Macroannouncements, Bond Auctions and Rating Actions in the European Government Bond Spreads[☆]

Simona Boffelli[a], Giovanni Urga[b,*]

[a] *Bergamo University, Italy*
[b] *Cass Business School, City University London, UK and Bergamo University, Italy*

Abstract

This paper investigates the impact of macroannouncements, government bond auctions and rating actions on the 10-year government bond spreads for Belgium, France, Italy, the Netherlands, Spain with respect to Germany. Using a unique tick-by-tick dataset over 1/02/2009-05/31/2012, we identify the impact of the three drivers via jump and cojump detection procedures. Disentangling the pre- from the post-announcement effects, real economy and forward looking news releases from US and Euro area, country specific Spanish and German macroannouncements, and auctions hold in distressed countries such Italy and Spain have a statistically and economically significant effect. No role is played by rating actions.

Keywords: Jumps, Cojumps,Government Bond Spreads, Macroannouncements, Government Bond Auctions, Rating Actions.

J.E.L. Classification Numbers: C58, C12, H63, G24.

Europe is under stress and integration among European countries seems more fragile than ever. Starting from the subprime crisis in 2007, markets are more aware of the differences between European countries, and this sentiment is reflected, amongst others, in increasing differentials of government bond yields. In 2008 and 2009, government bond spreads became sizable but it was in 2010 and 2011 that spreads substantially increase, reaching levels even higher than those experienced in the pre-Euro era. It was just after the famous Mario Draghi's "whatever it takes" in July 2012 that a more normal situation on government bond markets was restored. The European sovereign debt

[☆]We wish to thank participants in the 12th Oxmetrics User Conference (Cass, 3-4 September 2012), in particular Siem Koopman, Sebastien Laurent, and Bill Lyons for useful suggestions. We thank Michael J. Flemming and Jan Novotny for having provided very useful comments on a previous version of the paper. The usual disclaimer applies. Special thanks to Morningstar, in particular to Richard Barden, for having made available the rich data set used in this paper. Simona Boffelli acknowledges financial support from the Centre for Econometric Analysis of Cass Business School.

[*]Centre for Econometric Analysis, Faculty of Finance, Cass Business School, City University London, 106 Bunhill Row, London, EC1Y 8TZ, UK and Bergamo University, Italy. G.Urga@city.ac.uk, Tel: +44 (0)20 7040 8698, Fax: +44 (0)20 7040 8881.

crisis involving, although at different extents, all the peripheral countries have questioned the much celebrated markets' self-regulatory power as well as the ability of policy makers and regulators to adopt stability measures and stimulate economic growth. Thus, understanding which factors drive sovereign risk is particularly timely also for the macroeconomic consequences of the comovements associated to these factors. For instance, higher spreads deteriorate borrowing capabilities and market confidence which simultaneously impact on consumption and investment. The way to ameliorate the effects of the crisis on the real economy is a current political debate but the recipes to be put in place still need to be fully understood.

In this paper, we identify the role that market movers like macroeconomic announcements, government bond auctions and rating actions have in driving government bond markets, and whether the occurrence of specific events in a country affects other European countries. To this aim, we make use of a unique dataset of high frequency data on 10-year European government bond spreads. Moreover, we analyze the impact of the three drivers on both conditional mean and variance specifications, disentangling the pre- from the post-announcement effect. The econometric analysis is conducted using recent developments in the financial econometrics literature on jump and cojump detection procedures.

In the literature, the relationship between macroannouncements and returns is widely studied while the sensitivity of jumps is analyzed in a handful of papers such as [1], [2] and [3]. In particular, [2] estimate jumps and cojumps at intradaily frequency mapping them to macro news to find that bond markets are the most sensitive to news releases and that macroannouncement surprises are associated with cojumps even more consistently than jumps. [2] point out the advantage of using very high frequency data to study the impact of such events. On the other hand, [3] conclude that although a majority of jumps occurs at prescheduled news announcement times, surprises related to macroannouncements have limited power in explaining bond price jumps. Moreover, authors show that liquidity shocks play a key role in explaining jumps and that usually, during the preannouncement period, it is possible to observe a drop in market depth. [3] explain this result as that, as also discussed in [4], dealers tend to withdraw orders and place them further out to avoid being picked off in the upcoming information event. Thus, authors conclude that jumps observed in correspondence to macroannouncement releases are not only determined by news, but also by the drop in liquidity that is a market mover per se.

As far as government bond auctions are concerned, we refer to [5] where the impact of US treasury auctions on returns is assessed. [5] compute the "surprise" effect as the difference between the yield in the when-issued market with the actual ex-post yield without relevant findings.

Finally, although rating actions are expected to be an important determinant of spreads, as creditworthiness represents the long-term sustainability of countries' debt, the role and reliability of credit rating agencies (CRA) has been under investigation. In addition to concerns on CRAs effective capability to give accurate risk assessments, there is a sustained debate about the timing

of recent downgrades of European sovereigns claimed to promote uncertainty in financial markets: see for instance [6], [7], [8], [9] and [10]. In terms of the impact of rating actions, [11] reports that ratings are systematically related to daily movements in sovereign bond spreads, to budgetary developments, and that rating actions are not anticipated at 1-2 months horizon; in addition, authors show the existence of spillover effects, especially from lower rated countries to higher rated countries, as well as of persistent effects for recently downgraded countries. In our analysis, we consider also S&P, Moody's and Fitch separately to measure the distinct impact of the three rating agencies motivated by the results reported in [12] where it is shown that S&P is more active and provides higher flow of news information than Moody's and Fitch during crisis periods.

This paper makes an important contribution to the literature on the empirical determinants of government bonds spreads. Using a unique tick-by-tick 10-year government bonds spreads resampled at 5-minute frequency, we map jumps and cojumps to the three main drivers of spreads. We show that jumps and cojumps are very sensitive to macroannouncements from US and Euro area but also to individual countries releases in particular to those related to Germany and Spain. As per the category of macroannouncements, a very relevant role is played by real economy indicators, in particular US non-farm payroll, and forward looking indicators, such as consumer confidence and purchase manager index. In addition, significant is the role of the ECB Introductory Statement, bringing to the market the key information concerning decisions on ECB rates. We show the importance of taking into account the pre-announcement effect turning out to explain a great amount of jumps. Pre- and post-announcements convey different kind of information, with pre-announcements providing an indication about traders' perception of future news relevance while post-announcements, captured by surprises, leading traders to revise their positions according to the actual releases. As far as government bond auctions are concerned, they explain a great deal of jumps and cojumps, especially for auctions hold in Italy and Spain. On the contrary, rating actions play no role as determinants of spreads' movements. Finally, we observe an increasing number of jumps and cojumps during the preannouncement periods for both macroannouncements and auctions.

The remainder of the paper is organized as follows. In Section 1, we describe the data. In Section 2, we introduce the testing procedures adopted to detect jumps and cojumps and the summary statistics of identified jumps and cojumps events and related market activities (Section 2.1), we map jumps to macroannouncements, auctions and rating actions and we introduce the mean and variance models we propose (Section 2.2). The empirical results are reported and discussed in Section 3. Section 4 concludes.

1. Data Description

1.1. Spreads

We use data for the benchmark 10-year government bonds of Belgium, France, Germany, Italy, the Netherlands and Spain over the period 2nd January 2009 - 31st May 2012. We consider bid, rather than mid, data as more representative of the spreads during crisis periods considering the widening of bid-ask spreads witnessed by bond markets. The 10-year bond benchmarks are identified according to maturity and liquidity criteria. Morningstar provided us with this unique tick-by-tick data sample that we resampled at 5-minute frequency using previous tick scheme and calendar time, excluding time intervals with missing values for at least one country. The 5-minute frequency is robust to microstructure noise and offers sufficiently high frequency information to properly evaluate the impact of specific events. Moreover, this frequency is consistent with previous seminal contributions such as [5] and [13].

The trading period considered is 8 a.m. - 3:30 p.m. coordinated universal time (UTC). We remove holidays and detect and remove outliers by applying a filter which is a modification of the procedure proposed in [14], implemented following the steps suggested by [15] (p. 156). We summarize the procedure below.

Let $p_{t,i}$ be a tick-by-tick time series of log-prices, where t denotes day and i the time interval of day t, then an observation is removed if:

$$\left|p_{t,i} - \overline{p}_{t,i}\left(k^L\right)\right| > \max\left\{4MD_{t,i}(k), n\gamma\right\} \quad \wedge \quad \left|p_{t,i} - \overline{p}_{t,i}\left(k^R\right)\right| > \max\left\{4MD_{t,i}(k), n\gamma\right\} \qquad (1)$$

where k is the bandwidth, $\overline{p}_{t,i}\left(k^L\right)$ and $\overline{p}_{t,i}\left(k^R\right)$ are sample medians of the $k/2$ observations respectively before (L for left) and after (R for right) (t,i), $MD_{t,i}(k)$ is the mean absolute deviation from the median of the whole neighborhood of length k, $\wedge$ is the intersection operator, γ is the *granularity parameter* and it is computed as the mean of the $k$absolute returns and n is $\gamma-$multiplier. k and n are set equal to 20 and 10 respectively, in order to ensure that the neighborhood of ticks does not get too wide and that the threshold to identify outliers is reasonable.

The advantage of this rule lies in the separate comparison of the $(t,i)-$th trade against the left and right neighbors while the measure of dispersion is calculated on the whole bunch of k trades. This approach is specifically designed to avoid detecting jumps as false outliers.

Finally, we also remove the first return of the day that occurs at 8 a.m. as it largely reflects the adjustment to information accumulated overnight and hence exhibits a spurious excess variability compared to any other five-minute intervals. Data selecting procedure is summarized in Table 1.

[Insert Table 1 somewhere here]

In Panel A, for each time series, we report the overall number of ticks available from which we remove holidays, weekends and trades occurred outside the trading period 8 a.m. - 3:30 p.m.

UTC. We also remove outliers following the description in (1) which lead us to detect percentage of outliers ranging from 0.11% for Germany to the 0.19% for Belgium. In addition, we also report some descriptive statistics to get useful insights about market liquidity. In particular, we compute the mean number of trades per day and the time elapsed between two consecutive trades; both statistics indicate that the most liquid market is the German one with a daily average number of trades of 2,629 and a trade duration of 10.2 seconds, followed by Spain (910 trades, 28.5 seconds), France (908 trades, 29.4 seconds), Italy (805 trades, 33.1 seconds), Belgium (780 trades, 34.1 seconds) and the Netherlands (586 trades, 45.4 seconds). After resampling at the 5-minute frequency and removing the 8 a.m. time interval for each day, we end up with 78,660 returns, covering 874 days corresponding to 90 observations per day. In Table 1, we also report descriptive statistics about yields and spreads with respect to German Bund: Italy and Spain have the highest average yields, both corresponding to 4.67%, while Germany has the lowest equal to 2.76% denoting its safe heaven status; the average bid spread on Germany is equal to 192 bps for Spain, 191 for Italy, 106 for Belgium, 54 for France and 35 for the Netherlands. Of course, the information that the average indicator offers is limited in the light that government bond spreads vary a lot throughout our sample period as can be seen from Figure 1.

[Insert Figure 1 somewhere here]

Government bond spreads were moving very closely until May 2010, when markets start to pay more attention to sovereign debt risk in correspondence to the burst of Greek crisis. In May 2010, Greek government deficit was revised and estimated to be 13.6% of GDP with a correspondent decrease in international confidence in Greece's ability to repay its sovereign debt. As consequence, despite the first rescue package approved by Eurozone countries and the IMF, concerns about Euro countries solvability began to raise together with spreads.

In Panel B of Table 1, we report the analysis of the trading activity around the public events we are taking into consideration namely macroannouncements, government bond auctions and rating actions. The time window analyzed ranges from 1 hour before up to 1 hour after the release of each event. We compare both the number of trades per hour as well the time elapsed between two consecutive trades with respect to trading hours with no particular events. There is no evidence of a different trading activity around the events analyzed.

1.2. Macroannouncements

As far as macroannouncements, we consider news releases related to the US, the Euro area, Belgium, France, Germany, Greece, Italy, the Netherlands, Portugal and Spain. In some cases, we are unable to use all the available macroannouncements as they are released when some markets are still closed. This is for instance the case of France, with releases occurring between 6:30 and 7:45 a.m. UTC. Finally, in case of Spain, although macroannouncements are released at 8:00 a.m.

UTC, we keep these indicators shifting them to 8:05 a.m. in order to match with spreads data. Data related to macroannouncements are median expected value by survey panelists (E), forecasts standard deviation (σ) and actual value of the release (A) and they were collected from Bloomberg. A complete list of analyzed macroannouncements is presented in Table 2 where we report even details on surprises, defined as $S = (A - E)/\sigma$.

[Insert Table 2 somewhere here]

The size of the surprises related to US and Euro area macroannouncements are smaller than those concerning individual countries, implying a more accurate forecast by surveyors in the first two cases, though it is fair to mention that the number of surveyors interviewed for US and Euro area releases is higher than for individual countries. Finally, we drop the France industrial production given that in only two cases macroannouncements were released after 8 a.m. UTC, and the Portugal preliminary GDP because of its very high dispersion (standard deviation equals 10.7) due to both poor forecasts and low number of surveyors for this specific news.

1.3. Bond Auctions

We take into consideration auctions of European countries issuing Euro-denominated bonds: Austria, Belgium, Finland, France, Germany, Greece, Italy, the Netherlands, Portugal and Spain. Most auctions take place between 8 and 10 a.m. UTC. To capture the performance of an auction, we use two main variables: the average yield at which the government sells the bonds and the bid-to-cover, that is how many bids the Government received with respect to the total offer. These two data were collected just for auctions relative to 10-year bonds as they not only correspond to the maturity of the spreads analyzed but they even represent the most relevant ones.

In Table 3, we report the total number of auctions per country together with the detail of 10-year bond auctions for which we provide mean and standard deviation of average yield and bid-to-cover.

[Insert Table 3 somewhere here]

Bid-to-covers are very similar for all the countries analyzed ranging from a minimum of 1.42 for Italian auctions to a maximum of 2.34 for French ones, while average yields reflect countries different sovereign risk: safer countries such as Finland and Germany succeed in selling bonds at higher prices and lower returns, with an average yield of 2.75% and 3.04% respectively, while riskier countries such as Italy, Spain and Portugal allocate their bonds at an average yield of 4.76%, 4.85% and 5.01%, respectively.

1.4. Rating Actions

We collect data concerning rating actions from the three main rating agencies: Standard & Poor's, Moody's and Fitch. The aim is not only to assess whether downgradings have an impact on

government bond spreads but also to investigate whether some agencies have bigger and/or more lagged impacts. Note that in our sample, we deal mainly with downgrading actions as only two upgrading actions occurred during the period considered, namely on 22nd February 2011 and 13th March 2012 for Greece. Downgrading actions were taken against Austria, Belgium, France, Greece, Ireland, Italy, Portugal and Spain as reported in Table 4.

[Insert Table 4 somewhere here]

2. Econometric Identification and Modelling of Jumps and Cojumps

2.1. Identifying Jumps and Cojumps

We briefly describe the testing procedures implemented to identify jumps and cojumps.

2.1.1. Detecting Jumps

As we are interested in identifying the exact time of occurrence of jumps, the [16] (ABD henceforth) and the [17], (LM henceforth) jump detecting procedures are the only two suitable tests to this purpose[1]. In the light that the ABD and LM tests assume that spot volatility is approximately constant over the local window, we use the [16] filtered J test (FJ) statistic based on the standardization of returns by a periodicity component $\widehat{s}_{t,i}$ which has the function of making the volatility time-varying through the local window:

$$FJ_{t,i} = \frac{|r_{t,i}|}{\widehat{\sigma}_t \widehat{s}_{t,i}} \tag{2}$$

where $|r_{t,i}|$ is the absolute value of return on day t and time-interval i defined as $p_{t,i} - p_{t,i-1}$ and $\widehat{\sigma}_t$ is the bipower volatility of day t. [19] show that the filtered jump test statistics increases the accuracy of intraday jump detection methods. To obtain an estimate of the periodicity component $\widehat{s}_{t,i}$, we implement the [19] robust estimation technique based on the Truncated Maximum Likelihood (TML) estimator. The parametric specification we adopt for $\widehat{s}_{t,i}$ is similar to the one proposed by [20] but here we include even government bond auctions and rating actions as follows:

$$\widehat{s}_{t,i} = \frac{\exp f\left(\hat{\theta}_{TML}; x_{t,i}\right)}{\sqrt{\frac{1}{N}\sum_{i=1}^{N}\left(\exp f\left(\hat{\theta}_{TML}; x_{t,i}\right)\right)^2}} \tag{3}$$

[1] [18] report a comprehensive comparison between the alternative testing procedures to detect jumps.

$$
\begin{aligned}
f\left(\hat{\theta}_{TML}; x_{t,i}\right) \quad = \quad & \delta_0 + \delta_{0,1}\frac{i}{N_1} + \delta_{0,2}\frac{i^2}{N_2} + {}^{J}_{j=1}\lambda_j S^j_{t,i} + \\
& {}^{B}_{b=1}\phi_b R^b_{t,i} + {}^{4}_{j=1}\vartheta_j Weekdays_j + \\
& {}^{P}_{p=1}\left(\delta_{c,p}\cos\left(\frac{2\pi p}{N}i\right) + \delta_{s,p}\sin\left(\frac{2\pi p}{N}i\right)\right) + \varepsilon_{t,i}
\end{aligned} \tag{4}
$$

where N represents the number of intraday intervals i belonging to day t; $N_1 = (N+1)/2$ and $N_2 = (N+1)(N+2)/6$ are normalizing constants; $S^j_{t,i}$ is the surprise for macroannouncements and government bond auctions (for the last ones, surprises are computed as the difference in bid-to-cover between current and previous 10-year auction); J is the sum of macroannouncements and auctions considered; $R^b_{t,i}$ represents a dummy variable for rating action undertaken by rating agency b; B is the number of rating agencies; λ_j and ϕ_b are event specific loading coefficients; P is a tuning parameter determining the order of the expansion of the sinusoids; $\hat{\theta}_{TML}$ is full parameter vector to be estimated; $x_{t,i}$ denotes the entire set of explanatory variables. Moreover, the loading coefficients λ_j and ϕ_b are modeled applying the AndersenBollerslev1998 decay-structure which allows the specific event to impact over a time window with decaying weights. Macroannouncement surprises are allowed to impact starting from 30 minutes before the release up to one hour and 30 minutes after, as in [20]. As far as government bond auctions are concerned, we use a wider window, ranging from two hours before the auction ends up to one hour after it as we want to take into account markets uncertainty during the auction period. Finally, as the timing of rating actions is unforeseeable, we set the start of the window in correspondence to the rating action up to two hours after it.

2.1.2. Detecting Cojumps

In order to evaluate markets interdependence, we assess whether they share a simultaneous jump, that is whether there is evidence of a cojump. To identify cojumps, we adopt the definition proposed in [2]. Given C assets, the contemporaneous cojump is defined as:

$$
CoJump_{t,i} = \prod_{c=1}^{C} I\left(\left|FJ^c_{t,i}\right|\right) \tag{5}
$$

where $I(.)$ is the indicator function taking value 1 in case on day t at the interval i there was a significant jump $FJ_{t,i}$. In order to identify a sufficient number of cojumps for further analysis, we define a cojump if two or more jumps occur within a 15 minutes time window.

2.2. Modelling Jumps and Cojumps

2.2.1. Mapping Jumps

We now turn to assess the linkage between jumps and their possible determinants, namely macroannouncements, government bond auctions and rating actions. To this purpose, we compare the number of jumps around a pre-specified event with respect to other periods as it is discussed later in the paper. However, this simple comparison does not take into account either other variables which could cause the observed difference going beyond the impact of the single event or the concurrence with other news. Moreover, it is widely documented (see for instance [13]; [21]; [22] that it is not the release per se which explains jumps, as the surprise related to a particular event; in the case of government bond auctions, we define the surprise as the difference in the bid-to-cover and the average yield with the previous auction of bond of the same maturity. When the release is within market expectation, there is no reason for market to jump after the announcement. Moreover, when two releases occur simultaneously, the only way to impute the impact to the correct release is to use surprise.

The econometric model we propose is able to map jumps to macroannouncements, government bond auctions and rating actions in both the process governing the conditional mean and the conditional variance of government bond spreads. With respect to the conditional mean, we extend the Tobit-GARCH model in [2]:

$$|FJ_{t,i}| = \begin{cases} \mu + \eta_{t,i} + \mu_{t,i} + \xi_{t,i} + \varepsilon_{t,i} & if > 0 \\ 0 & otherwise \end{cases} \tag{6}$$

where $|FJ_{t,i}|$ is the absolute size of significant detected jumps; $\eta_{t,i}$ is the linear combination of day-of-the-week dummies; $\mu_{t,i}$ is the standardized US news surprises $\sum_{j=1}^{J} \lambda_j \left| S_{t,i}^{j} \right|$; $\xi_{t,i}$ is the intraday periodic component and N the number of intraday periods within a day. [2] allow for a potential delayed response to news by testing for lagged news; moreover they correct for heteroskedasticity estimating the Tobit-GARCH model of [23].

With respect to the conditional variance, rather than a simple GARCH model as in [2], we use a GARCH formulation driven by macroannouncements quite similar to the one adopted in [24]:

$$h_{t,i} = \omega_1 + \omega_2 D_{t,i-1} + \beta h_{t,i-1} + \left(\alpha_1 + \alpha_2 D_{t,i-1}^{*}\right) \varepsilon_{t,i-1}^{2} + \left(\nu_1 + \nu_2 D_{t,i-1}^{*}\right) \left(\varepsilon_{t,i-1}^{-}\right)^2 \tag{7}$$

where macroannouncements impact in three alternative ways. First, ω_2 allows for the unconditional volatility level to differ from ω_1 when an announcement $D_{t,i-1}$ is scheduled in the near future. This is the so-called pre-announcement effect and, if it is found to be positive, it implies a higher unconditional volatility level in the period preceding the releases. Second, the coefficient α_2 captures the difference in persistency of macroannouncements with respect to news with small surprise and

to other kind of news. In particular, $D^{*}_{t,i-1}$ are dummy variables taking value 1 in case the absolute size of the surprise is greater than its standard deviation and zero otherwise. If the parameters α_2 are found to be negative/positive and statistically significant, this means that macroannouncements bringing a big surprise are less/more persistent with respect to regular shocks. Finally, ν_2 accounts for a different leverage effect in correspondence to macroannouncements and, if it is found to be positive/negative, it implies that negative surprises have higher/lower impact than positive ones and that the leverage effect is more/less pronounced for macroannouncements with respect to news with small surprise and to other kind of news.

2.2.2. Modelling Jumps

The jump model we estimate is a Tobit-GARCH where both the mean and variance processes are driven by macroannouncements, government bond auctions and rating actions. In particular, we allow for a pre-announcement effect that takes into account future releases of macroannouncements and government bond auctions for a pre-specified number of time intervals, while rating actions are excluded as they are not pre-scheduled. As per post-announcement, we consider surprise effects related to macroannouncements and auctions rather than simple dummy variables, the only exception being the rating actions which indeed enter the model by dummy variables taking value 1 after the rating action got public. Finally, another novelty in our model is that we allow the surprise effect to impact for a pre-specified time window after the release; the surprise is in fact weighted by a polynomial decay structure as the one adopted in [20] for modelling intraday periodicity. [25] and [2] both account for delayed response of markets after an announcement but they enter their model with lags of the surprise, each loaded by its own coefficient, making the estimation procedure quite cumbersome. In our model instead we just need to estimate coefficients for decaying-weighted surprises, covering the 12 time periods (one hour) following the release. The model for the mean equation takes the following form:

$$\begin{aligned} |FJ_{t,i}| &= \mu + \sum_{j=1}^{J} \gamma_{1,j} D^{j}_{\tau} I\left[\tau \in \left((t,i),(t,i+\Delta)\right)\right] + \\ &\quad \sum_{j=1}^{J} \gamma_{2,j} \left|S^{j}_{\tau}\right| I\left[\tau \in \left((t,i-\Delta),(t,i)\right)\right] + \\ &\quad \sum_{b=1}^{B} \gamma_{2,J+b} R^{b}_{\tau} I\left[\tau \in \left((t,i-\Delta),(t,i)\right)\right] + \varepsilon_{t,i} \end{aligned} \tag{8}$$

where $|FJ_{t,i}|$ is the absolute size of significant detected jumps with $\alpha = 0.05$ by the LM test filtered by the intraday periodicity estimated by (3) and (4); D^{j}_{τ} are dummy variables taking value 1 if macroannouncements or government bond auctions are prescheduled in the next Δ periods after (t,i); $\left|S^{j}_{\tau}\right|$ are absolute surprises for macroannouncements and government bond auctions released

up to Δ periods before (t,i); J is the overall number of macroannouncements and auctions; R_τ^b are dummy variables taking value 1 if a rating action was undertaken up to Δ periods before (t,i); $\varepsilon_{t,i}|\digamma_{t,i-1} \sim N(0,h_{t,i})$, $\digamma_{t,i-1}$ is the information set available up to $(t,i-1)$.

The conditional volatility $h_{t,i}$ is specified as follows:

$$\begin{aligned} h_{t,i} &= \omega_1 + \sum_{j=1}^{J} \omega_{2,j} D_\tau^j I\left[\tau \in ((t,i),(t,i+\Delta))\right] + \beta h_{t,i-1} + \\ &\left(\alpha_1 + \sum_{j=1}^{J} \alpha_{2,j} D_\tau^{*\,j} I\left[\tau \in ((t,i-\Delta-1),(t,i-1))\right] + \right. \\ &\left. \sum_{b=1}^{B} \alpha_{2,J+b} R_\tau^b I\left[\tau \in ((t,i-\Delta-1),(t,i))\right] \right) \varepsilon_{t.i-1}^2 + \\ &\left(\nu_1 + \sum_{j=1}^{J} \nu_{2,j} D_\tau^{*\,j} I\left[\tau \in ((t,i-\Delta-1),(t,i-1))\right] \right) + \\ &\left. \sum_{b=1}^{B} \nu_{2,J+b} R_\tau^b I\left[\tau \in ((t,i-\Delta),(t,i))\right] \right) \left(\varepsilon_{t.i-1}^-\right)^2 \end{aligned} \tag{9}$$

where D_τ^j denotes the dummy variable taking value 1 if a macroannouncement or an auction is scheduled to take place in the next Δ periods after (t,i); $D_\tau^{*\,j}$ denotes the dummy variable taking value 1 for large macroannouncement surprises or big changes in bid-to-cover or average-yield occurred in the previous Δ periods; R_τ^b denotes the dummy variable taking value 1 if in the previous Δ periods a rating action occurred.

Unlike [24], we define large surprises if the absolute surprise is higher than one half of the standard deviation of this measure for all the macroannouncements of the same kind in order to set a unique rule for macroannouncements and bond auctions as, for auctions, we do not dispose of standard deviation of forecasts.

2.2.3. Modelling Cojumps

We adopt a simple logit model where the dependent variable is a dummy variable: cojump occurrence vs. non occurrence [2]. The cojump model has the same specification adopted for jump mean in (8) although here surprises are loaded by unitary weights throughout the response window rather than by a specific weighting pattern. The cojumps are determined on the basis of jumps identified by the LM test filtered by the intraday periodicity as discussed in Section 2.1. Considering that although we are modeling the simple event, cojump vs no-cojump, the identified cojumps are

[2] A multinomial model allowing to distinguish between 2, 3, 4 or 5 cojumps occurrence probability could not be implemented because only very few observations are available for each class of cojumps.

very few and that logit model require at least 20% of events to get robust estimates (see for instance [26], we proceed by oversampling and creating an artificial sample of size M with all the identified cojumps representing 20% of M while the other observations are chosen randomly. The procedure provides consistent and efficient estimates provided appropriate statistical corrections are implemented. To this purpose, we adopt a prior correction approach consisting in computing the usual logistic regression estimators corrected using prior information about the fraction of ones in the population, τ, and the observed fraction of ones in the sample, $\overline{y}$. For the logit model, [26] show that the MLE $\widehat{\beta}_i$ estimator for the covariate in the subsample is a statistically consistent estimate of β_i while the corrected estimate for the intercept β_0 is:

$$\widehat{\beta}_0 - \ln\left[\left(\frac{1-\tau}{\tau}\right)\left(\frac{\overline{y}}{1-\overline{y}}\right)\right] \tag{10}$$

3. Empirical Findings

3.1. Preliminary Analysis

As first step in assessing the relationship between jumps and macroannouncements, bond auctions and rating actions, we compare jumps occurrence around a specific event with respect to other periods. We set the time window for the macroannouncement releases and government bond auctions ranging from 1 hour before up to 1 hour after the release while for rating actions, given that these events are not pre-scheduled as the other two are, the response window covers the two hours following the release. For the selection of the time windows, we refer to [27], [28] and [29] who find that the stock price response essentially completes in the trading day and, more precisely, within one hour after the announcements[3]. Moreover, in order to properly set response time windows, we analyze the real behaviour of the absolute returns around the event specified. In Figures 2-3, we report the mean absolute returns around macroannouncements, government bond auctions and rating actions together with the 95% confidence level, on the left, and the same statistics but for days with no event although around the typical hour of release on the right. We distinguish between US and Euro macroannouncements as the usual release time is between 13:30 and 15:00 UTC and between 8:00 and 10:00 UTC respectively. On the x-axis we report the number of 5-minute intervals preceding/following the time of release. In Table 5, we report statistics on detected jumps for each country and a comparison of jump occurrences during news with respect to no-news periods[4].

[3] [30] shows that announcement surprises induce large but short-lived increases in volatility within thirty minutes of the announcements. [13], [31] and [32] confirm that reaction times to news are very short

[4] Though, as already mentioned in the paper, we may identify jumps by applying the ABD and LM testing procedures, we only report the LM tests adjusted for the intraday periodicity estimated by TML as this is the procedure allowing to reduce spurious jumps detection (see for instance [19]). Further, estimates for the intraday periodicity in (4) are not reported here but are available upon request.

[Insert Figures 2-3 and Table 5 somewhere here]

Overall, macroannouncements play an important role in explaining jumps in all countries. In particular, the biggest impact is due to US and Euro area releases while news concerning individual countries seem to play a minor role, with the most relevant ones being those on Germany, the *engine* of Europe. As far as the economic category of macroannouncements is concerned, news on US and Euro area real economy, such as production and employment indicators with the non-farm payroll (the so called "king of macroannouncements"), are the most important together with Euro area and individual country forward looking indicators, such as confidence indicators and purchase manager index. Instead, news on inflation and money demand have a minor role. Focusing now on government bond auctions, although they do not seem to be a fundamental market mover in aggregate, when focusing on auctions hold in countries with very high public debt, such as Italy, Greece and Belgium, we see that government bond spreads of almost all countries jump substantially[5]. In particular we detect a higher proportion of jumps around Italian and Greek auctions for all the spreads considered and around Spanish auctions for all spreads but Belgian. Finally, it is interesting to note that auctions hold in Belgium cause a higher number of jumps only in Belgian spread.

Turning to rating actions, there is some evidence that they too cause jumps in particular when these actions are undertaken by S&P and Moody's. In addition to that, a crucial role is played by the country which was the object of the rating action. In particular, actions taken against countries such as Belgium, Italy and Spain cause jumps on government bond spreads while actions against smaller and more fragile countries such as Ireland and Portugal do not seem to have any significant effect. This result contradicts those reported in other studies. Alsakka and Gwilym (2012) find that Moody's decision to downgrade Greece to Caa1 from B1 on 1st June 2011 determined an increase by 12 basis point in Greek 10-year government bond yields and a decline of bond prices for Ireland, Spain and Portugal. On 13 June 2011, S&P downgraded Greece from B to CCC (with negative outlook), causing Greek, Portuguese and Irish 10-year bond yields to jump of 16.79%, 10.66% and 11.34% respectively. See also Alsakka and Gwilym (2013).

With the purpose of detecting a large number of cojumps, we define cojump if two or more jumps occur in a 15-minute time window rather than in a 5-minute window. When we define a cojump considering a 5-minute time window we come up with just 1,956 cojumps while, when expanding the time window to 15 minutes, we can detect up to 3,478 cojumps. However, whenever possible, we conduct our analysis on both 5-minute and 15-minute window with substantially unchanged

[5]The debt-to-GDP ratio defined as consolidated general government gross debt to GDP in 2011 and 2012 respectively was 72.5% and 73.4% for Austria, 97.8% and 99.6% for Belgium, 49.0% and 53.0% for Finland, 85.8% and 90.2% for France, 80.4% and 81.9% for German, 120.8% and 127.0% for Italy, 65.5% and 71.2% for the Netherlands, 108.3% and 123.6% for Portugal, 69.3% and 84.2% for Spain (Eurostat).

results (Results are available upon request).

In Table 6, we report the analysis for cojumps identified using (5).

[Insert Table 6 somewhere here]

Results confirm what already reported for the analysis on jumps. In particular, US and Euro area macroannouncements are the most important drivers of cojumps, with particular relevance of those concerning real economy and those related to forward looking measures. With respect to individual countries, the only releases determining jumps are those from Germany and those conveying some information about the economic sentiment. As per auctions, those impacting the most are again those held in Italy, Greece and Spain although some evidence is found even with respect to Belgian and German auctions. Finally, as per rating actions we overall confirm the limited impact that such kind of news have on government bond markets. Some evidences of a higher proportion of cojumps is found just with respect to actions undertaken against Italy, Greece and Spain, three of the GIIPS countries.

3.2. Results for the Jump Model

The first step to estimate the model for the absolute jump size in (8) is the estimation of the response pattern of jumps on macroannouncements and government bond auctions. Once jumps response patterns are estimated, we pre-select, for the mean equation, statistically significant variables at $\alpha = 0.30$ using a simple Tobit regression. After this pre-selection, we estimate jointly the mean and the variance equations (8) and (9), respectively, following [23].

3.2.1. Mean Equation

Table 7 reports the results of mean equation in (8). Tobit coefficients measure the impact of a change in the corresponding independent variable on the latent dependent variable weighted by the probability of being above the threshold. In our case, this corresponds to the probability of observing a jump. Due to space constraint, we only report variables significant for at least one of the countries under analysis.

[Insert Table 7 somewhere here]

Results reported in Table 7 highlight the relevant role that macroannouncements and government bond auctions have in explaining jumps in government bond spreads. In particular both effects, pre- and post-announcement, turned out to be statistically significant. In addition to that, it is interesting to note that relevant news are not coming just from the US an the Euro area, but even some releases concerning individual countries, especially from Spain and Germany, are often important in explaining government bond spreads. This result constitutes an additional evidence in

favor of the strong linkages existing among European countries. Finally, no role is found for rating actions.

Entering now in details of results reported in Table 7, we can infer that the pure knowledge about a forthcoming announcement in the following hour is statistically important in explaining jumps. In this respect, 4 out of 16 US, 8 out of 13 Euro area and 6 out of 26 individual countries future macroannouncement releases significantly determine jumps. US non-farm payroll together with the Introductory Statement are the most important jumps driver in the five series considered with a coefficient ranging from a 0.0061 for France to a 0.0588 for Belgium in the case of US non-farm payroll and from 0.0118 for Italy to 0.0769 for France with respect to the ECB Introductory Statement. Besides these two announcements, the other main drivers of jumps during the pre-announcement period are US Chicago PMI for Italy, France and Belgium, Euro area industrial production on all countries but France and Euro area purchase manager index flash on all countries but the Netherlands. As per individual countries news, future releases on Italian industrial production increase the probability of observing jumps for Italian, French and Spanish spreads, on Spanish industrial production for French, Spanish and Belgian spreads and on Belgian business confidence for Italian, Spanish and Belgian spreads. Thus, we found that the scheduled releases contribute in explaining jumps, especially with respect to real economy and forward looking indicators, and that not only US and Euro area related news are relevant, but even releases from Belgium, Italy, Germany and Spain matter. Note that the Belgian is the first confidence indicator released in Europe, each month, and therefore it contributes in shaping the confidence about the economic environment.

Turning now to the post-announcement effects, 10 out of 16 from US, 5 out of 13 from Euro area and 7 out of 26 from individual countries surprises are statistically significant. In particular, the most important releases are US non-farm payroll, US GDP advance and the Introductory Statement, explaining large absolute jump sizes for all the five spread series considered. Among other macroannouncements, we notice the statistical significance of US retail sales on Italy, Spain, Belgium and the Netherlands, US consumer confidence indicator for France, Belgium and the Netherlands, Euro area business confidence indicator for Italy, Belgium and the Netherlands and Euro area PMI final on Italy, Spain and Belgium. As per individual countries, we signal German unemployment on France, Spain and Belgium and Spanish industrial production on Italy, Spain and Belgium.

The most important finding of our analysis so far is the high sensitivity of government bond spreads to US and Euro area macroannouncements together with to some individual countries news, from Spain and German in particular. The worsening of the Spanish macroeconomic fundamentals represents an important news for the markets and particularly important is the role of unemployment (at present the highest in Europe) and the industrial production, that is falling more than in any other European country. Moreover, while Greece and Portugal are small economies, Spain is the fourth largest economy in the Euro area and this makes the deterioration of its macro funda-

mentals extremely relevant to the markets. As far as Germany is concerned, the largest economy in Europe, markets pay attention to signals coming from Germany's economic indicators as they serve as leading indicators for the entire Euro area.

As per the category of macroannouncements, there is a confirmation of what already reported in the preliminary analysis that is the important role played by economic indicators such as employment level and industrial production, and forward looking variables, with Euro area purchase manager index and US and Euro area confidence indicators, as opposite to those related to the consumer prices/inflation indicator.

While the literature documents the importance of the US releases, the role played by the non-farm payroll and GDP ([2], [3], [25], and Miao et al. 2012), and timing of the news releases (see for instance [5], [33] and [32]) in explaining returns from various asset classes, there are some novel and interesting results from our analysis that the existing literature does not document. First of all, we find evidence of the important role played by the ECB Introductory Statement bringing to the market the key information concerning decisions on ECB rates. Moreover, our results show the sensitivity of European government bond spreads not only towards US and Euro area releases but also to individual countries, with particular reference to those related to Germany and Spain. Finally, we showed the importance of taking into account the pre-announcement effect which were found to explain a great amount of jumps. Pre- and post-announcement convey different kind of information with the first providing an indication about traders' perception of future news relevance while the second one, captured by surprises, leading traders to revise their positions according to the actual releases.

Focusing on government bond auctions, we can see that in the time frame preceding the publication of auction results the probability of observing jumps increases. In particular this holds true with respect to auctions hold in Germany, Greece, Italy and Spain, namely the country with the strongest economy in Europe together with three of the European countries which suffered the most during the sovereign crisis. In addition to that, it is interesting to note that we observe both a *self-referencing* effect, i.e. auctions hold in Italy and Spain impact on Italian and Spanish government bond spreads, as well as an *outer* effect, i.e. auctions hold in Greece determine a higher probability of observing jumps in French, Belgian and Dutch spreads and auctions hold in Italy on Spanish spreads. German auctions determine as well a *self-referencing* effect given that the dependent variable are spreads of 10-year benchmark bonds on German Bund.

German auctions are very important market movers even in the period following the publication of auctions results. Differences in bid-to-cover of 10-year German auctions significantly explain jumps in all the countries analyzed. The bid-to-cover captures market demand of auctioned bonds with respect to the total offer and therefore it provides an indication about the market sentiment towards those bonds. In particular, if German bid-to-cover increases, that implies that investors are switching their preferences towards German Bunds, acting during the sovereign crisis as a

safe-heaven and denoting therefore an increasing risk aversion. Not only German bid-to-cover is statistically significant in explaining jumps in sovereign spreads, but even Belgian bid-to-cover, on Belgian spreads, and Spanish bid-to-cover, on Spanish spreads, confirming the existence of a strong *self-referencing* effect.

In addition to changes in bid-to-cover, results indicate that even differences in average yield of current 10-year government bond auction with respect to the previous one contribute in explaining jumps in sovereign spreads. In particular, auctions on French government bonds determine sizable jumps in Italian and Spanish spreads while those on German bonds cause jumps on Italian, French and Spanish bonds. Finally, auctions hold in Italy impact on French, Belgian and Dutch spreads and those in Spain just on Spanish spreads. Coherently with results on pre-announcement and bid-to-cover, we find that the auctions explaining jumps in government bond spreads are those hold in the most troubled countries during the sovereign crisis, namely Italy, Spain, and in the safest European country, i.e. Germany. In addition to that, we point out that auctions hold in these countries not only determine jumps in these countries, but even in other countries confirming the existence of strong interlinkages among European countries.

Finally, there is no evidence that rating actions determine jumps in sovereign spreads. Our results contrast with findings in the literature assessing the impact of rating actions on returns or jumps. [34] discuss that the most of the incremental information value is transmitted through negative credit warnings (i.e., "outlooks," "reviews," and "watches,"), rather than actual rating changes. The same conclusion is also reported in [35], [36] and [12]. Our analysis confirms instead a *reputation issue* attached to rating agencies: market participants do not rely on rating agencies assessment in default risks in government bonds. This result can be read in light of the role they played in the subprime crisis, provided they did not provide investors with reliable assessment of the risk of structured products on US mortgage loans.

3.2.2. Variance Equation

Table 8 reports the results of variance equation (9). Again, due to space constraint, we only report variables significant for at least one of the countries under analysis.

[Insert Table 8 somewhere here]

The coefficients $\omega_{2,j},\ j = 1, ..., J$ account for a different level of unconditional volatility in correspondence to the future macroannouncement or government bond auction releases with respect to time intervals not preceding any news. Those coefficients take a positive sign and are statistically significant, suggesting that in the hour preceding one of the events in our analysis, the level of volatility raises above the level ω_1. In particular, 10 macroannouncements out of 55 are statistically different from zero. The most relevant news are those concerning US, with non-farm payroll playing its usual leading role and being significant for all the sovereign spreads but Belgian, together with

another real economy news, GDP final, determining sizable jumps for Italy, France and Belgium. Among Euro area related news, a great attention is devoted to the forthcoming reading of the Introductory Statement, being statistically significant for all the government spreads, but Italian, and of the PMI flash for French and Belgian spreads. Moreover we found that the level of volatility raises just before the release of German ZEW, being statistically significant for France, Belgium and the Netherlands, and Italian industrial production and Spanish unemployment, just impacting Italy and Spain respectively.

Turning now the attention to auctions, we found some evidence of a raise in volatility in correspondence of prescheduled auctions, in particular those hold in Greece and Italy.

All variables used so far capture the pre-announcement effect. Once information is released, traders process information and adjust the price according. Parameters $\alpha_{2,j}$, $j = 1, ..., J+B$ account for persistency of the surprise effect, once news has been released, while parameters $\nu_{2,j}$ allow for the different leverage effect in correspondence to negative surprise lead by macroannouncements with respect to news with no or little surprise and to other negative news.

As far as the persistency parameters are concerned, starting from macroannouncements we find that 14 of them are statistically significant indicating that actually, macroannouncements bringing a great surprise have a different level of persistency with respect to other news. In particular, given that almost all the significant coefficients take a positive sign, we can conclude that macroannouncements have a higher persistency. Focusing on the country and category of macroannouncements, we see that as usual those related to US and Euro area play a major role, with higher relevance of real economy and forward looking indicators. For instance, one of the most important driver is US non-farm payroll, US GDP final, Euro area Introductory statement and Euro area PMI final. The persistency of the ECB Introductory Statement can be explained in light of the great amount of information that it conveys which can take some time to be completely incorporated by the market. Moreover, the reading of the Introductory Statement per se together with the time devoted to questions and answers may take some time to be carried out. In addition, individual countries releases with high persistency are German unemployment, Italian GDP final, Spanish unemployment and industrial production, and Belgian business confidence.

It is interesting to see that news determining sizeable jumps in government bond spreads are even those which persist the most. Even with respect to government bond auctions, those with a higher persistency are hold in Italy, Spain and Belgium, confirming results highlighted previously in the paper.

Finally, let us take a look at the asymmetric effect. In particular, as far as both macroannouncements and auctions are concerned, coefficients are positive and statistically significant implying that the leverage effect associated to these events, with a big surprise, is more pronounced than same kind of news but with smaller surprises or with respect to other kind of news. We like to interpret this finding given the high attention that these news deserve from markets, implying that a huge

number of traders and portfolio managers take their decisions on these kind of releases. The evidence of the higher leverage effect associated to macroannouncements with respect to other kind of news is also coherent with findings in [24].

Focusing on countries and categories of announcements determining a higher leverage effect, we confirm results reported earlier in the paper. In particular, releases impacting the most belong to real economy and forward looking categories, and concern mostly the US and Euro area, although a number of releases on individual countries are statistically significant as well. As per government bond auctions, the most relevant are still those hold in Italy and Spain.

3.3. Results for the Cojump Model

In this final section, we report the results from model estimation for cojumps.

First, in order to get robust estimates, we remove all the dummy variables which had less than 15 observations for all the possible combinations with the dependent variable in a 2x2 contingency table; on the remaining variables we then estimate the logit model and adjust the estimates according to prior correction. In Table 9, we report only statistically significant variables explaining cojumps:

[Insert Table 9 somewhere here]

Results in Table 9 suggest that both pre- and post- announcement effects are statistically significant in explaining cojump occurrences.

As per macroannouncements, news related to US real economy play a prominent role, with non-farm payroll, GDP and retail sales. The relevance of US non-farm payroll and retail sales in explaining cojumps is also stated in [2]. Focusing on Euro are releases, we find confirmation of the importance of the Introductory Statement, entering the model with both pre- and post- effects, together with Euro area forward looking measures, such as business confidence and PMI final. Moreover, even some individual countries releases contribute in explaining cojumps, with two Spanish announcements, on GDP and industrial production, entering with their post-announcement effect and German ZEW, pre-announcements, and German business confidence, post-announcement. Finally, even Belgian business confidence and Italian GDP final determine a higher number of cojumps in the hour preceding their releases.

As far as auctions are concerned, Italian auctions are crucially entering the model with the change in average yield with a positive coefficient as well as with the pre-release effect. Even for this model, the impact of rating actions is statistically insignificant. The indications from the cojump models support therefore the existence of some leading news which, when associated to a big surprise, are able to determine sizeable movements in all or at least in most of the government bond spreads analyzed.

4. Conclusions

In this paper, we jointly modeled the impact of macroannouncements, government bond auctions and rating actions on the 10-year government bond spreads for the benchmarks of Belgium, France, Italy, the Netherlands and Spain with respect to the German Bund, over the period 2nd January 2009 - 31st May 2012. We measured the impact of three drivers on both mean and variance specifications, disentangling the pre- from the post-announcement effect, via the identification and mapping of jumps and cojumps. We considered a wide range of macroannouncements covering US, Euro area and individual countries together with government bond auctions and rating actions about largest European countries.

Our results show the high sensitivity of jumps and cojumps to US and Euro area macroannouncements plus specific Spanish and German macroannouncements. With respect to macroannouncements categories, very important is the role played by the variables concerning real economy, such as US non-farm payroll, retail sales and GDP, together with the forward looking indicators among all consumer confidence indicators and purchase manager indexes; monetary news are found to be irrelevant. Moreover, the Introductory Statement turned out to be a significant determinant of both jumps and cojumps, confirming the key role that European Central Bank is having in the management of the sovereign crisis. Finally, macroannouncements are important drivers for both the mean and variance of spreads entering significantly at both pre- and post-announcement levels.

Government bond auctions hold in countries experiencing deep economic downturn, such as Italy and Spain, significantly explain jumps and cojumps together with those hold in the European *leading* country, Germany. Finally, rating actions do not produce sizable jumps in the markets.

To the best of our knowledge this is the first paper assessing in a comprehensive way the drivers of jumps and cojumps associated to government bond spreads. Our framework allows to consider simultaneously a relevant number of variables which is crucial in order to properly measure the impact of these events; this is important also because macroannouncements in the Euro area and government bond auctions take place at almost the same time. Finally, the evaluation of the impact of auctions on spreads is relevant also to practitioners for determining their trading and asset allocation strategies.

There are important policy implications from our analysis. We showed that movements in government bond spreads are significantly determined by macroannouncements and government bond auctions, and thus in the recent sovereign crisis intraday movements were driven by changes in macroeconomic fundamentals and not, or at least not only, by speculative actions. In addition, the fact that events taking place in some individual countries, such as Germany and Spain for macroannouncements and Germany, Italy and Spain for auctions, have a significant impact in other countries, shows the great level of interdependence existing among European countries.

The findings in this paper suggest interesting additional developments. Our analysis is very comprehensive about the possible determinants of jumps and cojumps, however we envisage that at

least three other possible drivers may play an important role in an uncertain and volatile environment as the one that has been characterizing markets in the most recent years. In this paper, we analyzed the impact of downgrading actions once the decision of the rating agency becomes public: it will be interesting to study whether warnings and outlook changes announced by rating agencies could have some impact on government bond spreads. The second issue deals with the analysis of market's reactions to political events. For instance, the inconclusive results of Italian elections of the 25th February 2012 brought on the market a high level of uncertainty which determined a substantial increase in Italian government bond spread of 51 bps in just one day and which affected even Spanish spread with an increase of 30 bps. The last factor, that will deserve an entire research project, are policy announcements from central banks, considered for instance the great impact that Mario Draghi's *whatever it takes* had on government bonds. Finally, following [37] who look at announcement effects in the real and nominal US Treasury market using real yields, nominal yields, and the spread between the two, we may also look at yields on the German Bund, yields on the other bonds, and the spreads between them. This is part of an ongoing research agenda.

References

[1] M. Dungey, M. McKenzie, V. Smith, Empirical evidence on jumps in the term structure of the us treasury market, Journal of Empirical Finance 16 (2008) 430–445. doi:10.1016/j.jempfin.2008.12.002.

[2] J. Lahaye, S. Laurent, C. J. Neely, Jumps, cojumps and macro announcements, Journal of Applied Econometrics 26 (2011) 893–921. doi:10.1002/jae.1149.

[3] G. J. Jiang, I. Lo, A. Verdelhan, Information shocks, liquidity shocks, jumps, and price discovery: Evidence from the u.s. treasury market, Journal of Financial and Quantitative Analysis 46 (2011) 527–551. doi:10.1017/S0022109010000785.

[4] M. Fleming, M. Piazzesi, Monetary policy tick-by-tick, in market microstructure meeting, National Bureau of Economic Research, Inc.

[5] M. Fleming, E. Remolona, What moves the bond market?, Federal Reserve Bank of New York Economic Policy Review 3 (1997) 31–50.

[6] A. Akdemir, D. Karsli, An assessment of strategic importance of credit rating agencies for companies and organizations, Procedia - Social and Behaviour Sciences 58 (2012) 1628–1639. doi:10.1016/j.sbspro.2012.09.1150.

[7] R. Alsakka, O. ap Gwilym, Rating agencies.credit signals: An analysis of sovereign watch and outlook,, International Review of Financial Analysis 21 (2012) 45–55. doi:10.1016/j.irfa.2011.10.002.

[8] R. Alsakka, O. ap Gwilym, Rating agencies's signals during the european sovereign debt crisis: Market impact and spillover, Journal of Economic Behavior & Organization 85 (2013) 144–162. doi:10.1016/j.jebo.2011.12.007.

[9] J. He, J. Qian, P. Strahan, Are all ratings created equal? the impact of issuer size on the pricing of mortgage-backed securities, The Journal of Finance 6 (2012) 2097–2137. doi:10.1111/j.1540-6261.2012.01782.x.

[10] C. C. Opp, M. M. Opp, M. Harris, Rating agencies in the face of regulation, Journal of Financial Economics 108 (2013) 46–61. doi:10.1016/j.jfineco.2012.10.011.

[11] A. Afonso, D. Furceri, P. Gomes, Sovereign credit ratings and financial markets linkages: Application to european data, Journal of International Money and Finance 31 (2012) 606–638. doi:10.1016/j.jimonfin.2012.01.016.

[12] P. Hill, R. Faff, The market impact of relative agency activity in the sovereign ratings market, Journal of Business Finance and Accounting 37 (2010) 1309–1347. doi:10.1111/j.1468-5957.2010.02220.x.

[13] P. Balduzzi, E. J. Elton, T. Green, Economic news and bond prices: Evidence from the u.s. treasury market, Journal of Financial and Quantitative Analysis 36 (2001) 523–543. doi:10.2307/2676223.

[14] C. Brownlees, G. Gallo, Financial econometric analysis at ultra-high frequency: Data handling concerns, Computational Statistics and Data Analysis 51 (2006) 2232–2245. doi:10.1016/j.csda.2006.09.030.

[15] O. E. Barndorff-Nielsen, P. R. Hansen, P. Lunde, N. Shephard, Multivariate realised kernels: Consistent positive semi-definite estimators of the covariation of equity prices with noise and non-synchronous trading, Journal of Econometrics 162 (2011) 149–169. doi:10.1016/j.jeconom.2010.07.009.

[16] T. G. Andersen, T. Bollerslev, D. Dobrev, No-arbitrage semi-martingale restrictions for continuous-time volatility models subject to leverage effects, jumps and i.i.d. noise: Theory and testable distributional implications, Journal of Econometrics 138 (2007) 125–180. doi:10.3386/w12963.

[17] S. S. Lee, P. A. Mykland, Jumps in financial markets. a new non parametric test and jump dynamics, The Review of Financial Studies 21 (2008) 2535–2563. doi:10.1093/rfs/hhm056.

[18] A. Dumitru, G. Urga, Identifying jumps in financial assets a comparison between tests, Journal of Business and Economic Statistics 30 (2012) 242–255. doi:10.1080/07350015.2012.663250.

[19] K. Boudt, C. Croux, S. Laurent, Robust estimation of intraweek periodicity in volatility and jump detection, Journal of Empirical Finance 18 (2011) 353–367. doi:10.1016/j.jempfin.2010.11.005.

[20] T. G. Andersen, T. Bollerslev, Deutsche mark-dollar volatility: Intraday activity patterns, macroeconomic announcements and longer run dependencies, The Journal of Finance 53 (1998) 219–265. doi:10.1111/0022-1082.85732.

[21] B. Lu, L. Wu, Macroeconomic releases and the interest rate term structure, Journal of Monetary Economics 56 (2009) 872–884. doi:10.1016/j.jmoneco.2009.06.005.

[22] J. Rangel, Macroeconomic news, announcements, and stock market jump intensity dynamics, Journal of Banking & Finance 35 (2011) 1263–1276.

[23] G. Calzolari, G. Fiorentini, A tobit model with garch errors, Econometric Reviews 17 (1998) 85–104. doi:10.1080/07474939808800404.

[24] P. de Goeij, W. Marquering, Macroeconomic announcements and asymmetric volatility in bond returns, Journal of Banking & Finance 30 (2006) 2659–2680. doi:10.1016/j.jbankfin.2005.09.014.

[25] M. Andersson, L. J. Hansen, S. Sebestyn, Which news move the euro area bond market?, German Economic Review 10 (2009) 1–31. doi:10.1111/j.1468-0475.2008.00439.x.

[26] M. Tomz, G. King, L. Zeng, Relogit: Rare events logistic regression, Journal of Statistical Software 8 (2003) 137–163.

[27] D. K. Pearce, V. V. Roley, The reaction of stock prices to unanticipated changes in money: a note, The Journal of Finance 38 (1983) 1323–1333. doi:10.1111/j.1540-6261.1983.tb02303.x.

[28] D. K. Pearce, V. V. Roley, Stock prices and economic news, Journal of Business 58 (1985) 49–67.

[29] P. C. Jain, Response of hourly stock prices and trading volume to economic news, The Journal of Business 61 (1988) 219–231. doi:10.1086/296429.

[30] J. Wongswan, Transmission of information across international equity markets, The Review of Financial Studies 19 (2006) 1157–1189.

[31] R. Gurkaynak, B. Sack, E. Swanson, The sensitivity of long-term interest rates to economic news: Evidence and implications for macroeconomic models, American Economic Review 95 (2005) 425–436. doi:10.1257/0002828053828446.

[32] T. G. Andersen, T. Bollerslev, F. X. Diebold, C. Vega, Real-time price discovery in stock, bond and foreign exchange markets, Journal of International Economics 73 (2007) 251–277. doi:10.3386/w11312.

[33] T. G. Andersen, T. Bollerslev, F. X. Diebold, C. Vega, Micro effects of macro announcements: Real-time price discovery in foreign exchange, American Economic Review 93 (2003) 38–62. doi:10.3386/w8959.

[34] J. Kiff, S. Nowak, L. Schumacher, Are rating agencies powerful? an investigation into the impact and accuracy of sovereign ratings, IMF Working Paper 12/23.

[35] K. Pukthuanthong-Le, F. A. Elayan, L. Rose, Equity and debt market responses to sovereign credit ratings announcements, Global Finance Journal 18 (2007) 47–83.

[36] V. Hooper, T. Hume, S. J. Kim, Sovereign rating changes - do they provide new information for stock markets?, Economic Systems 32 (2008) 142–166. doi:10.1016/j.ecosys.2007.05.002.

[37] M. J. Beechey, J. H. Wright, The high-frequency impact of news on long-term yields and forward rates: Is it real?, Journal of Econometrics 56 (2009) 535–544. doi:10.1016/j.jmoneco.2009.03.011.

Figures and Tables

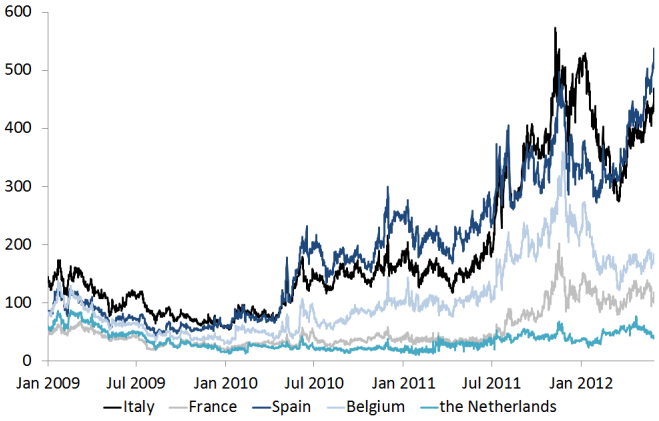
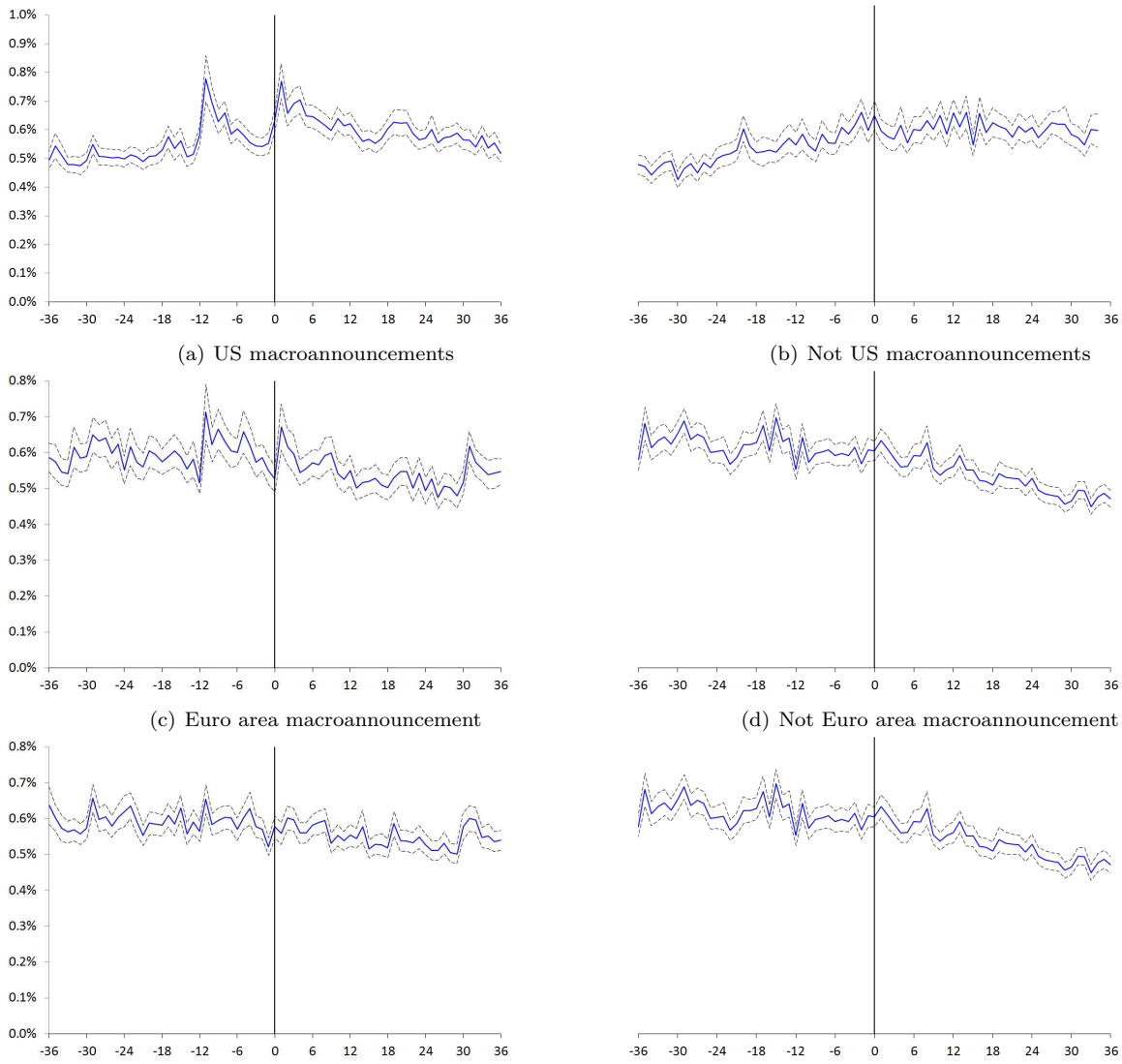


Figure 1: **10-year government bond spreads (bps)**
The figure reports the 10-year government bond spreads with respect to Germany for Belgium, France, Italy, the Netherlands, and Spain over the period 2nd January 2009 - 31st May 2012. Spreads are computed on bid yields at 5-minute sampling frequency.



(a) US macroannouncements

(b) Not US macroannouncements

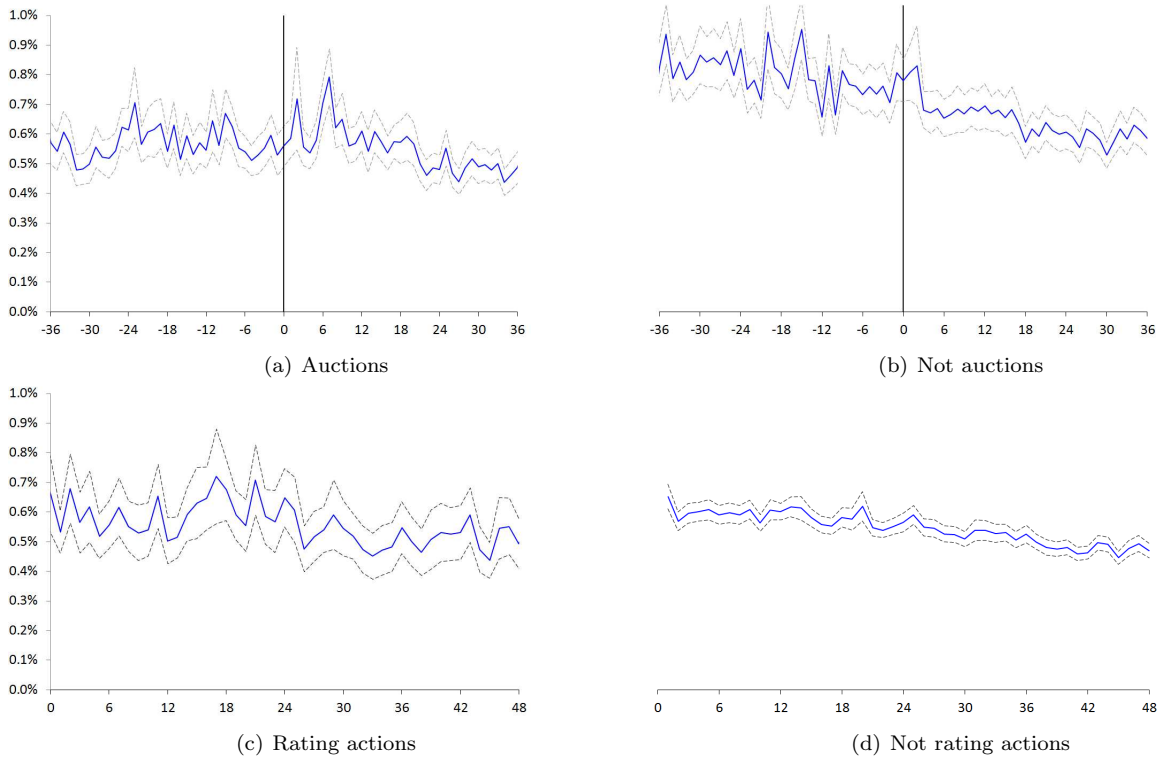
(c) Euro area macroannouncement

(d) Not Euro area macroannouncement

(e) Individual countries macroannouncements

(f) Not Individual countries macroannouncements

Figure 2: **Market activities around events: US, Euro area and individual countries macroannouncements.**
The left-hand column of the figure plots the mean absolute returns together with the 95% confidence interval around the release of the US, Euro area and individual countries macroannouncements. The right-hand column of the figure plots the mean absolute returns around the typical average release time of the news: 14:15 UTC for US macroannouncements, 9:00 UTC for Euro area and individual countries macroannouncements. On the x-axis, we report the number of 5-minute intervals preceding/following the time of the release.



(a) Auctions

(b) Not auctions

(c) Rating actions

(d) Not rating actions

Figure 3: **Market activities around events: government bond auctions and rating actions.**
The left-hand column of the figure reports the plots of the mean absolute returns with the 95% confidence interval around the government bond auctions and rating actions. The right-hand column of figure plots the mean absolute returns around the typical average release time of the news: 9:00 UTC for government bond auctions and 8:00 UTC for rating actions. On the x-axis, we report the number of 5-minute intervals preceding/following the time of the release.

Table 1: **Government bond yields and spreads: data selection and summary statistics**

	DE	IT	FR	ES	BE	NL
PANEL A						
No. ticks	2,980,063	917,630	1,035,631	903,233	799,610	605,155
Limiting trading time	2,294,951	704,701	794,602	796,529	682,408	512,789
Outliers: No. (%)	2,528 (0.11)	1,247 (0.18)	1,468 (0.18)	1,372 (0.17)	1,313 (0.19)	772 (0.15)
No. trades per day: Mean (SD)	2,629 (1,197)	805 (316)	908 (358)	910 (356)	780 (326)	586 (290)
Trade duration: Mean (SD) [s]	10.17 (27.01)	33.09 (62.97)	29.38 (58.16)	28.49 (57.85)	34.15 (69.05)	45.42 (82.33)
5-minute intervals	79,534	79,534	79,534	79,534	79,534	79,534
Exclude 1st daily obs	78,660	78,660	78,660	78,660	78,660	78,660
Bid YTM						
Mean (SD) [%]	2.76 (0.58)	4.67 (0.80)	3.29 (0.37)	4.67 (0.75)	3.82 (0.42)	3.11 (0.57)
Median (1st - 99th percentiles) [%]	3.00 (1.44 - 3.57)	4.49 (3.75 - 7.05)	3.39 (2.49 - 3.97)	4.39 (3.75 - 6.49)	3.82 (2.94 - 4.87)	3.29 (1.93 - 4.04)
Bid-Ask Spread of YTM						
Mean (SD) [bps]	0.63 (0.05)	0.65 (0.05)	0.8 (0.07)	0.76 (0.05)	0.97 (0.04)	0.7 (0.03)
Median (1st - 99th percentiles) [bps]	0.6 (0.55 - 0.76)	0.64 (0.59 - 0.81)	0.82 (0.68 - 0.94)	0.76 (0.7 - 0.9)	0.97 (0.89 - 1.08)	0.7 (0.64 - 0.77)
Bid Spread						
Mean (SD) [bps]	-	191 (124)	54 (34)	192 (117)	106 (63)	35 (16)
Median (1st - 99th percentiles) [bps]	-	148 (60 - 513)	38 (20 - 154)	184 (50 - 481)	90 (34 - 295)	30 (15 - 81)
PANEL B						
Around macroannouncements						
No. trades per hour: Mean (SD)	298 (211)	86 (54)	96 (61)	96 (62)	83 (54)	63 (44)
Trade duration: Mean (SD) [s]	9.56 (25.05)	33.1 (63.87)	29.65 (60.45)	28.61 (58.68)	34.34 (71.29)	44.91 (82.37)
Not around macroannouncements						
No. trades per hour: Mean (SD)	314 (178)	100 (46)	114 (53)	110 (54)	98 (48)	73 (41)
Trade duration: Mean (SD) [s]	10.65 (23.4)	32.96 (59.28)	29.09 (51.98)	28.31 (51.78)	33.83 (63)	45.49 (77.65)
Around auctions						
No. trades per hour: Mean (SD)	257 (199)	80 (53)	89 (60)	92 (62)	75 (52)	56 (43)
Trade duration: Mean (SD) [s]	10.26 (30.86)	33.81 (72.5)	30.03 (64.25)	28.86 (63.25)	35.74 (77.55)	47.45 (92.91)
Not around auctions						
No. trades per hour: Mean (SD)	334 (190)	103 (47)	116 (54)	110 (56)	100 (49)	75 (42)
Trade duration: Mean (SD) [s]	10.12 (21.62)	32.69 (58.43)	28.99 (52.21)	28.2 (51.43)	33.37 (63.17)	44.4 (76.38)
Around rating actions						
No. trades per hour: Mean (SD)	263 (205)	74 (52)	82 (58)	83 (59)	70 (51)	59 (44)
Trade duration: Mean (SD) [s]	8.87 (24.4)	31.65 (51.31)	28.66 (49.94)	27.36 (50.68)	33.3 (58.21)	39.47 (59.91)
Not around rating actions						
No. trades per hour: Mean (SD)	355 (184)	109 (44)	123 (50)	119 (53)	105 (46)	79 (41)
Trade duration: Mean (SD) [s]	10.17 (22.22)	33.06 (60.62)	29.31 (53.97)	28.44 (53.36)	34.07 (65.63)	45.44 (79.33)

PANEL A of the table reports the data procedure selection on government bond yields and spreads together with some summary statistics. Limiting trading time means removing all holidays, weekend days and considering trades occurred between 8:00 and 15:30 UTC. Outliers are detected as described in eq.(1) in the text. Tick-by-tick data are resampled using calendar time (see details in the body of the paper). The 1st observation of each day is removed as it presents excess volatility. In square brackets is the unit of measurement. **PANEL B** of the table reports the analysis of trading activity around the three categories of events analyzed: macroannouncements, government bond auctions and rating actions. The window around the event ranges from 1 hour before the release up to 1 hour after.

Table 2: **Macroannouncements with prescheduled releases**

Country	Macroannouncement	Frequency	Release time (UTC)	No.	Category	Surprise Mean (SD)
US	Business inventories	M	15:00	41	RE	-0.55 (2.08)
	Chicago PMI	M	14:45	39	FL	0.87 (2.54)
	Consumer confidence	M	15:00	39	FL	-0.29 (3.40)
	CPI	M	13:30	41	P	0.01 (1.03)
	Durable goods	M	13:30	40	FL	-0.59 (2.70)
	Factory orders	M	15:00	40	FL	0.16 (1.11)
	GDP advance	Q	12:30 / 13:30	14	RE	-0.13 (1.00)
	GDP preliminary	Q	12:30 / 13:30	14	RE	-0.53 (1.45)
	GDP final	Q	12:30 / 13:30	13	RE	0.00 (2.28)
	Industrial production	M	14:15	41	RE	-0.29 (1.82)
	Initial jobless claim	W	13:30	175	RE	0.00 (0.00)
	Nonfarm payroll	M	13:30	39	RE	-0.09 (2.23)
	Philadelphia FED Index	M	15:00	41	FL	-0.10 (3.69)
	PPI	M	13:30	41	P	0.06 (1.75)
	Retail sales	M	13:30	41	RE	0.05 (1.81)
	University of Michigan	M	14:55	39	FL	1.12 (1.49)
EA	Business climate	M	09:00	42	FL	0.17 (2.05)
	Consumer confidence	M	10:00	42	FL	0.14 (2.00)
	Flash HICP	M	10:00	42	P	0.07 (1.40)
	HICP	M	10:00	41	P	0.00 (0.00)
	Industrial production	M	10:00	41	RE	-0.29 (1.82)
	Introductory Statement	M	13:30	40	RE	-
	M3	M	09:00	41	P	-0.44 (2.66)
	Monthly Bulletin	M	10:00	41	RE	-
	PMI flash	M	09:00	41	FL	0.18 (2.51)
	PMI final	M	09:00	41	FL	0.79 (2.87)
	PPI	M	10:00	41	P	-0.05 (0.86)
	Retail sales	M	10:00	41	RE	-0.79 (1.66)
	Unemployment	M	10:00	41	RE	0.41 (1.67)
DE	CPI preliminary	M	13:00	37	P	0.00 (1.32)
	IFO: business confidence	M	09:00	41	FL	1.24 (2.55)
	Industrial production	M	11:00	41	RE	-0.15 (2.58)
	Unemployment	M	08:55	42	RE	-0.63 (2.54)
	ZEW	M	10:00	41	FL	0.73 (2.53)
IT	Business confidence	M	08:30 / 09:00	41	FL	0.26 (2.85)
	CPI preliminary	M	10:00	42	P	0.35 (2.49)
	CPI final	M	09:00 / 10:00	41	P	-0.98 (3.00)
	GDP preliminary	Q	09:00 / 10:00	13	RE	-1.33 (2.78)
	GDP final	Q	09:00 / 10:00	12	RE	-0.25 (0.87)
	Industrial production	M	09:00	41	RE	-0.04 (2.44)
FR	Industrial production	M	07:45 / 08:45	2	RE	6.67 (25.93)
ES	CPI	M	08:00	41	P	0.06 (0.75)
	GDP preliminary	Q	08:00	14	RE	0.14 (2.03)
	GDP final	Q	08:00	14	RE	-0.29 (0.73)
	Industrial production	M	08:00	40	RE	-0.38 (2.69)
	Unemployment	Q	08:00	14	RE	0.75 (1.42)
PT	CPI	M	10:00	40	P	-0.84 (2.79)
	GDP preliminary	Q	10:00	14	RE	6.43 (10.70)
	GDP final	Q	11:00	12	RE	-3.00 (2.38)
NL	CPI	M	08:30	39	P	0.02 (1.18)
	Industrial production	M	08:30	39	RE	-0.65 (3.74)
	Unemployment	M	08:30	41	RE	-0.37 (2.14)
BE	Business confidence	M	14:00	41	P	0.10 (2.19)
GR	CPI	M	10:00	40	P	-0.84 (3.49)
	GDP preliminary	Q	08:30 / 10:00	8	RE	-0.19 (1.03)
	GDP final	Q	08:30 / 10:00	7	RE	-3.00 (2.38)
	Unemployment	M	10:00	38	RE	-0.02 (2.61)

The table reports a description on macroeconomic announcements released in the period 2nd January 2009 - 31st May 2012. In some cases the release time changes according to the summertime. FL stands for Forward Looking, P for price and RE for Real Economy macroannouncement categories. Surprise is computed as (Actual Release -Median Forecasts)/SD Forecasts.

Table 3: **Government bond auctions**

	No. of auctions	**No. of 10-year bond auctions**	**Average yield [%] Mean (SD)**	**Bid-to-cover Mean (SD)**
Austria	34	15	3.64 (0.68)	2.16 (0.44)
Belgium	113	25	3.98 (0.55)	2.07 (0.56)
Finland	8	4	2.75 (0.46)	na
France	271	38	3.61 (0.59)	2.34 (0.75)
Germany	220	35	3.04 (0.84)	1.53 (0.29)
Greece	53	0	-	-
Italy	193	46	4.76 (0.75)	1.42 (0.17)
the Netherlands	142	18	3.42 (0.74)	na
Portugal	104	16	5.01 (0.79)	2.05 (0.76)
Spain	163	25	4.85 (0.81)	1.94 (0.40)

The table reports a description of government bond auctions hold in the period 2nd Janaury 2009 - 31st May 2012. Average yield: yield at which the government allocated the bonds issued in an auction. Bid-to-cover: ratio between the number of bids the Government received and the amount of bonds offered. Average yield and bid-to-cover are collected just for auctions concerning 10-year bonds.

Table 4: **Rating actions**

	S&P	Moody's	Fitch
Austria	13-Jan-12	-	-
Belgium	25-Nov-11	16-Dec-11	27-Jan-12
France	13-Jan-12	-	-
Greece	14-Jan-09	22-Dec-09	22-Oct-09
	16-Dec-09	22-Apr-10	08-Dec-09
	27-Apr-10	14-Jun-10	09-Apr-10
	29-Mar-11	07-Mar-11	14-Jan-11
	09-May-11	01-Jun-11	20-May-11
	13-Jun-11	25-Jul-11	13-Jul-11
	27-Jul-11	02-Mar-12	22-Feb-11 (•)
	27-Feb-12		09-Mar-12
	02-May-12		13-Mar-12 (•)
			17-May-12
Ireland	30-Mar-09	02-Jul-09	08-Apr-09
	08-Jun-09	19-Jul-10	04-Nov-09
	24-Aug-10	17-Dec-10	06-Oct-10
	23-Nov-10	15-Apr-11	09-Dec-10
	02-Feb-11	12-Jul-11	
	01-Apr-11		
Italy	19-Sep-11	05-Oct-11	07-Oct-11
	13-Jan-12	13-Feb-12	27-Jan-12
Portugal	21-Jan-09	13-Jul-10	24-Mar-10
	27-Apr-10	16-Mar-11	23-Dec-10
	24-Mar-11	05-Apr-11	24-Mar-11
	29-Mar-11	06-Jul-11	01-Apr-11
	24-Nov-11		24-Nov-11
	13-Jan-12		
Spain	19-Jan-09	30-Sep-10	28-May-10
	28-Apr-10	10-Mar-11	07-Jul-11
	13-Oct-11	18-Oct-11	27-Jan-12
	13-Jan-12	13-Feb-12	07-Jun-12
	26-Apr-12		

The table reports the rating actions undertaken by S&P, Moody's and Fitch during the period 2nd Janaury 2009 - 31st May 2012. All the rating actions presented in Table IV are downgradings, the only exceptions are the two upgradings (•) which took place on 22nd February 2011 and 13th March 2012 for Greece by Fitch.

Table 5: **Jumps: summary statistics**

	All countries	IT	FR	ES	BE	NL
PANEL A					No.	10,169
2,720	1,460	2,767	2,107	1,115		
P(Jump)	2.62	3.51	1.88	3.57	2.72	1.44
Mean abs Ssze (%)	2.31	2.74	2.08	2.54	2.23	1.97
	z-test	**z-test**	**z-test**	**z-test**	**z-test**	**z-test**
PANEL B: Macroannouncements						
All	**5.73 *****	**3.95 *****	**3.57 *****	**3.64 *****	**5.30 *****	**4.62 *****
US	**6.44 *****	**4.29 *****	**3.61 *****	**4.29 *****	**5.32 *****	**5.65 *****
Euro area	**3.78 ****	**3.49 ****	0.90	**2.37 *****	**2.80 *****	**1.93 ****
Individual countries	**1.40 ***	0.99	**1.72 ****	0.92	**1.34 ***	0.88
Germnay	**2.03 ****	**1.41 ***	**3.05 *****	-0.17	**2.47 *****	**1.32 ***
US - Real economy	**6.55 *****	**3.73 *****	**3.62 *****	**4.21 *****	**5.97 *****	**6.37 *****
US - Forward looking	**1.53 ***	**1.66 ****	0.48	0.89	0.79	**1.08**
US - Price	**2.26 ****	0.51	**2.22 ****	**1.80 ****	**1.43 ***	-0.27
Euro area - Real economy	**3.16 *****	**2.44 *****	-0.01	1.15	**3.13 *****	**1.84****
Euro area - Forward looking	**2.28 ****	**2.86 *****	0.91	**2.27 ****	0.86	**1.33 ***
Euro area - Price	0.25	0.66	-0.64	-0.17	0.12	-1.58
Individual countries - Real economy	0.65	0.24	0.86	-0.46	0.29	-0.03
Individual countries - Forward looking	**4.47 *****	**2.39 *****	**2.12 ****	**3.20 *****	**3.04 *****	**2.58 *****
Individual countries - Price	-2.54	-1.24	-0.44	-1.24	-0.5	-0.27
PANEL C: Bond auctions						
All	**1.28 ***	0.1	0.85	**1.41 ***	0.22	0.72
France	-1.92	-1.72	0.02	-0.71	-2.17	-0.39
Germany	-1.51	-1.46	-0.15	0.36	-0.91	-0.41
Belgium	**3.31 *****	**1.40 ***	**1.50 ***	-0.24	**2.77 *****	1.13
Greece	**4.30 *****	**1.59 ***	**3.08 *****	**1.46 ***	**4.78 *****	**3.72*****
Italy	**3.72 *****	**3.23 *****	**1.67 ****	**3.05 *****	**1.83 ****	**1.59 ***
Spain	**3.82 *****	**2.03 ****	**1.35 ***	**1.98 ****	1.03	**3.31 *****
PANEL D: Rating actions						
All	**4.08 *****	**1.34 ***	-0.03	**2.38 *****	**2.35 *****	**1.94 ****
S&P	**3.26 *****	**1.90 ****	1.19	**2.44 ****	**1.41 ***	**1.30 ***
Moody's	**3.20 *****	0.14	0.36	**1.72 ****	**3.44 *****	nd
Fitch	0.14	-0.03	na	-0.34	-0.93	**1.32 ***
Belgium	**7.73 *****	**2.75 *****	**6.45 *****	**3.32 *****	**3.53 *****	na
Italy	**3.13 *****	**5.66 *****	na	**2.93 *****	na	na
Spain	**2.52 *****	**1.73 ****	na	**1.66 ****	**1.37 ***	na
Greece	**2.12 ****	0.69	-0.36	0.81	0.81	**1.88 ****
Ireland	-0.80	na	na	0.42	0.40	na
Portugal	0.55	-0.37	-1.02	1.02	0.82	0.44

Panel A of the table reports the number of 5-minute returns identified as jumps by applying the Lee and Mykland (2008) test adjusted by the intraday periodicty of volatility according to Boudt et al. (2011), defined in (3) and (4), at the 5% significance level as well as the average absolute size of jumps. **Panels B-D** of the table report a preliminary analysis of the degree of association between jumps and macroannouncements, government bond auctions and rating actions by applying the z-test to compare the frequency of jumps occurrence around the event in analysis with respect to no-event situation. The null hypothesis is that the two percentages are equal. As per macroannouncements, we just show the analysis according to the classification in real economy, forward looking and price releases as reported in Table II while for government bond auctions, we report only relevant countries. In case one of the two categories has less than 10 observations, the test statistic is not reported (na). ***, **, and * denote 1%, 5% and 10% significance level, respectively.

Table 6: **Cojumps: summary statistics**

	≥ 2	**2**	**3**	**4**	**5**
PANEL A					
No.	3,478	2,101	875	336	166
P(Cojump)	4.48	2.71	1.13	0.43	0.21
P(Cojump—Jump)	34.20	26.38	10.99	4.22	2.08
	z-test	**z-test**	**z-test**	**z-test**	**z-test**
PANEL B: Macroannouncements					
All	**5.93 *****	**2.71 *****	**3.44 *****	**3.85 *****	**3.73 *****
US	**6.45 *****	**2.50 *****	**3.67 *****	**4.32 *****	**5.58 *****
EA	**4.16 *****	**2.41 *****	**3.08 *****	0.61	**2.27 *****
Individual countries	**2.17 *****	**1.84 *****	0.57	0.78	0.82
Germany	**3.01 *****	**2.60 *****	**1.70 *****	0.05	0.39
US - Real economy	**6.38 *****	**1.56 *****	**4.37 *****	**5.58 *****	**5.18 *****
US - Forward looking	**2.29 *****	0.76	**1.89 *****	**2.77 *****	na
US - Price	-0.11	0.68	na	na	na
EA - Real economy	**2.22 *****	0.73	**1.98 *****	0.80	**1.72 *****
EA - Forward looking	**3.68 *****	**2.05 *****	**3.46 *****	0.11	1.22
EA - Price	-0.05	1.15	-1.1	-0.83	na
Individual countries - Real economy	0.35	0.62	0.05	0.44	-1.36
Individual countries - Forward looking	**5.85 *****	**4.46 *****	**3.62 *****	1.04	0.78
Individual countries - Price	-2.17	-1.94	-2.23	0.89	0.96
PANEL C: Bond auctions					
All	1.02	-0.18	0.79	**1.51 *****	1.26
France	-1.86	-2.21	-1.46	**2.48 *****	-0.74
Germany	-1.48	-1.74	-0.38	-0.94	**1.67 *****
Belgium	**1.41 *****	0.31	**2.30 *****	-0.02	na
Greece	**5.18 *****	**3.61 *****	**1.85 *****	**3.49 *****	nd
Italy	**4.73 *****	**1.69 *****	**3.75 *****	**1.84 *****	**4.08 *****
Spain	**2.83 *****	**2.85 *****	0.47	**1.56 *****	na
PANEL D: Rating actions					
All	**2.53 *****	**2.67 *****	0.17	na	na
S&P	**3.38 *****	**2.66 *****	na	na	na
Moody's	**2.22 ****	**2.37 *****	**1.69 ****	na	na
Fitch	-1.57	-0.66	na	na	na
Belgium	**4.27 *****	na	na	na	na
Greece	**2.45 *****	**3.01 *****	na	na	na
Ireland	na	na	na	na	na
Italy	**3.66 *****	**2.99 *****	na	na	na
Portugal	0.34	0.83	na	na	na
Spain	**1.55 ***	**1.38 ***	na	na	na

Panel A of the table reports the number of contemporaneous cojumps identified by applying (5) on jumps identified by applying the Lee and Mykland (2008) test adjusted by the intraday periodicty of volatility according to Boudt et al. (2011), defined in (3) and (4), at the 5% significance level. Moreover, in order to identify a sufficient number of cojumps for further analysis, we define a cojump if two or more jumps occured in a 15-minute time window. P(Cojump—Jump) denotes the probability of a cojump given that at least one of the country had a jump. **Panels B-C** of the table report a preliminary analysis of the degree of association between cojumps and macroannouncements and government bond auctions by applying the z-test to compare the frequency of cojumps occurrence around the event in analysis with respect to no-event. The null hypothesis is that the two percentages are equal. We did not report tests for rating actions as we observe a very low number of cojumps around rating actions which did not allow us to carry out the tests. In case one of the two categories has less than 10 observations, the test statistic is not reported (na). As per macroannouncements, we just show the analysis according to the classification in real economy, forward looking and price releases as reported in Table II while for government bond auctions, we report only relevant countries. ***, **, and * denote 1%, 5% and 10% significance level, respectively.

Table 7: **Jumps: mean model**

	IT	FR	ES	BE	NL
constant	**-0.0084**	**-0.0267 ****	**-0.0478 ***	**-0.1207 *****	**-0.0527**
Macroannouncements - pre-release					
$\gamma_{1,2}$ (US - Chicago PMI)	**0.0081 ****	**0.0373 ****		**0.0349 ****	
$\gamma_{1,3}$ (US - Consumer confidence indicator)		**0.0702 *****			**0.0158 ****
$\gamma_{1,12}$ (US - Nonfarm payroll)	**0.0149 ****	**0.0061 ****	**0.0185 *****	**0.0588 ****	**0.0231 *****
$\gamma_{1,13}$ (US - Philadelphia FED index)			**0.0198 *****	**0.0621 *****	
$\gamma_{1,14}$ (EA - Business Confidence Indicator)				**0.0263 ****	
$\gamma_{1,18}$ (EA - Consumer confidence)	**0.0006**		**0.0138 *****		**0.024 *****
$\gamma_{1,21}$ (EA - Industrial production)	**0.0185 *****	0.0073	**0.0162 ****	**0.0742 *****	**0.0313 *****
$\gamma_{1,22}$ (EA - Introductory Statement)	**0.0118 *****	**0.0769 *****	**0.0363 ****	**0.0616 *****	**0.0134 ****
$\gamma_{1,24}$ (EA - Monthly Bulletin)		**0.0194 ****	**0.0121 ****		
$\gamma_{1,25}$ (EA - PMI Flash)	**0.0183 *****	**0.0107 ****	**0.0146 ****	**0.0523 *****	**0.007**
$\gamma_{1,26}$ (EA - PMI Final)		**0.0088 ***	**0.0111 ***	**0.0154 ***	
$\gamma_{1,29}$ (EA - Unemployment)			**0.0904 *****	**0.0274 ****	
$\gamma_{1,34}$ (DE - ZEW)		**0.0197 ****			**0.0138 ****
$\gamma_{1,32}$ (DE - Industrial production)	**0.0132 ****			**0.0282 ****	
$\gamma_{1,37}$ (IT - GDP preliminary)	**0.0179 *****		**0.0188 ***		
$\gamma_{1,40}$ (IT - Industrial production)	**0.0128 ****	**0.0054 ***	**0.0228 *****		
$\gamma_{1,42}$ (ES - Industrial production)		**0.0292 *****	**0.0726 *****	**0.0444 ****	
$\gamma_{1,53}$ (BE - Business confidence)	**0.0207 *****		**0.0266 ****	**0.0253 ****	
Macroannouncements - post-release					
$\gamma_{2,2}$ (US - Chicago PMI)			**1.728 ***		
$\gamma_{2,2}$ (US - Consumer confidence indicator)		**1.9614 *****		**1.5691 *****	**3.5726 ***
$\gamma_{2,4}$ (US - CPI)		**6.6378 *****	0.9187	**1.7196 ****	**12.8312 *****
$\gamma_{2,5}$ (US - Durable goods)			**1.7335 ***		
$\gamma_{2,6}$ (US - Factory orders)	**1.147 ***				**5.2546 ****
$\gamma_{2,7}$ (US - GDP advance)	**3.5485 *****	**4.5319 *****	**5.7478 *****	**4.9873 *****	**8.4896 *****
$\gamma_{2,8}$ (US - GDP preliminary)			**2.8208 ***		
$\gamma_{2,11}$ (US - Initial jobless claim)		**15.2567 ****		**9.7887 ****	
$\gamma_{2,12}$ (US - Nonfarm payroll)	**1.41 *****	**2.029 *****	**2.3598 *****	**4.971 ****	**3.5279 ****
$\gamma_{2,13}$ (US - Philadelphia FED index)		**2.3236 ****		**2.7091 *****	
$\gamma_{2,15}$ (US - Retail sales)	**2.356 *****		**3.0100 ****	**1.1768 ****	**9.2224 *****
$\gamma_{2,16}$ (US - University of Michigan)			**4.5626 ****		**2.2563**
$\gamma_{2,17}$ (EA - Business climate)	**5.0975 *****			**1.1355 ***	**7.313 *****
$\gamma_{2,22}$ (EA - Introductory Statement)	**3.4608 *****	**1.2720 ****	**3.6751 *****	**1.4495 ****	**5.6737 ****
$\gamma_{2,24}$ (EA - Monthly Bulletin)	**5.5966 ****		**1.9078 ****		**1.6095**
$\gamma_{2,25}$ (EA - PMI flash)			**1.5258 ***		**5.0795 ****
$\gamma_{2,26}$ (EA - PMI final)	**1.4799 ****		**1.9646 ****	**2.9073 ****	
$\gamma_{2,31}$ (DE - Indusrial production)		**1.5967 ***			
$\gamma_{2,33}$ (DE - Unemployment)		**3.229 ****	**1.5679 ***	**5.2105 *****	
$\gamma_{2,45}$ (ES - Industrial production)	**1.8163 ****		**2.3331 ****	**3.6045 *****	
$\gamma_{2,46}$ (ES - Unemployment)			**6.0707 ****		**8.7454 *****
$\gamma_{2,55}$ (GR - GDP preliminary)		**1.3366 ***	**1.5768 ***		
$\gamma_{2,66}$ (NL - CPI)				**0.121**	**7.5757 *****
$\gamma_{2,67}$ (NL - Industrial production)					**4.2871 ****
Auctions - pre-release					
$\gamma_{1,62}$ (Germany)	**0.0133 ****	**0.0173 ****	**0.0136 ****		
$\gamma_{1,63}$ (Greece)		**0.0205 ****		**0.1833 ***	**0.0183 ****
$\gamma_{1,64}$ (Italy)	**0.0281 *****		**0.0212 *****		
$\gamma_{1,65}$ (Spain)			**0.0276 *****		
Auctions - post-release (bid-to-cover)					

Table 7: **Jumps: mean model**

	IT	**FR**	**ES**	**BE**	**NL**
$\gamma_{2,59}$ (Belgium)			1.192	**2.2455 ***	
$\gamma_{2,62}$ (Germany)	**1.2966 ***	**10.4972 *****	**2.5659 ****	**5.0824 ****	**4.5817 ****
$\gamma_{2,65}$ (Spain)			**3.4627 *****		
Auctions - post-release (average yield)					
$\gamma_{2,71}$ (France)	**0.0281 *****		**0.0212 *****		
$\gamma_{2,72}$ (Germany)	**0.0133 ****	**0.0173 ****	**0.0136 ****		
$\gamma_{2,74}$ (Italy)		**0.0205 ****		**0.1833 ***	**0.0183 ****
$\gamma_{2,77}$ (Spain)			**0.0276 *****		
Rating actions					
$\gamma_{2,78}$ (S&P)	0.0025			0.0041	

The table reports the estimates for the mean equation of the Tobit-GARCH model in (8). The dependent variable is the absolute size of jumps identified by applying the Lee and Mykland (2008) test corrected by the intraday periodicity of the volatility as proposed by Boudt et al. (2011) and defined in (3) and (4). **Macroannouncements and auctions pre-release** are dummy variables taking value equal to 1 for time intervals preceding the release up to 1 hour before. **Macroannouncements and auctions post-release** effect is captured by the absolute size of surprise associated to the specific release. For bond auctions we define surprise as the difference in average yield and bid-to-cover with respect to the previous auction. These "surprises" are available just for 10-year bond auctions. Surprises are loaded by specifc polynomial which have a decay structure as proposed by Andersen and Bollerslev (1998) up to 1 hour after the release. **Rating actions** are dummy variables taking value 1 for time intervals following the action up to 2 hours after the release, zero otherwise.
We report just variables which are significant at 10% level for at least one country. In some cases estimates are missing because the correspondent dependent variable was not selected in the pre-selection procedure described in Section 4.2. Estimates for the periodic component ξ are not reported. ***, **, and * denote 1%, 5% and 10% significance level, respectively.

Table 8: **Variance model**

	IT	FR	ES	BE	NL
ω_1	**0.0004 ***	**0.0003 ****	0.0011	**0.0018 ***	0.0006
Macroannouncements - pre-release					
$\omega_{2,2}$ (US - Chicago PMI)	**0.0002 ****	0.0001	**0.001 ***	0.0002	0.0001
$\omega_{2,5}$ (US - Durable goods)	0.0000	-0.0001	0.0003	**0.0007 ***	0.0000
$\omega_{2,9}$ (US - GDP final)	**0.0002 *****	**0.0003 *****	0.0000	**0.0011 ****	-0.0004
$\omega_{2,12}$ (US - Nonfarm payroll)	**0.0002 ****	**0.0006 *****	**0.0002 ****	0.0001	**0.0008 ****
$\omega_{2,17}$ (EA - Business climate)	**0.0035 *****	0.0000	-0.0002	-0.0001	0.0000
$\omega_{2,22}$ (EA - Introductory Statement)	-0.0001	**0.0031 ****	**0.0024 *****	**0.0012 ***	**0.001 ****
$\omega_{2,25}$ (EA - PMI flash)	0.0001	**0.0002 *****	0.0008	**0.0002 *****	0.0000
$\omega_{2,30}$ (DE - ZEW)	0.0000	**0.0001 ***	0.0003	**0.0005 ***	**0.0004 ***
$\omega_{2,40}$ (IT - Industrial production)	**0.0002 *****	0.0002	0.0003	-0.0004	-0.0001
$\omega_{2,52}$ (ES - Unemployment)	0.0000	0.0000	**0.0002 *****	-0.0004	-0.0001
Auctions - pre-release					
$\omega_{2,62}$ (Germany)	0.0009	**0.0003 ****	0.0000	-0.0001	0.0000
$\omega_{2,63}$ (Greece)	**0.0001 ***	**0.0005 ****	**0.0002 ***	0.0000	**0.0006 ****
$\omega_{2,65}$ (Italy)	**0.0007 ****	0.0000	**0.0007 ****	**0.0001 ****	0.0000
$\omega_{2,67}$ (Spain)	0.0000	0.0000	**0.0009 *****	**0.0001 ****	0.0000
β	**0.7464 *****	**0.6843 *****	**0.8043 *****	**0.7839 *****	**0.7034 *****
α_1	**0.0234 *****	**0.0104 ***	**0.0123 ****	**0.0201 ****	0.0024
Macroannouncements - post-release					
$\alpha_{2,3}$ (US - Consumer confidence)	-0.0465	**0.8687 ****	0.6867	0.0416	**0.5822 ****
$\alpha_{2,8}$ (US - GDP preliminary)	0.0012	-0.0012	**0.0949 ****	-0.0007	**0.1236 ***
$\alpha_{2,9}$ (US - GDP final)	**0.1908 ***	**0.4237 *****	**0.5281 *****	**0.3977 *****	-0.1274
$\alpha_{2,12}$ (US - Nonfarm payroll)	-0.0093	**0.1849 *****	-0.0678	**0.9214 *****	**0.1141 ****
$\alpha_{2,15}$ (US - Retail sales)	**0.1304 *****	-0.0002	**-0.0359 ***	-0.0030	**0.1184 *****
$\alpha_{2,21}$ (EA - Industrial production)	-0.0029	**0.0286 ***	-0.0887	-0.0135	-0.0001
$\alpha_{2,22}$ (EA - Introductory Statement)	**0.9606 *****	0.0214	**0.2508 ****	**0.3083 ****	**0.2266 ****
$\alpha_{2,26}$ (EA - PMI final)	**0.3424 ****	**0.3635 ****	**0.0993 ***	-0.0865	0.0239
$\alpha_{2,31}$ (DE - Industrial production)	-0.0923	**0.1913 ***	**-0.0986 ***	-0.0080	-0.0180
$\alpha_{2,33}$ (DE - Unemployment)	**0.3564 *****	-0.0131	-0.0393	**0.0119 ****	**0.2223 ****
$\alpha_{2,37}$ (IT - GDP final)	**0.0881 *****	**0.1445 ***	-0.0391	**0.2002 ****	-0.0127
$\alpha_{2,45}$ (ES - Industrial production)	-0.0089	-0.0225	**0.2531 *****	-0.0420	**0.4423 *****
$\alpha_{2,46}$ (ES - Unemployment)	**0.1847 *****	0.0232	**0.0585 ****	-0.0376	0.0191
$\alpha_{2,53}$ (BE - Business confidence)	-0.0009	**0.0735 *****	**0.2813 ****	**0.2694 *****	-0.0026
Auctions - post-release (bid-to-cover)					
$\alpha_{2,61}$ (Italy)	-0.0018	**0.0942 ****	**0.0201 ***	**0.2105 ****	-0.0022
$\alpha_{2,67}$ (Spain)	-0.0114	**0.0232 ***	**0.1352 *****	-0.0483	**0.3068 *****
Auctions - post-release (average yield)					
$\alpha_{2,75}$ (Belgium)	**0.0834 ***	-0.0193	**0.0152 ***	0.0026	-0.0113
$\alpha_{2,75}$ (Germany)	**-0.041 ****	-0.0717	-0.0179	0.0008	**0.0139 ***
$\alpha_{2,75}$ (Italy)	**0.1523 *****	**-0.0850 ***	0.0026	**0.3799 ****	0.0031
ν_1	**0.4983 ****	**0.0584 ****	**0.0313 ****	**0.0244 ***	**0.0683 *****
Macroannouncements - post-release - Asymmetric effect					
$\nu_{2,5}$ (US - Durable goods)	**0.0975 ***	**0.372 ****	0.0401	-0.0249	-0.0814
$\nu_{2,9}$ (US - GDP final)	-0.0913	-0.1682	**0.1598 ***	**0.3252 *****	-0.0035
$\nu_{2,12}$ (US - Nonfarm payroll)	**0.6542 ****	-0.0966	0.0324	0.0501	**0.4138 *****
$\nu_{2,13}$ (US - Philadelphia FED Index)	0.0117	**0.5959 *****	**0.7321 *****	-0.0169	-0.0272
$\nu_{2,21}$ (EA - Industrial production)	**0.0996 ***	-0.0171	0.0083	-0.0731	**0.2282 ****
$\nu_{2,22}$ (EA - Introductory Statement)	-0.0722	**0.4025 *****	-0.0076	**0.0476 *****	-0.0297
$\nu_{2,26}$ (EA - PMI final)	**0.0984 ***	**-0.3264 ****	-0.0849	-0.0145	**-0.5248 ****
$\nu_{2,28}$ (EA - Retail sales)	**0.1041 ***	**0.1963 ***	**0.2745 *****	-0.0505	-0.0332
$\nu_{2,32}$ (DE - Industrial production)	**0.0989 ****	-0.0090	**0.2542 ****	**-0.1686 ****	-0.0983
$\nu_{2,35}$ (IT - Business confidence)	0.0033	0.0012	**0.3218 ****	-0.0156	**-0.6209 ****
$\nu_{2,39}$ (IT - GDP final)	**0.3359 *****	**0.1222 ****	**0.1038 ***	-0.0523	-0.0168

Table 8: **Variance model**

	IT	**FR**	**ES**	**BE**	**NL**
$\nu_{2,44}$ (ES - GDP Final)	**0.1376 ****	**0.3167 *****	**0.537 *****	-0.0785	-0.0031
$\nu_{2,45}$ (ES - Industrial Production)	0.0933	0.1370	-0.0307	**-0.1071 ****	-0.0539
$\nu_{2,46}$ (ES - Unemployment)	0.0008	0.0434	**0.3021 ****	**0.2864 ****	**0.4323 *****
$\nu_{2,53}$ (BE - Business confidence)	**0.0931 ***	0.1102	**-0.1317 ***	**-0.1822 ****	-0.0033
$\nu_{2,57}$ (GR - Unemployment)	-0.0977	**0.3788 ****	-0.0043	-0.1817	-0.0645
$\nu_{2,67}$ (NL - Industrial production)	-0.0405	**0.2785 ****	**0.3803 ****	-0.0674	**-0.1253 ***
Auctions - post-release (average yield) - Asymmetric effect					
$\nu_{2,72}$ (Germany)	0.0436	**0.1068 ***	0.0118	**-0.3326 *****	**-0.3062 *****
$\nu_{2,74}$ (Italy)	**0.1998 ****	**0.4182 *****	**0.1605 ****	-0.0148	-0.0800
$\nu_{2,77}$ (Spain)	**0.0499 ***	-0.0394	**0.0657 ***	0.0000	-0.0042

The table reports the estimates for the variance equation of the Tobit-GARCH model in (9). The dependent variable is the absolute size of jumps identified by applying the Lee and Mykland (2008) test corrected by the intraday periodicity of the volatility as proposed by Boudt et al. (2011) and defined in (3) and (4). **Macroannouncements and auctions pre-release** are dummy variables taking value equal to 1 for time intervals preceding the release up to 1 hour before the release. **Macroannouncements and auctions post-release** effect is captured by dummy variables equal to 1 for large surprise. Large surprises are defined as: —Surprise— $\geq$0.5 SD(Surprise). For bond auctions we define surprise as the difference in average yield and bid-to-cover with respect to the previous auction. These "surprises" are available just for 10-year bond auctions. Surprises are evaluated up to 1 hour after the release. **Rating actions** are dummy variables taking value 1 for time intervals following the action up to 2 hours after the release, zero otherwise. **Macroannouncements and auctions post-release - Asymmetric** and **Rating actions - Asymmetric** are defined as for Macroannouncements and auctions post-release. We report just variables which are statistically significant at 10% level for at least one Country. ***, **, and * denote 1%, 5% and 10% significance level, respectively.

Table 9: **Cojumps: logit model**

Constant	-3.1535 ***
Macroannouncements - pre-release	
$\gamma_{1,9}$ (US - Business inventories)	-0.7571 ***
$\gamma_{1,12}$ (US - Non-farm payroll)	1.2695 ***
$\gamma_{1,19}$ (EA - Business confidence indicator)	-0.6844 **
$\gamma_{1,22}$ (EA - Introductory Statement)	0.5952 **
$\gamma_{1,23}$ (EA - Monthly Bulletin)	0.7094 ***
$\gamma_{1,25}$ (EA - PMI flash)	0.7348 ***
$\gamma_{1,26}$ (EA - PMI final)	0.6965 ***
$\gamma_{1,27}$ (DE - ZEW)	0.4141 *
$\gamma_{1,36}$ (IT - GDP Final)	1.3138 ***
$\gamma_{1,55}$ (BE- Business confidence)	0.4185 **
Macroannouncements - post-release	
$\gamma_{2,7}$ (US - GDP advance)	0.3778 **
$\gamma_{2,12}$ (US - Nonfarm payroll)	0.4067 ***
$\gamma_{2,14}$ (US - Production index)	-0.4609 **
$\gamma_{2,15}$ (US - Retail sales)	0.3682 ***
$\gamma_{2,26}$ (EA - PMI final)	0.1006 *
$\gamma_{2,24}$ (EA - Introductory Statement)	0.6468 ***
$\gamma_{2,31}$ (DE - Business confidence)	0.1133 *
$\gamma_{2,44}$ (ES - GDP final)	1.2294 ***
$\gamma_{2,45}$ (ES - Industrial production)	0.2207 ***
Auctions - pre-release	
$\gamma_{1,59}$ (Belgium)	0.3908 *
$\gamma_{1,64}$ (Italy)	0.4389 **
$\gamma_{1,66}$ (Portugal)	-0.6717 **
Auctions - post-release (average yield)	
$\gamma_{2,64}$ (Italy)	0.8793 **
$\gamma_{2,67}$ (Spain)	3.1284 ***
Test statistics	
LogL	-4,888.52
LR test	346.38 ***
Area under ROC curve	0.61

The table reports the estimates for the logit model on cojumps. The dependent variable is the contemporaneous Cojump defined in (5) based on jumps identified according to Lee and Mykland (2008) test corrected by the intraday periodicity of the volatility as proposed by Boudt et al. (2011) and defined in (3) and (4). The interecept of the logit model is corrected by (10) as suggested by the prior correction approach. **Macroannouncements and auctions pre-release** are dummy variables taking value equal to 1 for time intervals preceding the release up to 1 hour before the release. **Macroannouncements and auctions post-release** effect is captured by the absolute size of surprise associated to the specific release. For bond auctions we define surprise as the difference in average yield and bid-to-cover with respect to the previous auction. These "surprises" are available just for 10-year bond auctions. Surprise effects are taken into consideration up to 1 hour after the release. We report just variables which are statistically significant at 10% level. ROC curve: receiver operating characteristic curve. ***, **, and * denote significance at 1%, 5% and 10%, respectively.