CESifo Working Papers
www.cesifo.org/wp

Sovereign Rating News and Financial Markets Spillovers: Evidence from the European Debt Crisis

Rabah Arezki
Bertrand Candelon
Amadou Sy

Sovereign Rating News and Financial Markets Spillovers: Evidence from the European Debt Crisis

Abstract

This paper examines the spillover effects of sovereign rating news on European financial markets during the period 2007-2010. Our main finding is that sovereign rating downgrades have statistically and economically significant spillover effects both across countries and financial markets. The sign and magnitude of the spillover effects depend both on the type of announcements, the source country experiencing the downgrade and the rating agency from which the announcements originates. However, we also find evidence that downgrades to near speculative grade ratings for relatively large economies such as Greece have a systematic spillover effects. Rating-based triggers may help explain these results.

Rabah Arezki
International Monetary Fund
700 19th Street Northwest
USA - Washington, DC 204
rarezki@imf.org

Bertrand Candelon
University of Maastricht
Minderbroedersberg 4-6
6211 LK Maastricht
The Netherlands
b.candelon@maastrichtuniversity.nl

Amadou Sy
International Monetary Fund
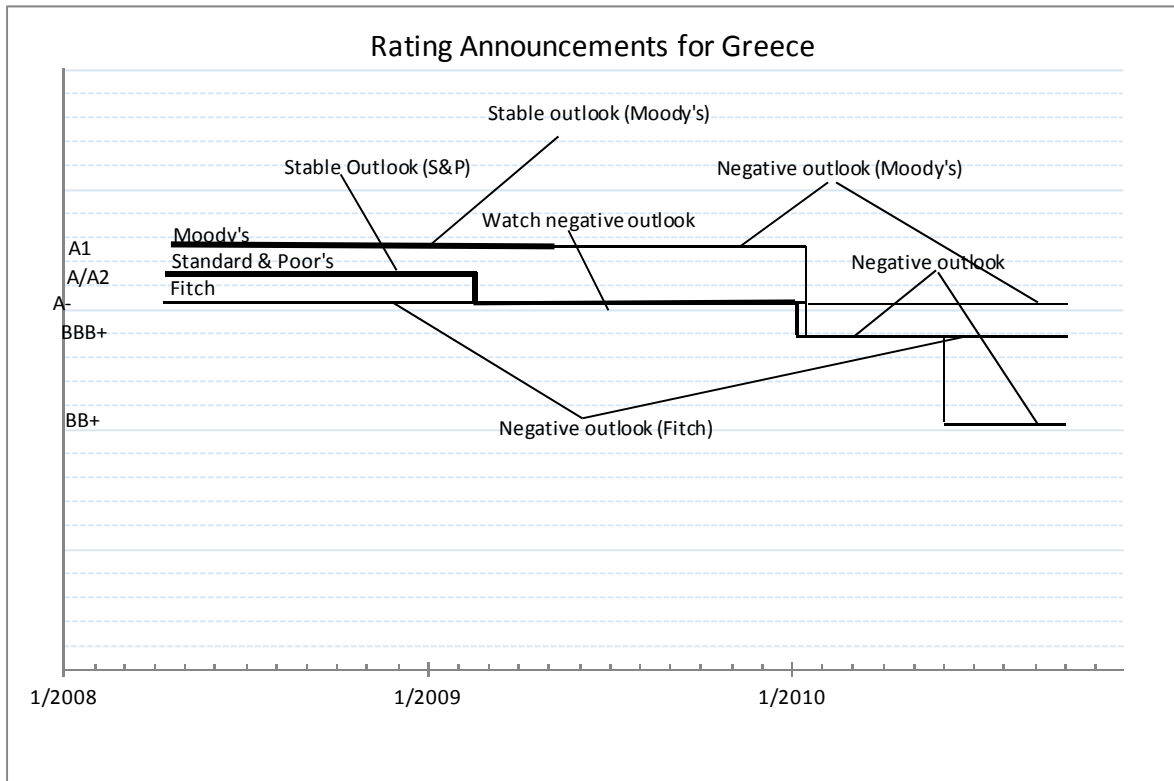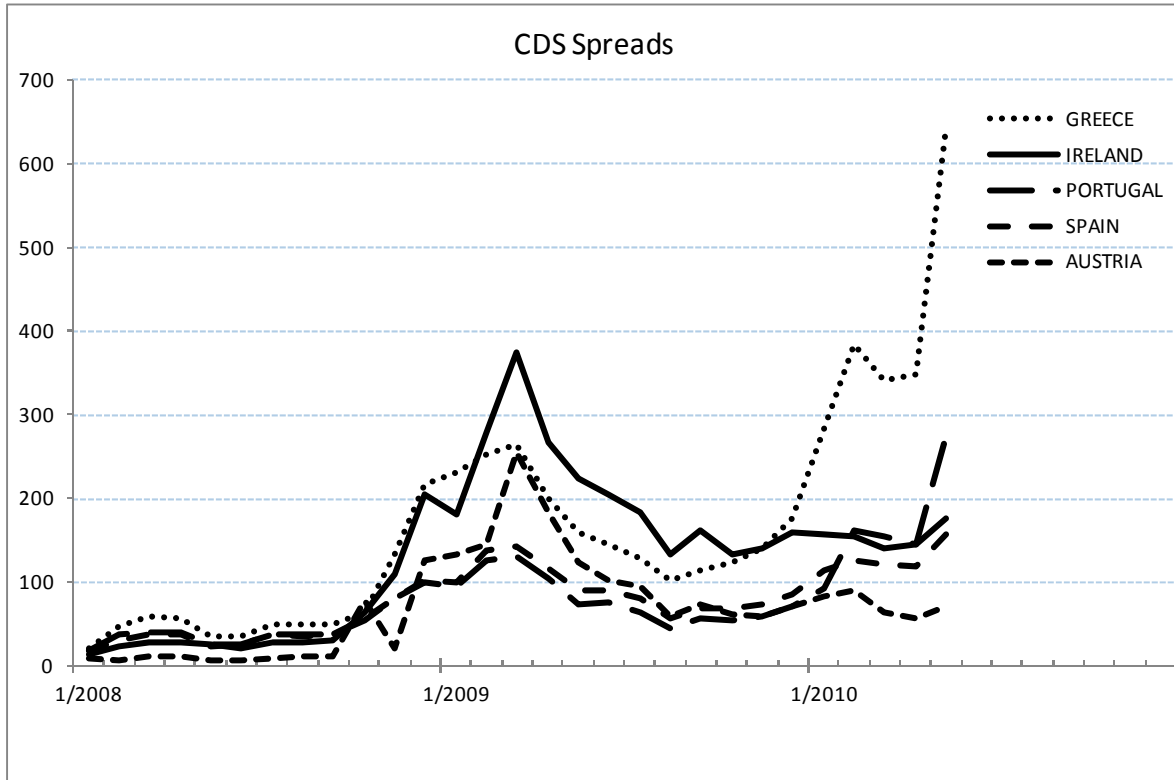*700 19th Street Northwest*
USA - Washington, DC 20431
asy@imf.org

I. Introduction

The ongoing European sovereign debt crisis has renewed the debate on the role credit rating agencies play during crises and the interdependence between different financial markets. This debt crisis has been the theater of sovereign credit rating downgrades, widening of sovereign bond and credit default swap (CDS) spreads, and pressures on stock markets. Interestingly, financial markets throughout the Euro zone have been under pressure although credit rating actions were concentrated in few countries such as Greece, Iceland, Ireland, Portugal and Spain (See Figure 1).

While the current debate echoes previous discussions during the Asian crisis in 1997-98, the degree of financial integration achieved in Europe over the past decade offers unique conditions to study the impact of rating news on financial markets. Ever since the Treaty of Rome in 1957, an uninterrupted series of deregulating measures especially in the banking sector have been put in place to foster European financial integration. The question at stake in the present paper is whether sovereign rating news, such as downgrades, have spillover effects both across countries and markets in a financially integrated environment such as Europe.

Figure 1: CDS Spreads for Selected European Countries and Greece Credit Ratings

CDS Spreads

GREECE
IRELAND
PORTUGAL
SPAIN
AUSTRIA

Rating Announcements for Greece

Stable outlook (Moody's)

Stable Outlook (S&P)

Watch negative outlook

Negative outlook (Moody's)

Moody's
A1
Standard & Poor's
A/A2
Fitch
A-
BBB+

Negative outlook

Negative outlook (Fitch)

BB+

Conceptually, there are many potential channels through which sovereign rating news may have spillover effect across countries and across financial markets. One example is the holding of foreign sovereign debt by domestic banks. A sovereign rating downgrade in a given country is thus likely to affect the profitability of banks in other countries where banks are holding this debt. This is the case of Europe where banks hold at times substantial amount of sovereign debt in both their trading and banking books (see Blundell-Wignall and Slovik, 2010). Another example of channels through which sovereign rating news may spill over across countries and markets is when banks across countries hold claims on banks in other countries and are thus exposed to one another. This cross-holding feature is at the core of the European financial market convergence process in Europe.[2] Sy (2010) provides a comprehensive discussion of the channels through which sovereign credit rating announcements may spillover to other markets including as a result of rating-based triggers such as those in banking regulation, ECB collateral rules, CDS contracts or investment mandates.

In spite of these channels, the literature on the spillover effects of rating news is sparse. Considering sovereign bond spreads data from emerging markets spanning the period 1991 to 2000, Gande and Parsley (2005) find that a country's rating downgrade has a significant negative effect on the sovereign bond spreads of other countries. In integrated financial markets, however, one should expect rating downgrade to have effects beyond bond markets. Indeed, a nascent literature including Ehrmann, Fratzscher and Rigobon (2010) analyze the transmission of shocks both across markets and countries. They find evidence of substantial international spillovers, both within and across asset classes. Kaminsky and Schmukler (2002) provide some evidence that changes in sovereign debt ratings and outlooks affect financial markets in emerging economies. More specifically, they find that sovereign rating affect not only the instrument being rated (bonds) but also stocks.

In line with Gande and Parsley (2004) and Kaminsky and Schmukler (2002), the present paper examines the impact of rating news on credit markets (albeit focusing on CDS markets) but considers more systematically the potential spillover effects that structurally exist within different asset market classes using stock market indices as well as banking and

---

[2] It has been stimulated by the first and second banking directive in 1977 and 1985. BIS (2010) provides figures on cross-border holding across countries.

insurance sub-indices. Also, the present paper is, to the extent of our knowledge, the first to focus on the spillover effects of sovereign rating news on mature markets namely Eurozone countries. Indeed, previous studies have focused on emerging markets where exchange rate fluctuations render difficult the identification of the effect of credit rating news. To do so, we use a VAR framework inspired from Favero and Giavazzi (2002) using dummies to capture the effect of sovereign rating news on various financial markets across countries.[3]

Our approach combines event study techniques with the interdependence literature (see inter alia Favero and Giavazzi, 2002) and allows identifying which markets and countries are affected by any given sovereign rating downgrade. We are also able to capture the dynamic spillover effect of rating news on different asset classes across countries by controlling for the lagged effects of the fluctuations in those assets.

Our main finding is that sovereign rating announcements have statistically and economically significant spillover effects both across countries and financial markets implying that rating agencies announcements could spur financial instability. The sign and the magnitude of the spillover effects depends both on the type of announcements, the source country experiencing the downgrade and the rating agency from which the announcements originate. However, we also find evidence that downgrades to near speculative grade ratings for relatively large economies such as Greece have a systematic spillover effects across Euro zone countries (17 and 5 basis points increase respectively for Greek and Irish CDS spreads). Rating-based triggers used in banking regulation, CDS contracts, and investment mandates may help explain these results.

The remainder of our paper is organized as follows. Section 2 describes the rating announcements during the ongoing European debt crisis. Section 3 discusses the estimation strategy and data. Section 4 presents the main results. Section 5 presents robustness checks. Section 6 concludes.

---

[3] This is shown to be equivalent to other empirical approach to identify contagion as documented in Dungey et al. (2004).

II.   The European Debt Crisis through the Lens of Credit Rating Agencies

We focus on the three major credit rating agencies, i.e. Fitch, Moody's and Standard and Poor's (S&P) making announcements of various types, namely rating changes (upgrades and downgrades), revision of outlook (positive and negative) and review for future rating changes. These different rating announcements can also occur simultaneously, even if rating agencies typically signal in advance their intention to consider rating changes. For example, Fitch, Moody's and S&P use a negative "outlook" notification to indicate the potential for a downgrade within the next two years (one year in the case of speculative-grade credits). They also use negative "watch" notifications to indicate that a downgrade is likely within the next 90 days.

A. Types of Credit Rating Announcements

There were 71 rating announcements between October 2006 and April 2010 which constitutes the period of analysis for this paper. An exhaustive list of these news together with the countries subject to the rating announcement and the dates of occurrence is provided in Table 1. Table 2 summarizes the volume and type of rating announcements broken down by credit rating agencies. It shows that out of the 71 announcements there were 29 rating changes mostly downgrades, 25 outlook revisions, 16 combined announcements and one review for future downgrade. S&P is the most frequent announcer (32 announcements), followed by Moody's (29 announcements) and Fitch (10 announcements).

Table 1: Rating Announcements

	Country	Date	Rating Announcements	Rating Agency
1	Lithuania	10/23/2006	Upgrade & Outlook revision	Fitch
2	Iceland	11/20/2007	Outlook Revision	S&P
3	Ukraine	6/12/2008	Downgrade & Outlook Revision	S&P
4	Russia	10/23/2008	Outlook Revision	S&P
5	Ukraine	10/24/2008	Downgrade & Outlook Revision	S&P
6	Croatia	10/27/2008	Outlook Revision	S&P
7	Romania	10/27/2008	Downgrade	S&P
8	Bulgaria	10/30/2008	Downgrade & Outlook Revision	S&P
9	Hungary	11/7/2008	Downgrade	Moody's
10	Latvia	11/7/2008	Downgrade	Moody's
11	Turkey	11/13/2008	Outlook Revision	S&P
12	Hungary	11/17/2008	Downgrade & Outlook Revision	S&P
13	Iceland	11/24/2008	Downgrade	S&P
14	Iceland	12/4/2008	Downgrade	Moody's
15	Russia	12/8/2008	Downgrade	S&P
16	Czech	12/8/2008	Outlook Revision	Moody's
17	Russia	12/12/2008	Outlook Revision	Moody's
18	Ireland	1/9/2009	Outlook Revision	S&P
19	Spain	1/12/2009	Outlook Revision	S&P
20	Portugal	1/13/2009	Outlook Revision	S&P
21	Greece	1/14/2009	Downgrade & Outlook Revision	S&P
22	Spain	1/19/2009	Downgrade & Outlook Revision	S&P
23	Portugal	1/21/2009	Downgrade & Outlook Revision	S&P
24	Ukraine	2/12/2009	Downgrade	Fitch
25	Latvia, Lithuania, Estonia	2/24/2009	Downgrade & Outlook Revision	S&P
26	Ukraine	2/25/2009	Downgrade & Outlook Revision	S&P
27	Greece	2/25/2009	Outlook Revision	Moody's
28	Ukraine	2/25/2009	Downgrade & Outlook Revision	S&P
29	Spanish	3/9/2009	Maintain Outlook	Moody's
30	Hungary	3/21/2009	Downgrade	Moody's
31	Slovakia	3/27/2009	Outlook Revision	Moody's
32	Hungary	3/30/2009	Downgrade	S&P
33	Ireland	3/30/2009	Downgrade	S&P
34	Estonia, Latvia and Lithuania	4/8/2009	Downgrade	Fitch
35	Croatia	4/17/2009	Downgrade	Moody's

	Country	Date	Rating Announcements	Rating Agency
36	Latvia	4/23/2009	Downgrade	Moody's
37	Lithuania	4/23/2009	Downgrade	Moody's
38	Montenegro	4/30/2009	Downgrade	Moody's
39	Ireland	6/8/2009	Downgrade	S&P
40	Ukraine	6/12/2009	Downgrade	Moody's
41	Kazakhstan	6/13/2009	Downgrade & Outlook Revision	Moody's
42	Azerbaijan	6/19/2009	Outlook Revision	Moody's
43	Ireland	7/2/2009	Downgrade	Moody's
44	Turkey	9/18/2009	Outlook Revision	Moody's
45	Portugal	10/29/2009	Outlook Revision	Moody's
46	Ireland	11/4/2009	Downgrade	Fitch
47	Iceland	11/11/2009	Downgrade & Outlook Revision	Moody's
48	Turkey	12/3/2009	Upgrade & Outlook revision	Fitch
49	Ukraine	12/3/2009	Downgrade	Fitch
50	Greece	12/8/2009	Downgrade	Fitch
51	Spain	12/9/2009	Outlook Revision	S&P
52	Greece	12/16/2009	Downgrade	S&P
53	Greece	12/22/2009	Downgrade	Moody's
54	Iceland	12/31/2009	Outlook Revision	S&P
55	Bulgaria	1/21/2010	Outlook Revision	Moody's
56	Russia	1/22/2010	Outlook Revision	Fitch
57	Ukraine	3/17/2010	Upgrade	S&P
58	Ukraine	3/17/2010	Outlook Revision	Fitch
59	Portugal	3/24/2010	Downgrade	Fitch
60	Iceland	3/30/2010	Downgrade & Outlook Revision	S&P
61	Lithuania	3/31/2010	Outlook Revision	Moody's
62	Latvia	3/31/2010	Outlook Revision	Moody's
63	Estonia	3/31/2010	Outlook Revision	Moody's
64	Iceland	4/6/2010	Outlook Revision	Moody's
65	Greece	4/22/2010	Downgrade	Moody's
66	Iceland	4/23/2010	Outlook Revision	Moody's
67	Greece	4/27/2010	Downgrade	S&P
68	Portugal	4/27/2010	Downgrade	S&P
69	Spain	4/28/2010	Downgrade	S&P
70	Portugal	5/5/2010	Review	Moody's
71	Ukraine	5/17/2010	Upgrade & Outlook revision	S&P

Table 2: Rating Announcements by Rating Agency

|	Fitch	Moodys	S&P	Total
Rating changes	6	12	11	29
of which upgrades	0	0	1	1
of which downgrades	6	12	10	28
Outlook revision	2	14	9	25
of which positive	0	7	6	13
of which negative	2	6	3	11
of which maintained	0	1		
Combined announcements	2	2	12	16
of which associated with upgrades	2	0	1	3
of which associated with downgrades	0	2	11	13
Review	0	1	0	1
Total	10	29	32	71

B. Sequencing of Rating Announcements

The rating announcements presented in tables 1 and 2 were concentrated over time. Figure 2 describes the number of rating announcements simply distinguishing between positive and negative announcements. It shows that there were very few announcements before July 2008. This observation suggests that rating agencies have not anticipated the macroeconomic weaknesses of European economies consecutive to the financial crisis.[4] The pick of negative announcements has been reached in January 2009. The number of negative rating announcements has since then decreased but remains relatively large.

This certainly reflects the unresolved nature of the European debt crisis. The number of positive credit rating announcements (mostly positive revisions of outlook) has also increased since October 2008. This could also suggest that credit rating agencies anticipate that those rating downgrades are temporary and that in the future European countries would recover their pre-crisis grade.

---

[4] Mora (2006) among others provides evidence of delayed sovereign rating announcements of credit rating agencies in the context of the Asian crisis. White (2010) provides an excellent overview of the literature on credit rating agencies including on the evidence of their sluggishness in making corporate rating announcements in the US.

Figure 2: Positive and Negative Announcements over Time
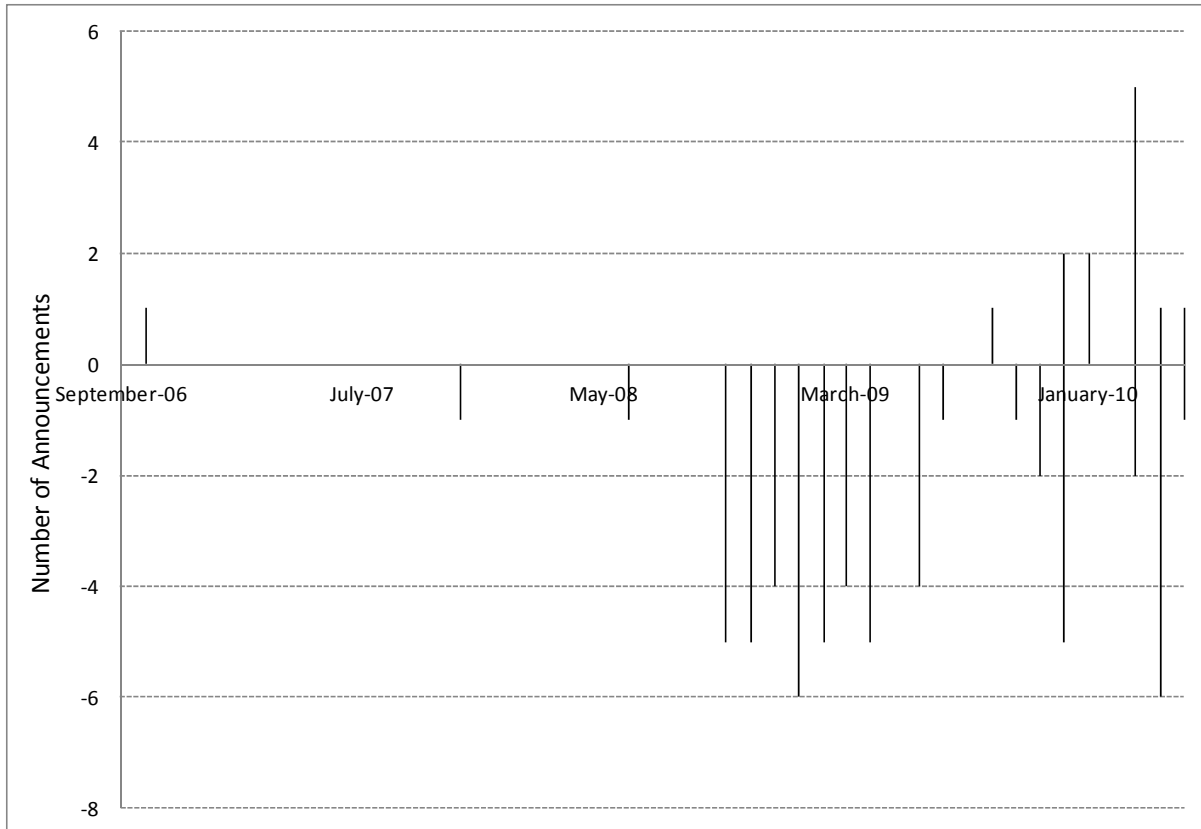
C. Spatial Distribution of Rating Announcements

Credit rating announcements are not only concentrated over time but are also concentrated spatially. Table 3 describes the number of rating announcements by regions and for a selected number of European countries. It indicates that Eastern Europe with 30 announcements has concentrated most of the announcements. We observe that 8 rating announcement were issued for Baltic States and 2 for Central Asia. Among individual countries, Greece followed by Ireland has concentrated the highest number of rating downgrades. Iceland has the highest number of rating announcements in Continental and Western Europe but has been subject to relatively fewer rating downgrades than revisions of outlook.

Table 3: Geographical Origin of the Credit Rating News

	Rating Changes	Outlook Revision	Combined Announcements	Review	Total
Regions					
Baltic states	3	3	2	0	8
Central Asia	0	1	1	0	2
Eastern Europe	12	10	8	0	30
Individual Countries					
Greece	5	1	1	0	7
Iceland	2	4	2	0	8
Ireland	4	1	0	0	5
Portugal	2	2	1	1	6
Spain	1	3	1	0	5
Total	29	25	16	1	71

Overall, we expect those rating announcements related to Euro zone countries to have the strongest effect on their own markets but also to spill over to other countries and financial markets in the Euro zone. We also expect an effect of rating announcements about Eastern European countries, Baltic States and Central Europe to have an effect on Euro zone countries that have structural and strong links with them. For instance, Austria, France, Germany, and the Netherlands, have strong financial linkages with Eastern European countries, and are thus likely to be subject to spillover effects from Eastern Europe countries. We now turn to the systematic empirical analysis of the effect of sovereign rating news on other countries and markets.

III.   Estimation Strategy and Data

In order to investigate the effect of rating announcements, hereafter labeled as "rating news", on a specific market i, most studies have so far used event study techniques.[5] This approach consists in explaining the return on market i (r^i) by a sequence of impulse dummies D_t

---

[5] Gande and Parsley (2004) constitutes a reference for such an approach applied to sovereign debt market.

characterizing the rating news released at time t.[6]

Formally, the relationship with the market return and the news can be expressed as follows:

$$r^i_t = a^i + b^i D_t + e^i_t, \ (1)$$

e^i_t being i.i.d and white noise residuals. If the coefficient associated with D_t is significant it indicates that news D lead to an abnormal returns for the market i at time t.

Equation (1) can be extended to represent the effects of a series of L news denoted D^j_t where $j=1,...,L$. In such a case (1) rewrites:

$$r^i_t = a^i + \Sigma_j b^{ij} D^j_t + u^i_t. \ (1')$$

Nevertheless, such a specification relies on two assumptions. First, it is assumed that market i is efficient as the return does not depend on past variables. In theory, the efficient market hypothesis implies that there should not be predictable changes in asset prices (see Fama, 1970). The intuition behind such hypothesis is that if everyone believed that the price of a stock would fall tomorrow, they would bid down the price today and the price would thus adjust instantaneously. However, there is a large body of empirical literature providing evidence of departures from market efficiency. Second, such a specification relies on the assumption that financial markets are not interrelated. However, the literature on financial globalization has shown otherwise (see Granger et al (2000)). There are evidence of spillovers between countries and between markets within the same country. Those spillover effects can be of a long-run nature often referred to as "interdependence" and of a short-run nature often referred to as "contagion". Using model (1') to evaluate the impact of rating news on financial markets would lead to a bias not only in the scope but also in the magnitude of the estimation.

Hence, our event study takes into account the potential linkages between markets. As in Favero and Giavazzi (2002), we consider a Vector Autoregression (VAR) framework. Variables are included in levels to allow for the possibility of long-run/cointegration

---

[6] The impulse dummy is 1 at time t and zero otherwise.

relationships.[7] The model we use in the following econometric analysis takes the following form:

$$Z_t^i = \Phi\,(L)\,Z_t^i + v_t^i\ (2)$$

where Z_t^i is a N-dimensional vector of asset prices (taken in logarithm) on market i, $\Phi\,(L)=I-\Theta_l L - \ldots - \Theta_p L^p$ is a N×N lag polynomial with $L^k y_t = y_{t-k}$, v_t, are reduced-form disturbances with zero means and constant covariance matrix with variances given by $E\,[v_{t,}^i] = \sigma^i$ and $E\,[v_{t,}^i, v_t^j] = 0\ for\ i$ not equal to j.

Nevertheless, as the model is specified in levels, the impulse dummies D_t^j are not appropriate. To be consistent with the specification in difference as in equation (1'), dummies are integrated and become step dummies $SD_t^i\,(SD_t = \Sigma_{i=1}^t D_i)$.

Hence, the specification we will use in the estimation is:

$$Z_t^i = \Phi(L)\,Z_t^i + \Sigma_j\,b^{ij}\,SD_t^j + v_t^i\ (3)$$

where b^{ij} is a matrix $N \times K$, K being the number of credit rating news.

Using such a specification will also allow us to obtain unbiased estimates of the effect of the rating news on market prices, disentangling the effects of the structural linkages between market (characterized by $\Phi(L)$) and the impact of credit rating news via the matrix b^{ij}).

---

[7] Engle and Granger (1987) showed that considering a VAR in difference while there exists one or more cointegration relationships would result in biases in the estimators.

IV. Results

The model is first estimated without dummies in order to exhibit the potential linkages between financial markets.[8] We then introduce all individual dummies at once in the VAR model using the rating announcements described in Section 2. Next, we proceed to estimate the average effects of those individual dummies along three different dimensions. First, we exploit the type of rating announcements that is whether the announcement is a rating change, an outlook revision or both to categorize the individual dummies. Second, the dummies are categorized on the basis of the region where the announcement originates from. Third, the dummies are categorized on the basis of the identity of credit rating agency which has issued the announcement namely S&P, Moody's or Fitch. In the following, we present the results of our regression analysis aimed at identifying which feature of the rating announcements financial markets react to.

The VAR model is composed of 4 equations each representing a given financial market namely sovereign CDS spread, banking stock index, insurance stock index and country stock market indices. It covers the 9 largest Euro-area countries: Austria, Belgium, France, Ireland, Italy, Germany, Greece, Netherlands and Spain and spans the period going from January 1, 2007 to April 12, 2010, representing hence 856 observations.[9] The data are all obtained from Datastream. All the series are taken in logarithms, except for the CDS spreads which are expressed in basis points. In order, to obtain robust estimators to possible remaining heteroscedasticity or/and autocorrelation in the residuals, a White correction is performed on the standard deviation of the estimated coefficients.

A. Preliminary Analysis

In a preliminary analysis, unit root tests namely ADF, PP, KPSS confirm that each series contain a stochastic trend. Johansen-Juselius' cointegration tests lead to accept that there

---

[8] The optimal lag order of the model is fixed to one as suggested by the BIC information criterion.
[9] As these countries share the same currency namely the Euro, the exchange rate cannot constitute a transmission channel for the news. Hence, the foreign exchange market is not included in our system of financial markets.

exists at least one cointegration relationship.[10] The results of the statistical test provide evidence for the existence of a long run relationship between the 4 financial markets under consideration in this paper. It is thus important to separate the direct impact of the rating news from the diffusion process between financial markets.

Also, the results of the Hausmann test lead us to reject the equality of coefficients associated with news between any couple of countries at the 1 percent level. It suggests that there is heterogeneity of coefficients associated with the dummies across countries. Such a result highlights the transmission heterogeneity of rating news across European countries, preventing us to use panel data techniques assuming homogeneity across countries as in Gande and Parsley (2005) and Kaminsky and Schmuckler (2002). We therefore conduct our estimation for each individual country separately.

B. Interdependence between Markets

The model is first estimated without considering any exogenous variables. It corresponds hence to model (2): $Z^i_t = \Phi(L) Z^i_t + v^i_t$. Results are reported in Table 4. Each equation features a lagged endogenous variable. The estimated coefficient is statistically significant and is not different from one. This result thus confirms the previous findings from the unit root and cointegration tests. Interestingly, the coefficients associated with lagged values for the sovereign CDS spread and for other stock market indices and sub-indices are sometimes significant in the other corresponding equations. It highlights the existence of a transmission channel between the four different financial markets. It is thus clear that traditional event study, which does not take into account such interdependence between financial markets, will lead to spurious correlations. Indeed, not taking into account such interdependence would not allow discriminating between the impacts of the rating news per se and the diffusion process due to the structural relationship between markets.

---

[10] The results of the cointegration tests are available from the authors upon request.

Table 4: Interdependence between Markets

	Austria	Belgium	France	Germany	Greece	Ireland	Italy	The Netherlands	Spain
				Eq1: Banking					
Banking	0.985 ***	0.946 ***	1.002 ***	1.026 ***	0.959 ***	0.965 ***	0.987 ***	0.993 ***	1.007 ***
Insurance	-0.015	0.011	-0.056 **	-0.023	-0.011	-0.001	-0.042	0.001	-0.007
Stock market	0.033	0.055 **	0.046	-0.014	0.056 *	0.048 *	0.040	0.053	-0.021
CDS	0.00007	-0.00026 *	-0.0002	0.00034	-0.00005 *	-0.0002	-0.00007	0.00022	-0.00008 *
				Eq2: Insurance					
Banking	0.010	-0.048	0.023	0.016 **	0.002	0.000	0.068 ***	0.013 **	0.050 **
Insurance	0.959 ***	0.983 ***	0.927 ***	0.961 ***	0.974 ***	0.967 ***	0.958 ***	0.954 ***	0.963 ***
Stock market	0.023	0.132	0.028	0.011	0.030	0.044 **	-0.045	0.035	-0.048
CDS	0.00007	-0.00005	-0.00027 **	0.00016	-0.00002	-0.00004	0.00001	-0.00014	-0.0001 ***
				Eq3: Stock market					
Banking	0.008	-0.019 **	0.018	0.018 **	-0.024	-0.003	0.02	0.002	0.008
Insurance	0.001	0.003	-0.033 **	-0.004	-0.008	0.001	-0.027	0.010 *	-0.002
Stock market	0.996 ***	1.022 ***	1.000 ***	0.970 ***	1.034 ***	1.004 ***	0.994 ***	1.006 ***	0.976 ***
CDS	0.00007	-0.00009	-0.0001	0.00009	-0.00003	0.00000	-0.00003	-0.00005	-0.00007 *
				Eq4: CDS					
Banking	-14.510 **	1.576	-3.503 **	-3.167 ***	13.740 ***	-0.626	-4.838	1.800 **	-1.729
Insurance	-4.712	-1.385 **	4.482 **	3.385 **	0.660	3.064 *	12.600 ***	-6.438	3.064 *
Stock market	12.580 **	0.112	-0.397	0.167	-18.407	-6.296	-7.995	-9.594	-0.871
CDS	0.94400 ***	0.99100 ***	0.988 ***	0.954 ***	1.000 ***	0.980 ***	0.979 ***	0.829 ***	0.997 ***

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

We find that the nature of the independence between the costs of insurance against sovereign defaults, measured by CDS spreads, and stock market performance is country specific suggesting that the transmission of sovereign rating news into the economy could be channeled through various "points of entry" depending on the destination country. For instance, we observe for Spain that an increase in CDS sovereign spread leads to a decline in stock market performance including in the insurance and banking markets but not the other way around. In contrast, in the Netherlands, an improvement in the performance in the banking sub-index leads to a decrease in CDS sovereign spread while in Italy, the performance in the insurance sub-index and CDS sovereign spread affect each other in both directions.

C. Individual Credit Rating News

The model is now estimated considering the individual dummies capturing rating news as in

$$(3)\ Z^i_t = \Phi(L)\ Z^i_t + \Sigma\ b^{ij}\ SD^j_t + v^i_t.$$

The main result is that sovereign rating downgrades not only impact the financial markets in

the country subject to the rating announcement but also in other Euro zone countries implying that rating agencies announcements could spur financial instability.

Given the large number of coefficients associated with the individual dummies, the estimation results are not reported here.[11] In the following sub-sections, we provide evidence that the sign and magnitude of the spillover effects depend both on the type of announcements, the source country experiencing the downgrade and the rating agency from which the announcements originates.

However, some rating announcements such as rating downgrades near speculative grade (e.g. Downgrade of Greece to BBB+ from A- by Fitch on December 8, 2009) have a systematic spillover effects across Euro zone countries.[12] We find those effects not only to be statistically but also economically significant. Indeed, we estimate the individual effect of this specific downgrade of Greece to increase CDS spread by 17 basis points for Greece but also to increase other Euro zone countries CDS spread. Indeed, we evaluate that Irish CDS spread would increase by 5 basis points consecutively to this particular Greece downgrade. If one recalls that Greece's bond issuance in March 2010 amounted to €5 billion, the increase in the cost of protecting against a sovereign default resulting from this Greece downgrade would have amounted to €8.5 million for Greece but also by €2.5million for Ireland, even so the latter country's rating would have remained unchanged.

For the other rating announcements, as discussed earlier, the sign and magnitude of the effect of news depend on the country from which the credit rating news originates. More specifically, we observe that the nature of the announcements and the linkages between destination and source country can explain the scope and the market through which the transmission operates. For instance, the downgrade of Iceland credit rating on November 24, 2008 spilled over Austrian stock market including the banking and insurance sectors but did not affect the sovereign CDS spread. In contrast, Romania credit rating downgrade on October 10, 2008 spilled over sovereign CDS spread and across stock market in the Netherlands and Austria.

---

[11] These results are available from the authors upon request

[12] Testing for the existence of threshold effects or more generally exploiting the rating scale is rendered uneasy given the concentration of rating grades in European countries. Indeed, there was no downgrade to speculative grade during the period under consideration.

In the following sub-sections, we provide estimates of average effects along various dimensions including the geographical origin of news.

D. Average Effects of Rating Changes and of Outlook Revisions

We now investigate the average effect of a rating change, denoted thereafter (*A*), outlook revision denoted (*OR*) and a combined announcements that is a rating change coupled with an outlook revision denoted (*CA*). We construct 3 different impulse dummies (*DA*, *DOR* and *DCA*) from the historical rating news sequence. The respective step dummies (*SDA*, *SDOR* and *SDCA*) are then constructed as the sum of the impulse dummies, e.g. $SDA_t = \Sigma_{i=1}^{t} DA_i$.

The specification can be expressed as follows:

$$Z_t^i = \Phi(L)\, Z_t^i + b^{i1}\, SDA_t + b^{i2}\, SDOR_t + b^{i3}\, SDCA_t + w_t^i. \quad (4)$$

Table 5 Panel 1 in Appendix 1 provides estimates of the average marginal effect of the various types of rating news. We find that that the type of rating news matters when considering the potential news spillover across markets and countries. Indeed, rating changes mostly downgrades in specific country are associated with positive spillover in the other countries ("flight to safety") while outlook revisions are associated with negative spillovers ("contagion"). This pattern continues to hold when we split the combined announcements into its two sub-components, as shown in Table 5 Panel 2. It should be noted however that the statistical significance of the average effects is limited. This could be explained by the averaging out of individual effects. As a result, in the next sub-sections we further split the type of rating announcement by region and by rating agency. We find the same sign pattern which becomes statistically significant.

Table 5: Average Marginal Effect by Type of Rating Announcements

Panel 1

	Austria	Belgium	France	Germany	Greece	Ireland	Italy	The Netherlands	Spain
					Eq1: Banking				
Rating changes	0.0010	0.0014	0.0019	-0.0021	0.0027 **	0.0022	0.0006	-0.0021	0.0023 **
Outlook revision	-0.0014	-0.0008	-0.0026	0.0003	-0.0012	-0.0083 *	-0.0007	-0.0032	-0.0007
Combined announcements	0.0008	-0.0012	0.0003	0.0030	-0.0021	0.0053	-0.0003	0.0058	-0.0010
					Eq2: Insurance				
Rating changes	-0.0005	0.0000	0.0015	-0.0005	0.0014	0.0010	0.0008	0.0063 **	0.0018
Outlook revision	-0.0010	-0.0034	-0.0016	0.0001	0.0005	-0.0050 *	0.0000	-0.0048 **	0.0002
Combined announcements	0.0018	0.0038	-0.0002	0.0007	-0.0046 **	0.0059 *	-0.0013	-0.0018	-0.0020 *
					Eq3: Stock market				
Rating changes	0.0004	0.0003	0.0012	-0.0003	0.0017 *	0.0004	0.0003	0.0022 **	0.0017 **
Outlook revision	-0.0008	-0.0005	-0.0011	0.0002	-0.0013	-0.0014	-0.0002	-0.0012 *	-0.0004
Combined announcements	0.0007	0.0003	-0.0004	0.0004	-0.0010	0.0017	-0.0002	-0.0007	-0.0008
					Eq4: CDS				
Rating changes	0.2871	0.0541	-0.0394	0.1902 **	-0.2610	-0.3614	-0.0768	-2.0142 ***	0.0525
Outlook revision	-0.0180	0.2546	0.1868	-0.0311	0.8047	0.6431 **	0.1942	0.7086 **	0.3544
Combined announcements	-0.4033	-0.4685 **	-0.1249	-0.2440 **	-0.1450	-0.4111	-0.0104	1.5979 ***	-0.3190

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Panel 2

	Austria	Belgium	France	Germany	Greece	Ireland	Italy	The Netherlands	Spain
					Eq1: Banking				
Rating changes	0.0013	0.0009	0.0021	-0.0007	0.0020 *	0.0052	0.0006	0.0010	0.0017 *
Outlook revision	-0.0013	-0.0010	-0.0024	0.0010	-0.0020	-0.0067	-0.0008	-0.0011	-0.0013
					Eq2: Insurance				
Rating changes	0.0005	0.0020	0.0014	-0.0002	0.0000	0.0037 *	0.0003	0.0054 ***	0.0008
Outlook revision	-0.0005	-0.0026	-0.0016	0.0002	-0.0008	-0.0036	-0.0004	-0.0054 ***	-0.0007
					Eq3: Stock market				
Rating changes	0.0007	0.0004	0.0011	-0.0002	0.0014	0.0011	0.0002	0.0017 ***	0.0012 *
Outlook revision	-0.0006	-0.0004	-0.0012	0.0003	-0.0015	-0.0011	-0.0003	-0.0015 **	-0.0009
					Eq4: CDS				
Rating changes	0.0956	-0.1655	-0.0979	0.0755	-0.4062	-0.5483 **	0.1101	-1.1990 ***	-0.1267
Outlook revision	-0.1187	0.1614	0.1245	-0.0898	0.6664	0.5459 *	0.1751	1.2350 ***	0.1870

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

The sign pattern associated with outlook revisions could suggest that financial markets react in a forward looking manner and expect the identified risks for a specific country to spread over other countries. Or, the outlook revision could be perceived as revealing information relating to a common risk across European countries. Conversely, the sign pattern associated

with rating changes could result from the fact that financial markets react to downgrades by fire-selling the downgraded bonds while buying other European countries' bond. This could be explained by ratings-based rules such as those in banking regulation, ECB collateral rules, "credit events" in CDS contracts or institutional investors' investment policies.

The importance of the ratings in the prudential and regulatory system can help explain the difference in the effect of credit downgrades as opposed to outlook revisions on CDS spreads and stock market indices and sub-indices. Indeed, under the 2004 Basel Committee on Banking Supervision (BCBS) capital adequacy framework (Basel II), banks can use ratings assigned by recognized credit rating agencies to determine credit risk weights for their credit exposures. This framework is currently under review but this adequacy framework can help explain why banks would react differently to various rating announcements.[13]

The ECB collateral rules can also help explain the dichotomous effects of rating downgrades as opposed to revisions of outlook. Indeed, under the Eurosystem Credit Assessment Framework (ECAF), there are specific rules governing the quality of the Government bonds that banks can use as collateral in exchange for funding. To be eligible for collateral, securities had to be assigned a credit rating above a pre-set minimum of BBB-. As a result, banks could not obtain funding for collateral with a rating lower than the minimum. In contrast, the higher the rating, the lower the haircut banks will pay.

In addition, a credit downgrade is a "credit event" in a CDS contract which typically increases the cost of insurance and triggers a collateral call for the insurance seller. Credit derivative product companies typically need an AAA rating to avoid posting collateral upon marked-to-market changes in their derivatives positions. Credit rating downgrades lead such companies, as per their derivatives contract, to post more collateral. Furthermore, collateral calls can occur if the issuer of the underlying securities is itself downgraded.[14]

---

[13] In 2009, the Basel Committee revised its risk-based capital framework so as to strengthen it. For instance, it introduced operational criteria to require banks to undertake independent analyses of the creditworthiness of their securitization exposures.

[14] In the US, this is illustrated by the threat by a credit rating agency to downgrade AIG in September 2008 which led to multiple collateral calls, increased liquidity stress, and falling market confidence.

Finally, the investment policy of institutional investors such as pension funds typically relies on credit ratings to restrict the types of assets in which they can invest. For instance, a pension fund which can only invest in investment grade European sovereign bonds would have to sell some assets of its portfolio should their ratings fall in the speculative grade category following a credit downgrade.

E. Average Effect of Rating Changes by Region of Origin

We now turn to estimating the average spillover effects of rating announcements originating from three different groups of countries. Instead of considering the individual credit rating news, we now investigate the average effect of Eurozone countries' rating announcements, denoted thereafter (***Euro***), Eastern Europe (***East***) and peripheral European countries (***Peri***).[15] Then, 3 different impulse dummies (***Euro***, ***East*** and ***Peri***) are built from the historical rating news sequence. They are 1 each time the respective rating announcement occurs and 0 otherwise. The respective step dummies (***SEuro***, ***SEast*** and ***SPeri***) are then constructed as the sum of the impulse dummies, e.g. $\textbf{\textit{SEuro}}_t = \Sigma^t_{i=1} \textbf{\textit{Euro}}_i.$. $\textbf{\textit{Z}}^i_t = \Phi(L) \textbf{\textit{Z}}^i_t + b^{i1} \textbf{\textit{SEuro}}_t + b^{i2} \textbf{\textit{SEast}}_t + b^{i3} \textbf{\textit{SPeri}}_t + \textbf{\textit{w}}^i_t$. Results are reported in Table 6.

---

[15] Peripheral European countries comprise Baltic states and Central Asian countries.

Table 6: Average Marginal Effect by Region

	Austria	Belgium	France	Germany	Greece	Ireland	Italy	The Netherlands	Spain
Rating change					Eq1: Banking				
Greece Iceland Ireland Portugal Spain	-0.001	-0.001	0.006 ***	0.000	0.006 **	0.000	0.001	-0.007	0.004 **
Eastern Europe	0.003	0.000	-0.003	-0.002	-0.001	0.019 *	-0.001	-0.001	-0.002
Peripheral Europe	-0.001	0.002	0.008 **	0.000	0.002	-0.010	0.002	0.004	0.006 **
Outlook revision									
Greece Iceland Ireland Portugal Spain	0.000	-0.004	-0.003	0.003	-0.004 **	-0.001	-0.002	0.000	-0.002
Eastern Europe	-0.002	0.000	0.001	0.001	0.001	-0.015 **	0.002	0.005	-0.001
Peripheral Europe	0.002	0.003	-0.010 ***	-0.003	-0.005	0.003	-0.002	-0.004	-0.002
Rating change					Eq2: Insurance				
Greece Iceland Ireland Portugal Spain	-0.004	-0.014	0.005 **	0.000	0.012 ***	-0.006	0.000	0.009	0.004 **
Eastern Europe	0.001	0.004	-0.006 **	-0.005 **	0.006 **	0.002	-0.001	0.005	0.000
Peripheral Europe	-0.002	0.003	0.007 *	0.002	-0.008 **	0.005	0.000	0.007	0.002
Outlook revision									
Greece Iceland Ireland Portugal Spain	0.000	0.001	-0.005 **	0.000	-0.009 ***	0.005	-0.001	-0.013	-0.003
Eastern Europe	0.002 **	0.000	0.006 ***	0.005 **	-0.003	-0.001	0.002	0.001	0.000
Peripheral Europe	0.003	0.008	-0.009 ***	-0.004 **	-0.004 **	-0.003	-0.001	-0.010	-0.002
Rating change					Eq3: Stock Market				
Greece Iceland Ireland Portugal Spain	-0.001	0.000	0.004 **	0.000	0.005 **	0.000	0.001	0.004	0.003 ***
Eastern Europe	0.000	-0.001	-0.004 **	-0.003	0.000	-0.001	-0.001	0.000	-0.001
Peripheral Europe	0.001	0.002	0.005 **	0.001	0.001	0.003	0.001	0.004	0.004 **
Outlook revision									
Greece Iceland Ireland Portugal Spain	0.001	-0.001	-0.003 ***	0.000	-0.003	0.001	-0.001	-0.004	-0.002 **
Eastern Europe	0.001	0.001	0.003 ***	0.002	0.001	0.000	0.002 **	0.001	-0.001
Peripheral Europe	-0.001	-0.001	-0.007 ***	-0.002	-0.005 **	-0.003	-0.002	-0.004	-0.002
Rating change					Eq4: CDS				
Greece Iceland Ireland Portugal Spain	0.829 *	0.146	0.557 ***	0.441 ***	0.443	1.092	0.746 **	0.170	0.012
Eastern Europe	0.450	-0.686	0.080	-0.041	-0.228	-0.175	0.029	-3.890 ***	0.248
Peripheral Europe	-0.369	0.319	-0.300	0.143	-0.961	-1.458	-0.469	2.087 ***	-0.685
Outlook revision									
Greece Iceland Ireland Portugal Spain	-0.365	0.386	-0.094	-0.143	-0.458	-0.298	-0.299	0.490	-0.024
Eastern Europe	-0.311	0.272	-0.059	-0.072	1.079	0.941 *	0.273	3.437 ***	0.101
Peripheral Europe	-0.596	-0.486 *	-0.250	-0.471 ***	0.557	-0.952	-0.438	-3.346 ***	0.521

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

The above mentioned table displays the results of the estimation for originating from three groups of countries. Overall, we confirm the results from the above sub-section that on average, rating announcements originating from Euro zone countries have a more systematic spillover-effect across the countries under consideration. When comparing the average coefficient, news originating from Eastern European countries and peripheral Europe are lower than the coefficients associated with Euro zone rating announcements. We also find that countries like the France, Netherlands and Germany are subject to spillovers from news originating from Eastern Europe and peripheral Europe suggesting that banking linkages between countries play a key role in the transmission channels of sovereign news.

F. Announcement by Different Credit Rating Agencies

In a final experiment, we categorize each of the previously used step dummies (**SDA** and **SDOR**) relatively to the credit rating agency that issued it. This should help assess the relative role of each of these agencies in the rating news spillover. The estimated model thus takes the following form:

$$Z^i_t = \Phi(L)\ Z^i_t + b^{i1}\ SDA_{SP,t} + b^{i2}\ SDOR_{SP,t} + b^{i3}\ SDA_{M,t} + b^{i4}\ SDOR_{M,t} + b^{i5}SDA_{F,t} + b^{i6}\ SDOR_{F,t} + w^i_t \ , \ (5)$$

where **SP** refers to S&P, **M** to Moody's and **F** to Fitch. Table 7 provides estimates of the average marginal effect by credit rating agency. When comparing the coefficient degree of statistical significant, we find that S&P rating announcement have far reaching consequence in terms of spillover effect compared to Moody's and Fitch. Fitch announcements have the least spillover effects. The spillover effects of Fitch rating announcements are also confined to CDS sovereign spreads while S&P and Moody's have spillover across other financial markets. This could be explained by the anteriority of S&P and Moody's compared to Fitch. Financial markets are indeed selective in the way they react to the rating news from different rating agencies. This suggests that the communication strategy of those rating agencies play a role in explaining the scope of spillover of rating news.

Table 7: Average Marginal Effect of News by Credit Rating Agency

	Austria	Belgium	France	Germany	Greece	Ireland	Italy	The Netherlands	Spain
Rating change				Eq1: Banking					
S&P	0.006 **	0.009 **	0.013 ***	0.006	0.008 ***	0.019 *	0.008 ***	0.015 ***	0.006 **
Moody's	-0.004	-0.004	-0.003	-0.005 **	-0.002	-0.004	-0.004 **	-0.004	-0.001
Fitch	0.001	0.001	-0.002	0.000	-0.001	-0.007	-0.001	-0.007 **	0.002
Outlook revision									
S&P	-0.004 **	-0.006 **	-0.011 ***	-0.003	-0.006 ***	-0.007	-0.006 ***	-0.007 **	-0.007 ***
Moody's	0.003	0.001	0.001	0.002	0.001	-0.006	0.002	-0.004	0.004 **
Fitch	-0.003	0.001	0.003	0.003	0.003	-0.009	0.001	0.003	-0.005 *
Rating change				Eq2: Insurance					
S&P	0.006 ***	0.011	0.013 ***	0.005 **	0.004	0.019 ***	0.004 **	0.023 ***	0.004
Moody's	-0.003	-0.004	-0.002	-0.002 **	0.000	-0.007 *	-0.002 **	0.003	0.000
Fitch	-0.004	-0.003	-0.006	-0.003	0.007 *	-0.006	0.000	-0.011 **	0.001
Outlook revision									
S&P	-0.003	-0.004	-0.010 ***	-0.004 **	-0.004	-0.008	-0.003 ***	-0.018 ***	-0.005 **
Moody's	0.001	-0.002	0.001	0.001	-0.007 **	0.000	0.001	-0.003	0.001
Fitch	0.003	-0.006	0.009 ***	0.004 **	0.009	-0.005	0.002	0.011 **	0.000
Rating change				Eq3: Stock market					
S&P	0.006 ***	0.005 **	0.007 ***	0.003	0.007 ***	0.005 **	0.006 ***	0.007 ***	0.004 **
Moody's	-0.003	-0.002 **	0.000	-0.002 **	-0.001	-0.003 ***	-0.003	0.001	0.000
Fitch	-0.001	-0.001	-0.003	-0.001	0.000	0.000	0.000	-0.004 **	0.002
Outlook revision									
S&P	-0.003	-0.003 ***	-0.006 ***	-0.002 **	-0.005 **	-0.003	-0.004 ***	-0.006 ***	-0.004 ***
Moody's	0.001	0.001	0.000	0.001	0.000	0.001	0.001	0.000	0.002
Fitch	0.001	0.001	0.003	0.002	0.003	-0.002	0.002	0.004 **	-0.003
Rating change				Eq4: CDS					
S&P	-1.214 **	-1.323 ***	-0.543	-0.385 **	-1.526 **	-1.302 *	-0.320	1.481 *	-1.209 ***
Moody's	0.736	0.595 **	0.101	0.37 ***	0.718	0.756	0.178	-1.172 **	0.485 **
Fitch	1.128 **	0.020	0.701	0.406 **	0.855	0.100	0.508	-1.541 *	0.554
Outlook revision									
S&P	0.821 **	0.951 ***	0.470	0.255 *	1168 **	1183 **	0.400	-0.160	0.909 ***
Moody's	-0.716	-0.355	-0.285	-0.408 ***	-0.666	-1.294 **	-0.499	-0.770 **	-0.234
Fitch	-1.083 *	0.050	-0.136	-0.224	0.976	1.762 **	0.540	3.109 ***	-0.129

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

V.   Robustness Checks

In this subsection, we conduct two robustness checks. First, we address a potential omitted variables bias resulting from the omission of US stock performance in our analysis. To do so, we control for the US stock market performance. Second, we re-estimate the model considering only the CDS and stock markets.[16]

---

[16] These tables of results are available from the authors upon request.

An important motivation behind the first robustness checks is the study by Erhmann and al. (2009) which does find that the US stock market does have significant effect on the European market. However, when introducing two lags in the various equation of our VAR estimation, the coefficients associated with those lagged values turn out to be insignificant in all equations while the coefficient associated with news remained virtually similar to the one obtained when not controlling for the performance of the US stock market. This confirms that the US stock market performance has been so far unrelated to the ongoing European debt crisis.[17] Second, the estimation of a bivariate model including CDS and stock markets only leads to qualitatively different results. This suggests that a bias arises from omitting to consider separately the banking and insurance market. This further suggests that even so the European Crisis is a sovereign crisis by nature, the spillover effects go well beyond sovereign CDS markets.

VI.   Conclusion

The paper has examined the spillover effects of sovereign rating news across countries and financial markets using daily data on sovereign credit default swaps (CDS) spreads, stock market indices and sub-indices for banking and insurance for selected European countries during the period 2007-2010. It finds that sovereign rating downgrades have statistically and economically significant spillover effects both across countries and financial markets implying that rating agencies announcements could spur financial instability. Those spillover effects depend both on the type of rating announcements, on the source country experiencing the downgrade and the rating agency from which the announcements originates from. However, we also find evidence that some rating announcements such as rating downgrades near speculative grade (e.g. downgrade of Greece to BBB+ from A- by Fitch on December 8, 2009) have a systematic spillover effects across Euro zone countries under consideration (17 and 5 basis points increase respectively for Greek and Irish CDS spreads). Rating-based triggers used in banking regulation, CDS contracts, and investment mandates may help explain these results.

Our results have important policy implications and suggest three possible avenues to address the risks from spillovers. First, as soon as other countries are downgraded, policy makers should act preventively by communicating effectively to dissipate concerns regarding what

---

[17] BIS (2010) documents US banks' exposure to Euro zone countries.

market participants perceive as weaknesses. Second, since spillover effects go beyond sovereign debt markets, policy makers should be prepared to address possible instability in the banking, insurance, and non-financial sector by preparing a contingency plan. Third, as financial instability may stem from the existence of ratings-based regulations, policy makers should review the appropriateness of using credit ratings in financial markets regulation.[18]

---

[18] The Financial Stability Board (FSB, 2010) presents a number of principles for reducing reliance on credit ratings.

References

BIS (2010), BIS Quarterly Review, December 2010, Basel, www.bis.org

Blundell-Wignall, A. and P. Slovik (2010), "The EU Stress Test and Sovereign Debt Exposures", OECD Working Papers on Finance, Insurance and Private Pensions, No. 4, OECD Financial Affairs Division, www.oecd.org/daf/fin

Dungey, M., Fry, R., Martin V. and B. Gonzalez-Hermosillo, (2004), "Empirical Modeling of Contagion: A Review of Methodologies," IMF Working Papers 04/78, International Monetary Fund.

Ehrmann, M., Fratzscher M.and R. Rigobon (2009)"Stocks, Bonds, Money Markets and Exchange Rates: Measuring International Financial Transmission", Journal of Applied Econometrics.

Engle, R.F. and C.W.J. Granger (1987), "Cointegration and Error-Correction: Representation, Estimation, and Testing", Econometrica, pp. 251-276

Fama, E. (1970), "Efficient Capital Markets: A Review of Theory and Empirical Work." Journal of Finance, 25, 383-417

Fang, W. and Miller, S. (2002), "Dynamic Effects of Currency Depreciation on Stock Market Returns during the Asian Financial Crisis," unpublished, Feng Chai University, Taiwan.

Favero, C.A. and Giavazzi, F. (2002), "Is the International Propagation of Financial Shocks Non Linear? Evidence from the ERM," Journal of International Economics, Vol. 57(1), pp. 231–246.

Forbes, K. and Rigobon, R. (2002), "No Contagion, Only Interdependence: Measuring Stock Market Co-movements," Journal of Finance, Vol. 57 (5), pp. 2,223–2,261.

FSB, 2010, "Principles for reducing reliance on CRA ratings," 27 October 2010, www.financialstabilityboard.org

Gande, A. & Parsley, D. C.(2005), "News Spillovers in the Sovereign Debt Market," Journal of Financial Economics, Elsevier, vol. 75(3), pp 691-734, March.

Granger, C., Huang, B. and Yang, C. (2000), "Bivariate Causality Between Stock Prices and Exchange Rates in Asian Countries," The Quarterly Review of Economics and Finance, Vol. 40, pp. 337–54.

Kaminsky, G. and Schmuckler, S.L. (2002), "Emerging Markets Instability: Do Sovereign Ratings Affect Country Risk and Stock Returns?, World Bank Economic Review, 16:2, pp. 171-195.

Mora, N. (2006), "Sovereign credit ratings: guilty beyond reasonable doubt?", Journal of Banking and Finance, 30, pp. 2041–2062.

Rigobon, R. (2002), "The Curse of Non-Investment Grade Countries," Journal of Development Economics, Vol. 69, pp. 423–49.

Sy, A. N. R. (2009), "The Systemic Regulation of Credit Rating Agencies and Rated Markets," *World Economics*, vol. 10(4), pp. 69-108, October.

White, L. J. 2010. "Markets: The Credit Rating Agencies." Journal of Economic Perspectives, 24(2): 211–26.