Influence of Rating Announcements and Their Characteristics on Abnormal Liquidity in Corporate Debt Market

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Abstract:

The influence of rating announcements on corporate debt market liquidity has been previously overlooked. Based on an event study, we examine the effects of the announcements of effective rating changes, outlook notices, and CreditWatch placements provided by credit rating agencies on abnormal liquidity in the Spanish corporate debt market. We propose several measures of trading activity as proxies of liquidity since other more usual liquidity measures are not suitable for this kind of analysis. Also, by means of cross-section regressions, we establish what factors determine the sign and intensity of the liquidity 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.

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1. Introduction

This study examines the impact on the Spanish corporate debt market liquidity of the rating action announcements: actual rating changes, outlook notices (or medium-term rating trends), and CreditWatch placement (warnings of a possible short-term rating change), made by the three largest international agencies: *Moody's*, *Standard and Poor's* and *Fitch*. We also identify the determinants of abnormal liquidity by considering the peculiarities of the change 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 the stock prices (e.g., Hand *et al.*, 1992; Elayan *et al.*, 2001 or, for the Spanish market, Abad & Robles, 2006). Some others analyzed these effects on corporate debt prices (e.g., Kliger & Sarig, 2000, Steiner & Heinke, 2001; in the European case, Gropp & 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 change announcements that postulate the expected performance of corporate debt prices, as well as possible determinant factors. However, none of them addresses the expected liquidity performance.

Ratings and rating changes can result in a specific market dynamic that could not only affect prices, but could also directly concern the market liquidity. This dynamic maybe 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 could force operators to increase their sales transactions, and could even cause a liquidity crisis.

In spite of the importance of the impact of rating actions on debt liquidity, 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), where the effects of rating announcements on yield spreads and different liquidity measures were analyzed in the Spanish corporate debt market.

Based on the work of Abad *et al.* (2007), in this study we analyze how several liquidity measures respond to rating change announcements. We also formulate different hypotheses that link the potential effect to different characteristics of the issue (such as sector, size, etc.), rating change characteristics (such as the type of rating action in question, or if that action is expected by the market, etc.), and economic environment characteristics. Finally, we define the possible explanatory factors of the liquidity response under these hypotheses.

A key factor in this analysis is how abnormal liquidity measures are defined. We consider a wide range of variants of abnormal liquidity measures based on different aspects of trading activity: trading volume, trading frequency and market share. These proxies are only a part of the proposed liquidity measures in the literature. As we comment later, other more popular measures are clearly inappropriate for our analysis, e.g. the age or the amount outstanding, or can be considered as unsuitable for our analysis, e.g. the bid-ask spread.

To carry out the analysis, we analyze a sample of daily corporate bond and commercial paper notes data from 1993 to 2004. 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 liquidity, and then we analyze the effects of the determinants by mean of a cross-section regression analysis.

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

2. Hypotheses Addressing the Reaction of Liquidity to Rating Announcements

All the details have been omitted to save space, but they are available in Abad et al. (2007b). Table 1 summarizes the hypothesis about the effect on liquidity to rating announcements.

3. Liquidity Measures

Most of the proposed liquidity measures in the literature are clearly inappropriate for our analysis, e.g. the age of the bond or the amount outstanding are independent of an eventual rating action. Also the most usual liquidity proxy, that is, the bid-ask spread, could be considered as unsuitable for our analysis. In general, a typical stock is traded several times per minute, a typical government bond is traded several times per day, and a typical off-the-run corporate bond is traded several times per year. In the context of an illiquid market, the bid-ask spread measure can be considered as anecdotic or artificial. To trade a seasoned corporate bond, the dealer should contact one of a number of "buy-side" clients and obtain the bond. The final price will depend on the search and transaction costs regardless of the quoted bid-ask spread. Even the US corporate bond market, the world's largest one, is described as highly illiquid by recent papers such as Edwards *et al.* (2007) and Mahanti *et al.* (2008). Latter authors emphasize problems of conventional measures of liquidity in these markets.

In this study we propose different proxies for corporate bond liquidity to obtain measures of abnormal liquidity. We focus the analysis on market condition variables. Specifically, we analyze the evolution of the trading volume and the frequency of trading. In addition, since the life cycle of commercial paper notes is extremely regular, we include the expected market shared proposed by Díaz *et al.* (2006) in the study of these assets. Based on these three proxies, we obtain the measures of abnormal liquidity caused by the event.

To analyze the effect of rating changes, we study these variables on the day on which the rating change is announced in the news (day $t = 0$) and on days around 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 liquidity 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 on the basis of a measure of the effective trading volume for each of the outstanding issues of issuer *i*. A calculation is then made of 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. Specifically:

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

where $v_{i,t1}$ *and* $v_{i,t2}$ are the logarithm 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 we expect in the absence of the event:

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

where $E(cV_{i,(t_2-t_1)})$ is the expected or "normal" rate of change of the trading volume on average between all 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 previous 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).[1] 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 or not 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).

The second abnormal liquidity 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. Specifically, the measure of abnormal frequency is calculated as:

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

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- and 2-week and 1- and 2-month windows. For the second windows, in which we measure the frequency before the event, we consider 1-, 2- and 3-month windows, and the entire period since issue. In this way, we are able to see what happens to abnormal liquidity 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 more long-lasting.

As remarked previously, the trading activity performance of commercial paper notes over their short life cycle is very regular. In this respect, the issuing activity of new commercial paper notes by large corporations is constant. Institutional investors trade these instruments very actively after issue. After a few days, trading ceases almost completely. The regularity in the life cycle is also observed by Díaz *et al.* (2006) for Spanish government bonds.[2] Although the

[1] Consequently, this latter measure is corrected if the asset is kept outstanding for less than three months.
[2] These assets are issued in successive tranches until they reach a certain amount outstanding. Thus, the amount outstanding of the recently issued bond is reduced in comparison to that of its predecessor and its liquidity is lower.

evolution of market share of both groups of assets differs widely, it follows a uniform pattern in both cases. For government bonds, it presents an initial spike with a subsequent exponential drop. For commercial paper, it shows a sharp initial drop and a much smoother exponential decline afterwards. This performance results from the fact that institutional investors take up positions on the recently issued commercial paper note and subsequently its trading loses appeal and it becomes residual. Thus, the average market share of a commercial paper note in its first week of life is 33.4% and it drops to 2.7% the following week.

We apply the model proposed by Diaz *et al.* (2006) to study the behavior of the weekly market share of each issue as a smooth, non-linear function of its age.[3] They prefer the market share over the trading volume per issue because the former variable is expressed in relative terms with respect to the total volume traded on the market during the week and, therefore, it eliminates possible data trends and possible volume fluctuations between weeks without relevance for asset liquidity. They define the market share of asset i during week t as the ratio between the nominal volume traded per asset and the total volume traded per all the outstanding issues. The market share permits to compare the different degrees of liquidity between issues and to monitor the evolution of the liquidity of an issue throughout its lifetime.

In our case, the original expression of Díaz *et al.* (2006) is adapted to the performance of the commercial paper market share. Thus, after adjusting several variants of the original equation:

$$MS_{it} = b_1 \exp\left(Age_{it} - b_2\right)^{b_3} + b_4 \cdot b_5^{Age_{it}} + u_{it} \tag{4}$$

we see that the best adjustment is attained with the following expression:

$$MS_{it} = b_1^{\left(Age_{it} - b_2\right)^{b_3}} + b_4 \cdot b_5^{Age_{it}} + u_{it} \tag{5}$$

where $b_i, i = 1,\ldots,5$ are the parameters to be estimated, and u_{it} is an error term *i.i.d.* with zero mean and constant variance.

Equation (5) is estimated from the weekly market share of each commercial paper note traded in the sampling period of 1998 to 2004.[4] We consider all the outstanding issues for each

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The market share of this asset will continue to grow up to a maximum amount, after which a rapid decline will begin as a result of the appearance of a new issue that replaces it as the market benchmark. Trading of this seasoned bond is practically residual.

[3] This model is inspired by actuarial methods used to model human mortality (see Heligman & Pollard, 1980).

[4] The model was also estimated on the basis of effective volume as a dependent variable. The results are similar to those obtained using the market share.

day of the week, despite of whether or not they were traded. In other words, when a commercial paper note was not traded during a session, its market share was zero and it was taken into account to calculate the mean market share of all the commercial paper notes of the same age.

These estimated market shares are the ones we use as the benchmark market shares that a commercial paper note should achieve as a function of its age and regardless of whether a rating event occurs. Thus, we define abnormal market share as the difference between the rate of market share change observed around the rating event and that expected of a typical commercial paper note of the same age:

$$AMS_{i,(t_2-t_1)} = cMS_{i,(t_2-t_1)} - E(cMS_{i,(t_2-t_1)}) \qquad (6)$$

where $cMS_{i,(t_2-t_1)} = ms_{i,t_2} - ms_{i,t_1}$, $ms_{i,t}$ is the market share in logarithms during week $t = t_1, t_2$, and $E(.)$ indicates the expected value according to model (5).

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).

The other sample we analyze in this paper consists of rating action 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 changes, and CreditWatch placement.

From the database, we select the issues of re-rated companies, and we exclude the cases that lacked the minimum of liquidity around the announcement date. The final sample consists of 158 rating action announcements that affect 1058 issues (271 bonds and 787 commercial paper notes).[5] Table 4 shows the 158 events divided into six categories: rating upgrades or downgrades, positive or negative outlooks, and CreditWatch placement for negative or positive reasons. In all,

[5] 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.

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.

Table 4 also shows the number of expected rating announcements. So as other authors, we used the CreditWatch placement to distinguish between expected and unexpected rating changes. When a rating change is preceded by a placing on the CreditWatch list in the same direction, it could be anticipated by the market and would 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.

5. Empirical Results

5.1. Estimation of Abnormal Liquidity

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 the bonds on the one hand and all the commercial paper notes on the other, before computing the liquidity measures. In this way, all 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 action announcement, i.e., zero mean abnormal liquidity: a standard *t-ratio* and, to avoid the effects of non-normality, the Wilcoxon rank test.

The results are shown in Tables 8 and 9. The first one shows the mean abnormal liquidity after upgrades and downgrades in the corporate bond portfolios. The results for the commercial paper portfolios are shown in Table 9. Both tables show the results for the two kind of proxies of abnormal liquidity: the trading volume-based and the trading frequency-based measures.

As shown in the left panel of Table 8, downgrade announcements imply a significantly positive abnormal liquidity for trading frequency liquidity proxies, whereas no significant excess liquidity is observed for trading volume. Notice that increased liquidity after the rating downgrade announcement is only observed in the measures based on the shortest, less than one month, post-event windows. In addition, liquidity increases more as the announcement date approaches, i.e., it is more clearly observed for the shortest pre-event windows. The results are independent of the test we use.

For rating upgrade announcements (right panel, Table 8), the excess liquidity is also significantly positive. This result is robust to the way of calculating liquidity (volume or frequency) and the test used (parametric or non-parametric). Just as in the case of downgrades, for the frequency measures the effect is greater immediately after the announcement date and it diminishes after that point.

Results for the short-term corporate debt market are shown in Table 9. In this case, the market share is also analyzed as liquidity proxy. There are no effects on liquidity after the downgrade announcements (Table 9, left panel). The mean abnormal liquidity is not significant when we use the trading volume but a significant drop of the mean market share occurs, whereas with the frequency measures we observe a significant positive effect on liquidity, except in two of the fifteen windows we analize. These apparently opposing results should not come as a surprise in view of the differences between both measures. While the market share is compared on two specific days (before and after the event), in the case of frequency the comparison concerns what happens in windows around the event. As a result, this result indicates that the abnormal market share decreases immediately after the downgrade announcement, and at the same time the abnormal trading frequency increases in windows subsequent to the announcement (the abnormal frequency being higher in the narrowest windows).

In the case of the behavior of commercial paper notes liquidity after rating upgrades (right panel, Table 9), significant effects are detected only with the frequency-based measure. The effect is positive in all the windows, indicating an increase in abnormal frequency after the upgrade. 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, the data for both segments show a significant positive response of liquidity to changes in both directions. An increased, more intense frequency is observed in the periods closest to the announcement date. In the case of commercial paper notes, the downgrade announcements cause a reduction of market share. These results are in tune with the informative content hypothesis but counter other hypotheses that postulate asymmetric performance for credit rating upgrade and downgrade announcements.

5.2. Determinants of Abnormal Liquidity

The purpose of this section is to analyze the determining factors of liquidity movements as result of rating announcements. To do so, we estimate a multiple regression model in which the variable to be explained is the measure of abnormal liquidity. The model is as follows:

$$AL_{i,(t_1-t_2)} = b_0 + b_1 AG_i + b_2 EXP_i + b_3 NOTCH_i + b_4 GRAD_i + b_5 FIN_i + b_6 PUB_i + \\ + b_7 W_i + b_8 O_i + b_9 IRV_i + b_{10} TBTF_i + b_{11} EP_i + b_{12} AGR_i + u_i \qquad (7)$$

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

In model (7), the explanatory variables help to verify the different hypotheses proposed in Section 3. Thus, 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 informative content hypothesis, we include different variables: *EXP*, which equals one if the announcement is preceded by a placement on the CreditWatch list in the same direction, and zero otherwise,[6] and *NOTCH* which indicates the number of notches the debt rating changes. We also define *GRAD*; this variable equals one, if the announcement implies 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, since only in this case the sample contains shifts from investment to speculative grade.

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 zero otherwise, and *PUB*, which equals one in the case of a public enterprise, and zero otherwise.

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 CreditWatch list placement/retirement, and zero otherwise; and *O*, which equals 1 if the event is an outlook change, and zero otherwise. If these rating actions 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*).[7] If investors are more concerned with risk in periods of economic crisis, we expect a positive effect of this variable.

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

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

Finally, to analyze the effect of company-specific characteristics, we include three variables. One distinguishes between large and small firms. We call it *TBTF* and equals one if the logarithm of 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*).[8, 9]

In addition to these variables, we included two control variables: *ISS* which indicates the number of issues that form the portfolio and *DAY* which measures the number of days in the event window, i.e., between t_1 and t_2.

Model (7) was estimated separately for the sample of downgrade and upgrade announcements, for the sample of bonds and commercial paper, and for the different abnormal liquidity measures provided in Section 4. This involved the estimation of 18 models in the case of bonds and 19 in the case of commercial paper notes for the rating downgrades, and just as many for the upgrades. We estimated the models by ordinary least-squares. In order to correct 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 multi-co-linearity in the models is ruled out, since the highest correlation found do not exceed 0.45 in any case.

5.2.1. Results for Downgrades

Tables 10 to 13 show the estimation of model (7) results in the case of downgrades. The first two tables show the results pertaining to bonds and the last two the results related to commercial paper notes.

The model for the estimation of abnormal liquidity of bonds calculated by trading volume is shown in Table 10. As we can see, no significant effects are found in nearly all the variables regardless of the trading volume measure used. Therefore, the results do not support any of the proposed hypotheses. They are not surprising, however, since we have not found a significant response of these abnormal-liquidity variables to the rating changes (see Table 8). We only observe that the growth rate of the company has a significant negative effect in the case of abnormal liquidity measured as 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

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

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

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 shows a negative correlation with the trading volume, as the corresponding parameter is significant in the case of TVWD and TVA.

When we estimate the models for the trading frequency measures (Table 11), the results are sharply different. In that case we find some significant factors, which seem to depend on the size of the window used to calculate the relative frequency before and after the announcement.[10] We observe that the explanatory ability of the model is greater for narrower post-event windows and in three of the models the constant is significantly positive, as we expect in light of the results presented in Table 8. [11]

In general, we find no response of the abnormal liquidity 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 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, since the hypothesis of restrictions on institutional investors implies more market activity after the shift from investment to speculative grade. Nevertheless, it should be noted that, in the sample, there are only 2 such grade shifts and both corresponded to public enterprises.

As for the variables used to test regulation hypothesis, the results are ambiguous. In the models for the shorter post-event windows, we observe that being in the financial sector cause significant effects. The effect is positive for the longer pre-event windows (*T-2w* and *T-1m*) and negative for shorter pre-event windows (*3m-1w* and *2m-1w*). In the case of *PUB*, significant effects with a different sign are also observed for the shorter post-event windows and, depending on the size of the pre-event windows. This result seems to indicate that the liquidity increases much earlier than the date of the rating change. However, as that date approaches, the effect becomes negative. This result would support the hypothesis of regulation, since it suggests that if

[10] In computing the liquidity measures, the sample sizes change. This is since 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.

[11] The constant term of the model is directly related with the mean of the endogenous variable. In this sense, it is very probable that this parameter be significant when this mean is different from zero. This is analyzed in the event study.

there is more information about the companies on the market, the impact on abnormal liquidity is lower on the days nearer to the event.

With regard to the influence of the different rating actions, which are used to test whether the market values them differently than the rating changes, we observe the following. A placement on the CreditWatch list does not affect abnormal liquidity whereas a change of outlook does it. In all the models, except for those calculated with the longest pre-event window, we observe that an outlook change has a significant positive effect. It seems that in the bond segment, the information provided by these outlook changes is taken into account by investors and it increases their trading activity.

On the other hand, the economic cycle provides information to the market, although only in models estimated for short windows, in particular *2m-1w* and *2m-2w*. In these cases, abnormal liquidity positively depends on the rate of variation of interest rates, which suggests that a deterioration of economic conditions causes an increase in the trading activity after rating downgrades. It seems that investors are prone to assume less risk in periods of recession.

In addition, the inherent characteristics of the issues also provide relevant information. In particular, economic profitability and the growth rate of the company's asset have a negative effect on liquidity that 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, except for one abnormal liquidity measure for which this effect is positive. This result contradicted the too-big-to-fail hypothesis.

Tables 12 and 13 show the results for the rating downgrades in the case of commercial paper notes. We observe certain effects in the case of trading volume and market share measures. In particular, in the case of mean volume per trading day, we observe that the abnormal volume is lower for financial issuers than for the others. The estimated value for the rest of the trading volume measures has a negative sign, although the parameter is not significant.

The results indicated that placement on the CreditWatch list and outlook changes provided more 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. In the case of the market share no significant effect is found, although for *FIN* and *W* the estimated effects are negatives and the p-values are relatively low.

Table 13 shows the results for rating downgrades in the commercial paper segment in the case of the trading frequency measures. Here, the explanatory capacity of the analyzed variables is greater than in the case of bonds. The adjusted R-square of the models range from 0.412 to 0.165, and the model as a whole is statistically significant in all the cases.

Also in this case, the rating agency or the fact that the action is expected, do not provide relevant information in any case. The number of notches that the rating shift after the announcement has a significant positive impact on most 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 liquidity.

Being in the financial sector always has a negative effect on liquidity which is significant in the case of measures *3m-1w* and *2m-1w*, and which has a relatively low associated p-value in the case of *3m-2w* and *2m-2w*. Variable *PUB* also has a significant impact on the 6 models corresponding to the 3- and 2-month pre-event windows and the less than one month post-event windows. The impact is negative, indicating that the reaction of the commercial paper liquidity to a downgrade is weaker for public firms. Thus, the results seem to support the regulation theory.

The type of rating action does not seem to provide relevant information to explain the abnormal frequency measures. A certain effect, however, is found in the case of the economic cycle. For instance, in the case of measure *T-2w*, the interest rates rate of change has a significant positive effect on liquidity. For the remaining measures, the estimator is positive and the p-values are relatively low in 7 models. This result suggests a greater impact of rating downgrades when economic conditions worsen.

We observe sharp changes in the performance of the firms. The higher the economic profitability, the lower the abnormal frequency caused by a downgrade in commercial paper notes. This relationship is clearly significant in all the models. At the same time, the asset growth rate has a negative impact, although it is significant only in 8 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 14 shows the estimation of model (7) for bonds when abnormal liquidity is trading volume-based.[12] 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 liquidity for financial issuers. Just as for downgrades, this result supports regulation hypotesis. The parameter associated with economic profitability (*EP*) is also significant and negative, showing a lower impact for the more profitable companies. On the contrary, the parameter associated with *EXP* is positive, which indicate that the excess liquidity in bonds after upgrades is greater for the expected events. This result disagrees with the informative content hypothesis, although it could be related to the loss of reputation hypothesis. According to that hypothesis, agencies allocate more resources to revealing negative information than positive. As a result, after upgrades, investors do not pay attention to the placements on the CreditWatch list, but rather seem to wait for confirmation of the change to make their decisions.

Continuing with the long-term segment, Table 15 shows the results of the estimation of model (7) using trading frequency as liquidity proxy. In two of the models, the constant is significantly positive, as we expect in light of the results presented in Table 8. As we can see, three variables that characterize the announcements have significant parameters: *AG*, *NOTCH* and *W*. Variable *AG* has a significant positive parameter in some 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. A placement on the CreditWatch list (*W*) has a significant negative impact when 2- or 3-month windows are used. This indicates that liquidity increases less when the announcement is based on CreditWatch lists. Therefore, the investors perceive these announcements differently than those that involve a rating change. The parameter of *NOTCH* is also significant and positive only in one of the fifteen estimated models indicating that the higher the number of notches the rating shifts upward, the greater the increase of abnormal liquidity.

On the other hand, the economy's growth rate has a negative impact on some models. As postulated by the economic environment hypothesis, investors attach more value to upgrades

[12] 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 the variables under consideration. Thus, we made an initial estimation by individually including the variables, and we selected those which showed a greater correlation with the endogenous variable. This criterion wa s used in all the models for upgrades.

when the general economic situation is worse. Just as when the liquidity is computed via volume, the firm economic profitability has a negative impact on abnormal frequency. Finally, large companies show a higher abnormal frequency after the upgrade than smaller ones.

In regard to the commercial paper notes, Table 16 shows the results for rating upgrades in the case of the volume and market share measures. Regardless of the measure used, 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 liquidity is different than when the announcement is made by the other agencies.

When we analyze the results for trading frequency measures in the short-term market (see Table 17), we find a good number of variables that significantly affect liquidity. Moreover, the variables and the signs of the effects reflect the situation in the bond market. Several models have a significant positive constant term, indicating an increase in abnormal liquidity as a result of the upgrade announcements, which supports the results of the event study.

Three characteristics of the announcement are relevant: the agency, if it is expected, and if it is an outlook change. It seems that the announcements by *Moody's* are more credible than those by *S&P's* and *Fitch*, since they have a stronger impact on liquidity. When an enhanced outlook change is announced, liquidity increases to a smaller extent than when other announcements are made. This indicates that the rating refinement contains different information for investors than a change *per se* or a placement on the CreditWatch list. It seems that the actions of commercial paper market investors do not support the hypothesis of Altman & Rijken (2007) that outlooks offer a better adjustment of ratings in the forecast of the default risk. According to the informative content hypothesis, expected upgrades imply a lower increase in abnormal liquidity, probably because the impact was anticipated. In that case, the expected upgrades are defined as those preceded by other announcements in the same direction in the last three months.

In accordance with the regulation hypothesis, the impact on abnormal liquidity is weaker when the announcement refers to financial firms subject to more regulations. Just as for bonds, upgrades related to the most profitable issuing companies result in a lower liquidity 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 the impact of an upgrade to decrease. This also could be related to the agency loss of reputation hypothesis.

6. Conclusions

We analyze the impact of credit rating agencies' announcements of rating changes, outlook changes and placement on the CreditWatch list on the liquidity of the Spanish corporate debt market, and in particular on the liquidity 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 liquidity of the Spanish corporate debt market? And, if so, what are the determinants of that effect? Are they the ones that could be expected in the light of the reinterpreted hypotheses formulated by other authors to explain the impact on prices? Two methodologies are used to answer these questions: event analysis and cross-section regressions. Moreover, a set of 18 variables are identified to measure abnormal liquidity, three trading volume-based and 15 trading frequency-based. For commercial paper notes, an additional measure, based on market share, is used.

With regard to the first question, our findings indicate that both rating upgrade and downgrade announcements cause a significant increase in abnormal liquidity, which is clearly evident when trading frequency is used as the liquidity proxy. 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 they cause the same kind of reaction: increases in trading activity of the securities by the firms targeted by the announcement.

With regard to the study of the determinants of abnormal liquidity, 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 economic profitability, the growth it has experienced, and its size. Secondly, we find clear evidence in favor of the regulation hypothesis. In general, when the announcement refers to financial firms, which are subject to greater regulation, there is a weaker impact on trading frequency. The same is true for public sector firms, though in a less explicit way. Thirdly, 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. Fourthly, 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 found data that disagree with the most frequent position in 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 the abnormal liquidity in the corporate bond market that follows a rating change. The results suggest that the information these changes contain is not complete, in the sense that investors base their decisions also on other factors. This could be a general pattern in all international markets or could indicate a specific Spanish situation. However, in order to answer this question, data for other countries need to be generated.

References

Abad, P. & Robles, M.D., 2006: "Risk and returns around bond rating changes announcements in Spanish stock market", *Journal of Business Finance and Accounting*, 33(5-6), 885-908.

Abad, P.; Díaz, A. & Robles, M.D., 2007: "The Impact of Credit Rating Announcements on Spanish Corporate Fixed Income Performance: Returns, Yields and Liquidity", Working Paper 316, FUNCAS, Fundación de Cajas de Ahorros, Madrid. http://www.funcas.ceca.es/Publicaciones/InformacionArticulos/Publicaciones.asp?ID=1294

Abad, P., Díaz A. y Robles, M. D., (2007b), "Influence of Rating Announcements and Their Characteristics on Abnormal Liquidity in Corporate Debt Market", Actas del XV Foro de Finanzas.

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

Dallocchio, M.; Hubler, J.; Raimbourg, P.; & Salvi, A., 2006: "Do Upgradings and Downgradings Convey Information? An Event Study of the French Bond Market", *Economic Notes: Review of Banking, Finance and Monetary Economics*, 35 (3), 293–317

Díaz, A.; Merrick, J. & Navarro, E., 2006: "Spanish Treasury Bond Market Liquidity and Volatility Pre- and Post-European Monetary Union", *Journal of Banking and Finance*, 30(4), 1309-1332

Gropp, R. & Richards A., 2001: "Rating agency actions and the pricing of debt and equity of European banks: What can we infer about private sector monitoring of bank soundness?" *Economic Notes by Banca Monte dei Paschi di Siena*, 30(3), 373-398

Hand, J.; Holthausen, R. & Leftwich, R., 1992: "The effect of bond rating agency announcements on bond and stock prices", *Journal of Finance*, 57, 733-752

Kliger, D., & O. Sarig, 2000: ''The Information Value of Bond Ratings'', *Journal of Finance*, 55, 2879–2902

Steiner, M. & Heinke, V. G., 2001: "Event study concerning international bond price effects of credit rating actions", *International Journal of Finance and Economics*, 6, 139-157

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

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

Table 4. Distribution of Rating Announcements Analyzed

	Bonds	**Commercial Paper Notes**	***Total***
Downgrades	73	70	**143**
Of rating	38 ***(25)*** [24]	36 ***(25)*** [24]	74
Of outlook	12 [8]	9 [8]	21
CreditWatch list	23 [15]	25 [15]	48
Upgrades	36	50	**86**
Of rating	17 ***(9)*** [12]	23 ***(12)*** [12]	40
Of outlook	11 [8]	20 [8]	31
CreditWatch list	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 8. Abnormal Liquidity in the Bond Market

	Downgrades			Upgrades		
	Mean abnormal liquidity %	T-ratio	Wilcoxon rank test	Mean abnormal liquidity %	T-ratio	Wilcoxon rank test
Volume Measures						
TVTD	-0.087	-0.450	0.096	0.834	2.523**	2.001*
		(0.653)	(0.924)		(0.012)	(0.045)
TVWD	0.063	0.712	1.644	0.628	2.129**	2.332**
		(0.476)	(0.100)		(0.033)	(0.020)
TVA	-0.148	-0.630	0.431	1.355	3.234**	2.843**
		(0.529)	(0.667)		(0.001)	(0.005)
Frequency Measures						
T-1w	0.354	8.815**	5.626**	0.371	3.923**	2.951**
		(0.000)	(0.000)		(0.000)	(0.003)
T-2w	0.187	4.550**	3.748**	0.292	3.082**	2.456**
		(0.000)	(0.000)		(0.002)	(0.014)
T-1m	0.089	2.258**	1.860*	0.217	2.575**	2.613**
		(0.024)	(0.063)		(0.010)	(0.009)
T-2m	-0.045	-1.025	0.875	0.029	0.413	0.036
		(0.305)	(0.382)		(0.680)	(0.971)
3m-1w	0.408	9.232**	5.752**	0.511	5.035**	3.551**
		(0.000)	(0.000)		(0.000)	(0.000)
3m-2w	0.268	6.396**	4.990**	0.318	3.442**	2.962**
		(0.000)	(0.000)		(0.001)	(0.003)
3m-1m	0.197	4.768*	3.891**	0.311	4.092**	3.077**
		(0.000)	(0.000)		(0.000)	(0.002)
3m-2m	0.062	1.452	1.301	0.158	2.531**	2.287**
		(0.146)	(0.193)		(0.011)	(0.022)
2m-1w	0.378	7.839**	5.4291**	0.405	3.900**	3.0301**
		(0.000)	(0.000)		(0.000)	(0.002)
2m-2w	0.242	5.398*	4.4857**	0.208	2.229**	1.5680
		(0.000)	(0.000)		(0.026)	(0.117)
2m-1m	0.164	3.781**	3.351**	0.184	2.278*	1.960**
		(0.000)	(0.001)		(0.023)	(0.050)
2m-2m	0.026	0.577	0.449	0.053	0.819	0.350
		(0.564)	(0.653)		(0.413)	(0.726)
1m-1w	0.276	5.848**	4.391**	0.334	3.122**	2.485**
		(0.000)	(0.000)		(0.002)	(0.013)
1m-2w	0.128	2.894**	2.611**	0.151	1.510	1.381
		(0.004)	(0.009)		(0.131)	(0.167)
1m-1m	0.060	1.493	1.423	0.088	1.183	1.216
		(0.135)	(0.155)		(0.237)	(0.224)

Note: 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, 2 , 3 months and the entire period since the issue (1M, 2M, 3M, T) and POSTW= 1 & 2 weeks and 1 & 2 months (1w, 2w, 1m, 2m). * and ** indicate significance at least at 10% or at 5%, respectively. p-value is in parentheses.

Table 9. Abnormal Liquidity in the Commercial Paper Notes Market

	Downgrades			Upgrades		
	Mean abnormal liquidity %	T-ratio	Wilcoxon test	Mean abnormal liquidity %	T-ratio	Wilcoxon test
Volume Measures						
TVTD	-0.177	-0.623	0.175	0.025	0.105	0.193
		(0.533)	(0.861)		(0.916)	(0.847)
TVWD	-0.455	-1.396	0.921	-0.039	-0.116	0.303
		(0.163)	(0.357)		(0.908)	(0.762)
TVA	-0.706	-1.561	1.551	-0.402	-0.787	0.666
		(0.119)	(0.121)		(0.431)	(0.505)
Market Share						
MS	-0.883	-1.886*	2.048**	-0.467	-1.006	0.811
		(0.059)	(0.041)		(0.315)	(0.417)
Frequency Measures						
T-1w	0.692	21.367**	6.843*	0.701	14.42**	5.639**
		(0.000)	(0.000)		(0.000)	(0.000)
T-2w	0.467	14.128**	7.054**	0.509	10.10**	5.867**
		(0.000)	(0.000)		(0.000)	(0.000)
T-1m	0.284	7.890**	6.101**	0.349	6.861**	5.254**
		(0.000)	(0.000)		(0.000)	(0.000)
T-2m	0.140	3.536**	3.294**	0.190	3.661**	3.051**
		(0.000)	(0.001)		(0.000)	(0.002)
3m-1w	0.509	15.243**	6.539**	0.556	14.15**	5.295**
		(0.000)	(0.000)		(0.000)	(0.000)
3m-2w	0.270	8.177**	5.826**	0.400	8.627**	4.922**
		(0.000)	(0.000)		(0.000)	(0.000)
3m-1m	0.118	3.242**	2.808**	0.139	3.424**	3.148**
		(0.001)	(0.005)		(0.001)	(0.002)
3m-2m	-0.024	-0.621	0.933	-0.015	-0.347	0.692
		(0.535)	(0.351)		(0.728)	(0.489)
2m-1w	0.427	12.749**	6.459**	0.449	10.48**	3.4903**
		(0.000)	(0.000)		(0.000)	(0.001)
2m-2w	0.194	5.590**	4.817**	0.270	4.845**	3.353**
		(0.000)	(0.000)		(0.000)	(0.001)
2m-1m	0.037	1.019	0.596	0.090	1.854*	1.878*
		(0.308)	(0.551)		(0.064)	(0.060)
2m-2m	-0.107	-2.780**	3.043**	-0.064	-1.288	1.942
		(0.005)	(0.002)		(0.198)	(0.052)
1m-1w	0.270	7.770**	5.686**	0.292	7.674**	5.252**
		(0.000)	(0.000)		(0.000)	(0.000)
1m-2w	-0.130	-3.604**	3.816**	0.106	2.463**	2.393**
		(0.000)	(0.000)		(0.014)	(0.017)
1m-1m	0.053	1.550	1.806	-0.062	-1.393	2.218
		(0.121)	(0.071)		(0.164)	(0.027)

Note: See note in Table 8. MS is the abnormal market share computed as the difference between the rate of change of the market share observed around the rating event and the one expected according to the model (5).

Table 10. Determinants of excess bond liquidity after rating downgrades: Volume measures

	TVTD	TVWD	TVA
Constant	-0.666	1.431	1.504
	(0.656)	(0.475)	(0.458)
Moody's (AG)	0.394	0.324	0.160
	(0.402)	(0.534)	(0.769)
Expected (ESX)	-0.035	-0.281	-0.311
	(0.960)	(0.754)	(0.735)
No. of Notches Shifts (NOTCH)	0.234	0.177	0.207
	(0.472)	(0.621)	(0.561)
Shift from investment to speculative (GRAD)	0.061	0.258	0.026
	(0.953)	(0.849)	(0.984)
Financial Sector (FIN)	0.438	-0.241	-0.153
	(0.554)	(0.813)	(0.883)
Public Enterprise (PUB)	-0.148	-1.662	-1.619
	(0.939)	(0.459)	(0.474)
CreditWatch List (W)	0.427	0.661	0.879
	(0.610)	(0.530)	(0.431)
Outlook (O)	0.764	0.611	0.679
	(0.376)	(0.553)	(0.518)
Interest rate variation (IRV)	-0.692	-1.687	-2.020
	(0.389)	(0.132)	(0.111)
Economic Profitability (EP)	5.528	-5.292	-7.654
	(0.683)	(0.728)	(0.633)
Size (TBTF)	0.141	-0.678	-0.619
	(0.876)	(0.581)	(0.623)
Asset growth rate (AGR)	-1.258*	-0.782	-0.989
	(0.088)	(0.450)	(0.342)
No. of issues (ISS)	-0.215	-0.565**	-0.621**
	(0.308)	(0.047)	(0.032)
Window size (DAY)	-0.002	-0.003	-0.003
	(0.662)	(0.512)	(0.570)
Adjusted R-squared	-0.038	-0.005	0.022
F	0.824	0.979	1.107
F p_val	(0.641)	(0.487)	(0.373)
Obs	68	68	68

Note: AG: *dummy* worth 1 if the announcement is from *Moody's*, 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, FIN: *dummy* equal to one when the announcement refers to a financial sector company, PUB: *dummy* equal to one when a public enterprise is involved, W: *dummy* equal to one if the announcement is a CreditWatch list input/output, O: *dummy* equal to one if the announcement is a change in outlook, IRV: is the rate of inter-annual variation of the Euribor at one year, GRE: is the growth rate of the economy (GDP), TBTF: *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 heteroscedasticity. * and ** indicate significance at least at 10% or at 5%, respectively. p-value is in parentheses.

Table 11. Determinants of excess bond liquidity after rating downgrades: frequency measures

	T-1w	*T-2w*	*T-1m*	*T-2m*	*3m-1w*	*3m-2w*	*3m-1m*	*3m-2m*	*2m-1w*	*2m-2w*	*2m-1m*	*2m-2m*	*1m-1w*	*1m-2w*	*1m-1m*
Const.	0.185	-0.266	-0.029	0.057	0.907**	0.419	0.275	0.412	1.105**	0.624*	0.353	0.499	0.523	0.055	0.216
	(0.428)	(0.354)	(0.913)	(0.853)	(0.001)	(0.164)	(0.284)	(0.177)	(0.000)	(0.055)	(0.194)	(0.125)	(0.238)	(0.893)	(0.427)
AG	-0.089	-0.001	0.015	0.050	-0.164*	-0.107	-0.029	-0.001	-0.103	-0.065	0.041	0.057	-0.106	-0.029	0.023
	(0.369)	(0.995)	(0.860)	(0.605)	(0.089)	(0.298)	(0.756)	(0.995)	(0.346)	(0.566)	(0.694)	(0.615)	(0.460)	(0.838)	(0.829)
EXP	0.038	-0.203	-0.146	-0.114	0.115	0.015	0.018	0.082	0.023	-0.067	-0.053	0.018	0.032	-0.139	0.014
	(0.765)	(0.179)	(0.244)	(0.364)	(0.347)	(0.900)	(0.872)	(0.534)	(0.844)	(0.561)	(0.618)	(0.887)	(0.788)	(0.199)	(0.899)
NOTCH	0.068	0.059	-0.027	-0.053	0.043	0.031	-0.017	-0.039	0.024	0.026	-0.028	-0.048	0.063	0.056	0.003
	(0.153)	(0.413)	(0.643)	(0.505)	(0.385)	(0.681)	(0.743)	(0.558)	(0.718)	(0.770)	(0.675)	(0.539)	(0.315)	(0.537)	(0.952)
GRAD	-0.518*	-0.519	0.039	-0.025	-0.198	-0.176	-0.100	-0.156	-0.137	-0.199	-0.071	-0.124	-0.449	-0.462	-0.361
	(0.095)	(0.301)	(0.933)	(0.967)	(0.546)	(0.734)	(0.802)	(0.753)	(0.763)	(0.742)	(0.890)	(0.838)	(0.282)	(0.465)	(0.383)
FIN	0.032	0.522**	0.238*	0.052	-0.399**	0.024	0.109	-0.089	-0.573**	-0.177	-0.055	-0.261	-0.232	0.181	-0.102
	(0.828)	(0.002)	(0.063)	(0.753)	(0.044)	(0.922)	(0.535)	(0.653)	(0.010)	(0.509)	(0.759)	(0.214)	(0.399)	(0.475)	(0.526)
PUB	0.491**	0.663**	0.366*	0.179	-0.208	0.007	0.181	0.017	-0.475**	-0.259	-0.065	-0.231	-0.270	-0.069	-0.103
	(0.027)	(0.050)	(0.050)	(0.451)	(0.365)	(0.982)	(0.399)	(0.946)	(0.054)	(0.442)	(0.773)	(0.381)	(0.360)	(0.845)	(0.602)
W	0.014	-0.046	-0.165	-0.138	0.099	0.128	0.101	0.096	0.005	0.092	0.022	0.008	0.124	0.167	0.173
	(0.941)	(0.803)	(0.324)	(0.447)	(0.542)	(0.450)	(0.515)	(0.528)	(0.975)	(0.597)	(0.890)	(0.962)	(0.557)	(0.354)	(0.272)
O	0.088	-0.071	-0.055	-0.105	0.351**	0.305**	0.264*	0.257*	0.345**	0.318**	0.259*	0.255*	0.268**	0.210*	0.298**
	(0.484)	(0.638)	(0.702)	(0.483)	(0.009)	(0.014)	(0.062)	(0.083)	(0.009)	(0.016)	(0.055)	(0.095)	(0.029)	(0.100)	(0.050)
IRV	-0.115	-0.113	0.018	-0.238	0.198	0.215	0.148	0.068	0.307**	0.289**	0.191	0.130	0.029	0.024	0.009
	(0.643)	(0.525)	(0.925)	(0.298)	(0.244)	(0.194)	(0.332)	(0.639)	(0.077)	(0.083)	(0.207)	(0.407)	(0.900)	(0.927)	(0.968)
EP	-3.298	2.147	3.474	3.808	-10.778**	-5.018**	-2.182	-2.540	-11.792**	-6.478**	-2.414	-2.958	-6.332	-1.221	-0.284
	(0.160)	(0.381)	(0.151)	(0.118)	(0.000)	(0.080)	(0.407)	(0.338)	(0.001)	(0.042)	(0.393)	(0.296)	(0.170)	(0.752)	(0.917)
TBTF	0.175	0.351**	-0.069	-0.176	-0.005	0.087	-0.056	-0.157	-0.156	-0.044	-0.197	-0.296	0.000	0.156	-0.232
	(0.218)	(0.016)	(0.575)	(0.248)	(0.974)	(0.689)	(0.767)	(0.413)	(0.344)	(0.850)	(0.316)	(0.159)	(0.998)	(0.169)	(0.119)
AGR	-0.468**	-0.247	-0.196*	-0.121	-0.786**	-0.601**	-0.218	-0.213	-0.775**	-0.610**	-0.124	-0.137	-0.251	-0.061	0.068
	(0.001)	(0.164)	(0.096)	(0.531)	(0.000)	(0.014)	(0.227)	(0.234)	(0.000)	(0.015)	(0.526)	(0.467)	(0.353)	(0.838)	(0.653)
ISS	0.033	0.007	0.040	0.009	-0.007	-0.028	-0.010	-0.041	0.010	-0.019	0.012	-0.018	-0.007	-0.035	-0.016
	(0.311)	(0.852)	(0.220)	(0.801)	(0.835)	(0.441)	(0.756)	(0.225)	(0.772)	(0.618)	(0.718)	(0.629)	(0.898)	(0.440)	(0.671)
DAY	-0.001	0.000	0.000	0.001	0.000	0.001	0.003	0.009**	0.000	0.001	-0.002	0.004	-0.004	-0.003	0.003
	(0.205)	(0.800)	(0.857)	(0.335)	(0.685)	(0.245)	(0.404)	(0.041)	(0.632)	(0.605)	(0.633)	(0.369)	(0.754)	(0.824)	(0.682)
Adj. R^2	0.120	0.152	0.158	0.049	0.282	0.129	0.114	0.020	0.344	0.210	0.144	-0.004	-0.078	0.031	-0.029
F	1.420	1.600	1.748*	1.220	2.373**	1.562	1.504	1.083	2.833**	2.005**	1.658	0.984	0.798	1.099	0.898
F p_val	(0.206)	(0.131)	(0.082)	(0.294)	(0.019)	(0.135)	(0.153)	(0.398)	(0.006)	(0.044)	(0.104)	(0.485)	(0.663)	(0.398)	(0.567)
Obs	44	48	57	61	50	54	56	59	50	54	56	59	40	44	52

Note: See note in Table 10. 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, 2 , 3 months and the entire period since the issue (1m, 2m, 3m, T) and POSTW= 1 & 2 weeks and 1 & 2 months (1w, 2w, 1m, 2m).

Table 12. Determinants of excess commercial paper notes liquidity after rating downgrades: volume and MS measures

	TVTD	TVWD	TVA	MS
Constant	3.238	1.310	1.893	2.155
	(0.255)	(0.413)	(0.287)	(0.474)
Moody's (AG)	-0.372	-0.658	-0.987	-0.398
	(0.735)	(0.366)	(0.254)	(0.715)
Expected (EXP)	-1.413	-0.805	-0.582	-0.551
	(0.312)	(0.367)	(0.558)	(0.703)
No. of notches shifts (NOTCHES)	0.273	0.255	-0.314	0.197
	(0.896)	(0.817)	(0.812)	(0.934)
Financial Sector (FIN)	-4.150*	-0.369	-1.818	-3.468
	(0.053)	(0.730)	(0.211)	(0.115)
Public Enterprise (PUB)	-1.393	0.346	1.703	-2.063
	(0.508)	(0.812)	(0.270)	(0.385)
CreditWatch List (W)	-4.468*	-2.025	-2.651	-4.036
	(0.094)	(0.173)	(0.120)	(0.150)
Outlook (O)	-1.682	-1.392*	-0.114	-1.371
	(0.284)	(0.064)	(0.910)	(0.401)
Interest rate variation (IRV)	2.704	1.818	0.901	1.523
	(0.180)	(0.336)	(0.580)	(0.444)
Economic Profitability (EP)	-15.350	12.572	-9.084	-7.988
	(0.564)	(0.512)	(0.700)	(0.766)
Size (TBTF)	-0.794	-0.615	-0.328	-0.697
	(0.574)	(0.499)	(0.739)	(0.637)
Asset growth rate (AGR)	0.474	1.102	-0.203	0.383
	(0.774)	(0.290)	(0.857)	(0.804)
No. of issues (ISS)	0.115	0.034	0.083	0.105
	(0.172)	(0.498)	(0.108)	(0.236)
Window size (DAY)	0.002	0.063	-0.016	0.020
	(0.987)	(0.271)	(0.827)	(0.846)
Adjusted R-squared	0.039	-0.029	-0.043	0.017
F	1.193	0.864	0.805	1.083
F p_val	(0.312)	(0.594)	(0.652)	(0.395)
Obs	63	63	63	63

Note: See note in Table 10. MS is the abnormal market share computed as the difference between the rate of growth of the market share around the rating event and the one expected according to the model (5).

Table 13. Determinants of excess commercial paper notes liquidity after rating downgrades: frequency measures

	T-1w	*T-2w*	*T-1m*	*T-2m*	*3m-1w*	*3m-2w*	*3m-1m*	*3m-2m*	*2m-1w*	*2m-2w*	*2m-1m*	*2m-2m*	*1m-1w*	*1m-2w*	*1m-1m*
Const	0.858**	0.698**	0.502**	0.279	0.732**	0.516**	0.326	0.145	0.686**	0.508**	0.317**	0.123	0.503**	0.342*	0.146
	(0.000)	(0.000)	(0.027)	(0.119)	(0.000)	(0.009)	(0.117)	(0.345)	(0.000)	(0.006)	(0.093)	(0.420)	(0.006)	(0.060)	(0.492)
AG	-0.024	-0.007	-0.013	0.016	-0.078	-0.044	-0.009	0.028	-0.105	-0.055	0.010	0.044	-0.028	-0.014	-0.021
	(0.709)	(0.912)	(0.855)	(0.843)	(0.274)	(0.474)	(0.911)	(0.726)	(0.107)	(0.425)	(0.897)	(0.579)	(0.725)	(0.854)	(0.817)
EXP	0.009	-0.141	-0.170	-0.129	-0.068	-0.163	-0.140	-0.121	-0.079	-0.174	-0.145	-0.120	0.044	-0.031	-0.060
	(0.914)	(0.233)	(0.231)	(0.336)	(0.520)	(0.235)	(0.274)	(0.256)	(0.400)	(0.169)	(0.219)	(0.247)	(0.707)	(0.791)	(0.658)
NOTCH	0.068	0.118	0.120	0.148	0.138	0.202**	0.212**	0.219**	0.143	0.177	0.190**	0.203**	0.132*	0.143**	0.144**
	(0.526)	(0.329)	(0.250)	(0.156)	(0.213)	(0.047)	(0.004)	(0.009)	(0.213)	(0.107)	(0.010)	(0.014)	(0.100)	(0.040)	(0.043)
FIN	-0.098	-0.026	-0.056	-0.083	-0.262*	-0.217	-0.035	-0.040	-0.256*	-0.245	-0.055	-0.067	-0.030	-0.022	-0.053
	(0.379)	(0.833)	(0.732)	(0.599)	(0.051)	(0.150)	(0.825)	(0.769)	(0.059)	(0.151)	(0.708)	(0.615)	(0.825)	(0.851)	(0.691)
PUB	0.114	-0.097	-0.155	0.139	-0.475**	-0.389**	-0.333**	-0.050	-0.413**	-0.316**	-0.248*	0.039	0.200	-0.049	-0.107
	(0.485)	(0.669)	(0.542)	(0.761)	(0.005)	(0.000)	(0.012)	(0.873)	(0.021)	(0.011)	(0.075)	(0.907)	(0.268)	(0.807)	(0.651)
W	0.028	-0.091	-0.124	-0.041	0.077	0.002	-0.011	0.029	0.091	-0.035	-0.037	0.017	0.092	-0.016	-0.050
	(0.845)	(0.576)	(0.491)	(0.822)	(0.612)	(0.990)	(0.948)	(0.859)	(0.546)	(0.831)	(0.821)	(0.918)	(0.601)	(0.923)	(0.799)
O	0.000	-0.164	-0.179	-0.080	0.030	-0.106	-0.242	-0.168	0.062	-0.041	-0.187	-0.105	-0.093	-0.139	-0.154
	(0.998)	(0.218)	(0.300)	(0.627)	(0.780)	(0.485)	(0.139)	(0.251)	(0.588)	(0.796)	(0.216)	(0.453)	(0.455)	(0.263)	(0.285)
ITV	0.149	0.253**	0.268	0.276	0.057	0.083	0.225	0.230	0.068	0.108	0.271	0.277	0.006	0.105	0.120
	(0.105)	(0.037)	(0.102)	(0.131)	(0.560)	(0.535)	(0.162)	(0.161)	(0.493)	(0.433)	(0.120)	(0.118)	(0.963)	(0.492)	(0.533)
EP	-5.678**	-5.426**	-4.649**	-4.811**	-5.101**	-5.344**	-5.106**	-5.214**	-4.720**	-5.565**	-5.335**	-5.460**	-5.516**	-6.100**	-5.324**
	(0.000)	(0.000)	(0.019)	(0.013)	(0.004)	(0.001)	(0.021)	(0.007)	(0.007)	(0.002)	(0.017)	(0.004)	(0.011)	(0.002)	(0.029)
TBTF	-0.019	-0.032	-0.057	-0.132	-0.187**	-0.158**	-0.118	-0.199**	-0.238**	-0.178**	-0.129	-0.209**	-0.116	-0.101	-0.125
	(0.781)	(0.665)	(0.570)	(0.140)	(0.033)	(0.067)	(0.205)	(0.015)	(0.007)	(0.053)	(0.128)	(0.009)	(0.166)	(0.218)	(0.188)
AGR	-0.337**	-0.313**	-0.364**	-0.428**	0.055	0.041	-0.240*	-0.289**	0.109	0.062	-0.247*	-0.301**	-0.084	-0.088	-0.140
	(0.010)	(0.023)	(0.011)	(0.008)	(0.670)	(0.702)	(0.061)	(0.026)	(0.377)	(0.616)	(0.053)	(0.023)	(0.529)	(0.463)	(0.288)
ISS	-0.007	-0.001	0.008	0.016**	-0.001	0.003	0.008	0.015**	0.000	0.004	0.007	0.014**	-0.005	-0.002	0.008
	(0.233)	(0.834)	(0.198)	(0.037)	(0.847)	(0.666)	(0.150)	(0.018)	(0.950)	(0.565)	(0.157)	(0.015)	(0.455)	(0.782)	(0.133)
DAY	-0.041**	-0.028	-0.021	-0.017	-0.027*	-0.013	0.003	0.005	-0.018	-0.005	0.015	0.018	0.016	0.015	0.022
	(0.035)	(0.112)	(0.357)	(0.453)	(0.075)	(0.427)	(0.879)	(0.785)	(0.262)	(0.757)	(0.399)	(0.271)	(0.488)	(0.423)	(0.371)
Adj. R^2	0.412	0.350	0.233	0.252	0.258	0.206	0.306	0.360	0.279	0.178	0.308	0.361	0.207	0.249	0.165
F	3.959**	3.484**	2.400**	2.578**	2.338**	2.077**	3.032**	3.637**	2.490**	1.898**	3.054**	3.656**	2.107**	2.528**	1.913*
F p_val	(0.000)	(0.001)	(0.014)	(0.009)	(0.022)	(0.038)	(0.003)	(0.001)	(0.015)	(0.060)	(0.002)	(0.000)	(0.034)	(0.010)	(0.053)
Obs	56	61	61	62	51	55	61	62	51	55	61	62	56	61	61

Note: See note in Table 10. 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, 2 , 3 months and the entire period since the issue (1M, 2M, 3M, T) and POSTW= 1 & 2 weeks and 1 & 2 months (1W, 2W, 1M, 2M).

Table 14. Determinants of excess bond liquidity after rating upgrades: volume measures

	TVTD	TVWD	TVA
Constant	4.060	6.002	6.415*
	(0.170)	(0.115)	(0.081)
Moody's (AG)	0.047	-0.098	0.067
	(0.964)	(0.934)	(0.956)
Expected (EXP)	2.212**	2.953*	2.215
	(0.041)	(0.052)	(0.114)
No. of grade shifts (GRAD)	0.117	0.545	0.258
	(0.767)	(0.290)	(0.573)
Financial Sector (FIN)	-3.524	-5.591*	-5.074*
	(0.164)	(0.082)	(0.100)
CreditWatch List (W)	1.404	2.803	1.856
	(0.368)	(0.143)	(0.302)
Outlook (O)	0.535	1.157	0.367
	(0.584)	(0.369)	(0.754)
Economy Growth Rate (GRE)	0.027	0.217	0.120
	(0.921)	(0.487)	(0.695)
Economic Profitability (EP)	-69.313	-118.677*	-108.041*
	(0.195)	(0.075)	(0.086)
Size (TBTF)	-0.856	-1.179	-1.242
	(0.450)	(0.367)	(0.332)
Adjusted R-squared	-0.029	0.075	0.020
F	0.904	1.278	1.070
F p_val	(0.539)	(0.303)	(0.421)
Obs	32	32	32

Note: See note in Table 10.

Table 15. Determinants of excess bond liquidity after rating upgrades: frequency measures

	T-1w	*T-2w*	*T-1m*	*T-2m*	*3m-1w*	*3m-2w*	*3m-1m*	*3m-2m*	*2m-1w*	*2m-2w*	*2m-1m*	*2m-2m*	*1m-1w*	*1m-2w*	*1m-1m*
Const	-0.175	-0.112	-0.350	0.304	0.924	1.021	0.557	0.521	0.783	0.932	0.463	0.496	0.733	1.044*	0.818*
	(0.864)	(0.903)	(0.660)	(0.600)	(0.193)	(0.192)	(0.311)	(0.161)	(0.371)	(0.326)	(0.498)	(0.224)	(0.225)	(0.070)	(0.052)
AG	0.539	0.401	0.439*	0.036	0.335	0.116	0.205	0.352*	0.424	0.159	0.186	0.297*	0.741*	0.357	0.328**
	(0.199)	(0.239)	(0.093)	(0.861)	(0.260)	(0.654)	(0.415)	(0.095)	(0.248)	(0.594)	(0.459)	(0.097)	(0.068)	(0.198)	(0.044)
EXP	0.068	0.231	0.300	0.435	0.003	0.161	0.390	0.024	-0.107	0.087	0.461	0.166	-0.386	-0.031	0.131
	(0.924)	(0.625)	(0.429)	(0.119)	(0.992)	(0.665)	(0.273)	(0.916)	(0.735)	(0.811)	(0.265)	(0.565)	(0.305)	(0.921)	(0.425)
NOTCH	0.163	0.152	0.212*	0.099	-0.028	-0.085	-0.018	-0.070	-0.027	-0.099	-0.008	-0.049	-0.057	-0.112	-0.035
	(0.500)	(0.317)	(0.085)	(0.290)	(0.748)	(0.500)	(0.878)	(0.362)	(0.766)	(0.464)	(0.955)	(0.577)	(0.567)	(0.457)	(0.632)
FIN	0.373	0.078	-0.021	-0.543	-0.026	-0.475	-0.408	-0.421	0.053	-0.456	-0.497	-0.560*	-0.144	-0.651*	-0.786**
	(0.503)	(0.872)	(0.961)	(0.227)	(0.961)	(0.407)	(0.323)	(0.134)	(0.938)	(0.526)	(0.321)	(0.070)	(0.700)	(0.086)	(0.031)
W	0.207	0.122	0.468	0.339	-0.167	-0.396	-0.106	-0.478**	-0.147	-0.428	-0.026	-0.374*	-0.386	-0.601	-0.180
	(0.773)	(0.827)	(0.308)	(0.298)	(0.612)	(0.300)	(0.766)	(0.025)	(0.695)	(0.303)	(0.948)	(0.066)	(0.270)	(0.116)	(0.282)
O	-0.285	-0.075	0.000	0.039	-0.258	-0.016	0.130	-0.124	-0.325	-0.049	0.226	-0.011	-0.565	-0.217	-0.098
	(0.674)	(0.900)	(1.000)	(0.873)	(0.272)	(0.958)	(0.644)	(0.555)	(0.110)	(0.870)	(0.445)	(0.951)	(0.114)	(0.412)	(0.487)
GRE	-0.121	-0.089	-0.121**	-0.048	-0.065	-0.045	-0.077	-0.075*	-0.039	-0.012	-0.066	-0.064*	-0.008	0.056	0.015
	(0.160)	(0.132)	(0.008)	(0.245)	(0.367)	(0.616)	(0.116)	(0.052)	(0.642)	(0.905)	(0.178)	(0.090)	(0.877)	(0.304)	(0.642)
EP	-6.100	-9.886	-2.993	-8.563	-6.625	-11.712	-9.053	-9.622*	-6.064	-11.428	-9.296	-10.908*	-14.451	-20.59**	-13.834**
	(0.571)	(0.264)	(0.726)	(0.309)	(0.363)	(0.171)	(0.109)	(0.064)	(0.499)	(0.300)	(0.298)	(0.095)	(0.177)	(0.024)	(0.012)
TBTF	0.383	0.405*	0.056	-0.012	-0.356	-0.119	-0.010	0.306*	-0.436	-0.193	-0.067	0.223	0.042	0.093	-0.279
	(0.246)	(0.068)	(0.711)	(0.950)	(0.379)	(0.794)	(0.969)	(0.070)	(0.374)	(0.714)	(0.828)	(0.211)	(0.854)	(0.464)	(0.185)
Adj. R^2	-0.565	-0.168	0.250	0.032	0.380	-0.170	0.357	0.192	0.273	-0.349	0.229	0.221	0.629	0.562	0.681
F	0.519	0.777	1.593	1.088	2.020	0.741	1.924	1.582	1.625	0.540	1.462	1.662	3.265	2.857	4.317*
F p_val	(0.804)	(0.651)	(0.276)	(0.425)	(0.202)	(0.670)	(0.219)	(0.219)	(0.285)	(0.808)	(0.353)	(0.203)	(0.180)	(0.162)	(0.061)
Obs	13	15	17	25	16	17	16	23	16	17	15	22	13	14	15

Note: See note in Table 10. 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, 2 , 3 months and the entire period since the issue (1m, 2m, 3m, T) and POSTW= 1 & 2 weeks and 1 & 2 months (1w, 2w, 1m, 2m).

Table 16. Determinants of excess commercial paper notes liquidity after rating upgrades: volume and MS measures

	TVTD	TVWD	TVA	MS
Constant	2.346	2.631	0.711	2.457
	(0.444)	(0.366)	(0.705)	(0.397)
Moody's (AG)	1.710*	1.221	0.543	0.687
	(0.100)	(0.275)	(0.297)	(0.423)
Expected (E3M)	0.488	1.508	0.173	-0.116
	(0.735)	(0.312)	(0.832)	(0.906)
No. of notches shifts (GRAD)	0.277	-0.033	-0.573	-0.249
	(0.710)	(0.967)	(0.280)	(0.680)
Financial Sector (FIN)	-3.218	-3.166	-0.322	-2.213
	(0.212)	(0.212)	(0.844)	(0.358)
CreditWatch List (W)	-0.759	-1.795	-0.902	-1.573
	(0.660)	(0.328)	(0.235)	(0.222)
Outlook (O)	-0.120	0.307	0.478	0.294
	(0.917)	(0.801)	(0.459)	(0.781)
Interest rate variation (IRV)	-1.329	-0.080	0.835	0.830
	(0.451)	(0.970)	(0.388)	(0.551)
Economic Profitability (EP)	-72.529	-68.887	-22.661	-48.500
	(0.202)	(0.216)	(0.489)	(0.369)
Size (TBTF)	-0.605	-0.354	0.517	0.163
	(0.517)	(0.727)	(0.406)	(0.839)
Adjusted R-squared	-0.069	-0.051	0.034	-0.085
F	0.664	0.746	1.185	0.589
F p_val	(0.736)	(0.665)	(0.332)	(0.798)
Obs	48	48	48	48

Note: See note in Table 10. E3M: dummy worth 1 if the announcement has been preceded by an announcement in the same direction in the three previous months, MS is the abnormal market share computed as the difference between the rate of growth of the market share observed around the rating event and the one expected according to the model (5).

Table 17. Determinants of excess commercial paper notes liquidity after rating upgrades: frequency measures

	T-1w	*T-2w*	*T-1m*	*T-2m*	*3m-1w*	*3m-2w*	*3m-1m*	*3m-2m*	*2m-1w*	*2m-2w*	*2m-1m*	*2m-2m*	*1m-1w*	*1m-2w*	*1m-1m*
Const	0.484	0.534*	0.193	0.107	0.353	0.278	0.042	-0.035	0.347	0.266	0.063	-0.011	0.799**	0.584**	0.271
	(0.163)	(0.082)	(0.607)	(0.768)	(0.209)	(0.198)	(0.880)	(0.918)	(0.318)	(0.295)	(0.844)	(0.976)	(0.004)	(0.044)	(0.346)
AG	0.107	0.229*	0.176	0.225*	0.041	0.114	0.158	0.187*	-0.034	0.039	0.190	0.211*	0.103	0.187*	0.130
	(0.396)	(0.064)	(0.159)	(0.059)	(0.665)	(0.257)	(0.119)	(0.072)	(0.766)	(0.753)	(0.104)	(0.073)	(0.250)	(0.068)	(0.252)
E3M	-0.082	-0.160	-0.110	-0.049	0.082	0.083	-0.056	0.004	-0.002	-0.014	-0.127	-0.067	-0.043	-0.175*	-0.128
	(0.572)	(0.226)	(0.455)	(0.728)	(0.376)	(0.294)	(0.613)	(0.975)	(0.986)	(0.884)	(0.288)	(0.564)	(0.683)	(0.089)	(0.247)
NOTCH	-0.035	0.018	-0.007	-0.020	-0.007	0.033	0.037	0.023	0.016	0.040	0.031	0.017	-0.011	0.019	0.004
	(0.510)	(0.784)	(0.925)	(0.796)	(0.860)	(0.518)	(0.524)	(0.722)	(0.758)	(0.470)	(0.607)	(0.801)	(0.796)	(0.676)	(0.944)
FIN	0.237	-0.050	0.167	0.104	0.172	0.011	0.041	-0.015	0.110	-0.026	0.013	-0.040	-0.402**	-0.428**	-0.246
	(0.329)	(0.800)	(0.495)	(0.630)	(0.397)	(0.930)	(0.831)	(0.950)	(0.662)	(0.874)	(0.956)	(0.873)	(0.031)	(0.043)	(0.183)
W	-0.104	-0.149	-0.163	-0.253	0.055	-0.012	-0.077	-0.168	0.032	-0.054	-0.146	-0.238	-0.185	-0.226	-0.233
	(0.560)	(0.364)	(0.429)	(0.215)	(0.726)	(0.933)	(0.625)	(0.348)	(0.864)	(0.737)	(0.422)	(0.228)	(0.230)	(0.156)	(0.208)
O	-0.111	-0.162	-0.213	-0.249	0.102	0.138	-0.203	-0.224*	0.141	0.172	-0.271*	-0.287*	-0.185	-0.220*	-0.277*
	(0.481)	(0.324)	(0.192)	(0.117)	(0.356)	(0.273)	(0.118)	(0.086)	(0.370)	(0.296)	(0.068)	(0.056)	(0.124)	(0.083)	(0.050)
IRV	-0.197	-0.370**	-0.392**	-0.421**	-0.069	-0.194	-0.297	-0.294*	-0.101	-0.219	-0.330	-0.313*	-0.242	-0.314*	-0.334
	(0.268)	(0.030)	(0.023)	(0.015)	(0.695)	(0.269)	(0.107)	(0.093)	(0.621)	(0.266)	(0.101)	(0.093)	(0.134)	(0.099)	(0.111)
EP	4.660	-4.381	2.319	-0.738	0.169	-5.682*	1.218	-1.821	-0.550	-5.413	2.194	-0.837	-9.412**	-9.257	-3.445
	(0.484)	(0.357)	(0.717)	(0.862)	(0.970)	(0.064)	(0.737)	(0.667)	(0.930)	(0.216)	(0.634)	(0.855)	(0.025)	(0.106)	(0.302)
TBTF	0.045	0.095	0.022	0.099	0.050	0.094	0.023	0.097	0.086	0.125	-0.052	0.021	-0.046	-0.017	-0.079
	(0.713)	(0.460)	(0.866)	(0.443)	(0.634)	(0.451)	(0.818)	(0.355)	(0.589)	(0.469)	(0.654)	(0.859)	(0.613)	(0.863)	(0.463)
Adj. R^2	-0.126	0.053	0.007	0.133	-0.175	0.035	-0.008	0.077	-0.220	-0.033	0.001	0.050	-0.052	0.078	0.013
F	0.513	1.266	1.032	1.764	0.437	1.158	0.963	1.416	0.319	0.862	1.004	1.265	0.786	1.402	1.063
F p_val	(0.853)	(0.290)	(0.435)	(0.110)	(0.902)	(0.356)	(0.486)	(0.218)	(0.961)	(0.568)	(0.455)	(0.289)	(0.631)	(0.226)	(0.413)
Obs	40	44	45	46	35	40	45	46	35	40	45	46	40	44	45

Note: See note in Table 10. E3M: dummy worth 1 if the announcement has been preceded by an announcement in the same direction in the three previous 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, 2 , 3 months and the entire period since the issue (1m, 2m, 3m, T) and POSTW= 1 & 2 weeks and 1 & 2 months (1w, 2w, 1m, 2m).