Credit rating agencies and unsystematic risk: Is there a linkage?*

Pilar Abad[a] and M. Dolores Robles[b]

Abstract

This study analyzes the effects of six different credit rating announcements on systematic and unsystematic risk in Spanish companies listed on the Electronic Continuous Stock Market from 1988 to 2010. We use an extension of the event study dummy approach that includes direct effects on beta risk and on volatility. We find effects in both kinds of risk, indicating that rating agencies provide information to the market. Rating actions that imply an improvement in credit quality cause lower systematic and unsystematic risk. Conversely, ratings announcements that imply credit quality deterioration cause a rebalance in both types of risk, with higher beta risk being joined with lower diversifiable risk. Although the event characteristics were not important to determine how the two types of risk reacted to rating actions, the 2007 economic and financial crises increase the market's sensitivity to these characteristics.

Keywords: Credit rating agencies, Rating changes, Market model, GARCH, Stock Returns, Systematic risk, Unsystematic risk

JEL Classification: G12, G14, G24, C22

* The information provided by Fitch and Moody's is appreciated. Any errors are solely the responsibility of the authors. This work has been funded by the Spanish Ministerio de Ciencia y Tecnología (ECO2009-10398/ECON and ECO2011-23959), Junta de Comunidades de Castilla-La Mancha (PCI08-0089) and Banco de Santander (UCM940063).

[a] Universidad Rey Juan Carlos, Paseo Artilleros s/n, 28032 Madrid, Spain and RFA-IREA. pabad@urjc.es. Corresponding author.

[b] Universidad Complutense de Madrid and ICAE, Campus de Somosaguas, 28223 Pozuelo de Alarcón, Madrid, Spain. mdrobles@ccee.ucm.es.

1. Introduction

The role of Rating agencies as providers of information is a central matter to market participants and regulators. Hence, the analysis of the effects of rating changes on financial markets is crucial. Even more now, when these agencies are under scrutiny after their failure to predict the crises at such firms as WorldCom in 2002 and Lehman Brothers in 2008 and for their central role in the sub-prime mortgage crisis.

All substantive changes in the performance of a firm should trigger alterations in Rating agencies' views on the solvency of the firm and the rating they assigned. These changes may also alter the investors' views on valuation and risk of the firm. Under the assumption that the CAPM is the suitable model for asset pricing, the systematic (non-diversifiable or beta-) risk can be viewed as a measure of organizational effectiveness. Both risk and rating are sources of information regarding the organization's worth. Consequently, it is expected that beta risk will be linked with credit rating (Abad and Robles, 2006).

On the other hand, investors are also concerned with the unsystematic (diversifiable, idiosyncratic) risk of the firms. This risk is essential in derivatives pricing as the value of a derivative is a function of total risk of the underlying (Hilliard and Savickas, 2002), and it is important for under-diversified portfolio management too (Campbell, Lettau, Malkiel and Xu, 2001, Goyal and Santa-Clara, 2003 or Angelidis and Tessaromati, 2009). We can therefore inquire if there is also a connection between credit rating and diversifiable risk.

While the effect of rating changes on stock prices is a well-developed area of study (see Dichev and Piotroski, 2001 or Abad and Robles, 2007), the analysis of the effect of rating changes on risk is almost unexplored. We only find the studies of Abad and Robles (2006) and Impson, Karafiath and Glascock (1992). These authors analyze the effect of rating changes on systematic risk in stock markets. Amazingly, we do not find any work about the relationship between unsystematic risk and credit rating changes. Our main purpose here is to extend the existing research on the effect of credit rating changes on stock markets, thereby filling this gap in the empirical literature.

This paper studies the effects of credit rating actions on both types of risk for the re-rated firms with a special emphasis on their unsystematic risk. We build on the analysis presented in Abad and Robles (2006) and focus on the effects of rating changes on the unsystematic risks of the re-rated firms. Abad and Robles (2006) find rating changes are related to changes in beta risk. They find lower levels of systematic risk for both downgrades and upgrades. Although they do not examine the unsystematic risk component of total risk, they conclude that downgrades are associated with a rebalancing of risks. In this study, we present evidence regarding the effect of rating changes on unsystematic risk. We improve the analysis allowing for direct effects of rating action announcements on the volatility of returns as well as on the beta risk and on the returns.

Instead of a traditional two-step event study, we present an extension of the dummy-variable regression approach, allowing for changes in the parameters of the market model. We consider different scenarios for the volatility of returns, which is specified either as a constant process or with an autoregressive conditional heteroskedasticity process. We analyze rating changes for Spanish companies listed on the Electronic Continuous Stock Market. We distinguish between different types of rating action announcements (effective rating changes, placement on the credit watch list and outlook notices) to analyze their informative content. We use daily returns of the re-rated companies between June 1988 and December 2010.

In this study, we also explore the cross-sectional variation in both types of risk responses to rating changes. To study these responses, we focus on characteristics of the rating action, the issuing firm and the economic environment, also giving special attention to the effects of the economic and financial crisis that began in 2007.

In the next section, we present the evolution and characteristics of the rating changes in the Spanish market. The modeling and testing strategies are described in section 3. The main results are presented in sections 4 and 5. The paper closes with several conclusions in section 6.

2. Rating action announcement on the Spanish Stock Market

Our initial sample of announcements contains a set of 482 rating actions corresponding to the "Big Three" rating agencies (Fitch, Moody's and Standard and Poor's) during the period from June 1988 to December 2010. These actions include effective rating changes, rating reviews and outlook reports[1]. Fitch and Moody's provide us with their announcement dates. We also examine Reuters to find the rating announcement dates of the S&P and complementary information.

Table 1 presents the rating action announcements grouped into six different types of announcement (effective upgrades/downgrades, review for upgrades/downgrades and positive/negative outlook reports) and into three different rating agencies. We use the previous information to distinguish between contaminated and uncontaminated rating changes. As is usual in the literature, we consider rating changes to be contaminated if during the previous 30 trading days, any firm-specific rating event that may cause abnormal behavior took place. In our sample, 96 rating changes are contaminated, more than 21% of the negative rating announcements and more than 16% of the positive announcements. After filtering for contaminated events, our final sample has 386 rating action announcements.

[Insert Table 1]

Focusing on the agency, Table 1 also shows the distribution of rating action per rating agency. Moody's released 42.5% of the rating actions, Fitch released 30.7%, and the remaining 26.8% were released by S&P. Furthermore, the distribution of the contaminated announcements is 47% from Moody's, 34% from Fitch and 19% from S&P.

[Insert Figure 1]

[1] Reviews or additions to the watch list occur after special events (e.g., changes in regulation, unexpected changes in management or merger announcements), indicating that the rating is under review for a likely change in a short period of time. Outlooks indicate the creditworthiness trend in a medium-term timeframe.

Figure 1 presents the distribution of rating actions per year and per type of announcement (positive or negative). In general, the yearly number of rating announcements increases during the sample period. The yearly number of rating changes increases during whole period with a slight decline in 2004. However, the most important information in this figure is that after recent market crises, the dot-com crash in 2001 and the subprime crisis in 2008, there was a significant increase in rating changes with a high percentage of negative rating announcements (88% negative in 2002 and 98% in 2009).

Figure 2 depicts the number of rating actions by the sector of the credit issuing firm. As seen, the majority of changes affected the financial sector (49.5%). In Spain, the majority of firms that issue corporate bonds are in the financial sector. The energy sector accounts for the second-most rating changes, with 30.3% of the total changes, followed by the telecommunications and the consumer cyclical sectors with 8.1% each one and the capital goods sector with 7.7%.

3. Modeling and testing strategy

Firm total risk should be associated with credit ratings because both are a measure of firm wealth. Therefore, we expect that rating change announcements must be followed by changes in risk. Any movement in firm total risk may be caused by a change in systematic risk, idiosyncratic risk or both. In the first case, we expect that rating changes will be accompanied by changes in the market beta. In the second case, we expect changes in volatility. In both cases, the change must be positive for downgrades and negative for upgrades. In the third case, both kinds of risk must change in an unknown direction because there must be a risk rebalancing.

To test this hypothesis, we consider the possibility that a debt rating change could exert a destabilizing influence on beta, which is the measure of the firm's systematic risk, by specifying the following model:

$$R_{it} = \alpha_i + \beta_i R_{mt} + \gamma_{si} D_s + \lambda_{si} D_s R_{mt} + \varepsilon_{it} , \tag{1}$$

where the rating action announcement is t=0, R_{it} is the return[2] on stock i at time t from day -250 to day $+T$; R_{mt} is the return on the market index at time t, which we calculate using an equal weight index; D_s is a dummy variable taking on the value of one for the days in the event window s=(L, T) and zero otherwise.

In model (1), α_i represents the average daily amount by which the stock outperformed the benchmark portfolio on days -250 through L and $\alpha_i + \gamma_{si}$ is the average daily amount by which the stock outperformed the benchmark portfolio in the event window.[3] Similarly, β_i is the stock's beta with respect to the benchmark portfolio on days -250 through L and $\beta_i + \lambda_{si}$ is the stock's beta with respect to the benchmark portfolio on the event window. Finally, ε_{it} is the error term and $\text{var}(\varepsilon_{it})$ is the unsystematic risk of the firm i. The model must be estimated for each firm and for the whole sample.

We can write the variance of the relationship in Equation (1) as

$$\text{var}(R_{it}) = \delta_i^2 \,\text{var}(R_{mt}) + \text{var}(\varepsilon_{it}), \quad (2)$$

where δ_i is $\beta_i + \lambda_{si}$ in the event window and β_i outside the event window. Equation (2) shows the total risk of asset i can be partitioned into two parts: systematic risk, $\delta_i^2 \,\text{var}(R_{mt})$, which is a measure of how the asset covaries with the economy and unsystematic risk, $\text{var}(\varepsilon_{it})$, which is independent of the economy.

To analyze the effect of credit rating change announcements on firm risk, we have to consider the two components of risk in Equation (2). The hypothesis that a

---

[2] Returns are calculated as $R_{it} = Ln\left(\frac{P_{it} + d_{it}}{P_{it-1}}\right)100$, where P_{it} is the price of the stock of firm i on day t and d_{it} is the dividend formally announced on day t. The data on stock prices from the Spanish Electronic Continuous Stock Market are daily closing prices corrected for stock splits, equity offerings and merger effects.

[3] Model (1) allows for changes in the constant component of expected returns, as well as for changes in beta risk. Therefore, we endow the model with more flexibility to avoid that misspecifications of the mean return could affect the variance of the error term. Results for the constant component of model (1) are not shown in this paper to save space but are available upon request.

credit rating change conveys information to the market about a change in the firm's systematic risk implies that $\lambda_{si} \neq 0$. Comparing the statistical properties of $\text{var}(\varepsilon_{it})$ inside and outside the event window, we can explore the effect of rating changes on unsystematic risk.

a) Test for systematic risk effects

To draw inferences for the systematic component of risk, the estimated variable, λ_{si}, or Cumulative Change in Beta (CCB) for firm *i* in event window *s*, is used to find the Cumulative Average Change in Beta (CACB) for a specific event window *s*.

$$CACB_s = \frac{1}{N}\sum_{i=1}^{N}\lambda_{si} \quad (3)$$
,

where *N* is the number of rating changes in the sample.

The null hypothesis of zero abnormal performance due to rating action announcements implies that CACB must be zero. To test the statistical significance of the CACB, we use a standard *t*-test. Non-normality (skewness, fat tails) can affect the properties of this parametric test. To overcome this problem, we compute two nonparametric tests. First, we use the Fisher-sign test. This test counts the number of times that CCB is positive. Under the null hypothesis, the test statistic follows a binomial distribution with p=0.5. Second, the Wilcoxon-signed-rank test is computed. This test assumes that there is information in the magnitudes, as well as the signs. To calculate the statistic, we take the series of CCB variables and rank them from smallest to largest by absolute value. Next, we add the ranks associated with positive values. We report *p*-values for the asymptotic normal approximation to the test. See Sheskin (1997) for details.

b) Test for unsystematic risk effects

We consider different scenarios for $\text{var}(\varepsilon_{it})$ in model (1): constant variance; time-dependent variance and time-dependent variance with the direct effect of rating change in the variance equation.

1. Constant volatility approach

In a first step, we assume a constant variance in model (1), $\text{var}(\varepsilon_{it}) = \sigma_i^2$, and test the structural change hypothesis, i.e., the rating action announcement causes a change in the variance level. To test this hypothesis, we compute the Variance Ratio (VR1) for asset i as $VR1_{is} = \frac{\hat{\sigma}_{is}^2}{\hat{\sigma}_{io}^2}$, where $\hat{\sigma}_{is}^2$ and $\hat{\sigma}_{io}^2$ are the sample mean variance estimated inside and outside the event window, respectively. VR1 =1 indicates that the event has no effect, while VR1 $>$ 1 implies the event increase in unsystematic volatility. Therefore, if the volatility of the event window significantly exceeds the one implied by the model, an event impact on unsystematic volatility is observed. The null hypothesis of no abnormal performance due to rating changes implies that VR1 must be equal to one. To test this hypothesis, we compute a standard F test and two nonparametric tests (Siegel-Tukey and Bartlett tests) for each event in our sample.

We also define the Average Variance Ratio (AVR1) as

$$AVR1_s = \frac{1}{N}\sum_{i=1}^{N}\frac{\hat{\sigma}_{is}^2}{\hat{\sigma}_{io}^2}, \tag{4}$$

and we test the AVR1=1 hypothesis with the Fisher-sign and Wilcoxon-signed-rank tests.

2. GJR-GARCH volatility approach

In the second scenario, we assume time-dependent variance, $\text{var}(\varepsilon_{it}) = h_{it}$; in model (1) that can be modeled by an appropriate GARCH model. The most general model that we consider is a GJR-GARCH model:

$$\begin{aligned} &\varepsilon_{it} \sim N(0, h_{it}) \\ &h_{it} = \omega_{0i} + \sum_{q=1}^{Q}\omega_{1iq}\varepsilon_{it-q}^2 + \sum_{p=1}^{P}\omega_{2ip}h_{it-p} + \sum_{q=1}^{Q}\omega_{3iq}S_{t-p}^{-}\varepsilon_{it-q}^2 \end{aligned} \tag{5}$$

To test the hypothesis that the rating action announcement causes a change in the variance level, we compute the Variance Ratio (VR2) for asset i as $VR2_{is} = \frac{\bar{\hat{h}}_{is}}{\bar{\hat{h}}_{io}}$ where $\bar{\hat{h}}_{is}$ and $\bar{\hat{h}}_{io}$ are the sample mean of conditional variance estimated inside and outside the event window, respectively.[4] We also define the Average Variance Ratio (AVR2) as

$$AVR2_s = \frac{1}{N}\sum_{i=1}^{N}\frac{\bar{\hat{h}}_{is}}{\bar{\hat{h}}_{io}}, \tag{6}$$

and we test the AVR2=1 hypothesis with the Fisher-sign and Wilcoxon-signed-rank tests.

At an event day t, two different types of factors may determine the level of unsystematic volatility: security-specific factors that are captured by the model formulated above and event specific-factors that are ignored here. Following Hilliard and Savickas (2002), their impact can be measured by the ratio λ of the cross-sectional variance of the estimated residuals of the market model and its conditional variance implied by the GARCH process:

$$\lambda_t = \frac{1}{N-1}\sum_{i=1}^{N}\frac{\left(\hat{\varepsilon}_{it} - 1/N\sum_{j=1}^{N}\hat{\varepsilon}_{jt}\right)^2}{(N-2)/N\,\hat{h}_{it} + 1/N^2\sum_{j=1}^{N}\hat{h}_{jt}} \tag{7}$$

In this context, the estimator of the Average Variance Ratio ($AVR2^{\lambda}$) in the event window is

$$AVR2_s^{\lambda} = \frac{1}{T-L}\sum_{t=L}^{T}\lambda_t \tag{8}$$

We compute the adjusted tests proposed by Hilliard and Savickas (2002), CHS-test ahead, to test the null hypothesis of zero abnormal performance due to rating changes ($\lambda=1$ and $AVR2^{\lambda}=1$).

3. *Dummy GJR-GARCH volatility approach*

Finally, in the third scenario, we take into account the possibility that a credit rating change could have a direct effect on the idiosyncratic risk. We include in the

[4] In this case, we do not test the hypothesis of zero abnormal performance due to rating changes (VR2 =1) at the individual level because the distribution of the mean-variance ratio is unknown.

variance model the dummy variable, D_{st} , defined above, which indicates if day t is in the event window:

$$\begin{aligned} &\varepsilon_{it} \sim N(0,h_{it}) \\ &h_{it} = \omega_{0i} + \sum_{q=1}^{Q} \omega_{1iq}\varepsilon_{it-q}^{2} + \sum_{p=1}^{P} \omega_{2ip}h_{it-p} + \sum_{q=1}^{Q} \omega_{3iq}S_{t-p}^{-}\varepsilon_{it-q}^{2} + \delta_{si}D_{s} \end{aligned} \tag{9}$$

If a debt rating change adds new information about a firm's idiosyncratic risk, then $\delta_{si} \neq 0$. To test the hypothesis of no abnormal performance due to rating action announcements, we use the estimated δ_{si} or Cumulative Change in Idiosyncratic Risk (CCIR) for firm i in event window s, to find the Cumulative Average Change in Idiosyncratic Risk (CACIR) for a specific event window s.

$$CACIR_s = \frac{1}{N}\sum_{i=1}^{N}\delta_{si} \tag{10}$$

To test the statistical significance of the CACIR, we use the *t-ratio* test, the Fisher-sign test and the Wilcoxon-signed-rank test again.

We study the existence of a structural change in both kinds of risk (systematic and unsystematic) by analyzing three kinds of event window. We analyze the impact of rating changes by looking at (a) five symmetric windows around the announcement date: [-1,1], [-5,5], [-10,10], [-15,15] and [-30,30]; (b) four post-event windows: [1,5], [1,10], [1,15] and [1,30] and (c) four pre-event windows: [-5,-1], [-10,-1], [-15,-1] and [-30,-1]. Thus, we can detect possible effects and determine when they happen.

4. Rating events effects

4.1. Improvements in credit quality

We first consider the impact of the three types of announcements for improved credit quality rating actions, i.e., actual rating changes, rating reviews and outlook assignments, on systematic and non-systematic risk. We analyze the different volatility scenarios, i.e., constant volatility (Table 2), GJR-GARCH volatility (Table 3) and dummy GJR-GARCH volatility (Table 4). In Table 2, we present the results for systematic risk (left panel) and for non-systematic risk (right panel). The systematic risk panel shows limited effects for any kind of rating action. The mean estimated change in beta is significant when we consider outlook reports, while the median is significant when we consider effective changes and reviews. When the estimated change in beta is significant, it is generally negative, indicating a decline in systematic risk.

[Insert Table 2]

In the case of unsystematic risk, when we consider effective upgrades the evidence of a change in variance at an individual level is not clear. Although the average variance ratio (AVR1) is greater than one in the three largest symmetric and pre-event windows, the F-test rejects the null at a slightly higher percentage than 50%, the Siegel-Tukey test's rejection percentages are always lower than 50% and the Bartlett percentage is sometimes higher than 50% and sometimes lower. Conversely, the median-variance ratio (M-VR1) is lower than one in all windows, indicating a decrease in the unsystematic risk level and this effect is always significant with both nonparametric tests.

In the case of positive outlook reports, the results for the average variance ratio are similar: there is no evidence of changes in variance. However, the median-variance ratio is always significantly lower than one and decreases with the size of the window. The results regarding the mean and median-variance ratio are similar for reviews as for upgrades, but the median is significantly lower than one in the narrower windows.

Table 3 shows results for rating actions that imply an improvement of credit quality of the firms in the second scenario, i.e., when we assume a time-dependent variance estimated from the GJR-GARCH model.[5] The mean estimated change in beta risk is significantly negative, as in the constant variance scenario, except in the case of positive outlook reports for the [-10,10], [-10,-1] and [1,10] windows and the effective upgrades for the largest window (see left panel).

[Insert Table 3]

With respect to the unsystematic risk (right panel of Table 3), for all three kinds of improvement in credit ratings, the average variance ratio (AVR2) is greater than one,

[5] In scenarios with conditional variance, we estimate models by QML. We consider all of the models nested by the GJR-GARCH (including ARCH and GARCH of different orders) and estimate the best model for each event in the sample.

but there is no evidence of a change in variance at the individual level. We find that VR2 is greater than one in less than 50% of cases. However, the median-variance ratio is always lower than one. For effective upgrades and positive outlook reports, the median-variance ratio is significant using the sign test and the rank test in all windows, except the largest window. This result indicates a decrease in the unsystematic risk level. For the Reviews for upgrades, the result is the same, but the median is significant only in the pre-event and post-event windows and the largest symmetric window. Finally, despite the fact that the λ is lower than one, we do not reject the null hypothesis of zero abnormal performance due to rating changes with the tests proposed by Hilliard and Savickas (2002) because the rejection rate (λ=1) is always lower than 20%, considering all three rating actions, and the CHS test never rejects the null hypothesis ($AVR2^{\lambda}=1$).

Table 4 shows the results for the third scenario, the dummy conditional volatility approach, where the effect of a rating action on unsystematic risk is captured using a dummy variable's parameter in the GJR-GARCH model. The systematic risk panel shows that for any type of rating action, the mean of estimated change in beta is not significant for all event windows, except those three windows that are significant for negative outlooks in the second scenario. In these windows, the mean of the estimated change in beta is significant and negative. However, the nonparametric test detects effects on the median of the estimated change in beta in the three different rating actions. For effective upgrades, the effect is always significant and negative in all windows, except the largest window where the effect is significantly positive. For positive outlooks, the effect is significantly negative in general, except in the largest post-event window. For positive reviews, the effect is significant and positive in larger windows and significantly negative in narrower windows, regardless of the symmetric or non-symmetric type. In general, we detect decreases in non-diversifiable risk.

[Insert Table 4]

Regarding the non-systematic risk (see right panel of Table 4), for effective upgrades, the Cumulative Average Change in Idiosyncratic Risk is negative and significant with the t-ratio or the nonparametric test in the majority of windows. Positive outlook reports have a similar effect. Reviews for upgrade have the same result for the median but in only three cases, the narrowest symmetric, pre- and post-event windows.

Overall, we find that announcements about improvements of credit quality have a statistically significant impact on both risks. These announcements are associated with statistically significant reductions in beta risk in a few windows, and these effects are clearer in the more flexible scenario, which is the dummy GJR-GARCH approach. This result is in line with the result in Abad and Robles (2006). In addition, we detect significant reductions in non-systematic risk regardless of the kind of announcement and scenario, and these findings are clearer with the effective upgrades and positive outlook reports announcements. This result is detected with the nonparametric tests only, implying a right-skewed distribution of abnormal non-systematic risk.[6] This evidence indicates that there is a reduction in the total risk of the firm because we detect a lower level of both kinds of risk: diversifiable and non-diversifiable.

4.2. Deteriorations in credit quality

First, we analyze results from the constant volatility approach. Table 5 shows results for rating actions that imply deterioration of firms' credit quality. As observed in the systematic risk panel, for any kind of rating action, the mean of the estimated change in beta is positive for all event windows. This finding may indicate increases in systematic risk. In the case of effective downgrades, the effect is only significant in the [-15,15] symmetric window, the [-30,-1] pre-event window and in the three largest post-event windows. For negative outlook reports, this effect is significant in all the windows except the [-1,1]. The rating review events have a significant effect for three symmetric windows and several pre- and post-event windows. These results indicate that rating refinements are more informative than the effective rating downgrades. The median change in volatility is always positive, although the nonparametric tests do not detect any significance.

[Insert Table 5]

The results for unsystematic risk are shown in the right panel of Table 5. When there is an effective ratings downgrade, the evidence for changes in variance at individual level is ambiguous. Although the average variance ratio is greater than one in the

[6] This asymmetric distribution implies a greater frequency of negative values, but the positive values are larger, keeping the sample mean at zero.

fourth biggest symmetric windows and in two of the pre-event ones, the F-test rejects the null in slightly more than the 50% of the time, the Siegel-Tukey's rejection percentage is always lower than 50%, and the Bartlett test shows a percentage larger than 50% for the biggest windows. Conversely, the median of the variance ratio is always lower than one, indicating a decrease in the unsystematic risk level. This effect is significant with the sign test, the rank test or both.

The results for the average variance ratio are almost identical for outlooks and rating reviews. AVR1 generally returns a value greater than one with uncertain evidence of structural change with the three individual tests. For the negative outlook reports, the median-variance ratio is always lower than one but only significant in the [-1,1] window, the asymmetric pre-event windows and the narrowest post-event window. This evidence seems to point to a decrease in volatility, indicating some degree of anticipation by the market. For review for downgrades, we find similar effects but for the post-event windows, indicating that the decrease in volatility persists until 30 days after the announcement. However, for symmetrical windows, except [-1,1], the median-variance ratio is over one. The rank test rejects the null in these cases, indicating an increase in volatility around the announcement of inclusions to the credit watch list.

[Insert Table 6]

In Table 6, we present results for the GJR-GARCH volatility approach. The results for systematic risk are similar to those found in the constant variance approach. We find a positive mean estimated change in beta in all windows and all kinds of rating events, indicating an increase of market risk. The effect is not significant for effective downgrades, but it is always significant for negative outlook reports, excluding the [-1,1] window. For reviews for downgrade, the effect is significant for all but five windows. However, though the estimated median VR2 is positive at all times, we never reject the null hypothesis with the two nonparametric tests.

As shown in the unsystematic risk panel of Table 6, the estimated average variance ratio is greater than one independent of the type of rating action and in almost the whole set of windows. However, the percentage of times the variance ratio is greater than one is clearly lower than 40% for effective downgrades and approximately

50% for outlooks and reviews. The median-variance ratio is significantly lower than one in every event window using both non-parametric tests. Despite the fact that the VR2 estimated by the Hilliard and Savickas (2002) is lower than one in all cases, the two applied tests failed to detect any downgrade effects on diversifiable risk.

We find similar results for the negative outlook reports. The median VR2 is lower than one, except for the [-30,30], [-15,15] and [1,15] windows. The nonparametric tests only detect lower levels of volatility in the smallest symmetric window, the three smallest pre-event windows and the smallest post-event window. In this case, $AVR2^{\lambda}$ is lower than one for all windows except for the fourth biggest symmetric one. The CHS-tests do not reject the null hypothesis in any of the cases.

To complete our analysis of the second volatility measurement approach, for those firms put on review for downgrades we find evidence of an increase in volatility after the inclusion on the watch list, as in the constant volatility case. In this case, the median VR2 is greater than one and significant in all symmetrical windows and for three pre-event windows. The CHS-tests also fail to reject the null hypothesis in this case.

Finally, we analyze the dummy GJR-GARCH approach (Table 7), where the effect of the rating action announcement on unsystematic risk is captured by the δ parameter in equation (9). In this case, we also find increments in systematic risk because CACB3 are positives in general. They are non-significant for effective downgrades, clearly significant in the case of negative outlook reports, except for [-1,1], and only significant in several symmetrical and asymmetrical windows for those companies under review for downgrade.

[Insert Table 7]

When we look at the unsystematic risk panel in Table 7, we find that for effective downgrades, CACIR estimation is positive but non-significant in general, while it is negative and clearly significant in [-1,1] and the narrower post-event windows. Nevertheless, the median CIR is negative except for [-30,30], and the null hypothesis is rejected in the majority of cases with nonparametric tests. For negative outlook reports, the mean value of the estimated δ is negative for [-1,1] and all asymmetrical windows. The median CIR is also negative in general, and it is significant for the same set of event windows as in the case of CACIR. In the case of review announcements, the findings are mixed. We find positive significant CACIR in the symmetric windows, except for [-1,1], and in the pre-event windows, but we find negative and significant effects in the post-event windows. This result could indicate higher levels of diversifiable risk before inclusion on the credit watch list that diminishes in days after the announcement. The whole effect, observed in the symmetrical windows, is an increase in volatility. The results for the median CIR also agree with this explanation as they take positive significant values in the biggest symmetrical and pre-event windows but show negative, significant values in [-1,1] and all the post-event windows.

To summarize, we always find increments in systematic risk that are clearly detected in the more flexible scenario, the dummy GJR-GARCH approach, and are more evident in the case of negative outlook reports. There are noticeable decreases in unsystematic risk for effective downgrades and negative outlook reports, whereas in the case of review for downgrades, we find a net increase in volatility.

5. Determinants of the abnormal risk reaction to rating changes

In this section, we use regression analysis to study the determinants of risk responses to rating changes. We focus on characteristics of the rating, the issuer and the economic environment. We expect to find a stronger impact on risk when the events provide more information to the market.

Our previous results report a different reaction of volatility and beta risk after different rating action announcements (effective rating changes, outlook reports or credit watch listing). Many researchers, such as Altman and Rijken (2007), assert that the refinements of a rating, such as outlooks and reviews, may be even more useful than effective rating changes in transferring relevant information about the issuers default risk to the markets. These events could reflect movements in the risk position of the firm preceding the announcement of the new rating by the agency.[7] Therefore, we hypothesize a different risk response to these different rating events.

Similarly, Boot, Milbourn and Schmeits (2006) stated that the announcement of a credit watch probably increases the information content of effective rating changes because it discloses more private information. According to this hypothesis, the effect of an effective rating change could be different, depending on the presence or absence of a prior review process, and the effect is stronger in the first case. To test this hypothesis, we define the expected rating changes as those that have been preceded by an announcement in the watch listing (66% of cases).

Many credit issues are rated by more than one agency. In certain situations, we can find split ratings related to differences in methodology or the importance that each agency gives to certain variables or particular matters. Experts disagree as to why agencies give different ratings and which agencies affect prices more. Therefore, we hypothesize that the amount of information available in a rating event depends on whether it presents the same opinion about the firm default risk as the other two agencies. To uncover this information, we define a new term, "consensus rating action", to be a rating action that follows a rating action in the same direction by another agency after the announcement (9.01% of the total sample). One may also expect to find differential information in rating actions across the three rating agencies. In our sample, 41.4% of the rating actions are made by Moody's; thus, we include an indicator variable to distinguish among Moody's and the other two agencies to test this hypothesis. Additionally, as the same issuer can be monitored by one, two or three agencies simultaneously, we hypothesize that this monitoring can lead to different impacts on issuer risk depending on whether it reflects the opinion of only "one agency" (in our sample this is found in 5.44% of the cases).

As we show in section 3, almost the 50% of firms in our sample are financial enterprises, mainly commercial banks. The well-known "too-big-to-fail" paradigm suggests that regulators might intervene to avoid the default of large banks because of

[7] Reviews give a stronger indication than outlooks concerning future changes in the company rating. This rating event indicates that there is a notably high probability that the issuer will be rerated. Rating outlooks merely indicate a possible direction for the rating in the medium term. The rating outlooks indicate a forecast of the future rating of the firm.

serious, adverse effects on the financial system.[8] Under this hypothesis, the market may be insensitive to rating actions affecting banks. This hypothesis implies lower effects from changes in the ratings of financial firms than for firms in other sectors.

To test these hypotheses, we run a regression of the abnormal risks in the [-1,1] window against a set of dummy variables that take on the value 1 (or 0), depending on whether the rating announcements involve outlook reports, reviews, expected rating changes, Moody's decision, a single agency decision, consensus rating action or financial sector firms. We also analyze a wider post-event window [1,30] to study if there is a short-run market reaction or if the reaction persists for 30 days after the announcement. We consider abnormal systematic risk and abnormal idiosyncratic risk computed in the more flexible scenario (the dummy GJR-GARCH volatility approach). We estimate models by OLS with a White heteroskedasticity-consistent covariance matrix. We consider a 10% significance level for the tests.

[Insert Table 8]

Table 8 shows results for the samples of upgrades and downgrades separately and for abnormal systematic and unsystematic risk in the [-1,1] and [1,30] windows. The left panel of Table 8 shows results for improvements in credit quality. We find that reaction of systematic post-event risk is significantly more negative for expected announcements, indicating that ratings upgrades affecting reviewed firms have a lower abnormal beta than those not reviewed. This result is compatible with the hypothesis of the information content of the credit watch listing stated by Boot, *et al.* (2006), which implies a stronger market response to rating changes preceded by a credit watch listing.

We also find differences among financial companies and the other firms in the sample. The reaction of systematic risk of financial enterprises is positive, indicating a lower reduction of beta risk in the financial sector in the post-event window. Abad and

---

[8] Major financial firms are assumed to be "too big to fail". Lehman Brothers was allowed to fail on September 15, 2008. However, after that there have been numerous government or central bank interventions to avoid banks defaults. Several examples are Fortis (Belgium, Netherland and Luxemburg, 2008), Dexia (France and Belgium, 2008), Bradford & Bingley (United Kingdom, 2008) and Caja Madrid (Spain, 2010).

Robles (2006) also find a different reaction to rating changes for financial companies. This result points to the existence of a too-big-to-fail effect.

The right panel of Table 8 shows results for deteriorations in credit quality. These results indicate that none of the analyzed factors have an effect on abnormal systematic risk in the [-1,1] window, whereas the stock market reaction is significantly less negative for unsystematic risk after the announcement of a review process. As we find in section 4, inclusion on a watch listing implies a change in volatility in the opposite direction than effective downgrades and outlooks. This result indicates that the review process provides a different information regarding movements in the risk position of the firm than the other kinds of rating actions. This result was also found in Altman and Rijken (2007).

For the post-event [1,30] window abnormal risks, we do not find any systematic risk effects, but announcements by Moody's have a significantly negative impact on idiosyncratic risk. According to this result, this agency seems to have bigger impact on the market than the other two. In addition, the reaction of unsystematic risk to a downgrade is significantly positively related with the sector of the firm, indicating that non-diversifiable risk of financial enterprises responds less negatively. This result is in line of the too-big-to-fail hypothesis, as we also found for improvements in credit quality.

5.1. Financial crisis effect

The sample period we analyze covers the recent economic recession. The crisis originated with the collapse of the housing bubble. We can date the beginning of the financial market tensions to August 2007. This period is characterized by a more uncertain informational environment and high increases in volatility of financial markets. Several authors find significant differences in rating action effects during the financial crisis. For example, Jorion, Liu and Shi (2005) find less negative effects of downgrades during the 2001 stock market crisis, and May (2010) finds a more negative reaction to downgrades in the US corporate bond market. In our case, we expect that the observed increase in the volatility markets after the crisis causes different responses to rating actions before and after the crisis began.[9]

[9] Our sample period covers the dot-com crash in 2000, as well. We analyze the crash's possible effect on the reaction of risk to rating changes, but, as in Abad and Robles (2006), we do not

At this time, rating agencies are under scrutiny. They failed to predict crises at firms such as Lehman Brothers in 2008, and they had a central role in the sub-prime mortgage crisis. The US Securities and Exchange Commission (US SEC, 2008) stated that the surveillance processes used by these agencies appears to have been less robust than their initial ratings processes. The European Parliament (2009) noted that agencies failed to reflect worsening market conditions early enough in the ratings, or to adjust them in time following the deepening market crisis.[10] This conflicting role might have led to a loss of reputation. As a consequence, we expect that the market will give less credibility to rating actions after the crisis.

To test these hypotheses, we split the sample into two sub-samples (before and after August 2007) and estimate the models for each subsample. Table 9 shows results for deteriorations in credit quality.[11] We find important differences in both abnormal risk reactions for the [-1,1] window. In the period preceding the financial crisis, we do not find significant effects for the analyzed factors. After the crisis began, several announcement characteristics are shown to provide important information to the market.

We find the review process has a significant effect on both risks. After August 2007, the rating effect is negative for systematic risk and positive for volatility, indicating a smoother rebalance of risks once the firm is on the watch list. The announcement of an outlook report also causes a significantly positive, strong response for idiosyncratic risk but does not have any effect on abnormal beta. The reaction of both abnormal risks is lower if the announcement is by Moody's after August 2007, indicating that this agency has lost credibility. In addition, we find a stronger, significant rebalance of risks for firms monitored by only one agency. The effect of the "one-agency" variable is positive for systematic risk and negative for the unsystematic risk.

---

find any significant difference related to the bursting of the tech bubble. To save space, we do not present these results.

[10] See Crouchy *et al.* (2008) for an analysis of the role played by rating agencies in the sub-prime mortgage crisis.

[11] In the case of improvements in credit quality, we only have six rating actions after 2007. The estimation of the model with the pre-crisis sample yields almost the same results as in the whole sample. To save space, these results are not included.

When we analyze the post-event [1,30] abnormal risks, we also find some differences between both periods. In the case of systematic risk, before August 2007, only the review and expected variables cause significantly positive responses. For the unsystematic risk, we only find a significant effect in the financial sector. After August 2007, we find a lower abnormal unsystematic risk in the case of an announcement by Moody's. We also find the same kind of significant risk rebalancing observed in the [-1,1] window for less-monitored firms.

6. Conclusions

Although the effects of rating events on market returns have been amply analyzed in the literature, the analysis of their impact on firm risk is almost nonexistent, especially in the case of unsystematic risk. This paper tries to fill this gap in the literature by studying the reaction of both kinds of risk in a daily sample of 386 rating action announcements during a period that spans from June 1988 to December 2010 in the Spanish stock market. We provide empirical evidence that rating changes affect both kinds of risk of the re-rated firms.

We consider a more flexible methodology and a wider sample period than do Abad and Robles (2006). Our evidence confirms the existence of the rebalancing-of-risks effect that Abad and Robles presumed for deteriorations in credit quality. The results suggest that the net effects have opposite signs for improvements and deteriorations in the credit quality, as we expected. However, while credit quality improvements diminish both kinds of risk, the deteriorations in credit quality affect both kinds of risk in the opposite directions, showing a rebalancing of risks.

Additionally, we analyze the relationship among the risk reactions and a set of characteristics describing the rating action, the firm and the economic environment. In general, we only find different reactions thirty days after the announcement. However, results for downgrades are notably sensitive to the time period considered. We do not find a different reaction of both risks in the event window before the 2007 financial crisis, but after this date, systematic and unsystematic risks are more sensitive to rating action and agency characteristics. The economic and financial turmoil seems to have caused a change in investors' behavior, which is more affected by rating actions' characteristics such as the type of announcement or the credit agency that made it.

Overall, our results are important because, besides confirming the limited results in the literature regarding the relationship between rating actions and beta risk, these findings show the existence of a link among rating actions and unsystematic risk, which is a previously unexplored issue. This evidence is essential to several areas of financial management, including derivatives valuation and under-diversified portfolio management.

References

Abad, P., Robles, M.D. (2007), “Bond rating changes and stock returns: evidence from the Spanish stock market”, *Spanish Economic Review*, 9, 79–103.

Abad, P., Robles, M.D. (2006), “Risk and returns around bond rating changes: new evidence from the Spanish stock market.” *Journal of Business Finance & Accounting,* 33(5) & (6), 885–908

Altman, E. I., Rijken, H. A. (2007), “The added value of Rating Outlooks and Rating Reviews to corporate bond ratings”, *Financial Management Association meeting*, Barcelona.

Angelidis, T., Tessaromati, N. (2009), “Idiosyncratic risk matters! A regime switching approach.” *International Review of Economics and Finance* 18, 132–141.

Boot, A.W.A., Milbourn, T.T., Schmeits, A. (2006), “Credit Ratings as Coordination Mechanisms”, *The Review of Financial Studies*, 19 (1), 81–118

Brooks, L.D., Ingram, R. W., Copeland, R. M. (1983), “Credit Risk, Beta, and Bond Ratings.” *Nebraska Journal of Economics & Business*, Winter83, 22, 1. P. 3

Campbell, J., Lettau, M., Malkiel, B., Xu, Y. (2001), “Have individual stocks become more volatile? An empirical exploration of idiosyncratic risk.” *Journal of Finance,* 56, 1-43.

Crouchy, M.G., Jarrow, R.A., Turnbull, S.M. (2008), “The Subprime Credit Crisis of 2007”, *The Journal of Derivatives*, 4, 81–110.

Dichev, I. D., Piotroski, J. D. (2001), “The long-run stock returns following bond rating changes,” *The Journal of Finance*, 56 (1), 173-203.

European Parliament (2009), “European Parliament legislative resolution of 23 April 2009 on the proposal for a regulation of the European Parliament and of the Council on Credit Rating Agencies”, (COM(2008)0704 – C6-0397/2008 – 2008/0217(COD)).

Goyal, A., Santa-Clara, P. (2003), "Idiosyncratic risk matters!." *Journal of Finance,* 58, 975-2007.

Hilliard, J.E., Savikas, R. (2002), "On the statistical significance of event studies on unsystematic volatility." *Journal of Financial Research*, 25, 447-462.

Impson, C.M., Karafiath, I., Glascock, J. (1992), "Testing Beta Stationarity across Bond Rating Changes," *The Financial Review,* 27 (4), 607-618.

Jorion, P., Liu, Z., Shi, C. (2005), "Informational effects of regulation FD: evidence from rating agencies," *Journal of Financial Economics*, 76(2), 309-330.

May, A. (2010), "The impact of bond rating changes on corporate bond prices: New evidence from the over-the-counter market," *Journal of Banking and Finance*, 34, 2822-2836.

Sheskin, D. J. (1997), *Handbook of Parametric and Nonparametric Statistical Procedures* (CRC Press, Boca Raton).

U.S. SEC (2008), "Summary Report of Issues Identified in the Commission Staff's Examinations of Select Credit Rating Agencies", July.

Table 1. Rating action announcements

	Agency			
	Fitch	**Moody's**	**Standard & Poor's**	**Total**
Negative rating announcements				
Effective Downgrade	70 (19)	59 (16)	42 (10)	171 (45)
Negative Outlook Assignment	5 (0)	20 (3)	15 (0)	40 (3)
Review for Downgrade	32 (9)	49 (10)	35 (4)	116 (23)
Positive rating announcements				
Effective Upgrade	31 (5)	38 (8)	19 (2)	88 (15)
Positive Outlook Assignment	4 (0)	16 (5)	5 (0)	25 (5)
Review for Upgrade	6 (0)	23 (3)	13 (2)	42 (5)
Total	148 (33)	205 (45)	129 (18)	482 (96)

Note: Contaminated rating changes in parentheses

Figure 1. Rating action announcements: distribution by year

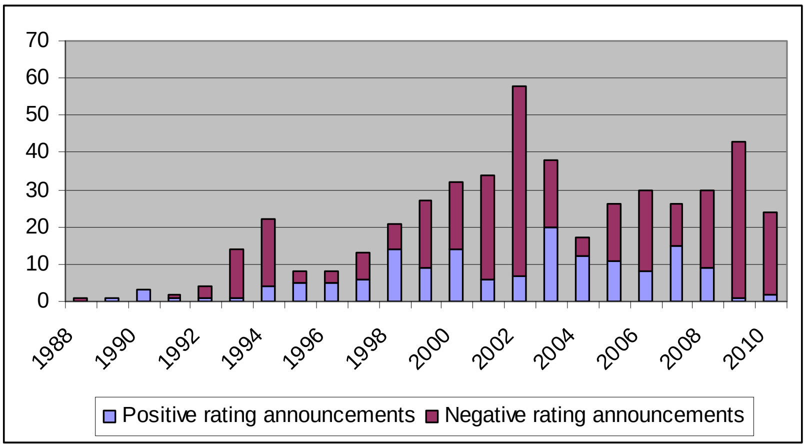

Figure 2. Rating action announcements: distribution by issuer's sector

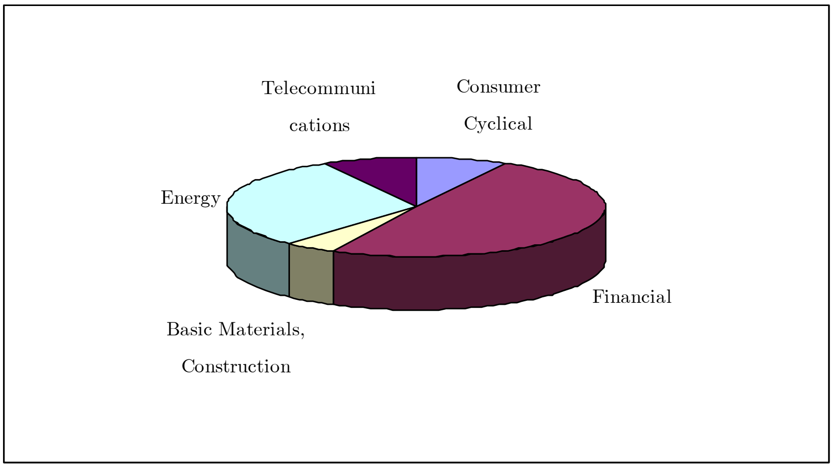

Table 2. Improvements in credit quality: Constant volatility approach

	Systematic risk		Unsystematic risk						
Window	**CACB1**	**M-CCB1**	**AVR1**	**F-test**	**S-T test**	**B test**	**M-VR1**	**Sign test**	**Rank test**
Effective Upgrades (N=73)									
[-30,30]	-0.057	-0.011*	1.484	57.5%	47.9%	56.2%	0.884	46*	1.034
[-15,15]	0.020	0.102	1.665	47.9%	31.5%	46.6%	0.741	49*	2.298*
[-10,10]	-0.038	0.068	1.842	52.1%	34.2%	49.3%	0.695	53*	3.436*
[-5,5]	0.042	0.081	0.730	52.1%	23.3%	49.3%	0.533	52*	3.826*
[-1,1]	-0.032	0.034*	0.382	67.1%	41.1%	45.2%	0.091	66*	5.800*
[-30,-1]	-0.029	0.003	0.963	53.4%	34.2%	50.7%	0.831	44	2.655*
[-15,-1]	0.049	0.070	0.906	53.4%	27.4%	52.1%	0.574	53*	3.463*
[-10,-1]	0.054	0.140	0.791	52.1%	32.9%	46.6%	0.520	59*	4.266*
[-5,-1]	0.074	0.129	0.476	64.4%	23.3%	49.3%	0.240	61*	5.349*
[1,30]	-0.035	0.006	1.812	58.9%	43.8%	60.3%	0.748	47*	2.073*
[1,15]	0.117	0.235	2.108	57.5%	41.1%	46.6%	0.541	52*	3.595*
[1,10]	-0.094	0.085	2.366	52.1%	31.5%	42.5%	0.485	57*	4.794*
[1,5]	0.062	0.173	0.516	56.2%	34.2%	38.4%	0.273	61*	5.399*
Positive Outlook Reports (N=37)									
[-30,30]	-0.064	-0.068	0.812	64.9%	29.7%	64.9%	0.639	31*	3.530*
[-15,15]	-0.109	-0.018	0.882	54.1%	24.3%	54.1%	0.676	29*	2.987*
[-10,10]	-0.250*	-0.278	0.886	56.8%	18.9%	45.9%	0.572	31*	3.606*
[-5,5]	-0.292	-0.183	1.053	54.1%	21.6%	40.5%	0.576	28*	2.942*
[-1,1]	-0.908	0.007	0.427	54.1%	37.8%	40.5%	0.102	33*	3.938*
[-30,-1]	-0.084	-0.021	0.870	62.2%	40.5%	54.1%	0.617	31*	3.379*
[-15,-1]	-0.162	-0.075	1.005	51.4%	21.6%	45.9%	0.603	29*	2.987*
[-10,-1]	-0.264*	-0.079	0.953	54.1%	21.6%	40.5%	0.491	30*	3.847*
[-5,-1]	-0.780	-0.345	0.857	43.2%	29.7%	32.4%	0.393	31*	3.817*
[1,30]	-0.054	-0.034	0.645	64.9%	16.2%	59.5%	0.564	34*	4.179*
[1,15]	-0.064	-0.003	0.583	51.4%	24.3%	40.5%	0.542	34*	4.662*
[1,10]	-0.393*	-0.219	0.518	48.6%	10.8%	43.2%	0.511	35*	4.722*
[1,5]	-0.454	-0.220	0.388	54.1%	24.3%	35.1%	0.268	36*	4.737*
Review for upgrades (N=20)									
[-30,30]	-0.037	-0.093	1.101	70.0%	60.0%	65.0%	0.802	14	0.728
[-15,15]	-0.094	-0.054	1.200	70.0%	55.0%	60.0%	0.679	12	0.205
[-10,10]	-0.239	-0.441	1.249	50.0%	25.0%	50.0%	0.732	12	0.616
[-5,5]	-0.392	-0.099	1.483	30.0%	30.0%	30.0%	0.720	14	0.915
[-1,1]	-5.818	-0.254	1.062	65.0%	25.0%	40.0%	0.123	17*	2.333*
[-30,-1]	-0.037	-0.011*	0.854	60.0%	50.0%	55.0%	0.704	14	1.699*
[-15,-1]	-0.174	0.001*	0.886	50.0%	25.0%	35.0%	0.702	14	0.952
[-10,-1]	-0.628	0.005	0.772	40.0%	30.0%	40.0%	0.652	15*	1.549
[-5,-1]	-0.765	-0.352	0.471	50.0%	40.0%	30.0%	0.306	18*	3.155*
[1,30]	0.023	-0.029	1.253	65.0%	40.0%	65.0%	0.822	13	0.616
[1,15]	0.093	-0.091	1.303	60.0%	55.0%	55.0%	0.601	14	1.587
[1,10]	-0.091	-0.153	1.400	40.0%	25.0%	35.0%	0.554	16*	2.296*
[1,5]	-0.307	0.243	1.337	45.0%	25.0%	40.0%	0.419	16*	2.184*

Note: In all cases, * indicates rejection of the H_0 that no effects due to rating actions at least to a 10% significance level. M-CCB1 is the median CCB1, and in this case * indicates rejection of H_0 with the sign test and + indicates the same but with the rank test. F-test, ST-test and B-test are respectively F-variance ratio, Siegel-Tukey and Bartlett tests and the figures show the proportion of times that H_0 is rejected individually. M-VR1 is the median of the variance ratio.

Table 3. Improvements in credit quality: GJR-GARCH volatility approach

	Systematic Risk		Unsystematic Risk							
Window	CACB2	M-CCB2	AVR2	%>1	M-VR2	Sign-t	R-test	AVR2$^{\lambda}$	% λ=1	CHS-test
Effective upgrades (N=73)										
[-30,30]	0.004	-0.002*	1.164	49.3%	0.995	37	0.291	1.003	3.3%	1032.1
[-15,15]	0.118	0.125	1.100	39.7%	0.925	44	2.369*	0.994	3.2%	807.5
[-10,10]	0.098	0.133	1.347	31.5%	0.903	50*	2.996*	0.934	9.5%	513.0
[-5,5]	0.111	0.124	0.830	34.2%	0.894	48*	3.507*	0.817	18.2%	1496.9
[-1,1]	0.007	0.065	0.910	28.8%	0.885	52*	3.705*	0.387	0.0%	389.8
[-30,-1]	0.011	0.006*	1.020	41.1%	0.961	43	1.726*	0.898	3.3%	1306.7
[-15,-1]	0.059	0.079	1.034	39.7%	0.948	44	1.908*	0.834	6.7%	886.5
[-10,-1]	0.097	0.163	1.008	30.1%	0.844	51*	3.507*	0.744	0.0%	387.8
[-5,-1]	0.176	0.309	0.837	26.0%	0.850	54*	3.986*	0.548	0.0%	526.4
[1,30]	-0.003	0.028	2.044	37.0%	0.932	46*	1.875*	0.953	6.7%	753.3
[1,15]	0.084	0.162	2.606	30.1%	0.908	51*	2.666*	0.858	6.7%	447.8
[1,10]	-0.058	0.141	2.958	31.5%	0.880	50*	3.051*	0.797	10.0%	208.1
[1,5]	0.107	0.094	0.858	27.4%	0.850	53*	3.562*	0.590	0.0%	786.2
Positive Outlook Reports (N=37)										
[-30,30]	-0.041	-0.067	0.907	27.0%	0.918	27*	2.942*	0.939	6.6%	713.8
[-15,15]	-0.080	-0.097	1.017	24.3%	0.896	28*	2.61*	0.923	9.7%	465.3
[-10,10]	-0.242*	-0.163	1.014	21.6%	0.851	29*	3.349*	0.879	9.5%	318.7
[-5,5]	-0.292	-0.193	0.815	24.3%	0.805	28*	3.063*	1.073	9.1%	112.3
[-1,1]	-0.874	0.001	0.913	24.3%	0.870	28*	2.806*	0.510	0.0%	19173
[-30,-1]	-0.095	0.014	0.967	24.3%	0.861	28*	2.474*	0.924	13.3%	622.3
[-15,-1]	-0.078	-0.020	0.986	29.7%	0.904	26*	2.489*	0.943	0.0%	322.3
[-10,-1]	-0.225*	-0.080	1.207	24.3%	0.909	28*	3.002*	0.785	10.0%	182.8
[-5,-1]	-0.602	-0.163	0.852	18.9%	0.838	30*	3.5*	0.820	0.0%	183.6
[1,30]	-0.022	-0.009	0.815	16.2%	0.866	31*	3.938*	0.811	13.3%	951.1
[1,15]	-0.014	0.037	0.818	8.1%	0.844	34*	4.254*	0.733	6.7%	505.1
[1,10]	-0.321*	-0.156	0.835	10.8%	0.867	33*	4.103*	0.663	10.0%	386.3
[1,5]	-0.436	-0.167	0.976	18.9%	0.820	30*	3.032*	0.483	20.0%	764.2
Review for upgrades (N=20)										
[-30,30]	0.030	0.082	0.929	30.0%	0.942	14	1.96*	1.002	4.9%	202.7
[-15,15]	-0.060	-0.086	0.887	30.0%	0.831	14	1.587	1.314	3.2%	57.90
[-10,10]	-0.045	-0.186	1.320	45.0%	0.894	11	0.989	1.079	9.5%	100.4
[-5,5]	-0.040	0.107	1.438	35.0%	0.906	13	0.877	1.061	9.1%	173.8
[-1,1]	-4.675	-0.104	0.912	35.0%	0.901	13	1.101	0.978	0.0%	5771.0
[-30,-1]	-0.042	-0.062	0.887	30.0%	0.824	14	2.147*	1.031	13.3%	183.5
[-15,-1]	-0.104	0.227	0.830	30.0%	0.761	14	2.259*	1.026	6.7%	136.4
[-10,-1]	-0.515	-0.008	0.868	25.0%	0.759	15*	1.811*	0.945	10.0%	98.20
[-5,-1]	-0.740	-0.258	0.739	15.0%	0.719	17*	3.005*	0.599	0.0%	134.7
[1,30]	0.119	0.023	0.885	25.0%	0.790	15*	1.325	1.067	3.3%	71.10
[1,15]	-0.025	0.034	2.909	25.0%	0.800	15*	1.176	1.106	13.3%	139.5
[1,10]	-0.086	-0.109	0.987	25.0%	0.825	15*	1.400	1.089	10.0%	18.60
[1,5]	-0.382	0.450	1.025	30.0%	0.854	14	1.363	1.089	20.0%	105.0

Note: In all cases, * indicates rejection of the H_0 that there are no effects due to the rating actions at least to a 10% significance level. M-CCB2 is the median CCB2, and in this case * indicates rejection of H_0 with the sign test and + indicates the same but with the rank test. . % >1 indicate the proportion of times that the VR2 is greater than 1, M-VR2 is the median VR2. AVR2$^{\lambda}$ is the average λ in equation (6), % λ=1 is the proportion of times that the individual

H-S test for H0: λ=1 is rejected and CHS-test is the cumulative H-S test..

Table 4. Improvements in credit quality: Dummy GJR-GARCH volatility approach

	Systematic Risk		Unsystematic Risk				
Window	**CACB3**	**M-CCB3**	**CACIR**	**% CCIR≠0**	**M-CCIR**	**Sign test**	**Rank test**
Effective upgrades (N=73)							
[-30,30]	-0.028	-0.001*+	-0.624	79.5%	0.001	37	0.984
[-15,15]	0.052	0.075+	-0.676	71.2%	-0.028	44	1.853*
[-10,10]	0.046	0.081+	-0.707	71.2%	-0.029	48*	2.683*
[-5,5]	0.057	0.051+	-0.819*	64.4%	-0.068	46*	2.007*
[-1,1]	-0.001	0.096+	-1.478*	27.4%	-0.672	65*	5.954*
[-30,-1]	0.020	0.014+	-0.914*	72.6%	-0.013	42	1.380
[-15,-1]	0.061	0.030+	-0.993*	65.8%	-0.074	52*	3.244*
[-10,-1]	0.092	0.207+	-0.975*	50.7%	-0.136	52*	4.013*
[-5,-1]	0.177	0.283+	-1.444*	30.1%	-0.484	59*	5.432*
[1,30]	-0.022	0.029+	-0.252	64.4%	-0.022	46*	2.051*
[1,15]	0.158	0.182+	-0.202	63.0%	-0.068	49*	2.859*
[1,10]	-0.026	0.162	0.129	63.0%	-0.142	51*	3.942*
[1,5]	0.065	0.080+	-1.339*	39.7%	-0.298	56*	4.546*
Positive Outlook Reports (N=37)							
[-30,30]	-0.051	-0.062+	0.052	83.8%	-0.021	26*	1.494
[-15,15]	-0.072	-0.041+	-0.065	75.7%	-0.013	22	0.875
[-10,10]	-0.196*	-0.150+	0.029	73.0%	-0.025	25*	1.177
[-5,5]	-0.247	-0.185	0.187	70.3%	-0.016	24*	0.754
[-1,1]	-0.570	0.000+	-0.388	24.3%	-0.425	33*	3.696*
[-30,-1]	-0.051	-0.011+	-0.034	81.1%	-0.048	27*	2.534*
[-15,-1]	-0.157	-0.069+	-0.237*	67.6%	-0.072	24*	2.384*
[-10,-1]	-0.261*	-0.134+	-0.092	67.6%	-0.084	25*	2.338*
[-5,-1]	-0.622	-0.175+	-0.301	48.6%	-0.179	30*	3.289*
[1,30]	-0.020	0.009*+	-0.12*	81.1%	-0.019	24*	2.157*
[1,15]	-0.018	0.052*+	-0.244*	75.7%	-0.070	28*	3.364*
[1,10]	-0.311*	-0.113+	-0.297*	70.3%	-0.087	32*	4.254*
[1,5]	-0.425	-0.187+	-0.668*	21.6%	-0.334	34*	4.828*
Review for upgrades (N=20)							
[-30,30]	-0.019	0.075+	-0.769	75.0%	0.034	11	0.168
[-15,15]	0.079	-0.006+	-0.280	75.0%	0.086	13	0.989
[-10,10]	-0.034	-0.127	0.145	70.0%	0.051	12	0.616
[-5,5]	-0.306	-0.113+	-0.825	80.0%	0.034	11	0.205
[-1,1]	-5.006	-0.334+	-1.608	20.0%	-1.154	17*	2.781*
[-30,-1]	0.102	0.009+	-0.582	85.0%	0.031	11	0.691
[-15,-1]	-0.152	0.075+	-0.016	70.0%	0.037	13	1.027
[-10,-1]	-0.460	-0.002+	-0.439	65.0%	-0.074	12	0.989
[-5,-1]	-0.704	-0.164+	-2.129	40.0%	-0.381	18*	2.856*
[1,30]	0.044	0.009*+	-0.743	70.0%	-0.054	12	0.653
[1,15]	0.013	-0.035+	-0.510	75.0%	-0.113	12	1.027
[1,10]	-0.206	0.028+	-0.093	45.0%	-0.146	15*	1.885*
[1,5]	-0.734	0.158+	-1.050	35.0%	-0.252	14	1.624

Note: In all cases, indicates rejection of the H_0 that there are no effects due to the rating actions at least to a 10% significance level. M-CCB3 is the median CCB3, and in this case * indicates rejection of H_0 with the sign test and + indicates the same but with the rank test. Figures in the % CCIR=0 column indicates the proportion of times the δ parameter is significant in model (7), and M-CCIR is the median CCIR

Table 5. Deteriorations in credit quality: Constant volatility approach

	Systematic risk		Unsystematic risk						
Window	**CACB1**	**M-CACB1**	**AVR1**	**F test**	**S-T test**	**B test**	**M-VR1**	**Sign-t**	**Rank-t**
Effective downgrades (N=126)									
[-30,30]	0.070	0.036	1.068	61.9%	49.2%	61.9%	0.769	78*	1.351
[-15,15]	0.096*	0.058	1.160	59.5%	46.0%	57.1%	0.781	82*	1.373
[-10,10]	0.082	0.076	1.134	55.6%	39.7%	54.0%	0.715	84*	2.445*
[-5,5]	0.104	0.077	1.143	51.6%	34.9%	46.8%	0.654	91*	3.421*
[-1,1]	0.225	0.189	0.488	69.8%	42.1%	44.4%	0.102	118*	7.867*
[-30,-1]	0.099*	0.045	0.983	57.1%	38.1%	56.3%	0.742	84*	2.557*
[-15,-1]	0.114	0.116	1.108	56.3%	32.5%	52.4%	0.612	84*	3.126*
[-10,-1]	0.023	0.043	1.083	47.6%	29.4%	42.9%	0.587	89*	4.022*
[-5,-1]	0.245	0.020	0.950	50.0%	24.6%	36.5%	0.354	103*	5.734*
[1,30]	0.117*	0.019	0.974	55.6%	42.9%	54.0%	0.774	79*	2.459*
[1,15]	0.161*	0.032	0.918	50.8%	31.0%	50.0%	0.615	89*	3.577*
[1,10]	0.215*	0.095	0.824	54.0%	29.4%	42.9%	0.501	97*	5.313*
[1,5]	0.132	-0.081	0.505	56.3%	22.2%	35.7%	0.279	109*	8.312*
Negative Outlook Reports (N=37)									
[-30,30]	0.245*	0.038	1.295	75.7%	40.5%	70.3%	0.870	22	0.332
[-15,15]	0.376*	0.141	1.412	59.5%	43.2%	59.5%	0.863	20	0.498
[-10,10]	0.513*	0.189	1.530	56.8%	37.8%	48.6%	0.890	22	0.407
[-5,5]	0.584*	0.394	1.711	40.5%	27.0%	29.7%	0.914	22	0.136
[-1,1]	0.120	0.057	1.009	59.5%	35.1%	35.1%	0.172	34*	4.164*
[-30,-1]	0.282*	0.289	1.128	51.4%	27.0%	43.2%	0.748	24*	1.177
[-15,-1]	0.337*	0.298	1.040	32.4%	13.5%	35.1%	0.789	25*	1.675*
[-10,-1]	0.576*	0.448	1.002	40.5%	21.6%	35.1%	0.792	25*	1.81*
[-5,-1]	0.846*	0.384	0.723	48.6%	29.7%	45.9%	0.400	27*	3.078*
[1,30]	0.265*	0.087	1.043	51.4%	35.1%	56.8%	0.726	22	0.905
[1,15]	0.427*	0.135	1.194	43.2%	32.4%	43.2%	0.768	21	0.000
[1,10]	0.514*	0.193	1.169	45.9%	40.5%	48.6%	0.787	23	0.483
[1,5]	0.603*	0.692	1.008	40.5%	27.0%	24.3%	0.458	26*	2.836*
Review for downgrades (N=93)									
[-30,30]	0.079	0.065	1.525	63.4%	46.2%	66.7%	1.138	54	3.065*
[-15,15]	0.143*	0.104	1.632	52.7%	39.8%	54.8%	1.123	51	2.51*
[-10,10]	0.18*	0.054	1.735	54.8%	38.7%	52.7%	1.092	53	2.487*
[-5,5]	0.286*	0.007	1.863	49.5%	36.6%	52.7%	1.096	48	2.188*
[-1,1]	0.733	0.195	1.665	49.5%	44.1%	44.1%	0.241	64*	2.889*
[-30,-1]	0.038	0.057	1.340	45.2%	28.0%	46.2%	1.011	47	1.866*
[-15,-1]	0.113	0.134	1.308	38.7%	31.2%	38.7%	0.863	54	0.268
[-10,-1]	0.159*	0.105	1.339	36.6%	22.6%	30.1%	0.939	50	0.215
[-5,-1]	0.296*	0.205	0.932	39.8%	21.5%	30.1%	0.543	63*	3.054*
[1,30]	0.142*	0.101	1.166	57.0%	35.5%	55.9%	0.833	57*	1.038
[1,15]	0.179*	0.136	1.149	43.0%	34.4%	45.2%	0.827	54	0.989
[1,10]	0.228*	0.205	1.059	45.2%	30.1%	52.7%	0.692	61*	1.295
[1,5]	0.326	0.045	0.980	50.5%	38.7%	43.0%	0.371	67*	2.782*

Note: In all cases, * indicates rejection of the H_0 that there are no effects due to the rating actions at least to a 10% significance level. M-CCB1 is the median CCB1, and in this case * indicates rejection of H_0 with the sign test and + indicates the same but with the rank test. F-test, ST-test and B-test are the summarized names of the F-variance ratio, Siegel-Tukey and Bartlett tests, respectively, and the figures show the proportion of times that H_0 is rejected individually. M-VR1 is the median of the variance ratio..

Table 6. Deteriorations in credit quality: GJR-GARCH volatility approach

	Systematic Risk		Unsystematic Risk							
Window	**CACB2**	**M-CCB2**	**AVR2**	**%>1**	**M-VR2**	**Sign-t**	**Rank-t**	**AVR2$^{\lambda}$**	**% λ=1**	**CHS-test**
Effective downgrades (N=126)										
[-30,30]	0.045	0.019	1.137	38.9%	0.927	77*	1.763*	0.975	6.6%	3736.4
[-15,15]	0.063	0.090	1.077	34.1%	0.882	83*	1.831*	0.989	9.7%	2342.2
[-10,10]	0.063	0.120	1.060	35.7%	0.885	81*	3.216*	0.965	4.8%	2003.1
[-5,5]	0.102	0.022	1.181	32.5%	0.875	85*	2.958*	0.867	9.1%	1274.5
[-1,1]	0.798	0.147	1.079	24.6%	0.818	95*	4.782*	0.385	0.0%	810.0
[-30,-1]	0.101	0.046	1.149	32.5%	0.885	85*	2.873*	0.923	13.3%	1647.7
[-15,-1]	0.159	0.075	1.013	29.4%	0.829	89*	3.813*	0.948	13.3%	1400.6
[-10,-1]	0.023	0.023	1.007	30.2%	0.824	88*	4.047*	0.899	10.0%	815.9
[-5,-1]	0.283	-0.033	1.142	24.6%	0.824	95*	4.719*	0.702	20.0%	256.9
[1,30]	0.103	0.084	1.026	38.1%	0.921	78*	2.094*	0.938	10.0%	3898.0
[1,15]	0.111	0.076	1.010	31.7%	0.870	86*	2.812*	0.886	6.7%	2321.1
[1,10]	0.188*	0.081	0.971	29.4%	0.817	89*	3.572*	0.789	10.0%	1290.7
[1,5]	0.117	-0.081	0.925	23.0%	0.763	97*	5.008*	0.545	0.0%	1007.3
Negative Outlook Reports (N=37)										
[-30,30]	0.233*	0.104	1.213	54.1%	1.025	20	0.619	1.005	6.6%	1090.7
[-15,15]	0.36*	0.054	1.297	54.1%	1.015	20	0.709	1.007	6.5%	650.3
[-10,10]	0.494*	0.263	1.373	48.6%	0.996	19	0.166	1.040	19.0%	407.8
[-5,5]	0.588*	0.424	1.463	40.5%	0.956	22	0.392	1.094	9.1%	309.6
[-1,1]	-0.203	0.079	1.094	21.6%	0.885	29*	2.534*	0.431	0.0%	269.0
[-30,-1]	0.193*	0.095	1.080	40.5%	0.977	22	0.588	0.969	6.7%	1002.7
[-15,-1]	0.303*	0.268	1.054	35.1%	0.937	24*	1.177	0.889	0.0%	888.6
[-10,-1]	0.579*	0.438	0.956	32.4%	0.879	25*	2.338*	0.905	0.0%	398.7
[-5,-1]	0.837*	0.448	1.075	24.3%	0.898	28*	2.851*	0.651	0.0%	99.1
[1,30]	0.275*	0.160	1.223	43.2%	0.988	21	0.211	0.930	10.0%	629.8
[1,15]	0.443*	0.075	1.500	51.4%	1.003	19	0.694	0.894	6.7%	358.2
[1,10]	0.542*	0.296	1.641	45.9%	0.941	20	0.196	0.818	10.0%	164.8
[1,5]	0.575*	0.655	1.931	32.4%	0.907	25*	0.739	0.646	0.0%	298.3
Review for downgrades (N=93)										
[-30,30]	0.103	0.037	1.349	60.2%	1.061	56*	3.015*	1.053	3.3%	1052.5
[-15,15]	0.133*	0.039	1.438	59.1%	1.042	55*	2.46*	1.082	3.2%	374.4
[-10,10]	0.185*	0.061	1.511	59.1%	1.062	55*	3.015*	1.098	4.8%	235.8
[-5,5]	0.529*	0.169	1.510	54.8%	1.049	51	2.33*	1.090	9.1%	162.3
[-1,1]	0.782	0.262	1.246	38.7%	0.902	57*	0.034	0.764	0.0%	538.1
[-30,-1]	0.051	0.031	1.195	52.7%	1.015	49	1.165	1.105	13.3%	1516.8
[-15,-1]	0.139	0.074	1.186	41.9%	0.970	54	0.027	1.063	20.0%	583.6
[-10,-1]	0.218*	0.129	1.197	44.1%	0.967	52	0.843	1.087	10.0%	616.0
[-5,-1]	0.534*	0.180	1.127	35.5%	0.904	60*	1.218	0.805	0.0%	129.1
[1,30]	0.146*	0.077	1.292	51.6%	1.003	48	1.253	0.895	10.0%	1792.3
[1,15]	0.202*	0.144	1.437	51.6%	1.038	48	1.946*	0.836	13.3%	687.2
[1,10]	0.236*	0.244	1.545	55.9%	1.023	52	2.142*	0.726	0.0%	674.5
[1,5]	0.269	0.132	1.656	49.5%	0.993	47	1.766*	0.607	0.0%	634.0

Note: In all cases, * indicates rejection of the H_0 that there are no effects due to the rating actions at least to a 10% significance level. M-CCB2 is the median CCB2, and in this case * indicates rejection of H_0 with the sign test and +

indicates the same but with the rank test. . % >1 indicate the proportion of times that the VR2 is greater than 1, M-VR2 is the median VR2. AVR2$^{\lambda}$ is the average λ in equation (6), % λ=1 is the proportion of times that the individual H-S test for H0: λ=1 is rejected and CHS-test is the cumulative H-S test..

Table 7. Deteriorations in credit quality: Dummy GJR-GARCH volatility approach

	Systematic Risk		Unsystematic Risk				
Window	**CACB3**	**M-CCB3**	**CACIR**	**% CCIR≠0**	**M-CIR**	**Sign test**	**Rank test**
Effective downgrades (N=126)							
[-30,30]	0.049	0.038+	0.056	76.2%	0.007	68	0.757
[-15,15]	0.078	0.092	0.133	78.6%	-0.008	65	0.105
[-10,10]	0.059	0.084+	0.004	68.3%	-0.052	77*	1.609
[-5,5]	0.100	0.029+	-0.189	56.3%	-0.174	84*	3.767*
[-1,1]	0.868	0.224+	-1.635*	24.6%	-1.292	11*	8.188*
[-30,-1]	0.051	0.02+	-0.068	76.2%	-0.005	65	0.550
[-15,-1]	0.101	0.113	0.137	68.3%	-0.055	76*	1.551
[-10,-1]	-0.009	-0.003*	0.139	61.1%	-0.123	83*	3.036*
[-5,-1]	0.283	-0.045	0.443	44.4%	-0.390	97*	5.78*
[1,30]	0.094	0.056+	0.017	77.8%	-0.026	69	0.743
[1,15]	0.138*	0.082+	-0.149	65.9%	-0.073	78*	2.116*
[1,10]	0.181*	0.099+	-0.258*	51.6%	-0.199	90*	4.176*
[1,5]	0.128	-0.088+	-0.977*	38.9%	-0.506	10*	7.185*
Negative Outlook Reports (N=37)							
[-30,30]	0.208*	0.035+	0.075	73.0%	-0.033	20	0.136
[-15,15]	0.329*	0.032+	-0.007	73.0%	0.003	19	0.091
[-10,10]	0.504*	0.295+	-0.060	64.9%	-0.011	19	0.241
[-5,5]	0.526*	0.473	0.140	64.9%	0.000	19	0.151
[-1,1]	0.001	0.16+	-1.223*	18.9%	-1.079	34*	4.435*
[-30,-1]	0.197*	0.161+	-0.169	81.1%	-0.020	21	0.709
[-15,-1]	0.31*	0.289+	-0.238*	73.0%	-0.111	24*	2.429*
[-10,-1]	0.615*	0.447+	-0.302*	64.9%	-0.047	21	1.614
[-5,-1]	0.898*	0.393+	-0.612*	35.1%	-0.483	29*	3.259*
[1,30]	0.238*	0.155+	-0.048	73.0%	-0.029	24*	0.815
[1,15]	0.505*	0.067+	-0.296*	75.7%	-0.106	24*	1.931*
[1,10]	0.594*	0.183+	-0.284*	67.6%	-0.114	25*	2.037*
[1,5]	0.666*	0.773+	-0.376*	51.4%	-0.312	28*	3.425*
Review for downgrades (N=93)							
[-30,30]	0.082	0.028+	0.075	83.9%	0.024	59*	1.824*
[-15,15]	0.14*	0.070	0.347*	83.9%	0.050	52	2.663*
[-10,10]	0.176*	0.068	0.439*	80.6%	0.083	58*	2.709*
[-5,5]	0.374*	0.106	0.689*	69.9%	0.107	53	1.797*
[-1,1]	0.673	0.054+	-0.389	24.7%	-0.895	69*	3.713*
[-30,-1]	0.055	0.063	0.298*	82.8%	0.082	55*	2.786*
[-15,-1]	0.137	0.087	0.406*	81.7%	-0.002	47	1.249
[-10,-1]	0.221*	0.190	0.443*	71.0%	0.047	53	0.927
[-5,-1]	0.417*	0.218+	0.003	50.5%	-0.287	59*	3.008*
[1,30]	0.156*	0.109+	-0.162*	69.9%	-0.053	56*	1.77*
[1,15]	0.147*	0.122+	-0.049	65.6%	-0.097	61*	1.521
[1,10]	0.236*	0.18+	-0.218	52.7%	-0.251	66*	3.579*
[1,5]	0.295	0.199+	-0.653*	32.3%	-0.732	75*	4.797*

Note: In all cases, indicates rejection of the H_0 that there are no effects due to the rating actions at least to a 10%

significance level. M-CCB3 is the median CCB3, and in this case * indicates rejection of H_0 with the sign test and + indicates the same but with the rank test. Figures in the % CCIR=0 column indicates the proportion of times the δ parameter is significant in model (7), and M-CCIR is the median CCIR.

Table 8. Determinants of abnormal risks

	Improvements in credit quality				Deteriorations in credit quality			
	[-1, 1]		[1, 30]		[-1, 1]		[1, 30]	
	Systematic	**Unsystematic**	**Systematic**	**Unsystematic**	**Systematic**	**Unsystematic**	**Systematic**	**Unsystematic**
Constant	1.54	-2.173*	-0.038	-0.567	-0.103	-1.867*	-0.045	-0.022
	(0.511)	(0.026)	(0.807)	(0.493)	(0.941)	(0.003)	(0.696)	(0.875)
Review	-5.461	-0.143	-0.025	-0.511	-0.049	1.283*	0.12	-0.151
	(0.198)	(0.951)	(0.908)	(0.8)	(0.962)	(0.009)	(0.254)	(0.228)
Outlook reports	-1.217	0.961	-0.024	-0.005	-0.716	0.473	0.21	-0.008
	(0.287)	(0.124)	(0.857)	(0.992)	(0.517)	(0.314)	(0.19)	(0.95)
Moody's	-1.005	1.297	0.094	0.798	-0.033	-0.479	0.024	-0.28*
	(0.539)	(0.143)	(0.501)	(0.413)	(0.974)	(0.278)	(0.805)	(0.007)
One agency	-2.05	-1.022	0.147	-0.483	2.565	-0.637	0.024	-0.322
	(0.364)	(0.378)	(0.679)	(0.387)	(0.242)	(0.239)	(0.925)	(0.298)
Expected	-1.089	0.909	-0.314*	0.584	1.001	0.441	0.155	0.028
	(0.405)	(0.414)	(0.039)	(0.584)	(0.349)	(0.371)	(0.104)	(0.777)
Consensus	-12.96	-1.234	-0.183	-1.335	1.851	1.017	-0.156	0.288
	(0.217)	(0.811)	(0.576)	(0.749)	(0.311)	(0.25)	(0.283)	(0.168)
Financial Sector	1.018	-0.348	0.244*	-0.33	-0.348	0.023	0.014	0.266*
	(0.319)	(0.464)	(0.071)	(0.358)	(0.703)	(0.959)	(0.882)	(0.019)
R2	0.166	0.051	0.055	0.017	0.017	0.049	0.018	0.074
Obs.	130	130	130	130	256	256	256	256

Note: In all cases, * indicates statistical significance at the 10% level in a two-tailed test

Table 9. Deteriorations in credit quality – 2007 financial crisis effect

	Before August 2007				After August 2007			
	[-1, 1]		[1, 30]		[-1, 1]		[1, 30]	
	Systematic	Unsystematic	Systematic	Unsystematic	Systematic	Unsystematic	Systematic	Unsystematic
Constant	-0.733	-1.563*	-0.118	-0.117	0.416	-4.071*	0.035	0.152
	(0.659)	(0.039)	(0.371)	(0.399)	(0.539)	(0.022)	(0.902)	(0.795)
Review	0.413	0.798	0.235*	-0.073	-0.99*	3.021*	-0.252	-0.257
	(0.747)	(0.18)	(0.055)	(0.557)	(0.063)	(0.001)	(0.257)	(0.436)
Outlook reports	-0.855	-0.176	0.29	-0.014	0.737	4.042*	-0.335	0.386
	(0.515)	(0.719)	(0.102)	(0.92)	(0.384)	(0.021)	(0.215)	(0.452)
Moody's	0.599	0.187	-0.002	-0.127	-1.15*	-2.31*	0.303	-0.751*
	(0.661)	(0.712)	(0.988)	(0.202)	(0.035)	(0.004)	(0.128)	(0.013)
One agency	2.439	-0.922	-0.033	-0.332	0.982*	-2.76*	0.712*	-0.718*
	(0.315)	(0.124)	(0.904)	(0.331)	(0.048)	(0.00)	(0.00)	(0.012)
Expected	1.484	0.502	0.194*	0.032	0.384	1.023	0.124	0.085
	(0.262)	(0.374)	(0.08)	(0.752)	(0.397)	(0.478)	(0.568)	(0.823)
Consensus	1.958	1.152	-0.186	0.271	0.416	0.082	-0.28	0.686
	(0.33)	(0.218)	(0.229)	(0.231)	(0.649)	(0.935)	(0.55)	(0.168)
Financial Sector	0.156	-0.059	0.104	0.293*	-0.059	1.84	-0.18	0.347
	(0.897)	(0.92)	(0.408)	(0.015)	(0.925)	(0.105)	(0.403)	(0.444)
R2	0.019	0.04	0.033	0.069	0.219	0.303	0.113	0.143
Obs.	197	197	197	197	59	59	59	59

Note: In all cases, * indicates statistical significance at the 10% level in two-tailed test.