Determinants of trading activity after rating actions in the Corporate Debt Market

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Abstract:

The influence of rating announcements on corporate debt market trading has been previously overlooked. Based on an event study, we examine the effects of the three types of announcements provided by credit rating agencies on abnormal trading volume and trading frequency in the Spanish corporate debt market. Additionally, by means of cross-section regressions, we establish what factors determine the sign and intensity of the trading reactions. The presented results indicate that factors related to the characteristics of the rating announcement, the issuing company and the economic environment are relevant in light of several hypotheses.

Keywords: Rating agencies, rating announcements, trading volume, trading frequency

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1. Introduction

This study examines the impact of rating announcements on the Spanish corporate debt market trading activity: actual rating changes, outlook reports (or medium-term rating trends), and reviews (warnings of a possible short-term rating change) made by the "Big three" credit rating agencies (*Moody's*, *Standard and Poor's* and *Fitch*). We also identify the determinants of abnormal trading activity by considering the peculiarities of the announcement in question, the issuer and the economic environment.

Many authors present evidence of the informative content of rating announcements. Most of them have focused on analyzing the effects of those announced changes on stock prices (e.g., Hand *et al.*, 1992; Elayan *et al.*, 2001 or, for the Spanish market, Abad and Robles, 2006). Some others have analyzed these effects on corporate debt prices (e.g., Kliger and Sarig, 2000, Steiner and Heinke, 2001; in the European case, Gropp and Richards, 2001, Dallocchio *et al*., 2006; or, in the Spanish case, Abad *et al.*, 2007). In the above-mentioned sources, we can find hypotheses regarding the effects of rating announcements that postulate on the expected performance of corporate debt prices, as well as possible determinant factors. However, none of them addresses the expected trading activity performance.

Ratings and rating changes can result in a specific market dynamic that can not only affect prices, but can also directly concern the market's trading activity. This dynamic may be caused by the way in which investors use ratings, as well as by its actual informative content. For example, the proliferation of "rating triggers" in the management of portfolios based on rating changes may force operators to increase their sales transactions and may even cause a trading activity crisis.

In spite of the importance of the impact of rating actions on debt trading activity, there is almost no theory or empirical research on that question. To our knowledge, the first work on that topic is the paper by Abad *et al.* (2007), which analyzes the effects of rating announcements on yield spreads and different liquidity measures analyzed in the Spanish corporate debt market. Recently, Chebbi and Hellara (2010) studied the same question with respect to Tunisian securities, and Da and Gao (2010) analyze liquidity shocks around downgrades.

Based on the work of Abad *et al.* (2007), in this study, we analyze how several trading activity measures respond to rating announcements. We also formulate different hypotheses that link the potential effect to different characteristics of the issue (e.g., sector or size) rating characteristics (such as the type of rating announcement, or if the action is expected by the

market), and economic environment characteristics. Finally, we define the possible explanatory factors of the trading response under these hypotheses.

A key factor in this analysis is how abnormal trading activity is measured. We consider a wide range of variants based on different aspects of trading activity: trading volume and trading intensity or frequency.

To carry out the analysis, we analyze a sample of daily corporate bond and commercial paper notes data. This database of Spanish corporate fixed income assets contains information about the trading volume per transaction, making it possible to develop trading activity measures. First, we perform an event study to determine if the rating changes generate significant abnormal trading activity, and then we analyze the effects of the determinants by means of a cross-section regression analysis.

The next section formulates the hypotheses addressing the reaction of trading activity to rating announcements. Section 3 presents the trading activity measures analyzed. Section 4 describes the database. Section 5 presents the results of the empirical analysis. The main conclusions are summarized in Section 6.

2. Trading Activity Response to Rating Announcements

The literature presents different and sometimes conflicting theories regarding the expected effects of rating announcements on prices in stock and debt markets. However, these theories do not address expected trading activity performance. Starting from these theories, we state and test a set of hypotheses about the effect of rating announcements on trading volume and trading frequency, which Table 1 summarizes.

[Insert Table 1]

First, the information content hypothesis (ICH) states that rating agencies handle confidential information, and, therefore, rating revisions include new information for the market that is rapidly included into prices. From the ICH theory, we hypothesize that this inclusion of new information into prices accompanies an increase in market activity. On the other hand, market microstructure models assert that the change in trading activity after the release of new information is related to the existence of asymmetric information among agents and market makers (e.g., see Balduzzi *et al.*, 2001). Informed investors anticipate such information and increase their activity before the announcement. Before the news is released, volatility increases and after the trading activity, volatility decreases. Nevertheless, Kim and Verrecchia (1994), in

the frame of these models, state the opposite. Some traders are able to make better decisions than others, based on the same information, leading to information asymmetry and positive abnormal trading volume after the release of new information about the firm. In this context, higher trading activity after the rating announcement will be expected.

The agencies' strategic behavior can influence the information content of rating. Some authors, such as Howe (1995), Löffler (2004) and Altman and Rijken (2006), indicate that agencies apply a "through-the-cycle" methodology to achieve stability in ratings. In similar terms, Fledelius *et al.* (2004) and Löffler (2005) assert that when the rating of a company is changed, the agency wants to be quite sure that this adjustment is stable and is not going to be reversed shortly after ("reversal aversion"). With respect to the investors, the economic environment may also be relevant (Dialynas and Edington, 1992) because in periods of prosperity investors will assume higher levels of risk.

In addition, agency behavior can reflect a "moral hazard risk problem" that would undermine the reliability of their ratings.[1] Almost all rating agency revenue comes from rating fees. One method for acting in the interest of issuers is to delay rating downgrades. With respect to this behavior, the rating changes would have no effect because the market would not value them.

Moreover, to safeguard their reputation, agencies may prefer to proceed slowly so as not to make mistakes (Steiner and Heinke, 2001; Hull *et al.*, 2004). The loss of reputation associated with giving a good rating to a high-risk company is more serious than that resulting from assigning a poor rating to a low-risk company because the first error may mean economic losses for investors. According to Holthausen and Leftwich (1986) and Ederington and Goh (1998), this asymmetry means that the agencies allocate more resources to revealing negative than positive information. Therefore, the impact on trading activity will be greater in downgrades than in upgrades.

[1] Steiner and Heinke (2001) demonstrate that agencies may systematically overrate issuers to gain market share or maintain leadership. Covitz and Harrison (2003) analyze if agencies are biased in favour of issuer interests at the expense of investors. Boot *et al.* (2006) provide a model based on an implicit contract between the credit rating agency and the firm that should prevent further downgrades. An agency initiates a monitoring regime through the credit watch procedure, and an issuer implicitly promises to initiate specific actions to mitigate the possible decline of its rating.

In addition to rating changes, the agencies make other rating-related decisions, e.g., outlook reports or reviews.[2] According to Steiner and Heinke (2001), Hull *et al.* (2004), Boot *et al.* (2006) and Altman and Rijken (2007) these announcements may even be more useful to the markets than rating changes, having larger effects on bond prices.

Sometimes, the performance of institutional investors conditions the final effect of rating changes. Credit ratings allow for making a distinction between investment and speculative grade debt. Some clauses force the investors' decisions on the observed rating (e.g., pension funds are often only allowed to deal with investment grade issues) and influence the effects caused by rating changes, even though the changes contain no new information for the market.[3] As well, institutional investors usually use a buy-and-hold strategy that can diminish the impact of rating changes on trading activity.

It is important to note that differences in the regulation affecting firms can lead to differences in the information content of rating changes (Schweitzer *et al.*, 1992). Thus, for highly regulated sectors, such as the financial sector or governmental firms, the market has more public information, and the debt of these enterprises is almost guaranteed by the State. Then the impact of rating announcements on that type of firm is diminished. This effect may also be observed for larger or more profitable firms. For instance, effects of downgrades on larger firms may be influenced by the *too-big-to-fail* paradigm because the market may consider that large corporations have systemic importance.[4]

3. Trading Measures

In this study we propose different proxies for corporate bond trading activity to obtain measures of abnormal trading activity. Specifically, we analyze the evolution of the trading volume and the frequency of trading. To analyze the effect of rating changes, we study these

[2] Reviews or watchlist additions 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.

[3] Similarly, specific markets, such as the Eurobond market, may simply require the presence of a particular minimum rating before listing the debt issue.

[4] Regulators might intervene to avoid the default of large banks because of serious, adverse effects on the financial system. Nevertheless, Lehman Brothers was allowed to fail on September 15, 2008. As a result, this event caused a widespread panic in the market.

variables on the day that the rating change is announced in the news (day $t = 0$) and on days surrounding it. Due to infrequent trading, these variables are often unavailable on days $t = -1$, $t = 0$ and $t = +1$. For this reason, we analyze window-spanning excess of trading activity from $t = t_1$ to $t = t_2$, where t_1 is the last trading day before the announcement and t_2 is the first trading day after the announcement.

The trading volume on day t_2 is obtained from a measure of the effective trading volume for each of the outstanding issues of issuer *i*. Then we compute the logarithmic rate of change of the trading volume between session t_2 and the last session prior to t_2 during which an asset of the issuer was traded, t_1,:

$$cV_{i,(t_2-t_1)} = v_{i,t_2} - v_{i,t_1} \qquad (1)$$

where $v_{i,t1}$ *and* $v_{i,t2}$ are the logarithms of the trading volume of the outstanding issues of issuer *i* on days t_1 and t_2, respectively.

The abnormal trading volume variable, $AV_{i,(t_2-t_1)}$, is obtained by comparing the observed rate of change $cV_{i,(t_2-t_1)}$ with the expected rate of change in the absence of the event:

$$AV_{i,(t_2-t_1)} = cV_{i,(t_2-t_1)} - E(cV_{i,(t_2-t_1)}) \qquad (2)$$

where $E(cV_{i,(t_2-t_1)})$ is the expected or "normal" rate of change of the trading volume on average between all of the issues of issuer *i*, considered as the benchmark.

The expected trading volumes in t_1 and t_2 are calculated from three alternative measures during the three months prior to t_1 and to t_2. Two measures are mean daily trading volumes; the first one is calculated *per* traded day (related to the average transaction size) and the second one *per* working day (related to the trading frequency).[5] Thus, they are computed as the average total traded volume of the issue in the last three months divided by the number of days on which the asset is traded during that period (*per* traded day) or divided by the number of working days in the last three months, regardless of whether the issue has been traded (*per* working day). The third measure is the accumulated trading volume of the asset in the last three months. Finally, we obtain the logarithmic rate of change between t_2 and t_1 of the mean traded volumes per day (TVTD), the mean daily trading volume (TVWD), and mean trading volume accumulated in the last three months (TVA).

[5] Consequently, this latter measure is corrected if the asset is kept outstanding for less than three months.

The second measure is based on comparing the mean trading frequency to the different outstanding issues by the issuer on the first day of transactions after the event and the day prior to the event. These frequencies are calculated for each issue as the ratio between the number of trading days and the number of days on which trading could have taken place, i.e., working days in a predefined window. The measure of abnormal frequency is calculated as:

$$AF_{i,(t_2-t_1)} = f_{i,t_2} - f_{i,t_1} \qquad (3)$$

where f_{i,t_2} and f_{i,t_1} are the logarithms of the two relative frequencies mentioned above. We consider different sizes of the windows in which f_{i,t_2} and f_{i,t_1} are calculated. For the first windows, in which we measure the frequency after the event, we select 1-week and 1-month windows after t_2. For the second windows, in which we measure the frequency before the event, we consider 1- and 3-month windows after t_1, and the entire period since issue after t_1.[6] In this way, we are able to see what happens to abnormal trading activity as the date of the rating change announcement approaches and, furthermore, if the impact is only observed in the market immediately after the event or it is longer-lasting.

4. Data

The original data set consists of daily observations derived from actual transactions in all commercial paper notes and corporate bonds traded on the secondary market of AIAF (*AIAF Mercado de Renta Fija* - Fixed Income Market).[7] This is by far the leading and almost only Spanish corporate fixed income market and is run by the Spanish security dealers association. At present, AIAF is one of the leading European corporate fixed income markets. In fact, in 2006, it was the second largest European market in mortgage-backed securities[8] and the first largest in covered bonds ("*Cédulas Hipotecarias*").[9]

We compute the abnormal trading activity measures from daily observations of trading volume and transactions carried out on all commercial paper and bonds traded on the secondary corporate debt market, AIAF. The database of bonds begins in 1993, whereas the commercial

[6] We also consider other windows before and after, but we do not include the results to save space.

[7] Corporate fixed income assets are also listed through the electronic trading system of the Spanish stock exchanges and through three of the four Spanish stock exchange markets (Barcelona, Bilbao and Valencia).

[8] ESF Securitisation Data Report, Spring 2007.

[9] Spanish *Cédulas Hipotecarias* are equivalent to German *Pfandbriefe* and French *Obligations Fonciéres*.

paper database begins in 1998, and both end in 2004. For each reference, AIAF provides daily information on the number of transactions and the nominal and effective transaction volumes. We excluded from the sample issues with special characteristics, such as, for example, floating interest rate issues, convertible bonds, issues with tax incentives.

The sample we analyze in this paper consists of rating announcements of *Fitch*, *Standard and Poor's* and *Moody's* from June 1993 to December 2004. Part of this information was provided by *Fitch* and *Moody's*. We also use the "*Hemeroteca de El País*" ["*El País*" newspaper library] to obtain information on the announcements of *Standard and Poor's*. The original sample was composed of 349 rating announcements, including rating changes, outlook reports and reviews.

From the database, we select the issues of re-rated companies, and we exclude the cases that lacked the minimum of activity around the announcement date. Likewise, we rule out those cases in which the re-rated firm has suffered any other event that might generate abnormal behavior in the event window. The final sample consists of 158 rating announcements that affect 1,058 issues (271 bonds and 787 commercial paper notes).[10] Table 2 presents the 158 events divided into six categories: rating upgrades or downgrades, positive or negative outlooks, and reviews for downgrades and upgrades. In all, the sample contains 109 rating announcements that affect the bond market and 120 that affect the short-term market. Of these, 71 simultaneously affect both markets.

[Insert Table 2]

Table 2 also presents the number of expected rating announcements. Therefore, similar to other authors, we used the reviews to distinguish between expected and unexpected rating changes. When a rating change is preceded by a review announcement in the same direction, it can be anticipated by the market and will not provide new information. In both market segments we find more than 50% of expected rating events. Finally, of the 229 announcements, 143 involve a decline of creditworthiness and 86 involve improvement. This seems to indicate a somewhat increased credit risk in the Spanish corporate debt market during the studied period.

[10] In many cases, the rating changes affect companies whose issues are not traded around the event. Other issues are not traded in the secondary market because they are fully incorporated into the investors' portfolios. Moreover, some large issuers put their debt into circulation on other international markets.

Table 3 presents the classification of rating announcements according to the number of notches the debt shifts after the rating change. Although the three agencies used different symbols to designate the different credit risk categories, it is easy to determine the equivalence between these symbols. This allows us to transform the ordinal scale applied by the agencies into a numeric scale, in which the highest values denote a greater probability of default.[11] Table 3 also presents in parentheses those changes that imply an entrance into speculative grade. As we can see, only two rating downgrades in the case of bonds caused a drop to the speculative grade.

[Insert Table 3]

Focusing on the agency, 49% of rating actions are by *Moody's*, 27% by *Fitch*, and the remaining 23% by *S&P's*. In addition, we find similar percentages for the two market segments individually. Finally, 68% of the announcements correspond to firms in the financial sector (savings or commercial bank), and 18% correspond to governmental enterprises.

5. Empirical Results

5.1. Estimation of Abnormal Trading Activity

Almost all issuers affected by rating actions simultaneously maintain various issues on the market, especially in the case of commercial paper notes. On most days, several references of each issuer are traded on the secondary market. To avoid correlation in the cross section resulting from the fact that the trading activity of the references issued by the same company may be highly correlated, we construct portfolios with all of the bonds, on the one hand, and all of the commercial paper notes, on the other hand, before computing the trading measures. In this way, all of the outstanding references of each issuer were aggregated and weighted by the volume of issues traded on the corresponding day in a portfolio, which was treated as an individual observation.

In the event analysis, we used two statistics to test the null hypothesis of inexistence of abnormal performance due to the rating announcement, i.e., zero mean abnormal trading activity: a standard *t-ratio* and, to avoid the effects of non-normality, the Wilcoxon rank test.

Results are presented in Table 4. The first panel presents mean abnormal trading activity after upgrades and downgrades in the corporate bond portfolios. The results for the commercial

[11] Rating Aaa of Moody's and AAA of Fitch and S&P corresponds to 1 on the numeric scale, rating Aa1 and AA+ to 2, rating Aa2 and AA to 3, and so on.

paper portfolios are shown in the second panel. The table presents the results for volume-based and the frequency-based trading measures.

[Insert Table 4]

For bonds, downgrade announcements imply a significantly positive abnormal trading frequency, whereas no significant excess trading activity is observed for trading volume. In addition, trading activity increases more as the announcement date approaches, i.e., it is more clearly observed for the shortest post-event windows. The results are independent of the test we use.

For rating upgrade announcements on bonds, the excess trading activity is also significantly positive. This result is robust to proxy of trading activity (volume or frequency) and the test used (parametric or non-parametric). For the frequency measures, the effect is greater immediately after the announcement, and it diminishes after that date, just as it does for downgrades.

In the case of the short-term corporate debt market (Table 4, right panel), for rating upgrades and downgrades, significant effects are detected only with the frequency-based measures. The effect is positive in all of the windows, indicating an increase in abnormal frequency after the announcement. This increased trading activity diminishes as the post-event window is broadened, indicating that its intensity decreases as time passes after the announcement.

In short, for both segments we find a significant positive response of trading activity to changes in both directions. An increased, more intense frequency is observed in the periods closest to the announcement date. These results are consistent with the predictions of the informative content hypothesis and some market microstructure models, but other hypotheses postulate on asymmetric performance for credit rating upgrade and downgrade announcements. According to Kim and Verrecchia (1994), trading activity will deteriorate around the release of an information event. Kandel and Pearson (1995) state that different interpretations of public signals resulting in high information asymmetry might be the origin of abnormal increased trading volume occurring after the news release.

5.2. Determinants of Abnormal Trading Activity

The purpose of this section is to analyze the determining factors of trading activity movements as a result of rating announcements. To do so, we estimate a multiple regression

model for which the variable to be explained is the measure of abnormal trading activity. The model is as follows:

$$AT_{i,(t_1-t_2)} = \beta_0 + \beta_1 EXP_i + \beta_2 NOTCH_i + \beta_3 GRAD_i + \beta_4 AG_i + \beta_5 W_i + \beta_6 O_i + \\ + \beta_7 IRV_i + \beta_8 FIN_i + \beta_9 GOV_i + \beta_{10} LSIZE_i + \beta_{11} AGR_i + \beta_{12} EP_i + u_i \quad (4)$$

where $AT_{i,(t_1-t_2)}$ denotes each of the described abnormal trading activity measures in the event window.

In model (4), the explanatory variables help to verify the different hypotheses presented in Section 3. Thus, to test the informative content hypothesis, we include different variables: *EXP*, which equals one if the announcement is preceded by a review in the same direction and zero otherwise,[12] and *NOTCH*, which indicates the number of notches the debt rating changes. We also define *GRAD*; this variable is equal to one when there is a shift from investment grade to speculative grade, and zero otherwise. This latter variable also allows us to test the hypothesis of pressure on prices associated with rating triggers. This variable is only included in the models for downgrades in the case of bonds because only in this case does the sample contain shifts from investment to speculative grade.

To analyze the effect of agencies' strategic behavior we include several variables. First, the variable *AG*, which equals one if the announcement is by *Moody's* and zero if it is by *S&P* or *Fitch*, is used to verify the hypothesis of reliability of agencies and competition between them. To test the hypothesis of long-term orientation of rating versus other agency actions, we include *W*, which equals 1 if the announcement is a review, and zero otherwise; and *O*, which equals 1 if the event is an outlook report, and zero otherwise. If these rating announcements incorporated useful short-term information, then their effect will be positive.

To consider the effects of the economic cycle, the model included the one-year Euribor inter-annual rate of change (*IRV*).[13] If investors are more concerned with risk in periods of economic crisis, we expect a positive effect of this variable.

We included two variables to analyze the importance of regulation affecting the issuer: *FIN*, which equals one if the announcement refers to a company from the financial sector, and

[12] Although this is the habitual definition of expected rating changes, we also construct a variable that is equal to 1 if the announcement is preceded by a rating announcement in the same direction in the three preceding months (*E3M*).

[13] In addition, we alternatively consider the growth rate of the economy (*GRE*).

zero otherwise, and *GOV*, which equals one in the case of a governmental enterprise, and zero otherwise.

Finally, to analyze the effect of company-specific characteristics, we include three variables. One distinguishes between large and small firms. We call it *LSIZE*, and it equals one if the logarithm of the asset is above the mean, and zero otherwise. The other two are performance measures: the firm asset growth rate (*AGR*) and its economic profitability (*EP*).[14, 15]

To take into account the possibility that some other simultaneous event that affects the issuer occurs in the event window, we include two control variables in the model: *ISS*, which indicates the number of issues that constitute the portfolio, and *DAY*, which measures the number of days in the event window, i.e., between t_1 and t_2.

Model (4) was estimated separately for the sample of downgrade and upgrade announcements, for the sample of bonds and commercial paper, and for the different abnormal trading activity measures provided in Section 4.[16] We estimated the models by ordinary least squares. To correct for the potential effects of heteroskedasticity in the variance-covariance matrix of the OLS estimator, we calculate the White's estimator of this matrix. Before estimating the models, we test the existence of significant correlations between the explanatory variables. The presence of multicolinearity in the models is ruled out because the highest correlation we find does not exceed 0.45 in any case.

5.2.1. Results for Downgrades

Tables 5 and 6 present the model (4) results in the case of downgrades. The former presents the results for trading volume, and the latter presents the results related to trading intensity or frequency.

The model for the estimation of abnormal trading volume of bonds is presented in the left panel of Table 5. As can be observed, no significant effects are found in nearly all of the variables, regardless of the trading volume measure used. Therefore, the results do not support any of the proposed hypotheses. However, they are not surprising, because we have not found a

[14] The economic profitability of the fiscal year has been calculated as the ratio of pre-tax results to total assets.

[15] We obtain the firm balance sheet information from different sources; for financial firms, it was provided by the CECA (Spanish Confederation of Savings and Loans) and the AEB (Spanish Commercial Banking Association), while for the remaining firms it was obtained from SABI database (Iberian Balance Sheet Analysis System).

[16] The segmentation of the sample by announcement type rating event (rating changes, outlook reports or reviews) would be interesting, but is not possible due to the small size of the resulting subsamples.

significant response of these abnormal trading volume variables to the rating announcements (see Table 4). We only observe that the growth rate of the company has a significant negative effect in the case of the mean daily volume of trading (TVWD). This would suggest that the faster the asset growth of the issuer, the lower the additional trading volume associated with the rating announcement. The effect of this variable on the models for TVWD and TVA is also negative, although not significant. The number of issues in the portfolio also indicates a negative correlation with the trading volume, as the corresponding parameter is significant in the case of TVWD and TVA**.**

[Insert Table 5]

In the case of commercial paper notes (right panel, Table 5) we observe that the abnormal volume is lower for financial issuers than for the others, when we use the mean volume per trading day**.** The estimated value for the remaining trading volume measures has a negative sign, although the parameter is not significant.

We also observe that reviews and outlook reports provide different information than the rating downgrades themselves, as the impact of variables *W* and *O* is negative for the three volume measures and significant at 10% for measures TVTD and TVWD, respectively.

When we estimate the models for the trading frequency measures (Table 6), the results are sharply different. In the case of bonds (left panel), we find some significant factors that seem to depend on the size of the window used to calculate the relative frequency before and after the announcement.[17] We observe that the explanatory ability of the model is greater for narrower post-event windows, and in one of the models the constant is significantly positive, as would be expected in light of the results presented in Table 4. [18]

[Insert Table 6]

In general, we find no response of the abnormal frequency to the rating agency in question, except in the model for measure *3m-1m*, in which variable *AG* has a significant negative effect at 10%. Just as in the case of the volume-based measures, the expected events do not lead to a differential effect. The number of notches the rating jumps does not provide any information

[17] In computing the frequency measures, the sample sizes change. This is because there is not enough data in some cases to calculate the relative frequency in the corresponding pre- or post-event window, especially in the bond sample.

[18] The constant term of the model is directly related to the mean of the endogenous variable. It is very probable that this parameter will be significant when this mean is different from zero. This is analyzed in the event study.

either. These results are contrary to the informative content hypothesis. The variable *GRAD* is only significant at 10% in the case of measure *T-1w*. The sign of the effect is negative, contrary to what we expect, because the hypothesis of restrictions on institutional investors implies more market activity after the shift from investment to speculative grade. Even so, it should be noted that in the sample there are only two such grade shifts.

As for the variables used to test the regulation hypothesis, the results are ambiguous. In the models for the shorter post-event windows, we observe that being in the financial sector has significant effects. The effect is positive for *T-1m* and negative for *3m-1w*. In the case of *GOV*, a significant effect is also observed for the wider pre-event windows. This result indicates that the trading activity increases after the date of the rating announcement.

Regarding the effects of the different rating announcements, we observe that a review does not affect abnormal market activity, whereas an outlook report does. In all of the models, except for those calculated with the longest pre-event window, we observe that an outlook report has significant positive effects. It seems that in the bond segment, the information content of these outlook reports is important to investors, and it increases their trading activity.

On the other hand, the economic cycle does not provide information to the market. In contrast, the inherent characteristics of the issues provide relevant information. In particular, economic profitability and the growth rate of the company's assets have a negative effect on trading activity, according to the models for the shorter post-event windows. This result indicates that the market reaction to downgrades depends on the information that investors have on the re-rated companies. The impact of downgrades is weaker on companies with better performance, suggesting that investors use other information beside the rating announcements. Finally, no effects related to the firm size are observed. This result does not support the too-big-to-fail hypothesis.

The right panel of Table 6 presents the results for rating downgrades in the commercial paper segment for the trading frequency measures. Here the explanatory ability of the analyzed variables is greater than in the case of bonds. The adjusted R-square of the models range from 0.412 to 0.233, and the model as a whole is statistically significant in all cases**.**

In addition, in this case, the rating agency or the fact that the announcement is expected does not provide relevant information in any case. The number of notches that the rating shifts after the announcement has a significant positive impact on one of the measures, and the

corresponding estimator is positive for all of them. This result supports the informative content theory because the higher the rating jump, the greater the effect on abnormal frequency.

Variable *GOV* also has a significant impact on the models corresponding to the 3-month pre-event windows. According to the regulation theory, the impact is negative, which indicates that the reaction of commercial paper trading activity to a downgrade is weaker for governmental firms.

The type of rating action does not seem to provide relevant information to explain the abnormal frequency measures. We observe sharp changes related to the performance of the firms. The higher the economic profitability, the lower the abnormal frequency caused by a downgrade in commercial paper. This relationship is clearly significant in all of the models**.** At the same time, the asset growth rate has a negative impact, although it is significant only in three models. Finally, the company size also has relevant information. For large firms, the abnormal frequency after the event has always been lower than for medium-sized companies, which supports the too-big-to-fail hypothesis.

5.2.2. Results for Upgrades

Table 7 presents the estimation of model (4) for trading volume.[19] In the case of bonds (left panel), only three variables have significant impacts and, although each one is only significant for two trading volume measures**,** the signs are the same in the one for which the variable was not significant. Specifically, we observe that the parameter associated with *FIN* is significant and negative, indicating a lower increase in abnormal bond market activity for financial issuers. Just as for downgrades, this result supports regulation hypothesis. The parameter associated with economic profitability (*EP*) is also significant and negative, indicating a lower impact for the more profitable companies. On the contrary, the parameter associated with *EXP* is positive, which indicates that the excess volume in bonds after upgrades is greater for expected events. This result disagrees with the informative content hypothesis, although it may be related to the reputation hypothesis. According to that hypothesis, agencies allocate more resources to revealing negative information than positive. As a result, after upgrades, investors do

[19] In this case, the sample for some trading frequency measures is very small, especially in the case of bonds. Therefore, it is not possible to simultaneously estimate the effect of all of the variables under consideration. Thus, we made an initial estimation by individually including the variables, and we selected those that presented a greater correlation with the endogenous variable. This criterion was used in all of the models for upgrades.

not pay attention to the reviews, but rather seem to wait for confirmation of the change to make their decisions.

[Insert Table 7]

Regarding the commercial paper notes (right panel, Table 7), no significant effects are found except for *AG* in the case of TVTD. This suggests that, just as in the bond segment, when the announcement is made by *Moody's*, the impact on abnormal volume is different than when the announcement is made by the other agencies.

Table 8 presents the results of the estimation of model (4) using trading frequency measures. In one of the models, the constant is significantly positive, as is expected in light of the results presented in Table 4. As can be observed, for bonds, two variables that characterize the announcements have significant parameters: *AG* and *NOTCH*. Variable *AG* has a significant and positive parameter in two models. In this case, the rating upgrades made by *Moody's* increase the frequency of abnormal bond trading to a higher extent than the other two agencies. The parameter of *NOTCH* is also significant and positive only in one of the models, indicating that the higher the number of notches the rating shifts upward, the greater the increase of abnormal frequency.

On the other hand, the economy's growth rate has a negative impact on one model. As postulated by the economic environment hypothesis, investors attach more value to upgrades when the general economic situation is worse.

When we analyze the results for trading frequency measures in the short-term market (see right panel, Table 8), we find a good number of variables that significantly affect trading intensity. Moreover, the variables and the signs of the effects reflect the situation in the bond market. In accordance with the regulation hypothesis, the impact on abnormal frequency is weaker when the announcement refers to financial firms subject to more regulations. Upgrades related to the most profitable issuing companies result in a lower trading activity increase in the market, in accordance with the baseline hypothesis.

Finally, the effects of upgrade announcements differ in the commercial paper notes segment according to the cycle phase. Just as with the volume-based measures, worsening economic conditions cause less impact of upgrades on abnormal frequency. This may also be related to the agency loss of reputation hypothesis.

6. Conclusions

We analyze the impact of credit rating agencies' announcements of rating changes, outlook reports and reviews on the trading volume and trading frequency of the Spanish corporate debt market, and, in particular, on the trading activity of bonds and commercial paper notes. Data from the Spanish corporate fixed income market allows us to perform this kind of analysis. Specifically, our objective was to answer several questions: Do rating announcements have any impact on the trading activity of the Spanish corporate debt market? If so, what are the determinants of that effect? Are they the ones that would be expected in light of the reinterpreted hypotheses formulated in the literature to explain the impact on prices? Two methodologies are used to answer these questions: event analysis and cross-section regressions. Additionally, a set of eight trading variables are used: three that are volume-based and five that are frequency-based.

With respect to the first question, our findings indicate that both rating upgrade and downgrade announcements cause a significant increase in abnormal trading activity, which is clearly evident when trading frequency is analyzed. In accordance with the informative content hypothesis, that evidence reveals that both types of announcements contain relevant information for Spanish corporate debt market investors and cause the same kind of reaction: increases in trading activity of the securities by the firms targeted by the announcement.

Regarding the study of the determinants of abnormal market activity, the results were consistent with the literature in several ways. First of all, as some authors argue, the stability of ratings forces investors to seek additional information from other sources. For instance, Spanish market investors combine the information contained in the announcements with the characteristics of the issuer, its profitability, the growth it has experienced, and its size. Second, we find clear evidence in favor of the regulation hypothesis. In general, when announcements refer to financial firms, subject to greater regulation, there is a weaker impact on trading frequency. The same is true for governmental firms, though in a less explicit way. Third, the impact of the announcements is not independent from the economic cycle, and the results support the proposed hypothesis, i.e., they are counter-cyclical in the case of downgrades and cyclical in the case of upgrades. Fourth, as it is postulated in the informative content hypothesis, the higher the number of notches the rating shifts, the greater the impact on trading frequency.

On the other hand, we find evidence that disagrees with the most frequent position in the literature regarding the credibility of the rating agencies. In contrast to other markets, the Spanish market grants greater credibility to the rating upgrades made by *Moody's*, which may be related

to its higher relative weight, illustrated by almost 50% of the rating actions analyzed in our sample, and to the fact that it has been operating for a longer time on the Spanish market.

In a final conclusion, these results provide new evidence that makes it possible to assess the role of the rating agencies in the financial market. They help to understand the determinants of trading activity in the corporate bond market following a rating announcement. The results suggest that the information these announcements contain is incomplete, in the sense that investors also base their decisions on other factors. This may be a general pattern in all international markets or may indicate a specific Spanish situation. However, to answer this question, evidence from other countries needs to be generated.

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Table 1. Summary of hypothesis about the effect on trading activity to rating announcements

Hypothesis	Effects on trading activity
Information content hypothesis	• Rating announcement cause an increase in market activity • The greater the jump in notches, the greater the expected trading reaction • Expected changes cause no effects on market activity
Market microstructure	• Balduzzi *et al.* (2001): After rating announcements a lower level of market activity is expected • Kim and Verrecchia (1994): higher trading activity after the rating announcement will be expected.
Agencies behaviour	• Stability of ratings: Rating changes do not affect activity • Refinement of ratings: Other rating announcement increase market activity more than rating changes does • Moral hazard risk problem: Rating changes have no effect on trading activity • Competition between agencies: Different effect related with different agency • Reputation of the agencies: The rise on market activity is greater for downgrades than for upgrades
Economic environment	• the effects of rating announcements differ according to the current phase of the economic cycle
Investment restrictions	• Downgrades from investment to speculative grade increase trading activity more • Upgrades from speculative to investment grade do not affect activity • Buy-and-hold strategies diminish the impact of rating changes on trading activity
Differences in regulation	• The effect of rating announcement of financial and governmental firms is weaker.
Characteristics of the firm	• too-big-to-fail: Effects for banks and large corporations is weaker than for smaller companies • Differences on market activity related with company's profitability or growth rate
Asymmetries	• The impact on activity is higher for downgrades than for upgrades • The impact on activity is different depending on the market segment

Table 2. Distribution of Rating Announcements Analyzed

	Bonds	Commercial Paper Notes	*Total*
Downgrades	73	70	**143**
Rating	38 ***(25)*** [24]	36 (***25)*** [24]	74
Outlook	12 [8]	9 [8]	21
Review	23 [15]	25 [15]	48
Upgrades	36	50	**86**
Rating	17 ***(9)*** [12]	23 ***(12)*** [12]	40
Outlook	11 [8]	20 [8]	31
Review	8 [4]	7 [4]	15
Total	109 ***(34)*** [71]	120 ***(37)*** [71]	**229**

Note: Expected announcements are in parentheses. Coincidences between segments are in brackets

Table 3. Distribution of Rating Grade Changes

	Bonds		Commercial Paper Notes		
Notches	Downgrades	Upgrades	Downgrades	Upgrades	*Total*
1	29	12	30	13	84
2	38	19	34	32	123
3	2	2	4	1	9
4	1	3	2	3	9
5				1	1
6	2 (1)				2
10	1 (1)				1
Total	73	36	70	50	229

Note: Notches is the number of categories that the debt rating changes. In the case of outlook reports and reviews, it is considered that a shift of one grade has occurred. The changes that imply entering or leaving the speculative grade are in parentheses.

Table 4. Abnormal Trading Activity

	Bonds						Commercial paper notes					
	Downgrades			Upgrades			Downgrades			Upgrades		
	AT %	T-ratio	WRT	AT %	T-ratio	WRT	AT %	T-ratio	WRT	AT %	T-ratio	WRT
Volume Measures												
TVTD	-0.087	-0.450	0.096	0.834	2.523**	2.001*	-0.177	-0.623	0.175	0.025	0.105	0.193
		(0.653)	(0.924)		(0.012)	(0.045)		(0.533)	(0.861)		(0.916)	(0.847)
TVWD	0.063	0.712	1.644	0.628	2.129**	2.332**	-0.455	-1.396	0.921	-0.039	-0.116	0.303
		(0.476)	(0.100)		(0.033)	(0.020)		(0.163)	(0.357)		(0.908)	(0.762)
TVA	-0.148	-0.630	0.431	1.355	3.234**	2.843**	-0.706	-1.561	1.551	-0.402	-0.787	0.666
		(0.529)	(0.667)		(0.001)	(0.005)		(0.119)	(0.121)		(0.431)	(0.505)
Frequency Measures												
T-1w	0.354	8.815**	5.626**	0.371	3.923**	2.951**	0.692	21.367**	6.843*	0.701	14.42**	5.639**
		(0.000)	(0.000)		(0.000)	(0.003)		(0.000)	(0.000)		(0.000)	(0.000)
T-1m	0.089	2.258**	1.860*	0.217	2.575**	2.613**	0.284	7.890**	6.101**	0.349	6.861**	5.254**
		(0.024)	(0.063)		(0.010)	(0.009)		(0.000)	(0.000)		(0.000)	(0.000)
3m-1w	0.408	9.232**	5.752**	0.511	5.035**	3.551**	0.509	15.243**	6.539**	0.556	14.15**	5.295**
		(0.000)	(0.000)		(0.000)	(0.000)		(0.000)	(0.000)		(0.000)	(0.000)
3m-1m	0.197	4.768*	3.891**	0.311	4.092**	3.077**	0.118	3.242**	2.808**	0.139	3.424**	3.148**
		(0.000)	(0.000)		(0.000)	(0.002)		(0.001)	(0.005)		(0.001)	(0.002)
1m-1w	0.276	5.848**	4.391**	0.334	3.122**	2.485**	0.270	7.770**	5.686**	0.292	7.674**	5.252**
		(0.000)	(0.000)		(0.002)	(0.013)		(0.000)	(0.000)		(0.000)	(0.000)
1m-1m	0.060	1.493	1.423	0.088	1.183	1.216	0.053	1.550	1.806	-0.062	-1.393	2.218
		(0.135)	(0.155)		(0.237)	(0.224)		(0.121)	(0.071)		(0.164)	(0.027)

Note: AT%: Mean abnormal trading activity in percentage. WRT: Wilcoxon rank test. TVTD: total volume traded in the last three months divided by the number of days on which each asset is traded during that period. TVWD: mean daily trading volume in the last three months. TVA: mean daily trading volume accumulated in the last three months. Abnormal frequencies calculated as the difference of the logarithm of the mean trading frequency of a pre-event window (PREW) with respect to a post-event window (POSTW): PREW-POSTW., where PREW= 1, 3 months and the entire period since the issue (1M, 3M, T) and POSTW= 1 week and 1 month (1w, 1m). * and ** indicate significance at least at 10% or at 5%, respectively. p-value is in parentheses.

Table 5. Determinants of abnormal trading activity after rating downgrades: Volume measures

	Bonds			Commercial paper notes		
	TVTD	TVWD	TVA	TVTD	TVWD	TVA
Constant	-0.666	1431	1.504	3.238	1.310	1.893
	(0.656)	(0.475)	(0.458)	(0.255)	(0.413)	(0.287)
Expected (EXP)	-0.035	-0.281	-0.311	-1.413	-0.805	-0.582
	(0.960)	(0.754)	(0.735)	(0.312)	(0.367)	(0.558)
No. of Notches Shifts (NOTCH)	0.234	0.177	0.207	0.273	0.255	-0.314
	(0.472)	(0.621)	(0.561)	(0.896)	(0.817)	(0.812)
Shift from invest. to spec. (GRAD)	0.061	0.258	0.026	--	--	--
	(0.953)	(0.849)	(0.984)			
Moody's (AG)	0.394	0.324	0.160	-0.372	-0.658	-0.987
	(0.402)	(0.534)	(0.769)	(0.735)	(0.366)	(0.254)
Review (W)	0.427	0.661	0.879	-4.468*	-2.025	-2.651
	(0.610)	(0.530)	(0.431)	(0.094)	(0.173)	(0.120)
Outlook (O)	0.764	0.611	0.679	-1.682	-1.392*	-0.114
	(0.376)	(0.553)	(0.518)	(0.284)	(0.064)	(0.910)
Interest rate variation (IRV)	-0.692	-1.687	-2.020	2.704	1.818	0.901
	(0.389)	(0.132)	(0.111)	(0.180)	(0.336)	(0.580)
Financial Sector (FIN)	0.438	-0.241	-0.153	-4.150*	-0.369	-1.818
	(0.554)	(0.813)	(0.883)	(0.053)	(0.730)	(0.211)
Governmental Enterprise (GOV)	-0.148	-1.662	-1.619	-1.393	0.346	1.703
	(0.939)	(0.459)	(0.474)	(0.508)	(0.812)	(0.270)
Large Size (LSIZE)	0.141	-0.678	-0.619	-0.794	-0.615	-0.328
	(0.876)	(0.581)	(0.623)	(0.574)	(0.499)	(0.739)
Asset growth rate (AGR)	-1.258*	-0.782	-0.989	0.474	1.102	-0.203
	(0.088)	(0.450)	(0.342)	(0.774)	(0.290)	(0.857)
Economic Profitability (EP)	5.528	-5.292	-7.654	-15.350	12.572	-9.084
	(0.683)	(0.728)	(0.633)	(0.564)	(0.512)	(0.700)
No. of issues (ISS)	-0.215	-0.565**	-0.621**	0.115	0.034	0.083
	(0.308)	(0.047)	(0.032)	(0.172)	(0.498)	(0.108)
Window size (DAY)	-0.002	-0.003	-0.003	0.002	0.063	-0.016
	(0.662)	(0.512)	(0.570)	(0.987)	(0.271)	(0.827)
Adjusted R-squared	-0.038	-0.005	0.022	0.039	-0.029	-0.043
F	0.824	0.979	1.107	1.193	0.864	0.805
F p-val	(0.641)	(0.487)	(0.373)	(0.312)	(0.594)	(0.652)
Obs	68	68	68	63	63	63

Note: See Table 4 note. EXP: *dummy* equal to one if the announcement is preceded by a CreditWatch list input/output in the same direction, NOTCH: number of notches that the debt rating changes, GRAD: *dummy* equal to one when the announcement implies a shift from investment grade to speculative grade, AG: *dummy* worth 1 if the announcement is from *Moody's*, W: *dummy* equal to one if the announcement is a review, O: *dummy* equal to one if the announcement is a outlook report, IRV: is the rate of inter-annual variation of the Euribor at one year, FIN: *dummy* equal to one when the announcement refers to a financial sector company, GOV: *dummy* equal to one when a governmental enterprise is involved, LSIZE: *dummy* equal to if the logarithm of the company asset is above the mean, AGR: is the growth rate of the company asset, EP: is the economic profitability of the company, ISS: is the no. of issues that form the portfolio, DAY: is the number of days in the window (t_1, t_2). TVTD: total volume traded in the last three months divided by the number of days on which each asset is traded during that period. TVWD: mean daily trading volume in the last three months. TVA: mean daily trading volume accumulated in the last three months. Estimation by OLS with the White's estimator of the variance-covariance matrix robust for heteroskedasticity. * and ** indicate significance at least at 10% or at 5%, respectively. p-value is in parentheses.

Table 6. Determinants of abnormal trading activity after rating downgrades: Frequency measures

	Bonds					**Commercial paper notes**				
	T-1w	*T-1m*	*3m-1w*	*3m-1m*	*1m-1w*	*T-1w*	*T-1m*	*3m-1w*	*3m-1m*	*1m-1w*
Const.	0.185	-0.029	0.907**	0.275	0.523	0.858**	0.502**	0.732**	0.326	0.503**
	(0.428)	(0.913)	(0.001)	(0.284)	(0.238)	(0.000)	(0.027)	(0.000)	(0.117)	(0.006)
EXP	0.038	-0.146	0.115	0.018	0.032	0.009	-0.170	-0.068	-0.140	0.044
	(0.765)	(0.244)	(0.347)	(0.872)	(0.788)	(0.914)	(0.231)	(0.520)	(0.274)	(0.707)
NOTCH	0.068	-0.027	0.043	-0.017	0.063	0.068	0.120	0.138	0.212**	0.132*
	(0.153)	(0.643)	(0.385)	(0.743)	(0.315)	(0.526)	(0.250)	(0.213)	(0.004)	(0.100)
GRAD	-0.518*	0.039	-0.198	-0.100	-0.449	-0.098	-0.056	-0.262*	-0.035	-0.030
	(0.095)	(0.933)	(0.546)	(0.802)	(0.282)	(0.379)	(0.732)	(0.051)	(0.825)	(0.825)
AG	-0.089	0.015	-0.164*	-0.029	-0.106	-0.024	-0.013	-0.078	-0.009	-0.028
	(0.369)	(0.860)	(0.089)	(0.756)	(0.460)	(0.709)	(0.855)	(0.274)	(0.911)	(0.725)
W	0.014	-0.165	0.099	0.101	0.124	0.028	-0.124	0.077	-0.011	0.092
	(0.941)	(0.324)	(0.542)	(0.515)	(0.557)	(0.845)	(0.491)	(0.612)	(0.948)	(0.601)
O	0.088	-0.055	0.351**	0.264*	0.268**	0.000	-0.179	0.030	-0.242	-0.093
	(0.484)	(0.702)	(0.009)	(0.062)	(0.029)	(0.998)	(0.300)	(0.780)	(0.139)	(0.455)
IRV	-0.115	0.018	0.198	0.148	0.029	0.149	0.268	0.057	0.225	0.006
	(0.643)	(0.925)	(0.244)	(0.332)	(0.900)	(0.105)	(0.102)	(0.560)	(0.162)	(0.963)
FIN	0.032	0.238*	-0.399**	0.109	-0.232	--	--	--	--	--
	(0.828)	(0.063)	(0.044)	(0.535)	(0.399)					
GOV	0.491**	0.366*	-0.208	0.181	-0.270	0.114	-0.155	-0.475**	-0.333**	0.200
	(0.027)	(0.050)	(0.365)	(0.399)	(0.360)	(0.485)	(0.542)	(0.005)	(0.012)	(0.268)
LSIZE	0.175	-0.069	-0.005	-0.056	0.000	-0.019	-0.057	-0.187**	-0.118	-0.116
	(0.218)	(0.575)	(0.974)	(0.767)	(0.998)	(0.781)	(0.570)	(0.033)	(0.205)	(0.166)
AGR	-0.468**	-0.196*	-0.786**	-0.218	-0.251	-0.337**	-0.364**	0.055	-0.240*	-0.084
	(0.001)	(0.096)	(0.000)	(0.227)	(0.353)	(0.010)	(0.011)	(0.670)	(0.061)	(0.529)
EP	-3.298	3.474	-10.78**	-2.182	-6.332	-5.678**	-4.649**	-5.101**	-5.106**	-5.516**
	(0.160)	(0.151)	(0.000)	(0.407)	(0.170)	(0.000)	(0.019)	(0.004)	(0.021)	(0.011)
ISS	0.033	0.040	-0.007	-0.010	-0.007	-0.007	0.008	-0.001	0.008	-0.005
	(0.311)	(0.220)	(0.835)	(0.756)	(0.898)	(0.233)	(0.198)	(0.847)	(0.150)	(0.455)
DAY	-0.001	0.000	0.000	0.003	-0.004	-0.041**	-0.021	-0.027*	0.003	0.016
	(0.205)	(0.857)	(0.685)	(0.404)	(0.754)	(0.035)	(0.357)	(0.075)	(0.879)	(0.488)
Adj. R^2	0.120	0.158	0.282	0.114	-0.078	0.412	0.233	0.258	0.306	0.207
F	1.420	1.748*	2.373**	1.504	0.798	3.959**	2.400**	2.338**	3.032**	2.107**
F p-val	(0.206)	(0.082)	(0.019)	(0.153)	(0.663)	(0.000)	(0.014)	(0.022)	(0.003)	(0.034)
Obs	44	57	50	56	40	56	61	51	61	56

Note: See note in Table 5. Abnormal frequencies calculated as the difference of the logarithm of the mean trading frequency of a pre-event window (PREW) with respect to a post-event window (POSTW): PREW-POSTW., where PREW= 1, 3 months and the entire period since the issue (1m, 3m, T) and POSTW= 1 week and 1 month (1w, 1m).

Table 7. Determinants of abnormal trading activity after rating upgrades: Volume measures

	Bonds			Commercial paper notes		
	TVTD	TVWD	TVA	TVTD	TVWD	TVA
Constant	4.060	6.002	6.415*	2.346	2.631	0.711
	(0.170)	(0.115)	(0.081)	(0.444)	(0.366)	(0.705)
Expected (EXP)	2.212**	2.953*	2.215	--	--	--
	(0.041)	(0.052)	(0.114)			
Expected (E3M)	--	--	--	0.488	1.508	0.173
				(0.735)	(0.312)	(0.832)
No. of grade shifts (GRAD)	0.117	0.545	0.258	0.277	-0.033	-0.573
	(0.767)	(0.290)	(0.573)	(0.710)	(0.967)	(0.280)
Moody's (AG)	0.047	-0.098	0.067	1.710*	1.221	0.543
	(0.964)	(0.934)	(0.956)	(0.100)	(0.275)	(0.297)
Review (W)	1.404	2.803	1.856	-0.759	-1.795	-0.902
	(0.368)	(0.143)	(0.302)	(0.660)	(0.328)	(0.235)
Outlook (O)	0.535	1.157	0.367	-0.120	0.307	0.478
	(0.584)	(0.369)	(0.754)	(0.917)	(0.801)	(0.459)
Economy Growth Rate (GRE)	0.027	0.217	0.120	--	--	--
	(0.921)	(0.487)	(0.695)			
Interest rate variation (IRV)	--	--	--	-1.329	-0.080	0.835
				(0.451)	(0.970)	(0.388)
Financial Sector (FIN)	-3.524	-5.591*	-5.074*	-3.218	-3.166	-0.322
	(0.164)	(0.082)	(0.100)	(0.212)	(0.212)	(0.844)
Large Size (LSIZE)	-0.856	-1.179	-1.242	-0.605	-0.354	0.517
	(0.450)	(0.367)	(0.332)	(0.517)	(0.727)	(0.406)
Economic Profitability (EP)	-69.313	-118.677*	-108.041*	-72.529	-68.887	-22.661
	(0.195)	(0.075)	(0.086)	(0.202)	(0.216)	(0.489)
Adjusted R-squared	-0.029	0.075	0.020	-0.069	-0.051	0.034
F	0.904	1.278	1.070	0.664	0.746	1.185
F p-val	(0.539)	(0.303)	(0.421)	(0.736)	(0.665)	(0.332)
Obs	32	32	32	48	48	48

Note: See note in Tables 4 and 5. E3M: dummy worth 1 if the announcement has been preceded by an announcement in the same direction in the three previous months, GRE: is the growth rate of the economy (GDP).

Table 8. Determinants of abnormal trading activity after rating upgrades: Frequency measures

	Bonds					Commercial paper notes				
	T-1w	*T-1m*	*3m-1w*	*3m-1m*	*1m-1w*	*T-1w*	*T-1m*	*3m-1w*	*3m-1m*	*1m-1w*
Const	-0.175	-0.350	0.924	0.557	0.733	0.484	0.193	0.353	0.042	0.799**
	(0.864)	(0.660)	(0.193)	(0.311)	(0.225)	(0.163)	(0.607)	(0.209)	(0.880)	(0.004)
EXP	0.068	0.300	0.003	0.390	-0.386	--	--	--	--	--
	(0.924)	(0.429)	(0.992)	(0.273)	(0.305)					
E3M	--	--	--	--	--	-0.082	-0.110	0.082	-0.056	-0.043
						(0.572)	(0.455)	(0.376)	(0.613)	(0.683)
NOTCH	0.163	0.212*	-0.028	-0.018	-0.057	-0.035	-0.007	-0.007	0.037	-0.011
	(0.500)	(0.085)	(0.748)	(0.878)	(0.567)	(0.510)	(0.925)	(0.860)	(0.524)	(0.796)
AG	0.539	0.439*	0.335	0.205	0.741*	0.107	0.176	0.041	0.158	0.103
	(0.199)	(0.093)	(0.260)	(0.415)	(0.068)	(0.396)	(0.159)	(0.665)	(0.119)	(0.250)
W	0.207	0.468	-0.167	-0.106	-0.386	-0.104	-0.163	0.055	-0.077	-0.185
	(0.773)	(0.308)	(0.612)	(0.766)	(0.270)	(0.560)	(0.429)	(0.726)	(0.625)	(0.230)
O	-0.285	0.000	-0.258	0.130	-0.565	-0.111	-0.213	0.102	-0.203	-0.185
	(0.674)	-1,000	(0.272)	(0.644)	(0.114)	(0.481)	(0.192)	(0.356)	(0.118)	(0.124)
GRE	-0.121	-0.121**	-0.065	-0.077	-0.008	--	--	--	--	--
	(0.160)	(0.008)	(0.367)	(0.116)	(0.877)					
IRV	--	--	--	--	--	-0.197	-0.392**	-0.069	-0.297	-0.242
						(0.268)	(0.023)	(0.695)	(0.107)	(0.134)
FIN	0.373	-0.021	-0.026	-0.408	-0.144	0.237	0.167	0.172	0.041	-0.402**
	(0.503)	(0.961)	(0.961)	(0.323)	(0.700)	(0.329)	(0.495)	(0.397)	(0.831)	(0.031)
LSIZE	0.383	0.056	-0.356	-0.010	0.042	0.045	0.022	0.050	0.023	-0.046
	(0.246)	(0.711)	(0.379)	(0.969)	(0.854)	(0.713)	(0.866)	(0.634)	(0.818)	(0.613)
EP	-6.100	-2.993	-6.625	-9.053	-14.451	4.660	2.319	0.169	1.218	-9.412**
	(0.571)	(0.726)	(0.363)	(0.109)	(0.177)	(0.484)	(0.717)	(0.970)	(0.737)	(0.025)
Adj. R^2	-0.565	0.250	0.380	0.357	0.629	-0.126	0.007	-0.175	-0.008	-0.052
F	0.519	1,593	2.020	1.924	3.265	0.513	1.032	0.437	0.963	0.786
F p-val	(0.804)	(0.276)	(0.202)	(0.219)	(0.180)	(0.853)	(0.435)	(0.902)	(0.486)	(0.631)
Obs	13	17	16	16	13	40	45	35	45	40

Note: See note in Table 5. E3M: dummy worth 1 if the announcement has been preceded by an announcement in the same direction in the three previous months, GRE: is the growth rate of the economy (GDP). Abnormal frequencies calculated as the difference of the logarithm of the mean trading frequency of a pre-event window (PREW) with respect to a post-event window (POSTW): PREW-POSTW., where PREW= 1, 3 months and the entire period since the issue (1m, 3m, T) and POSTW= 1 week and 1 month (1w, 1m).