of one year or more, but as argued by Loughran and Ritter (2000), using the calendar-time approach might be biased toward finding no significant results. Chart 3A compares the mean cumulative monthly abnormal returns (-12 month, +12 month) of rating no-change news events for 8 different models (Model 2-9). Model 6, 7, 9 all appear to be close to the 0% horizontal axis and show no economically significant mean bias from the graph.

Table 4 presents the mean abnormal returns, using the CRSP daily data and the same generated random dates used in Table 3. The results show that model selection in short-run event studies may also start to matter when the event window exceeds 7 days. It appears that our model (Model 9) edges over other models with regards to the total number of insignificant t-statistics and generalized sign Z statistics.

5. Hypotheses and event study results

5.1 Returns surrounding rating changes

Similar to Halek and Eckles (2010), we first investigate whether Best's rating change news provide new useful information to market investors using the full sample. In addition, we test whether market investors respond to the possible new information in a timely way following the rating changes. Furthermore, Holthausen and Leftwich (1986), Goh and Ederington (1999) observe significant negative abnormal returns prior to downgrades and significant positive abnormal returns prior to upgrades. This may suggest that the market investors anticipate the future rating changes, or in other words, the market adjusts public information related to rating changes in a more timely way than the rating agency does. In the following we state our first three related hypotheses (H1, H1.1 and H1.2) concerning short-run and long-run market response respectively.

H1 (*New Information Hypothesis*)*: The short-run abnormal returns are negative in response to rating downgrade news, and are positive for rating upgrade news.*

H1.1 (*Incomplete Market Response Hypothesis*)[23]*: If rating does provide new information, and if the market responds to rating change news incompletely in the short-run, we would observe a long-run negative market drift for downgrades, and a positive drift for upgrades.*

H1.2 (*Rating Change Anticipation Hypothesis*)*: If the market investors anticipate the future rating change news, we would observe pre-downgrade negative abnormal returns and pre-upgrade positive abnormal returns.*

Table 5 presents the abnormal returns surrounding A.M. Best rating changes using both monthly and daily data. We use our benchmark portfolio method which adjusts for size, market-to-book and industry factors described in Section 4.1. Panel A uses the full sample of 199 insurers and 210 rating changes during the period of 1996-2006. As a robustness check, we also find firms with premium accounting for at least 50% of revenue for all years of 1997-2005, using *Best Insurance Report* (year 1997-2000 data) and *SNL* (year 2001-2005 data) and present the results of this subsample in Panel B. Panel B thus consists of the subsample of 99 firms and 154 rating changes.

An examination of Panel A of Table 5 shows that downgraded firms experience about -13% of mean abnormal returns during the event month, around -40% during the 12-month pre-event window, and an average of around -6% of post-event drift for 3 months after the downgrades.

[23] The incomplete market response hypothesis that is related to long-run results is incorporated into the core short-run hypotheses in all of the following sub-sections, and thus is not stated separately.

The signs of the abnormal returns are consistent with existing finance literature[24], while the magnitudes in this study seem larger than the studies using the bond rating changes[25]. One explanation of this is that insurer ratings reflect the firm's ability to meet policyholder obligation to which bond obligations are subordinate, and thus a rating downgrade affects policyholders before affecting bondholders (Halek and Eckles, 2010). In comparisons to downgrade firms, in Panel A, upgrade firms experience only about 1.5% of mean abnormal returns during the event month, around 10% during the 12-month pre-event window, and show no evidence of post-event drift using the monthly data.

Panel A of Table 5 also presents the short-run event window results using the daily CRSP data. The 3-day announcement window (-1d, +1d) shows a statistically significant -8.67% mean abnormal return for downgrades[26] and a small but significant (at 10% significance level) 0.59% mean abnormal return for upgrades. The daily results are consistent with Halek and Eckles (2010) with regards to the signs and the evidence of asymmetric responses, but the magnitude of our 3-day announcement returns is larger than their reported result of -4.59%.[27] We also document a significant -12.01% of mean cumulative abnormal returns (CAR) for 30 days before the downgrades, and a significant 1.98% mean CAR during the pre-upgrade 30-day window.

In the 12-month window before the event, we document a significant -40.06% mean CAR for downgrades, and a significant 10.32% mean CAR for upgrades. This suggests that some information related to rating changes have already been incorporated into stock prices well

[24] See Holthausen and Leftwich (1986), Hand et al. (1992), Goh and Ederington (1993), Dichev and Piotroski (2001)
[25] For example, Dichev and Piotroski (2001) report a 3-month market drift of around -4% for bond rating downgrades (page 183).
[26] We also conduct the study using the market 1-factor model which is used by Halek and Eckles (2010), and we find the mean cumulative abnormal return of -8.83% for the (-1, +1) 3-day event window using the market model. The average actual 3-day return of downgrade firms is -9.25% in our sample.
[27] One possible explanation is that the time periods we use are different – in this study we use year 1996-2006, while Halek and Eckles use year 1993-2003. This may imply that the market reacts more strongly to downgrades in later years.

before the rating change news. After the downgrades, we show a slight mean reversion trend during the (+3d, +10d) day period, while the post-upgrade returns do not show such mean reversion trend. Panel B exhibits results very similar to those presented in Panel A and discussed above, implying that the inferences drawn from the full sample can be considered robust. We also present two charts (Chart 5A and Chart 5B) to show the cumulative monthly and daily abnormal returns during the (-12m, +12m) months and (-30d, +30d) days surrounding the rating changes. These results support our new information hypothesis H1 and incomplete market response hypothesis H1.1 for downgrades, and provide support for the rating change anticipation hypothesis H1.2 for both downgrades and upgrades.

5.2 Returns conditional on firm size

Existing finance literature shows that the long-run abnormal return measures are stronger for smaller firms[28]. The size of the rating change firms is not addressed in the short-run study in the finance literature, nor addressed in any study in the insurance literature. Small firms tend to be thinly followed, and thus the information asymmetry between the managers and investors could be larger. This may result in stronger short-run market response to rating change events for small firms than for large firms. Furthermore, if the market reacts incompletely to rating change news, we could see a stronger long-run effect for small firms than for large firms. We state our size-related hypotheses (H2) below:

H2 (*Information Asymmetry Hypothesis*)*: The short-run market response to rating change news measured by abnormal returns, if significant, should be stronger for small firms than for large firms, due to the higher level of information asymmetry for small firms. The long-run market*

[28] See Bernard and Thomas (1989), Fama (1998) and Dichev and Piotroski (2001).

response should have similar effect if the market responds to rating change news incompletely in the short run.

Based on the rankings of the market capitalization of the 13th month prior to the rating change month[29], we partition all firms into the top 50% (large firms) and bottom 50% (small firms) for each month. Therefore, among all 124 downgrades in our sample, 83 of them are downgrades for small insurers, and 41 downgrades are for large insurers; among all 86 upgrades, 55 are for small insurers and 31 are for large insurers.

The results are presented in Table 6, Chart 6A and Chart 6B. We do not find evidence of differential pre-event returns between small and large firms. We show three important findings. First, the market responds more negatively to downgrades for small insurers than for large insurers in the short run. The mean CAR for small insurers during the 3-day (-1d, +1d) event window is significantly at -10.75%, compared to -4.46% for large insurers. Second, we find some evidence of short-run significant market responses for small firm upgrades, but not large firm upgrades. Thirdly, we find that both small and large firms show a 3-month post-downgrade market drift of negative abnormal returns, though the difference of such abnormal returns between small and large firms is not significant. Both small and large firms exhibit around -6% of CAR during the 3-month (+1m, +3m) period, and do not show statistically significant CAR in other long-run windows such as the 12-month (+1m, +12m) event period. This is not consistent with the findings in Dichev and Piotroski (2001) that show 12-month negative abnormal returns are stronger for smaller firms following the bond rating downgrades, but consistent with their long-run finding that there is little evidence on the abnormal returns following the bond rating

[29] We use the market capitalization (firm size) of the 13th month prior to the rating change month due to the fact that we use (-12m, +12m) as one of our event windows, and the size is the result of stock returns.

upgrades even after controlling for size. Overall, the information asymmetry hypothesis (H2) is supported by the short-run study of the downgrade events.

5.3 Return conditional on market-to-book ratio

Market-to-book (MB) ratio is often an important financial ratio that measures investors' expectation of firm's future profit generation abilities[30]. Whether the market responds more or less to the rating changes of firms with high MB ratios is an empirical question and has yet to be tested in both finance and insurance literature. Generally market investors view high MB firms have better future profit prospects than low MB firms. If a low MB firm experience a downgrade, it is plausible to think that the bad news from the rating agency would possibly "reinforce" investor's low confidence, and thus the market would possibly respond more strongly to downgrade news for low MB firms than for high MB firms. Similarly, if the market responds more strongly to upgrade news for high MB firms than for low MB firms, it would also support this "reinforce" hypothesis. We state our hypothesis (H3) below:

H3 (*Reinforce Hypothesis*)*: The short-run market response to downgrade* (*upgrade*) *news measured by abnormal returns, if significant, should be stronger for low* (*high*) *MB firms than for high* (*low*) *MB firms, due to rating agency's rating news possibly reinforcing investors' confidence of firm prospects. The long-run market response should have similar effect if the market responds to rating change news incompletely in the short run.*

[30] See Pontiff and Schall (1998), Fama and French (1992)

We partition our sample based on the rankings of the market-to-book ratios within each size (market capitalization) quartile for the 13th month prior to the rating change month[31], and the top 50% firms within each size quartile are classified as high market-to-book (MB) firms, and the bottom 50% firms are classified as low MB firms. Among all 124 downgrades in our sample, 63 of them are downgrades for high MB insurers, and 61 downgrades are for low MB insurers; among all 86 upgrades, 43 are for high MB insurers and 43 are for low MB insurers.

Table 7, Chart 7A and Chart 7B present the results. We do not find evidence of differential pre-event returns between high MB and low MB firms. However, we find weak evidence supporting H3. Low MB firms experience more short-run negative abnormal returns in general, though results in Panel A of Table 7 show such difference to be significant in only some short-run event periods. For example, for the downgrades, Low MB firms experience significant CAR of -15.36% during the 20-day (-10d, +10d) event period, while high MB firms on average experience insignificant CAR of -3.65% during the same period. For upgrades, we do not find differential returns in the short run, but do find evidence of 12-month post-upgrade CAR significantly higher for high MB firms (7.71%) than for low MB firms (-3.96%). These evidence weakly supports the reinforce hypothesis H3.

5.4 Return conditional on pre-event credit quality

Existing finance literature shows that bond rating changes correspond to larger default risk revision for low credit quality firms than for high credit quality firms, and thus market responses

[31] We partition our sample based on the MB ratio of the 13th month prior to the rating change month due to the fact that we use (-12m, +12m) as one of our event windows, and the MB ratio is the result of stock returns.

tend to be stronger for rating changes of low credit quality firms both in the short and long run.[32] Similarly, we also test the hypothesis stated below.

H4 (*Non-linear Rating-Risk Hypothesis*): *The short-run market response to rating change news measured by abnormal returns, if significant, should be stronger for low credit quality firms than for high credit quality firms, due to the non-linear rating-risk structure* (*i.e., larger default risk revision related to rating change for low credit quality firms*)*. The long-run market response should have similar effect if the market responds to rating change news incompletely in the short run.*

To empirically test that using insurer rating, we partition our sample based on the pre-event *Best* ratings. Pre-event rating is defined as the most recently assigned *Best* rating prior to the rating change. We define low-quality firms as those with a pre-event rating lower than "A-", and high-quality firms as those with a pre-event rating equal to or higher than "A-". Previous insurance literature often use "A-" as the rating threshold in their analysis, and they point out that "A-" rating is also often used by consumers and institutional investors as a benchmark[33]. Among all 124 downgrades in our sample, 40 of them are downgrades for low-quality insurers, and 84 downgrades are for high-quality insurers; among all 86 upgrades, 53 are for low-quality insurers and 33 are for high-quality insurers.

The results presented in Table 8, Chart 8A and Chart 8B are generally consistent with the existing finance literature regarding bond ratings, and show that market responds more strongly to rating changes of low-quality firms, at least during the short run. For example, the

[32] See Ederington and Goh (1999), Keenan, Carty, and Shtogrin (1998), Dichev and Piotroski (2001)
[33] See Epermanis and Harrington (2006), Halek and Eckles (2010), Doherty and Phillips (2002)

mean CAR of downgrades for low-quality insurers during the 3-day (-1d, +1d) event window is a significant -13.33% compared to -6.45% for high-quality insurers, and that difference is statistically significant. Both low and high quality insurers exhibit pre-downgrade underperformance while this pre-downgrade underperformance is significantly greater in magnitude for low quality insurers, as shown in Table 8 Panel A. Low-quality firms also exhibit significant post-downgrade drift of -22.54% during the 12 months following the downgrade, and a short-term mean reversion of returns during the (+3d, +10d) days following the downgrades, and none of these are significant for high-quality firms. Table 8 Panel B shows that the short-run market responses to rating upgrades are marginally stronger for low-quality firms than for high-quality firms, similar in relative terms compared to downgrades, though the differences are less economically or statistically significant. For example, the 3-day (-1d, +1d) event period shows the mean CAR of +1.01% for low-quality insurer upgrades, and -0.08% for high-quality insurer upgrades, and such difference is significant at 10% level. Overall, these results provide supporting evidence for the non-linear rating-risk hypothesis H4.

5.5 Return on threshold and non-threshold rating changes

We also distinguish threshold rating changes from non-threshold rating changes, since the threshold ratings are often viewed as the benchmark ratings by consumers, insurance agents and brokers, and investors[34]. More specifically, Epermanis and Harrington (2006) point out that some insurance buyers are contractually prohibited from buying policy from an insurer rated below a certain threshold, and Halek and Eckles (2010) show that threshold downgrades create

[34] See Kosnett (1999), Sclafane (2000), Doherty and Phillips (2002), Epermanis and Harrington (2006), and Halek and Eckles (2010).

stronger negative abnormal returns than non-threshold downgrades[35]. These studies use "A-" as the threshold for Best ratings, as Halek and Eckles (2010) point out that the "A-" threshold is more often used by consumers and institutional investors. As shown from Appendix 1, Best defines "secure" rating as the one equal to or higher than "B+", and any rating below "B+" is defined as a "vulnerable" rating. In this study, we use both "A-" and "B+" as the thresholds, and define threshold downgrades/upgrades as the ones that lose/gain either "A-" or "B+" rating after the rating changes. Similar to Halek and Eckles (2010), we test the threshold rating hypothesis stated below.

H5 (*Threshold Rating Hypothesis*): *The short-run market response to rating change news measured by abnormal returns, if significant, should be stronger for threshold rating changes than for non-threshold rating changes. The long-run market response should have similar effect if the market responds to rating change news incompletely in the short run.*

Among all 124 downgrades in our sample, 44 of them are identified as threshold downgrades and 80 of them are non-threshold downgrades; among all 86 upgrades, 29 of them are identified as threshold upgrades, and 57 of them are non-threshold upgrades. The results are presented in Table 9, Chart 9A and 9B. Our short-run results are consistent with Halek and Eckles (2010) in that the market responds more strongly to threshold downgrades than to non-threshold downgrades. For example, the (-1d, +1d) 3-day period shows the mean CAR of -15.55%

[35] Halek and Eckles (2010) did not conduct a separate analysis for threshold upgrades, and did not address whether such difference of market response between threshold and non-threshold downgrades is statistically significant.

for the threshold downgrades[36], as compared to the mean CAR of -4.89% for the non-threshold downgrades, and we document that such difference is statistically significant at 0.1% level. We also find weak evidence that such differential market response also applies to upgrades, though at a much lower magnitude. For example, the (-1d, +1d) 3-day period exhibits a positive 1.36% mean CAR for threshold upgrades, and an insignificant but positive 0.19% for non-threshold upgrades, and such difference is statistically significant at 10% level. Another important finding, as shown by Panel A of Table 9 and Chart 9B, is that the threshold downgrades appear to have a significant market drift during the 6-month period following the downgrade events, as the 6-month (+1m, +6m) event period shows -21.78% as the mean CAR for the threshold downgrades, and an insignificant yet even positive 1.81% for non-threshold downgrades. These results provide supporting evidence for the threshold rating hypothesis H5.

5.6 Return on initial and subsequent rating changes

In our full sample, insurers are generally rated once per calendar year. We then define subsequent rating changes as the rating changes following the prior ones within 12-month period, and initial rating changes as all the other non-subsequent rating changes. Most finance and insurance literature do not perform separate analysis between these two groups, except that Kim and Nabar (2007) retain only the bond rating changes that are not followed by a subsequent rating change within one year, in order to control for the impact of multiple rating changes issued successively. Based on this partition of our rating change sample, among all 124 downgrades, 36 of them are identified as subsequent downgrades, and 88 of them are classified as initial downgrades. Among all 86 upgrades, only 4 upgrades are identified as subsequent upgrades,

[36] We also conduct a separate analysis for "A-" threshold downgrades and "B+" threshold downgrades, and find out the 3-day (-1, +1) mean CAR of -14.06% for "A-" threshold downgrades and -17.50% for "B+" downgrades, and such difference is not statistically different.

therefore we do not perform a separate analysis for upgrades between these two groups due to limited sample size.

It is plausible to state that the subsequent downgrades may contain more information value to the investors than initial downgrades, since they may be timelier and more surprising to the market investors than initial downgrades. However, subsequent downgrades are more likely to lose the "A-" or "B+" threshold rating. Therefore, it may be important to control for the threshold rating factor when comparing subsequent and initial downgrades. We state our subsequent rating hypothesis below.

H6 (*Subsequent Rating Hypothesis*): *If subsequent downgrade news are timelier and thus more surprising than initial downgrade news, then the short-run market response to downgrade news measured by abnormal returns, if significant, should be stronger for subsequent downgrades than for initial downgrades, even after controlling for the threshold rating factor. The long-run market response should have similar effect if the market responds to rating change news incompletely in the short run.*

Table 10, Chart 10A, and Chart 10B present two important findings. First, the short-term negative market responses to the downgrades are much more pronounced for subsequent downgrades than for initial downgrades, and that is consistent with our hypothesis H6 above. The mean CAR for subsequent downgrades during the 3-day (-1d, +1d) event window is a significant -17.64%, compared to -5.00% for initial downgrades, and such difference is both statistically and economically significant. Another interesting finding is that the mean reversion trend for subsequent downgrades during the 8-day (+3, +10) period is a significant +7.62%,

while such reversion trend is not significant for initial downgrades. Second, Table 10 and Chart 10A also show that the negative market drift during the 12-month period following the downgrades is more pronounced for subsequent downgrades than for initial downgrades (-23.58% vs. 1.96%).

Table 10.1, Chart 10.1A, and Chart 10.1B present the comparisons between subsequent and initial downgrades controlling for the threshold rating factors. The results are similar to those presented in Table 10, suggesting that both threshold and subsequent rating factors matter in the magnitude of abnormal returns. Among the 80 non-threshold downgrades, there are 18 subsequent downgrades and 62 initial downgrades. The mean CAR for this subsequent non-threshold downgrades during the 3-day (-1d, +1d) event window is -13.71%, significantly more negative than the corresponding -2.33% for initial non-threshold downgrades. Among the 44 threshold downgrades, there are 18 subsequent downgrades and 26 initial downgrades. The mean CAR for this subsequent threshold downgrades during the 3-day (-1d, +1d) event window is -21.57%, significantly more negative than the corresponding -11.37% for initial threshold downgrades. Furthermore, subsequent threshold downgrades exhibit an astounding mean CAR of -41.63% during the 12-month post-event period, as compared to only -0.96% for initial threshold downgrades. These results provide strong support for the subsequent rating hypothesis H6.

5.7 Return on pure property-casualty (PC) and pure life-health (LH) firms

Whether market responds differently to rating changes of property-casualty (PC) firms as compared to life-health (LH) firms is an empirical question, and may shed light on the level of opaqueness among PC and LH firms. PC insurer operations and finances may be more complex or difficult to evaluate based on public information. If that is true, it is plausible that the rating

change news for PC insurers may be more valuable to the market investors than the rating change news for LH firms. Prior insurance research literature has not explored this issue, and we here state our hypothesis below.

H7 (*Information Opaqueness Hypothesis*): *The short-run market response to rating change news measured by abnormal returns, if significant, should be stronger for PC firms than for LH firms, if the public information for PC firms is harder (more opaque) to evaluate by the market investors. The long-run market response should have similar effect if the market responds to rating change news incompletely in the short run.*

We partition our full sample into rating changes for pure PC firms, pure LH firms, and multi-line firms with both PC and LH operations. We exclude rating changes for multi-line firms in this analysis for the purpose of comparing pure PC and pure LH firms. Among all 124 downgrades in our sample, 60 of them are identified as downgrades of pure PC firms, and 28 as downgrades for pure LH firms[37]; among all 86 upgrades, 34 of them are identified as upgrades for pure PC firms, and 26 as upgrades for pure LH firms.

Our results in Table 11, Chart 11A and 11B show that downgrades of PC firms generate more negative abnormal returns than downgrades of LH firms during the event month and the 3-month period following the downgrade (-12.74% for PC firms vs. 0.74% for LH firms), but such comparison is generally not significant when we look at the daily windows. Another interesting finding is that we document significant over-performance of +20.61% for LH firms during the

[37] We also examine whether PC downgrades are more likely to be threshold downgrades than LH downgrades, and do not find such evidence. 24 out of 60 PC downgrades and threshold downgrades, while 11 out of 28 LH downgrades are threshold downgrades. So roughly about 40% of downgrades are threshold downgrades for both pure PC and pure LH firms.

12-month period prior to rating upgrades, but such pre-upgrade over-performance is not significant for PC firms. These results provide evidence that the market is timelier in adjusting LH firms' information than in adjusting PC firms' information, and it also provides weak evidence supporting our information opaqueness hypothesis H7 in that the market responds more strongly to PC downgrades, but not in a timely fashion (i.e., only in the long run period).

5.8 Return on mono-line firm (pure-PC or pure-LH firm) rating changes vs. multi-line firm rating changes

We also distinguish between mono-line firm (pure-PC or pure-LH firm) rating changes and the multi-line firm rating changes, and hypothesize that the effects of rating changes on stock prices are weaker for multi-line firm rating changes, due to the fact that such changes often reflect the assessment of only part of the firm. Prior finance or insurance research has not explored this "subsidiary effect" issue for rating changes, and we form our hypothesis H8 as the following.

H8 (*Subsidiary Effect Hypothesis*): *The short-run market response to rating change news measured by abnormal returns, if significant, should be stronger for mono-line firms* (*pure PC or pure LH firms*) *than for multi-line firms, if the rating change news for multi-line firms is likely to reflect the assessment of only part of the firm* (*i.e., subsidiary of the firm*)*. The long-run market response should have similar effect if the market responds to rating change news incompletely in the short run.*

Among all 124 downgrades, 88 of them are identified as mono-line (pure PC/LH) firm rating downgrades and 36 of them are multi-line firm downgrades; among all 86 upgrades, 60 of

them are identified as upgrades for mono-line (pure PC/LH) firms, and 26 of them are multi-line firm upgrades.

The results shown in Table 12, Chart 12A and 12B confirm that the market responds differently to these two types of rating changes in the short period using the 3-day (-1d, +1d) window, and the response is stronger for the mono-line firm rating changes than for the multi-line firm rating changes, in both downgrades and upgrades. However, such difference is more pronounced for downgrades. The (-1d, +1d) 3-day mean CAR for mono-line firm downgrade is -11.41%, compared to only -1.97% for multi-line firm downgrades. The (-1d, +1d) 3-day mean CAR for single-entity upgrade is much smaller in magnitude but still significant at +1.09%, while there is no reliable evidence that the mean CAR for multi-line firm upgrades is significantly different from zero. Furthermore, we document a long-run 6-month market drift (negative CAR) for mono-line firms, while such post-downgrade drift is not found in the multi-line firms. These results strongly support the subsidiary effect hypothesis H8.

5.9 Return on pre-Reg-FD and post-Reg-FD rating changes

Regulation Fair Disclosure (Reg FD) was adopted by Securities and Exchange Commission (SEC) in August 2000 and was implemented on October 23, 2000. The rule[38] mandates that all publicly traded firms must disclose material information to all investors at the same time, and thus prohibits firms from disclosing non-public information to favored investment professionals. However, the rule does not prohibit firms from disclosing such non-public information to credit rating agencies. Jorion, Liu and Shi (2005) find that the informational effect of bond rating changes is much larger in the post-Reg-FD period than in the pre-Reg-FD period, and such empirical finding is intuitively plausible. We test that difference using the insurer ratings in this

[38] See SEC final rule, File No. S7-31-99, http://www.sec.gov/rules/final/33-7881.htm

study. To our knowledge, this is also the first study to address the post-Reg-FD vs. pre-Reg-FD distinction on insurer financial strength ratings. We formally state our Reg-FD hypothesis below.

H9 (*Reg-FD Effect Hypothesis*): *If rating agency has more advantage of obtaining non-public information than the market investors during the post-Reg-FD period, then the short-run market response to rating change news measured by abnormal returns, if significant, should be stronger for post-Reg-FD rating changes than for pre-Reg-FD rating changes. The long-run market response should have similar effect if the market responds to rating change news incompletely in the short run.*

In our full sample of all 124 downgrades, 47 of them are identified as downgrades during the pre-Reg-FD period (that is, downgrades that happened before October 23, 2000), and 77 of them are downgrades during the post-Reg-FD period; among all 86 upgrades, 45 of them are pre-Reg-FD upgrades, and 41 of them are post-Reg-FD upgrades.

Our results are first presented in Table 13, Chart 13A and 13B. We document a statistically stronger market drift during the 12-month post-downgrade period for the pre-Reg-FD downgrades than for the post-Reg-FD period. If we look at the three short event windows of (0d, +2d), (-1d, +1d) and (-2d, +2d), we can see that the market responds marginally stronger for both downgrades and upgrades during the post-Reg-FD period, and but such difference is not all statistically significant for these three short event periods. For the 3-day event window (-1d, +1d), we also find that the market response is higher for post-Reg-FD upgrades (1.21%) than for pre-Reg-FD upgrades (0.02%). Though the difference is statistically significant, the magnitude of

such difference is small, and such statistical significance does not hold true in most other short-run windows for upgrades.

Overall the evidence that the rating contains more informational value during the post-Reg-FD period than during the pre-Reg-FD period is weak for insurer ratings, as compared to the evidence of bond ratings in the finance literature, thus we have little evidence supporting our Reg-FD hypothesis H9. This result is not consistent with Jorion, Liu and Shi (2005) in that they find the informational effect of bond rating changes is larger in the post-Reg-FD period.

To explore the possible cause of this inconsistency, we further compare pre- and post-Reg-FD rating downgrades by controlling for the threshold rating factor. Among 47 pre-Reg-FD downgrades, 31 of them are non-threshold downgrades and 16 of them are threshold downgrades. Among 77 post-Reg-FD downgrades, 49 of them are non-threshold downgrades while 28 of them are threshold downgrades. The results after controlling for the threshold rating factor are presented in Table 13.1, Chart 13.1A and Chart 13.1B. We still do not find the evidence supporting the Reg-FD effect hypothesis here. One possible explanation of the weaker than expected market response to rating changes during the post-Reg-FD period is that the increase of insurer's default risk after the downgrade is perceived to have lower magnitude by the investors than such magnitude during the pre-Reg-FD period. This is possibly due to the fact that rating standards have improved over time in recent years documented in the recent insurance literature[39], and therefore the improving standards may potentially narrow down the difference of default risk between any pair of neighboring ratings over a certain level. We do not wish to conclude this but only aim to offer a potential explanation, and if our explanation is true, future research may be able to find the supporting empirical evidence.

[39] See Doherty and Phillips (2002), Pottier and Sommer (2003)

5.10 Return on different levels of rating changes

Existing finance and insurance research show that the market responds more strongly to multiple-level downgrades than for one-level downgrades[40]. It is plausible that multiple-level rating changes may contain more information content and value to market investors than one-level rating changes. Similar to the approach of Eckles and Halek (working paper 2011), we state our multiple-level rating change effect hypothesis below.

H10 (*Multiple-level Rating Change Effect Hypothesis*): *If multiple-level rating changes contain more useful information to the market investors than one-level rating changes, then the short-run market response to rating change news measured by abnormal returns, if significant, should be stronger for multiple-level rating changes than for one-level rating changes. The long-run market response should have similar effect if the market responds to rating change news incompletely in the short run.*

In our full sample of all 124 downgrades, 98 of them are one-level downgrades, and 26 of them are multiple-level rating downgrades; among all 86 upgrades, there are 75 one-level upgrades and 11 multiple-level upgrades.

Our results are first presented in Table 14, Chart 14A and 14B. We document significantly stronger market responses to multiple-level downgrades than to one-level downgrades, both in the short and long run. For example, in the short run 3-day event window of (-1d, +1d), the mean CAR is -22.08% for multiple-level downgrades, and -5.28% for one-level downgrades. In the long-run 12-month post-downgrade event window, we find a negative market

[40] See Hand, Holthausen, and Leftwich (1992), Eckles and Halek (working paper 2011)

drift with the mean CAR of -30.64% for multiple-level downgrades, while such drift is not documented for one-level downgrades. We find little evidence that the market responds differently to different levels of rating upgrades both in short and long run. However, the abnormal returns for pre-event long-run windows are stronger for multiple-level downgrades, for both downgrades and upgrades. This implies that the market incorporates at least some information related to multiple-level rating changes before the rating change event. Overall, we find evidence supporting the multiple-level rating change effect hypothesis H10 for rating downgrades in both short and long run.

6. Regression Analysis

The event study analysis in the finance literature is generally concerned about the measurement of market response to one corporate event in the short run, and/or whether there is evidence of market drift following such event. Comparisons of subsamples are often used to directly draw inferences on how the market responds differently to different types of firms or events. We compare different subsamples in Section 5 above. In the insurance literature, Eckles and Halek (working paper 2011) recently use a cross-sectional regression approach to address the determinants of abnormal returns to rating downgrades using the short-run event period. We also follow that approach and present the cross-sectional regression results. We expand their analysis to include monthly event windows, upgrade firms, and additional factors such as market-to-book ratio, parent vs. subsidiary distinction, pre-Reg-FD vs. post-Reg-FD distinction, and "surprise" rating changes. The general regression equation is presented below:

$$CAR(t_1, t_2)_{i,t} = \beta_0 + \beta_1 Small_{i,t} + \beta_2 HighMB_{i,t} + \beta_3 PostFD_{i,t} + \beta_4 Subset_{i,t} + \beta_5 Severe_{i,t} + \beta_6 Level2\_dum_{i,t} + \beta_7 \Pr ior30d_{i,t} + \beta_8 \Pr ior\_12m_{i,t} + \varepsilon_{i,t}$$

where *CAR* stands for the cumulative abnormal returns of rating downgrades or upgrades between day/month t_1 and t_2, $Small_{i,t}$ is a dummy variable that indicates 1 if the firm *i* is in the bottom 50% of the market capitalization among all insurers during the month of the rating change *t*, and 0 otherwise. $HighMB_{i,t}$ is a dummy variable that indicates 1 if the public insurer *i* is in the top 50% of the market-to-book ratio among all insurers within the same size quartile during the month of the rating change *t*, and 0 otherwise. $PostFD_{i,t}$ is a dummy variable that indicates 1 if the rating change happens after October 23, 2000 when regulation fair disclosure (Reg-FD) was implemented, and 0 otherwise. $Subset_{i,t}$ is a dummy variable that indicates 1 if the insurer *i* is identified to have at least 50% of total revenue from premium revenues during year 1997-2005[41]. $Severe_{i,t}$ is a dummy variable that indicates 1 if the rating change of insurer *i* is a threshold, subsequent, or at least a 2-level change. $Prior30d_{i,t}$ is the cumulative abnormal return for insurer *i* during the 30-day period (-30, -1) prior to the rating change. $Prior\_12m_{i,t}$ is the cumulative abnormal return for insurer *i* during the 12-month period (-12*m*, -1*m*) prior to the rating change.

Table 15 presents the summary statistics of the variables used in the regression analysis. Table 16 presents the regression results for downgrade observations, and Table 17 presents the regression results for upgrade observations. Consistent with the findings from the subsample comparisons, in Table 15 we document a stronger short-term negative market response of downgrades to small insurers than to large insurers, though evidence shows that this size factor applies to mainly the multi-line insurers. A "severe" downgrade overall further reduces the 3-day

[41] Please see Section 5.1 for details on the sample data used.

CAR by around 10%, and also reduces the event-month CAR by nearly 20%. Interestingly, this "severe" effect is only significant for PC insurer downgrades. If "severe" downgrades reduce more information asymmetry between firm managers and investors than "non-severe" downgrades, this result implies that the level of information asymmetry may be much more prevalent in PC line than for life-health (LH) line. The effects of market-to-book ratio and regulation fair disclosure (Reg FD) are not significant in rating downgrades, consistent with our prior findings using subsample comparisons. In general, we do not find significant factors affecting upgrade CAR, as shown in Table 17. The regression results for both downgrades and upgrades are consistent with our findings in the subsample comparisons.

7. Conclusion

In this paper, we conduct the event studies of insurer rating changes. Previous insurance research has focused on short-run the stock market reactions to insurer rating changes. We aim to find how market may have responded differently to different types of firms and rating changes in the short run, and whether there is market drift following rating changes and/or market pre-event adjustment during the period of up to 12 months, and test 12 related hypotheses.

The nature of our study implies the importance of model specification, and inspired by Brown and Warner (1995) and Ahern (2009), we estimate and compare 10 event study models. We find that model selection in event studies is not only important in the long-run study using monthly returns, but may also start to matter in the short-run study when the event window exceeds 7 days. Our empirical results show that the benchmark portfolio method which adjusts for size, market-to-book, and industry factors is both empirically sound and intuitively plausible for this study. Specifically, based on the size and market-to-book quartile cutoffs, each month we

assign firms with no rating change news into one of the 16 (4×4) benchmark portfolios and calculate the equal-weighted returns. This method is also useful for future event study research of public insurers.

We first test the three hypothesis (H1 – new information hypothesis, H1.1 – incomplete market response hypothesis, and H1.2 – rating change anticipation hypothesis) using the full rating change sample. We find that downgraded firms experience statistically significant -13.03% of mean abnormal returns during the event month and a significant -8.67% mean abnormal return in the 3-day (-1d, +1d) event period. We also find evidence of a significant mean reversion trend of +2.89% during the 8-day (+3d, +10d) period following the downgrades, and that trend is significant in almost all of our subsamples. We also show a post-downgrade drift during the 3-month period following the downgrades. Upgrade firms experience only +1.53% of mean abnormal returns during the event month, and we find no reliable evidence of short-run market responses to upgrades, nor do we find market drift following upgrades. We also find evidence of pre-event market adjustments during the 30-day and 12-month period prior to rating changes, for both downgrades and upgrades. These results provide general support for all these hypotheses (H1, H1.1 and H1.2).

We then continue to test additional 9 hypotheses by continuing our analysis using different sets of full sample partitions based on size, market-to-book ratios, pre-change credit quality, pure PC vs. pure LH firm rating change, mono-line vs. multi-line firm rating change, threshold vs. non-threshold rating change, pre- vs. post-regulation-FD rating change, subsequent vs. initial rating change, and multiple-level vs. one-level rating change distinctions.

We find that the market responds more negatively to downgrades for small insurers than for large insurers, but there is no reliable evidence of significant market responses for upgrades

even after controlling for size. The high vs. low market-to-book (MB) firm comparisons provide weak evidence that the market responds more negatively for low MB firm downgrades than for high MB firm downgrades in the short run, and that the market responds more positively for high MB firm upgrades than for low MB upgrades in the long run. We also show that the market responds more negatively to downgrades of low-quality firms in both short and long run. We find that the market responds more strongly to threshold downgrades than to non-threshold downgrades in both short and long run, which is consistent with the short-run finding of Halek and Eckles (2010).

The subsequent vs. initial downgrade comparisons yield the important finding that both short and long-run negative abnormal returns are more pronounced for subsequent downgrades than for initial downgrades, even after controlling for the threshold rating factor. We also find that the market responds more strongly to mono-line (pure PC or pure LH) firm rating changes than to multi-line firm rating changes, for both downgrades and upgrades. We do not find reliable evidence that the rating contains more informational value during the post-Reg-FD period than during the pre-Reg-FD period, even after controlling for the threshold rating factor. This is inconsistent with the evidence of bond ratings in the finance literature[42]. We offer one potential explanation[43] to this and suggest future research may be needed. Lastly, we find that the market responds more negatively to multiple-level rating downgrades than to one-level rating downgrades in both short and long run.

The following table summarizes our hypotheses, the key findings, and our key contributions to the insurance literature.

[42] See Jorion, Liu, and Shi (2005).
[43] Please see Section 5.8 for more details.

Hypothesis	*Related prior bond rating literature*	*Prior insurance rating literature*	*Results support hypothesis?*
H1 (New information)	Holthausen and Leftwich (1986), Goh and Ederington (1999), etc.	Halek and Eckles (2010)	Yes, for downgrades only.
H1.1 (Incomplete market response)	Dichev and Piotroski (2001)	n/a	Yes, for downgrades only.
H1.2 (Rating change anticipation)	Holthausen and Leftwich (1986), Goh and Ederington (1999)	n/a	Yes, for both upgrades and downgrades.
H2 (Information asymmetry) – related to firm size	Dichev and Piotroski (2001)	Eckles and Halek (2011, working paper)[44]	Yes, for downgrades in the short run only.
H3 (Reinforce) – related to MB ratio	n/a	n/a	Weak support for downgrades in short run and upgrades in long run.
H4 (Non-linear rating-risk) – related to credit quality	Goh and Ederington (1999), Dichev and Piotroski (2001)	n/a	Yes, for downgrades in both short and long run, for upgrades in short run.
H5 (Threshold rating)	Holthausen and Leftwich (1986), Hand et al. (1992)	Halek and Eckles (2010), Eckles and Halek (2011 working paper)	Yes, for both downgrades and upgrades in both short and long run.
H6 (Subsequent rating)	Kim and Nabar (2007)[45]	n/a	Yes, for downgrades in both short and long run.
H7 (Information opaqueness) – related to pure PC vs. pure LH firms	n/a	n/a	Weak support for downgrades in the long run.
H8 (Subsidiary effect) – related to mono-line vs. multi-line firms	n/a	n/a	Yes, for downgrades in both short and long run, and for upgrades in the short run.
H9 (Reg-FD effect)	Jorion, Liu and Shi (2005)	n/a	Generally not supported, even after controlling for threshold rating factors.
H10 (Multiple-level rating change effect)	Hand et. al (1992)	Eckles and Halek (2011, working paper)	Yes, for downgrades in both short and long run.

[44] They use firm size as controls in regression models and do not have formal related hypothesis and direct comparisons of abnormal returns between small and large firms.
[45] They only retain initial rating changes that are not followed by subsequent rating change within one year.

We further conduct cross-sectional regression analysis to address the determinants of abnormal returns to rating changes[46], and show that the results are generally consistent with the findings from the subsample comparisons. The regression analysis also provides some additional insights, suggesting that both short-run and long-run market responses to "severe" downgrades exist only in PC firms, which implies that the level of information asymmetry may be more prevalent for the PC firm than for the LH firm.

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[46] We follow the cross-sectional regression analysis approach used by Eckles and Halek (2011, working paper).

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Table 1: Sample description (1996-2006)

Panel A: Firm characteristics

	All firms (199)			Firms with only upgrades (35)[3]			Firms with only downgrades (49)[4]		
	Mean	Median	Std. Dev.	Mean	Median	Std. Dev.	Mean	Median	Std. Dev.
Book value of equity ($million)[1]	2819.8	467.3	7242.1	1932.0	303.6	4663.5	2216.8	271.2	6710.2
Market value of equity ($million)[2]	3883.3	702.4	12745.3	2738.0	506.1	6609.0	1329.8	331.8	2395.6

Panel B: Time distribution of rating change events

Year	All upgrades	"A-" threshold upgrades[5]	"B+" threshold upgrades[6]	All downgrades	"A-" threshold downgrades[7]	"B+" threshold downgrades[8]	All rating changes	Downgrade percent
1996	11	3	2	6	3	1	17	35.3%
1997	10	2	0	11	1	1	21	52.4%
1998	9	2	0	9	3	0	18	50.0%
1999	8	0	2	10	3	1	18	55.6%
2000	8	3	1	12	1	2	20	60.0%
2001	6	1	1	21	2	6	27	77.8%
2002	5	0	1	23	7	3	28	82.1%
2003	6	1	2	16	3	3	22	72.7%
2004	9	2	2	7	2	1	16	43.8%
2005	6	1	0	5	0	0	11	45.5%
2006	8	2	1	4	1	1	12	33.3%
Total	86	17	12	124	26	19	210	59.0%

Panel C: Size and MB distribution of rating change firms[9]

Downgrades	MB 1	MB 2	MB 3	MB 4	Upgrades	MB 1	MB 2	MB 3	MB 4
Size 1	25	9	12	11	Size 1	6	11	9	5
Size 2	13	13	5	6	Size 2	4	3	7	8
Size 3	5	5	1	2	Size 3	6	2	4	3
Size 4	7	2	4	4	Size 4	6	4	4	4

Note:

1. For each firm, we use the mean of the quarterly book value of equity during the sample period of year 1996-2006 where data is available.
2. For each firm, we use the mean of the monthly market value of equity during the sample period of year 1996-2006 where data is available. Market value of equity is calculated by multiplying price per share by the total share outstanding for a month.
3. We only include firms with only upgrades during year 1996-2006; thus firms with both upgrades and downgrades are excluded in this category.
4. We only include firms with only downgrades during year 1996-2006; thus firms with both upgrades and downgrades are excluded in this category.
5. "A-" threshold upgrades are defined as upgrades that reach at least an "A-" rating with a prior rating below "A-".
6. "B+" threshold upgrades are defined as upgrades that reach at least an "B+" rating with a prior rating below "B+".
7. "A-" threshold downgrades are defined as downgrades that drop below an "A-" rating with a prior rating of "A-" or higher.
8. "B+" threshold downgrades are defined as downgrades that drop below an "B+" rating with a prior rating of "B+" or higher.
9. Size is defined as the market value of equity; MB is defined as the market-to-book ratios; "Size1" refers to the lowest quartile of all public insurers and so forth. "MB1" refers to the lowest quartile of all public insurers within the same size quartile. Detailed description of the assignment of size/MB portfolio is described in Section 4.1.

Table 2: Rating Transition Matrix (1996-2006)

Old Rating	A++	A+	A	A-	B++	B+	B	B-	C++	C+	C	C-, D or F
New Rating												
A++	---------	4										
A+	10	---------	16									
A		23	---------	13		1						
A-			25	---------	13	2	1		UPGRADE			
B++			1	22	---------	13	1					
B+				2	8	---------	9	1				1
B					6	5	---------	4				
B-		DOWNGRADE		1	1	3	3	---------	1	1	1	1
C++						1	1		---------	2		
C+								3	1	---------		1
C								2		1	---------	
C-, D or F					2		1		1			1

Note:

1. Three observations in our sample has a rating change from "B" to "NR" (not rated), and we exclude them in our study.
2. In total, there are 124 downgrade events and 86 upgrade events in our sample period (Jan 1996 to Dec 2006).
3. The rating change at the right bottom of the table represents a downgrade from "D" to "F".

Table 3: Mean performance measures for random dates (monthly data, 1996-2006)

Panel A - Actual return and event study models requiring estimation period

	1. Actual Returns (1183)			2. MM-PRE (1142)			3. MM-POST (1154)			4. FF4F-PRE (1142)			5. FF4F-POST (1154)		
Event window	Buyhold	t-Stat	Sign Z	CAR	t-Stat	Sign Z	CAR	t-Stat	Sign Z	CAR	t-Stat	Sign Z	CAR	t-Stat	Sign Z
(-12m, -1m)	15.52%	*14.897****	*8.361****	-2.43%	*-2.262**	*0.169*	3.32%	*2.250**	*3.099****	-2.96%	*-2.639***	*-0.547*	2.80%	*1.811**	*2.261**
(-6m, -1m)	8.00%	*11.534****	*5.549****	-0.67%	*-0.937*	*2.509***	2.43%	*2.676***	*3.011***	-0.71%	*-0.929*	*0.495*	1.68%	*1.822**	*2.410***
(-3m, -1m)	3.67%	*7.808****	*2.971***	-0.39%	*-0.744*	*2.657***	0.85%	*1.480$*	*3.631****	-0.47%	*-0.795*	*1.359$*	0.21%	*0.353*	*2.024**
event month	1.26%	*4.357****	*0.393*	-0.29%	*-0.93*	*0.107*	-0.01%	*-0.03*	*1.920**	-0.59%	*-1.830**	*-0.67*	-0.04%	*-0.119*	*0.601*
(1m, 3m)	4.68%	*9.405****	*4.622****	0.53%	*1.004*	*2.953***	1.99%	*3.513****	*4.485****	-0.23%	*-0.418*	*1.059*	1.17%	*1.849**	*1.698**
(1m, 6m)	8.93%	*12.081****	*6.616****	0.78%	*1.018*	*4.378****	2.85%	*3.327****	*4.603****	-0.69%	*-0.896*	*2.314**	1.55%	*1.705**	*2.587***
(1m, 12m)	15.17%	*13.197****	*8.610****	-0.38%	*-0.348*	*4.259****	4.53%	*3.149****	*5.074****	-2.51%	*-2.245**	*0.402*	1.94%	*1.293$*	*1.876**

Panel B - Models requring no estimation period

	6. MAR (1183)			7. Industry-Adj (1183)			8. Size-Adj (1135)			9. Our_Benchmark (1159)			10. Calendar-month (1183)	
Event window	CAR	t-Stat	Sign Z	CAR	t-Stat	Sign Z	CAR	t-Stat	Sign Z	CAR	t-Stat	Sign Z	AR	t-stat
(-12m, -1m)	-1.39%	*-1.468$*	*0.787*	-0.23%	*-0.279*	*2.485***	0.93%	*0.961*	*2.019**	-0.78%	*-0.863*	*0.46*	0.21%	*0.87*
(-6m, -1m)	-0.20%	*-0.297*	*1.776**	-0.88%	*-1.503$*	*1.903**	0.86%	*1.262*	*1.900**	-0.79%	*-1.291$*	*1.107*	N/A	*N/A*
(-3m, -1m)	-0.09%	*-0.18*	*2.242**	-0.38%	*-0.81*	*0.243*	0.27%	*0.549*	*1.544$*	0.14%	*0.305*	*0.519*	N/A	*N/A*
event month	-0.38%	*-1.206*	*0.555*	0.38%	*1.338$*	*0.651*	-0.06%	*-0.194*	*-0.772*	0.17%	*0.664*	*0.225*	N/A	*N/A*
(1m, 3m)	0.56%	*1.101*	*0.553*	0.28%	*0.632*	*1.231*	1.02%	*2.027**	*1.247*	-0.22%	*-0.514*	*-0.305*	N/A	*N/A*
(1m, 6m)	0.35%	*0.483*	*2.882***	0.75%	*1.27*	*3.271****	1.42%	*1.967**	*3.565****	0.25%	*0.419*	*0.871*	N/A	*N/A*
(1m, 12m)	0.67%	*0.674*	*2.649***	-0.19%	*-0.215*	*1.639$*	2.09%	*2.087**	*3.208****	-1.00%	*-1.159*	*0.636*	-0.03%	*-0.09*

Note:

1. The symbols $,*,**, and *** denote statistical significance at the 0.10, 0.05, 0.01 and 0.001 levels, respectively, using a generic one-tail test.
2. The number of random events (dates) indicated in the brackets may be slightly different among different models, due to CRSP data availability.
3. The event windows presented in the first column indicates the number of months, e.g., (-12m, -1m) indicates a window of 12 months before the event.
4. Model 1 presents the mean buy-and-hold returns of all events during all the specified event windows.
5. Model 2-9 presents the mean cumulative abnormal returns of all events during all the specified event windows.
6. All models report t-statistics and generalized sign z statistics.
7. Model 10 presents the average monthly abnormal returns for all events during the event windows that cover at least 12 months.
8. For detailed descriptions of each model, please see Section 4.1.

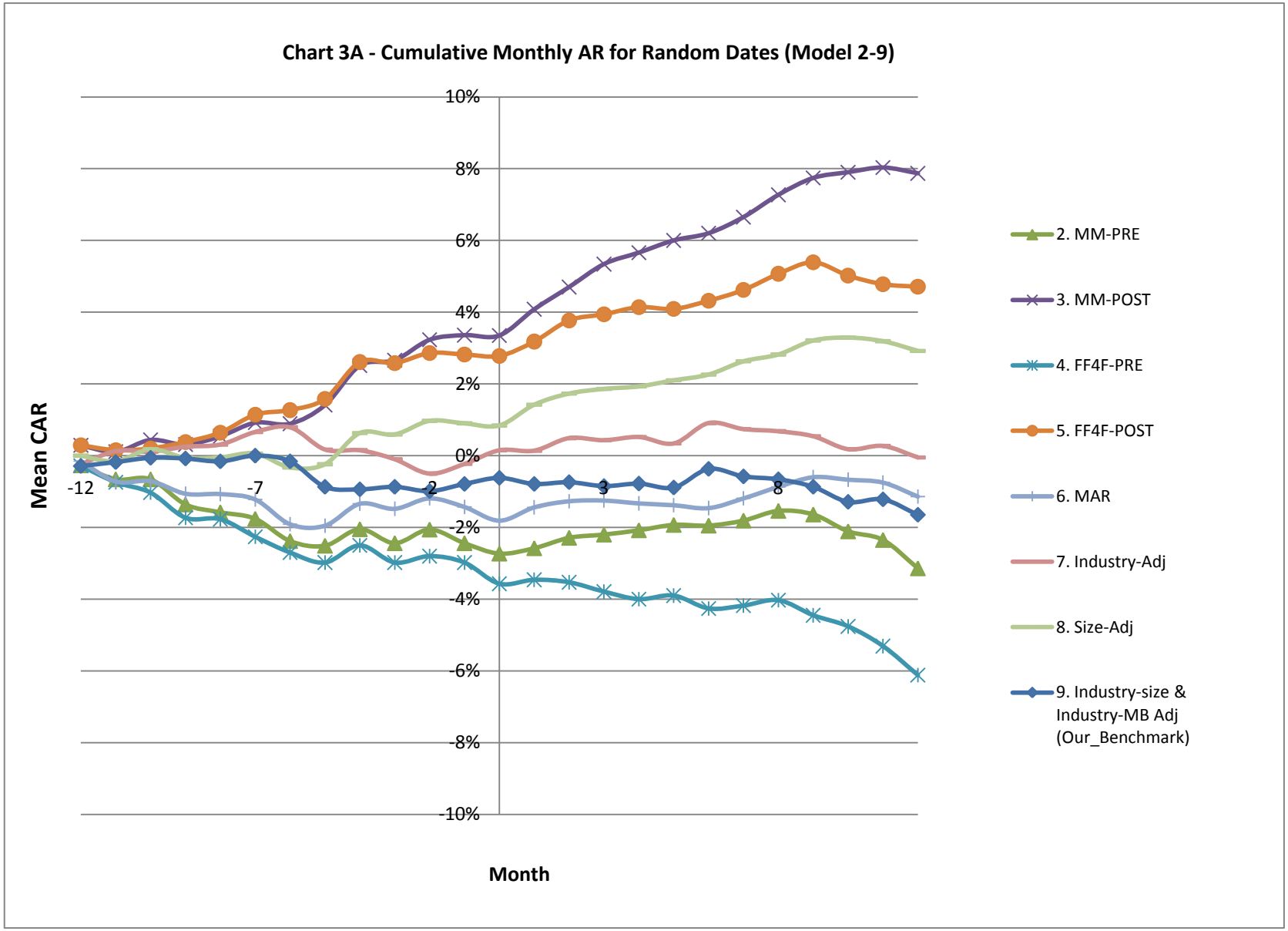


Chart 3A - Cumulative Monthly AR for Random Dates (Model 2-9)
10%
8%
6%
4%
2%
0%
-2%
-4%
-6%
-8%
-10%
-12
-7
-2
3
8
Mean CAR
Month
2. MM-PRE
3. MM-POST
4. FF4F-PRE
5. FF4F-POST
6. MAR
7. Industry-Adj
8. Size-Adj
9. Industry-size & Industry-MB Adj (Our_Benchmark)

Table 4: Mean performance measures for random dates (daily data, 1996-2006)

Panel A - Actual return and event study models requiring estimation period															
	1. Actual Returns (1190)			2. MM-PRE (1190)			3. MM-POST (1190)			4. FF4F-PRE (1190)			5. FF4F-POST (1190)		
Event window	Buyhold	t-Stat	Sign Z	CAR	t-Stat	Sign Z	CAR	t-Stat	Sign Z	CAR	t-Stat	Sign Z	CAR	t-Stat	Sign Z
(-30, -1)	3.22%	*5.136****	*9.221****	0.64%	*1.634$*	*2.194**	0.71%	*1.772**	*2.843***	0.96%	*2.419***	*2.426***	0.50%	*1.272*	*2.262**
(-10, -3)	1.12%	*5.337****	*7.069****	0.36%	*1.805**	*1.962**	0.40%	*2.043**	*1.507$*	0.45%	*2.272**	*2.078**	0.30%	*1.571$*	*1.159*
Day -2	0.12%	*1.537$*	*2.359***	0.06%	*0.699*	*1.846**	0.05%	*0.631*	*1.391$*	0.07%	*0.84*	*1.846**	0.09%	*1.161*	*1.740**
Day -1	0.01%	*0.113*	*-0.607*	-0.09%	*-1.164*	*-0.708*	-0.10%	*-1.306$*	*-0.931*	-0.10%	*-1.387$*	*-0.359*	-0.12%	*-1.617$*	*-0.291*
Day 0	0.00%	*0.008*	*-0.724*	-0.05%	*-0.676*	*-0.069*	-0.06%	*-0.746*	*-0.525*	-0.04%	*-0.537*	*0.801*	-0.05%	*-0.569*	*0.405*
Day +1	0.16%	*2.068**	*1.835**	0.09%	*1.237*	*0.975*	0.10%	*1.347$*	*0.52*	0.08%	*1.125*	*0.743*	0.08%	*1.134*	*0.927*
Day +2	0.15%	*2.179**	*0.846*	0.11%	*1.509$*	*0.917*	0.09%	*1.315$*	*1.101*	0.10%	*1.404$*	*0.743*	0.10%	*1.484$*	*2.262**
(0, +2)	0.31%	*2.280**	*4.103****	0.14%	*1.104*	*0.627*	0.13%	*1.007*	*0.695*	0.14%	*1.07*	*0.453*	0.14%	*1.077*	*-0.291*
(-1, +1)	0.15%	*1.210*	*3.987****	-0.05%	*-0.384*	*0.801*	-0.06%	*-0.451*	*0.114*	-0.06%	*-0.501*	*-0.011*	-0.08%	*-0.663*	*-0.813*
(-2, +2)	0.42%	*2.612***	*5.092****	0.11%	*0.733*	*1.266*	0.09%	*0.552*	*1.798**	0.10%	*0.656*	*0.627*	0.11%	*0.734*	*0.869*
(+3, +10)	0.35%	*1.882**	*4.336****	-0.20%	*-1.055*	*0.221*	-0.25%	*-1.323$*	*0.056*	-0.20%	*-1.046*	*0.279*	-0.30%	*-1.627$*	*0.231*
(-10, +10)	1.82%	*6.110****	*8.988****	0.27%	*0.887*	*2.949***	0.24%	*0.801*	*1.391$*	0.35%	*1.152*	*3.354****	0.11%	*0.388*	*1.275*
(+1, +30)	2.09%	*5.915****	*7.011****	0.14%	*0.365*	*1.324$*	0.01%	*0.023*	*1.972**	0.19%	*0.518*	*1.381$*	-0.19%	*-0.571*	*0.753*
(-30, +30)	5.01%	*9.381****	*10.558****	0.73%	*1.375$*	*2.369***	0.66%	*1.316$*	*2.552***	1.11%	*2.059**	*2.198**	0.26%	*0.565*	*0.707*
Panel B - Models requring no estimation period															
	6. MAR (1190)			7. Industry-Adj (1188)			8. Size-Adj (1143)			9. Our_Benchmark (1159)					
Event window	CAR	t-Stat	Sign Z	CAR	t-Stat	Sign Z	CAR	t-Stat	Sign Z	CAR	t-Stat	Sign Z			
(-30, -1)	-0.15%	*-0.354*	*0.530*	0.64%	*1.664**	*1.981**	1.17%	*2.807***	*3.132****	0.65%	*1.796**	*0.921*			
(-10, -3)	0.19%	*0.974*	*-0.515*	0.33%	*1.808**	*0.587*	0.49%	*2.504***	*1.475$*	0.17%	*0.971*	*0.274*			
Day -2	0.01%	*0.168*	*0.008*	0.05%	*0.62*	*1.981**	0.07%	*0.823*	*1.179*	0.05%	*0.677*	*0.921*			
Day -1	-0.14%	*-1.834**	*-0.921*	-0.09%	*-1.187*	*-0.981*	-0.07%	*-0.900*	*0.055*	-0.03%	*-0.483*	*0.627*			
Day 0	-0.07%	*-0.805*	*0.414*	-0.05%	*-0.616*	*-0.110*	-0.03%	*-0.396*	*-0.300*	-0.06%	*-0.800*	*-0.490*			
Day +1	0.06%	*0.849*	*0.937*	0.07%	*0.95*	*1.748**	0.08%	*0.990*	*0.647*	0.05%	*0.761*	*0.509*			
Day +2	0.08%	*1.125*	*0.937*	0.11%	*1.648**	*1.284$*	0.10%	*1.408$*	*-0.359*	0.13%	*2.024**	*0.744*			
(0, +2)	0.08%	*0.584*	*0.066*	0.13%	*1.043*	*0.819*	0.14%	*1.070*	*0.292*	0.12%	*1.033*	*0.450*			
(-1, +1)	-0.14%	*-1.096*	*-0.457*	-0.07%	*-0.552*	*0.006*	-0.03%	*-0.196*	*0.292*	-0.04%	*-0.358*	*0.627*			
(-2, +2)	-0.05%	*-0.290*	*1.169*	0.09%	*0.634*	*0.819*	0.14%	*0.892*	*0.588*	0.14%	*0.978*	*0.039*			
(+3, +10)	-0.46%	*-2.481***	*-0.631*	-0.25%	*-1.439$*	*0.006*	-0.11%	*-0.575*	*0.351*	-0.30%	*-1.797**	*-0.490*			
(-10, +10)	-0.32%	*-1.099*	*0.588*	0.17%	*0.633*	*1.168*	0.53%	*1.802**	*2.955***	0.01%	*0.021*	*0.450*			
(+1, +30)	-0.63%	*-1.775**	*-0.282*	0.11%	*0.341*	*0.703*	0.66%	*1.890**	*2.955***	-0.16%	*-0.54*	*0.098*			
(-30, +30)	-0.85%	*-1.624$*	*-0.457*	0.70%	*1.490$*	*2.097**	1.80%	*3.435****	*4.375****	0.43%	*0.991*	*0.568*			

Note:

1. The symbols $,*,**, and *** denote statistical significance at the 0.10, 0.05, 0.01 and 0.001 levels, respectively, using a generic one-tail test.
2. The number of random events (dates) indicated in the brackets may be slightly different among different models, due to CRSP data availability.
3. The event windows presented in the first column indicates the number of months, e.g., (-12m, -1m) indicates a window of 12 months before the event.
4. Model 1 presents the mean buy-and-hold returns of all events during all the specified event windows.
5. Model 2-9 presents the mean cumulative abnormal returns of all events during all the specified event windows.
6. All models report t-statistics and generalized sign z statistics.
7. Model 10 presents the average monthly abnormal returns for all events during the event windows that cover at least 12 months.
8. For detailed descriptions of each model, please see Section 4.1.

Table 5 - Mean abnormal stock returns surrounding A.M. Best rating changes

Panel A: Downgrades

	All firms (124)			Firms with 50%+ revenue from premium (85)			CAR Difference
Event window	CAR	t-Stat	Sign Z	CAR	t-Stat	Sign Z	t-stat
(-12m, -1m)	-40.06%	*-7.170****	*-2.021**	-39.26%	*-5.552***	*-1.304$*	*-0.089*
(-6m, -1m)	-26.87%	*-7.147****	*-1.452$*	-28.61%	*-5.829***	*-1.304$*	*0.285*
(-3m, -1m)	-14.94%	*-4.440****	*-0.884*	-16.61%	*-3.774***	*-0.844*	*0.305*
event month	-13.03%	*-4.787****	*-1.073*	-12.41%	*-3.569***	*-0.844*	*-0.141*
(+1m, +3m)	-6.19%	*-1.862**	*0.700*	-6.17%	*-1.445$*	*0.388*	*-0.003*
(+1m, +6m)	-6.50%	*-1.536$*	*2.222**	-4.66%	*-0.945*	*1.777**	*-0.281*
(+1m, +12m)	-5.36%	*-0.96*	*4.124****	-5.45%	*-0.881*	*2.934***	*0.010*
(-12m, +12m)	-58.41%	*-6.540****	*-1.642$*	-57.05%	*-5.530****	*-1.534$*	*-0.098*
(-30d, -1d)	-12.01%	*-4.155****	*-2.103**	-11.30%	*-3.024***	*-1.981**	*-0.152*
(-10d, -3d)	-3.30%	*-2.026**	*-2.103**	-3.42%	*-1.500$*	*-1.327$*	*0.044*
Day -2	0.11%	*0.187*	*1.233*	0.16%	*0.187*	*0.418*	*-0.049*
Day -1	-2.63%	*-3.157****	*-1.02*	-1.74%	*-2.601***	*-0.673*	*-0.774*
Day 0	-4.09%	*-2.968***	*-0.84*	-4.50%	*-2.611***	*-0.891*	*0.187*
Day +1	-1.95%	*-2.049**	*-1.923**	-2.23%	*-1.691**	*-1.545$*	*0.176*
Day +2	-0.42%	*-0.565*	*0.785*	-0.72%	*-0.731*	*1.072*	*0.247*
(0d, +2d)	-6.46%	*-3.881****	*-1.562$*	-7.45%	*-3.359***	*-1.763**	*0.363*
(-1d, +1d)	-8.67%	*-5.522****	*-3.909****	-8.46%	*-4.716***	*-3.072***	*-0.087*
(-2d, +2d)	-8.98%	*-4.849****	*-2.826***	-9.03%	*-3.922***	*-2.636***	*0.017*
(+3d, +10d)	2.89%	*1.900**	*1.776**	3.16%	*1.526$*	*0.958*	*-0.107*
(-10d, +10d)	-9.41%	*-3.306****	*-1.923**	-9.32%	*-2.490***	*-1.545$*	*-0.019*
(+1d, +30d)	-3.60%	*-1.289$*	*-0.659*	-2.67%	*-0.803*	*-0.673*	*-0.213*
(-30d, +30d)	-19.70%	*-4.404****	*-2.465***	-18.47%	*-3.279****	*-1.545$*	*-0.172*

Panel B: Upgrades

	All firms (86)			Firms with 50%+ revenue from premium (69)			CAR Difference
Event window	CAR	t-Stat	Sign Z	CAR	t-Stat	Sign Z	t-stat
(-12m, -1m)	10.32%	*3.006***	*3.477****	12.23%	*3.135***	*3.558***	*-0.367*
(-6m, -1m)	7.41%	*3.029***	*2.173**	9.13%	*3.266***	*2.102**	*-0.463*
(-3m, -1m)	3.65%	*1.865**	*1.738**	4.17%	*1.887**	*1.132*	*-0.176*
event month	1.53%	*1.316$*	*1.521$*	1.49%	*1.231*	*1.132*	*0.023*
(+1m, +3m)	-0.86%	*-0.572*	*0.652*	-1.23%	*-0.719*	*0.162*	*0.162*
(+1m, +6m)	-1.09%	*-0.422*	*0.217*	-1.49%	*-0.503*	*-1.051*	*0.102*
(+1m, +12m)	1.94%	*0.45*	*0.869*	3.16%	*0.66*	*0.404*	*-0.189*
(-12m, +12m)	13.79%	*2.328***	*3.477****	16.88%	*2.550***	*3.315****	*-0.347*
(-30d, -1d)	1.98%	*1.707**	*1.295$*	2.38%	*1.765**	*1.146*	*-0.225*
(-10d, -3d)	0.21%	*0.274*	*1.727**	0.02%	*0.018*	*1.387$*	*0.144*
Day -2	-0.27%	*-1.542$*	*-0.864*	-0.22%	*-1.293$*	*-0.543*	*-0.201*
Day -1	0.42%	*1.987**	*0.216*	0.40%	*1.700**	*0.181*	*0.063*
Day 0	0.02%	*0.064*	*0.216*	-0.19%	*-0.534*	*0.181*	*0.444*
Day +1	0.15%	*0.568*	*1.511$*	0.21%	*0.711*	*1.387$*	*-0.151*
Day +2	0.13%	*0.461*	*0.432*	-0.01%	*-0.024*	*-0.06*	*0.286*
(0d, +2d)	0.29%	*0.791*	*1.943**	0.02%	*0.046*	*1.629$*	*0.477*
(-1d, +1d)	0.59%	*1.452$*	*1.079*	0.42%	*0.917*	*0.664*	*0.277*
(-2d, +2d)	0.44%	*0.995*	*1.079*	0.20%	*0.415*	*1.146*	*0.365*
(+3d, +10d)	1.02%	*1.545$*	*1.295$*	0.83%	*1.305$*	*1.146*	*0.203*
(-10d, +10d)	1.68%	*1.953**	*2.375***	1.04%	*1.167*	*1.629$*	*0.512*
(+1d, +30d)	1.07%	*0.952*	*-0.216*	1.12%	*0.849*	*0.181*	*-0.029*
(-30d, +30d)	3.07%	*2.108**	*1.511$*	3.31%	*2.067**	*1.629$*	*-0.110*

Note:

1. The all-firm sample has 199 firms; the subset sample with 50%+ revenue from premium has 99 firms.
2. Our_Benchmark (Model 9) method is used to calculate the abnormal monthly and daily returns, which adjust the size, market-to-book ratio, and industry factors.
3. The symbols $,*,**, and *** denote statistical significance at the 0.10, 0.05, 0.01 and 0.001 levels respectively, using a generic one-tail test.
4. The number of rating changes are indicated in the brackets in the column headings.

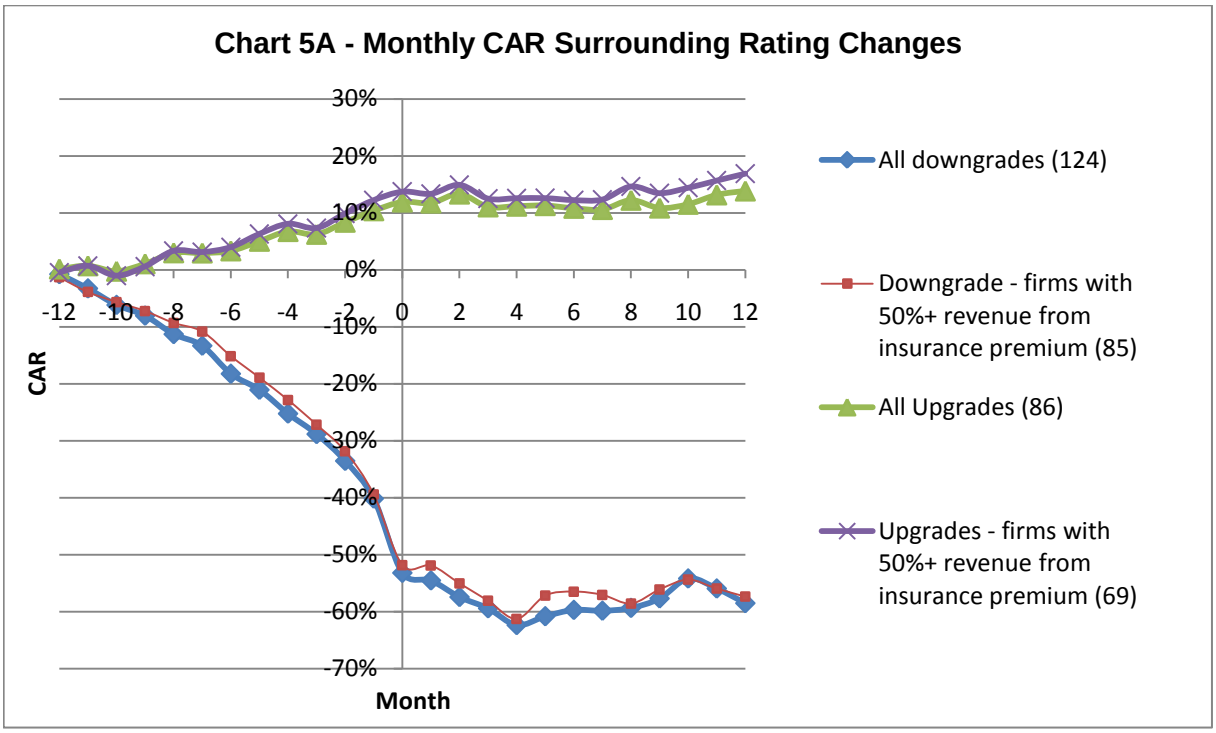


Chart 5A - Monthly CAR Surrounding Rating Changes
30%
20%
10%
0%
-10%
-20%
-30%
-40%
-50%
-60%
-70%
-12
-10
-8
-6
-4
-2
0
2
4
6
8
10
12
CAR
Month
All downgrades (124)
Downgrade - firms with 50%+ revenue from insurance premium (85)
All Upgrades (86)
Upgrades - firms with 50%+ revenue from insurance premium (69)

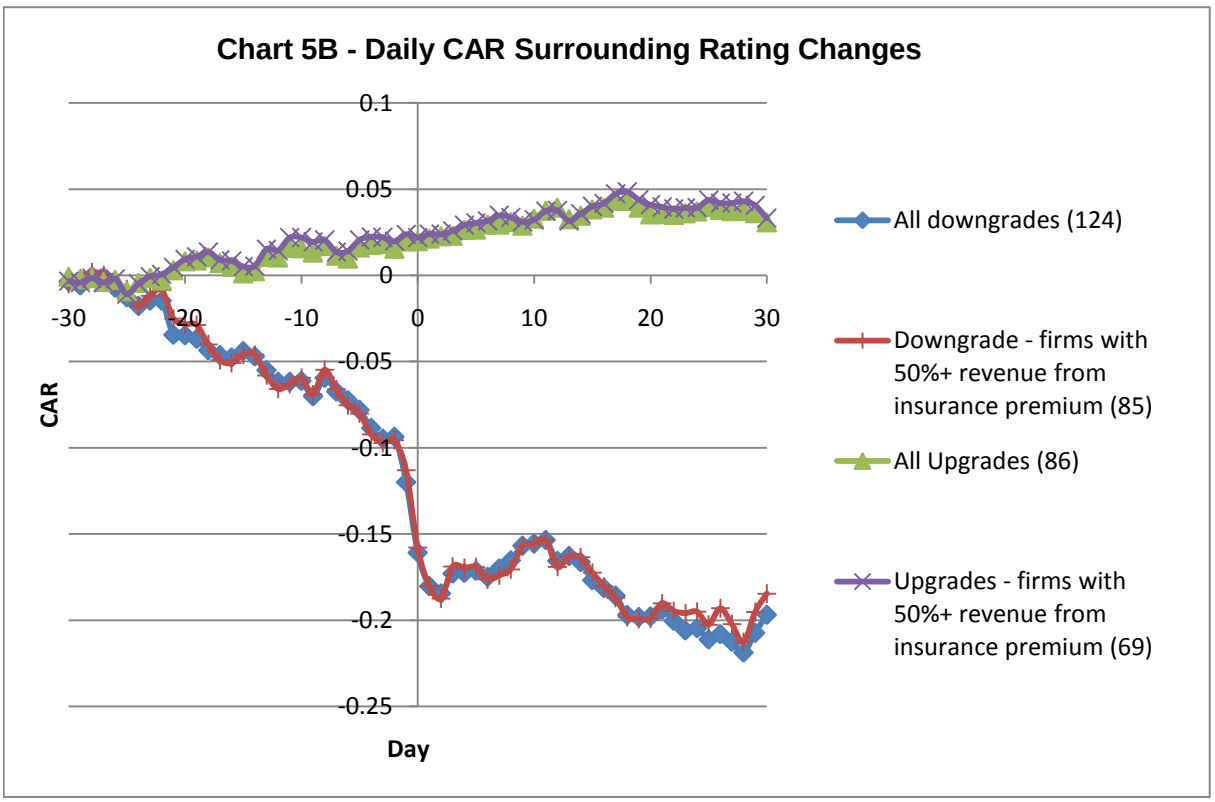


Chart 5B - Daily CAR Surrounding Rating Changes
0.1
0.05
0
-0.05
-0.1
-0.15
-0.2
-0.25
-30
-20
-10
0
10
20
30
CAR
Day
All downgrades (124)
Downgrade - firms with 50%+ revenue from insurance premium (85)
All Upgrades (86)
Upgrades - firms with 50%+ revenue from insurance premium (69)

Table 6 - Mean abnormal stock returns conditional on size (-13th month)

Panel A: Downgrades

	Small insurers (83)			Large insurers (41)			CAR Difference
Event window	CAR	t-Stat	Sign Z	CAR	t-Stat	Sign Z	t-stat
(-12m, -1m)	-41.95%	*-5.627****	*-1.386$*	-36.28%	*-4.685****	*-1.546$*	*-0.475*
(-6m, -1m)	-28.67%	*-5.561****	*-1.386$*	-23.26%	*-5.054****	*-0.552*	*-0.674*
(-3m, -1m)	-14.49%	*-3.205****	*-0.924*	-15.82%	*-3.478****	*-0.221*	*0.184*
event month	-14.76%	*-4.003****	*-1.848**	-9.56%	*-2.731***	*0.773*	*-0.896*
(+1m, +3m)	-6.26%	*-1.337$*	*1.244*	-6.04%	*-1.693**	*-0.552*	*-0.03*
(+1m, +6m)	-5.77%	*-1.025*	*2.406***	-7.95%	*-1.325$*	*0.442*	*0.24*
(+1m, +12m)	-5.00%	*-0.673*	*3.336****	-6.08%	*-0.769*	*2.429***	*0.09*
(-12m, +12m)	-61.65%	*-5.374****	*-0.924*	-51.92%	*-3.715****	*-1.546$*	*-0.51*
(-30d, -1d)	-11.94%	*-3.085***	*-1.781**	-12.14%	*-3.085***	*-1.124*	*0.032*
(-10d, -3d)	-2.50%	*-1.124*	*-2.002**	-4.91%	*-2.455***	*-0.81*	*0.695*
Day -2	-0.04%	*-0.053*	*0.529*	0.42%	*0.66*	*1.386$*	*-0.394*
Day -1	-3.17%	*-2.898***	*-1.781**	-1.54%	*-1.279*	*0.758*	*-0.919*
Day 0	-5.61%	*-2.837***	*-1.119*	-1.02%	*-0.975*	*0.131*	*-1.575$*
Day +1	-1.97%	*-1.470$*	*-2.223**	-1.90%	*-1.962**	*-0.183*	*-0.034*
Day +2	-0.89%	*-0.909*	*0.648*	0.55%	*0.564*	*0.444*	*-0.926*
(0d, +2d)	-8.48%	*-3.603****	*-1.781**	-2.37%	*-1.620$*	*-0.183*	*-1.741**
(-1d, +1d)	-10.75%	*-4.882****	*-3.989****	-4.46%	*-3.047***	*-1.124*	*-1.904**
(-2d, +2d)	-11.69%	*-4.517****	*-3.989****	-3.49%	*-2.026**	*0.758*	*-2.112**
(+3d, +10d)	4.45%	*2.051**	*1.861**	-0.24%	*-0.183*	*0.444*	*1.452$*
(-10d, +10d)	-9.79%	*-2.507***	*-1.781**	-8.64%	*-2.491***	*-0.81*	*-0.189*
(+1d, +30d)	-1.16%	*-0.336*	*-0.015*	-8.54%	*-1.810**	*-1.124*	*1.245*
(-30d, +30d)	-18.71%	*-3.188****	*-2.002**	-21.70%	*-3.311****	*-1.438$*	*0.313*

Panel B: Upgrades

	Small insurers (55)			Large insurers (31)			CAR Difference
Event window	CAR	t-Stat	Sign Z	CAR	t-Stat	Sign Z	t-stat
(-12m, -1m)	11.39%	*2.315**	*3.073***	8.35%	*2.248**	*1.704**	*0.425*
(-6m, -1m)	9.12%	*2.662***	*1.717**	4.29%	*1.464$*	*1.339$*	*0.951*
(-3m, -1m)	4.77%	*1.709**	*1.446$*	1.60%	*0.744*	*0.974*	*0.777*
event month	2.87%	*1.740**	*2.802***	-0.94%	*-0.795*	*-1.217*	*1.605$*
(+1m, +3m)	-0.48%	*-0.236*	*0.904*	-1.57%	*-0.716*	*-0.122*	*0.343*
(+1m, +6m)	-0.32%	*-0.089*	*0.09*	-2.51%	*-0.755*	*0.243*	*0.405*
(+1m, +12m)	4.84%	*0.802*	*1.175*	-3.37%	*-0.642*	*-0.122*	*0.915*
(-12m, +12m)	19.10%	*2.309**	*3.344****	4.05%	*0.576*	*1.339$*	*1.226*
(-30d, -1d)	2.95%	*1.836**	*1.843**	0.26%	*0.175*	*-0.301*	*1.11*
(-10d, -3d)	0.37%	*0.325*	*2.382***	-0.08%	*-0.121*	*-0.301*	*0.281*
Day -2	-0.31%	*-1.201*	*-1.393$*	-0.20%	*-1.168*	*0.422*	*-0.299*
Day -1	0.46%	*1.490$*	*-0.315*	0.35%	*1.658**	*0.783*	*0.249*
Day 0	0.27%	*0.561*	*0.494*	-0.42%	*-1.860**	*-0.301*	*1.038*
Day +1	0.17%	*0.459*	*0.764*	0.11%	*0.348*	*1.505$*	*0.109*
Day +2	0.11%	*0.278*	*-0.315*	0.16%	*0.477*	*1.144*	*-0.085*
(0d, +2d)	0.54%	*1.109*	*1.573$*	-0.15%	*-0.266*	*1.144*	*0.89*
(-1d, +1d)	0.90%	*1.493$*	*1.034*	0.04%	*0.119*	*0.422*	*1.017*
(-2d, +2d)	0.70%	*1.127*	*0.225*	0.00%	*0.001*	*1.505$*	*0.843*
(+3d, +10d)	1.13%	*1.162*	*-0.045*	0.83%	*1.300$*	*2.228**	*0.216*
(-10d, +10d)	2.20%	*1.778**	*2.113**	0.75%	*0.809*	*1.144*	*0.806*
(+1d, +30d)	1.49%	*0.931*	*-0.584*	0.32%	*0.246*	*0.422*	*0.498*
(-30d, +30d)	4.71%	*2.388***	*1.304$*	0.16%	*0.084*	*0.783*	*1.515$*

Note:

1. Our_Benchmark (Model 9) method is used to calculate the abnormal monthly and daily returns, which adjust the size, market-to-book ratio, and industry factors.
2. The symbols $,*,**, and *** denote statistical significance at the 0.10, 0.05, 0.01 and 0.001 levels respectively, using a generic one-tail test.
3. The number of rating changes are indicated in the brackets in the column headings.
4. Based on the rankings of the market capitalization of the 13th month prior to the rating change month , we partition all firms into the top 50% (large firms) and bottom 50% (small firms) for each month.

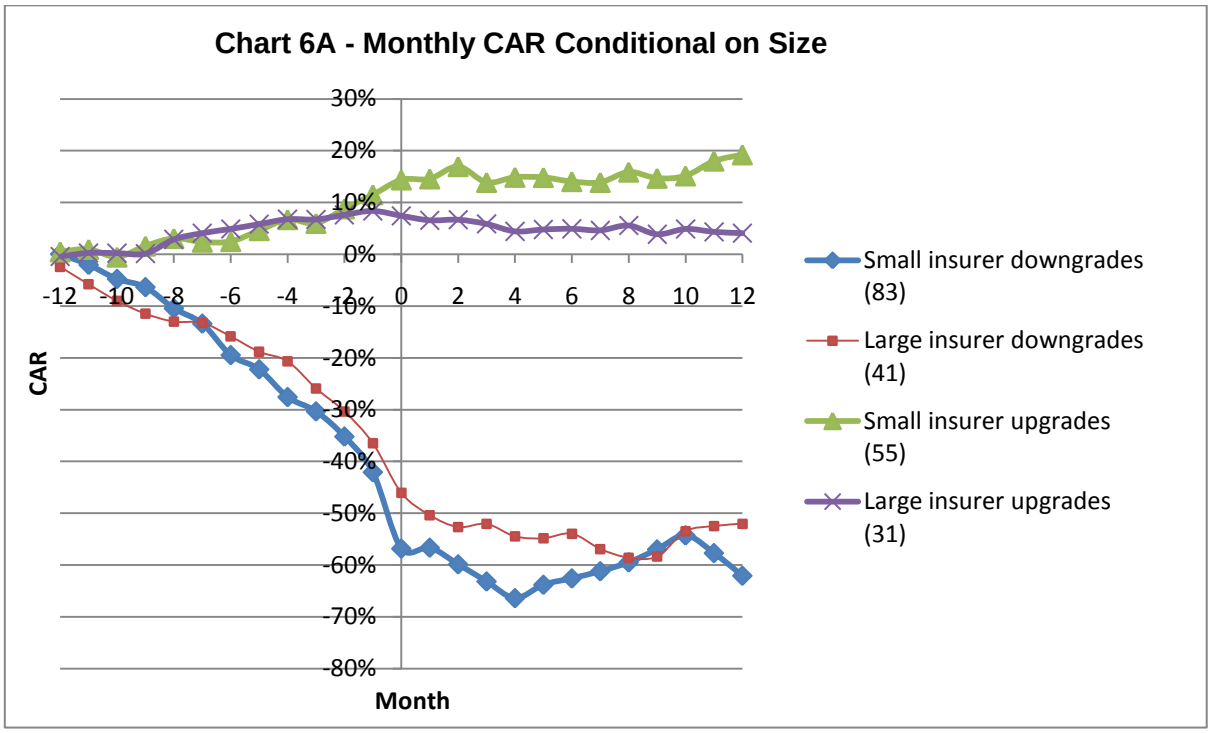


Chart 6A - Monthly CAR Conditional on Size
30%
20%
10%
0%
-10%
-20%
-30%
-40%
-50%
-60%
-70%
-80%
-12
-10
-8
-6
-4
-2
0
2
4
6
8
10
12
CAR
Month
Small insurer downgrades (83)
Large insurer downgrades (41)
Small insurer upgrades (55)
Large insurer upgrades (31)

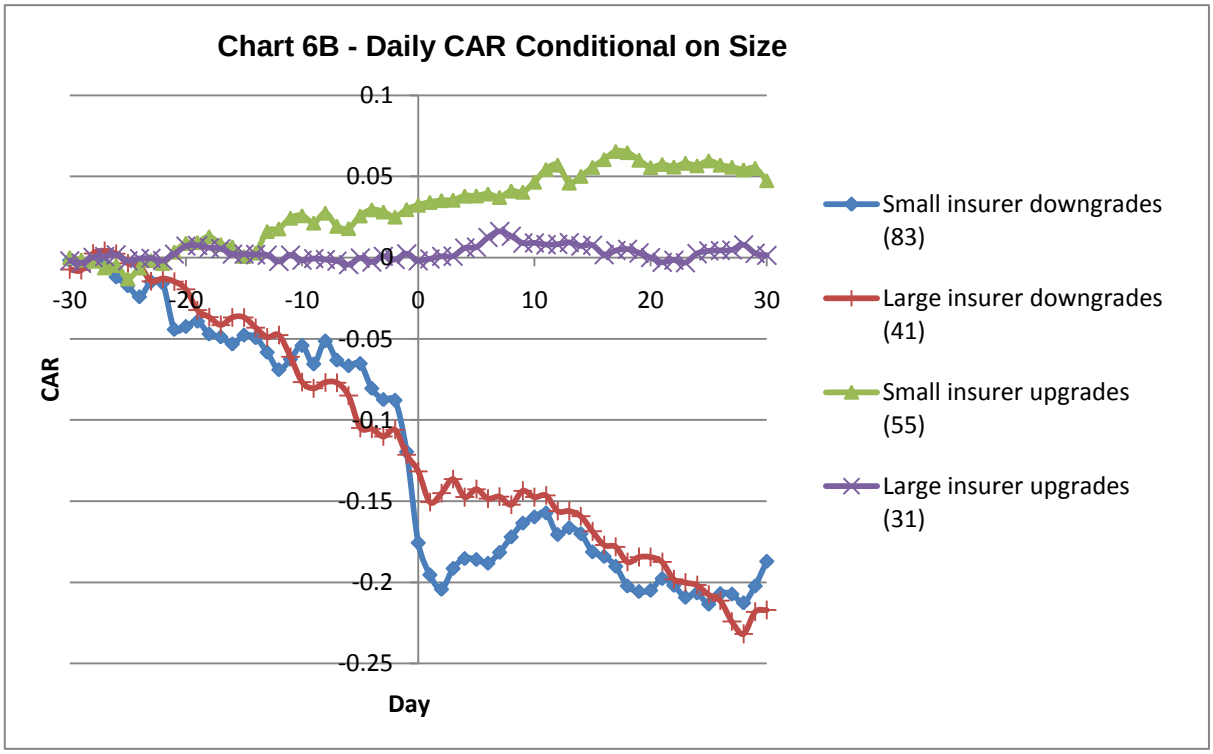


Chart 6B - Daily CAR Conditional on Size
0.1
0.05
0
-0.05
-0.1
-0.15
-0.2
-0.25
-30
-20
-10
0
10
20
30
CAR
Day
Small insurer downgrades (83)
Large insurer downgrades (41)
Small insurer upgrades (55)
Large insurer upgrades (31)

Table 7 - Mean abnormal stock returns conditional on market-to-book ratio (-13th month)

Panel A: Downgrades

	High MB (63)			Low MB (61)			CAR Difference
Event window	CAR	t-Stat	Sign Z	CAR	t-Stat	Sign Z	t-stat
(-12m, -1m)	-46.93%	*-5.516****	*-1.984**	-33.07%	*-4.606****	*-0.886*	*-1.241*
(-6m, -1m)	-30.10%	*-5.634****	*-1.443$*	-23.58%	*-4.449****	*-0.62*	*-0.866*
(-3m, -1m)	-19.77%	*-4.523****	*-1.172*	-10.03%	*-1.972**	*-0.089*	*-1.455$*
event month	-11.12%	*-3.407****	*-0.09*	-14.97%	*-3.413****	*-1.417$*	*0.707*
(+1m, +3m)	-2.66%	*-0.684*	*1.362$*	-9.71%	*-1.805**	*-0.354*	*1.067*
(+1m, +6m)	-4.14%	*-0.742*	*2.180**	-8.86%	*-1.386$*	*0.975*	*0.557*
(+1m, +12m)	1.72%	*0.22*	*4.089****	-12.45%	*-1.568$*	*1.772**	*1.271*
(-12m, +12m)	-56.35%	*-4.332****	*-0.631*	-60.49%	*-4.907****	*-1.683**	*0.23*
(-30d, -1d)	-11.55%	*-2.880***	*-1.997**	-12.47%	*-2.972***	*-0.968*	*0.158*
(-10d, -3d)	-0.78%	*-0.302*	*-1.745**	-5.90%	*-3.054***	*-1.226*	*1.579$*
Day -2	0.82%	*0.869*	*0.397*	-0.61%	*-0.873*	*1.355$*	*1.211*
Day -1	-4.32%	*-2.842***	*-1.239*	-0.89%	*-1.545$*	*-0.194*	*-2.084**
Day 0	-0.75%	*-0.568*	*-0.228*	-7.54%	*-3.167****	*-0.968*	*2.515***
Day +1	-2.48%	*-2.573***	*-1.492$*	-1.40%	*-0.841*	*-1.226*	*-0.565*
Day +2	-0.39%	*-0.56*	*0.025*	-0.44%	*-0.334*	*1.097*	*0.033*
(0d, +2d)	-3.62%	*-2.402***	*-1.239*	-9.38%	*-3.159****	*-0.968*	*1.746**
(-1d, +1d)	-7.55%	*-3.955****	*-3.767****	-9.83%	*-3.903****	*-1.742**	*0.724*
(-2d, +2d)	-7.13%	*-3.459****	*-3.009***	-10.88%	*-3.507****	*-0.968*	*1.012*
(+3d, +10d)	4.33%	*1.832**	*0.907*	1.42%	*0.746*	*1.613$*	*0.954*
(-10d, +10d)	-3.65%	*-0.879*	*-1.492$*	-15.36%	*-4.074****	*-1.226*	*2.084**
(+1d, +30d)	-0.66%	*-0.237*	*-0.228*	-6.64%	*-1.355$*	*-0.710*	*1.069*
(-30d, +30d)	-12.96%	*-2.218**	*-2.756***	-26.65%	*-3.960****	*-0.71*	*1.539$*

Panel B: Upgrades

	High MB (43)			Low MB (43)			CAR Difference
Event window	CAR	t-Stat	Sign Z	CAR	t-Stat	Sign Z	t-stat
(-12m, -1m)	10.00%	*2.180**	*2.441***	10.65%	*2.058**	*2.480***	*-0.093*
(-6m, -1m)	6.68%	*2.407***	*1.22*	8.16%	*1.996**	*1.860**	*-0.298*
(-3m, -1m)	5.83%	*1.977**	*1.830**	1.42%	*0.556*	*0.62*	*1.128*
event month	1.46%	*1.178*	*0.915*	1.60%	*0.801*	*1.24*	*-0.059*
(+1m, +3m)	0.62%	*0.332*	*1.525$*	-2.38%	*-0.994*	*-0.62*	*0.987*
(+1m, +6m)	2.34%	*0.577*	*0.610*	-4.61%	*-1.447$*	*-0.31*	*1.347$*
(+1m, +12m)	7.71%	*1.081*	*0.610*	-3.96%	*-0.84*	*0.620*	*1.364$*
(-12m, +12m)	19.17%	*1.971**	*2.441***	8.28%	*1.237*	*2.480***	*0.922*
(-30d, -1d)	0.26%	*0.175*	*-0.301*	1.81%	*1.133*	*1.886**	*-0.71*
(-10d, -3d)	-0.08%	*-0.121*	*-0.301*	0.11%	*0.089*	*0.663*	*-0.135*
Day -2	-0.20%	*-1.168*	*0.422*	-0.33%	*-1.318$*	*-0.561*	*0.428*
Day -1	0.35%	*1.658**	*0.783*	0.06%	*0.218*	*-0.255*	*0.834*
Day 0	-0.42%	*-1.860**	*-0.301*	-0.02%	*-0.033*	*-0.255*	*-0.618*
Day +1	0.11%	*0.348*	*1.505$*	0.00%	*0.005*	*1.275*	*0.348*
Day +2	0.16%	*0.477*	*1.144*	-0.06%	*-0.167*	*0.357*	*0.447*
(0d, +2d)	-0.15%	*-0.266*	*1.144*	-0.08%	*-0.134*	*0.663*	*-0.085*
(-1d, +1d)	0.04%	*0.119*	*0.422*	0.05%	*0.09*	*-0.561*	*-0.015*
(-2d, +2d)	0.00%	*0.001*	*1.505$*	-0.35%	*-0.503*	*-0.867*	*0.503*
(+3d, +10d)	0.83%	*1.300$*	*2.228**	1.78%	*1.859**	*2.192**	*-0.822*
(-10d, +10d)	0.75%	*0.809*	*1.144*	1.54%	*1.087*	*2.192**	*-0.466*
(+1d, +30d)	0.32%	*0.246*	*0.422*	1.51%	*0.948*	*0.969*	*-0.578*
(-30d, +30d)	0.16%	*0.084*	*0.783*	3.31%	*1.585$*	*1.581$*	*-1.112*

Note:

1. Our_Benchmark (Model 9) method is used to calculate the abnormal monthly and daily returns, which adjust the size, market-to-book ratio, and industry factors.
2. The symbols $,*,**, and *** denote statistical significance at the 0.10, 0.05, 0.01 and 0.001 levels respectively, using a generic one-tail test.
3. The number of rating changes are indicated in the brackets in the column headings.
4. We partition our sample based on the rankings of the market-to-book ratios within each size (market capitalization) quartile for the 13th month prior to the rating change month , and the top 50% firms within each size quartile are classified as high market-to-book (MB) firms, and the bottom 50% firms are classified as low MB firms.

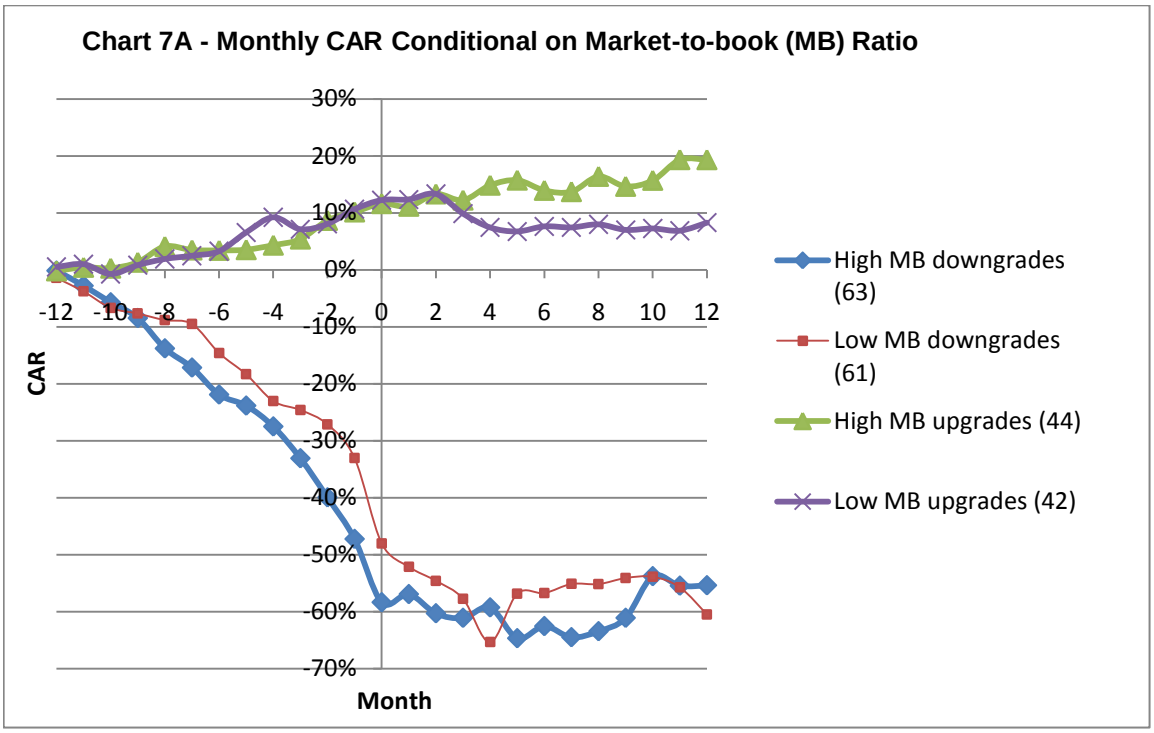


Chart 7A - Monthly CAR Conditional on Market-to-book (MB) Ratio
30%
20%
10%
0%
-10%
-20%
-30%
-40%
-50%
-60%
-70%
-12
-10
-8
-6
-4
-2
0
2
4
6
8
10
12
CAR
Month
High MB downgrades (63)
Low MB downgrades (61)
High MB upgrades (44)
Low MB upgrades (42)

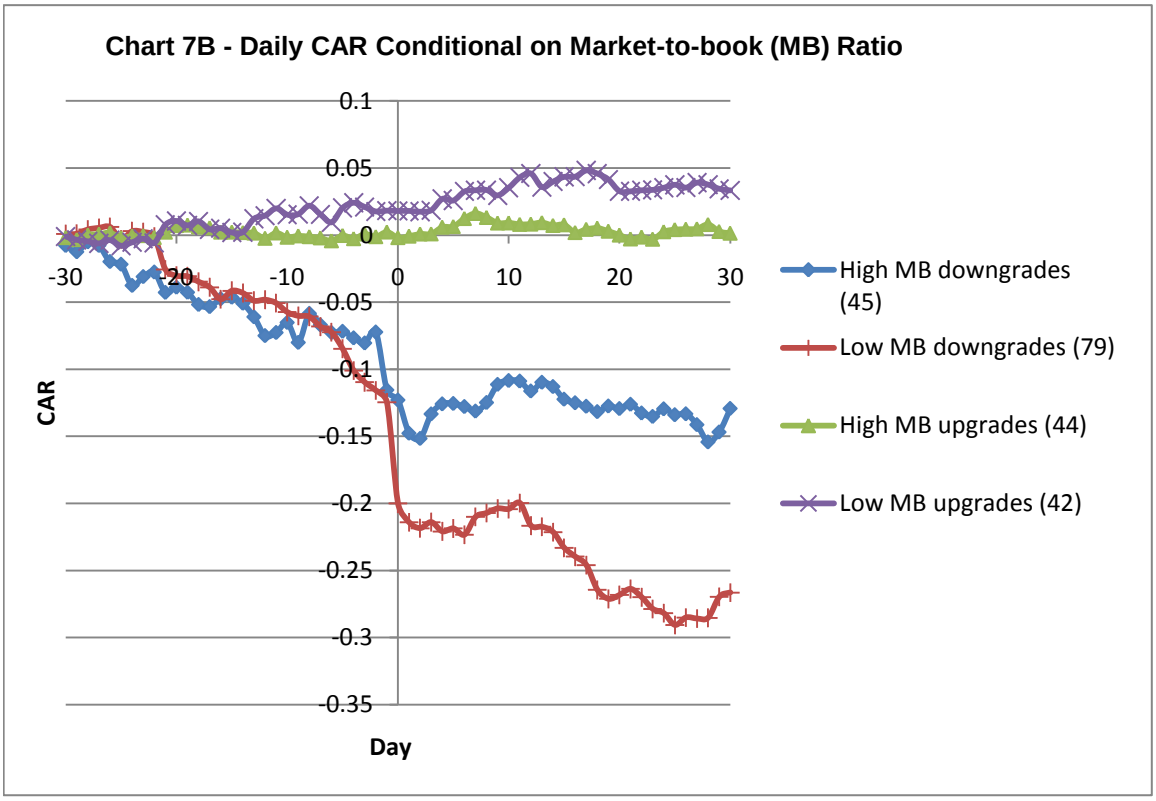


Chart 7B - Daily CAR Conditional on Market-to-book (MB) Ratio
0.1
0.05
0
-0.05
-0.1
-0.15
-0.2
-0.25
-0.3
-0.35
-30
-20
-10
0
10
20
30
CAR
Day
High MB downgrades (45)
Low MB downgrades (79)
High MB upgrades (44)
Low MB upgrades (42)

Table 8 - Mean abnormal stock returns conditional on pre-event credit quality

Panel A: Downgrades

	Pre-event rating < "A-" (40)			Pre-event rating >= "A-" (84)			CAR Difference
Event window	CAR	t-Stat	Sign Z	CAR	t-Stat	Sign Z	t-stat
(-12m, -1m)	-66.54%	*-5.010***	*-1.698**	-27.76%	*-5.675****	*-1.294$*	*-3.353****
(-6m, -1m)	-46.81%	*-5.432***	*-2.038**	-17.61%	*-5.221****	*-0.38*	*-3.800****
(-3m, -1m)	-23.71%	*-2.948***	*-0.34*	-10.86%	*-3.439****	*-0.837*	*-1.789**
event month	-14.34%	*-2.215**	*-1.698**	-12.42%	*-4.689****	*-0.152*	*-0.326*
(+1m, +3m)	-10.07%	*-1.529$*	*-0.574*	-4.43%	*-1.163*	*1.218*	*-0.789*
(+1m, +6m)	-9.92%	*-1.166*	*1.835**	-4.95%	*-1.028*	*1.446$*	*-0.545*
(+1m, +12m)	-22.54%	*-2.133**	*0.459*	2.41%	*0.375*	*4.642****	*-2.110**
(-12m, +12m)	-102.84%	*-5.803****	*-2.717***	-37.77%	*-4.010***	*-0.152*	*-3.552****
(-30d, -1d)	-17.44%	*-2.368***	*-2.296**	-9.42%	*-3.884****	*-0.97*	*-1.300$*
(-10d, -3d)	-1.18%	*-0.279*	*-1.661**	-4.30%	*-3.253****	*-1.409$*	*0.895*
Day -2	0.99%	*0.587*	*2.001**	-0.30%	*-0.798*	*0.128*	*1.007*
Day -1	-5.98%	*-2.846***	*-1.979**	-1.03%	*-1.569$*	*0.128*	*-2.861***
Day 0	-4.39%	*-1.588$*	*-1.344$*	-3.95%	*-2.525***	*-0.091*	*-0.148*
Day +1	-2.96%	*-1.795**	*-1.979**	-1.47%	*-1.257*	*-0.97*	*-0.729*
Day +2	-0.92%	*-0.459*	*1.196*	-0.18%	*-0.331*	*0.128*	*-0.466*
(0d, +2d)	-8.27%	*-2.149**	*-1.344$*	-5.59%	*-3.395****	*-0.97*	*-0.751*
(-1d, +1d)	-13.33%	*-4.007***	*-2.614***	-6.45%	*-3.903****	*-2.945***	*-2.076**
(-2d, +2d)	-13.29%	*-3.003***	*-2.614***	-6.92%	*-4.024****	*-1.628$*	*-1.619$*
(+3d, +10d)	7.29%	*1.822**	*2.001**	0.84%	*0.71*	*0.787*	*1.988**
(-10d, +10d)	-7.36%	*-1.018*	*-1.026*	-10.39%	*-4.242****	*-1.628$*	*0.495*
(+1d, +30d)	1.75%	*0.317*	*1.196*	-6.15%	*-1.947**	*-1.628$*	*1.327$*
(-30d, +30d)	-20.07%	*-1.869**	*-1.344$*	-19.52%	*-4.607***	*-2.067**	*-0.057*

Panel B: Upgrades

	Pre-event rating < "A-" (53)			Pre-event rating >= "A-" (33)			CAR Difference
Event window	CAR	t-Stat	Sign Z	CAR	t-Stat	Sign Z	t-stat
(-12m, -1m)	12.86%	*2.497***	*2.592***	6.32%	*1.805**	*2.327***	*0.919*
(-6m, -1m)	10.58%	*2.920***	*1.759**	2.42%	*0.97*	*1.28*	*1.631$*
(-3m, -1m)	5.00%	*1.676**	*1.203*	1.53%	*0.834*	*1.28*	*0.853*
event month	2.83%	*1.649**	*2.037**	-0.53%	*-0.44*	*-0.116*	*1.407$*
(+1m, +3m)	-1.66%	*-0.83*	*-0.185*	0.40%	*0.173*	*1.28*	*-0.659*
(+1m, +6m)	-2.32%	*-0.616*	*-1.574$*	0.83%	*0.267*	*2.327***	*-0.586*
(+1m, +12m)	2.83%	*0.443*	*-0.185*	0.55%	*0.113*	*1.629$*	*0.254*
(-12m, +12m)	18.52%	*2.138**	*2.592***	6.34%	*0.934*	*2.327***	*0.996*
(-30d, -1d)	2.54%	*1.504$*	*1.443$*	1.08%	*0.801*	*0.262*	*0.608*
(-10d, -3d)	-0.12%	*-0.107*	*1.443$*	0.74%	*0.971*	*0.96*	*-0.556*
Day -2	-0.32%	*-1.206*	*-1.580$*	-0.19%	*-1.11*	*0.611*	*-0.358*
Day -1	0.39%	*1.322$*	*-0.206*	0.47%	*1.636$*	*0.611*	*-0.182*
Day 0	0.52%	*1.105*	*1.443$*	-0.79%	*-3.044***	*-1.484$*	*2.074**
Day +1	0.09%	*0.246*	*0.069*	0.23%	*0.764*	*2.357***	*-0.268*
Day +2	0.27%	*0.691*	*0.618*	-0.11%	*-0.319*	*-0.087*	*0.671*
(0d, +2d)	0.88%	*1.900**	*1.993**	-0.66%	*-1.155*	*0.611*	*2.080**
(-1d, +1d)	1.01%	*1.726**	*1.168*	-0.08%	*-0.178*	*0.262*	*1.320$*
(-2d, +2d)	0.96%	*1.656**	*0.344*	-0.38%	*-0.554*	*1.309$*	*1.464$*
(+3d, +10d)	1.08%	*1.124*	*0.069*	0.92%	*1.194*	*2.008**	*0.117*
(-10d, +10d)	1.92%	*1.554$*	*1.718**	1.28%	*1.225*	*1.659**	*0.360*
(+1d, +30d)	2.39%	*1.518$*	*0.069*	-1.05%	*-0.74*	*-0.436*	*1.496$*
(-30d, +30d)	5.46%	*2.841***	*1.718**	-0.77%	*-0.369*	*0.262*	*2.118**

Note:

1. Our_Benchmark (Model 9) method is used to calculate the abnormal monthly and daily returns, which adjust the size, market-to-book ratio, and industry factors.
2. The symbols $,*,**, and *** denote statistical significance at the 0.10, 0.05, 0.01 and 0.001 levels respectively, using a generic one-tail test.
3. The number of rating changes are indicated in the brackets in the column headings.
4. we partition our sample based on the pre-event Best ratings. Pre-event rating is defined as the most recently assigned Best rating prior to the rating change. We define low-quality firms as those with a pre-event rating lower than “A-”, and high-quality firms as those with a pre-event rating equal to or higher than “A-”.

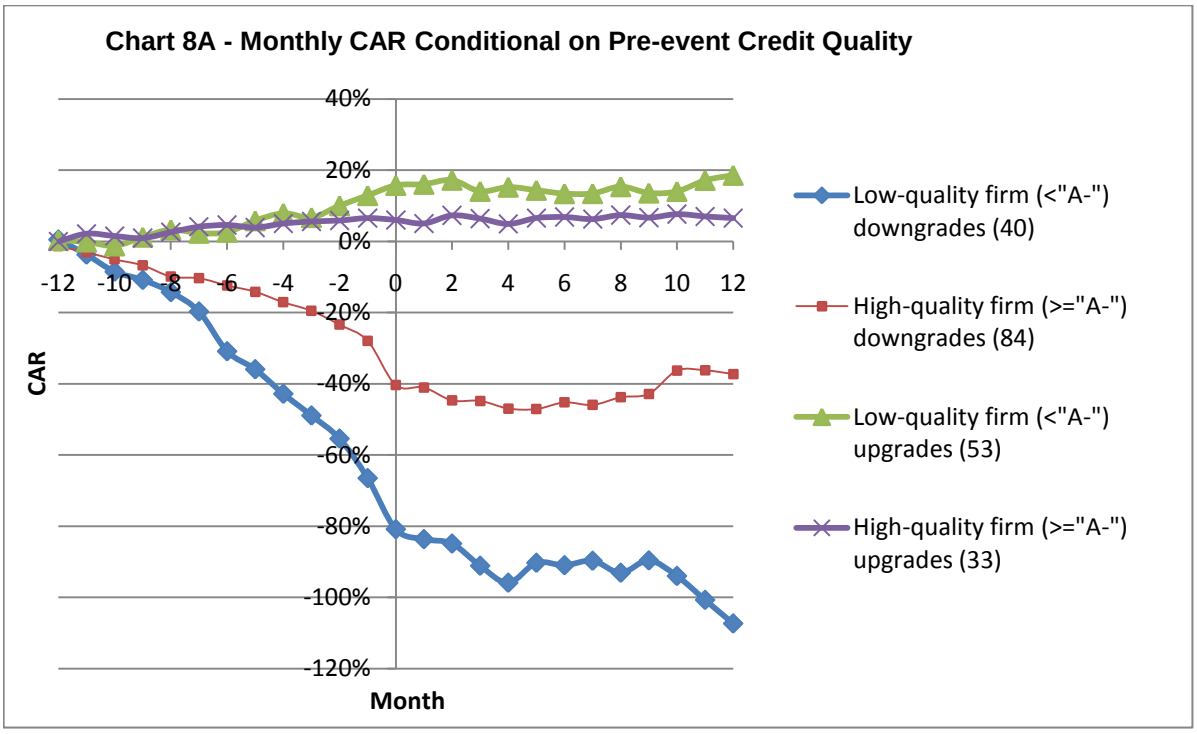


Chart 8A - Monthly CAR Conditional on Pre-event Credit Quality
40%
20%
0%
-20%
-40%
-60%
-80%
-100%
-120%
-12
-10
-8
-6
-4
-2
0
2
4
6
8
10
12
CAR
Month
Low-quality firm (<"A-") downgrades (40)
High-quality firm (>="A-") downgrades (84)
Low-quality firm (<"A-") upgrades (53)
High-quality firm (>="A-") upgrades (33)

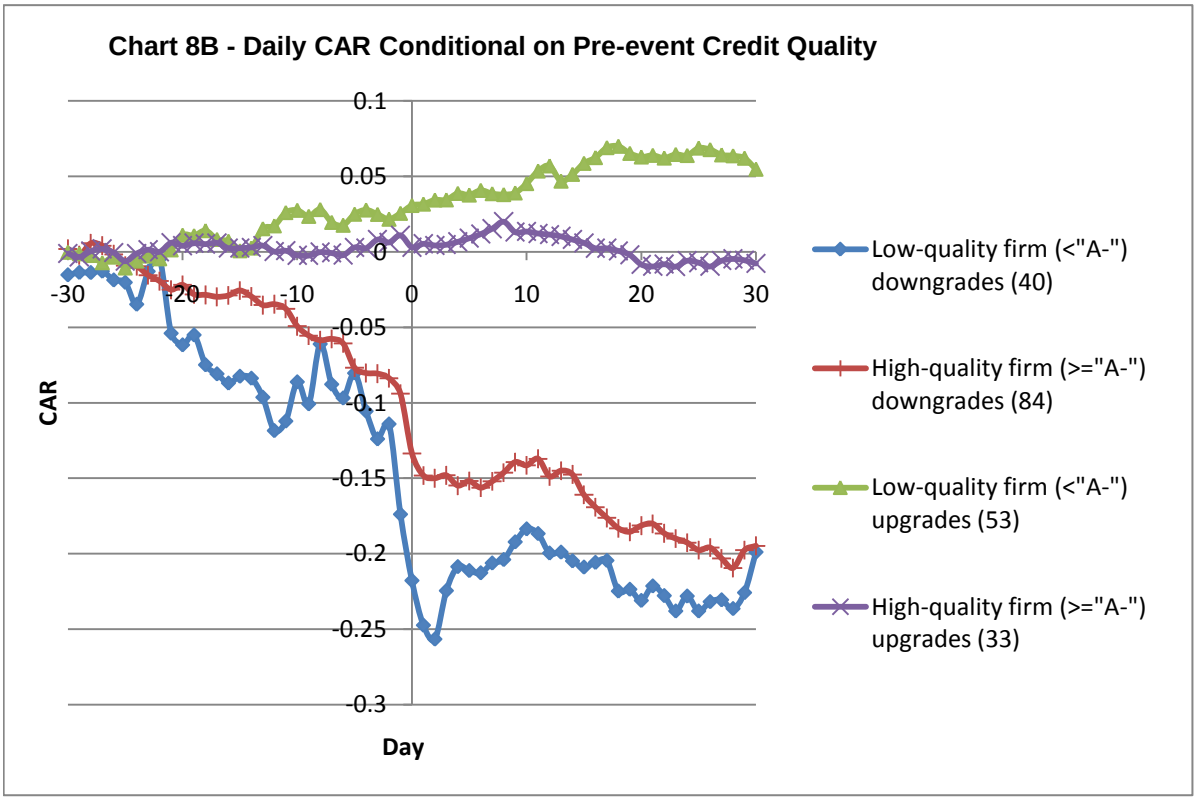


Chart 8B - Daily CAR Conditional on Pre-event Credit Quality
0.1
0.05
0
-0.05
-0.1
-0.15
-0.2
-0.25
-0.3
-30
-20
-10
0
10
20
30
CAR
Day
Low-quality firm (<"A-") downgrades (40)
High-quality firm (>="A-") downgrades (84)
Low-quality firm (<"A-") upgrades (53)
High-quality firm (>="A-") upgrades (33)

Table 9 - Mean abnormal stock returns: threshold vs. non-threshold rating changes

Panel A: Downgrades

	"A-" or "B+" Threshold (44)			Non-threshold (80)			CAR Difference
Event window	CAR	t-Stat	Sign Z	CAR	t-Stat	Sign Z	t-stat
(-12m, -1m)	-38.49%	*-3.933***	*-1.577$*	-40.90%	*-5.984***	*-1.344$*	*0.205*
(-6m, -1m)	-20.18%	*-3.223***	*-0.946*	-30.46%	*-6.512***	*-1.107*	*1.312$*
(-3m, -1m)	-7.74%	*-1.304$*	*0.000*	-18.80%	*-4.664***	*-1.107*	*1.581$*
event month	-29.39%	*-7.057***	*-2.524***	-4.23%	*-1.349$*	*0.553*	*-4.804****
(+1m, +3m)	-13.22%	*-1.759**	*-1.262*	-2.36%	*-0.771*	*1.830**	*-1.568$*
(+1m, +6m)	-21.78%	*-2.254**	*0.000*	1.81%	*0.502*	*2.784***	*-2.728***
(+1m, +12m)	-17.98%	*-1.431$*	*1.893**	1.51%	*0.291*	*3.739***	*-1.675**
(-12m, +12m)	-85.87%	*-4.542****	*-1.577$*	-43.64%	*-4.899****	*-0.870*	*-2.289**
(-30d, -1d)	-20.28%	*-3.822***	*-1.197*	-7.45%	*-2.249**	*-1.736**	*-2.156**
(-10d, -3d)	-8.04%	*-2.881***	*-2.118**	-0.69%	*-0.352*	*-1.064*	*-2.189**
Day -2	-1.03%	*-1.154*	*0.778*	0.72%	*0.949*	*0.952*	*-1.435$*
Day -1	-2.88%	*-1.867**	*-0.89*	-2.49%	*-2.541***	*-0.616*	*-0.223*
Day 0	-9.87%	*-3.453***	*-2.118**	-0.91%	*-0.683*	*0.504*	*-3.228****
Day +1	-2.79%	*-1.167*	*-1.811**	-1.49%	*-2.183**	*-1.064*	*-0.652*
Day +2	-1.45%	*-0.754*	*1.872**	0.15%	*0.358*	*-0.392*	*-1.045*
(0d, +2d)	-14.12%	*-3.607***	*-1.197*	-2.24%	*-1.856**	*-1.064*	*-3.577****
(-1d, +1d)	-15.55%	*-4.747***	*-3.345***	-4.89%	*-3.275***	*-2.408***	*-3.382****
(-2d, +2d)	-18.00%	*-4.490***	*-2.424***	-4.01%	*-2.498***	*-1.736**	*-3.810****
(+3d, +10d)	4.61%	*1.529$*	*1.710**	1.96%	*1.161*	*0.952*	*0.828*
(-10d, +10d)	-21.54%	*-4.489***	*-1.811**	-2.74%	*-0.823*	*-1.064*	*-3.282****
(+1d, +30d)	-9.12%	*-1.403$*	*-1.504$*	-0.56%	*-0.234*	*0.280*	*-1.478$*
(-30d, +30d)	-39.27%	*-5.176****	*-2.731***	-8.93%	*-1.722**	*-1.064*	*-3.381****

Panel B: Upgrades

	"A-" or "B+" Threshold (29)			Non-threshold (57)			CAR Difference
Event window	CAR	t-Stat	Sign Z	CAR	t-Stat	Sign Z	t-stat
(-12m, -1m)	14.55%	*2.238**	*1.867**	8.13%	*2.038**	*2.942***	*0.880*
(-6m, -1m)	8.91%	*2.113**	*1.494$*	6.64%	*2.193**	*1.605$*	*0.435*
(-3m, -1m)	3.19%	*0.760*	*1.120*	3.90%	*1.889**	*1.337$*	*-0.170*
event month	3.21%	*1.525$*	*1.867**	0.65%	*0.474*	*0.535*	*1.048*
(+1m, +3m)	-1.24%	*-0.508*	*-0.373*	-0.67%	*-0.347*	*1.070*	*-0.177*
(+1m, +6m)	-1.98%	*-0.324*	*-1.494$*	-0.64%	*-0.265*	*1.337$*	*-0.243*
(+1m, +12m)	9.90%	*0.993*	*-0.373*	-2.18%	*-0.541*	*1.337$*	*1.333$*
(-12m, +12m)	27.66%	*2.133**	*2.240**	6.61%	*1.128*	*2.674***	*1.704**
(-30d, -1d)	3.34%	*1.420$*	*2.074**	1.29%	*1.003*	*0.111*	*0.833*
(-10d, -3d)	1.65%	*1.546$*	*0.959*	-0.53%	*-0.526*	*1.438$*	*1.356$*
Day -2	-0.75%	*-2.616***	*-2.755***	-0.02%	*-0.108*	*0.907*	*-2.209**
Day -1	0.55%	*1.534$*	*0.588*	0.36%	*1.344$*	*-0.155*	*0.416*
Day 0	0.55%	*0.747*	*1.331$*	-0.25%	*-0.845*	*-0.686*	*1.198*
Day +1	0.27%	*0.481*	*0.588*	0.08%	*0.314*	*1.438$*	*0.354*
Day +2	0.43%	*0.872*	*0.588*	-0.03%	*-0.097*	*0.111*	*0.824*
(0d, +2d)	1.25%	*2.151**	*2.074**	-0.19%	*-0.422*	*0.907*	*1.906**
(-1d, +1d)	1.36%	*1.540$*	*1.331$*	0.19%	*0.471*	*0.376*	*1.384$*
(-2d, +2d)	1.05%	*1.453$*	*0.959*	0.14%	*0.244*	*0.642*	*0.951*
(+3d, +10d)	-0.81%	*-0.700*	*-1.640$*	1.95%	*2.481***	*2.766***	*-2.004**
(-10d, +10d)	1.90%	*1.638$*	*1.331$*	1.56%	*1.349$*	*1.969**	*0.185*
(+1d, +30d)	0.92%	*0.387*	*-1.640$*	1.15%	*0.951*	*0.907*	*-0.096*
(-30d, +30d)	4.81%	*1.920**	*0.959*	2.19%	*1.218*	*1.173*	*0.847*

Note:

1. Our_Benchmark (Model 9) method is used to calculate the abnormal monthly and daily returns, which adjust the size, market-to-book ratio, and industry factors.
2. The symbols $,*,**, and *** denote statistical significance at the 0.10, 0.05, 0.01 and 0.001 levels respectively, using a generic one-tail test.
3. The number of rating changes are indicated in the brackets in the column headings.
4. We use both "A-" and "B+" as the thresholds, and define threshold downgrades/upgrades as the ones that lose/gain either "A-" or "B+" rating after the rating changes.

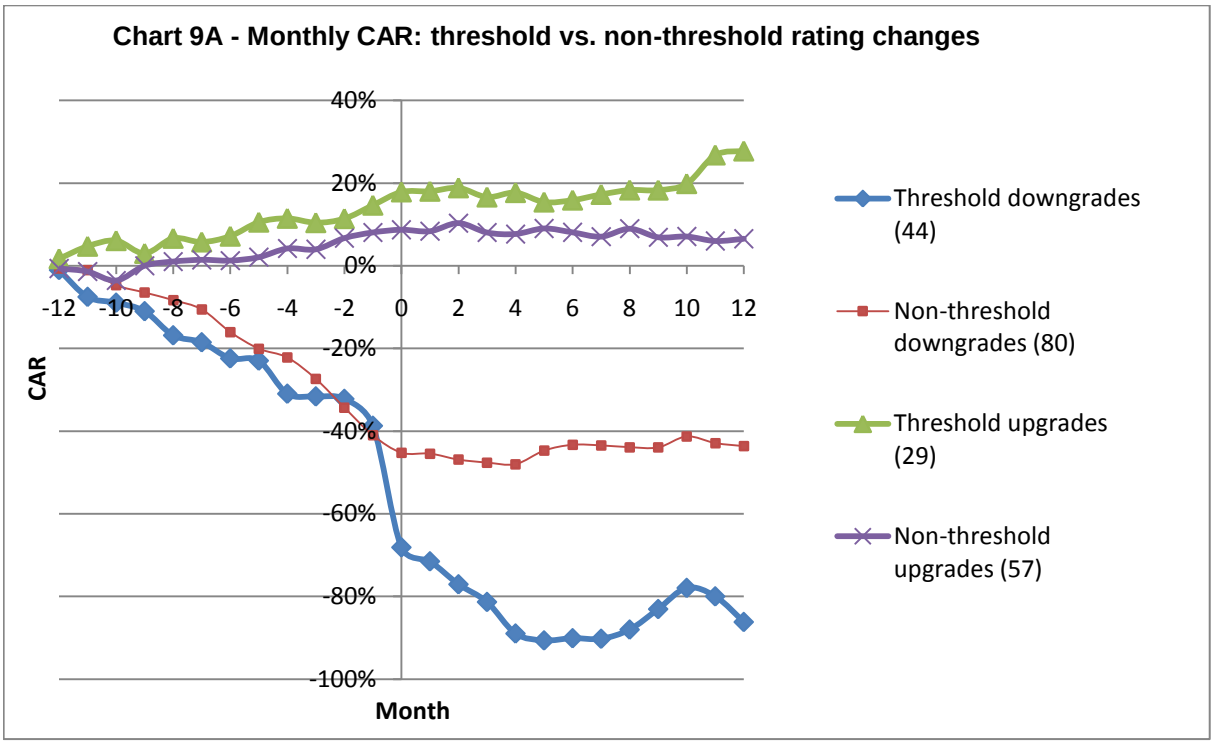


Chart 9A - Monthly CAR: threshold vs. non-threshold rating changes
40%
20%
0%
-20%
-40%
-60%
-80%
-100%
-12 -10 -8 -6 -4 -2 0 2 4 6 8 10 12
CAR
Month
Threshold downgrades (44)
Non-threshold downgrades (80)
Threshold upgrades (29)
Non-threshold upgrades (57)

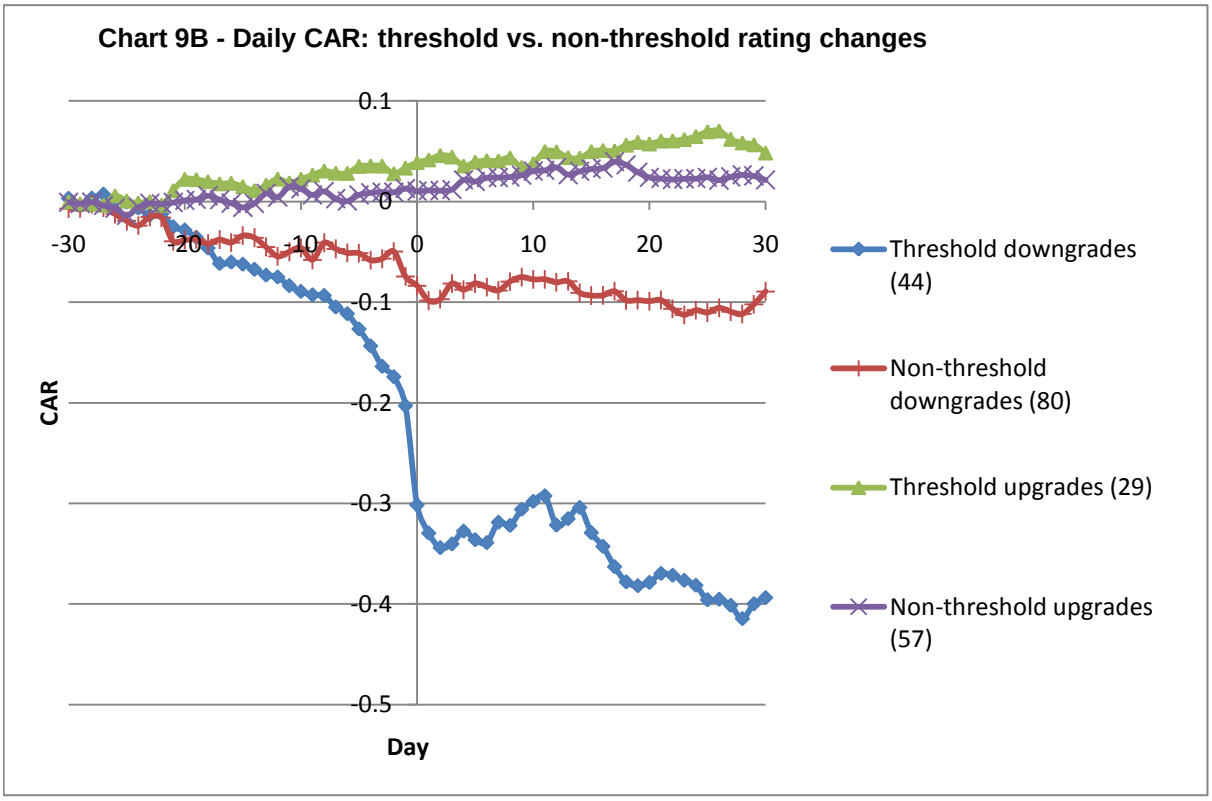


Chart 9B - Daily CAR: threshold vs. non-threshold rating changes
0.1
0
-0.1
-0.2
-0.3
-0.4
-0.5
-30 -20 -10 0 10 20 30
CAR
Day
Threshold downgrades (44)
Non-threshold downgrades (80)
Threshold upgrades (29)
Non-threshold upgrades (57)

Table 10 - Mean abnormal stock returns for subsequent and initial downgrades

	subsequent downgrades (36)			initial downgrades (88)			CAR Difference
Event window	CAR	t-Stat	Sign Z	CAR	t-Stat	Sign Z	t-stat
(-12m, -1m)	-87.65%	*-6.982***	*-2.533***	-20.36%	*-4.482****	*-0.817*	*-6.291****
(-6m, -1m)	-56.20%	*-6.865***	*-2.171**	-14.73%	*-4.401****	*-0.371*	*-5.611****
(-3m, -1m)	-28.94%	*-3.584***	*-0.362*	-9.14%	*-2.837***	*-0.817*	*-2.749***
event month	-18.70%	*-2.525***	*-1.809**	-10.68%	*-4.597****	*-0.149*	*-1.347$*
(+1m, +3m)	-8.85%	*-0.979*	*0.479*	-5.11%	*-1.732**	*0.52*	*-0.507*
(+1m, +6m)	-12.61%	*-1.17*	*2.314**	-4.04%	*-0.992*	*1.188*	*-0.915*
(+1m, +12m)	-23.58%	*-2.014**	*1.580$*	1.96%	*0.32*	*3.862****	*-2.102**
(-12m, +12m)	-129.27%	*-8.604****	*-3.618****	-29.08%	*-3.104***	*0.297*	*-5.718****
(-30d, -1d)	-20.03%	*-2.393***	*-1.001*	-8.72%	*-4.032****	*-1.857**	*-1.792**
(-10d, -3d)	-2.54%	*-0.541*	*-1.001*	-3.61%	*-2.805***	*-1.857**	*0.297*
Day -2	1.64%	*0.902*	*2.878***	-0.50%	*-1.276*	*-0.357*	*1.634$*
Day -1	-7.36%	*-2.811***	*-2.007**	-0.70%	*-2.129**	*0.071*	*-3.821****
Day 0	-6.17%	*-1.710**	*-0.665*	-3.24%	*-2.550***	*-0.571*	*-0.964*
Day +1	-4.12%	*-2.110**	*-1.001*	-1.06%	*-0.993*	*-1.643$*	*-1.468$*
Day +2	-1.39%	*-0.647*	*0.676*	-0.02%	*-0.029*	*0.5*	*-0.786*
(0d, +2d)	-11.68%	*-2.484***	*-0.665*	-4.32%	*-3.318****	*-1.428$*	*-2.033**
(-1d, +1d)	-17.64%	*-4.215***	*-3.013***	-5.00%	*-4.090****	*-2.714***	*-3.854****
(-2d, +2d)	-17.44%	*-3.354***	*-2.343***	-5.51%	*-3.998****	*-1.857**	*-3.020***
(+3d, +10d)	7.62%	*1.734**	*1.347$*	0.93%	*0.838*	*1.246*	*2.029**
(-10d, +10d)	-12.36%	*-1.472$*	*-1.001*	-8.20%	*-3.875****	*-1.643$*	*-0.661*
(+1d, +30d)	-0.79%	*-0.124*	*1.012*	-4.75%	*-1.603$*	*-1.428$*	*0.642*
(-30d, +30d)	-26.99%	*-2.220**	*-1.672**	-16.71%	*-4.292***	*-1.857**	*-1.043*

Note:

1. Our_Benchmark (Model 9) method is used to calculate the abnormal monthly and daily returns, which adjust the size, market-to-book ratio, and industry factors.

2. The symbols $,*,**, and *** denote statistical significance at the 0.10, 0.05, 0.01 and 0.001 levels respectively, using a generic one-tail test.

3. The number of rating changes are indicated in the brackets in the column headings.

4. We define subsequent rating changes as the rating changes following the prior ones within 12-month period, and initial rating changes as all the other non-subsequent rating changes.

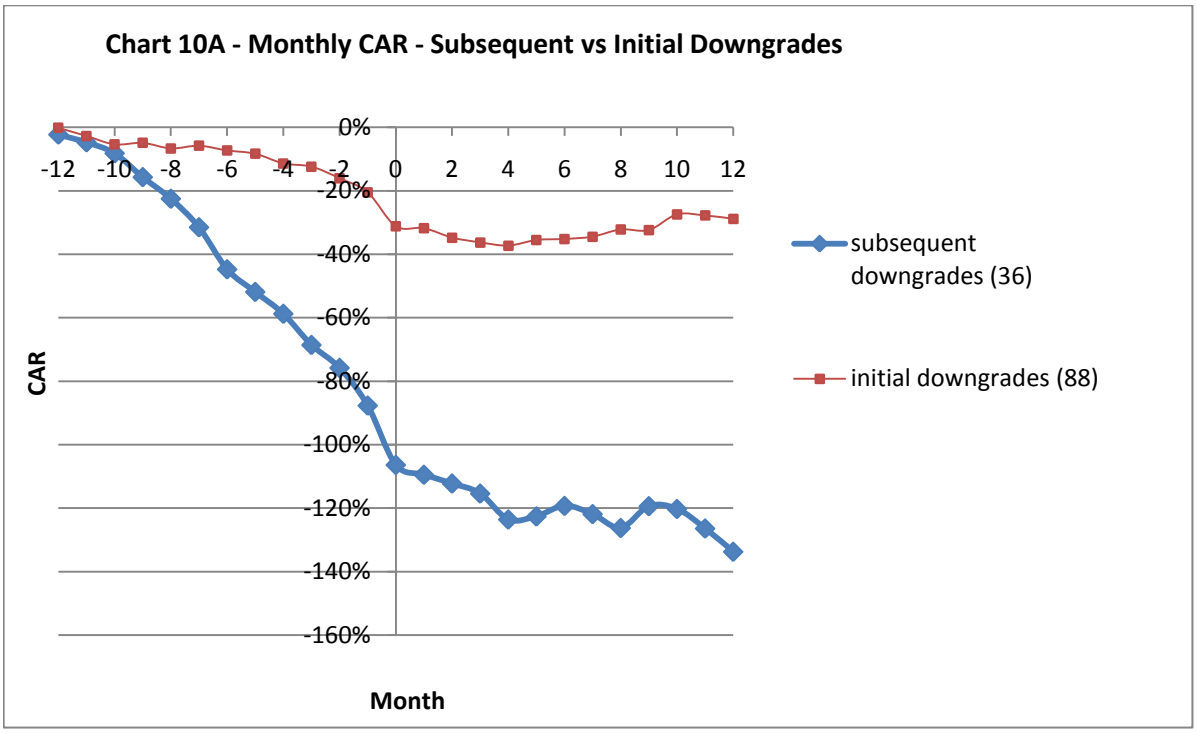


Chart 10A - Monthly CAR - Subsequent vs Initial Downgrades
0%
-20%
-40%
-60%
-80%
-100%
-120%
-140%
-160%
-12
-10
-8
-6
-4
-2
0
2
4
6
8
10
12
CAR
Month
subsequent downgrades (36)
initial downgrades (88)

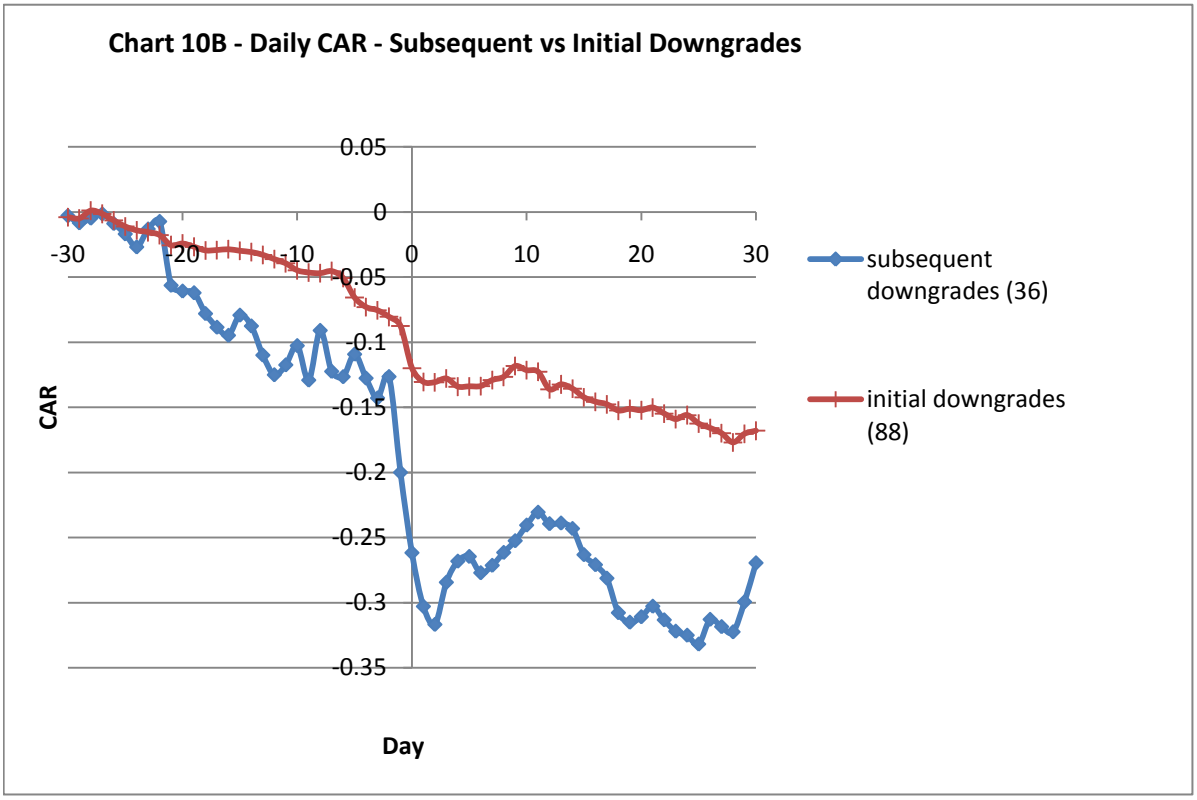


Chart 10B - Daily CAR - Subsequent vs Initial Downgrades
0.05
0
-0.05
-0.1
-0.15
-0.2
-0.25
-0.3
-0.35
-30
-20
-10
0
10
20
30
CAR
Day
subsequent downgrades (36)
initial downgrades (88)

Table 10.1 - Mean abnormal stock returns for subsequent and initial downgrades

Panel A: Non-threshold Downgrades: subsequent vs. initial

	Subsequent (18)			Initial (62)			CAR Difference
Event window	CAR	t-Stat	Sign Z	CAR	t-Stat	Sign Z	t-stat
(-12m, -1m)	-104.12%	*-5.867****	*-1.838**	-22.54%	*-4.258****	*-0.617*	*-5.824****
(-6m, -1m)	-71.66%	*-5.759****	*-1.286$*	-18.50%	*-5.014****	*-0.617*	*-5.424****
(-3m, -1m)	-44.36%	*-4.160****	*-0.735*	-11.39%	*-3.048***	*-0.882*	*-3.680****
event month	-3.43%	*-0.268*	*-0.184*	-4.46%	*-2.492***	*0.705*	*0.119*
(+1m, +3m)	5.16%	*0.442*	*2.217**	-4.42%	*-1.956**	*0.97*	*1.164*
(+1m, +6m)	9.39%	*0.829*	*3.919****	-0.26%	*-0.077*	*1.235*	*1.079*
(+1m, +12m)	-4.46%	*-0.303*	*2.217**	3.14%	*0.596*	*3.086***	*-0.608*
(-12m, +12m)	-111.76%	*-5.642****	*-2.389***	-23.87%	*-2.806***	*0.176*	*-4.792****
(-30d, -1d)	-8.00%	*-0.655*	*-0.236*	-7.29%	*-2.913***	*-1.844**	*-0.081*
(-10d, -3d)	5.29%	*0.678*	*0.236*	-2.42%	*-2.188**	*-1.336$*	*1.467$*
Day -2	3.58%	*1.211*	*1.652**	-0.11%	*-0.232*	*0.191*	*1.825**
Day -1	-8.95%	*-2.327***	*-1.18*	-0.62%	*-1.572$*	*-0.064*	*-3.302****
Day 0	-1.06%	*-0.187*	*0.708*	-0.87%	*-1.376$*	*0.191*	*-0.05*
Day +1	-3.70%	*-1.472$*	*-0.236*	-0.84%	*-1.750**	*-1.081*	*-1.619$*
Day +2	0.34%	*0.258*	*-0.236*	0.10%	*0.243*	*-0.318*	*0.226*
(0d, +2d)	-4.42%	*-0.951*	*0.236*	-1.61%	*-1.981**	*-1.336$*	*-0.873*
(-1d, +1d)	-13.71%	*-2.449***	*-2.125**	-2.33%	*-2.764***	*-1.590$*	*-2.997***
(-2d, +2d)	-9.79%	*-1.551$*	*-1.652**	-2.33%	*-2.485***	*-1.081*	*-1.745**
(+3d, +10d)	5.60%	*0.88*	*0.236*	0.91%	*0.762*	*0.954*	*1.052*
(-10d, +10d)	1.11%	*0.082*	*0.236*	-3.85%	*-1.994**	*-1.336$*	*0.543*
(+1d, +30d)	4.00%	*0.496*	*1.18*	-1.89%	*-0.905*	*-0.318*	*0.968*
(-30d, +30d)	-5.05%	*-0.247*	*0.236*	-10.05%	*-3.037***	*-1.336$*	*0.357*

Panel B: Threshold downgrades: subsequent vs. initial

	Subsequent (18)			Initial (26)			CAR Difference
Event window	CAR	t-Stat	Sign Z	CAR	t-Stat	Sign Z	t-stat
(-12m, -1m)	-71.19%	*-4.096****	*-1.790**	-14.95%	*-1.682**	*-0.551*	*-3.134***
(-6m, -1m)	-40.75%	*-4.224****	*-1.790**	-5.37%	*-0.77*	*0.276*	*-3.050***
(-3m, -1m)	-13.53%	*-1.201*	*0.163*	-3.57%	*-0.567*	*-0.138*	*-0.828*
event month	-33.97%	*-5.728****	*-2.278**	-26.10%	*-4.529****	*-1.378$*	*-0.924*
(+1m, +3m)	-22.08%	*-1.667**	*-1.302$*	-6.84%	*-0.782*	*-0.551*	*-1.001*
(+1m, +6m)	-33.40%	*-1.975**	*-0.325*	-13.41%	*-1.185*	*0.276*	*-1.022*
(+1m, +12m)	-41.63%	*-2.401***	*0.163*	-0.96%	*-0.056*	*2.343***	*-1.615$*
(-12m, +12m)	-146.79%	*-6.557****	*-2.766***	-42.01%	*-1.675**	*0.276*	*-2.953***
(-30d, -1d)	-32.06%	*-2.901***	*-1.188*	-12.13%	*-2.860***	*-0.567*	*-1.901**
(-10d, -3d)	-10.37%	*-2.193**	*-1.666**	-6.43%	*-1.865**	*-1.367$*	*-0.689*
Day -2	-0.42%	*-0.21*	*2.427***	-1.43%	*-2.013**	*-0.967*	*0.541*
Day -1	-5.76%	*-1.591$*	*-1.666**	-0.88%	*-1.474$*	*0.233*	*-1.583$*
Day 0	-11.28%	*-2.607***	*-1.666**	-8.90%	*-2.307**	*-1.367$*	*-0.405*
Day +1	-4.53%	*-1.483$*	*-1.188*	-1.59%	*-0.456*	*-1.367$*	*-0.599*
Day +2	-3.12%	*-0.757*	*1.204*	-0.29%	*-0.179*	*1.434$*	*-0.719*
(0d, +2d)	-18.93%	*-2.382***	*-1.188*	-10.78%	*-2.907***	*-0.567*	*-1.024*
(-1d, +1d)	-21.57%	*-3.456****	*-2.144**	-11.37%	*-3.403****	*-2.568***	*-1.556$*
(-2d, +2d)	-25.09%	*-3.121****	*-1.666**	-13.09%	*-3.499****	*-1.768**	*-1.492$*
(+3d, +10d)	9.64%	*1.554$*	*1.682**	0.98%	*0.389*	*0.81*	*1.448$*
(-10d, +10d)	-25.82%	*-2.759***	*-1.666**	-18.58%	*-3.719****	*-0.967*	*-0.737*
(+1d, +30d)	-5.59%	*-0.559*	*0.247*	-11.56%	*-1.333$*	*-2.168**	*0.447*
(-30d, +30d)	-48.92%	*-4.240****	*-2.622***	-32.59%	*-3.251****	*-1.367$*	*-1.059*

Note:

1. Our_Benchmark (Model 9) method is used to calculate the abnormal monthly and daily returns, which adjust the size, market-to-book ratio, and industry factors.
2. The symbols $,*,**, and *** denote statistical significance at the 0.10, 0.05, 0.01 and 0.001 levels respectively, using a generic one-tail test.
3. The number of rating changes are indicated in the brackets in the column headings.
4. We define subsequent downgrades as the downgrades following the prior rating changes within 12-month period, and initial downgrades as all the other non-subsequent downgrades. We use both "A-" and "B+" as the thresholds, and define threshold downgrades as the ones that lose either "A-" or "B+" rating after the downgrade.

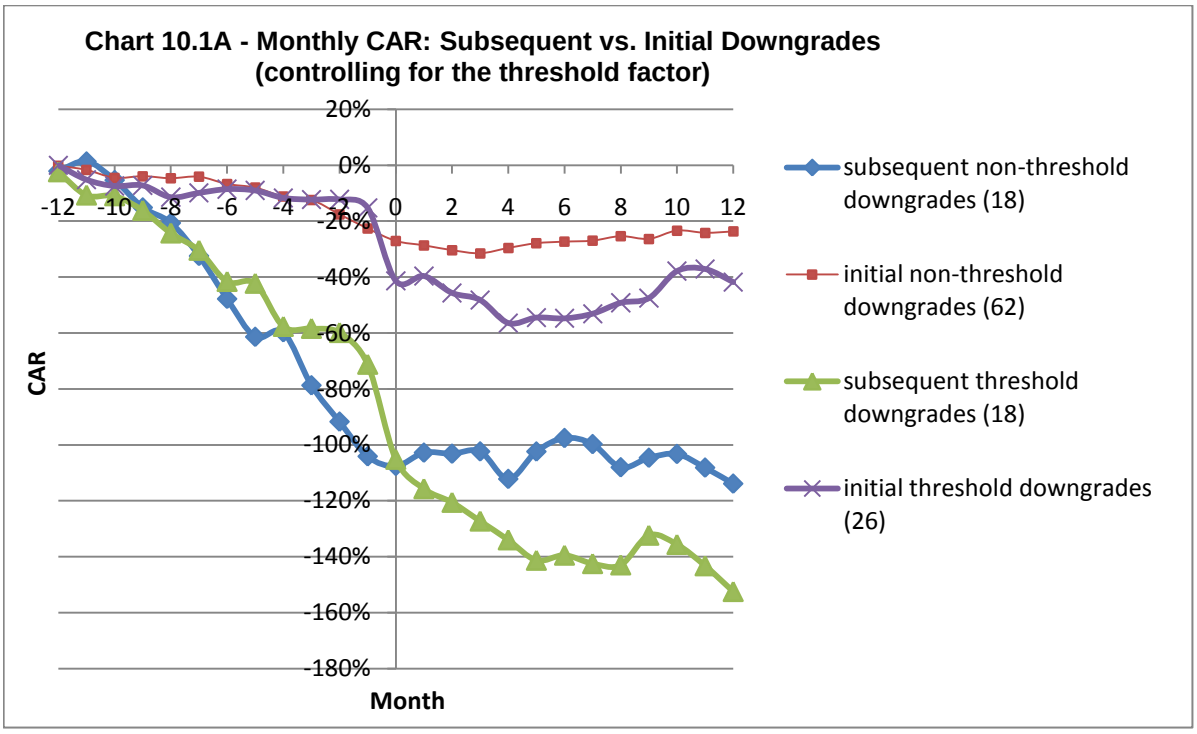


Chart 10.1A - Monthly CAR: Subsequent vs. Initial Downgrades (controlling for the threshold factor)
20%
0%
-20%
-40%
-60%
-80%
-100%
-120%
-140%
-160%
-180%
-12
-10
-8
-6
-4
-2
0
2
4
6
8
10
12
CAR
Month
subsequent non-threshold downgrades (18)
initial non-threshold downgrades (62)
subsequent threshold downgrades (18)
initial threshold downgrades (26)

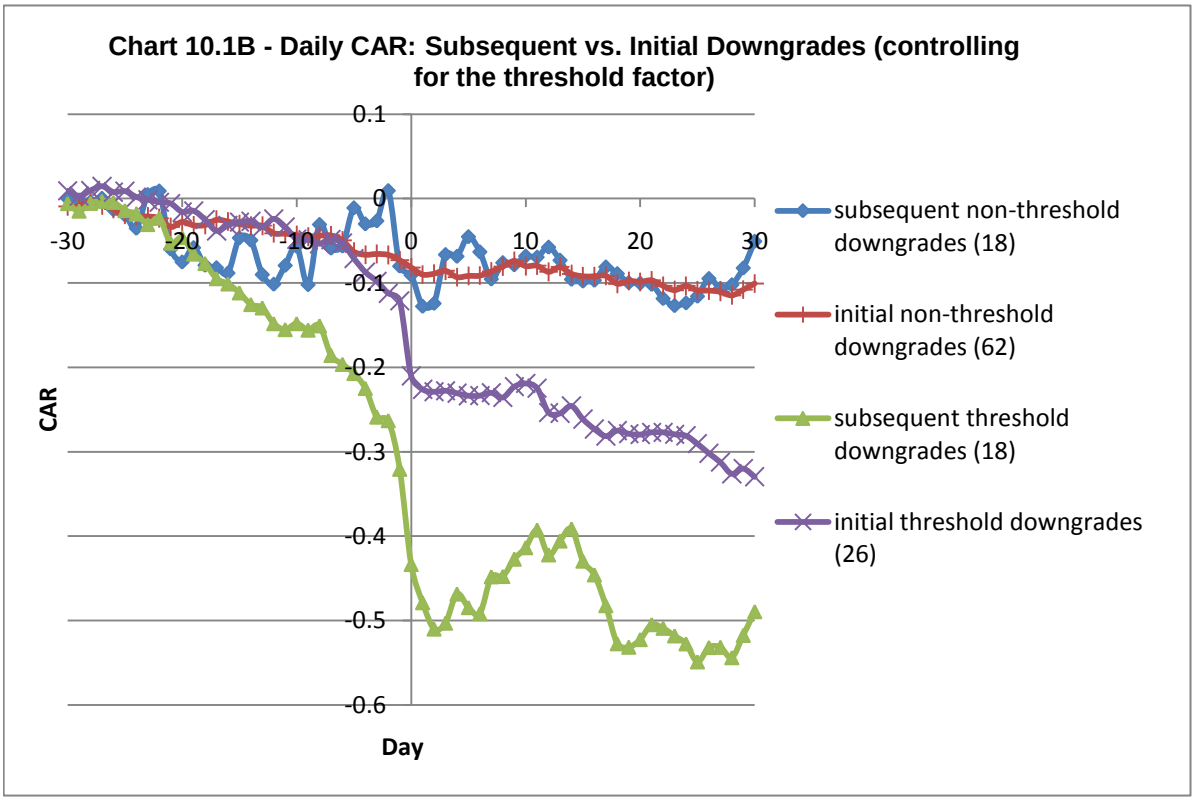


Chart 10.1B - Daily CAR: Subsequent vs. Initial Downgrades (controlling for the threshold factor)
0.1
0
-0.1
-0.2
-0.3
-0.4
-0.5
-0.6
-30
-20
-10
0
10
20
30
CAR
Day
subsequent non-threshold downgrades (18)
initial non-threshold downgrades (62)
subsequent threshold downgrades (18)
initial threshold downgrades (26)

Table 11 - Mean abnormal stock returns: Pure PC vs Pure LH firms

Panel A: Downgrades

	PC firms (60)			LH firms (28)			CAR Difference
Event window	CAR	t-Stat	Sign Z	CAR	t-Stat	Sign Z	t-stat
(-12m, -1m)	-39.84%	*-4.911****	*-1.353$*	-38.38%	*-3.007***	*-0.944*	*-0.099*
(-6m, -1m)	-27.22%	*-4.659****	*-1.083*	-27.44%	*-3.248****	*-0.54*	*0.021*
(-3m, -1m)	-14.71%	*-2.885***	*0*	-12.38%	*-1.426$*	*-0.54*	*-0.244*
event month	-19.52%	*-4.770****	*-2.436***	-8.86%	*-1.214*	*0.674*	*-1.368$*
(+1m, +3m)	-12.94%	*-2.407***	*-0.177*	0.74%	*0.097*	*0.27*	*-1.449$*
(+1m, +6m)	-12.37%	*-1.603$*	*0.641*	-5.05%	*-0.715*	*1.079*	*-0.594*
(+1m, +12m)	-10.65%	*-1.097*	*2.279**	0.34%	*0.035*	*2.293**	*-0.699*
(-12m, +12m)	-69.83%	*-4.962***	*-1.083*	-46.90%	*-2.600***	*-0.54*	*-0.954*
(-30d, -1d)	-15.62%	*-3.083***	*-1.580$*	-10.35%	*-2.068**	*-0.508*	*-0.644*
(-10d, -3d)	-4.93%	*-1.628$*	*-2.101**	-5.07%	*-2.443***	*-1.650**	*0.030*
Day -2	-0.18%	*-0.16*	*-0.429*	1.05%	*1.807**	*2.538***	*-0.724*
Day -1	-3.58%	*-2.450***	*-1.059*	-3.07%	*-1.744**	*-0.888*	*-0.207*
Day 0	-4.66%	*-2.312**	*-1.059*	-8.26%	*-2.003**	*-0.508*	*0.883*
Day +1	-3.89%	*-2.856***	*-1.059*	1.48%	*0.523*	*-0.888*	*-1.936**
Day +2	0.72%	*0.97*	*2.327***	-3.32%	*-1.288$*	*-0.888*	*1.960**
(0d, +2d)	-7.83%	*-3.389****	*-0.278*	-10.11%	*-1.952**	*-1.650**	*0.466*
(-1d, +1d)	-12.13%	*-4.587****	*-3.403****	-9.85%	*-2.968***	*-2.030**	*-0.507*
(-2d, +2d)	-11.59%	*-4.233****	*-2.361***	-12.13%	*-2.302**	*-1.269*	*0.100*
(+3d, +10d)	4.65%	*1.707**	*2.066**	2.31%	*1.383$*	*2.367***	*0.562*
(-10d, +10d)	-11.87%	*-2.422***	*-2.361***	-14.97%	*-2.624***	*-1.269*	*0.379*
(+1d, +30d)	-5.52%	*-1.184*	*-0.538*	1.79%	*0.282*	*0.254*	*-0.903*
(-30d, +30d)	-25.81%	*-3.196***	*-2.101**	-16.83%	*-2.204**	*-0.508*	*-0.693*

Panel B: Upgrades

	PC firms (34)			LH firms (26)			CAR Difference
Event window	CAR	t-Stat	Sign Z	CAR	t-Stat	Sign Z	t-stat
(-12m, -1m)	1.80%	*0.278*	*0.808*	20.61%	*4.019****	*2.223**	*-2.171**
(-6m, -1m)	2.64%	*0.616*	*-0.231*	12.76%	*2.879***	*2.223**	*-1.619$*
(-3m, -1m)	0.97%	*0.276*	*0.808*	7.12%	*2.023**	*0.654*	*-1.214*
event month	1.70%	*0.969*	*1.154*	3.18%	*1.286$*	*1.046*	*-0.501*
(+1m, +3m)	-1.29%	*-0.509*	*1.154*	0.54%	*0.177*	*-0.131*	*-0.464*
(+1m, +6m)	0.41%	*0.085*	*0.462*	-1.26%	*-0.263*	*-0.131*	*0.241*
(+1m, +12m)	5.72%	*0.734*	*0.808*	-0.94%	*-0.103*	*0.262*	*0.556*
(-12m, +12m)	9.22%	*0.818*	*1.847**	22.85%	*2.186**	*1.831**	*-0.862*
(-30d, -1d)	2.02%	*0.981*	*1.089*	3.46%	*1.544$*	*0.948*	*-0.470*
(-10d, -3d)	-1.61%	*-1.009*	*0.745*	2.42%	*2.217**	*1.733**	*-1.954**
Day -2	-0.15%	*-0.747*	*0.057*	-0.16%	*-0.383*	*-0.621*	*0.023*
Day -1	0.36%	*1.012*	*0.401*	0.26%	*0.655*	*-1.406$*	*0.186*
Day 0	0.11%	*0.209*	*-0.287*	0.96%	*1.935**	*1.341$*	*-1.145*
Day +1	0.68%	*1.729**	*1.433$*	-0.20%	*-0.342*	*0.164*	*1.292$*
Day +2	-0.16%	*-0.345*	*-0.287*	0.30%	*0.54*	*0.164*	*-0.639*
(0d, +2d)	0.63%	*1.137*	*2.120**	1.06%	*1.731**	*1.341$*	*-0.518*
(-1d, +1d)	1.15%	*1.569$*	*0.745*	1.02%	*1.339$*	*1.341$*	*0.121*
(-2d, +2d)	0.84%	*1.254*	*1.433$*	1.16%	*1.412$*	*1.341$*	*-0.304*
(+3d, +10d)	1.46%	*1.321$*	*1.089*	0.23%	*0.172*	*0.164*	*0.714*
(-10d, +10d)	0.68%	*0.504*	*1.089*	3.81%	*2.035**	*2.518***	*-1.391$*
(+1d, +30d)	1.62%	*0.834*	*1.089*	2.09%	*0.991*	*0.556*	*-0.162*
(-30d, +30d)	3.74%	*1.490$*	*1.776**	6.50%	*2.277**	*1.341$*	*-0.725*

Note:

1. Our_Benchmark (Model 9) method is used to calculate the abnormal monthly and daily returns, which adjust the size, market-to-book ratio, and industry factors.
2. The symbols $,*,**, and *** denote statistical significance at the 0.10, 0.05, 0.01 and 0.001 levels respectively, using a generic one-tail test.
3. The number of rating changes are indicated in the brackets in the column headings.
4. We partition our full sample into rating changes for pure PC firms, pure LH firms, and multi-line firms with both PC and LH operations. We exclude multi-line firms in this analysis for the purpose of comparing only pure PC and pure LH firms.

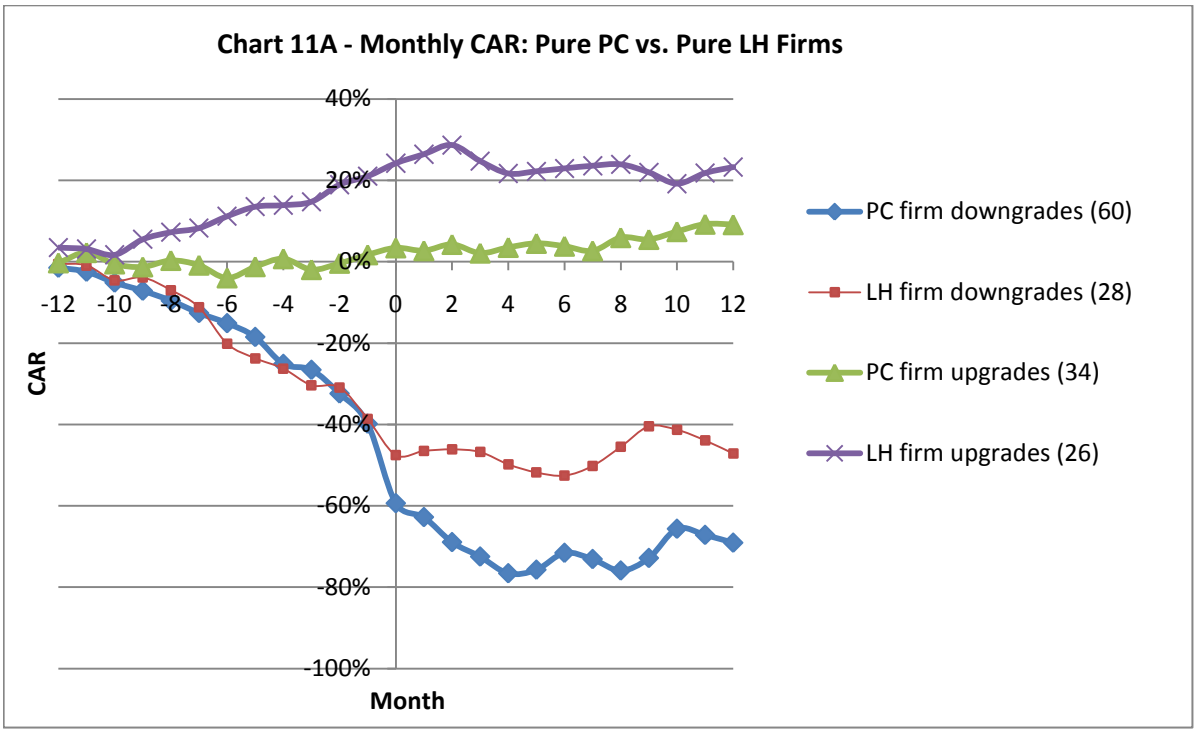


Chart 11A - Monthly CAR: Pure PC vs. Pure LH Firms
40%
20%
0%
-20%
-40%
-60%
-80%
-100%
-12 -10 -8 -6 -4 -2 0 2 4 6 8 10 12
CAR
Month
PC firm downgrades (60)
LH firm downgrades (28)
PC firm upgrades (34)
LH firm upgrades (26)

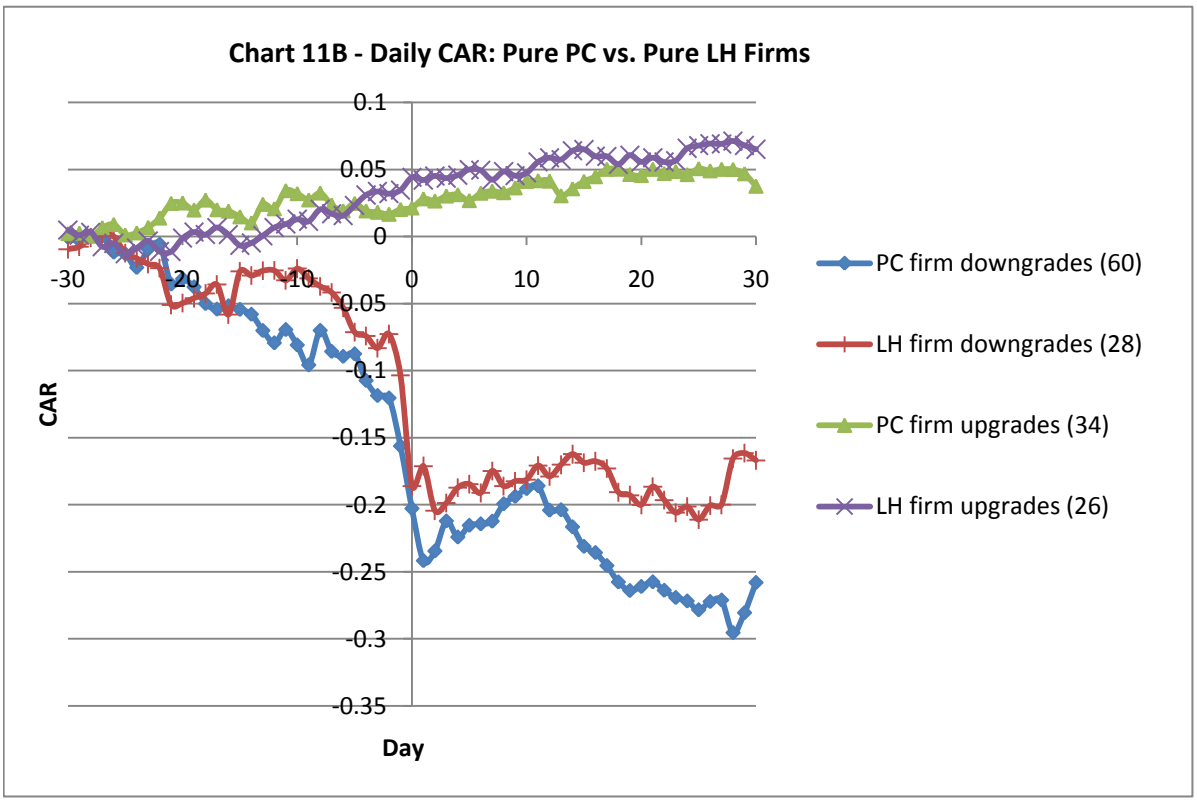


Chart 11B - Daily CAR: Pure PC vs. Pure LH Firms
0.1
0.05
0
-0.05
-0.1
-0.15
-0.2
-0.25
-0.3
-0.35
-30 -20 -10 0 10 20 30
CAR
Day
PC firm downgrades (60)
LH firm downgrades (28)
PC firm upgrades (34)
LH firm upgrades (26)

Table 12 - Mean abnormal stock returns: mono-line (pure PC/LH) vs multi-line firm rating changes

Panel A: Downgrades

	Pure PC/LH firm (88)			Multiline firm (36)			CAR Difference
Event window	CAR	t-Stat	Sign Z	CAR	t-Stat	Sign Z	t-stat
(-12m, -1m)	-39.39%	*-5.780****	*-1.650**	-41.68%	*-4.257****	*-1.171*	*0.185*
(-6m, -1m)	-27.29%	*-5.709****	*-1.200*	-25.85%	*-4.528****	*-0.819*	*-0.172*
(-3m, -1m)	-13.98%	*-3.177****	*-0.300*	-17.24%	*-3.903****	*-1.171*	*0.437*
event month	-16.21%	*-4.462****	*-1.650**	-5.33%	*-1.957**	*0.585*	*-1.828**
(+1m, +3m)	-8.64%	*-1.951**	*0.003*	-0.31%	*-0.083*	*1.288$*	*-1.135*
(+1m, +6m)	-10.07%	*-1.758**	*1.135*	2.03%	*0.498*	*2.341***	*-1.294$*
(+1m, +12m)	-7.20%	*-0.982*	*3.171****	-0.98%	*-0.135*	*2.692***	*-0.502*
(-12m, +12m)	-62.71%	*-5.597****	*-1.200*	-47.99%	*-3.394****	*-1.171*	*-0.746*
(-30d, -1d)	-13.95%	*-3.673****	*-1.591$*	-7.26%	*-2.047**	*-1.418$*	*-1.051*
(-10d, -3d)	-4.97%	*-2.304**	*-2.665***	0.80%	*0.459*	*0.250*	*-1.621$*
Day -2	0.22%	*0.275*	*1.089*	-0.15%	*-0.214*	*0.584*	*0.278*
Day -1	-3.42%	*-3.005***	*-1.376$*	-0.70%	*-1.138*	*0.250*	*-1.489$*
Day 0	-5.81%	*-3.064***	*-1.161*	0.11%	*0.167*	*0.250*	*-1.972**
Day +1	-2.18%	*-1.663**	*-1.376$*	-1.39%	*-1.949**	*-1.418$*	*-0.375*
Day +2	-0.57%	*-0.581*	*1.419$*	-0.05%	*-0.054*	*-0.751*	*-0.315*
(0d, +2d)	-8.56%	*-3.778****	*-1.161*	-1.32%	*-1.173*	*-1.084*	*-1.998**
(-1d, +1d)	-11.41%	*-5.478****	*-3.955****	-1.97%	*-1.525$*	*-1.084*	*-2.804***
(-2d, +2d)	-11.76%	*-4.721****	*-2.665***	-2.17%	*-1.570$*	*-1.084*	*-2.396***
(+3d, +10d)	3.92%	*2.017**	*3.034***	0.38%	*0.173*	*-1.418$*	*1.056*
(-10d, +10d)	-12.85%	*-3.394****	*-2.665***	-0.99%	*-0.348*	*0.584*	*-1.911**
(+1d, +30d)	-3.20%	*-0.85*	*-0.301*	-4.59%	*-1.579$*	*-0.751*	*0.224*
(-30d, +30d)	-22.95%	*-3.819***	*-2.021**	-11.74%	*-2.621***	*-1.418$*	*-1.139*

Panel B: Upgrades

	Pure PC/LH firm (60)			Multiline firm (26)			CAR Difference
Event window	CAR	t-Stat	Sign Z	CAR	t-Stat	Sign Z	t-stat
(-12m, -1m)	9.95%	*2.251**	*2.070**	11.21%	*2.247**	*3.203****	*-0.168*
(-6m, -1m)	7.02%	*2.238**	*1.294$*	8.35%	*2.305**	*2.002**	*-0.249*
(-3m, -1m)	3.64%	*1.440$*	*1.035*	3.69%	*1.303$*	*1.601$*	*-0.011*
event month	2.34%	*1.613$*	*1.553$*	-0.44%	*-0.240*	*0.400*	*1.105*
(+1m, +3m)	-0.50%	*-0.255*	*0.776*	-1.74%	*-0.800*	*0.000*	*0.374*
(+1m, +6m)	-0.32%	*-0.093*	*0.259*	-2.96%	*-0.832*	*0.000*	*0.460*
(+1m, +12m)	2.83%	*0.482*	*0.776*	-0.19%	*-0.045*	*0.400*	*0.322*
(-12m, +12m)	15.13%	*1.936**	*2.588***	10.58%	*1.404$*	*2.402***	*0.353*
(-30d, -1d)	2.64%	*1.753**	*1.444$*	0.45%	*0.279*	*0.164*	*0.867*
(-10d, -3d)	0.14%	*0.132*	*1.702**	0.37%	*0.504*	*0.556*	*-0.136*
Day -2	-0.16%	*-0.732*	*-0.366*	-0.53%	*-1.758**	*-1.014*	*0.956*
Day -1	0.32%	*1.203*	*-0.625*	0.66%	*1.902**	*1.341$*	*-0.731*
Day 0	0.48%	*1.307$*	*0.668*	-1.03%	*-1.806**	*-0.621*	*2.245**
Day +1	0.30%	*0.872*	*1.185*	-0.20%	*-0.633*	*0.948*	*0.887*
Day +2	0.04%	*0.118*	*-0.108*	0.32%	*0.836*	*0.948*	*-0.487*
(0d, +2d)	0.81%	*1.999**	*2.478***	-0.92%	*-1.250*	*-0.229*	*2.210**
(-1d, +1d)	1.09%	*2.078**	*1.444$*	-0.58%	*-1.124*	*-0.229*	*1.924**
(-2d, +2d)	0.98%	*1.895**	*1.961**	-0.79%	*-0.931*	*-1.014*	*1.836**
(+3d, +10d)	0.92%	*1.095*	*0.927*	1.25%	*1.227*	*0.948*	*-0.228*
(-10d, +10d)	2.04%	*1.811**	*2.478***	0.83%	*0.726*	*0.556*	*0.646*
(+1d, +30d)	1.82%	*1.286$*	*1.185*	-0.66%	*-0.375*	*-2.191**	*1.014*
(-30d, +30d)	4.94%	*2.629***	*2.219**	-1.24%	*-0.654*	*-0.621*	*1.980**

Note:

1. Our_Benchmark (Model 9) method is used to calculate the abnormal monthly and daily returns, which adjust the size, market-to-book ratio, and industry factors.
2. The symbols $,*,**, and *** denote statistical significance at the 0.10, 0.05, 0.01 and 0.001 levels respectively, using a generic one-tail test.
3. The number of rating changes are indicated in the brackets in the column headings.
4. We partition our full sample into rating changes for mono-line (pure PC/LH) firms, and multi-line firms with both PC and LH operations.

Chart 12A - Monthly CAR: pure PC/LH firm vs. multiline firm rating changes

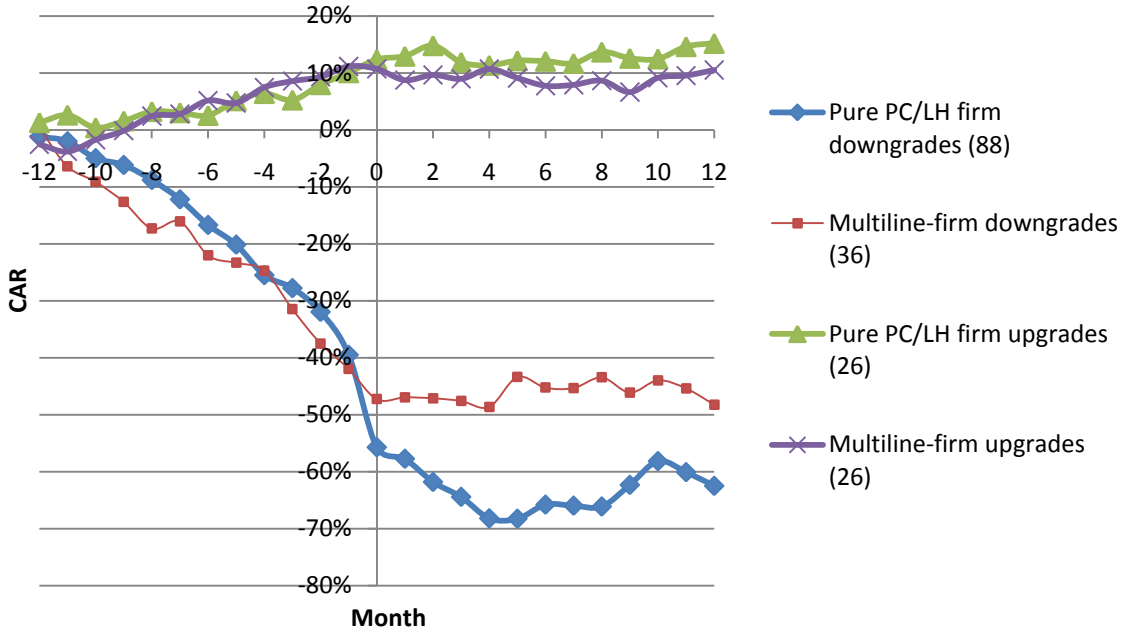


Chart 12B - Daily CAR: pure PC/LH firm vs. multiline firm rating changes

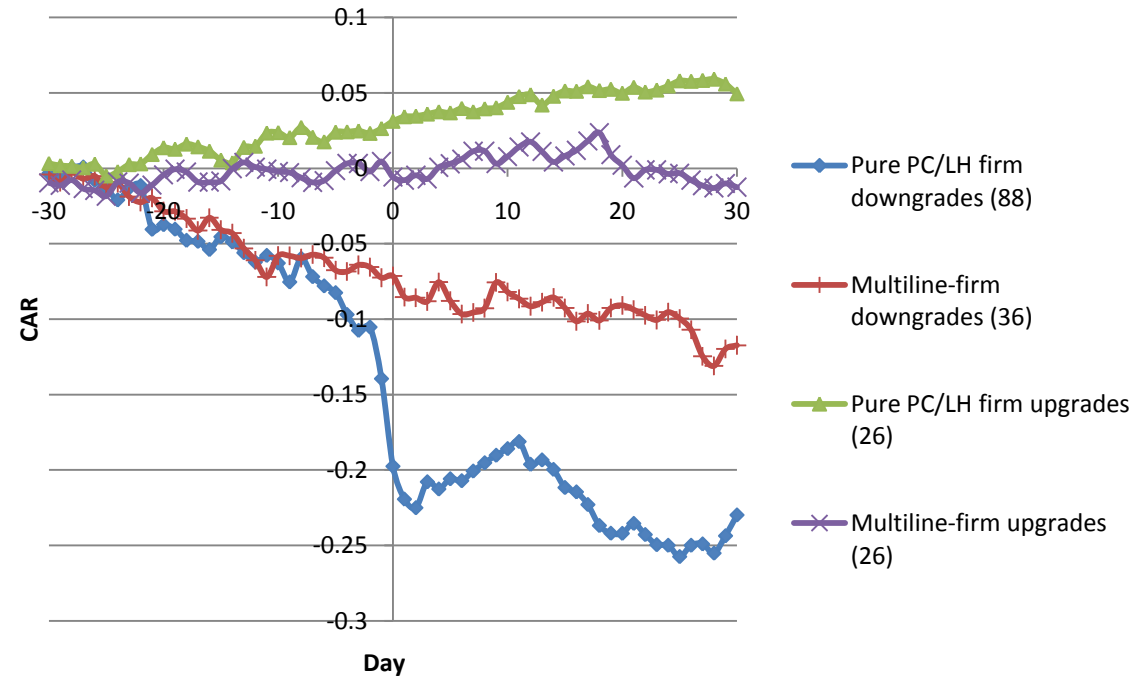


Table 13 - Mean abnormal stock returns: pre-regulation-FD vs. post-regulation-FD rating changes

Panel A: Downgrades

	Pre-regulation-FD (47)			Post-regulation-FD (77)			CAR Difference
Event window	CAR	t-Stat	Sign Z	CAR	t-Stat	Sign Z	t-stat
(-12m, -1m)	-42.37%	*-5.031***	*-1.634$*	-38.63%	*-5.199***	*-1.286$*	*-0.323*
(-6m, -1m)	-27.48%	*-4.655***	*-1.021*	-26.48%	*-5.409***	*-1.045*	*-0.128*
(-3m, -1m)	-16.57%	*-3.221***	*-0.102*	-13.93%	*-3.136***	*-1.045*	*-0.379*
event month	-16.39%	*-4.611***	*-1.940**	-10.94%	*-2.869***	*0.161*	*-0.969*
(+1m, +3m)	-11.76%	*-2.728***	*-0.715*	-2.69%	*-0.578*	*1.459$*	*-1.324$*
(+1m, +6m)	-14.17%	*-2.100**	*0.204*	-1.69%	*-0.314*	*2.672***	*-1.438$*
(+1m, +12m)	-18.91%	*-1.885**	*1.123*	3.13%	*0.487*	*4.371***	*-1.940**
(-12m, +12m)	-77.68%	*-4.726****	*-1.021*	-46.49%	*-4.590****	*-1.286$*	*-1.710**
(-30d, -1d)	-17.56%	*-4.638***	*-2.413***	-8.62%	*-2.150**	*-0.783*	*-1.508$*
(-10d, -3d)	-3.77%	*-1.994**	*-1.241*	-3.01%	*-1.273*	*-1.700**	*-0.225*
Day -2	-0.66%	*-1.112*	*-0.232*	0.57%	*0.653*	*1.738**	*-1.015*
Day -1	-3.11%	*-1.955**	*-0.948*	-2.34%	*-2.506***	*-0.554*	*-0.446*
Day 0	-2.75%	*-2.722***	*-0.948*	-4.91%	*-2.301**	*-0.325*	*0.758*
Day +1	-2.18%	*-2.106**	*-0.361*	-1.81%	*-1.292$*	*-2.158**	*-0.187*
Day +2	1.27%	*1.369$*	*0.811*	-1.45%	*-1.410$*	*0.363*	*1.806**
(0d, +2d)	-3.66%	*-2.635***	*-0.361*	-8.16%	*-3.228***	*-1.700**	*1.317$*
(-1d, +1d)	-8.04%	*-3.309***	*-2.999***	-9.05%	*-4.398***	*-2.617***	*0.311*
(-2d, +2d)	-7.41%	*-3.150***	*-1.827**	-9.93%	*-3.793***	*-2.158**	*0.658*
(+3d, +10d)	0.42%	*0.267*	*0.225*	4.41%	*1.964**	*2.083**	*-1.273*
(-10d, +10d)	-10.76%	*-3.076***	*-2.120**	-8.58%	*-2.109**	*-0.783*	*-0.370*
(+1d, +30d)	-8.08%	*-1.755**	*-1.827**	-0.87%	*-0.248*	*0.592*	*-1.253*
(-30d, +30d)	-28.39%	*-4.379****	*-2.706***	-14.39%	*-2.411***	*-1.012*	*-1.526$*

Panel B: Upgrades

	Pre-regulation-FD (45)			Post-regulation-FD (41)			CAR Difference
Event window	CAR	t-Stat	Sign Z	CAR	t-Stat	Sign Z	t-stat
(-12m, -1m)	5.31%	*1.036*	*2.911***	15.96%	*3.656***	*2.004**	*-1.565$*
(-6m, -1m)	3.69%	*1.312$*	*1.405$*	11.60%	*2.855***	*1.687**	*-1.621$*
(-3m, -1m)	2.00%	*0.946*	*1.405$*	5.51%	*1.610$*	*1.055*	*-0.889*
event month	-0.58%	*-0.372*	*0.803*	3.89%	*2.311**	*1.371$*	*-1.950**
(+1m, +3m)	0.83%	*0.465*	*1.706**	-2.77%	*-1.110*	*-0.844*	*1.188*
(+1m, +6m)	-1.27%	*-0.463*	*0.201*	-0.90%	*-0.194*	*0.105*	*-0.070*
(+1m, +12m)	0.50%	*0.126*	*0.502*	3.57%	*0.440*	*0.738*	*-0.349*
(-12m, +12m)	5.23%	*0.727*	*1.706**	23.42%	*2.461***	*3.270****	*-1.541$*
(-30d, -1d)	1.79%	*0.987*	*1.019*	2.19%	*1.536$*	*0.808*	*-0.170*
(-10d, -3d)	0.35%	*0.302*	*0.721*	0.05%	*0.055*	*1.746**	*0.200*
Day -2	-0.25%	*-0.952*	*-0.174*	-0.28%	*-1.282$*	*-1.069*	*0.086*
Day -1	0.60%	*1.819**	*-0.472*	0.22%	*0.866*	*0.808*	*0.896*
Day 0	-0.57%	*-1.365$*	*-1.368$*	0.66%	*1.438$*	*1.746**	*-1.981**
Day +1	-0.02%	*-0.057*	*1.318$*	0.33%	*0.916*	*0.808*	*-0.695*
Day +2	0.33%	*0.879*	*1.318$*	-0.09%	*-0.235*	*-0.756*	*0.782*
(0d, +2d)	-0.26%	*-0.492*	*0.124*	0.90%	*1.812**	*2.685***	*-1.590$*
(-1d, +1d)	0.02%	*0.032*	*-0.472*	1.21%	*1.941**	*2.059**	*-1.344$*
(-2d, +2d)	0.09%	*0.136*	*-0.174*	0.84%	*1.374$*	*1.746**	*-0.826*
(+3d, +10d)	0.65%	*0.663*	*0.721*	1.43%	*1.620$*	*1.121*	*-0.587*
(-10d, +10d)	1.09%	*1.069*	*1.019*	2.32%	*1.637$*	*2.372***	*-0.711*
(+1d, +30d)	1.01%	*0.748*	*-0.472*	1.14%	*0.614*	*0.182*	*-0.057*
(-30d, +30d)	2.23%	*1.318$*	*1.019*	3.99%	*1.635$*	*1.121*	*-0.601*

Note:

1. Our_Benchmark (Model 9) method is used to calculate the abnormal monthly and daily returns, which adjust the size, market-to-book ratio, and industry factors.
2. The symbols $,*,**, and *** denote statistical significance at the 0.10, 0.05, 0.01 and 0.001 levels respectively, using a generic one-tail test.
3. The number of rating changes are indicated in the brackets in the column headings.
4. Regulation Fair Disclosure (Reg FD) was implemented by SEC on October 23, 2000. The rule mandates that all publicly traded firms must disclose material information to all investors at the same time, and thus prohibits firms from disclosing non-public information to favored investment professionals. However, the rule does not prohibit firms from disclosing such non-public information to credit rating agencies. We define pre-regulation-FD rating changes as the ones prior to October 23, 2000, and post-regulation-FD as the ones after that date.

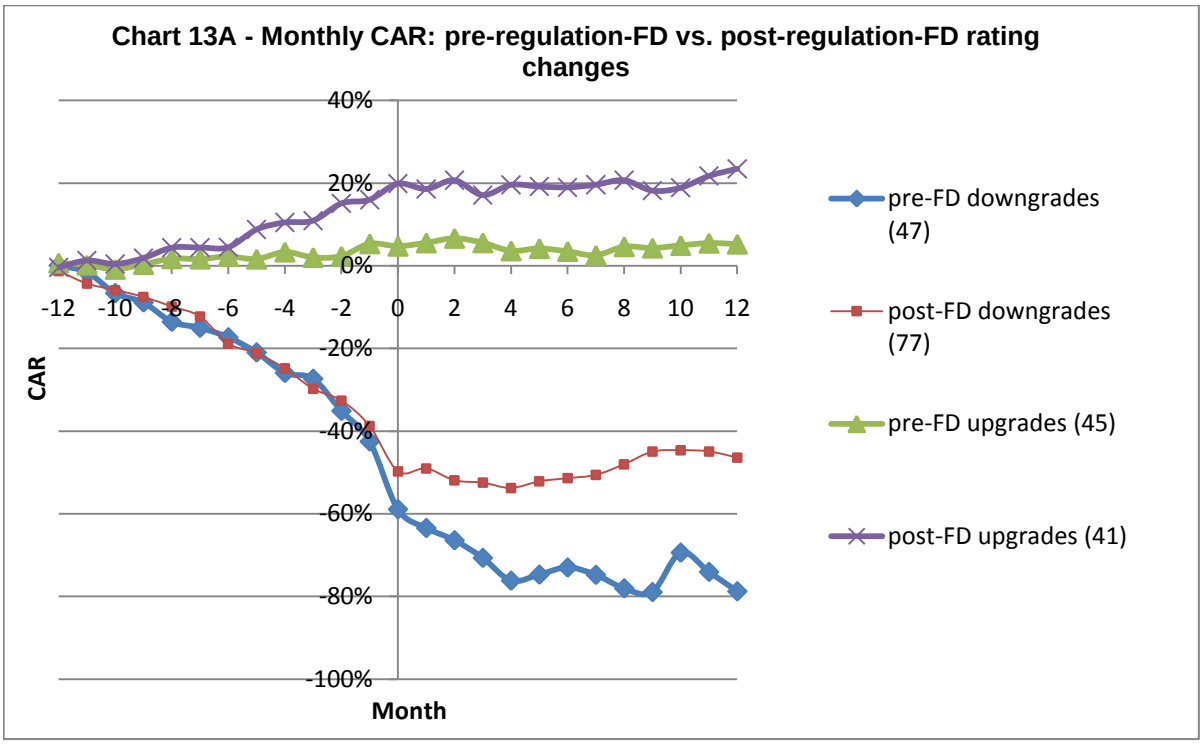


Chart 13A - Monthly CAR: pre-regulation-FD vs. post-regulation-FD rating changes
40%
20%
0%
-20%
-40%
-60%
-80%
-100%
-12 -10 -8 -6 -4 -2 0 2 4 6 8 10 12
CAR
Month
pre-FD downgrades (47)
post-FD downgrades (77)
pre-FD upgrades (45)
post-FD upgrades (41)

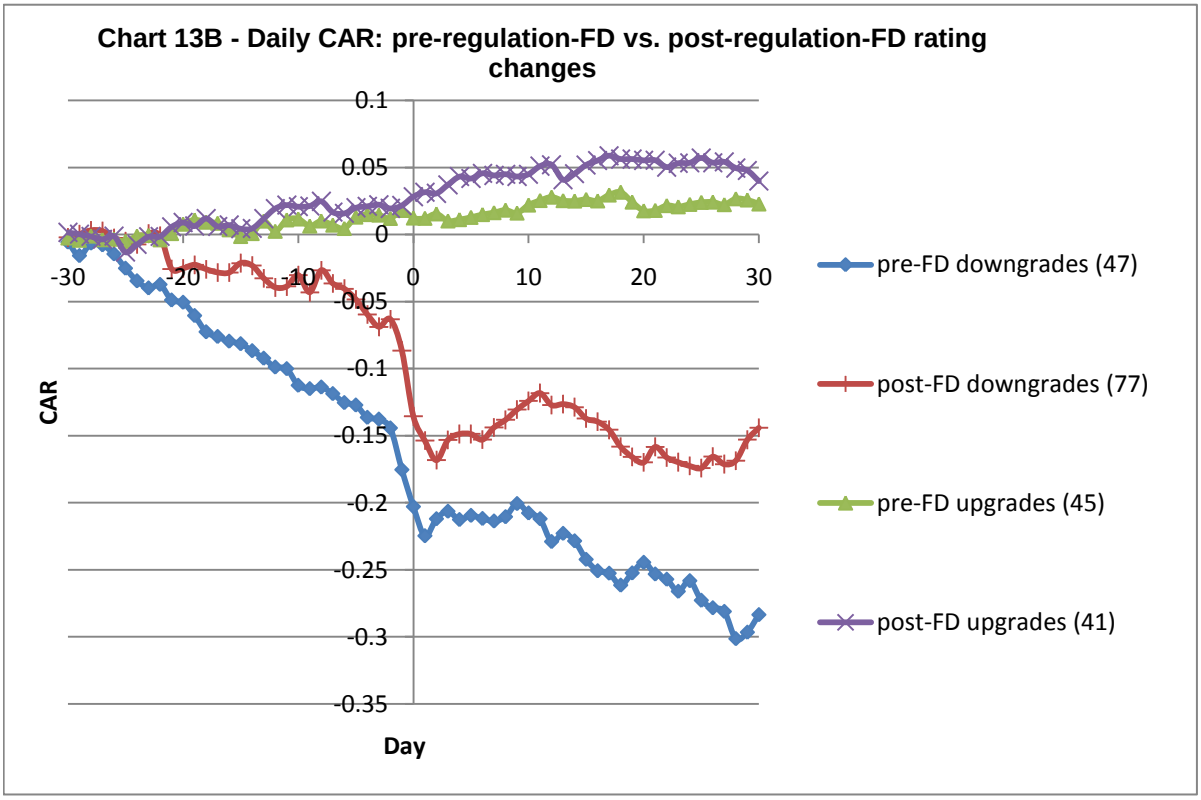


Chart 13B - Daily CAR: pre-regulation-FD vs. post-regulation-FD rating changes
0.1
0.05
0
-0.05
-0.1
-0.15
-0.2
-0.25
-0.3
-0.35
-30 -20 -10 0 10 20 30
CAR
Day
pre-FD downgrades (47)
post-FD downgrades (77)
pre-FD upgrades (45)
post-FD upgrades (41)

Table 13.1 - Mean abnormal stock returns: pre-regulation-FD vs. post-regulation-FD downgrades

Panel A: Non-threshold downgrades

	pre-Reg-FD (31)			post-Reg-FD (49)			CAR Difference
Event window	CAR	t-Stat	Sign Z	CAR	t-Stat	Sign Z	t-stat
(-12m, -1m)	-34.01%	*-3.217****	*-0.127*	-45.25%	*-5.051****	*-1.616$*	*0.799*
(-6m, -1m)	-25.70%	*-3.196****	*0.254*	-33.47%	*-5.850****	*-1.616$*	*0.807*
(-3m, -1m)	-16.70%	*-2.290**	*0.254*	-20.13%	*-4.240****	*-1.616$*	*0.412*
event month	-8.17%	*-2.296**	*-0.508*	-1.74%	*-0.378*	*1.111*	*-0.996*
(+1m, +3m)	-11.85%	*-2.937***	*-0.127*	3.77%	*0.92*	*2.449***	*-2.571***
(+1m, +6m)	-6.94%	*-1.195*	*0.635*	7.47%	*1.669**	*3.062***	*-1.973**
(+1m, +12m)	1.34%	*0.144*	*1.397$*	1.61%	*0.263*	*3.674****	*-0.025*
(-12m, +12m)	-40.85%	*-2.352***	*0.254*	-45.41%	*-4.688****	*-1.313$*	*0.247*
(-30d, -1d)	-12.98%	*-3.149****	*-2.398***	-3.96%	*-0.841*	*-0.31*	*-1.331$*
(-10d, -3d)	-2.00%	*-1.507$*	*-0.6*	0.14%	*0.046*	*-0.882*	*-0.538*
Day -2	-0.13%	*-0.17*	*0.12*	1.26%	*1.102*	*1.121*	*-0.889*
Day -1	-1.61%	*-1.266*	*-0.6*	-3.05%	*-2.197**	*-0.31*	*0.713*
Day 0	-1.73%	*-1.512$*	*-0.24*	-0.39%	*-0.189*	*0.835*	*-0.486*
Day +1	-0.53%	*-0.686*	*0.48*	-2.09%	*-2.103**	*-1.741**	*1.119*
Day +2	-0.15%	*-0.221*	*-0.959*	0.34%	*0.611*	*0.262*	*-0.554*
(0d, +2d)	-2.41%	*-1.531$*	*-0.6*	-2.14%	*-1.245*	*-0.882*	*-0.108*
(-1d, +1d)	-3.88%	*-1.478$*	*-1.319$*	-5.53%	*-3.070***	*-2.027**	*0.535*
(-2d, +2d)	-4.16%	*-1.574$*	*-1.679**	-3.92%	*-1.919**	*-0.882*	*-0.072*
(+3d, +10d)	0.32%	*0.157*	*-0.24*	3.00%	*1.225*	*1.407$*	*-0.769*
(-10d, +10d)	-5.84%	*-1.559$*	*-1.679**	-0.78%	*-0.159*	*-0.024*	*-0.737*
(+1d, +30d)	-2.78%	*-0.707*	*-1.319$*	0.84%	*0.272*	*1.407$*	*-0.726*
(-30d, +30d)	-17.49%	*-2.656***	*-1.679**	-3.51%	*-0.48*	*-0.024*	*-1.320$*

Panel B: Threshold downgrades

	pre-Reg-FD (16)			post-Reg-FD (28)			CAR Difference
Event window	CAR	t-Stat	Sign Z	CAR	t-Stat	Sign Z	t-stat
(-12m, -1m)	-58.57%	*-4.375****	*-2.582***	-26.60%	*-2.037**	*0*	*-1.594$*
(-6m, -1m)	-30.94%	*-3.923****	*-2.066**	-13.80%	*-1.590$*	*0.399*	*-1.322$*
(-3m, -1m)	-16.31%	*-2.867***	*-0.516*	-2.66%	*-0.303*	*0.399*	*-1.098*
event month	-32.33%	*-5.166****	*-2.582***	-27.66%	*-4.972****	*-1.196*	*-0.533*
(+1m, +3m)	-11.59%	*-1.134*	*-1.033*	-14.18%	*-1.355$*	*-0.797*	*0.163*
(+1m, +6m)	-28.19%	*-1.750**	*-0.516*	-17.98%	*-1.469$*	*0.399*	*-0.503*
(+1m, +12m)	-58.15%	*-2.840***	*0.000*	5.82%	*0.407*	*2.391***	*-2.618***
(-12m, +12m)	-149.04%	*-5.441****	*-2.066**	-48.44%	*-2.128**	*-0.399*	*-2.751***
(-30d, -1d)	-26.42%	*-3.553****	*-0.796*	-16.78%	*-2.334***	*-0.898*	*-0.871*
(-10d, -3d)	-7.21%	*-1.465$*	*-1.304$*	-8.51%	*-2.482***	*-1.668**	*0.221*
Day -2	-1.74%	*-2.070**	*-0.607*	-0.65%	*-0.498*	*1.412$*	*-0.590*
Day -1	-6.02%	*-1.518$*	*-0.796*	-1.09%	*-1.360$*	*-0.513*	*-1.561$*
Day 0	-4.73%	*-2.448***	*-1.304$*	-12.81%	*-2.987***	*-1.668**	*1.373$*
Day +1	-5.36%	*-2.142**	*-1.304$*	-1.32%	*-0.38*	*-1.283$*	*-0.810*
Day +2	4.03%	*1.750**	*2.761***	-4.58%	*-1.783**	*0.257*	*2.250**
(0d, +2d)	-6.07%	*-2.270**	*0.22*	-18.72%	*-3.214****	*-1.668**	*1.581$*
(-1d, +1d)	-16.11%	*-3.605****	*-3.337****	-15.22%	*-3.363****	*-1.668**	*-0.129*
(-2d, +2d)	-13.72%	*-3.160****	*-0.796*	-20.45%	*-3.526****	*-2.438***	*0.804*
(+3d, +10d)	0.63%	*0.24*	*0.728*	6.96%	*1.541$*	*1.596$*	*-1.001*
(-10d, +10d)	-20.30%	*-2.969***	*-1.304$*	-22.25%	*-3.403****	*-1.283$*	*0.193*
(+1d, +30d)	-18.34%	*-1.673**	*-1.304$*	-3.85%	*-0.478*	*-0.898*	*-1.073*
(-30d, +30d)	-49.49%	*-3.848****	*-2.321**	-33.44%	*-3.563****	*-1.668**	*-1.018*

Note:

1. Our_Benchmark (Model 9) method is used to calculate the abnormal monthly and daily returns, which adjust the size, market-to-book ratio, and industry factors.
2. The symbols $,*,**, and *** denote statistical significance at the 0.10, 0.05, 0.01 and 0.001 levels respectively, using a generic one-tail test.
3. The number of rating changes are indicated in the brackets in the column headings.
4. Regulation Fair Disclosure (Reg FD) was implemented by SEC on October 23, 2000. The rule mandates that all publicly traded firms must disclose material information to all investors at the same time, and thus prohibits firms from disclosing non-public information to favored investment professionals. However, the rule does not prohibit firms from disclosing such non-public information to credit rating agencies. We define pre-regulation-FD rating changes as the ones prior to October 23, 2000, and post-regulation-FD as the ones after that date. We use both "A-" and "B+" as the thresholds, and define threshold downgrades as the ones that lose either "A-" or "B+" rating after the downgrade.

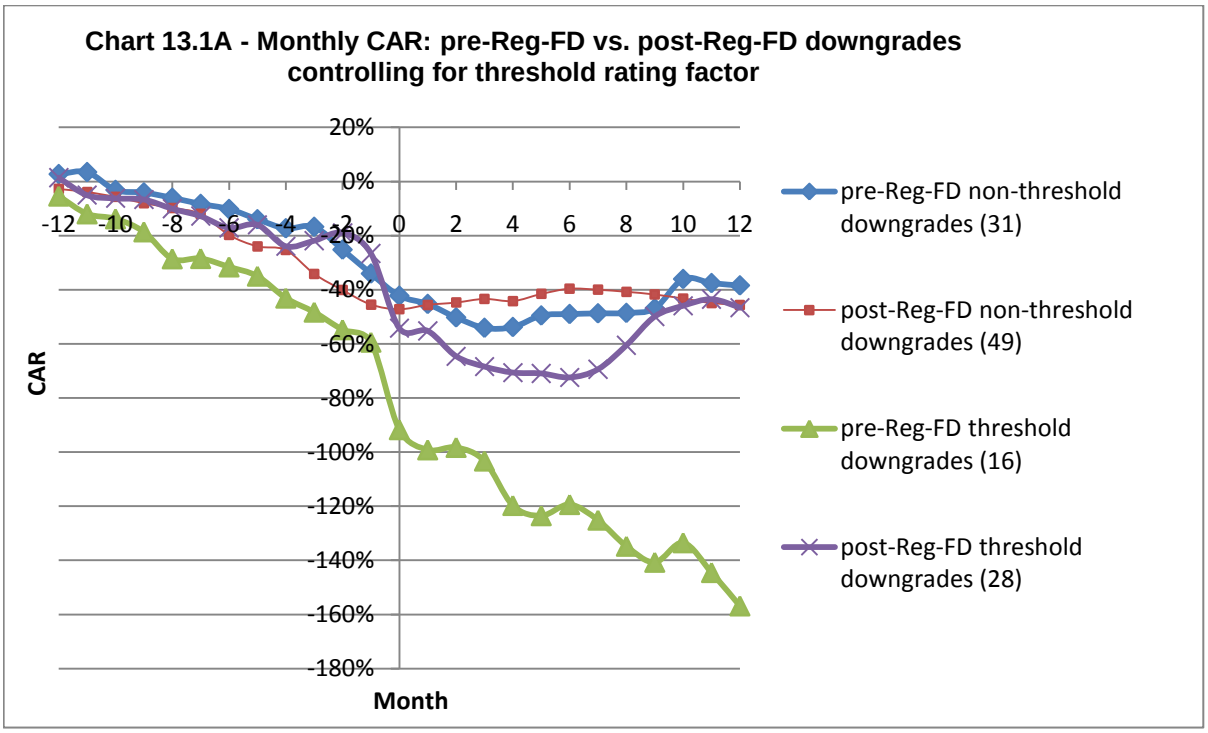


Chart 13.1A - Monthly CAR: pre-Reg-FD vs. post-Reg-FD downgrades controlling for threshold rating factor
20%
0%
-20%
-40%
-60%
-80%
-100%
-120%
-140%
-160%
-180%
-12
-10
-8
-6
-4
-2
0
2
4
6
8
10
12
CAR
Month
pre-Reg-FD non-threshold downgrades (31)
post-Reg-FD non-threshold downgrades (49)
pre-Reg-FD threshold downgrades (16)
post-Reg-FD threshold downgrades (28)

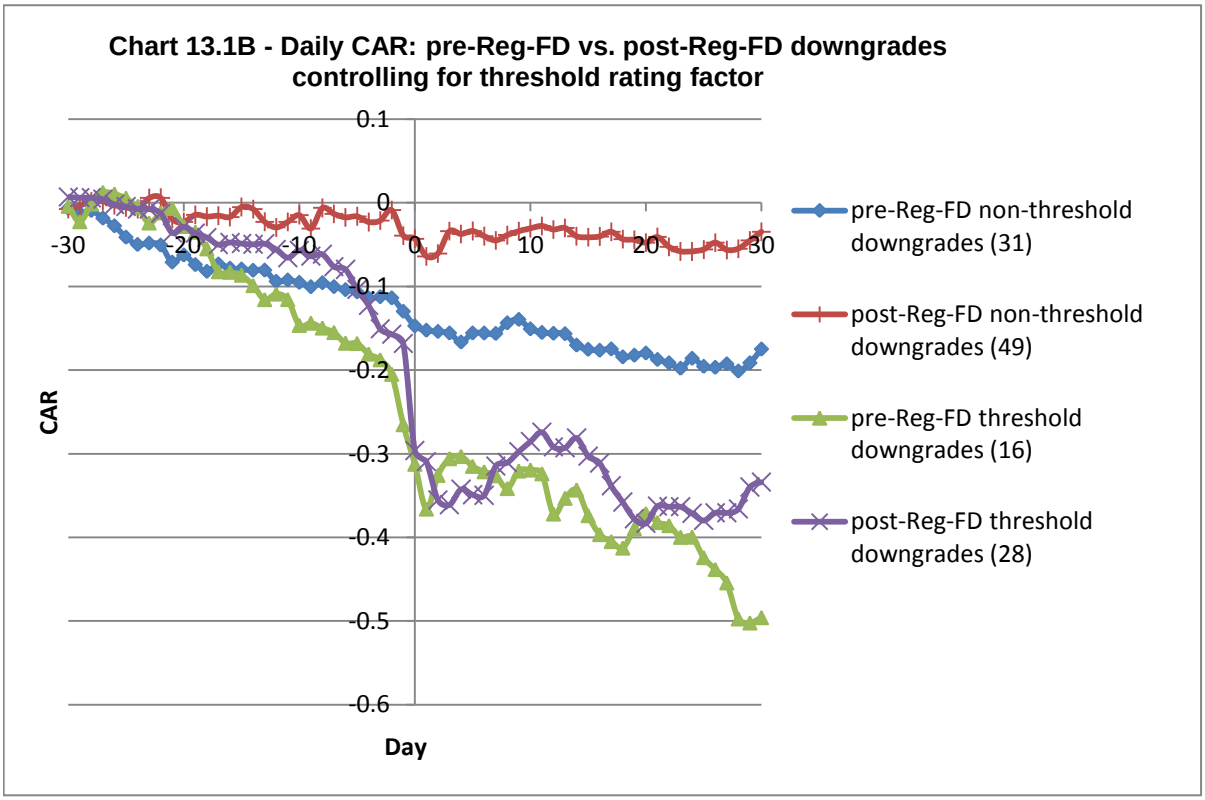


Chart 13.1B - Daily CAR: pre-Reg-FD vs. post-Reg-FD downgrades controlling for threshold rating factor
0.1
0
-0.1
-0.2
-0.3
-0.4
-0.5
-0.6
-30
-20
-10
0
10
20
30
CAR
Day
pre-Reg-FD non-threshold downgrades (31)
post-Reg-FD non-threshold downgrades (49)
pre-Reg-FD threshold downgrades (16)
post-Reg-FD threshold downgrades (28)

Table 14 - Mean abnormal stock returns for different levels of rating changes

Panel A: Downgrades

	1-level (98)			2 level or higher (26)			CAR Difference
Event window	CAR	t-Stat	Sign Z	CAR	t-Stat	Sign Z	t-stat
(-12m, -1m)	-31.09%	*-6.489****	*-1.627$*	-77.05%	*-4.000****	*-1.265*	*3.398****
(-6m, -1m)	-21.48%	*-6.512****	*-0.778*	-49.08%	*-3.806****	*-1.687**	*3.005***
(-3m, -1m)	-11.82%	*-3.568****	*-1.202*	-27.81%	*-2.702***	*0.422*	*1.913**
event month	-10.87%	*-4.084****	*-0.354*	-21.91%	*-2.573***	*-1.687**	*1.626$*
(+1m, +3m)	-2.56%	*-0.929*	*1.556$*	-21.80%	*-1.708**	*-1.561$*	*2.293**
(+1m, +6m)	-2.01%	*-0.542*	*2.192**	-25.85%	*-1.672**	*0.592*	*2.235**
(+1m, +12m)	0.51%	*0.088*	*4.738****	-30.64%	*-1.972**	*-0.269*	*2.240**
(-12m, +12m)	-41.46%	*-4.967****	*-0.566*	-128.32%	*-4.922****	*-2.530***	*4.117****
(-30d, -1d)	-9.98%	*-4.614****	*-2.105**	-20.02%	*-1.734**	*-0.496*	*1.399$*
(-10d, -3d)	-4.78%	*-3.780****	*-2.105**	2.59%	*0.412*	*-0.496*	*-1.836**
Day -2	-0.18%	*-0.488*	*0.724*	1.29%	*0.488*	*1.320$*	*-0.976*
Day -1	-1.07%	*-1.880**	*0.118*	-8.79%	*-2.729***	*-2.506***	*3.936****
Day 0	-3.28%	*-2.429***	*-0.488*	-7.31%	*-1.709**	*-0.898*	*1.174*
Day +1	-0.93%	*-0.957*	*-1.095*	-5.98%	*-2.289**	*-2.104**	*2.164**
Day +2	-0.13%	*-0.271*	*0.118*	-1.54%	*-0.49*	*1.514$*	*0.770*
(0d, +2d)	-4.34%	*-3.496****	*-1.701**	-14.83%	*-2.296**	*-0.094*	*2.588***
(-1d, +1d)	-5.28%	*-4.219****	*-2.913***	-22.08%	*-4.179****	*-2.908***	*4.638****
(-2d, +2d)	-5.59%	*-4.161****	*-2.105**	-22.38%	*-3.212****	*-2.104**	*3.836****
(+3d, +10d)	1.09%	*0.867*	*0.522*	10.31%	*1.818**	*2.961***	*-2.438***
(-10d, +10d)	-9.29%	*-4.121****	*-1.701**	-9.89%	*-0.889*	*-0.898*	*0.084*
(+1d, +30d)	-2.76%	*-1.035*	*-0.69*	-6.92%	*-0.761*	*-0.094*	*0.596*
(-30d, +30d)	-16.02%	*-4.514****	*-1.701**	-34.26%	*-1.999**	*-2.104**	*1.647$*

Panel B: Upgrades

	1-level (75)			2 level or higher (11)			CAR Difference
Event window	CAR	t-Stat	Sign Z	CAR	t-Stat	Sign Z	t-stat
(-12m, -1m)	9.30%	*2.918***	*3.373****	18.92%	*1.006*	*0.889*	*-0.857*
(-6m, -1m)	5.46%	*2.459***	*1.993**	23.91%	*1.858**	*0.889*	*-2.370***
(-3m, -1m)	1.54%	*1.096*	*1.763**	21.52%	*1.604$*	*0.222*	*-3.320****
event month	2.03%	*1.663**	*1.763**	-2.70%	*-0.746*	*-0.445*	*1.249*
(+1m, +3m)	-0.56%	*-0.352*	*1.303$*	-3.43%	*-0.688*	*-1.779**	*0.579*
(+1m, +6m)	-2.98%	*-1.334$*	*0.383*	14.84%	*0.963*	*-0.445*	*-2.154**
(+1m, +12m)	0.43%	*0.126*	*1.303$*	14.75%	*0.487*	*-1.112*	*-1.016*
(-12m, +12m)	11.76%	*2.389***	*3.603****	30.97%	*0.794*	*0.222*	*-0.994*
(-30d, -1d)	1.71%	*1.477$*	*1.16*	4.27%	*0.828*	*0.614*	*-0.671*
(-10d, -3d)	0.37%	*0.456*	*1.388$*	-1.19%	*-0.574*	*1.283$*	*0.629*
Day -2	-0.27%	*-1.466$*	*-0.437*	-0.25%	*-0.45*	*-1.395$*	*-0.035*
Day -1	0.56%	*2.480***	*0.703*	-0.76%	*-1.602$*	*-1.395$*	*1.936**
Day 0	-0.15%	*-0.513*	*-0.437*	1.48%	*0.888*	*1.953**	*-1.602$*
Day +1	0.32%	*1.192*	*2.072**	-1.37%	*-2.127**	*-1.395$*	*2.068**
Day +2	0.03%	*0.099*	*0.247*	0.96%	*0.871*	*0.614*	*-0.967*
(0d, +2d)	0.20%	*0.526*	*1.616$*	1.07%	*0.761*	*1.283$*	*-0.719*
(-1d, +1d)	0.73%	*1.804**	*1.16*	-0.65%	*-0.377*	*-0.056*	*1.046*
(-2d, +2d)	0.49%	*1.096*	*0.931*	0.06%	*0.028*	*0.614*	*0.288*
(+3d, +10d)	0.91%	*1.334$*	*1.388$*	1.95%	*0.784*	*-0.056*	*-0.479*
(-10d, +10d)	1.77%	*1.957**	*2.528***	0.82%	*0.296*	*-0.056*	*0.337*
(+1d, +30d)	1.05%	*1.025*	*0.019*	1.24%	*0.189*	*-0.725*	*-0.051*
(-30d, +30d)	2.61%	*1.814**	*1.16*	6.98%	*1.045*	*1.283$*	*-0.916*

Note:

1. Our_Benchmark (Model 9) method is used to calculate the abnormal monthly and daily returns, which adjust the size, market-to-book ratio, and industry factors.
2. The symbols $,*,**, and *** denote statistical significance at the 0.10, 0.05, 0.01 and 0.001 levels respectively, using a generic one-tail test.
3. The number of rating changes are indicated in the brackets in the column headings.
4. We define multiple-level rating changes as the ones that jump or drop at least 2 levels of rating, as compared to the one-level rating changes.

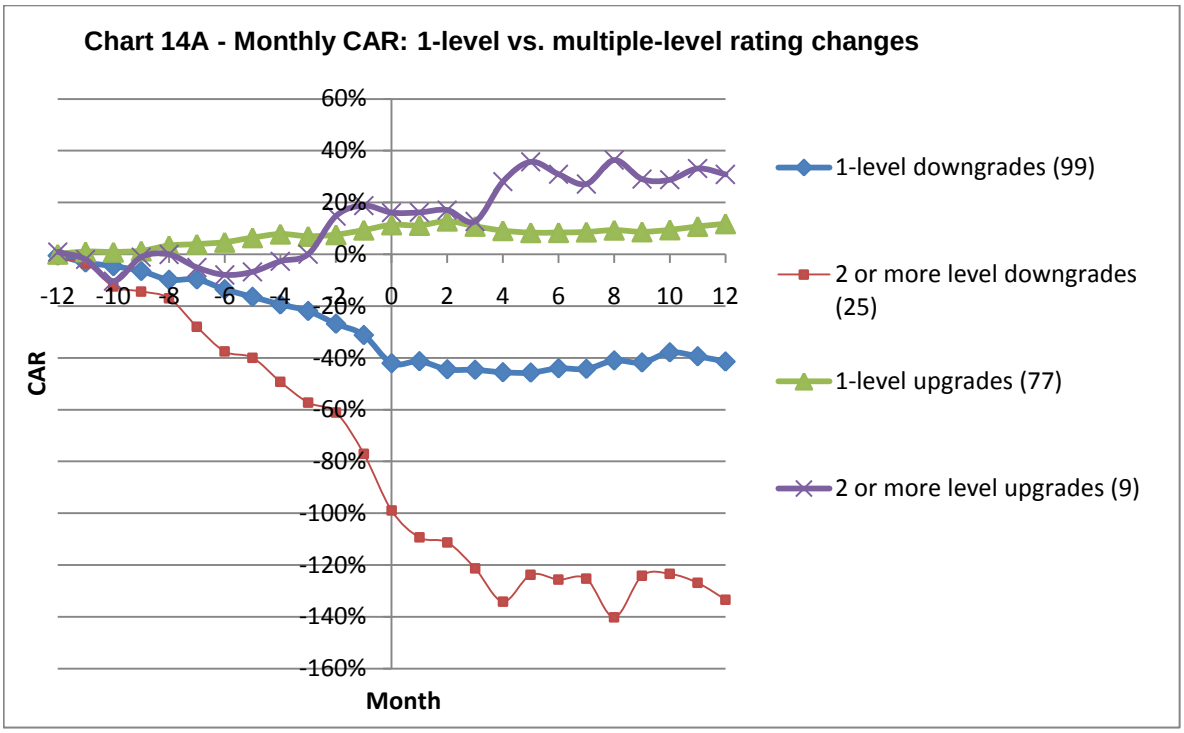


Chart 14A - Monthly CAR: 1-level vs. multiple-level rating changes
60%
40%
20%
0%
-20%
-40%
-60%
-80%
-100%
-120%
-140%
-160%
-12
-10
-8
-6
-4
-2
0
2
4
6
8
10
12
CAR
Month
1-level downgrades (99)
2 or more level downgrades (25)
1-level upgrades (77)
2 or more level upgrades (9)

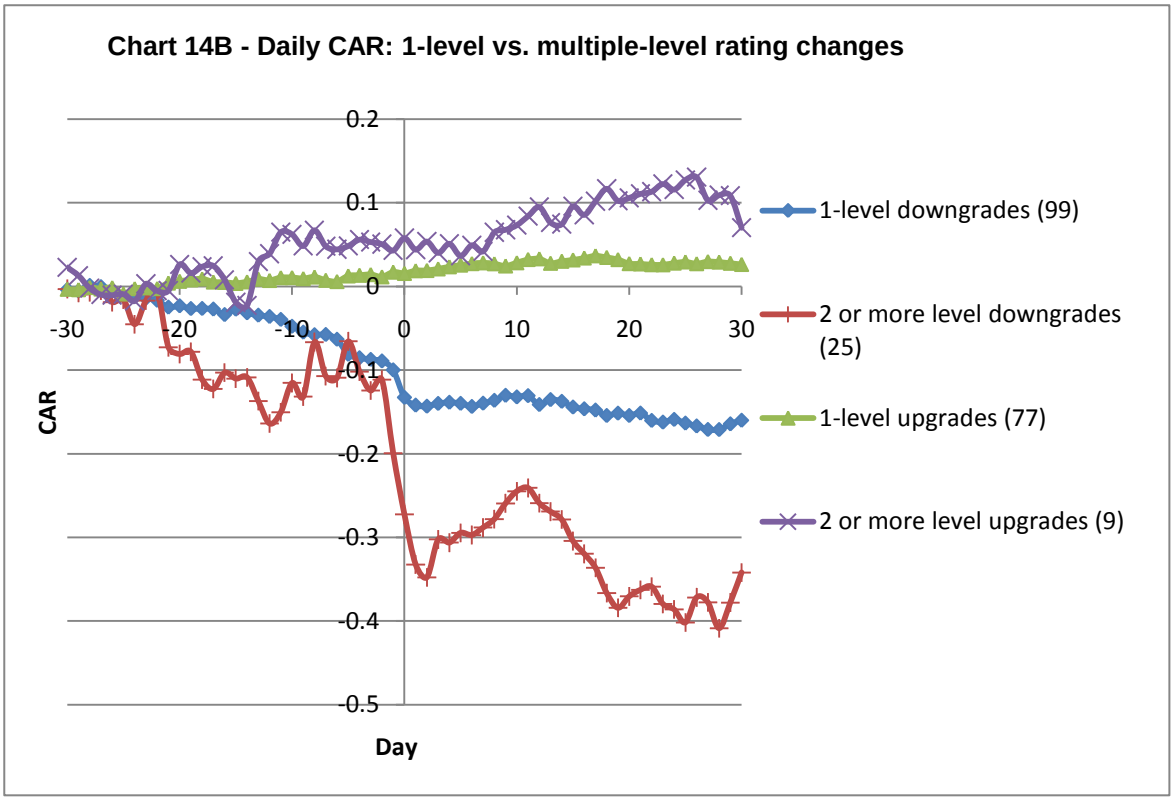


Chart 14B - Daily CAR: 1-level vs. multiple-level rating changes
0.2
0.1
0
-0.1
-0.2
-0.3
-0.4
-0.5
-30
-20
-10
0
10
20
30
CAR
Day
1-level downgrades (99)
2 or more level downgrades (25)
1-level upgrades (77)
2 or more level upgrades (9)

Table 15: Summary statistics of variables in regression analysis

Panel A: Downgrade observations

Variable	Definition	Mean	Std. Dev.	Min	Max	Obs.
CAR_3day	cumulative abnormal returns of rating downgrades during (-1d,+1d) 3-day period	-0.0867	0.1741	-0.9050	0.2028	124
AR_event_month	abnormal returns of rating downgrades during the event month	-0.1303	0.3018	-0.8011	1.2524	124
CAR_post_12m	cumulative abnormal returns of rating downgrades during the (+1,+12m) 12-month post-event period	-0.0536	0.6228	-1.8640	1.7061	124
small	dummy variable that indicates 1 if the firm is in the bottom 50% of the market capitalization among all insurers during the month of the rating change, and 0 otherwise	0.7581	0.4300	0	1	124
high_mb	dummy variable that indicates 1 if the firm is in the top 50% of the market-to-book ratio among all insurers within the same size quartile during the month of the rating change, and 0 otherwise	0.3629	0.4828	0	1	124
post_fd	dummy variable that indicates 1 if the rating change happens after October 23, 2000 when regulation fair disclosure (Reg-FD) was implemented, and 0 otherwise	0.6210	0.4871	0	1	124
subset	dummy variable that indicates 1 if the firm is identified to have at least 50% of total revenue from premium revenues during year 1997-2005, and 0 otherwise	0.6855	0.4662	0	1	124
threshold	dummy variable that indicates 1 if the rating change is a threshold change (gaining or losing either "A-" or "B+"), and 0 otherwise	0.3548	0.4804	0	1	124
subsequent	dummy variable that indicates 1 if the rating change is a subsequent change following the prior one within 12-month period, and 0 otherwise	0.2903	0.4558	0	1	124
level2	dummy variable that indicates 1 if the rating changes at least 2 levels	0.2016	0.4028	0	1	124
severe	dummy variable that indicates 1 if the rating change is a threshold change, subsequent change, or an at-least 2-level change, and 0 otherwise	0.5161	0.5018	0	1	124
prior_30d	cumulative abnormal return during the (-30d, -1d) pre-event 30-day period	-0.1201	0.3229	-1.6103	1.2062	124
prior_12m	cumulative abnormal return during the (-12m, -1m) pre-event 12-month period	-0.4006	0.6196	-2.5044	0.9493	124

Note:

1. The first three variables "CAR_3day", "AR_event_month", and "CAR_post_12m" are used as dependent variables in the regression analysis; all the other variables are used as independent variables in the regression analysis;

2. We separate downgrade and upgrade observations in our cross-sectional regression analysis, so we present two separate tables of summary statistics - Panel A for downgrades, and Panel B for upgrades.

Table 15: Summary statistics of variables in regression analysis

Panel B: Upgrade observations

Variable	Definition	Mean	Std. Dev.	Min	Max	Obs.
CAR_3day	cumulative abnormal returns of rating downgrades during (-1d,+1d) 3-day period	0.0059	0.0375	-0.1190	0.1109	86
AR_event_month	abnormal returns of rating downgrades during the event month	0.0153	0.1069	-0.2389	0.4168	86
CAR_post_12m	cumulative abnormal returns of rating downgrades during the (+1,+12m) 12-month post-event period	0.0194	0.3983	-1.1727	2.3701	86
small	dummy variable that indicates 1 if the firm is in the bottom 50% of the market capitalization among all insurers during the month of the rating change, and 0 otherwise	0.6163	0.4891	0	1	86
high_mb	dummy variable that indicates 1 if the firm is in the top 50% of the market-to-book ratio among all insurers within the same size quartile during the month of the rating change, and 0 otherwise	0.5116	0.5028	0	1	86
post_fd	dummy variable that indicates 1 if the rating change happens after October 23, 2000 when regulation fair disclosure (Reg-FD) was implemented, and 0 otherwise	0.4767	0.5024	0	1	86
subset	dummy variable that indicates 1 if the firm is identified to have at least 50% of total revenue from premium revenues during year 1997-2005, and 0 otherwise	0.8023	0.4006	0	1	86
threshold	dummy variable that indicates 1 if the rating change is a threshold change (gaining or losing either "A-" or "B+"), and 0 otherwise	0.3372	0.4755	0	1	86
subsequent	dummy variable that indicates 1 if the rating change is a subsequent change following the prior one within 12-month period, and 0 otherwise	0.0465	0.2118	0	1	86
level2	dummy variable that indicates 1 if the rating changes at least 2 levels	0.1047	0.3079	0	1	86
severe	dummy variable that indicates 1 if the rating change is a threshold change, subsequent change, or an at-least 2-level change, and 0 otherwise	0.3837	0.4891	0	1	86
prior_30d	cumulative abnormal return during the (-30d, -1d) pre-event 30-day period	0.0198	0.1076	-0.2002	0.3660	86
prior_12m	cumulative abnormal return during the (-12m, -1m) pre-event 12-month period	0.1032	0.3165	-1.0155	0.9890	86

Note:

1. The first three variables "CAR_3day", "AR_event_month", and "CAR_post_12m" are used as dependent variables in the regression analysis; all the other variables are used as independent variables in the regression analysis;

2. We separate downgrade and upgrade observations in our cross-sectional regression analysis, so we present two separate tables of summary statistics - Panel A for downgrades, and Panel B for upgrades.

Table 16 - OLS regression results of the downgrade CAR estimated using our benchmark portfolios

Panel A: Dependent variable - CAR of (-1, +1) 3-day event period

	All downgrades (124)			PC downgrades (60)			LH downgrades (28)			Multi-line downgrades (36)		
Indep. Var	Coeff.	Std. Error	P-value	Coeff.	Std. Error	P-value	Coeff.	Std. Error	P-value	Coeff.	Std. Error	P-value
small	-0.041 $	*0.021*	*0.051*	0.016	*0.039*	*0.692*	-0.052	*0.056*	*0.368*	-0.051 *	*0.024*	*0.044*
highmb	-0.016	*0.033*	*0.635*	-0.018	*0.057*	*0.748*	0.101	*0.066*	*0.141*	-0.034	*0.027*	*0.216*
postfd	-0.004	*0.027*	*0.874*	-0.039	*0.048*	*0.413*	-0.027	*0.076*	*0.730*	0.038	*0.025*	*0.135*
subset	0.007	*0.033*	*0.829*	0.030	*0.059*	*0.609*	0.076	*0.078*	*0.342*	-0.045	*0.028*	*0.120*
severe	-0.103 ***	*0.029*	*0.001*	-0.177 ***	*0.045*	*0.000*	-0.064	*0.065*	*0.335*	-0.005	*0.032*	*0.867*
prior30d	0.028	*0.048*	*0.558*	0.031	*0.061*	*0.612*	-0.162	*0.148*	*0.285*	-0.022	*0.041*	*0.601*
intercept	0.006	*0.037*	*0.876*	-0.027	*0.070*	*0.700*	-0.089	*0.093*	*0.350*	0.031	*0.025*	*0.223*
R-squared	0.1343			0.2048			0.2292			0.2630		

Panel B: Dependent variable - AR of event month

	All downgrades (124)			PC downgrades (60)			LH downgrades (28)			Multi-line downgrades (36)		
Indep. Var	Coeff.	Std. Error	P-value	Coeff.	Std. Error	P-value	Coeff.	Std. Error	P-value	Coeff.	Std. Error	P-value
small	-0.075 $	*0.040*	*0.063*	0.089	*0.071*	*0.217*	-0.086	*0.133*	*0.524*	-0.080 $	*0.046*	*0.089*
highmb	0.025	*0.047*	*0.600*	0.068	*0.078*	*0.387*	0.153	*0.121*	*0.222*	-0.064	*0.059*	*0.283*
postfd	0.075	*0.050*	*0.138*	0.051	*0.111*	*0.650*	-0.022	*0.166*	*0.898*	0.087	*0.054*	*0.118*
subset	-0.001	*0.052*	*0.988*	0.023	*0.088*	*0.796*	0.174	*0.213*	*0.425*	-0.057	*0.077*	*0.467*
severe	-0.196 ***	*0.049*	*0.000*	-0.351 ***	*0.072*	*0.000*	-0.127	*0.150*	*0.406*	-0.038	*0.062*	*0.544*
prior12m	-0.130 $	*0.076*	*0.092*	-0.161	*0.140*	*0.255*	-0.287	*0.191*	*0.148*	0.020	*0.065*	*0.761*
intercept	-0.080	*0.067*	*0.234*	-0.211 $	*0.111*	*0.062*	-0.199	*0.213*	*0.361*	0.024	*0.055*	*0.665*
R-squared	0.1539			0.2624			0.1856			0.2120		

Panel C: Dependent variable - CAR of (+1m, +12m) 12-month period

	All downgrades (124)			PC downgrades (60)			LH downgrades (28)			Multi-line downgrades (36)		
Indep. Var	Coeff.	Std. Error	P-value	Coeff.	Std. Error	P-value	Coeff.	Std. Error	P-value	Coeff.	Std. Error	P-value
small	0.067	*0.096*	*0.490*	0.377 $	*0.220*	*0.092*	-0.025	*0.264*	*0.927*	0.000	*0.143*	*0.997*
highmb	-0.065	*0.124*	*0.603*	0.002	*0.188*	*0.992*	0.133	*0.285*	*0.646*	0.004	*0.181*	*0.981*
postfd	0.270 *	*0.111*	*0.017*	0.524 *	*0.210*	*0.016*	0.142	*0.320*	*0.662*	0.038	*0.147*	*0.800*
subset	-0.062	*0.120*	*0.605*	-0.107	*0.228*	*0.640*	-0.068	*0.227*	*0.768*	-0.341 *	*0.154*	*0.035*
severe	-0.194	*0.126*	*0.126*	-0.585 **	*0.206*	*0.006*	0.052	*0.359*	*0.886*	0.218	*0.182*	*0.240*
prior12m	0.086	*0.127*	*0.500*	-0.105	*0.179*	*0.560*	0.238	*0.264*	*0.378*	0.220 $	*0.126*	*0.092*
intercept	-0.062	*0.137*	*0.649*	-0.321	*0.241*	*0.189*	-0.044	*0.278*	*0.877*	0.217	*0.137*	*0.124*
R-squared	0.0665			0.1666			0.1210			0.2364		

Note:

1. "small" is a dummy variable that indicates 1 if the firm is in the bottom 50% of the market capitalization among all insurers during the month of the rating change, and 0 otherwise;
2. "highmb" is a dummy variable that indicates 1 if the firm is in the top 50% of the market-to-book ratio among all insurers within the same size quartile during the month of the rating change, and 0 otherwise;
3. "post_fd" is a dummy variable that indicates 1 if the rating change happens after October 23, 2000 when regulation fair disclosure (Reg-FD) was implemented, and 0 otherwise;
4. "subset" is a dummy variable that indicates 1 if the firm is identified to have at least 50% of total revenue from premium revenues during year 1997-2005, and 0 otherwise;
5. "severe" is a dummy variable that indicates 1 if the rating change is a threshold change, subsequent, or a 2-level change, and 0 otherwise;
6. "prior_30d" is cumulative abnormal return during the (-30d, -1d) pre-event 30-day period;
7. "prior_12m" is cumulative abnormal return during the (-12m, -1m) pre-event 12-month period.
8. The symbols $,*,**, and *** denote statistical significance at the 0.10, 0.05, 0.01 and 0.001 levels respectively, using a two-tail test.

Table 17 - OLS regression results of the upgrade CAR estimated using our benchmark portfolios

Panel A: Dependent variable - CAR of (-1, +1) 3-day event period

	All upgrades (86)			PC upgrades (34)			LH upgrades (26)			Multi-line upgrades (26)		
Indep. Var	Coeff.	Std. Error	P-value	Coeff.	Std. Error	P-value	Coeff.	Std. Error	P-value	Coeff.	Std. Error	P-value
small	0.002	*0.007*	*0.789*	0.022	*0.013*	*0.110*	-0.010	*0.013*	*0.432*	-0.013	*0.012*	*0.284*
highmb	0.001	*0.008*	*0.911*	-0.028 $	*0.016*	*0.098*	0.007	*0.013*	*0.603*	0.019	*0.011*	*0.102*
postfd	0.013	*0.008*	*0.119*	0.013	*0.017*	*0.443*	0.015	*0.017*	*0.396*	0.015	*0.013*	*0.252*
subset	-0.012	*0.009*	*0.216*	-0.023	*0.020*	*0.245*	-0.016	*0.015*	*0.315*	-0.008	*0.016*	*0.632*
severe	0.008	*0.009*	*0.380*	0.021	*0.016*	*0.188*	0.011	*0.019*	*0.570*	0.008	*0.013*	*0.543*
prior30d	0.005	*0.044*	*0.903*	-0.098	*0.060*	*0.116*	0.072	*0.075*	*0.347*	-0.007	*0.076*	*0.926*
intercept	0.004	*0.010*	*0.685*	0.013	*0.016*	*0.428*	0.008	*0.017*	*0.625*	-0.012	*0.017*	*0.493*
R-squared	0.0513			0.1939			0.1287			0.2745		

Panel B: Dependent variable - AR of event month

	All upgrades (86)			PC upgrades (34)			LH upgrades (26)			Multi-line upgrades (26)		
Indep. Var	Coeff.	Std. Error	P-value	Coeff.	Std. Error	P-value	Coeff.	Std. Error	P-value	Coeff.	Std. Error	P-value
small	0.032	*0.022*	*0.141*	0.037	*0.033*	*0.265*	0.019	*0.067*	*0.779*	0.009	*0.037*	*0.820*
highmb	0.009	*0.024*	*0.723*	-0.037	*0.043*	*0.403*	0.031	*0.052*	*0.560*	0.037	*0.047*	*0.446*
postfd	0.043 $	*0.025*	*0.084*	0.029	*0.047*	*0.541*	0.067	*0.048*	*0.175*	0.004	*0.031*	*0.897*
subset	-0.009	*0.035*	*0.801*	0.105 *	*0.049*	*0.041*	-0.026	*0.082*	*0.757*	-0.108 **	*0.036*	*0.008*
severe	-0.019	*0.025*	*0.457*	-0.003	*0.042*	*0.950*	-0.019	*0.057*	*0.738*	-0.029	*0.037*	*0.436*
prior12m	0.004	*0.054*	*0.940*	-0.028	*0.069*	*0.684*	0.039	*0.157*	*0.805*	0.120 $	*0.058*	*0.051*
intercept	-0.015	*0.030*	*0.619*	-0.100 *	*0.044*	*0.030*	-0.019	*0.059*	*0.746*	0.047	*0.036*	*0.209*
R-squared	0.0710			0.2071			0.0963			0.4631		

Panel C: Dependent variable - CAR of (+1m, +12m) 12-month period

	All upgrades (86)			PC upgrades (34)			LH upgrades (26)			Multi-line upgrades (26)		
Indep. Var	Coeff.	Std. Error	P-value	Coeff.	Std. Error	P-value	Coeff.	Std. Error	P-value	Coeff.	Std. Error	P-value
small	0.056	*0.073*	*0.448*	-0.023	*0.119*	*0.851*	0.173	*0.211*	*0.421*	0.081	*0.084*	*0.349*
highmb	0.097	*0.100*	*0.335*	0.254 $	*0.145*	*0.092*	0.032	*0.270*	*0.907*	-0.115	*0.109*	*0.304*
postfd	0.017	*0.088*	*0.852*	0.096	*0.134*	*0.479*	-0.153	*0.195*	*0.444*	0.024	*0.084*	*0.782*
subset	0.032	*0.116*	*0.781*	-0.005	*0.113*	*0.968*	0.158	*0.271*	*0.568*	0.089	*0.146*	*0.550*
severe	0.032	*0.092*	*0.724*	0.062	*0.154*	*0.689*	0.029	*0.189*	*0.881*	-0.166 $	*0.085*	*0.067*
prior12m	0.024	*0.141*	*0.868*	0.142	*0.193*	*0.467*	-0.587	*0.387*	*0.146*	0.155	*0.164*	*0.360*
intercept	-0.113	*0.121*	*0.355*	-0.098	*0.128*	*0.451*	-0.060	*0.205*	*0.772*	-0.019	*0.148*	*0.900*
R-squared	0.0304			0.1577			0.1026			0.1726		

Note:

1. "small" is a dummy variable that indicates 1 if the firm is in the bottom 50% of the market capitalization among all insurers during the month of the rating change, and 0 otherwise;
2. "highmb" is a dummy variable that indicates 1 if the firm is in the top 50% of the market-to-book ratio among all insurers within the same size quartile during the month of the rating change, and 0 otherwise;
3. "post_fd" is a dummy variable that indicates 1 if the rating change happens after October 23, 2000 when regulation fair disclosure (Reg-FD) was implemented, and 0 otherwise;
4. "subset" is a dummy variable that indicates 1 if the firm is identified to have at least 50% of total revenue from premium revenues during year 1997-2005, and 0 otherwise;
5. "severe" is a dummy variable that indicates 1 if the rating change is a threshold change, subsequent, or a 2-level change, and 0 otherwise;
6. "prior_30d" is cumulative abnormal return during the (-30d, -1d) pre-event 30-day period;
7. "prior_12m" is cumulative abnormal return during the (-12m, -1m) pre-event 12-month period.
8. The symbols $,*,**, and *** denote statistical significance at the 0.10, 0.05, 0.01 and 0.001 levels respectively, using a two-tail test.

Appendix 1: Best's Financial Strength Rating Scale (source: Best's Credit Rating Methodology – A.M. Best, 2009)	
Secure	
A++ and A+	Superior
A and A-	Excellent
B++ and B+	Good
Vulnerable	
B and B-	Fair
C++ and C+	Marginal
C and C-	Weak
D	Poor
E	Under Regulatory Supervision
F	In Liquidation
S	Suspended

Appendix 2: List of all 199 publicly-traded insurers in the sample

	Company_Name	Type	PC_Lead_Entity	LH_Lead_Entity
1	21ST CENTURY HOLDING CO	PC	American Vehicle Insurance Com	N/A
2	21ST CENTURY INS GROUP	PC	20th Century Insurance Group	N/A
3	ACCEPTANCE INSURANCE COS INC	PC	Acceptance Insurance Companies	N/A
4	ACE LTD	PC	ACE American Pool	N/A
5	ACMAT CORP -CL A	PC	ACSTAR Insurance Company	N/A
6	AEGON NV	Multi	Monumental General Casualty Co	Life Investors Ins Co of Amer
7	AETNA INC	LH	N/A	Aetna Life Insurance Company
8	AFLAC INC	LH	N/A	American Family Life Assurance
9	ALFA CORP	Multi	Alfa Insurance Pool	Alfa Life Ins Corp
10	ALLCITY INSURANCE CO	PC	Allcity Insurance Company	N/A
11	ALLEGHANY CORP	PC	Allegany Insurance Group	N/A
12	ALLIANZ SE	Multi	Allianz Insurance Group	Allianz Life Ins Co N America
13	ALLIED GROUP INC	Multi	ALLIED Group	ALLIED Life Insurance Co
14	ALLSTATE CORP	Multi	Allstate Insurance Group	Allstate Life Ins Co
15	AMERICAN BANKERS INS GROUP	Multi	American Bankers Group	American Bankers Life Assur Co
16	AMERICAN EAGLE GROUP INC	PC	American Eagle Insurance Co	N/A
17	AMERICAN EQTY INVT LIFE HLDG	LH	N/A	American Equity Investment Lif
18	AMERICAN FINANCIAL GROUP INC	Multi	Great American Insurance Co	Great American Life Ins Co
19	AMERICAN GENERAL CORP	Multi	American General Property Ins	N/A
20	AMERICAN HERITAGE LIFE INVS	Multi	First Colonial Insurance Co	American Heritage Life Ins Co
21	AMERICAN INDTY FINL CORP	PC	American Indemnity Company	N/A
22	AMERICAN INTERNATIONAL GROUP	Multi	American International Group	American International Life Assurance
23	AMERICAN MEDICAL SECURITY GP	LH	N/A	United Wisconsin Life Ins Co
24	AMERICAN NATIONAL INSURANCE	Multi	American Nat Prop & Cas Group	American National Insurance Co
25	AMERICAN PHYSICIANS CAPITAL	PC	American Physicians Assurance	N/A
26	AMERICAN SAFETY INS HLDG LTD	PC	American Safety Insurance Grou	N/A
27	AMERIGROUP CORP	Multi	N/A	AMERIGROUP Texas, Inc.
28	AMERUS GROUP CO -CL A	LH	N/A	AmerUs Life Insurance Company
29	AMWEST INSURANCE GROUP INC	PC	Amwest Group	N/A
30	ANNUITY AND LIFE RE HOLDINGS	LH	N/A	Annuity & Life Reassurance Am
31	AON CORP	Multi	Virginia Surety Company, Inc.	Combined Ins Co of America
32	ARCH CAPITAL GROUP LTD	PC	Arch Reinsurance Company	N/A
33	ARISTA INVESTORS CORP	LH	N/A	Arista Insurance Company
34	ASPEN INSURANCE HOLDINGS LTD	PC	Aspen Specialty Insurance Comp	N/A
35	ASSURANT INC	Multi	Assurant Insurance Group	Time Insurance Company
36	ATLANTIC AMERICAN CORP	Multi	American Southern Insurance Co	Bankers Fidelity Life Insuranc
37	AXA	Multi	AXA Corporate Solutions Reinsurance	AXA Equitable Life Insurance Corp
38	AXIS CAPITAL HOLDINGS	PC	AXIS Reinsurance Company	N/A
39	BALDWIN & LYONS -CL B	PC	Baldwin & Lyons Group	N/A
40	BANCINSURANCE CORP	PC	BancInsure, Inc.	N/A
41	BERKLEY (W R) CORP	PC	Berkley Regional Group	N/A
42	BERKSHIRE HATHAWAY	PC	Berkshire Hathaway Homestate C	N/A
43	BRISTOL WEST HOLDINGS INC	PC	Coast National Insurance Compa	N/A
44	CANADA LIFE FINANCIAL CORP	LH	N/A	Canada Life Assurance Co
45	CAPITOL TRANSAMERICA CORP	PC	Capitol Transamerica Group	N/A
46	CENTENE CORP	LH	N/A	Managed Health Services Insura
47	CENTRIS GROUP INC	PC	Centris Insurance Group	N/A
48	CERES GROUP INC	LH	N/A	Central Reserve Life Insurance
49	CHANDLER INSURANCE LTD	PC	National American Ins Co	N/A
50	CHARTWELL RE CORP	PC	Chartwell Reinsurance Co	N/A
51	CHUBB CORP	PC	Chubb Group of Insurance Compa	N/A
52	CIGNA CORP	Multi	N/A	Connecticut General Life Ins
53	CINCINNATI FINANCIAL CORP	Multi	Cincinnati Insurance Cos	Cincinnati Life Insurance Co
54	CITIZENS FINANCIAL CORP/KY	Multi	N/A	Citizens Security Life Ins Co
55	CITIZENS INC	LH	N/A	Citizens Insurance Co of Amer

	Company_Name	Type	PC_Lead_Entity	LH_Lead_Entity
56	CNA FINANCIAL CORP	PC	Continental Casualty Company	N/A
57	CNA SURETY CORP	PC	CNA Surety Corporation Group	N/A
58	COBALT CORP	Multi	United Wisconsin Insurance Co	United Heartland Life Ins Co
59	COMMERCE GROUP INC/MA	PC	The Commerce Insurance Company	N/A
60	CONSECO INC	LH	N/A	Conseco Life Insurance Company
61	COTTON STATES LIFE INSURANCE	LH	N/A	Cotton States Life Ins Co
62	COVENTRY HEALTH CARE INC	LH	N/A	Coventry Health and Life Insur
63	DELPHI FINANCIAL GRP -CL A	PC	Safety National Casualty Corp	N/A
64	DIRECT GENERAL CORP	Multi	Direct General Insurance Group	N/A
65	DONEGAL GROUP INC	PC	Donegal Insurance Group	N/A
66	EMC INSURANCE GROUP INC	Multi	EMC Insurance Companies	Employers Modern Life Co
67	ENDURANCE SPECIALTY HOLDINGS	PC	Endurance Specialty Insurance	N/A
68	ERIE INDEMNITY CO -CL A	PC	Erie Insurance Group	N/A
69	EVEREST RE GROUP LTD	PC	Everest Re U.S. Group	N/A
70	EXECUTIVE RISK INC	PC	Executive Risk Group	N/A
71	FAIRFAX FINANCIAL HOLDINGS	PC	United States Fire Insurance C	N/A
72	FARM FAMILY HOLDINGS INC	Multi	Farm Family Casualty Ins Co	Farm Family Life Ins Co
73	FBL FINANCIAL GROUP INC-CL A	LH	N/A	Farm Bureau Life Insurance Com
74	FIRST ACCEPTANCE CORP	PC	First Acceptance Insurance Com	N/A
75	FIRST AMERICAN CORP/CA	PC	First American Corporation Pro	N/A
76	FIRST CENTRAL FINANCIAL CORP	PC	First Central Insurance Co	N/A
77	FIRST HEALTH GROUP CORP	LH	N/A	American Life and Health Ins
78	FOREMOST CORP OF AMERICA	PC	Foremost Corporation Group	N/A
79	FORTUNE FINANCIAL INC	PC	Fortune Insurance Company	N/A
80	FPIC INSURANCE GROUP INC	PC	FPIC Insurance Group, Inc.	N/A
81	FRONTIER INSURANCE GROUP INC	PC	Frontier Insurance Group	N/A
82	GENERAL RE CORP	PC	General Reinsurance Corp	N/A
83	GREAT AMERN FINL RESOURCES	PC	Great American Insurance Compa	N/A
84	GRYPHON HOLDINGS INC	PC	Associated International Ins	N/A
85	GUARANTEE LIFE COS INC	LH	N/A	Guarantee Life Ins Co
86	HALLMARK FINANCIAL SERVICES	PC	American Hallmark Insurance Co	N/A
87	HANOVER INSURANCE GROUP INC	PC	The Hanover Insurance Company	N/A
88	HARLEYSVILLE GROUP INC	Multi	Harleysville Insurance Cos	Harleysville Life Ins Co
89	HARTFORD LIFE INSURANCE CO	LH	N/A	Hartford Life and Accident Ins
90	HCC INSURANCE HOLDINGS INC	Multi	HCC Insurance Holdings	HCC Life Insurance Company
91	HEALTH NET INC	LH	N/A	Health Net Life Insurance Comp
92	HIGHLANDS INSURANCE GRP INC	PC	Highlands Insurance Group	N/A
93	HORACE MANN EDUCATORS CORP	Multi	Horace Mann Insurance Group	Horace Mann Life Ins Co
94	HUMANA INC	LH	N/A	Humana Insurance Company, Inc.
95	INDEPENDENCE HOLDING CO	LH	N/A	Madison National Life Insuranc
96	INFINITY PROPERTY & CAS CORP	PC	Infinity Property & Casualty G	N/A
97	ING GROEP NV	LH	N/A	Life Insurance Co of Georgia
98	INTEGON CORP/DE	PC	Integon Indemnity Corp	N/A
99	INTERCARGO CORP	PC	Intercargo Insurance Company	N/A
100	JEFFERSON-PILOT CORP	LH	N/A	Jefferson-Pilot Life Ins Co
101	JOHN ALDEN FINANCIAL CORP	Multi	N/A	John Alden Life Ins Co
102	KANSAS CITY LIFE INS CO	LH	N/A	Kansas City Life Insurance Com
103	KINGSWAY FINANCIAL SVCS INC	PC	Lincoln General Insurance Comp	N/A
104	LIBERTY FINANCIAL COS INC	PC	State National Fire Ins Co	N/A
105	LIFE RE CORP	LH	N/A	Life Reassur Corp of America
106	LIFE USA HOLDING INC	LH	N/A	LifeUSA Insurance Co
107	LINCOLN NATIONAL CORP	LH	N/A	The Lincoln National Life Insu
108	MANULIFE FINANCIAL CORP	LH	N/A	Manufacturers Life Ins Co
109	MARKEL CORP	PC	Evanston Insurance Company	N/A
110	MAXICARE HEALTH PLANS	LH	N/A	Maxicare Life and Health Ins
111	MCM CORP	PC	McM Corp Group	N/A

	Company_Name	Type	PC_Lead_Entity	LH_Lead_Entity
112	MEADOWBROOK INS GROUP INC	PC	Meadowbrook Insurance Group	N/A
113	MERCER INSURANCE GROUP INC	PC	Mercer Insurance Group	N/A
114	MERCHANTS GROUP INC	PC	Merchants Mutual Insurance Com	N/A
115	MERCURY GENERAL CORP	PC	American Mercury Insurance Gro	N/A
116	MERIDIAN INS GROUP INC	PC	Meridian Mutual Insurance Co	N/A
117	METLIFE INC	PC	MetLife Auto & Home	N/A
118	MID ATLANTIC MEDICAL SVCS	PC	Mid-Atlantic Medical Ins Co	N/A
119	MIDLAND CO	LH	N/A	Midland Life Ins Co
120	MIIX GROUP INC	PC	MIIX Group	N/A
121	MMI COMPANIES INC	Multi	MMI Companies Group	American Continental Life Ins
122	MOLINA HEALTHCARE INC	LH	N/A	Molina Healthcare of Washingto
123	MONY GROUP INC	LH	N/A	MONY Life Ins Co
124	NAC RE CORP	PC	NAC Re Group	N/A
125	NATIONAL INTERSTATE CORP	PC	National Interstate Insurance	N/A
126	NATIONAL SEC GROUP INC	Multi	National Security Group, Inc	N/A
127	NATIONAL WESTERN LIFE -CL A	LH	N/A	National Western Life Ins Co
128	NATIONWIDE FINL SVCS -CL A	Multi	Nationwide Group	Nationwide Life Ins Co
129	NAVIGATORS GROUP INC	PC	Navigators Insurance Group	N/A
130	NCRIC GROUP INC	PC	NCRIC Group	N/A
131	NOBEL INSURANCE LTD	PC	Nobel Insurance Company	N/A
132	NORTH EAST INSURANCE CO	PC	North East Insurance Group	N/A
133	ODYSSEY RE HOLDINGS CORP	PC	Odyssey Reinsurance Group	N/A
134	OHIO CASUALTY CORP	PC	Ohio Casualty Group	N/A
135	OLD GUARD GROUP INC	PC	Old Guard Insurance Pool	N/A
136	OLD REPUBLIC INTL CORP	PC	Old Republic Group	N/A
137	ORION CAPITAL CORP	PC	Orion Capital Companies	N/A
138	OXFORD HEALTH PLANS INC	LH	N/A	Oxford Health Plans (NY) Inc
139	PACIFICARE HEALTH SYSTEMS	LH	N/A	PacifiCare of California Inc
140	PARTNERRE LTD	PC	Partner Reinsurance Company of	N/A
141	PAULA FINANCIAL/DE	Multi	PAULA Insurance Company	N/A
142	PENN TREATY AMERN CORP	LH	N/A	Penn Treaty Network America In
143	PENN-AMERICA GROUP INC	PC	Penn-America Group, Inc	N/A
144	PHILADELPHIA CONS HLDG CORP	PC	Philadelphia Contributionship	N/A
145	PICO HOLDINGS INC	PC	Sequoia Insurance Company	N/A
146	PLATINUM UNDERWRITERS HLDG	PC	Platinum Underwriters Group	N/A
147	PMA CAPITAL CORP	PC	The PMA Insurance Group	N/A
148	PREPAID LEGAL SERVICES INC	PC	Pre-Paid Legal Casualty, Inc.	N/A
149	PRESERVER GROUP INC	PC	Preserver Insurance Company	N/A
150	PRESIDENTIAL LIFE CORP	LH	N/A	Presidential Life Ins Co
151	PRINCIPAL FINANCIAL GRP INC	LH	N/A	Principal Life Insurance Compa
152	PROASSURANCE CORP	PC	ProAssurance Group	N/A
153	PROFESSIONALS GROUP INC	PC	ProNational Insurance Group	N/A
154	PROGRESSIVE CORP-OHIO	PC	Progressive Casualty Insurance	N/A
155	PROTECTIVE LIFE CORP	LH	N/A	Protective Life Insurance Comp
156	PRUDENTIAL FINANCIAL INC	Multi	Prudential Prop & Cas Group	Prudential Ins Co of America
157	PXRE GROUP LTD	PC	PXRE Reinsurance Company	N/A
158	RELIABLE LIFE INS CO -CL A	LH	N/A	Reliable Life Insurance Co
159	RELIANCE GROUP HOLDINGS	PC	Reliance Insurance Group	N/A
160	RELIASTAR FINANCIAL CORP	LH	N/A	ReliaStar Life Ins Co
161	RENAISSANCERE HOLDINGS LTD	Multi	Stonington Insurance Company	N/A
162	RIGHTCHOICE MGD CARE	LH	N/A	RightCHOICE Insurance Co
163	RLI CORP	PC	RLI Group	N/A
164	SAFECO CORP	Multi	SAFECO Ins Co of America	SAFECO Life Ins Co
165	SAFETY INSURANCE GROUP INC	PC	The Safety Group	N/A
166	SCOTTISH RE GROUP LTD	LH	N/A	Scottish Re (U.S.), Inc.
167	SCPIE HOLDINGS INC	PC	The SCPIE Companies	N/A

	Company_Name	Type	PC_Lead_Entity	LH_Lead_Entity
168	SEABRIGHT INSURANCE HLDGS	PC	SeaBright Insurance Company	N/A
169	SELECTIVE INS GROUP INC	PC	Selective Insurance Company of	N/A
170	SIERRA HEALTH SERVICES	LH	N/A	Sierra Health and Life Insuran
171	SOUTHERN SECURITY LIFE INS	LH	N/A	Southern Security Life Ins Co
172	STANCORP FINANCIAL GROUP INC	LH	N/A	Standard Insurance Company
173	STANDARD MANAGEMENT CORP	LH	N/A	Standard Life Ins Co of IN
174	STATE AUTO FINANCIAL CORP	PC	State Auto Insurance Companies	N/A
175	SUN LIFE FINANCIAL INC	LH	N/A	Sun Life Assur Co of Canada
176	SUNAMERICA INC	LH	N/A	SunAmerica Life Ins Co
177	SYMONS INTERNATIONAL GRP INC	PC	Pafco General Insurance Co	N/A
178	TIG HOLDINGS INC	PC	TIG Holdings Group	N/A
179	TRANSAMERICA CORP	LH	N/A	Transamerica Occidental Life
180	TRANSATLANTIC HOLDINGS INC	PC	Transatlantic Holdings, Inc. G	N/A
181	TRAVELERS COS INC	PC	Travelers PC Pool	N/A
182	TRENWICK GROUP LTD	PC	Trenwick America Reins Corp	N/A
183	TRIGON HEALTHCARE INC	LH	N/A	Trigon Insurance Co
184	UICI	Multi	N/A	MEGA Life and Health Ins
185	UNITED AMERICA INDEMNITY LTD	PC	United National Insurance Comp	N/A
186	UNITED AMERICAN HEALTHCARE	LH	N/A	United American Insurance Comp
187	UNITED FIRE & CAS CO	PC	United Fire & Casualty Group	N/A
188	UNITEDHEALTH GROUP INC	LH	N/A	United HealthCare Insurance Co
189	UNITRIN INC	Multi	Trinity Universal Insurance Co	United Insurance Co of America
190	UNIVERSAL AMERICAN FINL CP	LH	N/A	American Progressive Life & He
191	UNIVERSAL INSURANCE HLDGS	PC	Universal Insurance Group	N/A
192	UNUM GROUP	LH	N/A	Unum Life Insurance Company of
193	VESTA INSURANCE GROUP INC	Multi	Vesta Insurance Group Inc	American Founders Life Ins Co
194	WALSHIRE ASSURN CO	PC	Lincoln General Insurance Co	N/A
195	WELLPOINT HEALTH NETWRKS INC	LH	N/A	BC Life & Health Ins Co
196	WELLPOINT INC	LH	N/A	Blue Cross of California
197	WHITE MTNS INS GROUP LTD	Multi	OneBeacon Insurance Company	N/A
198	XL CAPITAL LTD	PC	XL Reinsurance America Inc.	N/A
199	ZENITH NATIONAL INSURANCE CP	PC	Zenith Insurance Company	N/A

Appendix 3: List of all 199 publicly-traded insurers in the sample sorted by firm type in A.M. Best

	Company_Name	Type	PC_Lead_Entity	LH_Lead_Entity
1	AMERICAN INDTY FINL CORP	PC	American Indemnity Company	N/A
2	AMERICAN PHYSICIANS CAPITAL	PC	American Physicians Assurance	N/A
3	AMWEST INSURANCE GROUP INC	PC	Amwest Group	N/A
4	ARCH CAPITAL GROUP LTD	PC	Arch Reinsurance Company	N/A
5	BALDWIN & LYONS -CL B	PC	Baldwin & Lyons Group	N/A
6	BANCINSURANCE CORP	PC	BancInsure, Inc.	N/A
7	BRISTOL WEST HOLDINGS INC	PC	Coast National Insurance Compa	N/A
8	CHARTWELL RE CORP	PC	Chartwell Reinsurance Co	N/A
9	ENDURANCE SPECIALTY HOLDINGS	PC	Endurance Specialty Insurance	N/A
10	EXECUTIVE RISK INC	PC	Executive Risk Group	N/A
11	FRONTIER INSURANCE GROUP INC	PC	Frontier Insurance Group	N/A
12	GREAT AMERN FINL RESOURCES	PC	Great American Insurance Compa	N/A
13	KINGSWAY FINANCIAL SVCS INC	PC	Lincoln General Insurance Comp	N/A
14	MARKEL CORP	PC	Evanston Insurance Company	N/A
15	NAC RE CORP	PC	NAC Re Group	N/A
16	NOBEL INSURANCE LTD	PC	Nobel Insurance Company	N/A
17	NORTH EAST INSURANCE CO	PC	North East Insurance Group	N/A
18	OLD GUARD GROUP INC	PC	Old Guard Insurance Pool	N/A
19	OLD REPUBLIC INTL CORP	PC	Old Republic Group	N/A
20	PICO HOLDINGS INC	PC	Sequoia Insurance Company	N/A
21	PMA CAPITAL CORP	PC	The PMA Insurance Group	N/A
22	PRESERVER GROUP INC	PC	Preserver Insurance Company	N/A
23	RELIANCE GROUP HOLDINGS	PC	Reliance Insurance Group	N/A
24	SAFETY INSURANCE GROUP INC	PC	The Safety Group	N/A
25	SCPIE HOLDINGS INC	PC	The SCPIE Companies	N/A
26	SEABRIGHT INSURANCE HLDGS	PC	SeaBright Insurance Company	N/A
27	TIG HOLDINGS INC	PC	TIG Holdings Group	N/A
28	UNIVERSAL INSURANCE HLDGS	PC	Universal Insurance Group	N/A
29	21ST CENTURY HOLDING CO	PC	American Vehicle Insurance Com	N/A
30	CHUBB CORP	PC	Chubb Group of Insurance Compa	N/A
31	FORTUNE FINANCIAL INC	PC	Fortune Insurance Company	N/A
32	MERCHANTS GROUP INC	PC	Merchants Mutual Insurance Com	N/A
33	BERKLEY (W R) CORP	PC	Berkley Regional Group	N/A
34	CAPITOL TRANSAMERICA CORP	PC	Capitol Transamerica Group	N/A
35	ERIE INDEMNITY CO -CL A	PC	Erie Insurance Group	N/A
36	FIRST ACCEPTANCE CORP	PC	First Acceptance Insurance Com	N/A
37	HANOVER INSURANCE GROUP INC	PC	The Hanover Insurance Company	N/A
38	OHIO CASUALTY CORP	PC	Ohio Casualty Group	N/A
39	PHILADELPHIA CONS HLDG CORP	PC	Philadelphia Contributionship	N/A
40	SYMONS INTERNATIONAL GRP INC	PC	Pafco General Insurance Co	N/A
41	UNITED AMERICA INDEMNITY LTD	PC	United National Insurance Comp	N/A
42	XL CAPITAL LTD	PC	XL Reinsurance America Inc.	N/A
43	ZENITH NATIONAL INSURANCE CP	PC	Zenith Insurance Company	N/A
44	21ST CENTURY INS GROUP	PC	20th Century Insurance Group	N/A
45	ACCEPTANCE INSURANCE COS INC	PC	Acceptance Insurance Companies	N/A
46	ACE LTD	PC	ACE American Pool	N/A
47	ACMAT CORP -CL A	PC	ACSTAR Insurance Company	N/A
48	ALLCITY INSURANCE CO	PC	Allcity Insurance Company	N/A
49	AMERICAN EAGLE GROUP INC	PC	American Eagle Insurance Co	N/A
50	AMERICAN SAFETY INS HLDG LTD	PC	American Safety Insurance Grou	N/A
51	AXIS CAPITAL HOLDINGS	PC	AXIS Reinsurance Company	N/A
52	BERKSHIRE HATHAWAY	PC	Berkshire Hathaway Homestate C	N/A
53	CENTRIS GROUP INC	PC	Centris Insurance Group	N/A
54	CHANDLER INSURANCE LTD	PC	National American Ins Co	N/A
55	CNA FINANCIAL CORP	PC	Continental Casualty Company	N/A

	Company_Name	Type	PC_Lead_Entity	LH_Lead_Entity
56	CNA SURETY CORP	PC	CNA Surety Corporation Group	N/A
57	COMMERCE GROUP INC/MA	PC	The Commerce Insurance Company	N/A
58	EVEREST RE GROUP LTD	PC	Everest Re U.S. Group	N/A
59	FAIRFAX FINANCIAL HOLDINGS	PC	United States Fire Insurance C	N/A
60	FIRST AMERICAN CORP/CA	PC	First American Corporation Pro	N/A
61	FIRST CENTRAL FINANCIAL CORP	PC	First Central Insurance Co	N/A
62	FOREMOST CORP OF AMERICA	PC	Foremost Corporation Group	N/A
63	FPIC INSURANCE GROUP INC	PC	FPIC Insurance Group, Inc.	N/A
64	GENERAL RE CORP	PC	General Reinsurance Corp	N/A
65	GRYPHON HOLDINGS INC	PC	Associated International Ins	N/A
66	HALLMARK FINANCIAL SERVICES	PC	American Hallmark Insurance Co	N/A
67	INTEGON CORP/DE	PC	Integon Indemnity Corp	N/A
68	INTERCARGO CORP	PC	Intercargo Insurance Company	N/A
69	LIBERTY FINANCIAL COS INC	PC	State National Fire Ins Co	N/A
70	MCM CORP	PC	McM Corp Group	N/A
71	MEADOWBROOK INS GROUP INC	PC	Meadowbrook Insurance Group	N/A
72	MERCURY GENERAL CORP	PC	American Mercury Insurance Gro	N/A
73	MERIDIAN INS GROUP INC	PC	Meridian Mutual Insurance Co	N/A
74	METLIFE INC	PC	MetLife Auto & Home	N/A
75	MID ATLANTIC MEDICAL SVCS	PC	Mid-Atlantic Medical Ins Co	N/A
76	MIIX GROUP INC	PC	MIIX Group	N/A
77	NATIONAL INTERSTATE CORP	PC	National Interstate Insurance	N/A
78	NAVIGATORS GROUP INC	PC	Navigators Insurance Group	N/A
79	NCRIC GROUP INC	PC	NCRIC Group	N/A
80	ODYSSEY RE HOLDINGS CORP	PC	Odyssey Reinsurance Group	N/A
81	ORION CAPITAL CORP	PC	Orion Capital Companies	N/A
82	PARTNERRE LTD	PC	Partner Reinsurance Company of	N/A
83	PLATINUM UNDERWRITERS HLDG	PC	Platinum Underwriters Group	N/A
84	PREPAID LEGAL SERVICES INC	PC	Pre-Paid Legal Casualty, Inc.	N/A
85	PROASSURANCE CORP	PC	ProAssurance Group	N/A
86	PROGRESSIVE CORP-OHIO	PC	Progressive Casualty Insurance	N/A
87	SELECTIVE INS GROUP INC	PC	Selective Insurance Company of	N/A
88	STATE AUTO FINANCIAL CORP	PC	State Auto Insurance Companies	N/A
89	TRANSATLANTIC HOLDINGS INC	PC	Transatlantic Holdings, Inc. G	N/A
90	TRAVELERS COS INC	PC	Travelers PC Pool	N/A
91	TRENWICK GROUP LTD	PC	Trenwick America Reins Corp	N/A
92	UNITED FIRE & CAS CO	PC	United Fire & Casualty Group	N/A
93	WALSHIRE ASSURN CO	PC	Lincoln General Insurance Co	N/A
94	DONEGAL GROUP INC	PC	Donegal Insurance Group	N/A
95	INFINITY PROPERTY & CAS CORP	PC	Infinity Property & Casualty G	N/A
96	MERCER INSURANCE GROUP INC	PC	Mercer Insurance Group	N/A
97	PENN-AMERICA GROUP INC	PC	Penn-America Group, Inc	N/A
98	PROFESSIONALS GROUP INC	PC	ProNational Insurance Group	N/A
99	PXRE GROUP LTD	PC	PXRE Reinsurance Company	N/A
100	RLI CORP	PC	RLI Group	N/A
101	ALLEGHANY CORP	PC	Allegany Insurance Group	N/A
102	ASPEN INSURANCE HOLDINGS LTD	PC	Aspen Specialty Insurance Comp	N/A
103	DELPHI FINANCIAL GRP -CL A	PC	Safety National Casualty Corp	N/A
104	HIGHLANDS INSURANCE GRP INC	PC	Highlands Insurance Group	N/A
105	ANNUITY AND LIFE RE HOLDINGS	LH	N/A	Annuity & Life Reassurance Am
106	CONSECO INC	LH	N/A	Conseco Life Insurance Company
107	COVENTRY HEALTH CARE INC	LH	N/A	Coventry Health and Life Insur
108	FBL FINANCIAL GROUP INC-CL A	LH	N/A	Farm Bureau Life Insurance Com
109	GUARANTEE LIFE COS INC	LH	N/A	Guarantee Life Ins Co
110	JEFFERSON-PILOT CORP	LH	N/A	Jefferson-Pilot Life Ins Co
111	PRESIDENTIAL LIFE CORP	LH	N/A	Presidential Life Ins Co

	Company_Name	Type	PC_Lead_Entity	LH_Lead_Entity
112	RELIASTAR FINANCIAL CORP	LH	N/A	ReliaStar Life Ins Co
113	SCOTTISH RE GROUP LTD	LH	N/A	Scottish Re (U.S.), Inc.
114	SUNAMERICA INC	LH	N/A	SunAmerica Life Ins Co
115	AMERICAN EQTY INVT LIFE HLDG	LH	N/A	American Equity Investment Lif
116	RIGHTCHOICE MGD CARE	LH	N/A	RightCHOICE Insurance Co
117	UNITEDHEALTH GROUP INC	LH	N/A	United HealthCare Insurance Co
118	INDEPENDENCE HOLDING CO	LH	N/A	Madison National Life Insuranc
119	ING GROEP NV	LH	N/A	Life Insurance Co of Georgia
120	MONY GROUP INC	LH	N/A	MONY Life Ins Co
121	RELIABLE LIFE INS CO -CL A	LH	N/A	Reliable Life Insurance Co
122	SOUTHERN SECURITY LIFE INS	LH	N/A	Southern Security Life Ins Co
123	SUN LIFE FINANCIAL INC	LH	N/A	Sun Life Assur Co of Canada
124	TRANSAMERICA CORP	LH	N/A	Transamerica Occidental Life
125	AETNA INC	LH	N/A	Aetna Life Insurance Company
126	AMERICAN MEDICAL SECURITY GP	LH	N/A	United Wisconsin Life Ins Co
127	AMERUS GROUP CO -CL A	LH	N/A	AmerUs Life Insurance Company
128	ARISTA INVESTORS CORP	LH	N/A	Arista Insurance Company
129	CANADA LIFE FINANCIAL CORP	LH	N/A	Canada Life Assurance Co
130	CENTENE CORP	LH	N/A	Managed Health Services Insura
131	CERES GROUP INC	LH	N/A	Central Reserve Life Insurance
132	CITIZENS INC	LH	N/A	Citizens Insurance Co of Amer
133	COTTON STATES LIFE INSURANCE	LH	N/A	Cotton States Life Ins Co
134	FIRST HEALTH GROUP CORP	LH	N/A	American Life and Health Ins
135	HARTFORD LIFE INSURANCE CO	LH	N/A	Hartford Life and Accident Ins
136	HUMANA INC	LH	N/A	Humana Insurance Company, Inc.
137	KANSAS CITY LIFE INS CO	LH	N/A	Kansas City Life Insurance Com
138	LIFE RE CORP	LH	N/A	Life Reassur Corp of America
139	LIFE USA HOLDING INC	LH	N/A	LifeUSA Insurance Co
140	LINCOLN NATIONAL CORP	LH	N/A	The Lincoln National Life Insu
141	MAXICARE HEALTH PLANS	LH	N/A	Maxicare Life and Health Ins
142	MIDLAND CO	LH	N/A	Midland Life Ins Co
143	MOLINA HEALTHCARE INC	LH	N/A	Molina Healthcare of Washingto
144	NATIONAL WESTERN LIFE -CL A	LH	N/A	National Western Life Ins Co
145	OXFORD HEALTH PLANS INC	LH	N/A	Oxford Health Plans (NY) Inc
146	PENN TREATY AMERN CORP	LH	N/A	Penn Treaty Network America In
147	PRINCIPAL FINANCIAL GRP INC	LH	N/A	Principal Life Insurance Compa
148	PROTECTIVE LIFE CORP	LH	N/A	Protective Life Insurance Comp
149	STANCORP FINANCIAL GROUP INC	LH	N/A	Standard Insurance Company
150	TRIGON HEALTHCARE INC	LH	N/A	Trigon Insurance Co
151	UNITED AMERICAN HEALTHCARE	LH	N/A	United American Insurance Comp
152	UNUM GROUP	LH	N/A	Unum Life Insurance Company of
153	WELLPOINT HEALTH NETWRKS INC	LH	N/A	BC Life & Health Ins Co
154	WELLPOINT INC	LH	N/A	Blue Cross of California
155	AFLAC INC	LH	N/A	American Family Life Assurance
156	PACIFICARE HEALTH SYSTEMS	LH	N/A	PacifiCare of California Inc
157	SIERRA HEALTH SERVICES	LH	N/A	Sierra Health and Life Insuran
158	STANDARD MANAGEMENT CORP	LH	N/A	Standard Life Ins Co of IN
159	UNIVERSAL AMERICAN FINL CP	LH	N/A	American Progressive Life & He
160	HEALTH NET INC	LH	N/A	Health Net Life Insurance Comp
161	MANULIFE FINANCIAL CORP	LH	N/A	Manufacturers Life Ins Co
162	AXA	Mult	AXA Corporate Solutions Reinsurance	AXA Equitable Life Insurance Corp
163	CITIZENS FINANCIAL CORP/KY	Mult	N/A	Citizens Security Life Ins Co
164	FARM FAMILY HOLDINGS INC	Mult	Farm Family Casualty Ins Co	Farm Family Life Ins Co
165	PRUDENTIAL FINANCIAL INC	Mult	Prudential Prop & Cas Group	Prudential Ins Co of America
166	AMERIGROUP CORP	Mult	N/A	AMERIGROUP Texas, Inc.
167	ATLANTIC AMERICAN CORP	Mult	American Southern Insurance Co	Bankers Fidelity Life Insuranc

	Company_Name	Type	PC_Lead_Entity	LH_Lead_Entity
168	JOHN ALDEN FINANCIAL CORP	Mult	N/A	John Alden Life Ins Co
169	HORACE MANN EDUCATORS CORP	Mult	Horace Mann Insurance Group	Horace Mann Life Ins Co
170	VESTA INSURANCE GROUP INC	Mult	Vesta Insurance Group Inc	American Founders Life Ins Co
171	AEGON NV	Mult	Monumental General Casualty Co	Life Investors Ins Co of Amer
172	AMERICAN FINANCIAL GROUP INC	Mult	Great American Insurance Co	Great American Life Ins Co
173	AMERICAN HERITAGE LIFE INVS	Mult	First Colonial Insurance Co	American Heritage Life Ins Co
174	AMERICAN INTERNATIONAL GROUP	Mult	American International Group	American International Life Assurance
175	AON CORP	Mult	Virginia Surety Company, Inc.	Combined Ins Co of America
176	ASSURANT INC	Mult	Assurant Insurance Group	Time Insurance Company
177	CIGNA CORP	Mult	N/A	Connecticut General Life Ins
178	CINCINNATI FINANCIAL CORP	Mult	Cincinnati Insurance Cos	Cincinnati Life Insurance Co
179	COBALT CORP	Mult	United Wisconsin Insurance Co	United Heartland Life Ins Co
180	DIRECT GENERAL CORP	Mult	Direct General Insurance Group	N/A
181	HARLEYSVILLE GROUP INC	Mult	Harleysville Insurance Cos	Harleysville Life Ins Co
182	NATIONAL SEC GROUP INC	Mult	National Security Group, Inc	N/A
183	PAULA FINANCIAL/DE	Mult	PAULA Insurance Company	N/A
184	RENAISSANCERE HOLDINGS LTD	Mult	Stonington Insurance Company	N/A
185	UICI	Mult	N/A	MEGA Life and Health Ins
186	UNITRIN INC	Mult	Trinity Universal Insurance Co	United Insurance Co of America
187	WHITE MTNS INS GROUP LTD	Mult	OneBeacon Insurance Company	N/A
188	ALFA CORP	Mult	Alfa Insurance Pool	Alfa Life Ins Corp
189	ALLIED GROUP INC	Mult	ALLIED Group	ALLIED Life Insurance Co
190	AMERICAN BANKERS INS GROUP	Mult	American Bankers Group	American Bankers Life Assur Co
191	AMERICAN GENERAL CORP	Mult	American General Property Ins	N/A
192	MMI COMPANIES INC	Mult	MMI Companies Group	American Continental Life Ins
193	SAFECO CORP	Mult	SAFECO Ins Co of America	SAFECO Life Ins Co
194	EMC INSURANCE GROUP INC	Mult	EMC Insurance Companies	Employers Modern Life Co
195	ALLIANZ SE	Mult	Allianz Insurance Group	Allianz Life Ins Co N America
196	ALLSTATE CORP	Mult	Allstate Insurance Group	Allstate Life Ins Co
197	NATIONWIDE FINL SVCS -CL A	Mult	Nationwide Group	Nationwide Life Ins Co
198	HCC INSURANCE HOLDINGS INC	Mult	HCC Insurance Holdings	HCC Life Insurance Company
199	AMERICAN NATIONAL INSURANCE	Mult	American Nat Prop & Cas Group	American National Insurance Co

Appendix 4: List of all 199 publicly-traded insurers in the sample sorted by SIC code

	Company_Name	SIC	PC_Lead_Entity	LH_Lead_Entity
1	AMERICAN INDTY FINL CORP	6311	American Indemnity Company	N/A
2	AMERICAN PHYSICIANS CAPITAL	6311	American Physicians Assurance	N/A
3	AMWEST INSURANCE GROUP INC	6311	Amwest Group	N/A
4	ANNUITY AND LIFE RE HOLDINGS	6311	N/A	Annuity & Life Reassurance Am
5	ARCH CAPITAL GROUP LTD	6311	Arch Reinsurance Company	N/A
6	AXA	6311	AXA Corporate Solutions Reinsurance	AXA Equitable Life Insurance Corp
7	BALDWIN & LYONS -CL B	6311	Baldwin & Lyons Group	N/A
8	BANCINSURANCE CORP	6311	BancInsure, Inc.	N/A
9	BRISTOL WEST HOLDINGS INC	6311	Coast National Insurance Compa	N/A
10	CHARTWELL RE CORP	6311	Chartwell Reinsurance Co	N/A
11	CITIZENS FINANCIAL CORP/KY	6311	N/A	Citizens Security Life Ins Co
12	CONSECO INC	6311	N/A	Conseco Life Insurance Company
13	COVENTRY HEALTH CARE INC	6311	N/A	Coventry Health and Life Insur
14	ENDURANCE SPECIALTY HOLDINGS	6311	Endurance Specialty Insurance	N/A
15	EXECUTIVE RISK INC	6311	Executive Risk Group	N/A
16	FARM FAMILY HOLDINGS INC	6311	Farm Family Casualty Ins Co	Farm Family Life Ins Co
17	FBL FINANCIAL GROUP INC-CL A	6311	N/A	Farm Bureau Life Insurance Com
18	FRONTIER INSURANCE GROUP INC	6311	Frontier Insurance Group	N/A
19	GREAT AMERN FINL RESOURCES	6311	Great American Insurance Compa	N/A
20	GUARANTEE LIFE COS INC	6311	N/A	Guarantee Life Ins Co
21	JEFFERSON-PILOT CORP	6311	N/A	Jefferson-Pilot Life Ins Co
22	KINGSWAY FINANCIAL SVCS INC	6311	Lincoln General Insurance Comp	N/A
23	MARKEL CORP	6311	Evanston Insurance Company	N/A
24	NAC RE CORP	6311	NAC Re Group	N/A
25	NOBEL INSURANCE LTD	6311	Nobel Insurance Company	N/A
26	NORTH EAST INSURANCE CO	6311	North East Insurance Group	N/A
27	OLD GUARD GROUP INC	6311	Old Guard Insurance Pool	N/A
28	OLD REPUBLIC INTL CORP	6311	Old Republic Group	N/A
29	PICO HOLDINGS INC	6311	Sequoia Insurance Company	N/A
30	PMA CAPITAL CORP	6311	The PMA Insurance Group	N/A
31	PRESERVER GROUP INC	6311	Preserver Insurance Company	N/A
32	PRESIDENTIAL LIFE CORP	6311	N/A	Presidential Life Ins Co
33	PRUDENTIAL FINANCIAL INC	6311	Prudential Prop & Cas Group	Prudential Ins Co of America
34	RELIANCE GROUP HOLDINGS	6311	Reliance Insurance Group	N/A
35	RELIASTAR FINANCIAL CORP	6311	N/A	ReliaStar Life Ins Co
36	SAFETY INSURANCE GROUP INC	6311	The Safety Group	N/A
37	SCOTTISH RE GROUP LTD	6311	N/A	Scottish Re (U.S.), Inc.
38	SCPIE HOLDINGS INC	6311	The SCPIE Companies	N/A
39	SEABRIGHT INSURANCE HLDGS	6311	SeaBright Insurance Company	N/A
40	SUNAMERICA INC	6311	N/A	SunAmerica Life Ins Co
41	TIG HOLDINGS INC	6311	TIG Holdings Group	N/A
42	UNIVERSAL INSURANCE HLDGS	6311	Universal Insurance Group	N/A
43	MANULIFE FINANCIAL CORP	6311	N/A	Manufacturers Life Ins Co
44	21ST CENTURY HOLDING CO	6321	American Vehicle Insurance Com	N/A
45	AMERICAN EQTY INVT LIFE HLDG	6321	N/A	American Equity Investment Lif
46	AMERIGROUP CORP	6321	N/A	AMERIGROUP Texas, Inc.
47	ATLANTIC AMERICAN CORP	6321	American Southern Insurance Co	Bankers Fidelity Life Insuranc
48	CHUBB CORP	6321	Chubb Group of Insurance Compa	N/A
49	FORTUNE FINANCIAL INC	6321	Fortune Insurance Company	N/A
50	JOHN ALDEN FINANCIAL CORP	6321	N/A	John Alden Life Ins Co
51	MERCHANTS GROUP INC	6321	Merchants Mutual Insurance Com	N/A
52	RIGHTCHOICE MGD CARE	6321	N/A	RightCHOICE Insurance Co
53	UNITEDHEALTH GROUP INC	6321	N/A	United HealthCare Insurance Co
54	BERKLEY (W R) CORP	6324	Berkley Regional Group	N/A
55	CAPITOL TRANSAMERICA CORP	6324	Capitol Transamerica Group	N/A

	Company_Name	SIC	PC_Lead_Entity	LH_Lead_Entity
56	ERIE INDEMNITY CO -CL A	6324	Erie Insurance Group	N/A
57	FIRST ACCEPTANCE CORP	6324	First Acceptance Insurance Com	N/A
58	HANOVER INSURANCE GROUP INC	6324	The Hanover Insurance Company	N/A
59	HORACE MANN EDUCATORS CORP	6324	Horace Mann Insurance Group	Horace Mann Life Ins Co
60	INDEPENDENCE HOLDING CO	6324	N/A	Madison National Life Insuranc
61	ING GROEP NV	6324	N/A	Life Insurance Co of Georgia
62	MONY GROUP INC	6324	N/A	MONY Life Ins Co
63	OHIO CASUALTY CORP	6324	Ohio Casualty Group	N/A
64	PHILADELPHIA CONS HLDG CORP	6324	Philadelphia Contributionship	N/A
65	RELIABLE LIFE INS CO -CL A	6324	N/A	Reliable Life Insurance Co
66	SOUTHERN SECURITY LIFE INS	6324	N/A	Southern Security Life Ins Co
67	SUN LIFE FINANCIAL INC	6324	N/A	Sun Life Assur Co of Canada
68	SYMONS INTERNATIONAL GRP INC	6324	Pafco General Insurance Co	N/A
69	TRANSAMERICA CORP	6324	N/A	Transamerica Occidental Life
70	UNITED AMERICA INDEMNITY LTD	6324	United National Insurance Comp	N/A
71	VESTA INSURANCE GROUP INC	6324	Vesta Insurance Group Inc	American Founders Life Ins Co
72	XL CAPITAL LTD	6324	XL Reinsurance America Inc.	N/A
73	ZENITH NATIONAL INSURANCE CP	6324	Zenith Insurance Company	N/A
74	HEALTH NET INC	6324	N/A	Health Net Life Insurance Comp
75	21ST CENTURY INS GROUP	6331	20th Century Insurance Group	N/A
76	ACCEPTANCE INSURANCE COS INC	6331	Acceptance Insurance Companies	N/A
77	ACE LTD	6331	ACE American Pool	N/A
78	ACMAT CORP -CL A	6331	ACSTAR Insurance Company	N/A
79	AEGON NV	6331	Monumental General Casualty Co	Life Investors Ins Co of Amer
80	AETNA INC	6331	N/A	Aetna Life Insurance Company
81	ALLCITY INSURANCE CO	6331	Allcity Insurance Company	N/A
82	AMERICAN EAGLE GROUP INC	6331	American Eagle Insurance Co	N/A
83	AMERICAN FINANCIAL GROUP INC	6331	Great American Insurance Co	Great American Life Ins Co
84	AMERICAN HERITAGE LIFE INVS	6331	First Colonial Insurance Co	American Heritage Life Ins Co
85	AMERICAN INTERNATIONAL GROUP	6331	American International Group	American International Life Assurance
86	AMERICAN MEDICAL SECURITY GP	6331	N/A	United Wisconsin Life Ins Co
87	AMERICAN SAFETY INS HLDG LTD	6331	American Safety Insurance Grou	N/A
88	AMERUS GROUP CO -CL A	6331	N/A	AmerUs Life Insurance Company
89	AON CORP	6331	Virginia Surety Company, Inc.	Combined Ins Co of America
90	ARISTA INVESTORS CORP	6331	N/A	Arista Insurance Company
91	ASSURANT INC	6331	Assurant Insurance Group	Time Insurance Company
92	AXIS CAPITAL HOLDINGS	6331	AXIS Reinsurance Company	N/A
93	BERKSHIRE HATHAWAY	6331	Berkshire Hathaway Homestate C	N/A
94	CANADA LIFE FINANCIAL CORP	6331	N/A	Canada Life Assurance Co
95	CENTENE CORP	6331	N/A	Managed Health Services Insura
96	CENTRIS GROUP INC	6331	Centris Insurance Group	N/A
97	CERES GROUP INC	6331	N/A	Central Reserve Life Insurance
98	CHANDLER INSURANCE LTD	6331	National American Ins Co	N/A
99	CIGNA CORP	6331	N/A	Connecticut General Life Ins
100	CINCINNATI FINANCIAL CORP	6331	Cincinnati Insurance Cos	Cincinnati Life Insurance Co
101	CITIZENS INC	6331	N/A	Citizens Insurance Co of Amer
102	CNA FINANCIAL CORP	6331	Continental Casualty Company	N/A
103	CNA SURETY CORP	6331	CNA Surety Corporation Group	N/A
104	COBALT CORP	6331	United Wisconsin Insurance Co	United Heartland Life Ins Co
105	COMMERCE GROUP INC/MA	6331	The Commerce Insurance Company	N/A
106	COTTON STATES LIFE INSURANCE	6331	N/A	Cotton States Life Ins Co
107	DIRECT GENERAL CORP	6331	Direct General Insurance Group	N/A
108	EVEREST RE GROUP LTD	6331	Everest Re U.S. Group	N/A
109	FAIRFAX FINANCIAL HOLDINGS	6331	United States Fire Insurance C	N/A
110	FIRST AMERICAN CORP/CA	6331	First American Corporation Pro	N/A
111	FIRST CENTRAL FINANCIAL CORP	6331	First Central Insurance Co	N/A

	Company_Name	SIC	PC_Lead_Entity	LH_Lead_Entity
112	FIRST HEALTH GROUP CORP	6331	N/A	American Life and Health Ins
113	FOREMOST CORP OF AMERICA	6331	Foremost Corporation Group	N/A
114	FPIC INSURANCE GROUP INC	6331	FPIC Insurance Group, Inc.	N/A
115	GENERAL RE CORP	6331	General Reinsurance Corp	N/A
116	GRYPHON HOLDINGS INC	6331	Associated International Ins	N/A
117	HALLMARK FINANCIAL SERVICES	6331	American Hallmark Insurance Co	N/A
118	HARLEYSVILLE GROUP INC	6331	Harleysville Insurance Cos	Harleysville Life Ins Co
119	HARTFORD LIFE INSURANCE CO	6331	N/A	Hartford Life and Accident Ins
120	HUMANA INC	6331	N/A	Humana Insurance Company, Inc.
121	INTEGON CORP/DE	6331	Integon Indemnity Corp	N/A
122	INTERCARGO CORP	6331	Intercargo Insurance Company	N/A
123	KANSAS CITY LIFE INS CO	6331	N/A	Kansas City Life Insurance Com
124	LIBERTY FINANCIAL COS INC	6331	State National Fire Ins Co	N/A
125	LIFE RE CORP	6331	N/A	Life Reassur Corp of America
126	LIFE USA HOLDING INC	6331	N/A	LifeUSA Insurance Co
127	LINCOLN NATIONAL CORP	6331	N/A	The Lincoln National Life Insu
128	MAXICARE HEALTH PLANS	6331	N/A	Maxicare Life and Health Ins
129	MCM CORP	6331	McM Corp Group	N/A
130	MEADOWBROOK INS GROUP INC	6331	Meadowbrook Insurance Group	N/A
131	MERCURY GENERAL CORP	6331	American Mercury Insurance Gro	N/A
132	MERIDIAN INS GROUP INC	6331	Meridian Mutual Insurance Co	N/A
133	METLIFE INC	6331	MetLife Auto & Home	N/A
134	MID ATLANTIC MEDICAL SVCS	6331	Mid-Atlantic Medical Ins Co	N/A
135	MIDLAND CO	6331	N/A	Midland Life Ins Co
136	MIIX GROUP INC	6331	MIIX Group	N/A
137	MOLINA HEALTHCARE INC	6331	N/A	Molina Healthcare of Washingto
138	NATIONAL INTERSTATE CORP	6331	National Interstate Insurance	N/A
139	NATIONAL SEC GROUP INC	6331	National Security Group, Inc	N/A
140	NATIONAL WESTERN LIFE -CL A	6331	N/A	National Western Life Ins Co
141	NAVIGATORS GROUP INC	6331	Navigators Insurance Group	N/A
142	NCRIC GROUP INC	6331	NCRIC Group	N/A
143	ODYSSEY RE HOLDINGS CORP	6331	Odyssey Reinsurance Group	N/A
144	ORION CAPITAL CORP	6331	Orion Capital Companies	N/A
145	OXFORD HEALTH PLANS INC	6331	N/A	Oxford Health Plans (NY) Inc
146	PARTNERRE LTD	6331	Partner Reinsurance Company of	N/A
147	PAULA FINANCIAL/DE	6331	PAULA Insurance Company	N/A
148	PENN TREATY AMERN CORP	6331	N/A	Penn Treaty Network America In
149	PLATINUM UNDERWRITERS HLDG	6331	Platinum Underwriters Group	N/A
150	PREPAID LEGAL SERVICES INC	6331	Pre-Paid Legal Casualty, Inc.	N/A
151	PRINCIPAL FINANCIAL GRP INC	6331	N/A	Principal Life Insurance Compa
152	PROASSURANCE CORP	6331	ProAssurance Group	N/A
153	PROGRESSIVE CORP-OHIO	6331	Progressive Casualty Insurance	N/A
154	PROTECTIVE LIFE CORP	6331	N/A	Protective Life Insurance Comp
155	RENAISSANCERE HOLDINGS LTD	6331	Stonington Insurance Company	N/A
156	SELECTIVE INS GROUP INC	6331	Selective Insurance Company of	N/A
157	STANCORP FINANCIAL GROUP INC	6331	N/A	Standard Insurance Company
158	STATE AUTO FINANCIAL CORP	6331	State Auto Insurance Companies	N/A
159	TRANSATLANTIC HOLDINGS INC	6331	Transatlantic Holdings, Inc. G	N/A
160	TRAVELERS COS INC	6331	Travelers PC Pool	N/A
161	TRENWICK GROUP LTD	6331	Trenwick America Reins Corp	N/A
162	TRIGON HEALTHCARE INC	6331	N/A	Trigon Insurance Co
163	UICI	6331	N/A	MEGA Life and Health Ins
164	UNITED AMERICAN HEALTHCARE	6331	N/A	United American Insurance Comp
165	UNITED FIRE & CAS CO	6331	United Fire & Casualty Group	N/A
166	UNITRIN INC	6331	Trinity Universal Insurance Co	United Insurance Co of America
167	UNUM GROUP	6331	N/A	Unum Life Insurance Company of

	Company_Name	SIC	PC_Lead_Entity	LH_Lead_Entity
168	WALSHIRE ASSURN CO	6331	Lincoln General Insurance Co	N/A
169	WELLPOINT HEALTH NETWRKS INC	6331	N/A	BC Life & Health Ins Co
170	WELLPOINT INC	6331	N/A	Blue Cross of California
171	WHITE MTNS INS GROUP LTD	6331	OneBeacon Insurance Company	N/A
172	HCC INSURANCE HOLDINGS INC	6331	HCC Insurance Holdings	HCC Life Insurance Company
173	AFLAC INC	6351	N/A	American Family Life Assurance
174	ALFA CORP	6351	Alfa Insurance Pool	Alfa Life Ins Corp
175	ALLIED GROUP INC	6351	ALLIED Group	ALLIED Life Insurance Co
176	AMERICAN BANKERS INS GROUP	6351	American Bankers Group	American Bankers Life Assur Co
177	AMERICAN GENERAL CORP	6351	American General Property Ins	N/A
178	DONEGAL GROUP INC	6351	Donegal Insurance Group	N/A
179	INFINITY PROPERTY & CAS CORP	6351	Infinity Property & Casualty G	N/A
180	MERCER INSURANCE GROUP INC	6351	Mercer Insurance Group	N/A
181	MMI COMPANIES INC	6351	MMI Companies Group	American Continental Life Ins
182	PACIFICARE HEALTH SYSTEMS	6351	N/A	PacifiCare of California Inc
183	PENN-AMERICA GROUP INC	6351	Penn-America Group, Inc	N/A
184	PROFESSIONALS GROUP INC	6351	ProNational Insurance Group	N/A
185	PXRE GROUP LTD	6351	PXRE Reinsurance Company	N/A
186	RLI CORP	6351	RLI Group	N/A
187	SAFECO CORP	6351	SAFECO Ins Co of America	SAFECO Life Ins Co
188	SIERRA HEALTH SERVICES	6351	N/A	Sierra Health and Life Insuran
189	STANDARD MANAGEMENT CORP	6351	N/A	Standard Life Ins Co of IN
190	UNIVERSAL AMERICAN FINL CP	6351	N/A	American Progressive Life & He
191	ALLEGHANY CORP	6361	Allegany Insurance Group	N/A
192	ASPEN INSURANCE HOLDINGS LTD	6361	Aspen Specialty Insurance Comp	N/A
193	EMC INSURANCE GROUP INC	6399	EMC Insurance Companies	Employers Modern Life Co
194	ALLIANZ SE	6411	Allianz Insurance Group	Allianz Life Ins Co N America
195	ALLSTATE CORP	6411	Allstate Insurance Group	Allstate Life Ins Co
196	DELPHI FINANCIAL GRP -CL A	6411	Safety National Casualty Corp	N/A
197	HIGHLANDS INSURANCE GRP INC	6411	Highlands Insurance Group	N/A
198	NATIONWIDE FINL SVCS -CL A	6411	Nationwide Group	Nationwide Life Ins Co
199	AMERICAN NATIONAL INSURANCE	6411	American Nat Prop & Cas Group	American National Insurance Co

Note: List of all SIC codes in the firm list above:
6311- life insurance;
6321- accident and health insurance;
6324- hospital and medical service plans;
6331- fire, marine and casualty insurance;
6351- surety insurance;
6361- title insurance;
6399- insurance carriers;
6411- insurance agents, brokers and services

Essay Two

Insurer Rating Changes, Stock Returns, and Performance

1. Introduction

Rating agencies and stock investors evaluate information about insurance companies to form expectations regarding future firm performance. Like bond rating agencies, insurer rating agencies obtain proprietary information from company managers concerning business plans and in-depth information on asset and liability portfolios to determine insurer financial strength ratings (Best, 2007). Equity market participants must, in general, rely on publicly-available information to gauge their expectations about future earnings, cash flows, and market risks. In this paper, we run a "horse race" analysis between stock returns and rating agency's rating change news in predicting future insurer profitability. Using quarterly data and the Granger-causality framework, we also analyze how well the current insurer rating change news and stock returns reflect the past insurer profitability. Furthermore, extending the event study analysis of Essay one, we analyze the causality relationship between rating changes and stock returns.

Prior studies in the insurance literature on the relationship between rating changes and stock returns are limited in the scope of short-run event study. Halek and Eckles (2010) examine the stock market response to changes in insurer financial strength ratings and find negative stock market responses to rating downgrades, but no significant responses to rating upgrades. Prior studies have also considered the ability of insurer ratings and financial variables to predict insurer performance. Pottier (1998) finds that insurance company rating changes have predictive

power for the possibility of life insurer insolvency. Epermanis and Harrington (2006) analyze the premium growth surrounding the insurer rating changes for property-casualty (PC) insurers, and find evidence of premium decrease response to the rating downgrades. These studies do not directly address the insurer profitability and do not use a rigorous framework to formally address the issue of causality. This paper contributes to the literature by using the Granger-causality concept[1] to analyze the causality relationships among rating changes, stock returns, and insurer profitability. Granger-causality analysis is a unified model that not only uses multivariate regression approach to examining the relative timeliness of different regressors, but also is able to include all sample firms (firms experiencing good news, bad news, and no news) in the analysis.

Consistent with the bond rating literature[2], we find that the past stock returns measured by lagged quarterly cumulative abnormal returns (CAR) is positively related to the current quarterly change of insurer profitability for both property-casualty (PC) and life-health (LH) firms, but do not find past insurer rating changes predict current profitability. We also find that past stock returns are positively related to current rating changes, suggesting that at least some information relevant to the rating agency is impounded in stock prices before rating changes to reflect the new information. We document evidence that past profitability measures are positively related to the current rating changes in general, suggesting that the rating agency uses the past insurer profitability information in making rating decisions. We also find that in general, a past quarter threshold downgrade is negatively related to current quarter CAR for PC firms, but not for LH firms. We do not find past quarter threshold upgrades have any significant impact on the current quarter CAR. The past profitability measures are positively related to current

[1] See Wooldridge (2009)
[2] See Berger, Davies and Flannery (2000).

abnormal stock returns in general, suggesting that current stock returns reflect underlying company fundamentals.

The remainder of this paper is organized into the following seven sections. Section 2 provides a review of related finance and insurance literature. Section 3 discusses our sample and data selections. Section 4 describes the variables we use in our analysis. Section 5 presents the summary statistics of the variables. Section 6 discusses our Granger causality regression method. Section 7 presents the regression analysis results, and Section 8 concludes this study.

2. Literature Review

The impact of rating changes on firm operations and performances have been studied from various aspects in the finance and insurance literature. Kisgen (2006) examines the effect of credit ratings on capital structure decisions. He finds that firms near a credit rating change (either upgrade or downgrade) issue less debt relative to equity than firms not near a rating change. Prior studies of the relationship between insurer performance and ratings use annual financial data and virtually all insurers rated by A.M. Best (Best), which include both publicly traded and privately held firms. Pottier (1998) finds that insurance company rating changes have predictive power for the possibility of life insurer insolvency. Pottier and Sommer (1999) study the factors motivating insurance companies to obtain a rating, and find that insurers obtain ratings to reduce *ex ante* uncertainty about the insolvency risk. They also find that ratings are an increasing function of insurer profitability. Epermanis and Harrington (2006) analyze the relationship between insurance premium growth and changes in Best's property-casualty insurer ratings. Because they do not examine the stock market response to rating changes, they are able to include virtually all property-casualty insurers rated by Best. They find that premiums decrease

in the year of and the year following downgrades from the "A-" rating level, and that these premium declines are concentrated among commercial insurance. They also find some evidence that premiums decrease in the year preceding downgrades for insurers rated below the "A-" rating. Epermanis and Harrington (2006) interpret the greater premium response of commercial insurers as an indicator of greater risk sensitivity of insurance demand because of the weaker guaranty fund protection afforded commercial line policyholders.[3] Halek and Eckles (2010) examine the short-run stock market response to changes in insurer financial strength ratings for publicly traded insurers from 1993 to 2003, and find a significant negative stock market response to rating downgrades, which is substantially higher when the rating downgrades drop below the "A-" threshold. They do not find any significant response to Best rating upgrade announcements. More recently, Eckles and Halek (2011, working paper) investigate the determinants of these market negative reactions to rating downgrades. Using cross-sectional regression analysis, they find that various factors such as whether ratings are under review, the levels of the downgrade, the level of institutional ownership of property-casualty insurers, and the existence of other related announcements tend to significantly impact negative market reactions.

While the prior research provides insights into the impact of rating changes on firm operations and performances, return on equity (ROE) as an important measure of firm performance has not been studied in the insurer rating literature[4]. Epermanis and Harrington (2006) study the premium growth surrounding rating changes, but premium growth tells little about profitability. Furthermore, none of these studies uses the Granger causality analysis to

[3] This interpretation is consistent with Billet et al. (1998) who find that banks increase reliance on insured deposits more than the industry in the quarter of and quarter following a Moody's rating downgrade. They also find that downgraded banks with larger insured deposits relative to total liabilities experience smaller negative abnormal returns following the announcement of a rating downgrade.

[4] In other insurance literature, ROE has been used extensively to model insurer profitability. See Hoyt and Trieschmann (1991), Born (2001), and Greene and Segal (2004).

gauge the incremental explanatory power among each other for rating changes, stock returns, and firm performance. For example, these studies do not use rating change as the dependent variable. Epermanis and Harrington (2006) use premium growth as the only dependent variable in their analysis, and thus the causality issue is not fully addressed. In addition, prior insurer rating papers do not study both PC and LH insurers and treat them separately in the analysis. Epermanis and Harrington (2006) use the sample of PC firms only. Eckles and Halek (2011, working paper) use the sector variable only as the part of the interaction terms, and do not have a pure sector variable.

While drawing on the extant literature on insurer rating changes and bond rating changes, our study is most closely related to Berger, Davies and Flannery (2000) who compare the timeliness and accuracy of confidential government assessments of bank condition against bond rating agency and stock market evaluations of large U.S. bank holding companies.[5] Berger et al. (2000) find that lagged abnormal returns are significantly and positively related to current performance measured by changes in profitability, but do not find that lagged rating changes can predict current performance. Using data for insurers, we find that our results are consistent with their findings. They also find that lagged rating changes are significantly and positively related to current rating changes for both downgrades and upgrades, lagged abnormal returns are significantly and negatively related to current abnormal returns, but do not consider the Granger-causality between abnormal stock returns and bond rating changes. Like Berger et al. (2000), we examine quarterly changes in ratings, quarterly abnormal returns, and quarterly changes in performance measures. We also follow their Granger-causality approach to evaluate the

[5] In the insurance industry, regulatory assessments of insurer financial condition are made at the individual insurer level; that is, assessments are not made at the group or holding company level. In addition, the results of the most important regulatory assessment, known as FAST, are not publicly available.

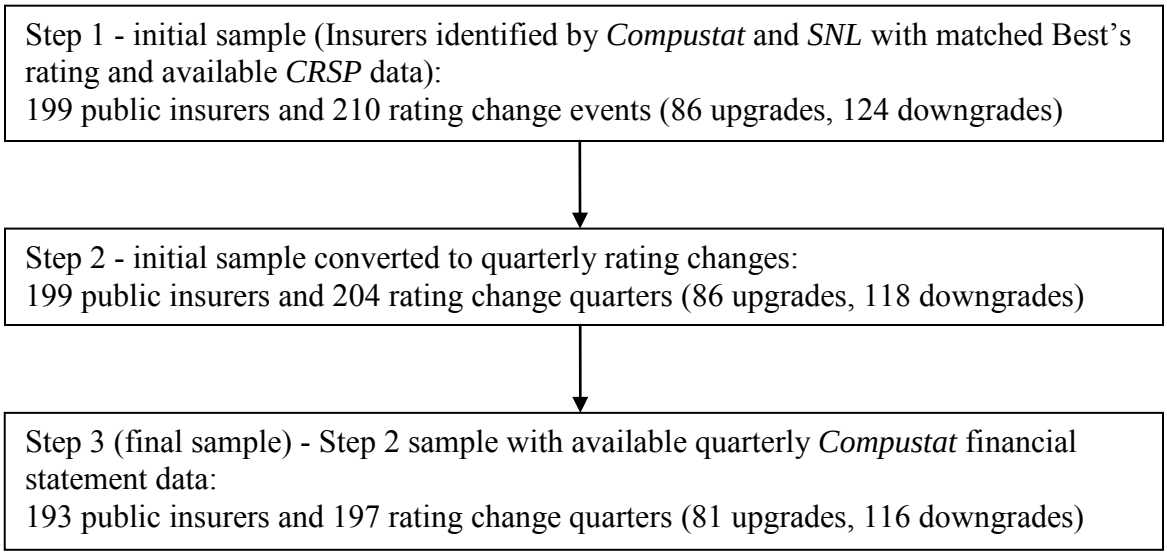
timeliness and the accuracy of stock returns and rating changes in predicting future holding company performance.

3. Sample and Data

Our initial sample[6] consists of public insurers identified by *Standard and Poor's Compustat* and *SNL Insurance Quarterly* for the period of year 1996-2006. Using *Best's Key Rating Guide*, we require all firms in our sample to have matched financial strength ratings with a letter grade of "A++" to "D" assigned by A.M. Best Company (Best), and to have monthly CRSP return data. This initial sample includes 199 public insurers and 210 rating change events that include 86 upgrades and 124 downgrades. We then convert all rating change events into quarterly rating changes. In other words, for a given quarter of analysis, no more than one rating change is recorded for each publicly-traded insurer.[7] This conversion results in same number (199) of insurers and 204 rating change quarters that include 86 upgrade quarters and 118 downgrade quarters.

We further require that each firm quarter has available quarterly financial statement data from *Compustat*. Our final sample consists of 193 public insurers and 197 rating change quarters. Among those 193 public insurers, 104 are property-casualty (PC) firms, 55 are liability-health (LH) firms, and the rest 34 are multi-line insurers[8]. Among 197 rating change quarters, 81 are upgrade quarters and 116 are downgrade quarters. The following graph briefly summarizes our sample generating process.

[6] This initial sample is the same as what we use in Essay one.
[7] For the entire sample period, an additional 6 quarters of rating changes are multiple changes related to the same publicly-traded insurer in the same quarter. In all of these 6 instances, there are 2 downgrades within the same quarter but no upgrades. In all of these 6 instances, the change was a change for the same matched entity.
[8] A PC or LH firm is defined as the public insurer that have either the property-casualty or life-health line as the only line of business reported by Best during the sample period.



The first quarter of rating change is 1996Q1 (the first quarter of 1996) and the last quarter of rating changes is the 2006Q4. Our regression analysis requires measures of four lags as explanatory variables. Therefore, four quarters from 1996Q1 to 1996Q4 are "eliminated" for dependent variables, but are used as lagged explanatory variables. Each insurer has thus the maximum of 40 quarter observations (1997Q1-2006Q4) in our regression analysis.

4. Variables

Our analysis consists of three main sets of variables and a set of control variables. The variables of primary interest are rating changes, abnormal stock returns, and changes in accounting measures of insurer performance.

The dependent variable of rating change is categorized as downgrade, no change, or upgrades and coded 0, 1, and 2, respectively. When rating changes are used an explanatory/independent variable, we differentiate between upgrades and downgrades, and whether the changes are threshold changes or non-threshold changes. We use both "A-" and

"B+" as our rating thresholds and a threshold rating change is defined as a change that either gain or lose any one of these two thresholds.[9] We also differentiate pre-regulation-FD and post-regulation-FD rating changes to address the potential issue of whether the Regulation FD (Fair Disclosure) affects the information value of rating agency's ratings. Regulation FD rule[10] mandates that all publicly traded firms must disclose material information to all investors at the same time, and thus prohibits firms from disclosing non-public information to favored investment professionals, but the rule does not prohibit firms from disclosing such non-public information to credit rating agencies. If Regulation FD makes rating agency have more advantage in obtaining non-public information than analysts, we would speculate that past rating changes become more valuable in predicting current abnormal returns or current profitability during the post-FD period. In this study, a pre-regulation-FD rating change is defined as a change that happened before October 23, 2000, when Regulation FD was implemented by Securities and Exchange (SEC), and a post-regulation-FD rating change is defined as a change that happened after that date. These rating change variables are coded as binary variables for the current quarter and for the four lags of the current quarter.

The quarterly abnormal return is calculated as the cumulative monthly abnormal return for the quarter. Monthly abnormal return is calculated as the actual monthly return of the firm minus the equal-weighted monthly return of our monthly-rebalanced benchmark portfolio. Our benchmark portfolios are carefully designed to adjust size, market-to-book, and industry factors and are rebalanced monthly. The formation of benchmark portfolios is explained as the following. For each calendar month during our sample period, we form 16 (4×4) equally

[9] Best defines "secure" rating as the one equal to or higher than "B+", and any rating below "B+" is defined as a "vulnerable" rating. Halek and Eckles (2010) point out that the "A-" threshold is more often used by consumers and institutional investors. In this study, we use both "A-" and "B+" as the thresholds.
[10] See SEC final rule, File No. S7-31-99, http://www.sec.gov/rules/final/33-7881.htm

weighted portfolios of all the identified public insurers with available stock return data, based on their size and market-to-book (MB) ratio[11]. First, we divide the monthly cross sections into size quartiles, based on the market capitalization, which is calculated by multiplying the closing prices from the previous month with the number of shares outstanding at the end of the previous month. Within each size quartile, we form 4 market-to-book portfolios. Book values equal to the last reported quarterly book value in *Compustat*, or the last reported quarterly book value in *SNL Quarterly* if *Compustat* does not have the quarterly book value data, or the last reported annual book value in *Compustat*, if quarterly data is not available in either *Compustat* or *SNL Quarterly*. Based on the size and MB quartile cutoffs, each month we assign firms into one of the 16 (4×4) benchmark portfolios and calculate the equal-weighted returns. If a firm has any rating change events in a month, we exclude that firm from the benchmark portfolio for that month. This size/MB matching benchmark method is also used by Dichev and Piotroski (2001) in the finance literature[12]. Our procedure produces 16 (4×4) monthly-rebalanced benchmark portfolio returns for each month during our sample period of year 1996-2006. Therefore, our quarterly abnormal return is represented by the following equation:

$$CAR_{i,T} = \sum_{t=1}^{T} \left(R_{i,t} - R_{benchmark-i,t} \right)$$

where $R_{i,t}$ is the stock return of insurer i in month t, $R_{benchmark\text{-}i,t}$ is the equally-weighted monthly return of the benchmark portfolio where firm i is assigned to during that month. $CAR_{i,T}$ is the cumulative abnormal return for insurer i in during the quarter T.

We use the quarterly change in the book return on equity, dROE, and RA-dROE, the risk adjusted dROE, as both accounting performance measures for the insurer. ROE is calculated as

[11] These public insurers also include firms that are not rated by *Best*, but are identified by *Compustat* & *SNL Quarterly* with available *CRSP* return data.

[12] They study the 3-month, 6-month, and 12-month market response to bond rating changes, and exclude the rating change firms but do not adjust for the industry factor in forming their benchmark portfolios.

the pre-tax quarterly income divided by the book value of equity for the quarter. dROE for the current quarter *t* is measured as the ROE for quarter *t*-1 minus the ROE for quarter *t*-2. We use this measure of quarterly dROE instead of the first difference of ROE, because the quarterly earnings are typically announced during the following quarter, and our quarterly dROE measures the change of ROE currently known for quarter *t*. RA-dROE for quarter *t* is calculated as the dROE for quarter *t* divided by the standard deviation of ROE over the past 8 quarters (quarter *t*-9 to quarter *t*-2)[13]. This risk-adjusted approach follows the method used by Berry Stolzle, Hoyt, and Wende (2010) where they adjust ROE by dividing ROE by the standard deviation of ROE over the past 5 years by using the annual data. For the purpose of our regression analysis, we use the log of total asset, the first lag of market-to-book ratio, and the first lag of the firm's financial leverage (debt to asset ratio) as control variables. In order to address the issue of possible outliers, we truncate our data to 1st and 99th percentile for variables CAR, ROE, MB and debt_ratio, before we calculate measures of dROE, RA_dROE, lag of MB, and lag of debt_ratio.

5. Summary Statistics

Summary statistics are presented in Table 1 Panel A, with the sample period of 1996Q1-2006Q4. The mean quarterly cumulative abnormal return (CAR) calculated based on our characteristic benchmark portfolios is negative 0.51 percent. The mean quarterly ROE is positive 2.89 percent, and the mean quarterly change in ROE is negative 0.49 percent. The mean of the rating change variable is 0.993, reflecting that the firm-quarters with downgrades exceeded the firm-quarters with upgrades. The mean values for "Up_No_Thresh" and "Down_No_Thresh" exceed the corresponding means for threshold changes, reflecting that most upgrades and downgrades are

[13] Our sample starts from 1996Q1, and since many insurers in our sample have missing *Compustat* earnings data before 1994, we use standard deviation of ROE over past 8 quarters to minimize the loss of observations for our regression analysis.

non-threshold rating changes. The mean market-to-book ratio is around 1.54, indicating that the equity is valued at 54% more than its book value. The mean financial leverage measure by debt to equity ratio is 76.1 percent. The mean log of asset 8.16 corresponds to assets of about $3.5 billion (as assets were in millions). Panel B presents a time series view of the median quarterly ROE during the period of 1996Q1-2006Q4.

6. Regression Method

Broadly speaking, our study includes four sets of variables, rating changes, abnormal stock returns, change in performance measures, and financial metrics that serve as controls. Suppose these four groups of variables are denoted *X*, *Y*, *Z* and *W*, with a subscript *t* denoting the current value and *t-k* denoting the k^{th} lag of the variable, where *k*=1 to 4. The vector *W* here contains relevant control variables. In general, three regression equations are estimated, then for each three some variation (or subset) of the independent variables are included. The three basic regression equations are as follows[14]:

$$X_t = \sum_{i=1}^{4} \alpha_i X_{t-i} + \sum_{j=1}^{4} \beta_i Y_{t-j} + \sum_{k=1}^{4} \gamma_i Z_{t-k} + \Phi W + \varepsilon_t$$

$$Y_t = \sum_{i=1}^{4} \delta_i Y_{t-i} + \sum_{j=1}^{4} \varphi_i X_{t-j} + \sum_{k=1}^{4} \eta_i Z_{t-k} + \Omega W + \mu_t$$

$$Z_t = \sum_{i=1}^{4} \lambda_i Z_{t-i} + \sum_{j=1}^{4} \pi_i X_{t-j} + \sum_{k=1}^{4} \theta_i Y_{t-k} + \Psi W + \upsilon_t$$

Granger (1969) starts from the premise that the future cannot cause the present of the past. If event A occurs after event B, we know that A cannot cause B. At the same time, if A occurs before B, it does not necessarily imply that A causes B. In practice, we observe A and B as time series and we would like to know whether A precedes B, or B precedes A, or they are

[14] Firm subscripts are omitted here for vector X, Y, Z, and W, since they represent vectors of firm observations.

contemporaneous. For instance, do movements in stock returns precede movements in ratings, or is it the opposite, or are the movements contemporaneous? In addition, are changes in firm performance before, after, or contemporaneous with changes in ratings? The purpose of Granger causality is to address such questions. Thus, we evaluate the timeliness of different information sets using the concept of Granger causality. More formally, a random variable Y Granger causes a random variable X if past Y helps improve the prediction of current X, given the past history of X and other control or explanatory variables[15]. Further, Y and X may be complementary and Granger causes each other, which would be the case if each discovered some different relevant information first. If in a regression of current values of Y on lagged values of Y and lagged values of X, the coefficients on the latter are jointly significant, then we say that X "Granger-causes" Y, recalling that by "causes" what is really meant is "precedes." However, Granger causality has nothing to say about contemporaneous causality between X and Y, and the form of the regression does not include contemporaneous values on the right hand side[16].

In economic terms, comparing stock market returns and rating changes, Granger causality tests measure the extent to which ratings agency information is 1) not impounded in lagged stock market returns, and 2) useful in forecasting subsequent movements in stock returns. Similarly, in comparing insurer performance and rating changes, Granger-causality tests measure the extent to which ratings agency information is 1) not impounded in lagged insurer performance measures, and 2) useful in forecasting subsequent movements in insurer performance. And likewise, Granger causality tests can also be conducted by comparing insurer performance and stock market returns. Although cross-sectional regression analysis of abnormal returns as can be done as part of an event study to address causality, normally this method lacks a control group (firms

[15] See Wooldridge (2009) for a brief introduction to Granger causality.
[16] See Wooldridge (2009) page 650.

that do not experience the event, or no news firms) and the design is not explicitly the same as that of the Granger causality. Granger causality is an extension of event study analysis and enables us to look at market response and explanatory power of different regressors in a unified model, while including all sample firms (good news, bad news, no news firms).

We use the ordered probit model when the dependent variable is the categorical variable rating change. When dependent variables are the continuous variables - abnormal returns and performance measures, we use fixed effect GLS regression for the panel data. In all regressions, we use robust standard errors to correct the potentially downward biased standard errors due to the possible heteroskedasticity between insurers and serial correlations within each insurer[17].

7. Regression Analysis

7.1 Predicting performance

In Table 2, 2.1, and 2.2, quarterly insurer performance measures calculated by changes in return on equity (dROE), and risk-adjusted dROE (RA-dROE) are regressed on lagged abnormal stock returns lagged rating upgrade and downgrade indicator variables, lagged dROE or RA-dROE, and control variables. Table 2 presents the results for all 193 firms, while Table 2.1 and 2.2 show the results for 104 PC firms (pure PC) and 55 LH (pure LH) firms respectively. Based on the results shown in Table 2, 2.1, and 2.2, lagged rating downgrade or upgrade variables generally do not do a good job of predicting current insurer performance, even after we control for lines of business. This seems to be inconsistent with Epermanis and Harrington (2006) that suggest insurer premium decreases surrounding rating downgrades. However, the premium decrease alone may not determine the profitability decrease, and the sample they use includes all public and non-public PC insurers, while our sample includes only the publicly-traded insurers. Lagged

[17] See Wooldridge (2002) page 276-278 for detailed theoretical discussions.

quarterly CAR is positively related to the current quarterly insurer performances for both PC and LH firms, indicating that the market does incorporate information about the future insurer performances, and thus wins the "horse race" against the rating agency in predicting future performance. This could very well reflect the impact of financial analysts' forecasts of earnings per share, which generally move in the same direction as actual (future) earnings per share. The lagged quarterly performance measured by both lagged dROE and lagged RA-dROE are negatively related to the current corresponding quarterly performance, indicating a mean reversion trend of quarterly performance measures. This is consistent with the evidence of mean reverting trend documented in the accounting literature[18]. PC Insurers with higher market-to-book ratio or higher financial leverage are more likely to experience a lower level of current performance, but this result does not hold true for LH firms.

7.2 Predicting rating changes

In Table 3, 3.1 and 3.2, the rating change variable, which has a value of 0, 1 or 2, is estimated by the ordered probit model using lagged abnormal stock returns, lagged quarterly performance, and lagged downgrade and upgrade rating change indicator variables, and control variables as the explanatory variables. Table 3 reports results for all firms, while Table 3.1 and 3.2 reports results for PC and LH firms respectively. Table 3 shows that for all firms in general, a past quarter threshold downgrade predicts a higher probability of current quarter downgrade. But when we break all firms down to PC and LH firms, the results seem to be mixed. For PC firms, future rating changes appear to have the same direction as the past rating changes. For LH firms, future rating changes appear to be more likely to have the opposite direction to the past rating changes, except that past quarter threshold downgrade predicts a higher probability of current quarter

[18] See Penman (1991)

downgrade[19]. A rating downgrade during the post-FD period appears to be more likely to be followed by another rating downgrade within the next four quarters, than a rating downgrade during the pre-FD period. As shown in Table 3, 3.1 and 3.2, lagged quarterly CAR is positively related to current rating change, suggesting that at least some information relevant to the rating agency is impounded in stock prices before rating changes to reflect the new information. Past performance as measured by quarterly ROE change (dROE) and the risk adjusted quarterly ROE change (RA-dROE) is positively related to the current rating change in general, suggesting that the rating change does reflect the past insurer performance. Overall, the results in Table 3, 3.1 and 3.2 support the hypothesis that abnormal stock returns and accounting performance Granger-cause rating changes for all public insurers.

7.3 Predicting abnormal stock returns

In Table 4, 4.1 and 4.2, quarterly abnormal stock returns CAR are regressed on lagged downgrade and upgrade rating change indicator variables, lagged quarterly performance measures, lagged CAR, and control variables. We find that in general, a past quarter threshold downgrade is negatively related to current quarter CAR, and this negative relationship is significant for PC firms but not for LH firms. For example, as shown in Table 4.1 and 4.2, a past quarter threshold downgrade lowers the current quarter CAR by around 15 percent for PC firms, and such result is statistically insignificant for LH firms. We do not find past quarter threshold upgrades have any significant impact on the current quarter CAR, for both PC and LH firms. An interesting finding of Table 4 is that a past quarter downgrade prior to Regulation FD reduces the

[19] In our original sample of 124 downgrade events, 32 downgrades are followed by a 2nd downgrade within the following four quarters; in the sample of 86 upgrade events, no upgrades are followed by a 2nd upgrade within the following four quarters; in the sample of 210 total rating changes, 8 rating changes (4 upgrades and 4 downgrades) are followed by a 2nd rating change of opposite direction within the following four quarters.

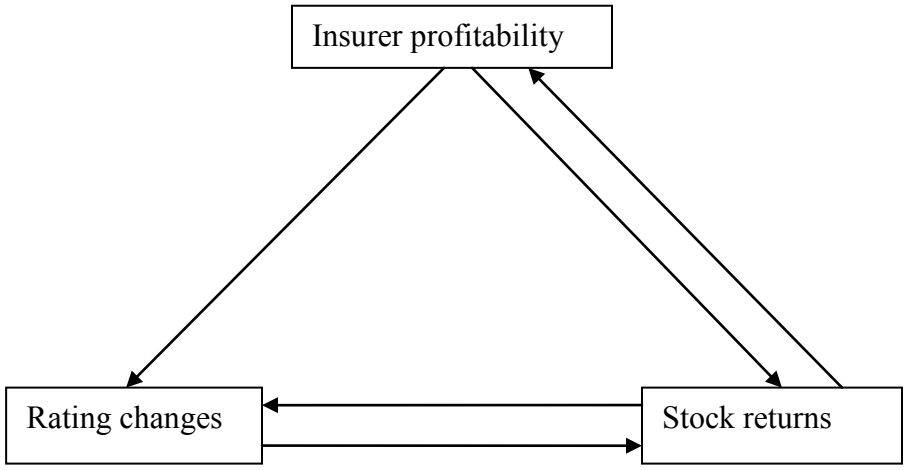
current quarter CAR by around 8 to 9 percent, while this negative relationship does not hold true for post-FD downgrades. Furthermore, a post-FD upgrade in the past 4 quarter increases the current quarter CAR by around 3 percent, while this positive relationship does not hold true for pre-FD upgrades. These findings suggest that during the post-FD period, past downgrades become less valuable in predicting negative abnormal returns, while past upgrades become more valuable in predicting positive abnormal returns. If Regulation FD makes rating agency have more advantage in obtaining non-public information than analysts, we would speculate that past rating changes become more valuable in predicting current abnormal returns during the post-FD period. We do not yet have a clear explanation to the fact that this speculation holds true for only upgrades but not downgrades. It could be due to the improved market efficiency, increased rating standards, or the combination of these factors. The lagged quarterly performance measures dROE and RA-dROE are positively related to current abnormal stock returns in general, consistent with the idea that stock returns reflect underlying company fundamentals. Lagged abnormal stock returns are significantly and negatively related to current abnormal stock returns, consistent with mean reversion in stock returns, which is well documented in the finance literature[20]. Table 4 also shows that firms with higher market-to-book ratios or larger size in the past quarter have lower current quarter CAR.

7.4 Granger causality summary

The following figure briefly summarizes our Granger-causality findings. Overall, we find that rating changes reflect the past insurer profitability measures, but rating changes do not have predictive power of future profitability. In addition, we also find Granger-causality flows both

[20] See Poterba and Summers (1988)

ways between quarterly insurer profitability measures and quarterly stock returns, and between quarterly stock returns and quarterly rating changes.



8. Conclusion

Rating agencies and stock investors evaluate information about insurance companies to form expectations regarding future firm performance. In this study, we contribute to the literature by using quarterly data to run a "horse race" analysis between stock returns and rating agency's rating change news in predicting future insurer profitability. We use the quarterly change in the book return on equity, dROE, and RA-dROE, the risk adjusted dROE, as both profitability measures for the insurer. Furthermore, we use the Granger-causality framework to systematically analyze the causality relationships among rating changes, stock returns, and insurer profitability.

Consistent with Berger et al (2000) that use bond ratings, we find that the past stock returns measured by lagged quarterly CAR is positively related to the current quarterly change of insurer profitability for both PC and LH firms, but do not find past insurer rating changes predict

current profitability. We also find that the lagged quarterly profitability measures are negatively related to the current quarter corresponding profitability measures – consistent with ROE mean reversion.

We also find that past stock returns are positively related to current rating changes, suggesting that at least some information relevant to the rating agency is impounded in stock prices before rating changes to reflect the new information. We document evidence that past performance as measured by both quarterly ROE change (dROE) and the risk adjusted quarterly ROE change (RA-dROE) is positively related to the current rating change in general. We also show that for all firms in general, a past quarter threshold downgrade predicts a higher probability of current quarter downgrade. Interestingly, for PC firms, future rating changes appear to have the same direction as the past rating changes. For LH firms, future rating changes appear to be more likely to have the opposite direction to the past rating changes, except the case of the threshold downgrade predicting a higher probability of future downgrade.

In predicting current stock returns, we find that in general, a past quarter threshold downgrade is negatively related to current quarter CAR, and this negative relationship is significant for PC firms but not for LH firms. We do not find past quarter threshold upgrades have any significant impact on the current quarter CAR, for both PC and LH firms. The past profitability measures are positively related to current abnormal stock returns in general, suggesting that current stock returns reflect underlying company fundamentals. We also find a mean reversion trend in stock returns, and that larger firms, firms with higher market-to-book ratios, tend to have lower stock returns.

With regards to our findings related to the impact of Regulation FD, we do not find either pre-FD or post-FD rating changes predict future insurer performance. However, a rating

downgrade during the post-FD period appears to be more likely to be followed by another rating downgrade within the next four quarters, than a rating downgrade during the pre-FD period. Interestingly, we also find evidence suggesting that during the post-FD period, past downgrades become less valuable in predicting negative abnormal returns, while past upgrades become more valuable in predicting positive abnormal returns. We do not yet have a clear explanation to this evidence but speculate that it could be due to the improved market efficiency, increased rating standards, or the combination of these factors.

Overall, we find that rating changes reflect the past insurer profitability measures, but rating changes do not have predictive power of future profitability. In general, we also find Granger-causality flows both ways between quarterly insurer profitability measures and quarterly stock returns, and between quarterly stock returns and quarterly rating changes.

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Table 1: Summary Statistics (Period: 1996Q1-2006Q4)

Panel A: Summary statistics

Name	Definition	Mean	Std. Dev.	Min	Max	Observations
CAR	Quarterly cumulative abnormal return[1]	-0.0051	0.1455	-0.4811	0.4554	4745
ROE	Quarterly pre-tax income divided by book value of equity	0.0289	0.0639	-0.3326	0.1819	4745
dROE	Quarterly ROE change(calculated by ROE_{t-1} minus ROE_{t-2} for quarter t)	-0.0007	0.0642	-0.5145	0.5145	4739
RAdROE	Risk-adjusted dROE[2]	-0.2028	2.1934	-18.322	19.399	4393
rating_change	Categorical variable: “0” for downgrade, “1” no change, “2” upgrade	0.9926	0.2036	0	2	4745
up_thresh	Dummy variable: “1” for threshold upgrades, and "0" otherwise[3]	0.0055	0.0738	0	1	4745
up_No_thresh	Dummy variable: “1” for non-threshold upgrades, and "0" otherwise	0.0116	0.1070	0	1	4745
down_thresh	Dummy variable: “1” for threshold downgrades, and "0" otherwise	0.0086	0.0926	0	1	4745
down_No_threshold	Dummy variable: “1” for non-threshold downgrades, and "0" otherwise	0.0158	0.1247	0	1	4745
up_postfd	Dummy variable: “1” for post-Reg-FD upgrades, and "0" otherwise[4]	0.0082	0.0903	0	1	4745
up_prefd	Dummy variable: “1” for pre-Reg-FD upgrades, and "0" otherwise	0.0089	0.0937	0	1	4745
down_prefd	Dummy variable: “1” for pre-Reg-FD downgrades, and "0" otherwise	0.0093	0.0959	0	1	4745
down_postfd	Dummy variable: “1” for post-Reg-FD downgrades, and "0" otherwise	0.0152	0.1223	0	1	4745
MB	Market-to-book ratio[5]	1.5372	0.9841	0.287	6.411	4745
debt_ratio	Debt-to-asset ratio	0.7611	0.1328	0.3794	0.9673	4745
log_asset	Natural log of total assets	8.1551	2.1473	-0.8393	14.145	4745

Note:

1. Quarterly CAR is calculated using monthly returns adjusted by our industry/size/mb adjusted and monthly rebalanced benchmark portfolios.
2. RAdROE is calculated by dROE divided by the standard deviation of ROE in the past 8 quarters (quarter t-9 to quarter t-2).
3. We use both "A-" and "B+" thresholds for A.M. Best financial strength ratings.
4. Reg-FD (Regulation-Fair-Disclosure) is implemented by SEC and takes effect on October 23, 2000.
5. MB is calculated by quarter-end market capitalization (=price * common shares outstanding) divided by quarter-end book value of equity.
6. We truncate the data to 1st and 99th percentile for variables CAR, ROE, MB and debt_ratio.

Panel B: Median ROE for each quarter

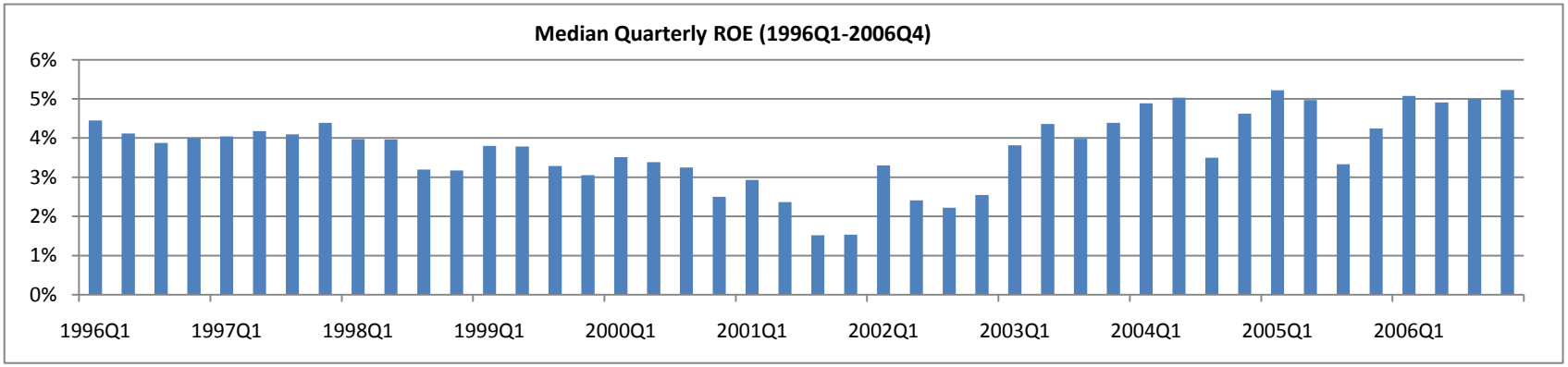

Table 1: Summary Statistics (Period: 1996Q1-2006Q4)

Panel C: Summary statistics for all (quarterly) lagged independent variables used in regressions

Name	Definition	Mean	Std. Dev.	Min	Max	Observations
Lcar	1st lag of CAR	-0.0052	0.1441	-0.4811	0.4554	4549
L2car	2nd lag of CAR	-0.0056	0.1427	-0.4811	0.4554	4353
L3car	3rd lag of CAR	-0.0050	0.1419	-0.4811	0.4554	4157
L4car	4th lag of CAR	-0.0042	0.1418	-0.4811	0.4554	3961
LdROE	1st lag of dROE	-0.0004	0.0632	-0.5145	0.5145	4543
L2dROE	2nd lag of dROE	0.0000	0.0627	-0.5145	0.5145	4347
L3dROE	3rd lag of dROE	-0.0011	0.0619	-0.5145	0.5145	4151
L4dROE	4th lag of dROE	-0.0011	0.0599	-0.5145	0.5145	3955
LRAdROE	1st lag of RAdROE	-0.2444	2.6339	-42.1477	15.8305	4202
L2RAdROE	2nd lag of RAdROE	-0.2364	2.6575	-42.1477	15.8305	4011
L3RAdROE	3rd lag of RAdROE	-0.2647	2.6609	-42.1477	15.8305	3821
L4RAdROE	4th lag of RAdROE	-0.2692	2.6466	-42.1477	15.8305	3634
Lup_thresh	1st lag of up_thresh	0.0057	0.0754	0	1	4549
L2up_thresh	2nd lag of up_thresh	0.0057	0.0756	0	1	4353
L3up_thresh	3rd lag of up_thresh	0.0055	0.0742	0	1	4157
L4up_thresh	4th lag of up_thresh	0.0058	0.0760	0	1	3961
Lup_No_thresh	1st lag of up_No_thresh	0.0114	0.1063	0	1	4549
L2up_No_thresh	2nd lag of up_No_thresh	0.0115	0.1066	0	1	4353
L3up_No_thresh	3rd lag of up_No_thresh	0.0115	0.1068	0	1	4157
L4up_No_thresh	4th lag of up_No_thresh	0.0119	0.1083	0	1	3961
Ldown_thresh	1st lag of down_thresh	0.0081	0.0898	0	1	4549
L2down_thresh	2nd lag of down_thresh	0.0080	0.0893	0	1	4353
L3down_thresh	3rd lag of down_thresh	0.0079	0.0888	0	1	4157
L4down_thresh	4th lag of down_thresh	0.0066	0.0808	0	1	3961
Ldown_No_thresh	1st lag of down_No_thresh	0.0160	0.1257	0	1	4549
L2down_No_thresh	2nd lag of down_No_thresh	0.0163	0.1267	0	1	4353
L3down_No_thresh	3rd lag of down_No_thresh	0.0154	0.1231	0	1	4157
L4down_No_thresh	4th lag of down_No_thresh	0.0157	0.1241	0	1	3961
Lup_postfd	1st lag of up_postfd	0.0079	0.0886	0	1	4549
L2up_postfd	2nd lag of up_postfd	0.0078	0.0880	0	1	4353
L3up_postfd	3rd lag of up_postfd	0.0075	0.0860	0	1	4157
L4up_postfd	4th lag of up_postfd	0.0078	0.0881	0	1	3961
Lup_prefd	1st lag of up_prefd	0.0092	0.0957	0	1	4549
L2up_prefd	2nd lag of up_prefd	0.0094	0.0966	0	1	4353
L3up_prefd	3rd lag of up_prefd	0.0096	0.0976	0	1	4157
L4up_prefd	4th lag of up_prefd	0.0098	0.0987	0	1	3961
Ldown_prefd	1st lag of down_prefd	0.0097	0.0979	0	1	4549
L2down_prefd	2nd lag of down_prefd	0.0096	0.0978	0	1	4353
L3down_prefd	3rd lag of down_prefd	0.0084	0.0914	0	1	4157
L4down_prefd	4th lag of down_prefd	0.0081	0.0895	0	1	3961
Ldown_postfd	1st lag of down_postfd	0.0145	0.1196	0	1	4549
L2down_postfd	2nd lag of down_postfd	0.0147	0.1204	0	1	4353
L3down_postfd	3rd lag of down_postfd	0.0149	0.1212	0	1	4157
L4down_postfd	4th lag of down_postfd	0.0141	0.1181	0	1	3961
Lmb	1st lag of MB (market-to-book ratio)	1.5349	0.9828	0.2872	6.4106	4549
Ldebt_ratio	1st lag of debt-to-asset ratio	0.7612	0.1324	0.3794	0.9673	4549

Table 2: Predicting performance (quarterly ROE changes) using fixed effect GLS regression with robust standard errors (All Firms)

Equation (2a-2d): dROE (or: RAdROE)$_{j,t}$ = *f* (Lagged CAR Variables, Rating Change Dummy Variables, Lagged performance (dROE or RAdROE) Variables, Control Variables) + ε_t

	Dep. Var: dROE (1997Q1-2006Q4)				Dep. Var: RAdROE (1997Q1-2006Q4)			
	Equation (2a)		Equation (2b)		Equation (2c)		Equation (2d)	
Indep. Variables	Coeff.	*t-stat*	Coeff.	*t-stat*	Coeff.	*t-stat*	Coeff.	*t-stat*
Up_Thresh								
First Lag	0.0034	*0.40*			0.5809 *	*2.13*		
Mean of 4 lags [1]	0.0056	*1.04*			0.2747	*1.08*		
Up_No_Thresh								
First Lag	-0.0047	*-0.62*			0.3138	*1.14*		
Mean of 4 lags	0.0015	*0.14*			0.0402	*0.02*		
Down_Thresh								
First Lag	0.0248	*1.29*			0.9577 *	*1.97*		
Mean of 4 lags	0.0043	*0.15*			0.5014 *	*3.85*		
Down_No_Thresh								
First Lag	-0.0112	*-1.10*			-0.6133	*-0.94*		
Mean of 4 lags	0.0167 ***	*11.08*			0.0004	*0.00*		
Up_post_FD								
First Lag			-0.0084	*-0.89*			0.1584	*0.56*
Mean of 4 lags			0.0073	*1.74*			0.2355	*1.18*
Up_pre_FD								
First Lag			0.0041	*0.76*			0.6309 *	*2.10*
Mean of 4 lags			0.0000	*0.00*			0.0480	*0.02*
Down_post_FD								
First Lag			0.0056	*0.49*			-0.3367	*-0.49*
Mean of 4 lags			0.0161 **	*7.62*			-0.0073	*0.00*
Down_pre_FD								
First Lag			-0.0161	*-0.98*			0.3692	*0.88*
Mean of 4 lags			0.0065	*0.48*			0.5502 *	*6.22*
CAR								
First Lag	0.0382 ***	*3.93*	0.0373 ***	*3.74*	1.3081 ***	*3.33*	1.3104 ***	*3.32*
Mean of 4 lags	0.0158 **	*8.23*	0.0162 **	*8.66*	0.6419 ***	*11.22*	0.6626 ***	*12.24*
dROE								
First Lag	-0.7105 ***	*-17.25*	-0.7178 ***	*-18.31*				
Mean of 4 lags	-0.4561 ***	*223.17*	-0.4608 ***	*218.93*				
RA_dROE								
First Lag					-0.2681 ***	*-12.22*	-0.2692 ***	*-12.03*
Mean of 4 lags					-0.1172 ***	*74.44*	-0.1179 ***	*76.98*
L_MB	-0.0041 *	*-2.05*	-0.0042 *	*-2.10*	-0.0584	*-0.61*	-0.0825	*-0.84*
L_DTA	-0.0244	*-0.84*	-0.0226	*-0.78*	-0.5633	*-0.56*	-0.4577	*-0.45*
log_asset	-0.0057 $	*-1.84*	-0.0063 *	*-1.98*	-0.1007	*-0.81*	-0.1059	*-0.89*
constant	0.0701 **	*2.71*	0.0739 **	*2.79*	0.9892	*0.74*	0.9881	*0.76*
Overall R squared	0.2427		0.2352		0.0430		0.0440	
# of Obs (firm-quarters)	3955		3955		3583		3583	
# of Firms	193		193		179		179	

Note: dROE is Quarterly ROE change; RA_dROE is the risk-adjusted dROE calculated by dROE divided by the standard deviation of ROE in the past 8 quarters; CAR is quarterly cumulative abnormal return calculated using our benchmark portfolio method; Up_Thresh, Up_No_Thresh, Down_Thresh, Down_No_Thresh, Up_pre_FD,Up_post_FD, Down_pre_FD, Down_Post_FD are rating change dummy variables that indicate whether the change is upgrade or downgrade, threshold or non-threshold, and pre- or post-regulation-FD changes; L_MB is the quarterly lag of the market-to-book ratio; L_DTA is the quarterly lag of the debt-to-asset ratio. The mean coefficients of all 4 lags are reported; the corresponding test statistic is the result of two-tailed joint F-test with null hypothesis that the mean coefficient of all lags equals 0; $, *, **, *** are signs of statistical significance (different from zero), based on two-sided t-statistic or F-statistic, with confidence level of 10%, 5%, 1%, and 0.1% respectively.

Table 2.1: Predicting performance (quarterly ROE changes) using fixed effect GLS regression with robust standard errors (PC Firms)

Equation (2a-2d): dROE (or: RAdROE)$_{j,t}$ = *f* (Lagged CAR Variables, Rating Change Dummy Variables, Lagged performance (dROE or RAdROE) Variables, Control Variables) + ε_t

	Dep. Var: dROE (1997Q1-2006Q4)				Dep. Var: RAdROE (1997Q1-2006Q4)			
	Equation (2a)		Equation (2b)		Equation (2c)		Equation (2d)	
Indep. Variables	Coeff.	*t-stat*	Coeff.	*t-stat*	Coeff.	*t-stat*	Coeff.	*t-stat*
Up_Thresh								
First Lag	0.0014	*0.10*			0.4103	*0.76*		
Mean of 4 lags [1]	0.0005	*0.00*			-0.0694	*0.02*		
Up_No_Thresh								
First Lag	0.0019	*0.23*			0.6060	*1.30*		
Mean of 4 lags	0.0041	*0.82*			0.7624 *	*6.04*		
Down_Thresh								
First Lag	0.0203	*0.64*			1.6321 ***	*3.45*		
Mean of 4 lags	0.0012	*0.01*			0.9492 **	*7.80*		
Down_No_Thresh								
First Lag	-0.0145	*-0.89*			0.0485	*0.10*		
Mean of 4 lags	0.0239 **	*7.27*			0.3317	*1.41*		
Up post FD								
First Lag			-0.0045	*-0.38*			-0.0356	*-0.07*
Mean of 4 lags			0.0088	*1.36*			0.5255	*2.42*
Up pre FD								
First Lag			0.0125 *	*2.11*			1.3028 ***	*3.97*
Mean of 4 lags			0.0001	*0.00*			0.4221	*1.07*
Down post FD								
First Lag			0.0234	*1.19*			0.7974 $	*1.83*
Mean of 4 lags			0.0300 ***	*16.60*			0.5610 *	*4.76*
Down_pre_FD								
First Lag			-0.0435 *	*-2.02*			0.3996	*0.61*
Mean of 4 lags			-0.0053	*0.17*			0.6011 $	*3.44*
CAR								
First Lag	0.0413 **	*2.81*	0.0397 **	*2.71*	1.8739 **	*2.82*	1.7648 **	*2.70*
Mean of 4 lags	0.0221 **	*7.41*	0.0228 **	*7.27*	1.1380 ***	*11.53*	1.0710 ***	*11.33*
dROE								
First Lag	-0.6938 ***	*-12.15*	-0.7016 ***	*-13.99*				
Mean of 4 lags	-0.5111 ***	*136.11*	-0.5089 ***	*139.91*				
RA_dROE								
First Lag					-0.2966 ***	*-10.84*	-0.2959 ***	*-10.84*
Mean of 4 lags					-0.1510 ***	*57.81*	-0.1510 ***	*57.58*
L_MB	-0.0155 **	*-2.70*	-0.0147 **	*-2.61*	-0.5834 *	*-2.41*	-0.5590 *	*-2.35*
L_DTA	-0.0840 *	*-2.22*	-0.0854 *	*-2.29*	-3.3869 *	*-2.01*	-3.2910 $	*-1.95*
log_asset	-0.0016	*-0.35*	-0.0025	*-0.55*	0.1065	*0.54*	0.0797	*0.41*
constant	0.0909 *	*2.48*	0.0983 **	*2.66*	1.9897	*1.26*	2.0903	*1.33*
Overall R squared	0.2554		0.2639		0.0613		0.0598	
# of Obs (firm-quarters)	1943		1943		1746		1746	
# of Firms	104		104		95		95	

Note: dROE is Quarterly ROE change; RA_dROE is the risk-adjusted dROE calculated by dROE divided by the standard deviation of ROE in the past 8 quarters; CAR is quarterly cumulative abnormal return calculated using our benchmark portfolio method; Up_Thresh, Up_No_Thresh, Down_Thresh, Down_No_Thresh, Up_pre_FD,Up_post_FD, Down_pre_FD, Down_Post_FD are rating change dummy variables that indicate whether the change is upgrade or downgrade, threshold or non-threshold, and pre- or post-regulation-FD changes; L_MB is the quarterly lag of the market-to-book ratio; L_DTA is the quarterly lag of the debt-to-asset ratio. The mean coefficients of all 4 lags are reported; the corresponding test statistic is the result of two-tailed joint F-test with null hypothesis that the mean coefficient of all lags equals 0; $, *, **, *** are signs of statistical significance (different from zero), based on two-sided t-statistic or F-statistic, with confidence level of 10%, 5%, 1%, and 0.1% respectively.

Table 2.2: Predicting performance (quarterly ROE changes) using fixed effect GLS regression with robust standard errors (LH Firms)

Equation (2a-2d): dROE (or: RAdROE)$_{j,t}$ = *f* (Lagged CAR Variables, Rating Change Dummy Variables, Lagged performance (dROE or RAdROE) Variables, Control Variables) + ε_t

	Dep. Var: dROE (1997Q1-2006Q4)				Dep. Var: RAdROE (1997Q1-2006Q4)			
	Equation (2a)		Equation (2b)		Equation (2c)		Equation (2d)	
Indep. Variables	Coeff.	*t-stat*	Coeff.	*t-stat*	Coeff.	*t-stat*	Coeff.	*t-stat*
Up_Thresh								
First Lag	-0.0062	*-0.88*			0.2776	*1.09*		
Mean of 4 lags [1]	0.0034	*0.51*			0.3084	*1.05*		
Up_No_Thresh								
First Lag	-0.0313	*-1.48*			0.1070	*0.26*		
Mean of 4 lags	-0.0015	*0.03*			-0.8352	*1.15*		
Down_Thresh								
First Lag	-0.0071	*-0.35*			-0.9708	*-0.85*		
Mean of 4 lags	-0.0248	*1.65*			-0.8833	*2.40*		
Down_No_Thresh								
First Lag	-0.0061	*-0.38*			0.4674	*0.76*		
Mean of 4 lags	0.0092	*0.36*			-0.2853	*0.29*		
Up_post_FD								
First Lag			-0.0291	*-1.47*			0.0122	*0.05*
Mean of 4 lags			0.0013	*0.02*			-0.1651	*0.32*
Up_pre_FD								
First Lag			-0.0064	*-1.08*			0.4830	*0.81*
Mean of 4 lags			0.0015	*0.08*			-0.6248	*0.26*
Down_post_FD								
First Lag			-0.0071	*-0.46*			-0.3671	*-0.42*
Mean of 4 lags			-0.0122	*0.55*			-0.6783	*1.64*
Down_pre_FD								
First Lag			-0.0319	*-1.10*			-0.6291	*-1.12*
Mean of 4 lags			0.0236 $	*3.82*			0.3076	*0.56*
CAR								
First Lag	0.0505 **	*2.80*	0.0491 **	*2.58*	1.4720 **	*2.69*	1.4651 **	*2.60*
Mean of 4 lags	0.0175	*2.43*	0.0183	*2.56*	0.6155 *	*4.03*	0.6387 *	*4.78*
dROE								
First Lag	-0.7320 ***	*-8.62*	-0.7310 ***	*-8.47*				
Mean of 4 lags	-0.3694 ***	*33.98*	-0.3705 ***	*32.61*				
RA_dROE								
First Lag					-0.2793 ***	*-5.17*	-0.2734 ***	*-5.62*
Mean of 4 lags					-0.1045 ***	*11.24*	-0.0979 ***	*14.87*
L_MB	-0.0016	*-0.48*	-0.0022	*-0.68*	0.0982	*0.75*	0.0583	*0.42*
L_DTA	0.0185	*0.30*	0.0167	*0.27*	2.6562	*1.31*	2.6393	*1.35*
log_asset	-0.0073	*-1.13*	-0.0065	*-1.00*	-0.0561	*-0.18*	-0.1012	*-0.39*
constant	0.0495	*0.78*	0.0456	*0.72*	-2.0449	*-0.53*	-1.5847	*-0.47*
Overall R squared	0.3176		0.3181		0.0955		0.1110	
# of Obs (firm-quarters)	993		993		902		902	
# of Firms	55		55		51		51	

Note: dROE is Quarterly ROE change; RA_dROE is the risk-adjusted dROE calculated by dROE divided by the standard deviation of ROE in the past 8 quarters; CAR is quarterly cumulative abnormal return calculated using our benchmark portfolio method; Up_Thresh, Up_No_Thresh, Down_Thresh, Down_No_Thresh, Up_pre_FD,Up_post_FD, Down_pre_FD, Down_Post_FD are rating change dummy variables that indicate whether the change is upgrade or downgrade, threshold or non-threshold, and pre- or post-regulation-FD changes; L_MB is the quarterly lag of the market-to-book ratio; L_DTA is the quarterly lag of the debt-to-asset ratio. The mean coefficients of all 4 lags are reported; the corresponding test statistic is the result of two-tailed joint F-test with null hypothesis that the mean coefficient of all lags equals 0; $, *, **, *** are signs of statistical significance (different from zero), based on two-sided t-statistic or F-statistic, with confidence level of 10%, 5%, 1%, and 0.1% respectively.

Table 3: Predicting Rating Changes using Ordered Probit Regression with Robust Standard Errors (All Firms, 1997Q1-2006Q4)

Equation (3a-3d): Probability (Rating_Change$_{j,t}$) = f (Lagged quarterly CAR variables, Lagged performance (dROE or RA-dROE) variables, lagged rating change dummy Variables, control variables) + ε_t

	Equation (3a)		Equation (3b)		Equation (3c)		Equation (3d)	
Indep. Variables	Coeff.	*z-stat*	Coeff.	*z-stat*	Coeff.	*z-stat*	Coeff.	*z-stat*
Up_Thresh								
First Lag	-0.2174	*-1.40*			-0.2424	*-1.63*		
Mean of 4 lags [1]	-0.0761	*1.07*			-0.1076	*2.07*		
Up_No_Thresh								
First Lag	0.0376	*0.63*			0.0178	*0.27*		
Mean of 4 lags	0.1245	*1.33*			0.1444	*1.67*		
Down_Thresh								
First Lag	-0.7055 *	*-2.45*			-0.7643 *	*-2.55*		
Mean of 4 lags	-0.0322	*0.03*			0.0078	*0.00*		
Down_No_Thresh								
First Lag	-0.2156	*-1.06*			-0.0822	*-0.36*		
Mean of 4 lags	0.0368	*0.10*			0.0256	*0.04*		
Up_post_FD								
First Lag			-0.0537	*-0.71*			-0.1111	*-1.48*
Mean of 4 lags			0.1522	*1.77*			0.0607	*0.20*
Up_pre_FD								
First Lag			0.0536	*0.65*			0.0774	*0.88*
Mean of 4 lags			-0.0181	*0.04*			0.0755	*1.75*
Down_post_FD								
First Lag			-0.4640 *	*-2.22*			-0.3883 $	*-1.66*
Mean of 4 lags			-0.0282	*0.05*			-0.0150	*0.01*
Down_pre_FD								
First Lag			-0.3486	*-1.30*			-0.4466	*-1.55*
Mean of 4 lags			0.0551	*0.11*			0.0151	*0.01*
CAR								
First Lag	0.7258 **	*2.70*	0.7877 **	*2.95*	0.8970 **	*3.17*	0.9361 ***	*3.33*
Mean of 4 lags	0.7994 ***	*35.56*	0.8023 ***	*34.97*	0.8375 ***	*37.39*	0.8473 ***	*38.51*
dROE								
First Lag	0.5804	*0.82*	0.5840	*0.84*				
Mean of 4 lags	1.1895 $	*3.44*	1.2740 $	*3.76*				
RA_dROE								
First Lag					0.0105	*0.72*	0.0082	*0.57*
Mean of 4 lags					0.0181 *	*5.14*	0.0164 *	*4.15*
L_MB	-0.0114	*-0.31*	-0.0142	*-0.39*	-0.0122	*-0.32*	-0.0119	*-0.32*
L_DTA	-0.7695 *	*-2.53*	-0.7991 **	*-2.64*	-0.6715 *	*-2.07*	-0.6671 *	*-2.08*
log_asset	0.0085	*0.43*	0.0115	*0.59*	0.0037	*0.18*	0.0039	*0.18*
Pseudo R squared	0.0801		0.0763		0.0787		0.0684	
# of Obs (firm-quarters)	3955		3955		3595		3595	
# of Firms	193		193		180		180	

Note: dROE is Quarterly ROE change; RA_dROE is the risk-adjusted dROE calculated by dROE divided by the standard deviation of ROE in the past 8 quarters; CAR is quarterly cumulative abnormal return calculated using our benchmark portfolio method; Up_Thresh, Up_No_Thresh, Down_Thresh, Down_No_Thresh, Up_pre_FD,Up_post_FD, Down_pre_FD, Down_Post_FD are rating change dummy variables that indicate whether the change is upgrade or downgrade, threshold or non-threshold, and pre- or post-regulation-FD changes; L_MB is the quarterly lag of the market-to-book ratio; L_DTA is the quarterly lag of the debt-to-asset ratio. The mean coefficients of all 4 lags are reported; the corresponding test statistic is the result of two-tailed joint F-test with null hypothesis that the mean coefficient of all lags equals 0; $, *, **, *** are signs of statistical significance (different from zero), based on two-sided t-statistic or F-statistic, with confidence level of 10%, 5%, 1%, and 0.1% respectively.

Table 3.1: Predicting Rating Changes using Ordered Probit Regression with Robust Standard Errors (PC Firms, 1997Q1-2006Q4)

Equation (3a-3d): Probability (Rating_Change$_{j,t}$) = f (Lagged quarterly CAR variables, Lagged performance (dROE or RA-dROE) variables, lagged rating change dummy Variables, control variables) + ε_t

Indep. Variables	Equation (3a) Coeff.	*z-stat*	Equation (3b) Coeff.	*z-stat*	Equation (3c) Coeff.	*z-stat*	Equation (3d) Coeff.	*z-stat*
Up_Thresh								
First Lag	-0.1815	*-1.00*			-0.2790	*-1.56*		
Mean of 4 lags [1]	-0.0558	*0.32*			-0.1014	*1.00*		
Up_No_Thresh								
First Lag	0.1858 *	*2.01*			0.1835 $	*1.66*		
Mean of 4 lags	0.4517 ***	*16.49*			0.3889 **	*9.17*		
Down_Thresh								
First Lag	-0.7142 $	*-1.82*			-0.8746 *	*-2.11*		
Mean of 4 lags	-0.1520	*0.33*			-0.0599	*0.06*		
Down_No_Thresh								
First Lag	-0.3365	*-0.95*			-0.5472	*-1.54*		
Mean of 4 lags	-0.0403	*0.06*			-0.1902	*1.37*		
Up_post_FD								
First Lag			0.0051	*0.04*			-0.0264	*-0.24*
Mean of 4 lags			0.3554 **	*8.55*			0.2511 $	*3.35*
Up_pre_FD								
First Lag			0.1907	*1.60*			0.2099	*1.48*
Mean of 4 lags			0.1757 *	*4.46*			0.1558 $	*2.95*
Down_post_FD								
First Lag			-0.5328	*-1.52*			-0.6730 $	*-1.88*
Mean of 4 lags			-0.1318	*0.35*			-0.2001	*0.77*
Down_pre_FD								
First Lag			-0.5643 $	*-1.66*			-0.6939 $	*-1.90*
Mean of 4 lags			-0.1459	*0.51*			-0.1796	*0.72*
CAR								
First Lag	0.3342	*0.92*	0.4243	*1.18*	0.5291	*1.37*	0.5654	*1.51*
Mean of 4 lags	0.5792 **	*7.14*	0.5761 **	*6.86*	0.6977 **	*10.50*	0.6876 **	*10.21*
dROE								
First Lag	0.7913	*0.92*	0.5235	*0.60*				
Mean of 4 lags	1.4528	*2.10*	1.3252	*1.81*				
RA_dROE								
First Lag					-0.0084	*-0.39*	-0.0111	*-0.54*
Mean of 4 lags					0.0123	*0.78*	0.0117	*0.73*
L_MB	-0.1063	*-1.47*	-0.1025	*-1.45*	-0.1259	*-1.54*	-0.1221	*-1.55*
L_DTA	-1.3973 **	*-3.07*	-1.4266 **	*-3.16*	-1.1802 *	*-2.43*	-1.1693 *	*-2.46*
log_asset	0.0494 $	*1.70*	0.0502 $	*1.72*	0.0433	*1.38*	0.0440	*1.39*
Pseudo R squared	0.0978		0.0871		0.0931		0.0769	
# of Obs (firm-quarters)	1943		1943		1750		1750	
# of Firms	104		104		95		95	

Note: dROE is Quarterly ROE change; RA_dROE is the risk-adjusted dROE calculated by dROE divided by the standard deviation of ROE in the past 8 quarters; CAR is quarterly cumulative abnormal return calculated using our benchmark portfolio method; Up_Thresh, Up_No_Thresh, Down_Thresh, Down_No_Thresh, Up_pre_FD,Up_post_FD, Down_pre_FD, Down_Post_FD are rating change dummy variables that indicate whether the change is upgrade or downgrade, threshold or non-threshold, and pre- or post-regulation-FD changes; L_MB is the quarterly lag of the market-to-book ratio; L_DTA is the quarterly lag of the debt-to-asset ratio. The mean coefficients of all 4 lags are reported; the corresponding test statistic is the result of two-tailed joint F-test with null hypothesis that the mean coefficient of all lags equals 0; $, *, **, *** are signs of statistical significance (different from zero), based on two-sided t-statistic or F-statistic, with confidence level of 10%, 5%, 1%, and 0.1% respectively.

Table 3.2: Predicting Rating Changes using Ordered Probit Regression with Robust Standard Errors (LH Firms, 1997Q1-2006Q4)

Equation (3a-3d): Probability (Rating_Change$_{j,t}$) = f (Lagged quarterly CAR variables, Lagged performance (dROE or RA-dROE) variables, lagged rating change dummy Variables, control variables) + ε_t

	Equation (3a)		Equation (3b)		Equation (3c)		Equation (3d)	
Indep. Variables	Coeff.	*z-stat*	Coeff.	*z-stat*	Coeff.	*z-stat*	Coeff.	*z-stat*
Up_Thresh								
First Lag	-0.2780	*-1.50*			-0.3518 $	*-1.74*		
Mean of 4 lags [1]	-0.3039 $	*3.94*			-0.3966 *	*5.59*		
Up_No_Thresh								
First Lag	-0.2059	*-1.37*			-0.2689 $	*-1.93*		
Mean of 4 lags	-0.2540 $	*2.77*			-0.2940 $	*3.61*		
Down_Thresh								
First Lag	-1.0805 *	*-2.18*			-1.0744 *	*-2.17*		
Mean of 4 lags	-0.4500 $	*4.09*			-0.4845 *	*4.64*		
Down_No_Thresh								
First Lag	0.3411	*1.50*			0.4348	*1.41*		
Mean of 4 lags	0.4532 **	*9.99*			0.5812 ***	*12.36*		
Up_post_FD								
First Lag			-0.2413	*-1.54*			-0.3364 *	*-2.19*
Mean of 4 lags			-0.3028 $	*3.72*			-0.3975 *	*5.77*
Up_pre_FD								
First Lag			-0.1915	*-1.23*			-0.1201	*-0.76*
Mean of 4 lags			-0.1596	*1.99*			-0.1339	*1.24*
Down_post_FD								
First Lag			-0.6860 $	*-1.70*			-0.7515 $	*-1.74*
Mean of 4 lags			-0.0360	*0.02*			-0.0468	*0.04*
Down_pre_FD								
First Lag			0.1588	*0.71*			0.1276	*0.54*
Mean of 4 lags			0.3301 *	*5.73*			0.3205 *	*5.53*
CAR								
First Lag	0.2675	*0.57*	0.4453	*0.91*	0.3991	*0.82*	0.5723	*1.15*
Mean of 4 lags	0.6743 **	*8.98*	0.7366 **	*10.65*	0.7260 ***	*10.80*	0.7901 ***	*12.66*
dROE								
First Lag	1.4770	*1.25*	1.2894	*1.10*				
Mean of 4 lags	1.1419	*0.97*	0.9383	*0.68*				
RA_dROE								
First Lag					0.0143	*0.72*	0.0105	*0.49*
Mean of 4 lags					0.0157 $	*3.12*	0.0090	*0.79*
L_MB	0.0408	*0.78*	0.0348	*0.68*	0.0429	*0.81*	0.0366	*0.70*
L_DTA	0.6223	*1.13*	0.5444	*1.02*	0.5481	*0.90*	0.5310	*0.91*
log_asset	-0.0750 $	*-1.80*	-0.0644	*-1.64*	-0.0767 $	*-1.65*	-0.0631	*-1.46*
Pseudo R squared	0.1121		0.0851		0.1188		0.0920	
# of Obs (firm-quarters)	993		993		905		905	
# of Firms	55		55		51		51	

Note: dROE is Quarterly ROE change; RA_dROE is the risk-adjusted dROE calculated by dROE divided by the standard deviation of ROE in the past 8 quarters; CAR is quarterly cumulative abnormal return calculated using our benchmark portfolio method; Up_Thresh, Up_No_Thresh, Down_Thresh, Down_No_Thresh, Up_pre_FD,Up_post_FD, Down_pre_FD, Down_Post_FD are rating change dummy variables that indicate whether the change is upgrade or downgrade, threshold or non-threshold, and pre- or post-regulation-FD changes; L_MB is the quarterly lag of the market-to-book ratio; L_DTA is the quarterly lag of the debt-to-asset ratio. The mean coefficients of all 4 lags are reported; the corresponding test statistic is the result of two-tailed joint F-test with null hypothesis that the mean coefficient of all lags equals 0; $, *, **, *** are signs of statistical significance (different from zero), based on two-sided t-statistic or F-statistic, with confidence level of 10%, 5%, 1%, and 0.1% respectively.

Table 4: Predicting quarterly CAR using fixed effect GLS regression with Robust Standard Errors (All Firms, 1997Q1-2006Q4)

Equation (4a-4d): $CAR_{j,t}$ = f (Lagged quarterly CAR variables, Lagged performance (dROE or RA-dROE) variables, lagged rating change dummy Variables, control variables) + ε_t

	Equation (4a)		Equation (4b)		Equation (4c)		Equation (4d)	
Indep. Variables	Coeff.	*t-stat*	Coeff.	*t-stat*	Coeff.	*t-stat*	Coeff.	*t-stat*
Up_Thresh								
First Lag	-0.0203	*-0.67*			-0.0176	*-0.52*		
Mean of 4 lags [1]	0.0128	*0.50*			0.0119	*0.38*		
Up_No_Thresh								
First Lag	0.0062	*0.30*			0.0133	*0.58*		
Mean of 4 lags	0.0095	*0.73*			0.0086	*0.46*		
Down_Thresh								
First Lag	-0.1326 **	*-2.87*			-0.1065 *	*-2.24*		
Mean of 4 lags	0.0152	*0.32*			0.0217	*0.57*		
Down_No_Thresh								
First Lag	0.0005	*0.02*			-0.0012	*-0.05*		
Mean of 4 lags	0.0177	*2.33*			0.0169	*1.79*		
Up post FD								
First Lag			0.0006	*0.03*			-0.0088	*-0.38*
Mean of 4 lags			0.0304 *	*4.98*			0.0266 $	*3.19*
Up_pre_FD								
First Lag			0.0033	*0.11*			0.0265	*0.85*
Mean of 4 lags			-0.0039	*0.08*			-0.0027	*0.03*
Down_post_FD								
First Lag			-0.0115	*-0.43*			-0.0053	*-0.20*
Mean of 4 lags			0.0285 *	*4.54*			0.0300 *	*4.27*
Down_pre_FD								
First Lag			-0.0891 *	*-2.29*			-0.0850 $	*-1.87*
Mean of 4 lags			-0.0033	*0.02*			0.0003	*0.00*
CAR								
First Lag	-0.0996 ***	*-4.26*	-0.0969 ***	*-4.16*	-0.0831 ***	*-3.41*	-0.0811 ***	*-3.35*
Mean of 4 lags	-0.0391 **	*9.13*	-0.0406 **	*9.69*	-0.0342 *	*6.44*	-0.0350 **	*6.73*
dROE								
First Lag	0.1333 $	*1.93*	0.1480 *	*2.15*				
Mean of 4 lags	0.1015 $	*3.41*	0.1116 $	*4.03*				
RA_dROE								
First Lag					0.0000	*-0.02*	0.0001	*0.09*
Mean of 4 lags					0.0014 *	*4.32*	0.0016 *	*5.38*
L_MB	-0.0299 ***	*-5.37*	-0.0295 ***	*-5.33*	-0.0288 ***	*-4.94*	-0.0287 ***	*-4.93*
L_DTA	0.0230	*0.40*	0.0300	*0.52*	-0.0073	*-0.12*	0.0012	*0.02*
log_asset	-0.0223 **	*-3.01*	-0.0254 ***	*-3.31*	-0.0233 **	*-3.04*	-0.0263 ***	*-3.34*
constant	0.2046 ***	*3.21*	0.2242 ***	*3.44*	0.2377 ***	*3.45*	0.2557 ***	*3.65*
Overall R squared	0.0006		0.0004		0.0007		0.0005	
# of Obs (firm-quarters)	3955		3955		3595		3595	
# of Firms	193		193		179		179	

Note: dROE is Quarterly ROE change; RA_dROE is the risk-adjusted dROE calculated by dROE divided by the standard deviation of ROE in the past 8 quarters; CAR is quarterly cumulative abnormal return calculated using our benchmark portfolio method; Up_Thresh, Up_No_Thresh, Down_Thresh, Down_No_Thresh, Up_pre_FD,Up_post_FD, Down_pre_FD, Down_Post_FD are rating change dummy variables that indicate whether the change is upgrade or downgrade, threshold or non-threshold, and pre- or post-regulation-FD changes; L_MB is the quarterly lag of the market-to-book ratio; L_DTA is the quarterly lag of the debt-to-asset ratio. The mean coefficients of all 4 lags are reported; the corresponding test statistic is the result of two-tailed joint F-test with null hypothesis that the mean coefficient of all lags equals 0; $, *, **, *** are signs of statistical significance (different from zero), based on two-sided t-statistic or F-statistic, with confidence level of 10%, 5%, 1%, and 0.1% respectively.

Table 4.1: Predicting quarterly CAR using fixed effect GLS regression with Robust Standard Errors (PC Firms, 1997Q1-2006Q4)

Equation (4a-4d): $CAR_{j,t}$ = f (Lagged quarterly CAR variables, Lagged performance (dROE or RA-dROE) variables, lagged rating change dummy Variables, control variables) + ε_t

Indep. Variables	Equation (4a) Coeff.	*t-stat*	Equation (4b) Coeff.	*t-stat*	Equation (4c) Coeff.	*t-stat*	Equation (4d) Coeff.	*t-stat*
Up_Thresh								
First Lag	-0.0325	*-0.71*			-0.0263	*-0.54*		
Mean of 4 lags [1]	-0.0011	*0.00*			-0.0018	*0.00*		
Up_No_Thresh								
First Lag	0.0296	*1.04*			0.0318	*1.05*		
Mean of 4 lags	0.0142	*0.72*			0.0142	*0.59*		
Down_Thresh								
First Lag	-0.1585 *	*-2.35*			-0.1393 *	*-2.15*		
Mean of 4 lags	0.0084	*0.05*			0.0087	*0.05*		
Down_No_Thresh								
First Lag	-0.0024	*-0.06*			0.0093	*0.20*		
Mean of 4 lags	0.0392 $	*3.80*			0.0456 *	*4.68*		
Up post FD								
First Lag			0.0287	*0.98*			0.0188	*0.59*
Mean of 4 lags			0.0510 **	*6.94*			0.0479 *	*5.33*
Up_pre_FD								
First Lag			-0.0046	*-0.11*			0.0117	*0.27*
Mean of 4 lags			-0.0269	*1.57*			-0.0238	*1.03*
Down_post_FD								
First Lag			-0.0143	*-0.31*			0.0031	*0.07*
Mean of 4 lags			0.0446 *	*4.33*			0.0502 *	*5.10*
Down_pre_FD								
First Lag			-0.1052 $	*-1.86*			-0.1015	*-1.58*
Mean of 4 lags			0.0059	*0.03*			0.0081	*0.04*
CAR								
First Lag	-0.1293 ***	*-3.75*	-0.1255 ***	*-3.70*	-0.1061 **	*-2.95*	-0.1031 **	*-2.94*
Mean of 4 lags	-0.0481 *	*6.31*	-0.0518 **	*7.09*	-0.0321	*2.44*	-0.0355 $	*2.96*
dROE								
First Lag	0.1299	*1.25*	0.1535	*1.52*				
Mean of 4 lags	0.1369	*2.42*	0.1515 $	*2.99*				
RA_dROE								
First Lag					-0.0010	*-0.58*	-0.0008	*-0.42*
Mean of 4 lags					0.0016	*1.79*	0.0019	*2.44*
L_MB	-0.0551 ***	*-4.38*	-0.0532 ***	*-4.23*	-0.0566 ***	*-3.87*	-0.0540 ***	*-3.71*
L_DTA	-0.1289	*-1.62*	-0.1121	*-1.40*	-0.1870 *	*-2.07*	-0.1643 $	*-1.82*
log_asset	-0.0046	*-0.43*	-0.0096	*-0.89*	-0.0052	*-0.48*	-0.0103	*-0.94*
constant	0.1925 *	*2.43*	0.2162 **	*2.74*	0.2448 **	*2.96*	0.2645 ***	*3.22*
Overall R squared	0.0085		0.0097		0.0115		0.0125	
# of Obs (firm-quarters)	1943		1943		1750		1750	
# of Firms	104		104		95		95	

Note: dROE is Quarterly ROE change; RA_dROE is the risk-adjusted dROE calculated by dROE divided by the standard deviation of ROE in the past 8 quarters; CAR is quarterly cumulative abnormal return calculated using our benchmark portfolio method; Up_Thresh, Up_No_Thresh, Down_Thresh, Down_No_Thresh, Up_pre_FD,Up_post_FD, Down_pre_FD, Down_Post_FD are rating change dummy variables that indicate whether the change is upgrade or downgrade, threshold or non-threshold, and pre- or post-regulation-FD changes; L_MB is the quarterly lag of the market-to-book ratio; L_DTA is the quarterly lag of the debt-to-asset ratio. The mean coefficients of all 4 lags are reported; the corresponding test statistic is the result of two-tailed joint F-test with null hypothesis that the mean coefficient of all lags equals 0; $, *, **, *** are signs of statistical significance (different from zero), based on two-sided t-statistic or F-statistic, with confidence level of 10%, 5%, 1%, and 0.1% respectively.

Table 4.2: Predicting quarterly CAR using fixed effect GLS regression with Robust Standard Errors (LH Firms, 1997Q1-2006Q4)

Equation (4a-4d): $CAR_{j,t}$ = f (Lagged quarterly CAR variables, Lagged performance (dROE or RA-dROE) variables, lagged rating change dummy Variables, control variables) + ε_t

Indep. Variables	Equation (4a) Coeff.	*t-stat*	Equation (4b) Coeff.	*t-stat*	Equation (4c) Coeff.	*t-stat*	Equation (4d) Coeff.	*t-stat*
Up_Thresh								
First Lag	-0.0094	*-0.19*			-0.0165	*-0.29*		
Mean of 4 lags [1]	0.0145	*0.28*			0.0062	*0.04*		
Up_No_Thresh								
First Lag	-0.0326	*-0.94*			-0.0362	*-0.96*		
Mean of 4 lags	-0.0051	*0.06*			-0.0141	*0.38*		
Down_Thresh								
First Lag	-0.0648	*-0.81*			-0.0731	*-0.90*		
Mean of 4 lags	0.0588	*1.31*			0.0593	*1.30*		
Down_No_Thresh								
First Lag	0.0174	*0.27*			-0.0126	*-0.14*		
Mean of 4 lags	-0.0290	*0.77*			-0.0325	*0.58*		
Up_post_FD								
First Lag			-0.0529	*-1.51*			-0.0711 $	*-1.77*
Mean of 4 lags			0.0030	*0.02*			-0.0092	*0.14*
Up_pre_FD								
First Lag			0.0141	*0.27*			0.0395	*0.77*
Mean of 4 lags			-0.0099	*0.19*			-0.0128	*0.29*
Down_post_FD								
First Lag			-0.0005	*-0.01*			-0.0357	*-0.52*
Mean of 4 lags			0.0296	*0.90*			0.0335	*0.97*
Down_pre_FD								
First Lag			-0.0208	*-0.38*			0.0322	*0.98*
Mean of 4 lags			-0.0403	*0.44*			-0.0320	*0.27*
CAR								
First Lag	-0.0909 *	*-2.07*	-0.0828 $	*-1.89*	-0.0837 $	*-1.78*	-0.0752	*-1.61*
Mean of 4 lags	-0.0163	*0.42*	-0.0167	*0.43*	-0.0143	*0.29*	-0.0151	*0.32*
dROE								
First Lag	0.1599	*1.13*	0.1522	*1.04*				
Mean of 4 lags	0.0284	*0.08*	0.0341	*0.11*				
RA_dROE								
First Lag					-0.0002	*-0.09*	-0.0001	*-0.04*
Mean of 4 lags					0.0002	*0.02*	0.0005	*0.11*
L_MB	-0.0182 *	*-2.25*	-0.0176 *	*-2.18*	-0.0166 $	*-1.94*	-0.0161 $	*-1.88*
L_DTA	0.2230 *	*2.11*	0.2322 *	*2.19*	0.2391 *	*2.18*	0.2486 *	*2.28*
log_asset	-0.0271 *	*-1.96*	-0.0299 *	*-2.15*	-0.0250 $	*-1.78*	-0.0267 $	*-1.89*
constant	0.0882	*0.62*	0.1034	*0.73*	0.0553	*0.38*	0.0616	*0.43*
Overall R squared	0.0017		0.0004		0.0025		0.0013	
# of Obs (firm-quarters)	993		993		905		905	
# of Firms	55		55		51		51	

Note: dROE is Quarterly ROE change; RA_dROE is the risk-adjusted dROE calculated by dROE divided by the standard deviation of ROE in the past 8 quarters; CAR is quarterly cumulative abnormal return calculated using our benchmark portfolio method; Up_Thresh, Up_No_Thresh, Down_Thresh, Down_No_Thresh, Up_pre_FD,Up_post_FD, Down_pre_FD, Down_Post_FD are rating change dummy variables that indicate whether the change is upgrade or downgrade, threshold or non-threshold, and pre- or post-regulation-FD changes; L_MB is the quarterly lag of the market-to-book ratio; L_DTA is the quarterly lag of the debt-to-asset ratio. The mean coefficients of all 4 lags are reported; the corresponding test statistic is the result of two-tailed joint F-test with null hypothesis that the mean coefficient of all lags equals 0; $, *, **, *** are signs of statistical significance (different from zero), based on two-sided t-statistic or F-statistic, with confidence level of 10%, 5%, 1%, and 0.1% respectively.