Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

Elsevier hereby grants permission to make all its COVID-19-related research that is available on the COVID-19 resource centre - including this research content - immediately available in PubMed Central and other publicly funded repositories, such as the WHO COVID database with rights for unrestricted research re-use and analyses in any form or by any means with acknowledgement of the original source. These permissions are granted for free by Elsevier for as long as the COVID-19 resource centre remains active.
Rating Announcements, CDS Spread and Volatility During the European Sovereign Crisis

Philippe Raimbourg\textsuperscript{a}, Federica Salvadè\textsuperscript{b, *}

\textsuperscript{a} Ecole de Management de la Sorbonne, Université Paris 1 Panthéon-Sorbonne, France
\textsuperscript{b} PSB Paris School of Business, Paris, France

\textbf{ARTICLE INFO}

\textbf{JEL Classification:}
G01
G14
G24

\textbf{Keywords:}
Sovereign rating announcements
Credit default swap
Volatility
Financial crisis

\textbf{ABSTRACT}

This paper analyzes the evolution of CDS spread and CDS volatility around European sovereign rating announcements over the period 2008–13. We show that the effect of the announcement differs depending on the credit quality of the issuer (Investment Grade versus Speculative). The downgrading and negative credit watch of an investment grade country stabilize the market, as volatility decreases right after their release. By contrast, the announcements regarding speculative grade countries trigger an increase in both CDS spread and volatility. Lastly, we show that these announcements not only affect the CDS of the country, but spill over the German CDS.

1. Introduction

What is the link between sovereign credit rating changes and financial crisis? Did the downgrading of European sovereign debt after the 2008 crisis amplify the market stress?

Tackling with rating agencies’ influence on sovereign credit markets put in light two questions. The first one is: is there any information transmission when a rating agency discloses its new ratings during a period of financial crisis? The second point is: in case there is an information transmission, can a downgrading or a negative credit watch be considered as good news for the market? We investigate these questions by looking at the evolution of Sovereign CDS spread and realized CDS volatility of European countries around sovereign rating announcements.

The focus on the reaction of sovereign CDS markets to rating changes helps us to contribute to the literature on the factors affecting the sovereign default risk. Additionally, our research question helps to understand whether rating announcements increase the uncertainty and pressure on the European debt market. In the recent time of market stress associated with the COVID-19 pandemic, this issue can be of particular interest for market practitioners and policy makers.

Our sovereign CDS data consists of intraday price quotes between 2008 and 2013 provided by CMA (Credit Market Analysis Ltd.). When the announcement is not anticipated, that is when the CDS premium does not move significantly before the announcement’s release, we find strong evidence that the release transmits information to the market. However, even if the downgrading is preceded by a move in spreads which anticipates the change in credit quality, its release may still play a role. The announcement may help to stabilize the market and reduce the uncertainty about the market price. We test this hypothesis looking at the evolution of volatility around the release. A decrease in volatility would suggest a convergence of investors’ beliefs. Alternatively, an increase in volatility

* Corresponding author.
E-mail address: f.salvade@psbedu.paris (F. Salvade).

https://doi.org/10.1016/j.frl.2020.101663
Received 4 February 2020; Received in revised form 29 May 2020; Accepted 22 June 2020
Available online 24 June 2020
1544-6123/© 2020 Elsevier Inc. All rights reserved.
would imply a higher disagreement on the fair CDS price among investors, which can come from an unexpected change in credit quality.

In our study, we find that the effects of the announcements concerning investment grade (IG) countries differ from the effects observed for non-investment grade countries. We show that the downgrading and negative credit watch announcements of IG countries trigger a decrease in the spread volatility. This suggests that for IG countries, rating agencies help to stabilize the CDS market. On the opposite, the downgrading of a non-investment grade country triggers a pronounced increase in the spread volatility and the spread level, thus worsening the market stability in times of stress. This result adds evidence to previous papers dealing with the destabilizing role of sovereign ratings (for example, Ferri et al. (1999)).

We also test whether the German CDS market is influenced by negative rating changes of other European countries. We find confirmation that the downgrade of a European country’s sovereign rating generates spillover effects on the German market.

This article relates to the literature on the effects of rating actions on credit market. Most of these studies show that bond market is often able to anticipate the downgrading action. Studies about the CDS market are not so numerous but go in the same direction. For example, Hull et al. (2004) find that the reviews for downgrades have an important effect on the US CDS spreads and are anticipated by investors. Similarly, Norden and Weber (2004) show that the CDS market anticipates both downgrades and reviews for downgrades. Focusing on 22 emerging markets over the period 2001–2009, Ismailescu and Kazemi (2010) show that CDS spreads anticipate negative sovereign rating actions. Our results highlight that, although anticipated, rating changes can play a role in the market.

This article is also related to studies on the contamination effects of sovereign ratings changes among countries (see, e.g., Bissoondoyal-Bheenick (2012) and Ferreira (2007)). Drago and Gallo (2016) analyze the effect of sovereign rating changes (and their spillover effects) on the euro area CDS market during the financial crisis. This work is closely related to our paper. However, the authors do not focus on the impact of these events on the CDS volatility. To the best of our knowledge, the relation between European sovereign credit ratings and sovereign CDS volatility that we investigate has not yet been studied.

Lastly, this paper contributes to the vast literature on sovereign CDS spreads in Europe and cross-market linkages during the European sovereign debt crisis (see, among others, Mili (2019), Kışla and Önder (2018), Wang (2019)).

The paper proceeds as follows. Next section will present the data set and the statistical methodology, Section 3 the results and Section 4 the conclusion of the paper.

2. Data and methodology

2.1. Data

Our sovereign CDS data consists of intraday price quotes provided by CMA (Credit Market Analysis Ltd.) Datavision, which is found to be one of the more reliable CDS data sources by Mayordomo et al. (2014). CMA gathers information on CDS prices from the largest and most active credit investors. CMA applies a time and liquidity weighted aggregation so that each reported price is based on the most recent and liquid quotes.

We use 5-year USD-denominated sovereign CDS quotes for the ten countries in our sample. 5-year CDS is the most liquid segment. We use 60-minute time interval, which means we use the quotes reported for CDS within each hour interval. This time interval gives us a satisfactory trade-off between data frequency and missing observations.

While previous studies mainly estimate the effect of news on volatility using GARCH family models (e.g., Bouzgarrou and Chebbi (2016)), the availability of high-frequency CDS data allows us to employ a simple, non-parametric, measure of volatility: We compute CDS daily realized volatility by squaring and adding 60-minute mid-quote returns.

We cover EU countries in the European monetary union, for which CDS data are available and at least one rating announcement between 2008 and 2013 occurs. We use Thomson Reuters to collect rating announcements by Standard & Poor’s, Moody’s and Fitch. Announcements collected consist of downgrades, negative credit watch and outlook. We do not analyze separately credit watches and outlooks; For brevity, hereafter, we refer to both these events as “negative reviews”. We consider only uncontaminated credit rating announcements which means which are not followed by a new rating event in the next 15 days. We start with 150 announcements and after imposing the filters, the final baseline sample of uncontaminated announcements consists of 97 announcements: 56 downgrades and 41 negative reviews. Precisely, the number of rating changes per country is the following: Austria (3), Belgium (5), France (7), Greece (13), Ireland (17), Italy (12), Netherland (6), Portugal (17), Spain (17). 11 downgrades involve countries for which the sovereign rating is at the speculative grade level after the announcement.

2.2. Variable definitions

Several empirical analyses show that an international risk factor is the main driver of the euro area sovereign spreads (Favero et al. (2010); Gerlach et al. (2010)). This factor is often proxied by the US stock market implied volatility (VIX), which gives a model-free

---

1 Results do not change if we remove also announcements which are preceded by other rating events in the previous 20-days.

2 Regarding the distribution by year, the majority of rating changes happens in 2010, 2011 and 2012 with respectively 20, 27 and 21 uncontaminated rating announcements.

3 The rating level BBB- is usually the threshold used to classify a bond with the investment grade status (“IG”, which means above or equal to the rating BBB-) or speculative grade status (“SG” or junk status, which means below the rating BBB-).
option implied estimate of the volatility of the S&P500 (see e.g. Longstaff et al. (2011), Galariotis et al. (2016)) documents that between 2008 and 2012 the VIX contributes to European sovereign CDS variance by approximately 31%.

We compute the evolution of CDS spread and realized volatility around rating announcements, neutralizing the effect of this international risk factor. The VIX index allows us to control for changes in risk premium over time. One should note that the use of a risk factor for the euro area (implied volatility of Euro STOXX 50) leaves results unchanged.

We thus compute CDS spread changes as follows:

\[
\text{Adjusted CDS spread} = (\Delta \text{CDS spread} - \Delta \text{VIX})
\]

(1)

The daily CDS spreads we use for the computation is the last CDS mid-quote of the day reported by CMA. We use the end-of-day level of VIX index collected from Bloomberg.

We then study the change in volatility around the rating news looking at the evolution of the difference between the realized volatility and the VIX index (see Eraker (2008)):

\[
\text{Adjusted Volatility} = (\text{Realized volatility} - \text{VIX})
\]

(2)

The computation of CDS volatility is thus based on intraday CDS mid-quote. The realized variance (RV) is defined as the sum of all available intraday high frequency squared returns given by

\[
\text{RV}_t = \sum_{i=1}^{m} [P_{t,i} - P_{t,-1}]^2
\]

(3)

where \( p \) is the intraday log mid-quote of the CDS for day \( t \) and \( m \) denotes the number of intraday returns to be summed. We observe for each day and each country 11 intraday CDS mid-quotes. The number of intraday mid-quotes reported by CMA are stable among country. As demonstrated in the literature (see, e.g., Andersen et al., 2001), this “model-free” realized variance measure based on intraday data can provide much more accurate estimation than those based on daily data.

2.3. Statistical methodology

We want to analyze the evolution of CDS spreads and realized volatility around rating announcements during the financial crisis. We define the minimal pre-announcement window as the fifteen trading days after the previous announcement up to the day of the current announcement. When the previous announcement happens more than 120 trading days prior, we set the pre-announcement window to be 120 trading days prior to the announcement, that is \((-120, -1)\), where 0 is the announcement day. We set the post-announcement window to be 10 trading days after the release: \((0, +10)\).

We split the pre-announcement window \((-120, -1)\), in one observation window:

(1) Observation window: \((-120, -11)\)

and two anticipation windows:

(2) First anticipation window: \((-10, -6)\)
(3) Second anticipation window: \((-5, -1)\).

We compute the evolution of CDS spreads and volatility as the average daily indicators in each window \( i \) minus both the average daily indicators in the previous window \( i-1 \) and the average indicators in the observation window \( 1 \). We start by analyzing the change in spreads between the anticipation windows and the observation window. A statistically significant change would suggest that the new rating is anticipated by the CDS market.

Next, we observe the effect of the rating release. We split the post announcement window \((+1, +10)\), in two windows as follows:

(1) Event window: \((0, +5)\)
(2) Post event window \((+6, +10)\)

For each variable, we compute the change between the event window \((0, +5)\) and the second anticipation window \((-1, -5)\) and the change between the post event window \((+6, +10)\) and the event window \((0, +5)\). This change signals whether the announcement disseminates any information about the issuer credit risk. Thus, after the release, we could observe a change in CDS premium and a decrease in volatility, suggesting a price stabilization.

Finally, we also investigate whether, after the announcement, our variables go back to their original level, which is their level in the observation windows. To observe this effect, we look at the difference between the post announcement window and the observation window.

---

4 Our anticipation and event windows are similar to the ones used in Bissoonoyal-Bheenick (2012), Drago and Gallo (2016) and Lobão et al. (2019) which also investigate the effects of ratings changes on the market price.
3. Empirical results

We study separately announcements regarding investment grade and non-investment grade countries.

3.1. Sovereign investment grade CDS spread and volatility after a rating announcement

Table 1 summarizes the evolution of the CDS spread and volatility around downgrades of investment grade EU countries. The CDS spread increases significantly in the two weeks before the event. This increase in mid-quote CDS prices suggests that...
3.2. Sovereign non-investment grade CDS spread and volatility after a rating announcement

We now focus on rating changes of speculative grade countries. Table 3 shows the effects of downgrading on spread and volatility. Results strongly differ from the analysis of IG countries. We observe an important increase in spreads and volatility immediately after the announcement. Once again, it seems that rating agencies transmit information to the market, but this time, it has a negative impact on the market. Interestingly, looking at the CDS spread data in table 3A, we cannot say that the downgrading is anticipated. Indeed, no significant change appeared in the CDS spread before the announcement. It seems to be an unexpected event and investors react, with the consequence of increasing spreads and volatility. The fact that the downgrade is an unexpected event for speculative sovereign issues while this is not the case of investment grade ones remains to be explored.

### Table 3

**Abnormal Changes in CDS Spread and Volatility around Downgrades of Non-Investment Grade Countries from the Euro Area.** Adj. CDS Spread is the adjusted CDS spread computed as the difference between the spread and the level of the VIX index. Volatility is the difference between CDS realized volatility and the VIX index. We report the mean of all variables in each window (column mean). In the line corresponding to Window $K = 1$, we report the value for the observation window ($-120$, $-10$); in the one corresponding to Window $K = 4$, the value for the event window ($0$, $5$). We report the evolution of the variables by computing in each windows their changes with both the prior window (see column window($K$) - window($K-1$)) and the observation window (see column window($K$) - window($1$)). ***, **, * indicates a p-value below 1%, 5% and 10% for the $t$-test of the null hypothesis that the average change is zero.

|                | Mean window ($K$) | Evolution window ($K$)-window ($1$) | Window($K$)-window($K-1$) |
|----------------|-------------------|-------------------------------------|---------------------------|
| **Adj. CDS Spread** |                  |                                     |                           |
| $(-120, -11)$  | 0.13              | 1                                   |                           |
| $(-10, -6)$    | $-0.14$           | 2                                   | $-0.27^{**}$              |
| $(-5, -1)$     | 0.04              | 3                                   | $-0.08$                  |
| $(0,5)$        | 0.80              | 4                                   | 0.67*                     |
| $(6,10)$       | 0.54              | 5                                   | 0.41*                     |

| **Volatility** |                  |                                     |                           |
| $(-120, -11)$  | 11.50             | 1                                   |                           |
| $(-10, -6)$    | 14.20             | 2                                   | 2.70                      |
| $(-5, -1)$     | 15.01             | 3                                   | 3.52                      |
| $(0,5)$        | 29.01             | 4                                   | 17.51^{***}               |
| $(6,10)$       | 26.20             | 5                                   | 14.70^{***}               |

Lastly, we test whether Germany’s sovereign CDS premiums react to rating announcements of other European countries. We employ our sample of downgrades but we now investigate the evolution of Germany’s sovereign CDS spread and volatility around the release. Results are in table 4. In line with our previous result, we find again a clear difference between downgrades of IG and SG countries. For downgrades of investment grade EU countries, realized volatility of German CDS increases in the 5-day before the rating announcements and starts to decrease after the release. By contrast, for speculative grade EU countries CDS spread volatility...
experiences a pronounced increase after the release. In untabulated results, we find that German CDS spread follows similar evolution.

This spillover effect of a sovereign rating announcement on the German CDS market has an important implication for future studies on the effects of rating events. Indeed, the effect of a rating change could be underestimated if the abnormal CDS returns of the involved sovereign issuer is computed using German CDS as a reference entity.

4. Conclusion

In this paper, we focus on the evolution of CDS spread and volatility around European sovereign rating announcements. While the evolution of the CDS spread around rating changes has been the focus of several studies, the evolution of CDS volatility has received much less attention.

We show that results differ according to the credit quality of the issuer (Investment Grade versus Speculative). The rating announcement of an investment grade country is generally anticipated by the investors. But it does not mean that its release does not affect the market: the rating announcement decreases the CDS volatility, and so helps to stabilize the market.

We observe the opposite effect when looking at the release of announcements for speculative grade countries. The rating actions seem not to have been expected by investors and trigger an increase in both CDS spreads and volatility: the rating actions thus worsen the market stability in times of stress.

Lastly, we show that the German CDS spread and volatility move in case of a rating action involving another country of the Euro area.

CRediT authorship contribution statement

*Philippe Raimbourg*: Methodology, Writing - original draft, Writing - review & editing, Visualization, Investigation, Supervision, Validation. *Federica Salvad`e*: Data curation, Software, Writing - original draft, Writing - review & editing, Visualization, Investigation.

Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.frl.2020.101663.

References

Andersen, T.G., Bollerslev, T., Diebold, F.-X., Ebens, H., 2001. The distribution of realized stock return volatility. J. Financ. Econ. 61, 43–76.
Bisnoodoyal-Bheenick, E., 2012. Do sovereign rating changes trigger spillover effects? Res. Int. Bus. Finance 26 (1), 79–96.
Bouzgarrou, H., Chebbi, T., 2016. The reaction of sovereign CDS spread volatilities to news announcements. J. Asset Manage. 17 (5), 347–360.
Drago, D., Gallo, R., 2016. The impact and the spillover effect of a sovereign rating announcement on the euro area CDS market. J. Int. Money Finance 67, 264–286.

Favero, C.A., Pagano, M., von Thadden, E.-L., 2010. How does liquidity affect government bond yields? J. Financial Quant. Anal. 45, 107–134.

Ferreira, M.A., Gama, P.M., 2007. Does sovereign debt ratings news spill over to international stock markets? J. Bank. Financ 31 (10), 3162–3182.

Ferri, G., Liu, L.-G., Stiglitz, J.-E., 1999. The procyclical role of rating agencies: evidence from the East Asian crisis. Economic Notes 28 (3), 335–355.

Galariotis, E.C., Makrichoriti, P., Sprou, S., 2016. Sovereign CDS spread determinants and spill-over effects during financial crisis: a panel VAR approach. J. Financial Stab. 26, 62–77.

Gerlach, S., Schulz, A., Wolff, G.B., 2010. Banking and sovereign risk in the euro area. CEPR Discussion Paper, N. 7833.

Hull, J., Predescu, M., White, A., 2004. The relationship between credit default swap spreads, bond yields and credit rating announcements. J. Bank. Finance 28, 2789–2811.

Ismailescu, I., Kazemi, H., 2010. The reaction of emerging market credit default swap spreads to sovereign credit rating changes. J. Bank. Finance 34, 2861–2873.

Kısla, G.H., Onder, A.O., 2018. Spatial analysis of sovereign risks: the case of emerging markets. Finance Research Letters 26, 47–55.

Lobao, J., Pacheco, L., Campos, S., 2019. Stock price effects of bank rating announcements: an application to European Union countries. Int. J. Finance Econ. 24 (1), 4–19.

Longstaff, F.A., Pan, J., Pedersen, L.H., Singleton, K.J., 2011. How Sovereign Is Sovereign Credit Risk? Am. Econ. J.: Macroeconomics 3, 75–103.

Mayordomo, S., Peña, J.I., Schwartz, E.S., 2014. Are all credit default swap databases equal? European Financial Manage. 20, 677–713.

Mili, M., 2019. The impact of tradeoff between risk and return on mean reversion in sovereign CDS markets. Res. Int. Bus. Finance 48, 187–200.

Norden, L., Weber, M., 2004. Informational efficiency of credit default swap and stock markets: the impact of credit rating announcements. J. Bank. Finance 28, 2813–2843.

Wang, A.T., 2019. The information transmissions between the European sovereign CDS and the sovereign debt markets of emerging countries. Asia Pacific Manage. Rev. 24 (2), 176–189.