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The Impact of Credit Rating Announcements on Spanish Corporate Fixed Income Performance: Returns, Yields and Liquidity *

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Abstract:
This paper analyzes daily Spanish corporate bond and commercial paper note behavior around the time of corporate bond rating action announcements by the three largest international rating agencies. We analyze the effects of actual rating changes, watch-listings (warnings of possible rating changes) and outlook notices (trend in the future) on corporate fixed income performance. We analyze a wide set of measures of return, yield spread and liquidity. On an efficient market, these announcements will only have some significant effect if they contain some new information. In the bonds sample, we find significant effects of rating actions on both prices and trading activity. In the commercial paper notes sample, the only statistically significant impact is on liquidity.

Keywords: Credit Rating Agencies, Rating changes, Event study, Yields, Liquidity.
JEL Classification: G12, G14, C34.

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1. Introduction

The aim of this study is to analyze the relationship between corporate debt rating action announcements and the corporate fixed income market. We examine the impact of all types of rating actions (outlooks, watch-listings and rating changes) on prices and liquidity of commercial paper notes (CPN) and medium- and long-term corporate bonds. To our knowledge, analysis of effects on trading activity is an issue so far unexplored in the existing literature, nor have CPN been a subject of study. Finally, we examine a wide set of return, yield spread and liquidity measures.

All large corporate bond issues are rated by at least one rating agency. Rating agencies assign an initial rating to new bond issues on the basis of solvency of the issuing firms and on factors related to the industry and the macroeconomic environment. After that, agencies successively reevaluate corporate bonds as some of these relevant conditions change.

Recently the informative content of rating actions has been a subject of debate. According to Wakeman (1990), the agencies only summarize public information, implying that no response to rating changes should be observed on an efficient market. On the other hand, agencies claim that they handle private information. Firms usually pay a fee for the rating and are interested in incorporating insider information into the assigned rating without disclosing specific details to the public at large. Publicly revealing insider information might benefit competitors, whereas rating agencies can incorporate this kind of information into the ratings without fully revealing it. If this is so, the successive reevaluations should have some effect on the markets.

Economists have considered rating important enough to generate a voluminous body of literature on this subject. Indeed, a number of studies have examined the effect of rating changes on stock prices and on bond prices or yields. Most studies analyze the response of stock prices to credit rating changes. Among those that use bond returns or yield to examine the information content of rating changes, most early studies report that changes in bond ratings convey no new information to the market (Weinstein, 1974; Wakeman, 1978; Zaima and McCarthy, 1988). In contrast, more recent studies find that rating changes have information content. For instance, Ingram *et al*. (1983), employing monthly changes in municipal bond yields, and Hand *et al.* (1992), analyzing daily bond returns, find significant bond price reactions.

Hite and Warga (1997) examine the investment performance of industrial bonds undergoing rating changes. They find a significant effect to being upgraded from a non-investment-grade level to an investment-grade. Returns to other upgrades reveal very little

evidence of any effects. For downgrades, movement to a non-investment grade level results in the strongest reactions, and results for movement to another investment grade reveal evidence of a smaller magnitude reaction. Kish *et al*. (1999) estimate the rating effect on bond yields and test whether the market perceives differences among the ratings agencies. They find that Moody's is less credible than Standard & Poor's. Kliger and Sarig (2000) and Liu *et al.* (1999) test whether bond ratings contain pricing-relevant information by examining security price reactions to Moody's rating system refinement in 1982. This refinement was not accompanied by any fundamental change in issuers' risks or preceded by any announcement, and was carried out simultaneously for all bonds. They found that ratings *per se* contain some informational value and affect bond prices.

Only a few papers show evidence coming from non-U.S. markets. For instance, Steiner and Heinke (2001), examining the daily excess Eurobond returns, show statistically significant bond price reactions for announcements of downgrading and negative watch-listing. Gropp and Richards (2001), focusing on European banks, find little evidence of announcement effects on bond prices and suggest that this result may reflect the lack of liquidity in bond markets in Europe. Creighton *et al.* (2004) test the response of bond yield spreads and equity prices to credit rating changes in the Australian financial market and find evidence that yield spreads move in the 'expected' direction following rating changes.

This paper contributes to the existing literature in five ways. First, we analyze the effect of rating action announcements on market liquidity. This study fills a gap in the empirical literature concerning the effects of rating changes. Second, we jointly analyze short-term corporate debt and medium- and long-term corporate bonds. Third, we propose a wide set of alternative proxies to control the effect of rating actions on corporate debt returns, yield spreads and liquidity. Fourth, many studies have examined the price impact of rating announcements but few have distinguished between the different types of rating announcements. Fifth, we examine announcement effects on the pricing of the Spanish corporate market. No studies have analyzed this question in the Spanish fixed income market.

Our evidence suggests that all types of rating actions have a significant price and liquidity impact on corporate bonds. According to Micu *et al.* (2005), investors seem to value both a timely signal of possible changes in creditworthiness as well as a stable signal of underlying creditworthiness. The reaction is most pronounced for upgrade announcements. On the other hand, no evidence of a price reaction to rating changes in CPN is found. In any case, trading activity of these assets seems to be affected by certain rating announcements.

The rest of the paper is organized as follows. In Section 2, the characteristics of the sample of rating announcements and the data set of transactions on the Spanish corporate market are presented. Section 3 explains the different hypotheses to be tested. In Section 4, we examine different measures of abnormal behavior in returns and yields and we present our measures of abnormal liquidity. The main results are presented in Section 5. The paper closes with some conclusions in Section 6 and one appendix.

2. Rating actions on the Spanish corporate debt market

The sample of actual rating announcements consists of bond rating actions by Fitch IBCA, Standard and Poor's and Moody's during the period June 1993–December 2004. Fitch IBCA and Moody's provide us with the announcement dates. We also use *Hemeroteca El País* (newspaper library of the major Spanish journal) to find the Standard and Poor's rating announcement dates and complementary information. The initial sample contained a set of 349 rating actions, including rating changes, credit watch-listings and rating outlooks.[1]

Following Hand *et al*. (1992), we use the information of the Credit Watch List to distinguish between anticipated (or contaminated) and unanticipated rating changes. When a rating change is preceded by a watch-listing in the same direction, it should be largely anticipated by the market and, hence, should not necessarily be associated with a reaction in prices. We also study the impact of inclusion in this credit watch list and also in outlooks on returns and liquidity behavior, testing whether it contains market relevant information.

The original data set consists of daily observations derived from actual transactions in all CPN and corporate bonds traded on the secondary market of AIAF. This market is by far the leading and almost only Spanish corporate fixed income market and is run by the Spanish security dealers association. The database of bonds extends from January 1993 to December 2004, whereas the database of CPN starts in January 1998. We use a similar daily database of the Spanish government debt market covering the same sample period to obtain risk-free interest

[1] The watch-listing procedure should be distinguished from the rating outlook feature. Both processes seek to provide investors with timely information about potential changes. The watch-listing procedure occurs under special circumstances, such as unanticipated operating developments, regulatory action, and mergers and recapitalizations, provided that the rating agency believes that a rating change is likely. It typically covers short periods of time (mostly resolved within 90 days). The outlook feature incorporates trends and risks with less certain implications for credit quality. Its horizon is more long term (typically over two years) and it should be considered as more of a refinement of the rating. It is a weaker signal than a watch-listing.

rates from reverse agreements of Treasury securities and to estimate daily term structures of interest rates.[2]

Table 1 compares the trading activity and the amount outstanding for the AIAF corporate fixed income market and the Spanish Treasury debt market from 1996 to 2004. Activity and size of both markets rise sharply during the period but in the case of AIAF the rise is spectacular. Since 1997, trading volume has increased 6211.1% for commercial paper, 4426.8% for medium-term corporate bonds and 79.1% for long-term corporate bonds, whereas this increment is 23.9% for Treasury debt. The drastic evolution of AIAF is related to several legislative changes (e.g. CPN in 1999 became exempt from withholding tax) and the substantial reduction of the Public sector issuing pressure. Moreover, the Spanish secondary corporate fixed income market is relatively thin and illiquid and trading of most of the securities is infrequent.[3]

The CPN segment of AIAF is quite particular.[4] They are the most heavily traded corporate assets in recent years. Their overall trading volume represents 49.8% of the total in the last year of the sample, and 74.6% in 2002. CPN are actively traded by institutional investors during the first weeks after issuance. Afterwards they are hardly ever traded. However the primary market of commercial papers is especially dynamic. The most active corporations are continuously issuing new references. This activity in the primary market generates transactions in the secondary market, mainly involving just-issued assets. Thus, almost every day the database contains several transactions in the secondary market affecting some of the outstanding references of each issuer.

Most of the CPN are issued via backup lines or loan commitments. These contracts allow firms to borrow up to a pre-determined amount of funds at a fixed spread over a safe market benchmark interest rate such as Euribor. Under normal circumstances, CPN offer the lowest cost source of short-term financing for large, well-established firms. Commercial paper issuers secure

[2] Controlling for market conventions (simple or compound interest and 360-day or 365-day year basis depending on the security's term to maturity), the yields to maturity of all the analyzed securities are recalculated using compound interest and the yearly basis ACT/ACT.

[3] The size of both the commercial paper and corporate bond segments of AIAF is far smaller than the value of the equivalent U.S. debt. At the end of 2004, the amount outstanding of Spanish commercial paper (44.1 billion euros) represents only 4.2% of the U.S. value (1402.6 billion US$ or, according to the official exchange rate, 1045.9 billion euros). In the case of corporate bonds, this percentage drops to 1.9% (68.6 billion euros in the Spanish case and 3508.2 billion euros in the U.S. case).

[4] In the Spanish case, CPN have different maturities, the most frequent ones being 15 days and 1, 3, 6 and 12 months.

a backup line of credit from a bank as protection against declines in liquidity in the primary market.[5] It provides insurance against the possibility of having to borrow (e.g. because outstanding paper is maturing) when CPN are expensive. Borrowing in the CPN market can be expensive due to declines in either the firm's credit quality or in the overall supply of liquidity. These important differences between the CPN segment and the medium- and long-term corporate bonds segment have led us to analyze them separately.

For each reference, the AIAF data set reports daily information on the number of transactions and both the nominal and effective trading volumes. It also reports the average price and yield to maturity for each issue computed from all AIAF transactions over each day in the sample. We match this information with each issue's coupon rate, maturity date, issuance date and remaining coupon payment dates. We consider outright transactions and discard repo and reverse agreements. We exclude issues with special features such as floating rate notes, sinking fund bonds, convertible issues, callable and/or putable bonds, and issues with tax incentives.

From this data set of corporate debt we select the issues involved in rating actions. Most of these rating actions concern firms without outstanding issues in our sample period. We also exclude issues that do not have a minimum level of liquidity around the event window. Our final sample contains 158 rating actions affecting 1058 issues (271 bonds and 787 CPN).[6] Table 2 shows the 158 rating actions in our sample grouped into six different sets: Upgrades, Downgrades, Positive outlook changes, Negative outlook changes, Positive watch-listing and Negative watch-listing. We have 109 rating actions affecting the bond market and 120 affecting the short-term segment. 71 of them simultaneously affect both markets. Table 2 also shows the number of Expected rating actions (preceded by an entry in the Credit Watch List). As can be seen, in both segments more than 50% effective rating changes in both directions are expected.

Table 3 presents the time distribution of rating changes. After the filtering, the final sample of corporate bonds begins in 1994, whereas the starting year for CPN is 1998. In general, the period of analysis is characterized by growth in the number of rating action announcements. Finally, Table 4 presents the number of issuers in our final sample, making a distinction among

[5] Gatev and Straham (2006) provide a detailed description of the backup lines and study the banks' role in offering liquidity insurance for the commercial paper market.

[6] Many rating actions involve companies whose issues are not traded around the event window. Other issues are never traded in the secondary market; they are initially absorbed in investors' portfolios. Also a few large corporations put their issues into circulation in other foreign markets.

bond issuers, CPN issuers and issuers in both markets. We also report the number of issuers in the financial sector due to the heavy weight of these firms in our sample (71%).

Tables 5, 6 and 7 present the transition matrix of the different rating changes in the sample. Table 5 shows changes in long-term debt, Table 6 shows changes in short-term debt, and Table 7 shows changes in issuer ratings. Although the credit rating agencies use different symbols for assessing credit risk, each symbol of one agency has its counterpart on the credit rating scale of the other two agencies. This correspondence allows a comparison of the credit ratings assigned by the three agencies. Moreover, it permits a linear transformation of the agencies' ordinal credit rating scales into numbers, where a higher number denotes a higher probability of default.[7]

3. The expected effect of rating actions

The literature has tested some theories about the effects of rating change announcements that establish the expected behavior of re-rated firm bond returns or yields around the announcement date, but they indicate little about the expected liquidity behavior. The effect of rating actions on CPN returns yield or liquidity has also not been previously analyzed.[8]

The main hypothesis concerning rating change effects on debt markets states that rating agencies are supplied with considerable non-public information about a certain company and thus a rating revision may provide additional information about total firm value and its organizational effectiveness. In this way, bond rating changes provide information about changes in firm solvency. As a result, the debt price of downgraded (upgraded) firms should decline (increase). On the other hand, if the market participants already perceive the change in the company's underlying conditions that motivated the credit rating adjustment, no effect on returns or yields should be expected.

But even if rating announcements convey no new information about the solvency of issuers, we can find some effects related to institutional and regulatory constraints. Many institutional investors, like mutual and pension funds, are constrained to hold only investment-grade rated debt securities. A rating downgrade from an investment-grade category to a speculative-grade one could imply radical declines in the number of potential investors and could have a greater price impact than other downgrades. This would be an additional reason to

[7] See Tables A, B and C in Appendix.

[8] Nayard and Rozeff (1994) analyze the effect of CPN rating changes on equity returns, and Crabbe and Post (1994) analyze the effects of CPN rating downgrades on outstanding amounts of commercial paper.

rebalance portfolios. According to this, we could expect effects on returns and yields in the same direction of the rating action but stronger than in the information-hypothesis case. At any rate, we cannot test this hypothesis since our sample contains just two jumps from the investment-grade to the speculative-grade.

Additionally, we can expect an asymmetric price reaction to downgrades and upgrades. The agencies may be worried about their reputation, which will be affected if they assign mistaken ratings such as upgrading the debt of a risky firm or downgrading the debt of a safer firm. As Holthausen and Leftwich (1986) state, rating agencies face asymmetric loss functions and they allocate more resources to revealing negative credit information than positive information, since the loss of reputation is more severe when a false rating is too high than when it is too low. The former error is worse since investors can suffer economic losses if a bad firm, classified as good, fails to make a principal or interest payment. Also, the price pressure subsequent to a rating action is different for downgrades and upgrades. While downgrades force selling transactions, upgrades do not force buying transactions. Transaction costs tend to encumber subsequent buying activities after upgrades. In this context, we expect a stronger reaction in the case of downgrades.

It is also important to consider that, whereas the market is the end customer of rating agencies, almost all their revenues came from rating fees paid by the rated firms. Covitz and Harrison (2003) indicate that agencies may act in the interest of issuers delaying rating downgrades to postpone the parallel increase in funding costs and to give the firm time, and hence an option value, to correct the decline in its credit quality. The incentive to delay downgrades may be compelling for relatively large clients since the fees increase with the number and size of rated bonds.[9] In our case, all the issuers affected by rating changes are large and well-known firms, most of them banks, i.e. highly regulated entities. According to this hypothesis, we expect asymmetric effects depending on the direction of the rating action.[10]

It should be noted that these different theories about rating change effects on debt returns and yields do not consider specific characteristics of the debt such as the term to maturity. However, in our case, we study bonds and CPN and, due to the particular characteristics of the

[9] In any event, downgrade delays may also affect the agencies' reputation if the market anticipates the rating change.

[10] This hypothesis interfaces with other areas of finance. Some studies support the link between improved disclosure quality, reduced asymmetric information and improved liquidity. For example, Ascioglu *et al.* (2005) study the impact of fees paid for audit and non-audit services on disclosure quality and stock market liquidity.

CPN segment commented above, we expect that the effects of rating events may well differ from those of the bond segment. The trading activity concentrated in the early days of each issue and the constant issuance process would prevent any significant effect.

Finally, there is no specific literature about the expected effect of rating actions on asset liquidity. We expect that under the information hypothesis, the new information provided by the rating action might induce institutional investors to rebalance their portfolios. It should consequently lead to a temporary increase in trading activity involving the asset. We also expect to find asymmetries between downgrade and upgrade effects on liquidity, related mainly to the differences in price pressure discussed above.

However, most owners of corporate bonds are institutions that characteristically take large stakes in firms and have low portfolio turnover. Due to their large, stable ownership positions, they often have better access to private information about their portfolio firms. Also, these institutions are not frequent traders. They use a passive, buy-and-hold strategy of investing. As a result, information disclosed in rating actions could be of little importance in monitoring firms and the effects on liquidity could be limited.

In any case, the result should be interpreted with caution due to the particular characteristics of the Spanish market and the time period analyzed. First, we examine a relatively low number of rating events in several subsamples because of the small number of issuers. Second, in general corporate assets are infrequently traded. This inconvenience does not affect the CPN segment since we analyze portfolios and the issuers are very active. Third, Díaz and Navarro (2002b) suggest that liquidity premium is the main component of the yield spreads of Spanish corporate bonds, with the default premium assuming a secondary role. Fourth, our entire sample period could be considered as an expansive or stable stage in the business cycle. Authors such as Dialynas and Edington (1992) suggest that, in periods of prosperity, investors become less aware of security and more prone to bear more default risk. They are less concerned about credit rating actions, providing they do not imply a movement to speculative-grade categories.

4. Measures of abnormal behavior

4.1. Abnormal returns and yield spreads

Our first objective is to analyze the impact of rating actions on both corporate debt returns and yields. The literature on fixed income assets focuses attention on one of these two different measures: bond returns from prices and yield spreads from yields to maturity. We apply both measures in our analysis.

In order to determine abnormal behavior, we must define what "normal" behavior is. We must compare actual returns (or yields) with a benchmark that gives us the expected returns (or yield) in the absence of released information, given the risk class of the security. The literature has proposed different benchmarks. For instance, Hite and Warga (1997) use a bond index having the same broad rating and maturity classification as the bond in question to compute the benchmark returns. Covitz and Harrison (2003) use yield to maturity relative to corporate bond indexes with a similar rating and maturity. Gropp and Richards (2001) estimate a standard market model in which a government bond index acts as the market indicator. We discard this kind of benchmark because there are no corporate bond indexes in the Spanish case. Also, this method has several drawbacks. As Alexander (1980) reports, there are some serious violations of the basic assumptions of the market model when the market is defined as a debt index.

An alternative benchmark used in the literature is the return or yield of a bond with similar characteristics (a similarly rated bond or even a Treasury bond).[11] However, this procedure may lead to a misestimation due to differences in coupon rates and tax treatment. In our case, to find this kind of benchmark is difficult given the relatively small number of outstanding bonds within any single rating and maturity category in the Spanish corporate debt market. It is even difficult to find a Treasury security with features similar to the corporate one.

Due to these limitations, we propose a more accurate approach. Ideally, the preferred way of constructing the benchmark would be to calculate a corporate yield curve estimated for debt in the same rating class. However, this procedure requires quite a high number of different bonds with a similar rating being traded simultaneously to estimate the zero coupon yield curve for each rating grade. The implementation of this approach is complex, even in developed markets.

Our measure is based on the previous estimation of the Treasury term structure of interest rates. More specifically we use risk free synthetic bonds. We produce synthetic Treasury

[11] Other authors, such as Liu *et al.* (1999), estimate yield to maturity of a Treasury bond with the same coupon, maturity and discount from the face value. Previously they regress the actual yield to maturity of the Treasury bonds in the sample against three explanatory variables: coupon rate, maturity and discount.

securities by discounting coupon and principal payments of the corporate asset experiencing the rating action according to fitted term structures.[12, 13] Since we use Treasury debt as benchmark, we control for shifts in interest rates due to changes in real rates or expected inflation. However, we do not control for variation in default premium. This fact may bias the estimation of rating effects but, as Hand *et al.* (1992) state, this bias is negligible for short estimation periods.

Once we select the benchmark, we define the measure of abnormal returns and yields. To analyze the effect of rating changes, we study the behavior of these variables on the day on which the rating change is announced in the news (day 0) and on days around it. Due to infrequent trading, these variables are often unavailable on days 0 and +1. For this reason, we analyze a window-spanning excess of returns and yields along the lines of Hand *et al.* (1992).

In order to compute abnormal returns, we measure raw returns from the last transaction price before the rating action announcement (day t_1) to the first transaction price after this announcement date (day t_2). The raw return is defined as:

$$r_{i,(t_2-t_1)} = p_{i,t_2} - p_{i,t_1} \tag{1}$$

where $p_{i,t1}$ and $p_{i,t2}$ are the log of prices on days t_1 and t_2, respectively. We measure the *abnormal returns* as the difference between raw bond return and the return of the benchmark ($r_{B,\tau}$) for the same window-spanning period (τ):

$$AR_{i,(t_2-t_1)} = r_{i,(t_2-t_1)} - r_{B,(t_2-t_1)} \tag{2}$$

In the case of yields, the *yield differential* is defined as:

$$S_{it} = y_{it} - y_{Bt} \tag{3}$$

where y_{it} and y_{Bt} are the yields to maturity of security i and the benchmark on day t, respectively. We measure the *yield spreads* as the yield differential change in the window-spanning period:

$$AS_{i,(t_2-t_1)} = S_{i,t_2} - S_{i,t_1} \tag{4}$$

[12] Treasury trading data is obtained from annual files from Banco de España. It reports daily information of actual transactions in all Spanish Treasury bills and bonds traded on the secondary market for Spanish Treasury debt (Mercado de Deuda Pública Anotada) from January 1993 to December 2004. To estimate a daily term structure of interest rates, we use actual averaged daily Treasury transaction prices. We include all the spot transactions that took place with Treasury bills and bonds for all issues with a daily trading volume of at least €3 million and terms to maturity between 15 days and 15 years. We also include the one-week general collateral repo market interest rate to provide a liquid point at the very front of the yield curve. We fit Nelson and Siegel's (1987) exponential model for estimation of the yield curve and we minimize price errors weighted by duration.

[13] These synthetic securities are also used in Fleming (2001) or Díaz *et al.* (2006).

The different characteristics of CPN allow us to propose one additional measure of abnormal return and yield spread when we use another benchmark. The liquidity of the short-term assets used to estimate the Treasury yield curve is limited. Therefore the corresponding risk free interest rates could be of low quality. However, the market of reverse agreements of Treasury debt is a very active segment of the secondary market of Treasury debt in short-term maturities, and this allows us to obtain average daily interest rates for a wide range of terms. In this sense, we can use two alternative measures of returns and yield spreads: one measure from the yield curve and another from the reverse agreement data.

4.2. Abnormal liquidity measures

One of our main objectives in this paper is to analyze rating change effects on liquidity. First we must select a liquidity measure. A large body of literature investigates liquidity in the U.S. debt markets. A wide range of market condition variables and security-specific characteristics have been used as proxies for liquidity. Although the most common of these is the bid-ask spread, Elton and Green (1998) indicate that the best proxy for liquidity is trading volume, although Fleming (2001) finds improved performance by using the number of trades instead. Houweling *et al.* (2005) compare nine different liquidity proxies in a sample of euro corporate bonds and they find only limited differences between proxies.

In terms of security-specific characteristics, Fisher (1959) uses the amount of bonds outstanding on the basis of the potential correlation between the existing stock of a particular bond and the flow of trade in the bond. Both Sarig and Warga (1989) and Warga (1992) suggest that younger bonds are usually traded more frequently. Warga (1992) proxies for liquidity by indicating whether an issue is "on-the-run," that is, if it is the most recently issued security of a particular maturity. Amihud and Mendelson (1991) observe that bonds close to maturity have significantly reduced liquidity since they are "locked away" in investors' portfolios. Goldreich *et al.* (2005) and Díaz *et al.* (2006) propose measures of expected liquidity over the full life of the issue, rather than merely the current level of any liquidity measure.

In the Spanish case, Díaz and Navarro (2002b) analyze corporate debt liquidity, and Díaz and Navarro (2002a), Alonso *et al.* (2005) and Díaz *et al.* (2006) examine the case of Spanish government debt. These authors track liquidity in a typical Spanish Treasury issue in the secondary market by using a trading activity life cycle approach.

Most of the proposed measures in the literature are inappropriate for our analysis, e.g. the age of the bond, or our database simply does not contain information about them, e.g. the bid-ask spread. 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. We consider both trading volume and trading frequency. We compute the trading volume on day *t* as the average effective trading volume of all outstanding issues of the issuer. In this case, to obtain the abnormal volume measures, we first compute the trading volume rate of change as:

$$cV_{i,(t_2-t_1)} = v_{i,t_2} - v_{i,t_1} \tag{5}$$

where $v_{i,t1}$ and $v_{i,t2}$ are the logs of the trading volume on days t_1 and t_2, respectively. Then we compare this variable to the benchmark that shows the normal volume of the issuer as:

$$AV_{i,(t_2-t_1)} = cV_{i,(t_2-t_1)} - E(cV_{i,(t_2-t_1)}) \tag{6}$$

where $E(cV_{i,(t_2-t_1)})$ is the expected or "normal" average daily trading volume rate of change. We define this benchmark as the change between the average daily trading volume per traded day on day t_2 and on day t_1. On a particular day t, this measure is calculated by dividing the total trading volume in the last three-month interval by the number of days on which the issue is traded in the period.[14]

Our second abnormal liquidity measure is based on the trading frequency calculated as the ratio between the number of traded days and the number of available working days before and after the announcement date. We use two months of observations before and two months after the announcement. Computing this measure in relative terms, we avoid a possible bias whenever the previous available trading interval for a reference is less than two months. In particular, the abnormal frequency measure is computed as:

$$AF_{i,(t_2-t_1)} = f_i^{after} - f_i^{before} \tag{7}$$

where f_i^{after} and f_i^{before} are the logs of the two frequency ratios mentioned above, respectively.

In the case of CPN, their particular characteristics allow us to consider more liquidity proxies than in the case of corporate bonds. In particular, for CPN we analyze the market share of trading activity as the liquidity proxy. Market share for a CPN during a week is measured as the ratio of the issue par value traded to the total face value traded of all outstanding issues during the week.

[14] We also consider another two benchmarks over the previous three-month period: the accumulated average daily trading volume and the average daily trading volume. The former measure is calculated by dividing the total trading volume by the number of working days in the last three-month interval. Results are similar to those obtained in the case of the average daily trading volume per traded day. They are available from the authors upon request.

In order to compute the benchmark for the market share, we take advantage of the regularity of the CPN trading behavior.[15] Following Díaz *et al.* (2006), we track liquidity in a typical CPN by using a trading activity life cycle approach. In particular, we model CPN liquidity (measured as market share of trading activity, MS_{it}) as a smooth, nonlinear function of its age (Age_{it}):[16]

$$MS_{it} = \beta_1 \exp\left(Age_{it} - \beta_2\right)^{\beta_3} + \beta_4 \cdot \beta_5^{\,Age_{it}} + u_{it} \qquad (8)$$

where $\beta_i, i = 1,...,5$ are the unknown parameters and u_{it} is an *i.i.d.* error term with zero mean and constant variance. For positive values of all parameters, the $MS(\cdot)$ function is positive.

Equation (8) is estimated by using weekly data on individual CPN shares of trading volume for all issues in our database.[17] We consider all the outstanding references on each day, even if they are not traded.[18] After that, we use model (8) to compute the benchmark market share of all issues in our CPN sample.

Thus, we define the *abnormal market share* as the actual rate of change in market share (or raw effective trading volume) against the expected one for a typical CPN of the same age:

$$AMS_{i,(t_2-t_1)} = cMS_{i,(t_2-t_1)} - E(cMS_{i,(t_2-t_1)}) \qquad (9)$$

where $cMS_{i,(t_2-t_1)} = ms_{i,t_2} - ms_{i,t_1}$, $ms_{i,\tau}$ is the market share in logs on day $\tau = t_1, t_2$, and $E(.)$ indicates the expected value.

5. Empirical results

Almost all the issuers affected by rating actions simultaneously keep several outstanding securities in the market, especially in the case of CPN. Most days the activity in the secondary market involves various outstanding references of each issuer. The abnormal returns of corporate debt issued by the same company are probably almost perfectly correlated in the cross-section. For this reason we construct liquidity weighted portfolios with all bonds and CPN of the same firm after computing returns, yield spreads and liquidity measures. We aggregate the outstanding

[15] As we mentioned in Section 2, institutional investors take positions in these assets in the early days after issuance. The trading of these assets during the remaining lifetime is residual.

[16] Equation (8) is inspired by the actuarial research on human mortality (see Heligman and Pollard, 1980). The first term captures the steep drop of average liquidity during the initial weeks of note life. The second is a smooth decreasing exponential function describing the declining trading activity of the note as it matures.

[17] We also estimate the model by using the raw effective trading volume as a dependent variable. Results are similar to those obtained in the case of market share.

[18] To save space, full details of this analysis are suppressed. They are available from the authors upon request.

references of each issuer by weighting the effective trading volume of the issues actually traded during the day. Each portfolio is treated as a single observation.[19]

The null hypothesis of zero abnormal performance due to rating actions implies that averaged excess security returns (abnormal returns and yield spreads) and averaged abnormal liquidity are zero. To test the statistical significance of the mean for these series, we use a standard t-ratio test:

$$t = \frac{x\sqrt{N-1}}{s_x} \tag{10}$$

where x is the cross-sectional averaged abnormal return, yield spread or abnormal liquidity computed in each case, s_x is the standard deviation of x, and N is the number of re-rated firms.

In order to avoid the effects of non-normality (skewness, fat tails, etc.), we also compute the median value of the series and two nonparametric tests. First, we use the Fisher sign test. This test counts the number of times that one variable is positive. Under the null the test statistic follows a binomial distribution with $p = 0.5$. Second, the Wilcoxon signed rank test is computed. This test assumes that there is information in the magnitudes as well as the signs of the variable. To calculate the test, we rank the variable from smallest to largest by absolute value. Then we add up all the ranks associated with positive values. We report p-values for the asymptotic normal approximation to the test.

We group rating actions in six different samples. First we analyze the whole sample of rating actions in the same direction (rating changes, outlook changes and watch-listings). We also group together the rating actions that imply a change in relative position (rating and outlook changes). Additionally, we consider separately the sample of rating changes, the sample of outlook changes and the sample of watch-listings. Finally, we analyze the sample of non-expected rating changes. We separately report results for the CPN segment and the medium- and long-term corporate bonds segment.

5.1. Result for excess returns and yields

The results for excess returns and yields for corporate bond portfolios are presented in Tables 8 and 9. Panel A reports yield spread results and Panel B reports abnormal return results. Both of them were calculated by using the risk free synthetic bonds as the benchmark. We analyze the effect of the downgrades in Table 8. The estimated median yield spreads are always positive, but we only detected significant effects in the case of negative watch-listing and in the

[19] We also analyze equally weighted portfolios, but results are almost the same. They are available from the authors upon request.

whole sample (Panel A).[20] In both cases, the non-parametric tests, based on the percentage of positive yield spreads, reveal a significantly positive reaction. One of the concerns that led us to control for previous samples is whether the result for the whole sample is dominated by some of the subsamples. In this case, the result appears to be solely due to negative watch-listing. In the abnormal returns case (Panel B), estimated mean abnormal returns are positive and statistically significant in the effective rating downgrades sample (it contains only rating downgrades). As the coefficient is statistically insignificant only in the outlook downgrades sample, the significant market reaction seems to be originated by rating downgrades. These results indicate that downgrade actions have valuable informational content.

In the case of upgrades, the estimated mean and median yield spreads are significantly positive for corporate bonds in effective upgrades and the whole sample, based on the t-statistic and the non-parametric statistics (Panel A, Table 9). These results appear to point to a positive and significant effect on yield spreads of upgrades. We examine bond price reactions to upgrade announcements in Panel B. Consistently with previous results, the estimated mean and median abnormal returns are significantly negative for all samples.

Summarizing results for corporate bond samples, we obtain evidence of significant effects on abnormal returns and yield spreads of different rating actions. Negative credit watches imply positive abnormal yield spreads, and effective rating downgrades involve positive abnormal returns. All considered upgrade rating actions have significant effects on abnormal yield spreads and returns. This result suggests that upgrade announcements have stronger effects than downgrades. This asymmetry in market reaction to upgrades and downgrades is in line with most of the previous literature, but the sign that we observe is not the expected one. The literature documents significant announcement effects for downgrades but not for upgrades. Also we should expect negative abnormal returns for downgrades, as they are bad news for bondholders, and positive abnormal returns for upgrades.

We commented above on several factors beyond rating effects that can condition the result and some explanations in the literature that can support this seemly disappointing result. The incentive to delay downgrades could be fully applicable to the Spanish case, as all considered issuers are large and well-known firms. We can assume that a large amount of information about these corporations is available to the market. Moreover only two rating changes move the firm out of investment-grade category. The remaining rating events have no

[20] When an estimated coefficient is insignificant, the lack of precision makes it impossible to draw conclusions about its sign or size. For this reason, we interpret only the statistically significant coefficients.

special institutional and regulatory implications. Consequently, we think that the bond market anticipates rating changes but the final movements are not as bad as expected. The result should be an adjustment to the price that implies a positive abnormal return. This explanation is also consistent with the results observed for negative credit watches. These negative watch-listings indicate a substantial probability of downgrading in the near future. These announcements provide new and relevant information to the market. In this case, we obtain evidence of a significant positive effect on yield spreads and consequently a fall in prices.

As regards upgrades, rating agencies may be worried about their reputation and will be more reluctant to upgrade than to downgrade and will take more time to make the decision. As a result, when the agency announces the rating action, it may have already been discounted by the market and the announced upgrade may be smaller than expected, causing a fall in prices.

Tables 10 and 11 report results for the short-term issue segment. Although other alternative proxies are used in the case of commercial paper portfolios, we only show results for yield spreads and abnormal returns relative to risk free interest rates obtained from reverse agreements of Treasury debt.[21] For downgrades in Table 10, the estimated median and mean yield spreads are significantly positive in three samples analyzed: effective outlook downgrades, effective downgrades and the whole sample with the t-ratio and non-parametric statistics. While these results show announcement effects for yield spreads, we should caution that only seven effective negative outlook notices dominant the effects. For the remaining cases, abnormal returns in downgrades (Panel B of Table 10) and yield spreads and abnormal returns in upgrades (Table 11), we do not detect statistically significant effects. This weak evidence of significant reactions is consistent with our expected result for commercial paper notes.

Overall, our results differ from previous literature except for finding a significant reaction of returns and yields to rating actions in any direction. Nevertheless, we propose plausible economic explanations. At any rate, some important features may be behind these seemly puzzling results, such as the sector of the re-rated firm, the number of notches changed, the rating agency, the trend in the direction of the change, deviating and consenting rating changes from a consensus rating of all the rating agencies, etc. Responding to all these questions is our next objective, as an extension of the work presented in this paper.

5.2. Rating action effects on liquidity

[21] This approach is more suitable as this is a very active segment on the secondary market of Treasury debt.

In this case we have a number of different proxies of abnormal liquidity: trading activity proxies, trading volume proxies and the market share in the case of commercial paper. We present the excess liquidity measured as the average daily trading volume per traded day, the trading frequency and the market share (only for commercial paper).

Results for excess liquidity are shown in Tables 12 to 15. The first one reports results for rating downgrade effects on liquidity of corporate bond portfolios. For both liquidity measures, the estimated median excess liquidity is positive. We do not find significant excess liquidity in any case, including non-expected rating downgrades for the trading volume measure, whereas the effect is significantly positive in three subsamples for the trading frequency measure (in all cases, effective downgrades and effective outlook downgrades) and with all tests used.

In the case of upgrades (Table 13), there are significantly positive effects in several cases. For the trading volume measure (Panel A), we find significant positive reactions to upgrades, using the t-ratio statistic, in four of the six analyzed subsamples (whole sample, effective upgrades, effective rating upgrades and positive watch-listing). The signed rank test indicates a significant reaction only in the whole sample and in the effective rating upgrades, although p-values are relatively low for the other three mentioned samples. Results seem to be dominated by effective rating upgrades and positive watch-listing. Panel B of Table 13 shows results for the trading frequency measure. Here we also find a significant reaction to rating upgrades in several samples. In particular, we find positive effects with the three tests in the whole, effective upgrade and effective outlook upgrade samples.

These results indicate that rating actions in any direction cause a reaction on the liquidity of corporate bonds. These effects are always positive, suggesting that rating actions cause more frequent trading in the market followed by larger amounts per transaction after upgrades.

Results for commercial paper notes (Tables 14 and 15) are along the same lines. In this case we show in Panel A of both tables the abnormal liquidity measured *via* market share. Table 14 reports the case of downgrades. We find negative median abnormal market shares in all samples that are significant only in the case of the whole sample and the negative watch-listing one. In the case of abnormal volume, we also find a significantly negative effect for the watch-listing sample. As can be seen in Panel C, rating action effects on liquidity are statistically insignificant in all cases for the trading frequency proxy, with the exception of the non-expected rating downgrades. For this sample, the effect is significantly positive.

Table 15 contains results for upgrades. For these rating actions we only find a significant reaction in the case of the abnormal frequency measure for three subsamples (the whole sample,

effective upgrades and effective rating upgrades) and with all tests in use. In this case the effects are always positive.

Summarizing the case of commercial paper notes, we also find significant reactions of liquidity measures to rating actions in any direction. Inclusion in the Credit Watch List with negative implications causes a reduction in market share and volume but leaves the frequency unaffected. In the case of upgrades, we find a higher frequency related to effective rating actions but no reaction in market share or volume.

6. Conclusions

In this paper we analyze the information content of credit rating actions by leading international agencies on the Spanish corporate debt market. We examine effects on returns, yields and liquidity, distinguishing between the long- and medium-term segment and the short-term segment and between three different types of rating actions: effective rating changes, outlook changes and watch-listing.

The evidence regarding whether rating actions convey new information to corporate bond and commercial paper markets is mixed and depends on the considered rating action. Our results for corporate bonds suggest that negative credit watches are associated with abnormal positive yield spreads, whereas effective rating downgrades imply abnormal positive returns. In the case of upgrades, all the changes affect returns and yield spreads. We only find little evidence of downgrade announcement effects on yields for CPN.

One of our main contributions is the analysis of whether rating actions have affected the liquidity of the Spanish corporate debt market. In particular, we propose several measures to assess abnormal liquidity: trading activity, trading volume and market share. Our analysis reveals significant effects on corporate bonds and CPN liquidity. Whereas downgrades cause a positive reaction on both bonds and CPN trading frequency, negative watch-listings cause a drop in CPN market share and volume. In turn, effective upgrades are related to higher volume and trading activity in the bond market, whereas in the CPN market only the trading activity reflects a positive impact.

Despite the discrepancies, we conclude that there are both corporate bond and CPN changes in returns, yields and liquidity associated with announcements of credit rating actions. We find evidence of stronger announcement effects on abnormal yield spreads, returns and trading activity for upgrades than for downgrades. In any case, the signs of these relationships are not always the expected ones. Rating actions increase general trading frequency but have a

weak effect on trading volumes. Finally, the addition of a firm to the credit watch list is the rating action that contains the most relevant market information, affecting both prices and liquidity.

Finally, almost all firms in our sample are large corporations. In this sense, we cannot rule out that our results are driven by a "too-big-to-fail" effect. These results can also be explained by other factors. Almost all the corporate debt we analyze is classified as investment-grade. While this may, in part, be explained by the relatively low number of expected events, there are some important features that can explain these puzzling results, such as the sector of the re-rated firm, the number of categories changed, the rating agency, the trend in the direction of the change, etc. All these questions will be carefully analyzed as an extension of this work.

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Table 1. Spanish corporate fixed income market and Spanish Treasury debt market

	AIAF corporate market					Treasury debt market (1)
	Commercial paper	Medium-term bond	Long-term bond	Other corporate assets (2)	Total AIAF	Public Debt
	Panel A. Trading volume					
1996	3,737	1,109	6,739	4,972	16,557	--
1997	4,474	779	8,871	7,261	21,385	1,724,505
1998	7,845	1,532	16,089	17,653	43,120	1,720,232
1999	21,866	1,008	14,546	48,848	86,268	1,856,613
2000	40,870	2,222	8,036	48,695	99,824	1,641,773
2001	90,117	1,515	11,391	37,786	140,810	2,043,759
2002	197,747	1,517	13,576	52,127	264,967	2,312,936
2003	257,544	6,619	14,794	101,233	380,190	2,246,360
2004	282,360	35,264	15,887	233,068	566,579	2,136,698
	Panel B. Amount outstanding					
1996	2,024	2,587	8,056	7,996	20,663	216,074
1997	2,176	2,941	9,734	11,457	26,308	231,738
1998	3,012	3,484	10,066	15,766	32,328	241,801
1999	17,568	9,639	12,697	29,464	69,369	265,317
2000	14,845	8,167	15,798	39,489	78,300	276,795
2001	21,253	8,196	16,647	53,309	99,406	281,176
2002	20,064	8,022	20,299	78,557	126,943	291,454
2003	29,230	13,149	22,050	133,313	197,743	293,611
2004	44,113	41,815	26,829	195,271	308,029	301,970

(1) Treasury debt in the Central Book-Entry Office fixed income market (MDPA)
(2) Other corporate securities such as matador bonds, mortgage-backed bonds, asset-backed bonds, mortgage bonds, territorial bonds, preferred shares, and backed promissory notes.
Figures include outright trades, repo and reverse agreements.
Source: AIAF and Bank of Spain. In million euros.

Table 2. Rating action announcements analyzed

	Corporate bonds (medium- and long-term issue segment)	**Commercial paper** (short-term issue segment)
Downgrade	38 ***(25)*** [24]	35 ***(25)*** [24]
Upgrade	17 ***(9)*** [12]	24 ***(12)*** [12]
Outlook negative	13 [8]	10 [8]
Outlook positive	10 [8]	19 [8]
Credit watch list negative	23 [15]	25 [15]
Credit watch list positive	8 [4]	7 [4]
Total	109 ***(34)*** [71]	120 ***(37)*** [71]

Expected rating changes in parentheses. Coincidences between segments in brackets.

Table 3. Rating action announcements analyzed by year

	Corporate bonds (medium- and long-term issue segment)	**Commercial paper** (short-term issue segment)
1994	9	--
1995	1	--
1996	1	--
1997	6	--
1998	10	2
1999	11	12
2000	14	19
2001	13	17
2002	25	39
2003	16	24
2004	3	7
Total	109	120

Table 4. Debt issuers in the sample analyzed

	Total	**Financial sector**
Bond Issuers	15 *(10)*	10 *(8)*
Commercial Paper Issuers	23 *(10)*	17 *(8)*

Coincidences between segments in brackets.

Table 5. Old and new ratings. Rating and outlook change announcements analyzed in portfolios. Corporate bonds (the medium- and long-term issue segment)

New \ Old	1	2	3	4	5	6	7	8	9	11	SO	NO
1			2									
2	1		1		2							
3		2		1								
4			6		5		1					
5				5		4		1				
6	1			2	6		1					
7						1		1				
8					2	1			1			
9								2				
10										1		
11		1				1						
14										1		
SO												9
NO											9	
PO											11	

Downgrades are below the principal diagonal and Upgrades above it. The shaded area indicate speculative grade. SO, NO and PO indicate stable, negative and positive outlooks, respectively. Long-term debt rating equivalences defined in Appendix (Table A).

Table 6. Old and new ratings. Rating and outlook change announcements analyzed in portfolios. Commercial paper (short-term issue segment)

New \ Old	1	2	3	NO	SO
1		7			
2	9		3		
3		1			
4		1			
PO					1
SO				1	

Downgrades are below the principal diagonal and Upgrades above it. SO, NO and PO indicate stable, negative and positive outlooks, respectively. Short-term debt rating equivalences defined in Appendix (Table B)

Table 7. Old and new ratings. Rating and outlook change announcements analyzed in portfolios. Issuer rating

New \ Old	2	3	4	5	6	7	8	NO	SO
2		1							
3	2		2						
4		3		3					
5					3				
6				2		1			
7									
8						2			
NO									3
PO									3
SO								2	

Downgrades are below the principal diagonal and Upgrades above it. SO, NO and PO indicate stable, negative and positive outlooks, respectively.

Table 8. Downgrade effects on abnormal returns and yield spreads. Corporate Bond portfolios (the medium- and long-term issue segment)

	Number of issues	Number of rating actions	Mean % Excess Return	t-ratio	Median % Excess Return	Number of ER >0	Signed Rank Test
Panel A. Yield spreads							
All Cases (R+O+W)	189	73	0.065	0.692	0.040	46*	1.694*
				(0.489)		(0.017)	(0.090)
Effective downgrades (R+O)	128	50	0.017	0.304	0.035	29	0.298
				(0.761)		(0.193)	(0.766)
Effective rating downgrades (R)	95	38	-0.002	-0.037	0.035	22	0.038
				(0.970)		(0.324)	(0.970)
Effective outlook downgrades (O)	33	12	0.077	0.718	0.045	7	0.489
				(0.473)		(0.549)	(0.625)
Negative watch-listing (W)	61	23	0.169	0.615	0.130	17*	2.282*
				(0.538)		(0.035)	(0.022)
Non-expected rating downgrades (NER)	32	13	-0.035	-0.508	0.040	8	-0.035
				(0.611)		(0.581)	(0.972)
Panel B. Abnormal returns							
All Cases (R+O+W)	189	73	0.632	0.831	-0.200	39	0.042
				(0.406)		(0.556)	(0.966)
Effective downgrades (R+O)	128	50	0.844	1.622	0.020	25	1.119
				(0.105)		(1.000)	(0.263)
Effective rating downgrades (R)	95	38	1.313	2.097*	-0.090	19	1.328
				(0.036)		(1.000)	(0.184)
Effective outlook downgrades (O)	33	12	-0.639	-0.828	0.065	7	0.275
				(0.407)		(0.774)	(0.784)
Negative watch-listing (W)	61	23	0.170	0.079	-0.720	15	1.354
				(0.937)		(0.210)	(0.176)
Non-expected rating downgrades (NER)	32	13	0.433	0.635	-0.290	8	0.039
				(0.526)		(0.388)	(0.969)

Abnormal returns computed by considering accrued interest. * indicates significance at a level lower than 10%. P-values in parentheses. R, O and W indicate rating, outlook and watch-listing, respectively. NER indicates non-expected rating change.

Table 9. Upgrade effects on abnormal returns and yield spreads. Corporate Bond portfolios (the medium- and long-term issue segment)

	Number of issues	Number of rating actions	Mean % Excess Return	t-ratio	Median % Excess Return	Number of ER >0	Signed Rank Test
Panel A. Yield spreads							
All Cases (R+O+W)	82	36	0.138	1.838*	0.065	23*	1.925*
				(0.066)		(0.089)	(0.054)
Effective upgrades (R+O)	64	28	0.174	1.817*	0.090	19*	1.856*
				(0.069)		(0.087)	(0.063)
Effective rating upgrades (R)	40	17	0.195	1.325	0.130	11	1.373
				(0.185)		(0.332)	(0.170)
Effective outlook upgrades (O)	24	11	0.140	1.49	0.080	8	1.379
				(0.136)		(0.227)	(0.168)
Positive watch-listing (W)	18	8	0.015	0.396	0.015	4	0.508
				(0.692)		(1.000)	(0.612)
Non-expected rating upgrades (NER)	21	8	0.286	0.925	0.140	5	0.630
				(0.355)		(0.727)	(0.529)
Panel B. Abnormal returns							
All Cases (R+O+W)	82	36	-2.283	-1.369	-0.245	25*	2.758*
				(0.171)		(0.029)	(0.006)
Effective upgrades (R+O)	64	28	-2.830	-1.321	-0.310	20*	2.448*
				(0.186)		(0.036)	(0.014)
Effective rating upgrades (R)	40	17	-4.175	-1.186	-0.350	14*	2.178*
				(0.236)		(0.013)	(0.029)
Effective outlook upgrades (O)	24	11	-0.751	-1.881*	-0.140	6	1.201
				(0.060)		(1.000)	(0.230)
Positive watch-listing (W)	18	8	-0.371	-1.71*	-0.140	5	1.192
				(0.087)		(0.727)	(0.233)
Non-expected rating upgrades (NER)	21	8	-8.113	-1.086	-0.645	7*	1.610
				(0.277)		(0.070)	(0.107)

Abnormal returns computed by considering accrued interest. * indicates significance at a level lower than 10%. P-values in parentheses. R, O and W indicate rating, outlook and watch-listing, respectively. NER indicates non-expected rating change.

Table 10. Downgrade effects on abnormal returns and yield spreads. Commercial Paper portfolios (the short-term issue segment)

	Number of issues	Number of rating actions	Mean % Excess Return	t-ratio	Median % Excess Return	Number of ER >0	Signed Rank Test
Panel A. Yield spreads							
All Cases (R+O+W)	482	63	0.015	0.831	0.020	38*	0.981
				(0.406)		(0.072)	(0.327)
Effective downgrades (R+O)	317	41	0.026	1.192	0.040	27*	1.659*
				(0.233)		(0.060)	(0.097)
Effective rating downgrades (R)	251	33	0.015	0.587	0.030	20	1.001
				(0.557)		(0.296)	(0.317)
Effective outlook downgrades (O)	66	8	0.071	1.79*	0.080	7*	1.544
				(0.073)		(0.070)	(0.123)
Negative watch-listing (W)	165	22	-0.004	-0.119	0.005	11	0.598
				(0.905)		(0.824)	(0.550)
Non-expected rating downgrades (NER)	69	11	0.007	0.159	0.040	7	0.935
				(0.874)		(0.549)	(0.350)
Panel B. Abnormal returns							
All Cases (R+O+W)	482	63	-0.004	-0.311	0.000	27	0.532
				(0.756)		(0.672)	(0.595)
Effective downgrades (R+O)	317	41	-0.002	-0.109	0.000	20	0.814
				(0.913)		(0.296)	(0.416)
Effective rating downgrades (R)	251	33	0.006	0.29	0.000	15	0.369
				(0.772)		(0.557)	(0.712)
Effective outlook downgrades (O)	66	8	-0.034	-0.808	-0.015	5	1.016
				(0.419)		(0.453)	(0.310)
Negative watch-listing (W)	165	22	-0.009	-0.4	0.000	10	0.474
				(0.689)		(0.629)	(0.635)
Non-expected rating downgrades (NER)	69	11	-0.011	-0.502	0.000	4	0.254
				(0.615)		(1.000)	(0.800)

Abnormal returns computed by considering accrued interest. * indicates significance at a level lower than 10%. P-values in parentheses. R, O and W indicate rating, outlook and watch-listing, respectively. NER indicates non-expected rating change.

Table 11. Upgrade effects on abnormal returns and yield spreads. Commercial Paper portfolios (the short-term issue segment)

	Number of issues	Number of rating actions	Mean % Excess Return	t-ratio	Median % Excess Return	Number of ER >0	Signed Rank Test
Panel A. Yield spreads							
All Cases (R+O+W)	305	42	-0.012	-0.671	0.005	21	0.415
				(0.502)		(1.000)	(0.678)
Effective upgrades (R+O)	262	36	-0.004	-0.235	0.005	18	0.008
				(0.814)		(1.000)	(0.994)
Effective rating upgrades (R)	128	20	-0.002	-0.092	0.015	11	0.037
				(0.927)		(0.824)	(0.970)
Effective outlook upgrades (O)	134	16	-0.007	-0.259	-0.005	8	0.085
				(0.796)		(1.000)	(0.932)
Positive watch-listing (W)	43	6	-0.055	-1.267	-0.035	3	0.839
				(0.205)		(1.000)	(0.402)
Non-expected rating upgrades (NER)	75	10	-0.007	-0.221	-0.030	6	0.459
				(0.825)		(0.754)	(0.646)
Panel B. Abnormal returns							
All Cases (R+O+W)	305	42	0.010	1.095	0.000	17	0.433
				(0.273)		(1.000)	(0.665)
Effective upgrades (R+O)	262	36	0.006	0.662	0.000	16	0.033
				(0.508)		(0.711)	(0.974)
Effective rating upgrades (R)	128	20	0.002	0.143	-0.005	10	0.183
				(0.886)		(0.455)	(0.855)
Effective outlook upgrades (O)	134	16	0.012	0.891	0.000	7	0.035
				(0.373)		(1.000)	(0.972)
Positive watch-listing (W)	43	6	0.028	1.53	0.005	3	1.105
				(0.126)		(0.625)	(0.269)
Non-expected rating upgrades (NER)	75	10	-0.022	-1.235	-0.010	6	0.896
				(0.217)		(0.508)	(0.370)

Abnormal returns computed by considering accrued interest. * indicates significance at a level lower than 10%. P-values in parentheses. R, O and W indicate rating, outlook and watch-listing, respectively. NER indicates non-expected rating change.

Table 12. Downgrade effects on liquidity. Corporate Bond portfolios (the medium- and long-term issue segment)

	Number of issues	Number of rating actions	Mean % Excess Liquidity	t-ratio	Median % Excess Liquidity	Number of EL>0	Signed Rank Test
Panel A. Average trading volume per traded day							
All Cases (R+O+W)	189	73	-0.142	-0.754	0.030	37	0.358
				(0.451)		(0.260)	(0.721)
Effective downgrades (R+O)	128	50	-0.140	-0.605	0.025	25	0.395
				(0.545)		(0.551)	(0.693)
Effective rating downgrades (R)	95	38	-0.333	-1.39	0.000	17	0.956
				(0.165)		(1.000)	(0.339)
Effective outlook downgrades (O)	33	12	0.471	0.808	0.265	9	0.902
				(0.419)		(0.146)	(0.367)
Negative Watch-listing (W)	61	23	-0.145	-0.444	0.030	12	0.020
				(0.657)		(0.359)	(0.984)
Non-expected rating downgrades (NER)	32	13	-0.065	-0.18	0.060	7	0.133
				(0.857)		(0.549)	(0.894)
Panel B. Frequency of traded days							
All Cases (R+O+W)	189	60	0.164	3.781*	0.258	43*	3.351*
				(0.000)		(0.001)	(0.001)
Effective downgrades (R+O)	128	43	0.169	3.497*	0.256	32*	2.947*
				(0.000)		(0.002)	(0.003)
Effective rating downgrades (R)	95	32	0.084	1.611	0.139	21	1.431
				(0.107)		(0.110)	(0.152)
Effective outlook downgrades (O)	33	11	0.417	5.570*	0.377	11*	2.890*
				(0.000)		(0.001)	(0.004)
Negative Watch-listing (W)	61	17	0.150	1.594	0.301	11	1.563
				(0.111)		(0.332)	(0.118)
Non-expected rating downgrades (NER)	32	10	0.074	0.745	0.195	7	0.510
				(0.457)		(0.344)	(0.610)

* indicates significance at a level lower than 10%. P-values in parentheses. R, O and W indicate rating, outlook and watch-listing, respectively. NER indicates non-expected rating change.

Table 13. Upgrade effects on liquidity. Corporate Bond portfolios (the medium- and long-term issue segment)

	Number of issues	Number of rating actions	Mean % Excess Liquidity	t-ratio	Median % Excess Liquidity	Number of EL>0	Signed Rank Test
Panel A. Average trading volume per traded day							
All Cases (R+O+W)	82	36	0.948	2.615*	0.240	20	2.180*
				(0.009)		(0.296)	(0.029)
Effective upgrades (R+O)	64	28	0.746	1.892*	0.100	14	1.423
				(0.058)		(0.845)	(0.155)
Effective rating upgrades (R)	40	17	0.773	2.071*	0.280	9	1.676*
				(0.038)		(0.607)	(0.094)
Effective outlook upgrades (O)	24	11	0.705	0.828	-0.060	6	0.400
				(0.408)		(1.000)	(0.689)
Positive Watch-listing (W)	18	8	1.654	1.89*	0.990	6	1.606
				(0.059)		(0.125)	(0.108)
Non-expected rating upgrades (NER)	21	8	-0.078	-0.217	-0.325	5	0.490
				(0.829)		(0.727)	(0.624)
Panel B. Frequency of traded days							
All Cases (R+O+W)	82	16	0.184	2.278*	0.156	12*	1.960*
				(0.023)		(0.035)	(0.050)
Effective upgrades (R+O)	64	12	0.233	2.245*	0.253	9*	1.645*
				(0.025)		(0.065)	(0.100)
Effective rating upgrades (R)	40	8	0.158	1.115	0.162	5	0.761
				(0.265)		(0.453)	(0.447)
Effective outlook upgrades (O)	24	4	0.385	3.242*	0.345	4	1.643*
				(0.001)		(0.125)	(0.100)
Positive Watch-listing (W)	18	4	0.037	0.743	0.022	3	0.548
				(0.457)		(0.625)	(0.584)
Non-expected rating upgrades (NER)	21	3	-0.135	-0.618	-0.344	2	0.802
				(0.536)		(1.000)	(0.423)

* indicates significance at a level lower than 10%. P-values in parentheses. R, O and W indicate rating, outlook and watch-listing, respectively. NER indicates non-expected rating change.

Table 14. Downgrade effects on liquidity. Commercial Paper portfolios (the short-term issue segment)

	Number of issues	Number of rating actions	Mean % Excess Liquidity	t-ratio	Median % Excess Liquidity	Number of EL>0	Signed Rank Test
Panel A. Market Share							
All Cases (R+O+W)	482	70	-0.883	-1.885*	-0.730	45*	2.045*
				(0.059)		(0.022)	(0.041)
Effective downgrades (R+O)	317	45	0.058	0.108	-0.260	25	0.248
				(0.914)		(0.551)	(0.804)
Effective rating downgrades (R)	251	36	0.315	0.504	-0.150	19	0.134
				(0.614)		(0.868)	(0.894)
Effective outlook downgrades (O)	66	9	-0.968	-0.986	-0.830	6	0.711
				(0.324)		(0.508)	(0.477)
Negative Watch-listing (W)	165	25	-2.576	-3.261*	-3.570	20*	2.704*
				(0.001)		(0.004)	(0.007)
Non-expected rating downgrades (NER)	69	11	-0.135	-0.127	-0.420	7	0.489
				(0.899)		(0.549)	(0.625)
Panel B. Average trading volume per traded day							
All Cases (R+O+W)	482	70	-0.456	-1.398	0.000	33	0.928
				(0.162)		(1.000)	(0.353)
Effective downgrades (R+O)	317	45	0.182	0.534	0.130	24	0.894
				(0.593)		(0.441)	(0.371)
Effective rating downgrades (R)	251	36	0.189	0.476	0.245	20	0.92
				(0.634)		(0.296)	(0.357)
Effective outlook downgrades (O)	66	9	0.154	0.233	-0.010	5	0
				(0.816)		(1.000)	(1.000)
Negative Watch-listing (W)	165	25	-1.605	-2.587*	-1.980	15	2.296*
				(0.010)		(0.210)	(0.022)
Non-expected rating downgrades (NER)	69	11	0.479	0.965	0.900	8	1.022
				(0.334)		(0.227)	(0.307)
Panel C. Frequency of traded days							
All Cases (R+O+W)	482	68	0.037	1.019	-0.009	35	0.596
				(0.308)		(0.904)	(0.551)
Effective downgrades (R+O)	317	43	0.043	0.938	0.002	22	0.670
				(0.348)		(1.000)	(0.503)
Effective rating downgrades (R)	251	34	0.055	1.031	0.005	18	0.735
				(0.303)		(0.864)	(0.462)
Effective outlook downgrades (O)	66	9	-0.001	-0.009	-0.031	5	0.000
				(0.992)		(1.000)	(1.000)
Negative Watch-listing (W)	165	25	0.025	0.432	-0.029	14	0.215
				(0.666)		(0.690)	(0.830)
Non-expected rating downgrades (NER)	69	9	0.139	1.885*	0.018	8*	2.014*
				(0.059)		(0.039)	(0.044)

* indicates significance at a level lower than 10%. P-values in parentheses. R, O and W indicate rating, outlook and watch-listing, respectively. NER indicates non-expected rating change.

Table 15. Upgrade effects on liquidity. Commercial Paper portfolios (the short-term issue segment)

	Number of issues	Number of rating actions	Mean % Excess Liquidity	t-ratio	Median % Excess Liquidity	Number of EL>0	Signed Rank Test
Panel A. Market Share							
All Cases (R+O+W)	305	50	-0.467	-1.006	-0.110	27	0.816
				(0.314)		(0.672)	(0.415)
Effective upgrades (R+O)	262	43	-0.402	-0.767	-0.160	24	0.616
				(0.443)		(0.542)	(0.538)
Effective rating upgrades (R)	128	23	-0.627	-0.872	-0.710	14	0.776
				(0.383)		(0.405)	(0.438)
Effective outlook upgrades (O)	134	20	-0.143	-0.183	0.115	10	0.056
				(0.855)		(1.000)	(0.955)
Positive Watch-listing (W)	43	7	-0.870	-0.995	0.110	4	0.423
				(0.320)		(1.000)	(0.673)
Non-expected rating upgrades (NER)	75	11	-1.145	-1.577	-0.800	7	1.289
				(0.115)		(0.549)	(0.197)
Panel B. Average trading volume per traded day							
All Cases (R+O+W)	305	50	-0.039	-0.117	-0.060	26	0.308
				(0.906)		(0.665)	(0.758)
Effective upgrades (R+O)	262	43	0.083	0.219	0.000	21	0.05
				(0.826)		(1.000)	(0.960)
Effective rating upgrades (R)	128	23	-0.293	-0.812	0.000	11	0.292
				(0.417)		(1.000)	(0.770)
Effective outlook upgrades (O)	134	20	0.515	0.738	0.040	10	0.467
				(0.460)		(1.000)	(0.641)
Positive Watch-listing (W)	43	7	-0.790	-1.384	-0.230	5	1.258
				(0.166)		(0.219)	(0.208)
Non-expected rating upgrades (NER)	75	11	-0.325	-0.525	0.000	5	0.102
				(0.600)		(1.000)	(0.919)
Panel C. Frequency of traded days							
All Cases (R+O+W)	305	47	0.090	1.854*	0.061	33*	1.878*
				(0.064)		(0.008)	(0.060)
Effective upgrades (R+O)	262	40	0.104	1.913*	0.063	28*	1.848*
				(0.056)		(0.017)	(0.065)
Effective rating upgrades (R)	128	22	0.171	2.084*	0.073	17*	2.143*
				(0.037)		(0.017)	(0.032)
Effective outlook upgrades (O)	134	18	0.021	0.330	0.038	11	0.392
				(0.742)		(0.481)	(0.695)
Positive Watch-listing (W)	43	7	0.009	0.088	0.015	5	0.423
				(0.930)		(0.453)	(0.673)
Non-expected rating upgrades (NER)	75	10	0.079	0.903	0.029	6	0.612
				(0.367)		(0.754)	(0.541)

* indicates significance at a level lower than 10%. P-values in parentheses. R, O and W indicate rating, outlook and watch-listing, respectively. NER indicates non-expected rating change.

Appendix

Table A. Long-term debt rating equivalences

Num.	Moody's	S&P	Fitch-IBCA
1	Aaa	AAA	AAA
2	Aa1	AA+	AA+
3	Aa2	AA	AA
4	Aa3	AA-	AA-
5	A1	A+	A+
6	A2	A	A
7	A3	A-	A-
8	Baa1	BBB+	BBB+
9	Baa2	BBB	BBB
10	Baa3	BBB-	BBB-
11	Ba1	BB+	BB+
12	Ba2	BB	BB
13	Ba3	BB-	BB-
14	B1	B+	B+
15	B2	B	B
16	B3	B-	B-
17	Caa1	CCC+	CCC+
18	Caa2	CCC	CCC
19	Caa3	CCC-	CCC-
20	Ca1	CC+	CC+
21	Ca2	CC	CC
22	Ca3	CC-	CC-
23	C1	C+	C+
24	C2	C	C
25	C3	C-	C-
26	CI	D	D

Table B. Short-term debt rating equivalences

Num.	Moody's	S&P	Fitch-IBCA
1	P1	A1	F1
2	P2	A2	F2
3	P3	A3	F3
4	NP	B	B
5		C	C
6		D	D

Table C. Issuer rating equivalences

Num.	Moody's	Fitch-IBCA
1	A+	A
2	A	A/B
3	A-	B
4	B+	B/C
5	B	C
6	B-	C/D
7	C+	D
8	C	D/E
9	C-	E
19	D+	
11	D	
12	D-	
13	E	

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