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Market price effects of agency sovereign debt announcements: Importance of prior credit states☆

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ABSTRACT

This paper investigates the price response to credit rating agency (CRA) announcements on sovereign bonds. We characterize credit rating events controlling announcements for the prior credit state – outlook, watch/review, or stable status as well as the level of the credit rating. Emphasizing the transition from one state to another allows us to distinguish between different types of announcement (rating changes, watch and outlook events) and their price effects. We also investigate whether price responses have diminished since the Global Financial Crisis (GFC). We employ an event study methodology and gauge market response by standardized cumulative abnormal returns (SCAR) and directional change statistics in daily credit default swap (CDS) spreads. We find that rating announcements provide a rich and varied set of information on how credit rating agencies influence market perceptions of sovereign default risk. CRA announcements continued to have significant effects on CDS spreads after the GFC, but the magnitude of the responses generally fell. Moreover, we find that accurate measurement of these effects depends on conditioning for the prior credit state of the sovereign bond.

1. Introduction

Critical views of credit rating agencies and the value of their rating judgments became commonplace during the Global Financial Crisis (GFC) and European Sovereign Debt Crisis– especially in light of the conflicts of interest and mispricing of risk on mortgage-backed securities and other derivatives. Indeed, the International Organization of Securities Commissions (IOSCO) revised the Code of Conduct Fundamentals for credit Rating Agencies in 2008 to address issues of independence, conflict of interest, transparency and competition. And a new government entity was set up in the United States, the Office of Credit Ratings (OCR), as part of the Dodd-Frank Act, to monitor and regulate credit rating agencies. The 2015 OCR report documented continued problems with how credit rating agencies (CRAs) function and how they have failed to follow regulator rules. In the Eurozone, Greece, Ireland and Portugal have been particularly affected by credit downgrades, with one or more CRAs downgrading their bonds to "junk" status at some point since spring

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2010. Many officials publicly stated that these downgrades accelerated a burgeoning Eurozone sovereign debt crisis and, partly in response to this criticism, several new regulations and rules on CRAs have been put in place by the European Commission (EC). An EC memo explaining the new rules states: "CRAs have a major impact on today's financial markets, with rating actions being closely followed and impacting on investors, borrowers, issuers and governments: e.g. sovereign ratings play a crucial role for the rated country, since a downgrading has the immediate effect of making a country's borrowing more expensive." (European Commission (2013)). The new legislation requires CRAs operating in Europe to register with the Committee of European Securities Regulators (CESR), and the regulation of CRAs is under the European Securities and Markets Authority (ESMA).

It is not clear, however, whether credit rating agencies play such a pervasive role in the pricing of sovereign risk as their critics assume, especially since they were "discredited" with their systematic underpricing of CDOs (Collateralized Debt Obligations) during the GFC. There is some evidence that CRAs primarily gather publicly available information from various sources, incorporating this into a single measure of default risk (S&P (2012)). In this case, markets would most likely have already incorporated the same information used by CRAs into risk pricing, such as macro fundamentals or bond prices, with little value added by the agencies and only a small price effect from rating changes. Moreover, credit rating changes would especially be limited if one or more agencies had already previously placed a particular sovereign bond on watch or outlook status–signals designed to forewarn market participants of changing economic and political conditions, rating reviews and possible rating changes. And if CRAs systematically under- or over-estimate risk assessments, as with CDOs prior to the onset of the GFC, then one would expect markets to largely discount credit-rating changes.[1]

The GFC and the Euro area sovereign debt crisis increased concerns about the information content of credit ratings and their association with sovereign spreads and default risk. Reviewing recent literature and developments in sovereign ratings, Powell (2013) addresses the criticism directed toward rating agencies for downgrading highly rated sovereigns. Arezki, Candelon, and Sy (2011) find that these downgrades also had significant spillover effects both across countries and financial markets. Aizenman, Hutchison, and Jinjarak (2013b) investigate the euro debt crisis in the context of the pricing of sovereign debt, and find a complex and time-varying environment with a key role for fiscal space in pricing sovereign risk. Aizenman et al. (2013a) find that the association between credit rating changes and sovereign spreads shifts between the pre-crisis and crisis periods.

Against this background, the foci of our study are two-fold. First, our primary objective is precisely measuring the information value of various CR announcement on the CDS spreads of sovereign bonds. We account for prior information associated with the status of a sovereign bond at the time of agency announcements, i.e. whether bonds are on outlook, watch or stable/developing status. For example, the response of a credit rating downgrade would in principle be much larger if the bond in question was on a "stable" status than on a "negative watch" status since the latter is already signaling the strong likelihood of downgrade. Similarly, the announcement of "negative watch" for a sovereign bond when the prior status is "stable" would in principle be larger than if the prior status was "negative outlook" since the latter is already signaling some weakness. These distinctions prove critical for accurate assessments of information value. Second, we investigate whether the information value of CRA announcements has diminished following the GFC.

To this end, three main questions are addressed: First, do CRAs provide information value to market participants, thereby having substantial impacts on risk pricing? Second, how has this information value changed since the GFC? Third, in addition to rating changes, are supplementary announcements by credit rating agencies, in particular watch/review, outlook or stable/developing designations, incorporated into the market pricing of default risk?

To address our research questions, we employ an event study framework using daily data, calculating (standardized) abnormal returns to assess the information value of rating announcements. We consider a two-day event window, as well as two pre-event windows and a post-event window to measure the effects of conditional announcements and the extent to which they are persistent and anticipated. To evaluate market assessments of sovereign default risk, we employ credit default swap (CDS) spreads on sovereign bonds. These spreads are closely related to expectations, as reflected in market prices, of the probability of sovereign default. Our sample spans 55 advanced and emerging market economies, using daily data from January 1, 2005 to December 31, 2012. Our sample is defined by countries with functioning CDS markets – CDS transactions on sovereigns were severely regulated in the EU in recent years– and with sovereign bonds rated by the CRAs.

Summarizing our main conclusions, we find that credit agency announcements have a statistically significant and economically important impact on CDS spreads. Following the GFC, however, some "discounting" of the information value of the CRA announcements is evident. In particular, the effect on CDS spreads was generally less after the GFC, especially the responses to credit downgrades and upgrades transitioning from the stable/developing state. Spreads also responded less to negative watch announcements and to negative outlook announcements transitioning from the stable/developing state. It is evident that accurate measurement of these effects depends importantly on conditioning the prior-state of the sovereign bond prior to the credit rating announcement.

The remainder of this paper is organized as follows. We start with a brief overview of the background literature in Section 2 and also discuss theoretical predictions and our main contributions. We then present data and methodology in Section 3, and our empirical results in Section 4. We conclude in Section 5.

2. Literature review and hypotheses

2.1. Literature review

In theory, CRAs provide valuable information to investors about the riskiness of sovereign bonds. This information provision may

[1] For discussion on methodological changes in CRAs in post GFC, for example, see Amstad and Packer (2015).

work through several channels.[2] CRAs may add valuable information to markets in a world of asymmetric information, where payoffs depend on noisy ex-post monitors of information quality.[3] CRAs also provide certification services in many countries. In particular, ratings are often used to classify as either investment or non-investment grade, which influences institutional demand and market liquidity, and serve as triggers in investment decisions and regulatory oversight.[4] Finally, CRAs may serve as monitors and help co-ordinate investors' beliefs in situations where the possibility of multiple equilibria is present.[5]

Some of the earliest papers investigating the impact of credit rating changes on corporate asset prices are Weinstein (1977), focusing on bond prices, and Pinches and Singleton (1978) focusing on stock prices. In terms of sovereigns, Cantor and Packer (1996) is the first study of which we are aware to investigate the impact of CRA announcements on daily sovereign bond prices. Their study, based on sovereign bond spreads for advanced and emerging economies, finds that the single rating variable explains 92 percent of the cross-country variation in spreads. Most of the correlation appears to reflect similar interpretations of publicly available information by the rating agencies and by market participants. In their event study analysis, using daily data, they find evidence that the rating agencies' opinions independently affect market spreads, especially in the case of non-investment grade sovereigns. In particular, they consider announcements by Moody's or Standard and Poor's between 1987 and 1994 that indicated a change in sovereign risk assessment for countries with dollar bonds that traded publicly during that period. This gave them a sample of seventy-nine announcements in eighteen countries, thirty-nine (forty) of which were actual rating changes (outlook, watch/reviews). They considered a two-day window, the day of and the day after the announcement, to capture the immediate effect.[6] Within this window, relative spreads rose 0.9 percentage points for negative announcements and fell 1.3 percentage points for positive announcements. For the full sample of seventy-nine events, the impact of rating announcements on dollar bond spreads is highly statistically significant.

Other studies consider the impact of CRA announcements on equity prices (e.g. Dichev and Piotroski (2001); Vassalou & Xing, 2003), corporate and sovereign bond prices (e.g. Hamilton and Cantor (2004); Hite and Warga (1997); Steiner and Heinke (2001); Gande and Parsley (2005), foreign exchange rates (e.g. Alsakka and ap Gwilym (2012)), and CDS spreads (e.g. Hamilton and Cantor (2004); Hull, Predescu, and White (2004); Finnerty, Miller, and Chen (2013)).

Several asymmetries in the responses of asset prices to credit rating announcements have been found in the literature. In particular, previous studies have tested the hypothesis that outlook and watch events have more impact on market prices than actual credit rating changes. Examples providing evidence in favor of this hypothesis on CDS spreads for bond markets is reported by the IMF (2010) and Hull et al. (2004), on the foreign exchange market by Alsakka and ap Gwilym (2012), and on the stock market by Norden and Weber (2004). Hull et al. (2004), for example, consider the relationship between the credit default swap market and ratings announcements for CDS spreads on corporate bond issues. They find that reviews (watches) for downgrade contain significant information, but actual credit downgrades and negative outlooks do not.

Another asymmetry is that most studies in this literature find that negative events (credit downgrades or negative outlook/watch announcements) have a greater impact on asset prices than do positive events (upgrades or positive outlook/watch). In particular, a number of papers find that negative rating events impact own country asset prices movements (and cause significant spillovers to other countries asset prices), while upgrades have limited or insignificant impacts (e.g. Brooks, Faff, Hillier, and Hillier (2004); Gande and Parsley (2005); Ferreira and Gama (2007); Hooper, Hume, and Kim (2008); Hill and Faff (2010); Afonso et al. (2012).

Alsakka & ap Gwilym (2010), for example, argue that negative credit announcements are typically more informative than positive ones because of the stronger negative reputational effects for an agency being tardy in the case of downgrades. This may be because issuers have little incentive to leak negative news prior to a downgrade, while they may do so for positive news prior to an upgrade.

However, a number of studies find the opposite result: positive CRA announcements have a larger market impact. Cantor and Packer (1996), Ismailescu and Kazemi (2010) and Finnerty et al. (2013) find that positive credit rating events have a greater impact on asset prices than negative events. These are quite diverse studies as Cantor and Packer (1996) focus on sovereign bond spreads, Ismailescu and Kazemi (2010) investigate CDS spreads on sovereign bonds for emerging markets, and Finnerty et al. (2013) consider CDS spreads on corporate senior-debt tier credit ratings.

Our contributions to the literature are to address (1) changes in the effects of CRA announcements on asset prices generally, and CDS on sovereign bonds in particular, since the GFC; and (2) condition our events carefully on the basis of outlook, watch or stable/developing assignments on sovereign bonds in analyzing the effects of credit rating changes or other agency announcements. These transitions vary substantially, as documented and discussed below. A few studies have conditioned on prior announcements of watch and outlook in selecting a "control" sample (Finnerty et al. (2013)) for corporate rating changes, or to calculate transition likelihoods for upgrades and downgrades on corporate bonds (Hamilton and Cantor (2004)). We contribute to this literature by considering for sovereign bonds all of the possible states of transition for credit rating change announcements as well as outlook and watch announcements, separately estimating impact effects on asset prices.[7]

[2] See Kiff et al. (2012) for a review of the literature.

[3] See Millon and Thakor (1985).

[4] Ratings are also frequently employed to calculate Basel II risk-based capital requirements and serve other regulatory functions.

[5] See Boot, Milbourn, and Schmeits (2006).

[6] The announcements are not time-stamped so they could not ascertain if the announcements occurred before or after the daily close of the bond market.

[7] Our focus is on the effects of credit rating changes on CDS spreads.

2.2. Predictions: Post GFC and conditional on prior states

We begin by identifying whether an announcement constitutes a positive or negative event. All positive (negative) events, whether rating change or outlook/watch announcements, are predicted to lower (raise) CDS spreads. Although all positive (negative) credit rating and watch announcements are positive (negative) events, assessing whether outlook and stable/developing announcements are positive or negative events depends on the prior credit status of the bond. In addition, we identify the relative information value (strength of the signal) of the event which in turn depends on the prior state, i.e. whether the sovereign bond is on stable/developing, watch or outlook status. The greater the information value, the larger (absolute value) predicted impact on CDS spreads.

The first area of investigation leads to a straight-forward prediction. If CRAs are generally discredited by their systematic failure to accurately judge credit risk of certain derivative products in the run-up to the GFC, then we would expect investors to discount the information value of their credit announcements. To the extent that this carries over to doubts about CRA judgement of sovereign default risk, the implication is that their announcements have less effect (in absolute value) on CDS spreads in the post-GFC period than the pre-GFC period.

The second area of investigation relates to the importance of conditioning on prior credit states in evaluating the effect of CRA announcements. This issue may be addressed by the type of CRA announcement and the transition from the prior state, highlighting both the expected sign and magnitude of the CDS spread response.

Credit rating upgrades (downgrades) are positive (negative) events, irrespective of the prior state. However, the information value is stronger (largest surprise component) if the bond is on stable status rather than outlook or watch status when the credit rating change is announced. The reason for this is that stable is a neutral status about the likelihood of future credit rating changes, while outlook or watch status is a leading indicator of likely future credit rating changes. The least information value (least surprising) associated with a credit rating change is when a bond is already on watch status at the time of the credit rating change. CRAs view watch status as a strong signal of a likely near-term credit rating change, so relatively little new information is revealed when the actual credit rating is announced.

Positive (negative) watch announcements are positive (negative) events, but predicted to have greater information value when the bond is transitioning from stable status rather than from positive (negative) outlook status as the latter already incorporates a signal of the credit rating agencys views on the credit status of the bond.

Positive (negative) outlook announcements are positive (negative) events when the transition is from stable/developing status, but a negative (positive) event if the transition is from positive (negative) watch status. This latter prediction arises since watch status is signaling a likely near-term credit rating change, and a change to outlook status indicates that the likelihood of a credit rating change is now less imminent.

Finally, *announcement of stable/developing status* from positive (negative) watch or outlook status is a negative (positive) event since the CRA is signaling that it *no longer* views a rating change as likely in the short-term (from watch status) or medium-term (from outlook status).

This discussion highlights how the sign and the magnitude of the CDS response to credit rating agency announcements depends on the prior state, and how unconditional estimates of CDS responses may be misleading. In the “preliminaries” part of the empirical results section we present the historical statistics associated with the “transition matrix” of agency announcements and the expected effects on CDS spreads.

3. Data and methodology

3.1. Data

We use daily data in our analysis, ranging from January 1, 2005 to December 31, 2012 for 55 countries.[8] Daily data on CDS prices were taken from Markit. The data are unavailable for some issuers on some days owing to a lack of liquidity; we do not interpolate across announcement days but close the gap by assuming the latest price prevails until a new price is available. The data are 5-year on-the-run CDS spreads in US dollars on sovereign bonds. The quoting convention for CDS is the annual premium payment as a percentage of the notional amount of the reference obligation. The sovereign CDS spreads are reported in basis points, with a basis point equal to $1000 to insure $10 million of debt.[9]

The credit ratings are taken from S&P, Moody’s and Fitch. For consistency and comparison across agencies, we consider sovereign rating changes on long-term foreign currencies. Rating agencies apply an ordinal-alphabetic scale reflecting an opinion about credit risk, i.e. the agency’s judgment about the ability and willingness of a debtor to meet its obligations in full and on time. For example, S&P provides 25 rating categories, ranging from ‘AAA’, described as ‘extremely strong capacity to meet financial commitments’, to ‘D’, described as ‘payment default on financial commitments’. In its description of the credit ratings, S&P notes that likelihood of default is the single most important factor in its assessment of creditworthiness, but that reasons for ratings adjustments vary, and may be broadly related to overall shifts in the economy or business environment, or more narrowly focused on circumstances affecting a specific industry, entity, or individual debt issue, e.g. the creditworthiness of a state or municipality may be impacted by population shifts or lower incomes of taxpayers, which reduce tax receipts and ability to repay debt (S&P (2013)). In terms of sovereign ratings, S&P states that five

[8] The sample is limited to 2012 due to weakening price discovery and shallow liquidity following the European dept crisis and related regulations.

[9] Online Appendix Table A1 and A2 provide summary statistics on the CDS spreads, and the number of upgrade and downgrade events for each country in our sample.

factors form the foundation of its sovereign credit analysis: institutional effectiveness and political risks; economic structure and growth prospects; external liquidity and international investment position; fiscal performance and flexibility, as well as debt burden; and monetary flexibility (S&P (2012)).

In addition to credit ratings, however, CRAs also provide signals about the possibility of future credit rating changes. These signals, for S&P announcements (the other CRAs have similar designations), take the form of either "outlook" or "watch" designations. The outlook and watch designations may be either positive or negative, signaling the likelihood and direction of a future rating change. The two other designations are "stable" and "developing", where the latter signals an uncertain state of events. Rating agencies have different horizons for outlook and watch designations. For instance, S&P describes the outlook horizon as 6–24 months ahead, and the watch horizon as within 3 months. Fitch Ratings (2017) writes: "Outlooks indicate the direction a rating is likely to move over a one-to two-year period. They reflect financial or other trends that have not yet reached or been sustained the level that would cause a rating action, but which may do so if such trends continue… Outlooks can be raised or lowered without a prior revision to the Outlook." On the other hand, "Rating Watches indicate that there is a heightened probability of a rating change and the likely direction of such a change… A Rating Watch is typically event-driven, and as such, it is generally resolved over a relatively short period. The event driving the Watch may be either anticipated or have already occurred, but in both cases, the exact rating implications remain undetermined. The Watch period is typically used to gather further information and/or subject the information to further analysis…"

3.2. Methodology

To determine the impact of credit rating events on the sovereign CDS markets, we employ an event study methodology. We use daily data on sovereign CDS spreads and rating announcements. The raw sample includes 55 countries and 1221 rating announcements.

3.2.1. Event window

Define day 0 as the day of a credit rating event for a sovereign CDS issuer. Since our data covers only weekdays, our event windows are also defined on weekdays. Define day n as the day that is n weekdays ahead of the event day and $[a, b]$ as the $(b - a + 1) -$ day window from the beginning of day a (or equivalently, the close of day $(a - 1)$) to the close of day b. For example, suppose an event falls on Wednesday. The interval $[0, +4]$ refers to the one-week period from the beginning of Wednesday to end of the next Tuesday[10].

The event window is set to be 11 weeks, starting 8 weeks before a credit rating event and ending 3 weeks after an event. The preceding period of 8 weeks was selected as the preceding period because rating agencies seek to act upon material information within three months (Keenan, Fons, and Carty (2000, pp. 477–533)).

The event window is divided into four intervals: $[-40, -15]$, 8 to 3 weeks prior to a rating event; $[-14, -1]$, 3 weeks to one weekday before a rating event; $[0, +1]$, the event day and the subsequent day; $[+2, +14]$, two weekdays to three weeks after the event. If a negative rating event has an impact on market sentiments, then we anticipate a positive/negative significant CDS return on $[0, +1]$. If the market expects the credit rating event prior to its announcement, then the returns in the first two intervals $[-40, -15]$ and $[-14, -1]$ would be statistically significant.

3.2.2. Excluding overlapping events

When a credit rating event is preceded by another event within a short period of time, then the impact of the announcement may be muted. Following standard practice, we therefore exclude any event that is preceded by another event within three weeks when evaluating the effects of credit rating announcements. If two events of opposite nature (e.g., an upgrades and a downgrade for the same country) occur on the same day, then we exclude both events. If two events of the same type (e.g., downgrades for the same country) are on the same day, then these two events are counted as one event in the sample.

3.2.3. Calculation of daily and abnormal return

Let $R^C_{i,t}$ designate the observed arithmetic sovereign CDS return for country i at day t:

$$R^C_{i,t} = \frac{S_{i,t}}{S_{i,t-1}} - 1. \tag{1}$$

A positive spread change or a positive CDS return following a credit rating announcement can imply a significant effect of the credit rating event, but it can also stem from market-wide factors that move all prices simultaneously. To disentangle the country-specific spread change from the market-wide movement, we calculate the abnormal return for country i's CDS. The abnormal return $AR^C_{i,t}$ for security i at day t is the difference between the actual return $R^C_{i,t}$ and the return as predicted by the market model:

$$AR^C_{i,t} = R^C_{i,t} - \alpha^C_i - \beta^C_i R^C_{k,t}, \tag{2}$$

where we define the market CDS spread at time t to be the simple average of all sovereign CDS spreads in our sample at time t[11]:

[10] In some literature, (a, b) is known as the $(b - a)$- day interval from the end of day a to end of day b.

[11] As a robust test we also employ a GDP-weighted average of CDS spreads, calculated by the Bank for International Settlements, as an alternative for the market portfolios.

$$S_{k,t} = \frac{1}{N}\sum_{i=1}^{N} S_{i,t}, \tag{3}$$

and the market CDS return is given by

$$R^{C}_{k,t} = \frac{S_{k,t}}{S_{k,t-1}} - 1. \tag{4}$$

In our sample, the number of countries $N = 55$. The parameters α_i^C and β_i^C are estimated over a six-month (26-week) period preceding each event window. Cumulative abnormal returns (CAR) over the event window are given by

$$CAR^{C}_{i,[t+w_1,t+w_2]} = \sum_{s=t+w_1}^{t+w_2} AR^{C}_{i,s}, \tag{5}$$

where $t + w_1$ ($t + w_2$) is the first (last) day of the event window. Whether an abnormal return is sufficiently high to justify the effect of the credit rating announcement depends on the volatility or the standard deviation of the abnormal return. We, therefore, standardize the abnormal return on one single trading day by its standard deviation

$$SAR^{C}_{i,t} = \frac{AR^{C}_{i,t}}{\widehat{s}_i^{C}\sqrt{1+\frac{1}{T}+\frac{\left(R^{C}_{k,t}-\widehat{R}^{C}_{k}\right)^2}{\sum_{p=1}^{T}\left(R^{C}_{k,p}-\widehat{R}^{C}_{k}\right)^2}}} \approx \frac{AR^{C}_{i,t}}{\widehat{s}_i^{C}\sqrt{1+\frac{1}{T}}}, \tag{6}$$

where s_i^C is the standard deviation of the abnormal return of country i's CDS over the estimation period. See, e.g., Boehmer, Masumeci, and Poulsen (1991). Standardized cumulative abnormal returns (SCAR) for the window $[w_1, w_2]$ is

$$SCAR^{C}_{i,[t+w_1,t+w_2]} \approx \frac{CAR^{C}_{i,[t+w_1,t+w_2]}}{\widehat{s}_i^{C}\sqrt{(w_2-w_1+1)\left(1+\frac{1}{T}\right)}} \tag{7}$$

The discussion above focuses on one single event on country i and on event day t. To evaluate the average effect of one event category, e.g., all downgrades conditioning on a prior negative outlook designation, we need to aggregate the SCAR over all events in this category. Let $j = 1, 2, \ldots\ldots M$ be indices for all events in the same category. Define event j in the category to be the credit rating announcement for country i and day t:

$$SCAR^{C}_{j,[w_1,w_2]} = SCAR^{C}_{i,[t+w_1,t+w_2]}. \tag{8}$$

The standardized aggregated test statistic over all events in the category on the same the event window is given by

$$t^{S}_{M-1} = \frac{\frac{1}{M}\sum_{j=1}^{M} SCAR^{C}_{j,t}}{\sqrt{\frac{1}{M(M-1)}\sum_{j=1}^{M}\left[SCAR^{C}_{j,t}-\frac{1}{M}\sum_{j=1}^{M} SCAR^{C}_{j,t}\right]^2}} \tag{9}$$

Under H_0, the hypothesis that the credit rating events (e.g., downgrades) do not have any effect on the SCAR, the test statistic t^{S}_{M-1} follows a t-distribution with degrees of freedom $(M - 1)$. We test H_0 against the alternative hypothesis H_1 that the events have a significant effect on these CDS spreads. We document the empirical results for credit rating announcement categories with at least 4 events.

3.2.4. Number of positive/negative spread changes in the same event category

In addition to positive or negative abnormal returns, an alternative measure for the impact of a credit rating announcement on the CDS market is the spread change in the event window. On a priori grounds, a positive event should cause the CDS spread to decrease, while a negative event should cause the CDS spread to increase. If the positive/negative event category has a significant impact on CDS spreads, then we would anticipate the proportion of negative/positive spread change would be significantly higher than $1/2$ (random change). We employ the chi-square test to investigate whether the proportion of positive or negative spread changes is significantly different from $1/2$ for each event category. We term this the "directional change" test statistic.

4. Empirical results

4.1. Preliminaries

Table 1(a) shows the transition matrix from watch (negative and positive), outlook (negative and positive), and stable/developing/other status (shown in the first column) to the myriad of new status positions (shown in top row), e.g. the first element of the table shows

Table 1
aTransition matrix of outlook and watch.

New Status	Neg	Neg	Neg	Neg	Neg	Neg	Stable/	Stable/	Stable/	Pos	Pos	Pos	Pos	Total
Prior Status	Watch	Watch	Watch	Outl.	Outl.	Outl.	Dev	Dev	Dev	Outl.	Outl.	Watch	Watch	
	Downg.	N/C	Upg.	Downg.	N/C	Upg.	Downg.	N/C	Upg.	N/C	Upg.	N/C	Upg.	
Negative Watch	13	0	2	51	18	0	13	4	3	0	0	0	0	104
Negative Outlook	14	37	0	70	0	0	26	48	0	1	0	0	0	196
Stable/Dev/Others	1	34	1	10	98	1	9	0	74	77	3	7	0	315
Positive Outlook	0	2	0	0	0	0	0	28	40	0	13	24	0	107
Positive Watch	0	0	0	0	2	0	0	3	19	6	6	0	1	37
Total	28	73	3	131	118	1	48	83	136	84	22	31	1	759

The table depicts the frequencies of transitions from an outlook/watch status to another, with a credit upgrade/downgrade or without credit rating change. N/C = no credit rating change; Downg. = credit rating downgrade; Upg. = credit rating upgrade; Outl. = outlook. As an example, the $(2, 1)$ element of the matrix is 14, implying that of all the 196 negative outlook events that turn to the other states, 14 of them turn to negative watch with a downgrade. The $(2, 2)$ element of the matrix is 37, implying that 37 of them will turn to negative watch without a credit rating change. Two columns, positive outlook/watch with a downgrade, are not in this table since no events are in these two categories.

Table 1
bThe expected signs of the credit rating events, conditioned on each bond's status.

Prior Status	Transition to:	Pos(+) Neg (−) Event		No. events		Percentage	
Stable/	pos outlook	+		77		(24%)	
Developing/	pos watch	+		7		(2%)	
Others	credit upgrade	+		79		(25%)	
	and stable/developing				74		(94%)
	and pos outlook				3		(4%)
	and neg outlook				1		(1%)
	and neg watch				1		(1%)
	neg outlook	−		98		(31%)	
	neg watch	−		34		(11%)	
	credit downgrade	−		20		(6%)	
	and stable/developing/other				9		(45%)
	and neg outlook				10		(50%)
	and neg watch				1		(5%)
			Total	315		(100%)	
Positive	pos watch	+		24		(22%)	
Outlook	credit upgrade	+		53		(50%)	
	and stable/developing				40		(75%)
	and pos outlook				13		(25%)
	neg outlook	−		2		(2%)	
	stable/developing/other	−		28		(26%)	
			Total	107		(100%)	
Positive	credit upgrade	+		26		(70%)	
Watch	and stable/developing				19		(73%)
	and pos outlook				6		(23%)
	and pos watch				1		(4%)
	pos outlook	−		6		(16%)	
	stable/developing/other	−		3		(8%)	
	neg outlook	−		2		(5%)	
			Total	37		(100%)	
Negative	pos outlook	+		1		(1%)	
Outlook	stable/developing/other	+		48		(24%)	
	neg watch	−		37		(19%)	
	credit downgrade	−		110		(56%)	
	and stable/developing/other				26		(24%)
	and neg outlook				70		(64%)
	and neg watch				14		(13%)
			Total	196		(100%)	
Negative	stable/developing/other	+		4		(4%)	
Watch	neg outlook	+		18		(17%)	
	credit upgrade	+		5		(5%)	
	and stable/developing				3		(60%)
	and neg watch				2		(40%)
	credit downgrade	−		77		(74%)	
	and stable/developing				13		(17%)
	and neg outlook				51		(66%)
	and neg watch				13		(17%)
			Total	104		(100%)	

All credit upgrades are positive events, while all credit downgrades are negative events. Entering the same outlook/watch status without credit rating change can be a positive or a negative event. For example, a move to positive outlook is a negative news signal if it is from a prior status of positive watch; a move to negative outlook is a positive news signal if it is from a prior status of negative watch.

that from negative watch status there are 13 credit rating downgrades combined with continued negative watch status. The table shows that there are a total of 759 transitions in our data set (last column), of which most are from stable/developing status (315), followed by negative outlook (196), and least from positive watch status (37). The most frequent transitions (136) are upgrades combined with stable/developing status. Outside of 4 "outliers" (seemingly contradictory moves), the least common transitions are moves from positive watch to an upgrade combined with continued positive watch (only 1 case), upgrades combined with positive outlook status (22 cases) and positive watch with no grade change (31 cases).[12] In principle, each of these transitions leads to a different set of information for investors about the default risk of sovereign bonds. The move from negative watch to a downgrade with continued negative watch (13 cases), following the previous example, has a larger negative signal than the transition from negative watch to downgrade combined with a stable/developing status (also 13 cases).

For ease of presentation, we consider the expected signs of each transition and the breakdown frequency in Table 1(b). Table 1(b)

[12] Two groups of transitions are seemingly contradictory: 3 credit upgrades combined with a negative watch status, and1credit upgrade combined with a negative outlook status.

shows the expected signs of the credit rating events, conditioned on the status of each bond (stable/developing, positive and negative outlooks, positive and negative watch/review) at the time of the announcement. We also list the number of events in each category and the percentage. We group each category by "prior status" in the first column and list the announcements (credit rating events) in the second column. For example, the first row of results indicates that credit rating agencies made 77 positive outlook announcements (without credit rating change) that were preceded by a stable/developing status. This represents 24% of the transitions from stable/developing status and we expect this to have a positive effect (falling spreads) on CDS.

It is evident from Table 1(b) that most events (315) are transitions from stable/developing status. Events from stable/developing status is the norm for sovereign bonds, followed by negative (196) and positive (107) outlook transitions. Negative watch transitions are also common. Positive watch transitions are the least frequent.

How often do sovereign bonds on watch status transition to stable/developing status, sending negative signals (transition from positive watch/outlook to stable/developing) or positive signals (removing the stigma of negative watch/outlook in a transition to stable/developing) to investors? Table 1(b) indicates that it is unusual to move from positive watch to stable/developing (8% of the transitions) and moves to positive outlook are also infrequent (16%). It is also unusual for transitions from negative watch to the "neutral" assessment of stable/developing (4%), though more common for a modest positive signal from negative watch to negative outlook (17%). By contrast, transitions from positive/negative outlook are more evenly balanced across the three categories: to credit rating changes, moves to watch status, and moves to the stable/developing designation.

The implication is that watch status is much more likely to result in a credit rating change, and therefore less likely to contain a "surprise" component than credit rating changes from outlook (uncommon) or stable/developing (very uncommon) status. The corollary is that watch status, either positive or negative, is less likely to be reversed by a move to neutral status (i.e. stable/developing) or change to the more moderate outlook status.

Table 2 provides details on the timing and dynamics of the transitions to credit rating changes. The first column of the table shows the six categories of announcements other than credit rating changes: outlook (positive and negative), watch (positive and negative), stable and developing. The second column shows the number of events, and the remaining columns show how many of these events were followed by a credit rating upgrade (columns 3–5) or credit rating downgrade (columns 6–8). The timing is grouped by 30 days or less, 61 days or less and 91 days or less. For example, there were 89 negative watches issued during our sample period, of which none were followed by an upgrade within a 91-day period. However, 17 (19%) of the negative watch assignments were followed by a downgrade within 31 days, 37 (42%) were followed by a downgrade within 61 days and 55 (62%) were followed by a downgrade within 91 days. The remaining 38% of negative watch announcements were not followed by a downgrade within 91 days. A similar pattern emerges for the positive watch events where 58% (13%, 39%) of positive watch announcements were followed by a credit rating upgrade within a three-month (one month, two month) time frame.

Table 2 supports the findings reported in Table 1. There is a symmetric and strong pattern linking negative and positive watch events to subsequent rating changes in terms of timing and likelihood. By contrast, there is a much weaker pattern associating negative and positive outlook announcements and credit rating changes, e.g. only 11% (6%) of negative (positive) outlook announcements are followed by negative (positive) credit rating changes within a 3-month period. Not surprisingly, stable and developing announcements are only infrequently followed by credit rating changes within a 3-month window.

The implication is that negative and positive watch are less frequent than outlook (or stable) announcements, but present a much stronger signal in terms of being followed by a credit rating change within a couple of months. "Watch" events have a relative short-maturity and send a strong signal that a credit rating event is likely to follow. This suggests that watch events send strong signals to the market, with the corollary that credit rating changes conditioned on prior watch status are largely predictable within a couple of months.

4.2. Full sample results

Table 3 presents the full sample results for credit rating changes conditional on prior status (Panel A) and for watch and outlook announcements conditional on prior status (Panel B). Following our theoretical discussion and findings from the statistics presented in the previous tables, we condition rating changes on the bond status immediately prior to the rating announcement. We focus on CDS returns and spreads for a two-day event window $[0, +1]$.[13] The panels depict the responses to bond rating upgrades/downgrades and watch/outlook announcements conditional on whether the bond was on a stable, positive (negative) watch, or positive (negative) outlook prior to the rating change. The unconditional change ("all" prior states) is also shown in the table. Also shown are the number of events in each category, the median and mean values of the CAR, the SCAR test statistics (t-statistics and p-values). The SCAR, discussed in the methodology section, is a weighted average of the CAR values that takes into account that the standard errors vary across events. In addition, we show the unadjusted median spread change as well as the percentage of spread changes in the positive (negative) direction with the p-value of the one-sided test of whether the changes are in the expected direction.[14]

There is strong evidence that credit rating events have information value in the CDS market judging both by the SCAR and directional change statistics within the two-day event window. All the significant changes in the SCAR and spread directional changes (7/8 t-

[13] The two-day event window $[0, +1]$ is the period starting at the beginning of the event day, day 0 (or the end of the day prior to the event day) to the end of the day after the event day, day 1. This interval is also known as $(-1, +1)$ in some literature.

[14] The expected directional signs are shown in Table 1(b). For example, the transition from positive outlook to positive watch (positive watch to positive outlook) is a positive (negative) signal, with an expected decline (rise) in CDS spreads.

Table 2
Number of upgrades and downgrades subsequent to outlook and watch events.

Outlook/Watch events	total	Days to upgrades			Days to downgrades		
		(+)≤ 30	(+)≤ 61	(+)≤ 91	(−)≤ 30	(−)≤ 61	(−)≤ 91
1	89	0	0	0	17	37	55
Negative watch	(100%)	(0%)	(0%)	(0%)	(19.1%)	(41.57%)	(61.8%)
2	180	0	0	0	4	13	20
Negative outlook	(100%)	(0%)	(0%)	(0%)	(2.22%)	(7.22%)	(11.11%)
3	220	0	0	1	0	0	4
Stable	(100%)	(0%)	(0%)	(0.45%)	(0%)	(0%)	(1.82%)
4	31	0	1	1	0	0	0
Developing	(100%)	(0%)	(3.23%)	(3.23%)	(0%)	(0%)	(0%)
5	93	0	4	6	0	0	0
Positive outlook	(100%)	(0%)	(4.3%)	(6.45%)	(0%)	(0%)	(0%)
6	31	4	12	18	0	0	0
Positive watch	(100%)	(12.9%)	(38.71%)	(58.06%)	(0%)	(0%)	(0%)

The table depicts the credit rating events within 91 days after an outlook/watch event. A positive sign refers to an upgrade, while a negative sign a downgrade. For example, there were 89 negative watches (the first row) issued in the sample period, and there is no upgrades within 91 days following the negative watches. 17 of them were followed by a downgrade within 30 days, and 37 of them were followed by a downgrade within 61 days, 55 (61.8%) were followed by a downgrade within 91 days, implying 38.2% were not followed by any upgrade or downgrade within 91 days. The counts are cumulative, meaning that 37-17 = 20 downgrades occurred 31–61 days after negative watch events.

Table 3
The effects of credit rating changes (Panel A) and outlook/watch status changes (Panel B) on CDS in the event window $[0, +1]$ for the whole sample, conditioning on the prior outlook/watch status.

Panel A: Credit Rating Changes

Credit Rating Change	Prior Status	Number of Events	CAR Mean	CAR Median	SCAR		Median Spread Change	% Positive Spread Change	% Negative Spread Change	p-value of Spread Change
					t-stat.	p-value				
up	Stable	46	−2.315	−1.355	−3.453	0.001	−2.472	30.435	67.391	0.013
up	Pos Outlook	63	−1.464	−1.072	−1.975	0.026	−0.604	31.746	61.905	0.039
up	Pos Watch	29	1.101	−0.572	0.663	0.744	−0.511	37.931	62.069	0.133
up	All	143	−1.389	−1.072	−1.721	0.044	−1.062	31.469	64.336	0.000
down	Stable	13	2.965	2.462	2.115	0.028	3.442	69.231	30.769	0.134
down	Neg Outlook	73	3.800	1.310	3.785	0.000	3.775	68.493	31.507	0.001
down	Neg Watch	52	2.525	1.398	2.792	0.004	5.129	67.308	32.692	0.009
down	All	138	3.241	1.435	5.109	0.000	4.151	68.116	31.884	0.000

Panel B: Outlook/Watch Changes

Current Outlook Watch	Prior Status	Number of Events	CAR Mean	CAR Median	SCAR		Median Spread Change	% Positive Spread Change	% Negative Spread Change	p-value of Spread Change
					t-stat.	p-value				
Neg Watch	Neg Outlook	31	2.517	1.660	1.690	0.051	8.368	64.516	35.484	0.075
Neg Watch	Stable/ Developing	32	2.265	−0.848	1.498	0.072	0.878	56.250	43.750	0.298
Neg Watch	All	63	2.389	0.017	2.075	0.021	3.142	60.317	39.683	0.065
Neg Outlook	Neg Watch	41	2.069	1.791	1.732	0.955	5.025	68.293	31.707	0.986
Neg Outlook	Stable/ Developing	95	4.223	2.033	3.740	0.000	4.908	78.947	17.895	0.000
Pos Watch	Pos Outlook	19	5.944	−0.482	0.943	0.821	0.012	52.632	42.105	0.677
Pos Watch	Stable/ Developing	7	0.124	0.898	0.104	0.540	−1.433	42.857	57.143	0.500
Pos Watch	All	26	4.378	−0.221	0.948	0.824	0.006	50.000	46.154	0.578
Pos Outlook	Pos Watch	6	2.226	0.568	1.383	0.113	0.049	50.000	50.000	0.500
Pos Outlook	Stable/ Developing	94	−0.707	−0.788	−2.253	0.013	−0.582	35.106	61.702	0.015

statistics for SCAR, and 6/8 for directional changes) are in the expected direction except for upgrades on positive watch status.[15] For instance, unconditional upgrades (including all outlook, watch and stable/developing prior states experienced mean (median) CAR declines of −1.4% (−1.1%) with the 2-day event window. The corresponding CDS increase for unconditional downgrades was 3.2% (1.4%). Both positive and negative credit rating announcements transmit useful information as evidenced by the CDS market even after controlling for prior status of outlook and watch events. CDS market reaction to downgrades, however, was substantially larger than to upgrades.

Relative magnitudes of the responses largely conform to our priors. Credit rating changes that are transitions from stable/developing status have the largest effect on CDS spreads. A credit rating upgrade from stable status (46 events) lowers the mean CAR value of CDS spreads by −2.3 (SCAR p-value of 0.001) and 67% (p-value 0.013) of the directional changes in spreads are in the expected (negative) direction. Analogously, a credit rating downgrade from stable status (13 events) raises the mean CAR value of CDS spreads by 3.0% (SCAR p-value of 0.028) and 69% of the directional changes in spreads are in the expected (positive) direction. By contrast, and as expected, credit rating upgrades from watch status have the smallest effect (statistically insignificant). Overall, we find evidence in support of the view that credit rating changes from a neutral stance (stable) have the largest surprise component in terms of updating investors expectations about sovereign default risk, while transitions from watch status to credit rating changes have the smallest surprise component.

The effect of outlook and watch status announcements on CDS spreads during the whole sample is presented in Panel B of Table 3. Again we find that conditioning on the prior state is critical in the interpretation of results. Unconditional negative watch announcements have a highly significant positive impact on CDS spreads, judging both by SCAR and direction of change statistics. However, this effect is primarily due to announcements of negative watch when the bonds are already on negative outlook status (31 events). Surprisingly, negative watch announcements when the bonds are on stable/developing status at the time (32 events) have more muted effects on CDS spreads and the direction of change statistics indicate that the percentage of positive spread movements following the announcements (56%) is not significantly different than the percentage of negative spread movements (44%) during the two-day event window.[16]

Similar findings are found for negative outlook announcements. In this case, we expect a negative outlook announcement to reduce CDS spreads if the transition is from negative watch (reducing the likelihood of expected sovereign bond default) and increase spreads if the move is from stable/developing status (increasing the likelihood of expected default). We find no evidence, however, that negative outlook announcements conditioned on negative watch status (41 events) reduce CDS spreads. As expected, however, negative outlook conditioned on stable/developing status have a large positive effect (4.2%, SCAR p-value of 0.000) on spreads.

Turning to positive watch announcements, we find no evidence of a CDS spread reaction either conditioned on positive outlook or stable/developing status. Positive outlook announcements from stable/developing status (94 cases) are highly significant, but not significant when these announcements are transitions from positive watch status. By contrast to many other studies, we find that both upgrades and downgrades have high information content in certain circumstances–the former case when preceded by positive outlook and stable states, and the latter case when preceded by either negative outlook or watch states. These effects are large in magnitude and statistically significant measured by mean change, median change and directional change. Moreover, our results are robust to an alternative measure of abnormal returns where the market portfolio is defined as the GDP-weighted average of CDS spreads across 19 countries.[17]

4.3. *Are events anticipated?*

In this section we address whether there is evidence that events were systematically "anticipated" prior to the event, i.e. are significant CARs evident prior to announcements? To investigate this issue we consider credit rating changes and outlook/watch announcements conditioned on prior status over two event windows prior to the rating event: three to eight-business weeks $[-40, -15]$ and one-day to three-business weeks $[-14, -1]$. Table 4 presents results for both event windows.

We do not find any evidence that CARs were present evident prior to credit rating change announcements– none of the SCAR statistics were statistically significant at conventional levels. However, SCAR statistics were statistically significant in most of the windows prior to negative outlook or watch announcements. These results are shown in Table 5. In particular, negative watch announcements from the stable/developing state and all states (outlook and stable/developing), were significantly positive in the three-to-eight week window. This indicates that negative watch announcements were either anticipated or, more likely, preceded by adverse economic news that led to rising CDS spreads. Interestingly, these announcements did not experience significant increases in the three-week pre-event window. Rather, CDS spreads (CAR) were declining during this pre-event window. The dynamic pattern is that spreads initially rise and then fall prior to the negative watch announcement. At the time of the announcement (two-day event window), CDS spreads rise as expected.

Recall that negative outlook announcements when bonds are on negative watch status are expected to decrease CDS spreads, but that no evidence of this effect is evident during the two-day event window. By contrast, statistically significant and economically large CAR

[15] Statistical significance refers to the 10% significant level in unless otherwise specified.

[16] We do not present the unconditional effect of positive/negative outlook announcements because it is a mixture of positive/negative events. A move from positive/negative watch to positive/negative outlook is a negative/positive event, while a move to positive/negative outlook from stable or developing is a positive/negative event.

[17] These results are available from the authors upon request.

Table 4
The effects of credit rating changes on CDS in the pre-event windows for the whole sample, conditioning on the prior outlook/watch status.

Panel A: Pre-event window [− 40, − 15]

Credit Rating Change	Prior Status	Number of Events	CAR Mean	CAR Median	SCAR t-stat.	SCAR p-value	Median Spread Change	% Positive Spread Change	% Negative Spread Change	p-value of Spread Change
up	Stable	46	−1.033	−0.135	−1.098	0.139	−3.659	36.957	63.043	0.052
up	Pos Outlook	63	2.977	0.809	1.004	0.840	−0.533	42.857	57.143	0.157
up	Pos Watch	29	−2.500	−5.222	−0.320	0.376	−0.723	41.379	58.621	0.229
up	All	143	0.534	−0.459	0.044	0.517	−0.908	41.259	58.741	0.022
down	Stable	13	3.214	9.328	0.867	0.202	48.093	69.231	30.769	0.134
down	Neg Outlook	73	0.881	2.780	0.425	0.336	13.383	64.384	35.616	0.010
down	Neg Watch	52	−9.394	−8.248	−3.927	1.000	11.532	61.538	38.462	0.064
down	All	138	−2.771	−1.562	−1.664	0.951	14.128	63.768	36.232	0.001

Panel B: Pre-event window [− 14, − 1]

Credit Rating Change	Prior Status	Number of Events	CAR Mean	CAR Median	SCAR t-stat.	SCAR p-value	Median Spread Change	% Positive Spread Change	% Negative Spread Change	p-value of Spread Change
up	Stable	46	−0.773	−0.751	−0.058	0.477	−1.122	41.304	58.696	0.151
up	Pos Outlook	63	−0.141	0.615	−0.376	0.354	−0.538	38.095	60.317	0.065
up	Pos Watch	29	−0.614	0.117	−0.300	0.383	0.432	58.621	41.379	0.771
up	All	143	−0.916	−0.475	−0.937	0.175	−0.625	41.958	56.643	0.066
down	Stable	13	−0.519	−1.580	0.066	0.474	17.752	53.846	46.154	0.500
down	Neg Outlook	73	0.936	1.428	0.891	0.188	13.851	71.233	28.767	0.000
down	Neg Watch	52	−4.290	−6.048	−2.073	0.978	1.493	51.923	48.077	0.445
down	All	138	−1.170	−1.277	−0.392	0.652	8.723	62.319	37.681	0.002

are found in both pre-event windows. Apparently, good news on these sovereign bonds were incorporated into market prices before rating agencies switched the status of these bonds from negative watch to negative outlook, i.e. removed the threat of an impending credit rating downgrade. Finally, we also find that CARs rise in the three-week period prior to negative outlook announcements conditional on stable/developing status. Again, bad economic news is apparently incorporated into market pricing before credit agencies place sovereign bonds on negative outlook status (transitioning from the neutral stable/developing position) and the announcement itself also causes a significant rise in CDS spreads.

In summary, credit rating changes and positive outlook/watch announcements are not preceded by rising/falling CDS spreads (CAR) during the two pre-event windows. On the other hand, negative outlook and watch announcements are either largely anticipated or preceded by economic news that is incorporated into CDS spreads. Large and significant effects are also clearly evident during the event window after the announcement.

4.4. Effects of the financial crisis on credit rating agency market impacts

This section investigates the differential impacts of credit rating announcements from the sample period prior to the GFC (January 2005–August 2008) and the post-crisis sample period (January 2010–December 2012). The crisis period, September 2008 through December 2009, was dropped from the sample. The basic analysis is analogous to the preceding section based on the two subsamples. Table 6 reports the conditional effects of credit rating change announcements on CDS spreads in the two-day event window [0,+1], with the pre-crisis period in Panel A and the post-crisis period in Panel B. Table 7 reports the market responses to outlook and watch announcements. The question raised earlier is whether the mistakes made by CRAs in rating many financial products prior-to and during the GFC have led investors and markets to pay less attention to announcements from credit rating agencies.[18] In other words, have the credit rating agencies been discredited?

In the post-crisis period downgrades in all categories – stable, negative outlook and negative watch states as well as the aggregate

[18] It is noteworthy that the mistakes made by credit rating agencies were largely concentrated on CDO products, however, rather than sovereign bonds.

Table 5
The effects of outlook/watch status changes and on CDS in the pre-event windows for the whole sample, conditioning on the prior outlook/watch status.

Panel A: Pre-event window [− 40, − 15]

Current Outlook Watch	Prior Status	Number of Events	CAR Mean	CAR Median	SCAR		Median Spread Change	% Positive Spread Change	% Negative Spread Change	p-value of Spread Change
					t-stat.	p-value				
Neg Watch	Stable/ Developing	32	4.882	10.438	1.289	0.103	29.196	81.250	18.750	0.000
Neg Watch	All	63	3.597	5.131	1.954	0.028	33.579	76.190	23.810	0.000
Neg Outlook	Neg Watch	41	−16.378	−15.494	−6.057	1.000	−8.126	46.341	53.659	0.623
Neg Outlook	Stable/ Developing	95	−1.082	−1.322	−0.273	0.607	3.880	57.895	40.000	0.075
Pos Outlook	Pos Watch	6	−3.694	−3.123	−0.216	0.419	−0.913	33.333	66.667	0.342
Pos Outlook	Stable/ Developing	94	1.828	0.692	0.256	0.601	−0.716	42.553	57.447	0.090
Pos Watch	Pos Outlook	19	−2.030	−0.997	0.006	0.502	−0.188	42.105	57.895	0.323
Pos Watch	Stable/ Developing	7	0.466	−2.573	0.237	0.590	0.480	57.143	42.857	0.500
Pos Watch	All	26	−1.358	−1.110	0.127	0.550	−0.119	46.154	53.846	0.422

Panel B: Pre-event window [− 14, − 1]

Current Outlook Watch	Prior Status	Number of Events	CAR Mean	CAR Median	SCAR		Median Spread Change	% Positive Spread Change	% Negative Spread Change	p-value of Spread Change
					t-stat.	p-value				
Neg Watch	Stable/ Developing	32	−7.819	−7.522	−3.163	0.998	−0.112	50.000	50.000	0.500
Neg Watch	All	63	−4.329	−3.933	−1.751	0.958	10.475	58.730	41.270	0.104
Neg Outlook	Neg Watch	41	−3.554	−3.351	−1.884	0.967	−5.012	39.024	60.976	0.894
Neg Outlook	Stable/ Developing	95	2.429	1.143	1.803	0.037	0.702	53.684	44.211	0.269
Pos Outlook	Pos Watch	6	−0.822	−0.197	−0.492	0.322	0.067	50.000	50.000	0.500
Pos Outlook	Stable/ Developing	94	0.494	−0.219	0.282	0.611	−0.328	39.362	59.574	0.040
Pos Watch	Pos Outlook	19	−2.217	−1.945	−0.689	0.250	0.079	52.632	47.368	0.500
Pos Watch	Stable/ Developing	7	6.207	−0.863	0.962	0.813	−0.068	42.857	57.143	0.500
Pos Watch	All	26	0.051	−1.486	0.148	0.558	0.005	50.000	50.000	0.500

grouping – are statistically significant by both SCAR and directional change statistics. Clearly, CRA credit-downgrade announcements contain informational value for the market pricing of risk. In the pre-crisis period, downgrades from the negative-outlook state, downgrades from all states (aggregated), and credit upgrades from the stable state are statistically significant by both of these metrics. Comparing magnitudes, however, we generally find much smaller responses to downgrades after the GFC. The mean (median) CAR associated with a downgrade (all prior states) was 6.8 (4.3) percentage points before the GFC, and 2.2 (1.1) percentage points after the GFC. The mean (median) response for downgrades transitioning from a negative outlook state was 8.1 (5.0) percentage points before the GFC compared to only 1.7 (1.1) percentage point after.

There are somewhat mixed results for outlook and watch announcement effects across the two samples, shown in Table 7. It is also noteworthy that the samples exhibit large differences in the number of positive and negative announcements: the pre-crisis period was dominated by positive news (77 positive watch and outlook announcements compared to 33 negative announcements) and the post-crisis period was dominated by negative news (106 negative watch and outlook announcements compared to 34 positive announcements).

In terms of negative announcements, only negative outlook announcements conditioned on the stable/developing state pass the two statistical metrics (statistically significant SCAR and directional change) in both the pre- and post-crisis samples. Negative watch and outlook announcements from the stable/developing state do not pass both metrics for either sample. Moreover, no positive outlook or watch announcements pass both test metrics.

In sum, we find evidence that the market responses from credit rating agency announcements continued to be statistically significant following the GFC, but that the magnitude of the price-response to credit rating downgrades in the period after the GFC became much weaker.

4.5. Extensions

We extend our empirical results in several directions. First, we distinguish between the effects of single- and of multiple-notch rating changes to test the hypothesis of whether multiple-notch changes have a larger effect on CDS spreads. Results are shown in Table 8. Multiple-notch changes are much less frequent than single-notch changes, especially for upgrades– only 9 multiple-notch upgrades,

Table 6
The effects of credit rating changes conditioning on the prior outlook/watch status on CDS in the event window $[0, +1]$ for the pre-crisis period, 01/2005-08/2008 (Panel A), and for the post-crisis period, 01/2010-12/2012 (Panel B).

Panel A: The pre-crisis period, 01/2005-08/2008

Credit Rating Change	Prior Status	Number of Events	CAR Mean	CAR Median	SCAR t-stat.	SCAR p-value	Median Spread Change	% Positive Spread Change	% Negative Spread Change	p-value of Spread Change
up	Stable	27	−2.671	−1.085	−2.802	0.005	−1.438	35.185	64.815	0.089
up	Pos Outlook	43	−1.299	−0.718	−1.169	0.125	−0.249	39.535	60.465	0.111
up	Pos Watch	20	1.023	−1.341	0.527	0.698	−0.275	40.000	60.000	0.251
up	All	92	−1.202	−1.133	−0.833	0.203	−0.434	37.500	62.500	0.011
down	Stable	4	4.980	5.957	1.553	0.109	8.783	50.000	50.000	0.500
down	Neg Outlook	26	8.125	4.961	3.195	0.002	3.320	76.923	23.077	0.005
down	Neg Watch	6	2.026	0.302	0.966	0.189	−1.614	33.333	66.667	0.658
down	All	36	6.759	4.346	3.648	0.000	1.397	66.667	33.333	0.033

Panel B: The post-crisis period, 01/2010-12/2012

Credit Rating Change	Prior Status	Number of Events	CAR Mean	CAR Median	SCAR t-stat.	SCAR p-value	Median Spread Change	% Positive Spread Change	% Negative Spread Change	p-value of Spread Change
up	Stable	11	−0.503	−0.578	−0.824	0.215	−2.383	45.455	54.545	0.500
up	Pos Outlook	14	−1.588	−1.072	−1.501	0.079	−1.263	35.714	64.286	0.211
up	Pos Watch	4	2.233	1.421	2.572	0.959	0.674	50.000	50.000	0.500
up	All	30	−0.644	−0.322	−1.052	0.151	−0.909	41.667	58.333	0.233
down	Stable	8	3.104	2.228	1.841	0.054	5.851	87.500	12.500	0.039
down	Neg Outlook	23	1.731	1.051	2.719	0.006	2.704	65.217	34.783	0.105
down	Neg Watch	34	2.225	0.645	1.873	0.035	6.960	73.529	26.471	0.005
down	All	65	2.158	1.051	3.226	0.001	4.720	72.308	27.692	0.000

Note: The empirical results are presented for categories with at least 4 events.

compared to 134 single-notch upgrades– limiting statistical power of the multiple-notch tests. Nonetheless, conditioning on the prior outlook/watch status, multiple-notch changes generally have larger effects than single-notch changes. The CAR mean is −2.2 and −1.3 for multi-notch and single-notch upgrades, respectively, and analogously 3.6 and 3.1 respectively for all downgrades. The CAR median (median spread) rise for all downgrades, for example, is 1.3 (3.4) and 1.9 (10.5) for one-notch and multiple-notch changes, respectively.

The second extension is to examine the relationship between the announcement effect and the previous rating level (e.g. Altdörfer, las Salas Vega, Guettler, and Löffler (2019)). The announcement effect could vary depending on the previous rating level, not only depending on the outlook/watchlist status. To analyze this issue, we divide ratings into 4 categories high, high-medium, low-medium and low as well as initial bond status (outlook and watch). We report the main results in Tables A5 and A6 in the online appendix, showing only statistically significant effects. Again we consider significant responses passing both the SCAR and Directional Change tests, only the SCAR test, and only the Directional Change test. The results indicate that highly rated bonds are especially sensitive to downgrades and that low-rated bonds are both sensitive to upgrades and downgrades conditional on outlook status. The "middle" ratings appear less sensitive to announcements in the sense of passing both statistical tests robustly. However, a caveat is that small sample sizes for classes other than high rating results in lower testing power. Further discussion and empirical results are presented in the online appendix to this paper.

The third extension is to examine the relative impact of rating announcements with respect to the rating agency. The literature shows that the CRAs have differing impacts on the market, e.g. in the case of split ratings prior to the announcement (Alsakka and ap Gwilym (2013). We extend this literature by examining the events from each rating agency conditioning on their prior credit state. Results are presented in Table 9 for rating changes (and Table A7 in the online appendix for outlook/watch status changes) for the three rating agencies covered in our data (Panels A, B, C report the results for S &P, Moodys, and Fitch, respectively). It should be noted that decomposing the sample by the particular CRA (i.e. conditioning both by the particular CRA and the prior-state) reduces the sample size of events for each category, and therefore the power of statistical tests.

Among three agencies, S &P has the largest number of rating event and outlook/watch events, and Fitch has the lowest. The results in Table A7 are consistent with the extant literature in finding some variation in results across rating agencies. Perhaps not surprising,

Table 7
The effects of outlook/watch status changes conditioning on the prior outlook/watch status on CDS in the event window $[0, +1]$ for the pre-crisis period, 01/2005-08/2008 (Panel A), and for the post-crisis period, 01/2010-12/2012 (Panel B).

Panel A: The pre-crisis period, 01/2005-08/2008

Current Outlook Watch	Prior Status	Number of Events	CAR Mean	CAR Median	SCAR t-stat.	SCAR p-value	Median Spread Change	% Positive Spread Change	% Negative Spread Change	p-value of Spread Change
Neg Watch	All	5	13.130	2.052	1.733	0.079	7.892	80.000	20.000	0.186
Neg Outlook	Stable/ Developing	28	8.852	3.326	2.580	0.008	2.876	82.143	14.286	0.001
Neg Outlook	All	28	8.852	3.326	2.580	0.008	2.876	82.143	14.286	0.001
Pos Watch	Pos Outlook	16	7.468	−0.221	0.965	0.825	0.056	62.500	31.250	0.894
Pos Watch	All	17	6.837	−0.482	0.943	0.820	0.037	58.824	35.294	0.834
Pos Outlook	Stable/ Developing	60	−1.013	−0.788	−2.807	0.003	−0.505	30.000	65.000	0.014

Panel B: The post-crisis period, 01/2010-12/2012

Current Outlook Watch	Prior Outlook Watch	Number of Events	CAR Mean	CAR Median	SCAR t-stat.	SCAR p-value	Median Spread Change	% Positive Spread Change	% Negative Spread Change	p-value of Spread Change
Neg Watch	Neg Outlook	19	−1.156	−0.717	−0.149	0.558	4.973	52.632	47.368	0.500
Neg Watch	Stable/ Developing	21	−1.430	−1.591	−1.050	0.847	−0.730	42.857	57.143	0.669
Neg Watch	All	40	−1.300	−1.023	−0.763	0.775	−0.425	47.500	52.500	0.563
Neg Outlook	Neg Watch	30	2.949	2.174	1.794	0.958	6.401	76.667	23.333	0.997
Neg Outlook	Stable/ Developing	36	1.678	1.657	2.876	0.003	3.031	75.000	19.444	0.002
Pos Outlook	Stable/ Developing	29	−0.356	−0.968	−0.460	0.325	−1.830	44.828	55.172	0.355
Pos Watch	All	5	−0.717	0.898	−0.093	0.465	−4.805	20.000	80.000	0.186

Note: The empirical results are presented for categories with at least 4 events.

given the number of announcements, the effect of S &P's rating change announcement and outlook/watch status changes on the CAR median (median spread) are very similar to those in the aggregate sample both in magnitude and statistical significance, albeit with some variation in results across upgrades and downgrades. For instance, the CAR median decline for all upgrades is largest for S &P announcements, while the CAR median rise for downgrades is smallest. Generally the results on credit downgrade announcements are more similar across rating agencies than upgrade announcements.

The forth extension and a robustness test is to examine whether the definition of overlapping effects matters. As discussed in the methodology section, when a credit rating event is preceded by another event within a short period of time, then the impact of the announcement may be muted. Therefore, our baseline results are presented by excluding any event that is preceded by another event within three weeks when evaluating the effects of credit rating announcements. We relax this condition and we conduct empirical analysis distinguishing between overlapping and non-overlapping events. Table 10 presents the full sample results for credit rating changes conditional on prior status (Panel A), and for outlook/watch announcements conditional on prior status (Panel B). Comparing Table 10 with our baseline Table 3 results, we find that overlapping events account for only a small portion of all credit rating changes, while their share in all outlook/watch events is significantly larger. In this light it is not surprising that the results are robust, i.e. including overlapping events for credit rating changes and for outlook/watch changes are generally not qualitatively different than their benchmark counterparts.

4.6. Comparison with previous studies

Given our emphasis on the conditionality of announcements, perhaps it is not surprising that some of our results contrast with a number of previous studies. For instance, among the studies predominantly performed on corporate CDS markets, Norden and Weber (2004) and Hull et al. (2004) conclude that only negative credit rating announcements transmit useful information as evidenced by the markets' strong reaction to these events. This result is confirmed by Kiesel and Kolaric (2018) on corporate CDS spreads. They find that downgrades preceded by watchlist assignments have no effect, while "direct" downgrades (not preceded by watch assignments) and negative watch announcements raise CDS spreads. They also find that CDS spreads do not react to rating upgrades, regardless of whether on a positive watchlist or not, but that watchlist placements for upgrade decrease CDS spreads. Explaining this result, Gande and Parsley

Table 8
The effects of one-notch and multiple-notch credit rating changes on CDS in the event window $[0, +1]$ for the whole sample, conditioning on the prior outlook/watch status.

Panel A: One-notch rating changes

Credit Rating Change	Prior Status	Number of Events	CAR Mean	CAR Median	SCAR		Median Spread Change	% Positive Spread Change	% Negative Spread Change	p-value of Spread Change
					t-stat.	p-value				
up	Stable	45	−2.081	−1.200	−3.247	0.001	−2.406	31.111	66.667	0.018
up	Pos Outlook	61	−1.530	−1.072	−2.025	0.024	−0.903	31.148	62.295	0.037
up	Pos Watch	26	1.442	−0.301	0.764	0.774	−0.335	42.308	57.692	0.278
up	All	134	−1.332	−1.002	−1.482	0.070	−1.137	32.836	63.433	0.001
down	Stable	10	2.618	1.400	1.221	0.127	3.103	60.000	40.000	0.376
down	Neg Outlook	60	4.209	2.085	3.920	0.000	4.151	70.000	30.000	0.001
down	Neg Watch	33	1.252	1.197	1.756	0.044	2.503	63.636	36.364	0.082
down	All	103	3.108	1.349	4.442	0.000	3.442	66.990	33.010	0.000

Panel B: Multiple-notch rating changes

Credit Rating Change	Prior Status	Number of Events	CAR Mean	CAR Median	SCAR		Median Spread Change	% Positive Spread Change	% Negative Spread Change	p-value of Spread Change
					t-stat.	p-value				
up	All	9	−2.238	−1.072	−1.635	0.070	−0.716	11.111	77.778	0.091
down	Neg Outlook	13	1.913	0.445	0.570	0.290	1.111	61.538	38.462	0.290
down	Neg Watch	19	4.736	2.255	2.209	0.020	16.252	73.684	26.316	0.033
down	All	35	3.635	1.919	2.559	0.008	10.461	71.429	28.571	0.009

(2005) suggest that this may be "due to greater incentives by a foreign government to leak good news after favorable discussion with a rating agency". By contrast, Ismailescu and Kazemi (2010) find that CDS markets react only weakly to negative credit rating events but respond strongly to positive events.

Our results indicate that both types of events contain important information incorporated by market participants although negative events have a distinctly larger impact. Moreover, the magnitude of the response and the effects vary by the state. The effect of unconditional upgrades is generally smaller than downgrades arising from the watch status prior state. Credit upgrades from positive outlook or stable/develop status are statistically significant with the largest effect, as expected, from the stable/developing state. As expected, credit downgrades also have large effects when coming from stable/developing states. However, the downgrade effect conditional upon a prior negative outlook status is surprisingly large. These results point to substantial asymmetries of upgrades and downgrades depending on conditional states.

5. Conclusion

Credit agency announcements continue to have a statistically significant and economically important impact on CDS spreads following the GFC. Systematic mispricing by CRAs and conflicts of interest in rating collateralized debt obligations before the GFC did not carry over to completely "discrediting" the information value of their announcements on sovereign bonds in the post-crisis period. However, the effect on spreads was generally less, especially the responses to credit downgrades transitioning from stable/developing and negative outlook states and credit upgrades transitioning from the stable/developing state. Spreads also responded less following the GFC to negative watch announcements and to negative outlook announcements transitioning from the stable/developing state.

The conditioning of credit rating announcements, whether rating changes, watch or outlook, helps us measure different types of announcement effects. Measuring the market response to CRA announcements is helped by identifying the specific type of announcement– the transition from the prior-state (watch or outlook) to the new state. Both upgrades and downgrades have large effects on CDS spreads, but in the case of upgrades this effect is seen only when the bonds are on prior stable/developing or positive outlook status and not on positive watch status.

Conditioning on prior states also allows us to precisely estimate the quantitative effects for each announcement. We find, for example, that both positive and negative credit rating changes on sovereign bonds on stable/developing status have the largest market responses, while the weakest response occurs when the bond is already on watch status. This suggests that credit rating changes for bonds on watch status, already signaling a credit rating change in the near future, have less marginal information value than those on the

Table 9
The effects of credit rating changes announced by each CRA on CDS in the event window $[0, +1]$ for the whole sample, conditioning on the prior outlook/watch status.

Credit Rating Change	Prior Status	Number of Events	CAR Mean	CAR Median	SCAR t-stat.	SCAR p-value	Median Spread Change	% Positive Spread Change	% Negative Spread Change	p-value of Spread Change
Panel A: S & P										
up	Stable	21	−2.695	−1.509	−3.004	0.004	−3.136	28.571	66.667	0.095
up	Pos Outlook	28	−1.981	−0.976	−2.043	0.025	−0.394	32.143	57.143	0.285
up	All	54	−2.650	−1.199	−3.633	0.000	−1.685	27.778	62.963	0.038
down	Neg Watch	26	2.158	1.720	2.231	0.017	6.164	73.077	26.923	0.015
down	Neg Outlook	32	3.155	1.330	1.944	0.031	4.420	71.875	28.125	0.011
down	All	62	2.709	1.435	2.987	0.002	5.129	70.968	29.032	0.001
Panel B: Moody's										
up	Stable	6	−2.420	−1.674	−0.999	0.182	−3.039	33.333	66.667	0.342
up	Pos Outlook	15	−1.144	−1.072	−0.418	0.341	−1.022	40.000	60.000	0.303
up	Pos Watch	24	1.495	−0.554	0.739	0.766	−0.237	45.833	54.167	0.419
up	All	45	0.093	−0.670	0.407	0.657	−0.646	42.222	57.778	0.186
down	Neg Watch	20	3.198	0.942	1.814	0.043	5.791	65.000	35.000	0.132
down	Neg Outlook	15	3.417	2.112	2.943	0.005	3.643	66.667	33.333	0.151
down	Stable	6	4.367	2.228	1.596	0.086	5.512	83.333	16.667	0.110
down	All	41	3.449	1.760	3.249	0.001	3.775	68.293	31.707	0.014
Panel C: Fitch										
up	Stable	19	−1.862	−0.608	−1.682	0.055	−2.383	31.579	68.421	0.084
up	Pos Outlook	20	−0.981	−0.813	−0.646	0.263	−0.691	25.000	70.000	0.059
up	All	44	−1.359	−0.805	−1.999	0.026	−1.666	25.000	72.727	0.002
down	Neg Watch	6	1.875	0.558	0.752	0.243	−1.925	50.000	50.000	0.500
down	Neg Outlook	26	4.816	1.181	2.444	0.011	2.998	65.385	34.615	0.085
down	All	35	3.941	1.233	2.599	0.007	1.696	62.857	37.143	0.088

more-neutral stable/developing status. Similarly, negative and positive outlook announcements from the stable/developing state elicit large market responses, while analogous outlook announcements from watch status do not.

Credit rating changes are generally not anticipated by the market, judging by abnormal return distributions prior to the announcements in our sample. However, we find that negative news is incorporated into market pricing prior to both negative outlook and watch announcements, i.e. significant abnormal returns are evident in the pre-event windows. By contrast, no abnormal returns are present in the pre-event windows for positive outlook and watch announcements. Highly rated bonds respond very strongly to downgrades, while low-rated bonds respond strongly both to upgrade and downgrade announcements transitioning from outlook status. Not surprisingly, bonds marginally above investment-grade status are particularly sensitive to downgrade announcements while bonds marginally below investment-grade status are especially sensitive to upgrade announcements.

Overall, credit rating announcements provide a rich and varied set of information on how credit rating agencies influence market perceptions of sovereign default risk. We find that CRA announcements continue to have significant information value after the GFC, but that the magnitudes of the responses are generally smaller. Moreover, conditioning the prior-state of the sovereign bond prior to the credit rating announcement is helpful in identifying why seemingly similar announcements may have different impacts.

Table 10
The effects of credit rating changes (Panel A) and outlook/watch status changes (Panel B), including overlapping events, on CDS in the event window $[0, +1]$ for the whole sample, conditioning on the prior outlook/watch status.

Panel A: Credit Rating Changes

Credit Rating Change	Prior Status	Number of Events	CAR Mean	CAR Median	SCAR		Median Spread Change	% Positive Spread Change	% Negative Spread Change	p-value of Spread Change
					t-stat.	p-value				
up	Stable	48	−2.196	−1.355	−3.486	0.001	−2.406	33.333	64.583	0.030
up	Pos Outlook	67	−1.409	−0.880	−2.077	0.021	−0.604	31.343	61.194	0.044
up	Pos Watch	30	1.095	−0.515	0.668	0.745	−0.451	36.667	60.000	0.181
up	All	152	−1.307	−0.967	−1.782	0.038	−1.011	31.579	62.500	0.001
down	Stable	19	1.483	1.236	2.682	0.004	6.042	67.105	31.579	0.002
down	Neg Outlook	107	3.519	1.233	4.523	0.000	4.720	71.028	28.972	0.000
down	Neg Watch	76	1.908	1.994	1.729	0.050	2.764	63.158	31.579	0.179
down	All	203	2.563	1.233	5.434	0.000	5.025	68.966	30.049	0.000

Panel B: Outlook/Watch Changes

Credit Rating Change	Prior Status	Number of Events	CAR Mean	CAR Median	SCAR		Median Spread Change	% Positive Spread Change	% Negative Spread Change	p-value of Spread Change
					t-stat.	p-value				
Neg Watch	Neg Outlook	50	2.832	0.681	2.157	0.018	8.139	66.000	34.000	0.017
Neg Watch	Stable/ Developing	38	2.264	−0.515	1.653	0.053	1.473	60.526	39.474	0.128
Neg Watch	All	88	2.587	0.253	2.433	0.009	4.318	63.636	36.364	0.007
Neg Outlook	Neg Watch	68	1.115	1.332	1.664	0.950	5.236	64.706	35.294	0.989
Neg Outlook	Stable/ Developing	108	4.133	2.013	3.988	0.000	4.558	78.704	18.519	0.000
Pos Watch	Pos Outlook	25	3.897	−1.159	0.824	0.791	−0.300	40.000	52.000	0.500
Pos Watch	Stable/ Developing	10	0.386	1.216	0.325	0.624	0.670	60.000	40.000	0.624
Pos Watch	All	35	2.894	−0.755	0.842	0.797	0.000	45.714	48.571	0.500
Pos Outlook	Pos Watch	12	0.772	0.498	0.558	0.294	−0.042	33.333	50.000	0.807
Pos Outlook	Stable/ Developing	104	−0.128	−0.706	−0.226	0.411	−0.505	37.500	58.654	0.048

CRediT authorship contribution statement

Mahir Binici: Conceptualization, Methodology, Writing - original draft, Writing - review & editing, Investigation. **Michael Hutchison:** Writing - review & editing, Supervision, Methodology, Conceptualization. **Evan Weicheng Miao:** Writing - original draft, Software, Visualization, Investigation, Formal analysis, Data curation, Methodology.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.iref.2020.04.005.

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