sciendo

European Financial Markets Integration and the Politics of Credit Rating Agencies: An Econometric Approach to Study Microeconomic Dynamics and Sustainability

Cecilia CIOCÎRLAN
Institute for World Economy, Romanian Academy, Bucharest, Romania
cecilia.ciocirlan@iem.ro

Andreea STANCEA
National University of Political Studies and Public Administration, Bucharest, Romania
andreea.stancea@comunicare.ro

Dimitrie-Daniel PLĂCINTĂ*
Bucharest University of Economic Studies, Bucharest, Romania
**Corresponding author, daniel.placinta@csie.ase.ro*

Abstract. On sovereign credit default swaps markets, contagion serves as a sobering reminder of the interconnectedness of global financial systems. Like ripples in a pond, the impact of sovereign default or downgrades can cascade across borders, highlighting the intricate web of dependencies among nations. Utilizing sovereign CDS spreads between 2006-2020 on local European markets, the study employs an event study methodology to assess the effects of rating changes on CDS spreads, focusing on negative events such as sovereign rating downgrades. The findings reveal that negative events have a greater impact on the CDS market than positive events, abnormal returns are higher during economic crises, and states with public debt exceeding the Maastricht criteria experience higher abnormal returns. These results suggest that investors are sensitive to adverse news and risk factors, see opportunities for profit during economic turmoil, and closely monitor fiscal sustainability metrics. Understanding and managing contagion risk in these markets requires not only vigilance but also cooperation and coordination among policymakers and market participants.

Keywords: European financial market, integration, credit rating, microeconomic dynamics, sustainability.

Introduction

Fear of financial contagion has often been cited in the international press and is considered one of the main determinants of sovereign credit risk swap spreads. However, the way contagion risk impacts credit risk swaps is controversial. One possible mechanism of contagion transmission is the "domino effect," in which the sovereign default of one country increases the likelihood of default in other countries. This domino effect can be driven by several fundamental economic dynamics: direct trade links between countries, exposure of the domestic banking sector, or rebalancing of foreign investors' portfolios. A second possible mechanism is related to the potential effect of default on investor behavior: the default of one country could prompt investors to demand higher spreads from non-defaulting countries, thereby increasing the possibilities of default themselves (De Grauwe & Ji, 2013). A third possible mechanism is also related to investor behavior and their ability to update information as they receive public signals – news (Benzoni et al., 2015).

DOI: 10.2478/picbe-2024-0265

Investors remain uncertain and powerless in estimating the possibility of default resulting from fundamental economic dynamics and develop "fragile beliefs" (Hansen & Sargent, 2010). It is worth mentioning that, from the authors' perspective, the third mechanism mentioned earlier is not opposed to the first mechanism relating to economic fundamentals. The third mechanism, which assesses investors' behavior based on public signals, including credit rating agency announcements rather stems from the need to develop explanations for the rebalancing of foreign investors' portfolios.

The objective of this paper is to study the impact of rating agency announcements on the sovereign credit risk swaps market (credit default swaps - CDS). Studying is a preliminary step that aims to identify the risk of contagion. Additionally, studying this impact could contribute to the development of economic policies adapted to variations in the credit market over time. From a pragmatic perspective, this paper identifies, first and foremost, the impact of sovereign rating change announcements (downgrades and upgrades) on the European Union's credit risk swaps market. Second, the impact of downgrade announcements during crises and "normal periods" is identified. Lastly, the impact of downgrades is investigated in states whose public debt levels exceed the limit established by the Maastricht Treaty (60% public debt/GDP).

The study utilizes sovereign CDS spreads from the period 2006-2020. Sovereign credit default swaps function like insurance contracts that allow investors to purchase protection against the possibility of a state defaulting on its debt or restructuring it. CDS spreads were used instead of sovereign bond yields as the latter do not consider changes caused by interest rate changes, which may lead to more accurate estimations. Sovereign CDS values more directly reflect the financial market's assessment of sovereign risk. As (Gyntelberg et al., 2013)also mention, the CDS market is more important for discovering the price of sovereign credit risk compared to the bond market. The CDS market adjusts more quickly and reflects new information faster than bond spreads. To study the effect of sovereign rating change announcements, the paper utilizes the event study methodology developed by (MacKinlay, 1997). This methodology evaluates the impact of an event using abnormal returns. An abnormal return is the difference between the realized return and the expected return. The normal return, in this case, is defined as the expected return without conditioning on the occurring event. Furthermore, from the methodology developed by (MacKinlay, 1997), we employ the market model, which requires the use of a reference index.

The results obtained from conducting the preliminary research are intuitive: negative events, such as sovereign rating downgrades, have a greater impact on the CDS market than positive events, abnormal returns are higher during economic crises compared to "normal periods.", abnormal returns for states with a level of public debt exceeding the Maastricht criteria are higher than those of other states. In terms of implications, investors are more sensitive to adverse news and risk factors, including sovereign rating downgrades. This level of increased risked aversion is natural taking into account rational market theoretical assumptions. The observation that abnormal returns are higher during economic crises compared to "normal periods" suggests that investors may see heightened opportunities for profit during times of economic turmoil. Indeed, it may be the case of the old saying: "Buy When There's Blood in the Streets". This could reflect increased market volatility, where traders may capitalize on short-term price movements driven by uncertainty and panic selling. The finding that states with public debt exceeding the Maastricht criteria experience higher abnormal returns than those with lower debt levels indicates that investors closely monitor and react to fiscal sustainability metrics. Governments with higher debt levels may face greater scrutiny and risk premiums from investors, leading to higher abnormal returns in their sovereign debt markets.

The remaining part of this paper is structured as follows. In the next section, we discuss the related literature discussing both the role of investors' expectations and their implications for CDS markets. The next section also provides information about hypothesis development. Section 3 presents the data, while Section 4 describes the empirical strategy employed for testing the hypotheses. Second 5 presents the results and section 6 concludes emphasizing policy recommendations and future research.

Literature review

The specialized literature on the impact of rating agency announcements is closely related to studies on investor behavior and their ability to update information as they receive additional information (Benzoni et al., 2015). As mentioned earlier in the introduction, this mechanism of contagion transmission does not exclude arguments and explanations related to economic fundamentals. Therefore, we attempt to divide the specialized literature into two main theoretically compatible directions: papers that explain contagion as an effect of economic developments and papers that explain contagion as an effect of investor behavior and study the impact of other elements, including news, on portfolio rebalancing.

On the one hand, there are the papers that explain contagion as an effect of economic developments. For example, (Aizenman et al., 2013) demonstrate that inflation, state fragility, and external debt have been positively associated with CDS variation, while trade openness and the fiscal balance/GDP ratio have been negatively associated with sovereign CDS spreads. However, the relative importance of economic fundamentals in determining sovereign risk prices varies over time. Key factors include trade openness and state fragility in the pre-crisis period, the external debt/GDP ratio and inflation during the crisis period, and the inflation and public debt/GDP ratio in the post-crisis period. Additionally, Caporin et al. (2018) show that shock propagation in the European CDS market remained remarkably constant from 2008 to 2011, despite a significant portion of peripheral countries in the sample being heavily affected by their sovereign debt and fiscal situations, the integration among different countries within the Eurozone is stable, and the contagion risk between these countries is not affected by the size of the shock, implying that contagion has remained low so far. However, the repetition of the analysis using sovereign bond data shows a change in the intensity of shock propagation in the pre-crisis period of 2003-2006 and the post-Lehman period of 2008-2011, but the coefficients decline. Regarding the specific impact of rating announcements in relation to contagion propagation effects, (Afonso et al., 2012) study the reaction of sovereign bond yield spreads and CDS market spreads in the EU before and after rating agency announcements. Their results show a significant impact, especially in the case of negative announcements. The announcements are not anticipated by the market over a 1–2-month horizon, but there is bidirectional causality between agency announcements and spreads over a 1–2-week horizon. Furthermore, the results demonstrate that there are contagion effects among Eurozone member states, with the effects originating from lower-rated states.

On the other hand, several papers explain contagion as an effect of investor behavior and study the impact of other elements, including news, on portfolio rebalancing. Benzoni et al. (2015) propose a model that explains contagion as an effect of investors with "fragile beliefs" about the economic state. Estimates using European sovereign credit default swap (CDS) data show that investors require a time-varying risk premium to compensate them for state uncertainty. The model outperforms affine specifications with the same number of state variables, suggesting important nonlinearities in credit spreads that are captured by their model. Contagion accounts for the largest

part of CDS spread variation, especially prior to the crisis. However, economic fundamentals represent a significant fraction during the crisis. Subsequent studies (presented in the following section) have highlighted the impact of rating announcements on CDS spread variation. (Drago & Gallo, 2016) demonstrate that downgrades and upgrades significantly affect CDS spread variation. The relevance of the impact is due to the introduction of "new" information after a rating change announcement (information discovery effect) and the role of ratings in current financial regulation (certification effect). Furthermore, they show that there are contagion effects only after downgrade announcements, and the size of the contagion effects depends on the economic and financial conditions of the states. In contrast, (Rodríguez et al., 2019) demonstrate that changes in CDS spreads can predict sovereign events, while rating changes cannot. According to the study, the predictability of CDS spreads is higher when there is a disagreement between Moody's and S&P for a country's rating. However, there are empirical studies that attempt to address both research directions. For example, (Heinz & Sun, 2014) examine the determinants of variation in the sovereign CDS market in European countries. Firstly, they investigate the impact of cross-border contagion effects on short-term CDS spread movements. The results conclude that propagation effects from eurozone peripheral countries to Central, Eastern, and Southeastern Europe (CESEE) did not contribute to CDS variation, but rather direct cross-border influences from the CESEE region were more important for shock transmission. Secondly, they examine the connection between economic fundamentals and CDS market variation, including in the GMM (Generalized Method of Moments) and a variable that includes the monthly average forecasts for the real GDP growth rate, the balance of the public administration, the balance of the current account, and the balance of the trade. Their results are intuitive: optimistic forecasts regarding economic growth significantly reduce CDS spreads, future fiscal consolidation efforts have a considerable impact on the CDS market, and high levels of public debt increase CDS spreads. In conclusion, we note two fundamental elements: the division of states based on their level of development and the separation of time periods based on economic turbulence.

Next, we present the process of formulating the research hypothesis for this paper correlated to the relevant literature and the research objectives. Firstly, there are several studies that specifically examine the impact of positive or negative events on the CDS market (Afonso et al., 2012). Some of these studies observe a significant impact of all types of announcements, regardless of whether they are positive or negative (Micu et al., 2006). Another part of these studies concludes that positive events do not have a significant impact on the market. Instead, these studies suggest that only negative events influence the market (Galil & Soffer, 2011), (Imbierowicz & Wahrenburg, 2009), (Hull et al., 2004). For example, (Kiff et al., 2012)have shown that negative credit watch announcements have the most significant impact on CDS spreads, while downgrades and upgrades only affect the market when the announcement changes the issuer's rating category. To evaluate the impact of positive events (rating upgrades) and negative events (rating downgrades), we formulate the first research hypothesis.

- *1st hypothesis: The announcement of a sovereign rating change (positive or negative event) has a significant impact on the sovereign CDS market in the European Union.*

Secondly, we note the difference in the impact of rating change announcements on CDS markets during crises. The impact of the announcement differs depending on the credit quality of the issuer (Investment Grade versus Speculative), and announcements regarding speculative-grade countries trigger an increase in both CDS spreads and volatility (Raimbourg & Salvadè, 2021).

However, our preliminary data set does not allow us to investigate this impact. Instead, we formulate a general research hypothesis:

- *2nd hypothesis: During crises, abnormal returns observed around a downgrade are higher than those recorded around a downgrade announced in "normal periods".*

Thirdly, there are several studies that explore the determinants of sovereign credit, comparing crisis periods with "normal periods". For example, (Reusens & Croux, 2017) provide empirical evidence that credit rating agencies have modified their evaluation of sovereign credit ratings after the start of the European debt crisis in the context of increasing public debt. Furthermore, (Ismailescu & Kazemi, 2010) analyzed the spread propagation reaction in developing countries to rating changes. They observed a relevant impact of positive events, while the market seems to anticipate negative events. Like the distinction made by (Ismailescu & Kazemi, 2010), our sample allows for the division of European countries based on their public debt/GDP ratio. From the analysis of public debt levels in Europe, we observe that emerging or developing states (Table 3) have a lower public debt level than the Maastricht criterion. Exceptions to this rule are the Netherlands, Denmark, and Sweden, which, despite their high level of development, have a public debt level below the Maastricht criterion. On the other hand, states with a public debt/GDP level exceeding the Maastricht criterion are Italy, Portugal, Belgium, France, Austria, Croatia, and Spain. Therefore, we formulate the following hypothesis.

- *3rd hypothesis: Abnormal returns for states with a level of public debt that exceeds the Maastricht criterion are higher than those of other states around a downgrade announcement.*

Data

The data set includes daily 5-year credit risk swaps representing the mid-market (the average between bid and ask) from October 30, 2006, to November 9, 2020, totaling 84,203 observations. The selected sample consists of 23 European Union member states. The data were extracted from Datastream and are denominated entirely in euros to ensure comparability of time series. Price series adjustments, to maintain an equal number of observations, were done by repeating the previous day's price. Data regarding rating downgrades and upgrades for each country was extracted from Standard & Poor's. The yield series are positive for all states in the sample. The states with the highest average yields are Ireland, Estonia, Sweden, Germany, and France, while the states with the lowest average yields are Lithuania, Bulgaria, Hungary, Romania, and Croatia.

A large portion of states with high average yields (Estonia, Ireland, France, Germany) are also characterized by a high level of volatility as captured by the standard deviation. Similarly, states with low average yields have a low level of volatility in credit risk swaps.

Overall, it is observed that yields for emerging markets are lower than yields for advanced markets. The skewness indicators for all member states are positive, indicating deviation from a normal distribution. Given that all extracted yield values are positive, we can conclude that the data from each country in the sample have a right-skewed distribution, as evidenced by the kurtosis index. Additionally, the verification of time series stationarity is not necessary as the event methodology is applied to CDS yields. The results of the descriptive statistics are presented in Table 1, and the dynamics of CDS yields for each country are shown in Figure 1.

Table 1. Descriptive statistics

Country	Mean	Standard deviation	Minimum	Maximum	Skewness	Kurtosis	Dickey-Fuller index	P-value for ADF test (Augmented Dickey–Fuller)
Czech Republic	0.001167	0.041444	-0.4269	0.9924	6.645834279	136.5927935	-14.76	0.01
Germany	0.002350	0.069728	-0.5328	0.9177	2.469718641	33.14333854	-15.35	0.01
France	0.002350	0.069728	-0.5328	0.9177	2.469718641	33.14333854	-15.61	0.01
Ireland	0.012833	0.250676	-0.8759	6.9395	17.16506555	361.8405521	-18.70	0.01
Belgium	0.001800	0.060178	-0.6369	1.7541	7.260019539	206.4988057	-14.65	0.01
Denmark	0.001419	0.060332	-0.5613	0.4961	0.907751549	12.61286213	-13.99	0.01
Spain	0.002185	0.058157	-0.5302	1.1288	3.234473903	57.30771425	-14.26	0.01
Sweden	0.003204	0.078059	-0.4019	0.7025	1.700701612	15.18096245	-14.76	0.01
Austria	0.002063	0.061602	-0.3667	0.6962	2.610889296	28.94372314	-15.09	0.01
Bulgaria	0.000743	0.035482	-0.5101	1.1054	8.450169082	278.7693231	-15.09	0.01
Croatia	0.000907	0.038673	-0.3553	1.3989	14.50895385	491.3459221	-15.42	0.01
Estonia	0.008264	0.499265	-0.2472	30.1543	60.14761547	3628.739405	-14.75	0.01
Hungary	0.000764	0.037228	-0.2138	1.1303	9.987493349	260.7815559	-14.41	0.01
Italy	0.001471	0.043895	-0.3636	0.4447	1.038791511	13.3405101	-14.70	0.01
Latvia	0.001818	0.077292	-0.2186	4.1500	43.99464311	2291.133691	-14.93	0.01
Lithuania	0.000148	0.029232	-0.3198	1.0246	13.8621845	459.8970274	-14.93	0.01
Poland	0.001249	0.048939	-0.4800	1.8690	16.58231377	600.1865013	-15.30	0.01
Portugal	0.001460	0.046716	-0.4457	0.4454	1.118006916	13.85933291	-13.90	0.01
Slovenia	0.001126	0.037802	-0.3030	0.7500	4.61327905	80.60540144	-14.14	0.01
Romania	0.000803	0.030733	-0.2877	0.4869	3.598217214	55.14656829	-13.25	0.01
Slovakia	0.001345	0.044283	-0.4712	0.8169	4.292619013	75.12971495	-15.86	0.01
Great Britain	0.002080	0.059198	-0.4663	1.5500	5.682856363	137.5840178	-14.47	0.01
Netherlands	0.002066	0.060331	-0.4828	0.9333	4.765569786	72.06475952	-13.44	0.01

Source: Authors' own research based on CDS data obtained through Datastream.

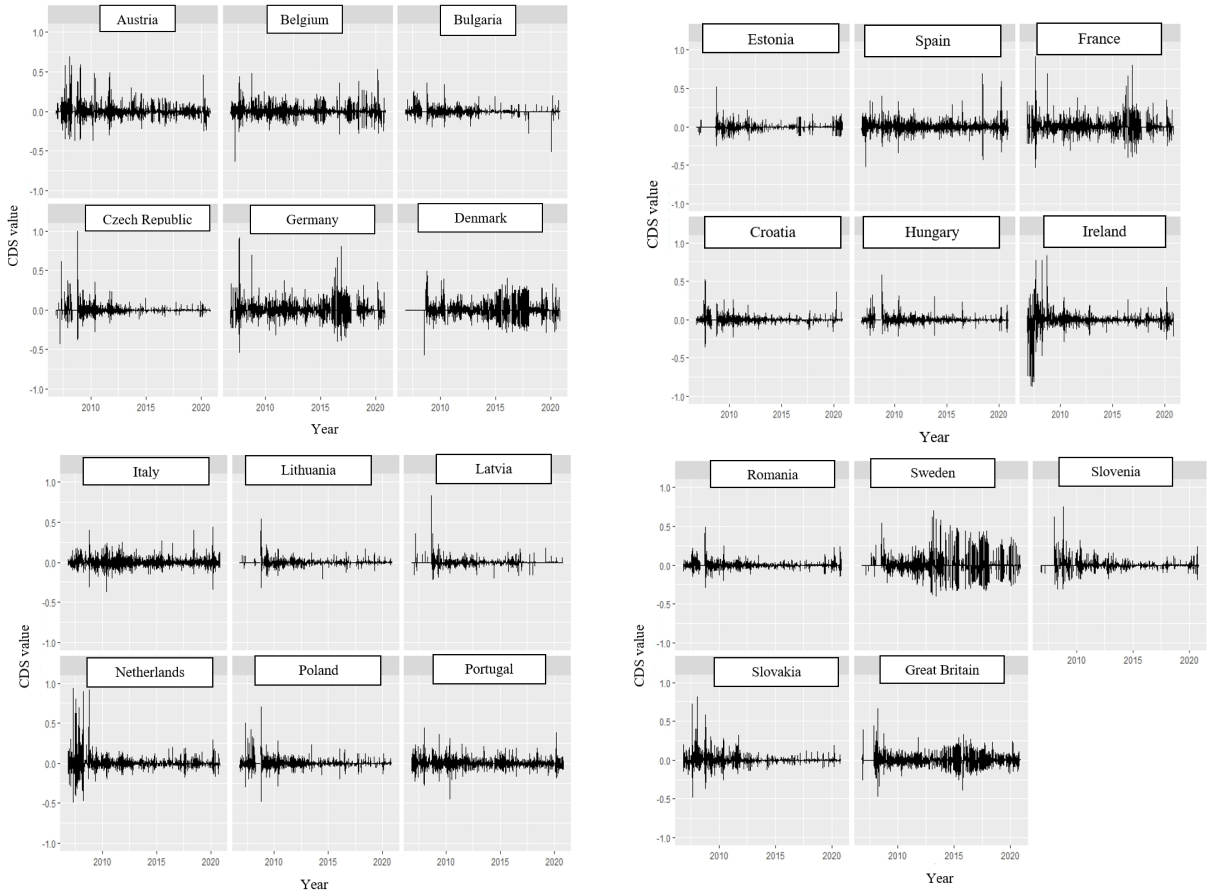

Figure 1. CDS dynamics across EU member states

Source: Authors' own research based on CDS data obtained through Datastream.

Methodology

To study the effect of a sovereign rating change announcement on the credit risk exchange market, we employ the event study methodology (MacKinlay, 1997). The event is an announcement that changes the sovereign rating. We include both downgrades (negative events) and upgrades in the analysis. Financial markets can either anticipate a positive or negative announcement or have a delayed reaction.

For this reason, we analyze market trends from the day before the announcement as well as the day after. Therefore, we consider three windows: [-1, 1], [-1, 0], [0, +1]. We do not consider longer time intervals to prevent contamination with other events that could affect CDS spreads. The analysis is conducted in three stages.

We calculate the observed and expected yields for each country. For the expected yield, the median value of credit risk exchanges for all countries in the sample is used as a benchmark. Next, we calculate abnormal yields using the market model. The model differentiates between observed and expected yields based on the following equation:

$$RA = R_{it} - (\alpha_i + \beta_i * R_{mt})$$

where:

$R_{it} = observed\ return$ for country i on day t

$(\alpha_i + \beta_i * R_{mt}) = expected\ return$ for the reference index (m = median) on day t

For each event, we evaluate the relationship between the observed and expected return using the OLS method ($\alpha_i + \beta_i * R_{mt}$) using an estimation window to ensure model stability [-7, -100]. We calculate the average abnormal yields for each event window and for each country. We quantify the average abnormal yields for all countries for each type of event (downgrade, upgrade). If a sovereign rating change has a significant impact on the CDS market, we should identify effects around the announcement days. Following the aggregation of abnormal yields, to evaluate their significance, we conducted a t-test. We can assume that abnormal yields have a t-distribution. Thus, we evaluate whether the aggregate CDS yield at t1 and t2 is different from 0, with the null hypothesis being: H_0: RA = 0. If we reject the null hypothesis, sovereign rating announcements have an impact on the CDS market: if country risk increases, the aggregate yield also increases. If negative events occur, we assume that the aggregate yield is greater than 0, and if positive events occur, the aggregate yield is less than zero, with the hypothesis being H_1: RA > 0 for negative events, and RA < 0 for positive events. Furthermore, using the same rationale, we investigate the impact of sovereign rating changes in periods of economic crisis and in "normal" periods. We also explore the impact of rating changes by dividing European states based on their level of public debt.

Results and discussions

The quantification of abnormal yields for each estimation window and their statistical significance is presented in Table 2. First, we can assert that downgrades have a significant impact on the CDS market one day after the credit agency announcement. Additionally, we notice that all abnormal yield values are positive for downgrade announcements, confirming the first part of the 1st hypothesis.

However, we cannot argue that the market anticipates rating downgrades, as asserted by (Ismailescu & Kazemi, 2010), since the results are not statistically significant for the estimation windows [-1,1] and [-1, 0]. This preliminary analysis suggests that investors change their perception of credit risk following downgrade announcements. Our results align with some empirical studies in literature (Drago & Gallo, 2016).

Secondly, we observe abnormal yields because of sovereign rating improvements. The abnormal yields obtained in the estimation window [0,1] are negative and statistically significant, confirming the second part of the 1st hypothesis 1. Overall, the results indicate that negative events impact the market more than positive ones, consistent with the findings of (Kiff et al., 2012) and (Afonso et al., 2012).

Table 2. Daily abnormal observed return before and after sovereign rating change announcements

Estimation window	Downgrades (N=53)			Improvements (N=33)		
	[-1,1]	[-1, 0]	[0, 1]	[-1,1]	[-1, 0]	[0, 1]
RA (%)	0.0057	0.0039	0.0120	-0.0026	0.0014	-0.0035
T-test	(0.370)	(0.376)	(0.049)*	(0.459)	(0.336)	(0.035)**

Source: Authors' own research.

To further substantiate the previous observation that negative events impact the market more than positive ones, we examine the impact of downgrades by comparing periods of economic turbulence with normal periods. Thus, we verify if our results are driven by the impact of downgrades during

crises, distinguishing between: downgrades during crisis periods and downgrades during normal periods.

We identify three crisis periods, as per the literature: the global financial crisis (02/2008 – 06/2009) and the sovereign debt crisis (05/2011 – 02/2013). Until November 2020, no negative rating changes were identified to determine their impact during the Covid-19 pandemic (01.2020 – 11.2020). We reiterate the 2nd hypothesis: During crises, abnormal yields observed around a downgrade are greater than those recorded around a downgrade announced in "normal periods".

We report in Table 3 the average daily abnormal yields observed around a downgrade announcement, which separates the downgrades based on economic periods. Indeed, we observe higher and statistically significant abnormal yields during economic crises in the estimation window [0,1] (RA 1.4298% compared to 0.0081%). Interesting results pertain to the impact of downgrades during crises, with one day before the downgrade announcement: the market appears to anticipate downgrade announcements during crises, and investors seem to maintain their perception of credit risk, as abnormal yields are observed in the estimation window [-1,0].

Table 3. Daily abnormal observed return before and after sovereign rating change announcements

Estimation window	Downgrades during crises (N=31)			Downgrades during "normal periods" (N=20)		
	-1,1	-1, 0	0, 1	-1,1	-1, 0	0, 1
RA (%)	0.0461	0.7351	1.4298	1.389	2.144	0.0081
T-test	(0.033)**	(0.027)**	(0.033)**	(0.324)	(0.369)	(0.362)**

Specification: The p-values are significant at a 95% confidence interval.
Source: Authors' own research.

Furthermore, we verify if the impact of downgrade announcements is consistent across all countries in our sample. To delineate the states, we used the public debt/GDP level for the sample period and separated the states based on exceeding the Maastricht criteria (above 60% public debt/GDP) in Table 4. We used the public debt indicator as rating agencies perceive it as a significant risk factor. The following table presents the classification of states based on this threshold value:

Table 4. Classification of states based on the Maastricht criteria for public debt

Country	Public debt / GDP (%)
Italy	123.7112
Portugal	107.7677
Belgium	100.0732
France	86.28763
Austria	77.13507
Croatia	73.419
Spain	71.64641
Great Britain	71.39008
Germany	70.68094
Ireland	65.91703
Hungary	62.62279
Netherlands	57.10789
Poland	50.53098

Country	Public debt / GDP (%)
Slovenia	49.50922
Slovakia	43.6452
Sweden	39.86526
Denmark	37.76042
Czech Republic	34.9829
Lithuania	30.97625
Lavia	30.77968
Romania	27.38586
Bulgaria	19.2331
Estonia	7.406025

Source: Authors' own research, The European Central Bank.

Table 5 presents the results of the analysis. We recall the 3rd hypothesis 3, which posits that the abnormal yields of states with a public debt level exceeding the Maastricht criteria are higher than those of other states around a downgrade announcement. Indeed, we observe high yields for all estimation windows for states that exceed this criterion. This result indicates that markets perceive the public debt/GDP indicator as risky. However, the yields are significant only for the estimation window [0,1], certifying once again the impact of downgrades in the market. Additionally, we observe negative abnormal yields for states that do not exceed the Maastricht criterion in the period before the downgrade announcement.

Table 5. Daily abnormal yields observed for states exceeding / not exceeding the Maastricht Criteria

Estimation window	Downgrades for states that exceed Maastricht criterion (N=31)			Downgrades for states that do not exceed Maastricht criterion (N=20)		
	-1,1	-1, 0	0, 1	-1,1	-1, 0	0, 1
RA (%)	0.0143	0.0160	0.0180	-0.0077	-0.0177	0.0032
T-test	(0.382)	(0.379)	(0.035)**	(-0.025)**	(0.119)	(-0.068)

Specification: The p-values are significant at a 95% confidence interval.
Source: Authors' own research.

Conclusion

In conclusion, this analysis cannot claim that negative or positive changes in sovereign ratings have a significant impact on the CDS market. The application of this methodology could be biased for the following reasons: the sample size may be insufficient as the lack of data for CDS values did not allow the inclusion of all EU member states; additionally, it is necessary to include other countries in the sample, including Greece, presence of asymmetry levels in the observed yield distribution, the estimation window is relatively small and does not allow for medium or long term evaluations.

Subsequently, the application of estimation windows covering more days requires the application of other statistical validity tests as well. However, despite the implementation of the methodology presenting some inconveniences regarding intuitive results, further research should aim to verify the presence of the transmission effects of a rating announcement on the CDS markets in the Economic and Monetary Union's member states. This verification could be done by applying a regression model that includes, according to the literature, control variables for the financial and

economic situation of the countries (public debt/GDP, current account balance, trade balance, stock market indices). Additionally, verifying the general level of interconnectivity in the European CDS market can be done by applying the (F. X. Diebold & Yilmaz, 2012; F. Diebold & Yilmaz, 2016). Discovering this level of interconnectivity will subsequently allow for an in-depth study of the impact of rating announcements and other elements.

The findings will have implications in identifying the risk of contagion: a more densely connected financial network improves financial stability if the magnitude of the negative shocks is small enough (Acemoglu et al., 2015). Additionally, delineating European countries based on their level of development is necessary to obtain results that contribute to the financial integration process. Moreover, in terms of implications and future research it could be useful to study the politics surrounding credit rating agencies. These political dynamics are complex and multifaceted, involving considerations of regulation, accountability, or conflicts of interest. Nonetheless, further research should include the influence of politics, including regulatory reforms that aim to address these issues and improve reliability of credit ratings.

References

Acemoglu, D., Ozdaglar, A., & Tahbaz-Salehi, A. (2015). Systemic Risk and Stability in Financial Networks. *American Economic Review*, *105*(2), 564–608. https://doi.org/10.1257/aer.20130456

Afonso, A., Furceri, D., & Gomes, P. (2012). Sovereign credit ratings and financial markets linkages: Application to European data. *Journal of International Money and Finance*, *31*(3), 606–638. https://doi.org/10.1016/j.jimonfin.2012.01.016

Aizenman, J., Jinjarak, Y., & Park, D. (2013). *Fundamentals and Sovereign Risk of Emerging Markets* (Issue 18963). https://ideas.repec.org/p/nbr/nberwo/18963.html

Benzoni, L., Collin-Dufresne, P., Goldstein, R. S., & Helwege, J. (2015). Modeling Credit Contagion via the Updating of Fragile Beliefs. *The Review of Financial Studies*, *28*(7), 1960–2008. https://doi.org/10.1093/rfs/hhv018

Caporin, M., Pelizzon, L., Ravazzolo, F., & Rigobon, R. (2018). Measuring sovereign contagion in Europe. *Journal of Financial Stability*, *34*, 150–181. https://doi.org/10.1016/j.jfs.2017.12.004

De Grauwe, P., & Ji, Y. (2013). Self-fulfilling crises in the Eurozone: An empirical test. *Journal of International Money and Finance*, *34*, 15–36. https://doi.org/10.1016/j.jimonfin.2012.11.003

Diebold, F. X., & Yilmaz, K. (2012). Better to give than to receive: Predictive directional measurement of volatility spillovers. *International Journal of Forecasting*, *28*(1), 57–66. https://doi.org/10.1016/j.ijforecast.2011.02.006

Diebold, F., & Yilmaz, K. (2016). Trans-Atlantic Equity Volatility Connectedness: U.S. and European Financial Institutions, 2004–2014. *The Journal of Financial Econometrics*, *14*(1), 81–127. https://EconPapers.repec.org/RePEc:oup:jfinec:v:14:y:2016:i:1:p:81-127.

Drago, D., & Gallo, R. (2016). The impact and the spillover effect of a sovereign rating announcement on the euro area CDS market. *Journal of International Money and Finance*, *67*, 264–286. https://doi.org/10.1016/j.jimonfin.2016.06.004

Galil, K., & Soffer, G. (2011). Good news, bad news and rating announcements: An empirical investigation. *Journal of Banking & Finance*, *35*(11), 3101–3119. https://doi.org/10.1016/j.jbankfin.2011.04.010

Gyntelberg, J., Hördahl, P., Ters, K., & Urban, J. (2013). *Intraday dynamics of euro area sovereign CDS and bonds*. https://www.bis.org/publ/work423.pdf

Hansen, L., & Sargent, T. (2010). Wanting Robustness in Macroeconomics. In B. M. Friedman & M. Woodford (Eds.), *Handbook of Monetary Economics* (1st ed., Vol. 3, pp. 1097–1157). Elsevier. https://EconPapers.repec.org/RePEc:eee:monchp:3-20

Heinz, F. F., & Sun, Y. (2014). Sovereign CDS Spreads in Europe: The Role of Global Risk Aversion, Economic Fundamentals, Liquidity, and Spillovers. *IMF Working Papers*, *14*(17), 1. https://doi.org/10.5089/9781484393017.001

Hull, J., Predescu, M., & White, A. (2004). The relationship between credit default swap spreads, bond yields, and credit rating announcements. *Journal of Banking & Finance*, *28*(11), 2789–2811. https://doi.org/10.1016/j.jbankfin.2004.06.010

Imbierowicz, B., & Wahrenburg, M. (2009). *The impact of reasons for credit rating announcements in equity and CDS markets*.

Ismailescu, I., & Kazemi, H. (2010). The reaction of emerging market credit default swap spreads to sovereign credit rating changes. *Journal of Banking & Finance*, *34*(12), 2861–2873. https://doi.org/10.1016/j.jbankfin.2010.05.014

Kiff, Mr. J., Nowak, S., & Schumacher, M. L. B. (2012). *Are Rating Agencies Powerful? An Investigation Into the Impact and Accuracy of Sovereign Ratings* (Issue 2012/023). https://ideas.repec.org/p/imf/imfwpa/2012-023.html

MacKinlay, A. C. (1997). Event Studies in Economics and Finance. *Journal of Economic Literature*, *35*(1), 13–39.

Micu, M., Remolona, E. M., & Wooldridge, P. D. (2006). The Price Impact of Rating Announcements: Which Announcements Matter? *SSRN Electronic Journal*. https://doi.org/10.2139/ssrn.911598

Raimbourg, P., & Salvadè, F. (2021). Rating Announcements, CDS Spread and Volatility During the European Sovereign Crisis. *Finance Research Letters*, *40*, 101663. https://doi.org/10.1016/j.frl.2020.101663

Reusens, P., & Croux, C. (2017). Sovereign credit rating determinants: A comparison before and after the European debt crisis. *Journal of Banking & Finance*, *77*, 108–121. https://doi.org/10.1016/j.jbankfin.2017.01.006

Rodríguez, I. M., Dandapani, K., & Lawrence, E. R. (2019). Measuring Sovereign Risk: Are CDS Spreads Better than Sovereign Credit Ratings? *Financial Management*, *48*(1), 229–256. https://doi.org/10.1111/fima.12223