Credit Rating Impact on European Stock Markets: Home and abroad*

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Abstract

The impact of credit rating changes in both the bond and the stock market has been a widely discussed subject in the press since the outburst of the last financial crises. In this paper, we study home and foreign stock market impacts of sovereign credit rating downgrades by Standard and Poor's in Europe – focusing on Portugal, Ireland, Italy, Greece and Spain – since 2008. Firstly, we run an event study on the effect of sovereign credit rating downgrades in the national stock market returns. We confirm the existence of a statistically significant average abnormal market underreaction of 140 basis points. Secondly, we perform a contagion analysis of this effect. We find that when there is a credit rating downgrade, other European countries underperform by 38 basis points. This stock market underreaction has implications in the Efficient Market Hypothesis.

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1. Introduction

There is a long financial literature in explaining both bond and stock markets reactions to credit ratings events, concerning either private or sovereign credit ratings revisions by the main rating agencies. In one of the first papers devoted to the topic, Cantor and Packer (1996) find evidence that the announcements of changes in the agencies' sovereign ratings are followed by bond yield movements in the expected direction that are statistically significant. Similar findings regarding the impact on stocks markets are presented in Brooks et al (2004). They also confirm that only rating downgrades have a significant impact on stock returns and that amidst rating agencies, S&P has the greatest impact on market returns.

Another topic that attracts the attention of finance practitioners regards the spillovers effects of rating revisions. Whether or not they are economically meaningful for other countries has been widely covered in the literature. Gande and Parlsey (2003) study the spillover effects in the sovereign debt market and find evidence of the existence of asymmetric spillovers. Whereas positive ratings events abroad have no significant impact on the sovereign spreads, negative ratings events are associated with a statistically significant increase in spreads. Ferreira and Gama (2007) find similar patterns regarding the stock markets, with only credit downgrades impacting foreign stock markets returns.

Nonetheless, previous work in the literature concerning the effect of sovereign rating changes has focused in emerging and developing economies (Afonso, Furcen and Gomes, 2011) and thus little work exists regarding developed economies, since ratings announcements for developed economies were rare events as rating tended to be largely stable. Although the situation has significantly changed, the prevailing literature has not yet addressed this issue. Recently, Bissoondoyal-Bheenick and Brooks (2008) subdivide countries into developed and emerging countries, but their sub sample of 15 developed countries includes only 15 downgrades for the time span considered. This issue became more pressing since the recent sovereign debt crisis which forced Ireland, Greece and Portugal to bailout.

The goal of our article is threefold: (1) to determine if previous findings hold in this context of crisis within developed economies and thus sovereign credit ratings downgrades have an self market impact on developed stock markets; (2) if there are spillover effects within the chosen set of European countries and (3) discuss the suitability of the Efficient Market Hypothesis in the semi-strong form.

We find that credit rating downgrades are in fact followed by self market abnormal negative reactions that are statistically significant. These results hold in all our robustness tests, although we find that they are stronger when we use S&P 500 as a benchmark. This is most likely due to the fact that among the alternatives tested, it is the only one that does not include European stocks. Spillovers effects within European countries are confirmed. S&P 500 is likely to be less affected by them and thus captures the abnormal reactions within our sample of European countries. We also find some evidence of prior market negative reaction. We confirm the existence of spillover effects within the countries under study if S&P 500 is used as a benchmark. Regarding whether or not this homeland and spillovers effects constitute evidence contrary to the EMH, we find evidence that the impact on stock prices is not persistent and accordingly abnormal negative reactions are most likely an irrational reaction.

Our work now proceeds as follows. In Section 2, we conduct an event study on the impact on stock markets returns in the event country (which can be seen as our base case). In Section 3, we extend our analysis to study the spillovers effects of the same event sample, using a methodological approach initially proposed by Gande and Parlsey (2003) for bond markets and adapted by Ferreira and Gama (2007) to stock markets. In Section 4, we question the semi-strong form and the consequences of our results. In Section 5, we conclude.

2. Sovereign debt rating changes impact on stock markets

2.1 Data

Considering that this paper focus on the impact of credit ratings revisions in stock markets of developed countries we choose to use European Countries. Among them, Portugal, Ireland, Italy, Greece and Spain are selected for presenting the more relevant sample of events: the sovereign debt crisis that has been affecting Europe since 2008 has brought a significant number of credit rating downgrades to these countries in the period under investigation. Their status of advanced economies is also a point of interest. Hungary and Cyprus are also included later on, to test for the robustness of the results when we add additional countries. Both daily stock market returns for each index and Foreign Currency Sovereign Ratings downgrades data were withdrawn from *Bloomberg*.

We only analyze the effect of downgrades for two main reasons. Firstly, for the period covered in our study most of the sovereign credit rating revisions have been downgrades. Secondly, rating upgrades have no significant impact in previous studies (Barron, Clare and Thomas, 1997; Brooks et al, 2004). We focus in Foreign Currency Sovereign ratings following Brooks et al's (2004) findings that "local currency ratings appear to impart no information to the market".

The period covered starts in 2008 up to 2012 and includes 26 downgrades, a number that rises to 34 when we also consider Hungary and Cyprus. For the purpose of this paper we narrow our analysis to S&P rating revisions, given the fact that in previous literature, they have the greatest impact on market returns when announcing a ratings downgrade (Brooks et al, 2004).

2.2 Methodology

To understand if sovereign credit rating changes by S&P impact market returns and convey new information to the market, we perform an event study of the downgrade impact on the above mentioned countries index returns following the methodology presented in the paper of Brooks et al (2004), using S&P 500 index as a benchmark to calculate the abnormal returns.

First daily abnormal returns for the indexes are regressed as in mentioned paper, using the market model:

$$AR_{it} = R_{it} - \left(\alpha_i + \beta_i \times R_{mt}\right) \quad (1)$$

In equation (1), R_{it} is the daily log return on the market i, R_{mt} is the daily log return of our benchmark (in this case S&P 500), α_i and β_i are the model parameters obtained from a least squared regression. The parameters are estimated using historical data from a window of 120 days before the event until 21 days before. Abnormal returns are then computed for the event period, ranging from 10 days before until 10 after the announcement of the sovereign credit rating revision by S&P.

To test for the statistical relevance of the abnormal results obtained (if they are statistically different from zero or not) we use two different methodologies that differ in the assumption made regarding volatility: i) the one proposed by Brooks et al (2004), under which abnormal returns are not i.i.d and as such the volatility changes in the event window; ii) under the assumption that returns are i.i.d, implying that a constant volatility in the event window is used to perform the t-test. For the first approach, abnormal returns are first standardized (SAR_{it}) to allow for the calculation of the cross sectional standard deviation ($\sigma_{SAR_{it}}$) as follows:

$$SAR_{it} = AR_{it}/\sigma_i \times \sqrt{1 + \frac{1}{T_i} + \frac{(R_{mt} - R_m)^2}{\sum_{E=-120}^{-21}(R_{mt} - R_m)^2}} \qquad (2)$$

Where σ_i is the standard deviation of the abnormal returns in the market of each country during the estimation period, T_i is the number of training days in the period and R_m is the average of the benchmark return during estimation period. The cross sectional standard deviation is then computed as shown in equation (3):

$$\sigma_{SAR_{it}} = \sqrt{\frac{\sum_{i=1}^{N}\left(SAR_{it} - \sum_{i=1}^{N} {SAR_{it}}/{N}\right)^2}{N \times (N-1)}} \qquad (3)$$

The test statistic is computed as stated in equation (4):

$$Z = \frac{\sum_{i=1}^{N} SAR_{it} / N}{\sigma_{SAR_{it}}} \qquad (4)$$

2.3 Results

The initial analysis of the results plotted in Figure 2 shows a self market negative average abnormal reaction in the announcement day, which is in line with the results published in Brooks et al (2004) paper, which found an average negative abnormal reaction of -1.97%. It is important to notice that this negative market reaction seems to disappear over time, under a 10 day window, indicating a possible overreaction of the market to the downgrade. This could be due to an initial irrational reaction from the market, pointing out that sovereign credit ratings do not convey new information. We will further deepen this analysis in Section 5.

In Table 1, we report the significance tests conducted to both AAR and CAR under two different methodologies. The negative abnormal return of 1.40% at the time of the event is statistically different from zero at a 5% significance level under both approaches. The cumulative abnormal return is also significant, but only at 10%, for the event day and the following day.

Moreover, to address the fact that this sample is rather small for statistical purposes, we test for the robustness of our results when incorporating different countries and add Hungary and Cyprus to our event sample - since these two countries have also been under close scrutiny by rating agencies. As summarized in Table 2, our main finding of average negative market reaction to the announcement holds although they seem to lose some magnitude in terms of value (-1.27% compared to previous -1.40%).

In light of these results, we can state that there is a clear evidence of a negative impact of downgrades in the country's main stock index.

Given that we will be testing for the existence of spillover effects, we additionally test for the robustness of our results when using different benchmarks. In addition to the S&P500, we test MSCI Europe, MSCI World and DAX. The main conclusions hold regardless of the benchmark, with an average negative abnormal return in the event day.

Nonetheless, it is important to highlight that the results are weaker (lower self market negative abnormal return at the event day and lower t-stat) for MSCI Europe as denoted by Table 3. As a matter of fact, results are extremely close when we use S&P 500 or MSCI World, which we consider to be explainable by the nature of the spillovers effects. Since MSCI Europe and DAX include only European stocks, if there are spillovers effects, the benchmark would also be affected by the event at study, reducing the abnormal returns relative to the benchmark, which leads to biased results. When we use a benchmark that does not have European stocks (S&P 500) or where they have a lower weight (MSCI World), the spillover effects are likely to be lower and thus using this indices as benchmark captures better the self market effect of rating downgrades.

It is also interesting to notice that regardless of the benchmark, there seems to be a previous day negative reaction (for S&P 500 and MSCI World as a benchmark it is stronger 3 days before), although not statistically significant with any of the benchmark. This could nonetheless indicate access to private information by some market players or that there was some public leakage previous to the announcement. We can only speculate that considering that the rating revision process is complex and that the rating agencies also have business relationships with most of the quoted companies, it is plausible that market players do have some access to private information.

We finally test the robustness of our results under different estimation windows. Comparing with previous studies in the literature, our sample has the drawback of time clustering of events, which can be biasing the estimation of the coefficients of the market model in the estimation window and thus the abnormal returns. To try to mitigate this problem, we test shorter time windows of 70 and 50 days, thus reducing the likelihood of events overlapping. The main conclusions are unchanged, regardless of the estimation window chosen, as depicted by the results in Table 4.

We decide also to do an initial and rather simple test for eventual spillover effects of the events in our sample to Germany and Italy. We choose Germany because although it hasn't faced a sovereign credit rating downgrade, it could still be impacted by other's countries credit revisions. Italy is included because among our sample of countries, it is the one that has the least observations and thus studying the spillover effect using Italy as an example made us loose less events.

We adapt Brooks et al (2004) methodology to capture the spillover effects by replacing in the abnormal returns equation R_{it} by DAX and FTSEMIB returns and calculating the market model for both against our benchmark (S&P 500). The results, although only statistically significant at 10% for Italy (can be due to small sample problems, as the number of rating events in our sample since 2008 is relatively small), seem to point out to an average negative market reaction to the downgrade announcement of third countries. Interesting to notice is that this effect is stronger for Italy, suggesting that lower rating countries are more impacted by spillovers effects. This relation is economically meaningful as we would expect Germany, a AAA-rated country, to be less impacted by events in foreign countries as it has more stable perspectives; it is also consistent with the findings of Afonso, Furceri and Gomes (2011) for bond markets that "spillover effects [exist] especially from lower rated countries to higher rated countries."

However, considering that this methodology, although intuitive and easy to interpret, is unsatisfactory to assess the spillovers effects, in Section 3 we propose an alternative one.

3. Spillover effects

Following the preliminary study done in the previous Section, we further investigate the hypothesis of spillover effects in Europe. Our analysis to assess them in the chosen set of European countries is similar to that of Ferreira and Gama's (2007), and departures from their methodology are noted.

3.1 Methodology

To understand if sovereign credit rating changes affect not only the country under scrutiny but also its peers, our sample is composed of Portugal, Spain, Greece, Ireland and Italy's downgrades since 2008. The sample is the same as the one used and described in Section 2, without Hungary and Cyprus.

In this analysis, we make a distinction between event and non-event countries, but each group is seen as homogeneous; it is not an objective of the study to check for particular effects between pairs of countries. For each credit rating event – a downgrade of one of the aforementioned countries' rating level – we measure the stock market reaction of the non-event countries in the day of the event and the day that follows as a spread to the chosen benchmark. We also generate randomly a similar sample of non-event days to control for the normal reaction in terms of spread between the non-event country index and our benchmark. We estimate two regressions. The first one includes four variables directly related to the event:

$$\widehat{r_{j,i}} = \alpha + \hat{\beta}_1 Event_{i,t} + \hat{\beta}_2 Lag\ event + \hat{\beta}_3 CCR_i + \hat{\beta}_4 CCR_j \qquad (5)$$

The second equation includes the first four variables and four more controls associated to the relationship between the countries and being bailout in the last financial crisis:

$$\widehat{r_{j,i}} = \alpha + \hat{\beta}_1 Event_{i,t} + \hat{\beta}_2 Lag\ event + \hat{\beta}_3 CCR_i + \hat{\beta}_4 CCR_j + \hat{\beta}_5 Distance_{j,i} + \\ + \hat{\beta}_6 Trade_{j,i} + \hat{\beta}_7 Adjacent_{j,i} + \hat{\beta}_8 Bailout_j \qquad (6)$$

where i denotes the event country and $j \neq i$ the non-event country, $\widehat{r_{j,i}}$ indicates the two day return of the non-event country over the benchmark, $Event_{i,t}$ measures the absolute change in rating of the event country, $Lag\ event$ measures the cumulative change of non-event countries' credit rating in the preceding twenty days, CCR_i the comprehensive credit rating level of the non-event country after the change and CCR_j the credit rating level of the non-event country after the change. On (6) we tried to add variables that would explain differences in the magnitude of spillover effects. The variable $Distance_{j,i}$measures the distance, in kilometers, between capital cities of the event and non-event countries, $Trade_{j,i}$ measures the weight of the event country in the non-event country's exports, $Adjacent_{j,i}$ is a dummy variable that controls for proximity (value of one if the countries share borders) and $Bailout_j$checks if at the time of the downgrade, the non-event country had already been bailed out by the IMF (which never happens for Spain and Italy).[1] Given the fact that a rating

[1] All of these variables were presented by Ferreira and Gama except for $Trade_{j,i}$ and $Bailout_j$, proposed by us.

placed in negative watch is somehow an anticipation of a downgrade, $Event_{i,t}$ will take the value of 0.5 when that happens.

In both regressions, significant $\hat{\beta}_1$ will indicate spillover effects, while other coefficients account for the cross sectional difference in the magnitude of these effects. The remaining variables intend to control for specificities in rating changes or to capture magnifying effects: $Lag\ event$, as stated by Ferreira and Gama (2007), will check for the importance of rating history, whereas $CCR_i$and CCR_j may reveal if some countries (e.g. those with low ratings) are more exposed to downgrades by their peers; the variable $Distance_{j,i}$, $Trade_{j,i}$ and $Adjacent_{j,i}$ check if the spillover effects are stronger in countries with geographic proximity and economic ties; $Bailout_j$ tries to capture if bailed-out countries are less sensitive to downgrades, considering that they do not need to access the financial markets in the short term.

The sample used by Ferreira and Gama (2007) is much larger and focus on a broader group of countries. Besides adding the two aforementioned variables $Trade_{j,i}$ and $Bailout_j$ (and leaving out some used by the authors), we generate our sample of non-event days in a different way. While the authors choose the sample excluding the observations within a two-month window centered in each event day, we are forced to loosen that constraint, otherwise our observations would date mostly back to 2008 and 2009. Given the increased activity from rating agencies since the outburst of the financial crisis, we reduce the limit to two weeks.

3.2 Results

The results of our study are significantly influenced by the choice of the benchmark, since using MSCI Europe will not lead to any significant coefficient in equations (5) and (6).

The rationale, as we have seen in the home effects, would be that if there are indeed spillovers effects in Europe, a European index will not be a good benchmark since it reacts in the same direction as the country under study and the spread return may not be significant.

Choosing S&P 500 as the relevant benchmark, the results obtained can be summarized in Table 6. Focusing on Equation (5), we can observe that the explanatory variable $Event_{i,t}$ is significant at a 5% level, which indicates that when there is a downgrade in one country, the other countries have inferior returns by -0.38% vis-à-vis the S&P 500 in that date and the day that follows. None of the other variables is significant, which is consistent with the findings of Ferreira and Gama (2007), who state that the effect of credit rating level of the non-event country is only marked for upgrades and that the rating history (captured by the $Lag\ event$ variable) is not relevant. Thus, we are not able to confirm our initial intuition that higher credit rated countries would be less affected by credit ratings downgrades in third party countries, as the Level CCR non-event variable turns out insignificant even at 10%.

Equation (5) is a nested regression of (6), and the latter presents additional explanatory variables. None of these proves to be statistically significant, even though they make sense economically. We can only speculate that maybe some of these factors affect particular sets of country, but the effect is not generalized: we expect downgrades in Spain to loom stock markets in Portugal, given the strong trading ties, but maybe that is not the case with Italy and Spain.

The fact that our analysis focusses on a period of high activity by credit rating agencies and a stock bearish market may be blurring the results obtained; it is more difficult to attribute negative returns to specific events since there are too many occurrences and they tend to cluster.

We also encounter more multiple events than Ferreira and Gama (2007) in their original sample and the treatment of these multiple events can be cumbersome. With those observations we exclude “false” non-event countries but leave the returns on the non-event countries more than once. Interestingly, eliminating those events completely would lead to a considerable loss of observations and significance; this may indicate that those 10 observations are influencing our results, but are also a sign that our sample is small and results should be interpreted carefully.

Another noteworthy point is that as we previously mentioned, in our sample non-event dates are closer to event dates and can still be influenced by those (as well as other events). The fact that non-event dates have negative results which are lower than “normal” make it more difficult to obtain significant spreads, although in this case we were able to.

4. Efficient Market Hypothesis

A cornerstone concept for any event study is the Efficient Market Hypothesis (EMH). As proposed by Eugene Fama, if a market is semi-strong market efficient, securities prices reflect all public available information. Thus, the announcement of sovereign credit ratings changes, under this hypothesis, should only have an impact on prices if new information is conveyed to the market. If it does react to this event but there is no new information it would be due to market inefficiencies, where irrational behavior leads to prices changes. In this Section, we want to ascertain if credit ratings agencies convey new information to the market (therefore reflecting the semi-strong form of market efficiency) or, as suggested by many European governments, simply contribute to the climate of irrational fear.

In the literature we find mixed findings regarding this issue: although negative market reactions to downgrades are well documented, Cantor and Packer (1996) were able to explain 90% of the sample variation in ratings using a set of 8 macroeconomic variables. Ferreira and Gama (2007) state that the stock market should react to a sovereign rating downgrade because a downgrade can affect a country's ability to borrow in international market. We add that this holds as longs as investor and lenders' decisions are influenced by the agency rating decisions. Moreover, Ferreira and Gama (2007) also mention that sovereign rating can "provide information on the future economic health of the rated country that is not otherwise available to stock market participants", although this is only true if agency ratings have access to additional information than the public ones.

It terms of our results, under the assumption that new information is conveyed to the market the sovereign credit rating downgrades should have a permanent impact on securities prices, and thus CAR should remain persistently different from 0. However, we observe the opposite scenario in Figure 3, where after the initial abnormal negative reaction, markets seem to recover and CAR converges to zero under both an extended 20 days and a 50 days event window. The conclusions are consistent when we use a short estimation window. This could indicate an initial irrational reaction, due for instance to panic, from the market pointing out that sovereign credit ratings do not convey new information. This information seems to point out to the rejection of the efficient market hypothesis (EMH).

However, we would again stress the fact that this period was abnormal in terms of events: credit rating changes by many agencies to sovereign debt and key sectors, mainly Banking; bail outs to European countries;

political impasses or elections turmoil. This multitude of events can contribute to the apparently erratic behavior of prices as well as the irrational reactions by investors.

5. Final Remarks

In this paper we examine both the self stock market reaction and the spillover effects to Sovereign Credit Ratings Downgrades in a sample of European countries in the period following the 2008 financial crisis. Consistent with prevailing literature, we find evidence that home stock markets are affected by downgrades in the sovereign debt credit level, results which are tested for robustness with different samples and methodologies and still hold. Moreover, we conclude that foreign markets are also impacted by rating downgrades of another country.

Some interesting points for future research include adding more countries to our sample and test for spillover effects in the Eurozone and the European Union, to see if there is one group with stronger effects (we would expect the first to have more contagion).

References

Afonso, A., Furceri, D. and Gomes, Pedro M., (May 20, 2011), “Sovereign Credit Ratings and Financial Markets Linkages: Application to European Data”, *ECB Working Paper* No. 1347

Bissoondoyal-Bheenick, E. and Brooks, R., (2008), “The Impact of Sovereign Ratings Changes: A Comparison of the Market Model, Quadratic Market Model and Downside Model”, *21st Australasian Finance and Banking Conference 2008 Paper*.

Brooks, R., Faff, R., Hiller, D. and Hiller, J., 2004, “The national market impact of sovereign rating changes”, *Journal of Banking and Finance*, 28, 233-250

Ferreira, M. and Gama, P. (2007), “Does sovereign debt ratings news spill over to international stock markets?”, *Journal of Banking and Finance*, 31, 3162-3182.

Gande, A. and Parsley, D., 2005, “News spillovers in the sovereign debt market”, *Journal of Financial Economics*, 75, 691–734

Table 1 – Event study: baseline

This table reports average abnormal returns (AAR), calculated as in Equation (1), and cumulative abnormal returns (CAR) with both measuring the self market reaction to S&P Foreign Currency Sovereign Ratings Changes, as well as the statistics tests conducted to ascertain the significance of our results. S&P 500 is the benchmark we use to compute the abnormal returns. * represents a 10% significance level, and ** represents a 5% significance level.

	Brooks et al (2004) Methodology		Assuming i.i.d returns		
Day	AAR (%)	t-stat	t-stat	CAR (%)	t-stat
-10	0.38	0.16	1.06	0.38	1.06
-9	-0.19	-0.74	-0.53	0.19	0.37
-8	-0.15	-0.39	-0.43	0.03	0.05
-7	-0.09	-0.19	-0.24	-0.05	-0.07
-6	-0.19	-0.81	-0.53	-0.24	-0.30
-5	-0.23	-0.96	-0.65	-0.47	-0.54
-4	0.16	0.41	0.44	-0.31	-0.33
-3	-0.40	-1.07	-1.13	-0.71	-0.71
-2	-0.07	-0.33	-0.19	-0.78	-0.73
-1	-0.18	-0.81	-0.50	-0.96	-0.85
0	-1.40	-3.44**	-3.94**	-2.36	-2.00*
1	0.22	0.16	0.62	-2.14	-1.74*
2	0.78	2.06**	2.21**	-1.36	-1.06
3	-0.04	0.22	-0.12	-1.40	-1.05
4	-0.01	-0.09	-0.02	-1.41	-1.02
5	-0.27	-0.93	-0.76	-1.68	-1.18
6	0.25	0.77	0.70	-1.43	-0.98
7	0.33	1.13	0.92	-1.11	-0.73
8	-0.39	-1.48	-1.09	-1.49	-0.97
9	1.31	2.20**	3.69**	-0.18	-0.12
10	-0.17	-0.28	-0.48	-0.35	-0.31

Table 2 – Event study: large sample

This table reports average abnormal returns (AAR), calculated as in equation (1), and cumulative abnormal returns (CAR) with both measuring the self market reaction to S&P Foreign Currency Sovereign Ratings Changes, as well as the statistics tests conducted to ascertain the significance of our results when we also include Hungary and Cyprus in our sample. S&P 500 is the benchmark we use to compute the abnormal returns. * represents a 10% significance level, and ** represents a 5% significance level.

Day	AAR (%)	t-stat
-1	-0.17	-0.79
0	-1.27	-3.69**
1	-0.14	-0.52

Table 3 – Event study: different benckmarks

This table reports average abnormal returns (AAR), calculated as in equation (1), and cumulative abnormal returns (CAR) with both measuring the self market reaction to S&P Foreign Currency Sovereign Ratings Changes, as well as the statistics tests conducted to ascertain the significance of our results. S&P 500 is the benchmark we use to compute the abnormal returns. * represents a 10% significance level, and ** represents a 5% significance level.

	MSCI Europe		S&P 500		MSCI World		DAX	
Day	AAR (%)	t-stat	AAR (%)	t-stat	AAR (%)	t-stat	AAR (%)	t-stat
-10	0.41	0.86	0.38	0.16	0.29	0.14	0.55	1.29
-9	-0.18	-0.72	-0.19	-0.74	-0.06	-0.13	-0.21	-0.73
-8	-0.40	-1.91*	-0.15	-0.39	-0.18	-0.33	-0.17	-0.55
-7	0.00	-0.05	-0.09	-0.19	-0.21	-0.68	0.11	0.65
-6	0.01	-0.68	-0.19	-0.81	0.04	-0.46	-0.11	-1.13
-5	-0.12	-0.84	-0.23	-0.96	-0.20	-0.98	-0.20	-1.23
-4	0.14	0.27	0.16	0.41	0.12	0.48	0.19	0.25
-3	-0.22	-0.64	-0.40	-1.07	-0.42	-1.01	-0.44	-1.51
-2	0.10	0.24	-0.07	-0.33	0.10	0.20	-0.09	-0.68
-1	-0.47	-1.41	-0.18	-0.81	-0.22	-0.83	-0.50	-1.46
0	-0.84	-3.13**	-1.40	-3.44**	-1.37	-3.30**	-0.96	-3.12**
1	0.01	-0.51	0.22	0.16	0.31	0.80	0.08	-0.31
2	0.52	1.68	0.78	2.06**	0.71	1.92*	0.55	1.46
3	-0.05	0.21	-0.04	0.22	-0.12	-0.28	-0.20	-0.37
4	-0.14	-0.52	-0.01	-0.09	-0.05	-0.07	-0.11	-0.36
5	-0.09	-0.67	-0.27	-0.93	-0.29	-0.71	-0.37	-1.59
6	-0.03	-0.24	0.25	0.77	0.12	0.62	0.01	0.14
7	0.28	1.20	0.33	1.13	0.23	0.64	0.17	0.12
8	-0.38	-1.04	-0.39	-1.48	-0.56	-1.83*	-0.59	-1.63
9	0.58	1.65	1.31	2.20**	1.31	1.99*	1.11	1.98*
10	-0.25	-1.09	-0.17	-0.28	-0.25	-0.51	-0.37	-1.17

Table 4 – Event study: different estimation windows

This table reports average abnormal returns (AAR), calculated as in equation (1), and cumulative abnormal returns (CAR) with both measuring the self market reaction to S&P Foreign Currency Sovereign Ratings Changes, as well as the statistics tests conducted to ascertain the significance of our results. S&P 500 is the benchmark we use to compute the abnormal returns. * represents a 10% significance level, and ** represents a 5% significance level.

	50 days		70 days		100 days	
Day	AAR (%)	t-stat	AAR (%)	t-stat	AAR (%)	t-stat
-1	-0.18	-0.83	-0.17	-0.78	-0.18	-0.81
0	-1.32	-3.20**	-1.36	-3.41**	-1.40	-3.44**
1	0.19	0.07	0.19	0.09	0.22	0.16

Table 5 – Event study: market reaction on DAX and FTSEMIB

This table reports average abnormal returns (AAR) for the DAX and FTSEMIB to S&P Foreign Currency Sovereign Ratings downgrades of Portugal, Spain, Greece and Ireland. AARs are calculated as in equation (1), and we present also the t-stats for the event day as well as the 5 previous and following days, using S&P 500 as a benchmark. Standardized abnormal returns (SARs) and standard deviation are calculated as in Brooks et al (2004), but only the final t-stats are reported. * represents a 10% significance level, and ** represents a 5% significance level.

	Day	-5	-4	-3	-2	-1	0	1	2	3	4	5
Germany	AAR (%)	-0.07	0.11	0.10	-0.07	0.44	-0.49	0.36	0.29	0.11	-0.03	0.04
	t-stat	-0.49	1.39	0.36	0.42	1.95	-1.17	1.40	1.61	0.35	-0.75	-0.01
Italy	AAR (%)	0.12	0.06	-0.44	-0.12	0.29	-0.65	0.16	0.16	0.25	0.07	-0.29
	t-stat	0.46	0.74	-2.17**	-0.33	0.85	-1.75*	0.38	0.47	0.29	0.06	-1.10

Table 6 – Spillover effects

This table shows the coefficient estimation as well as the t-stat associated with the explanatory variables of Equations (5) and (6) following an OLS regression. * represents a 10% significance level, and ** represents a 5% significance level.

	Dependent variable: return of each national market			
	Coefficient	t-stat	Coefficient	t-stat
Constant	0.0074	1.2080	0.0043	0.3996
Event	-0.0038	-2.0072*	-0.0039	-2.0521*
Lag event	-0.0003	-0.3246	-0.0005	-0.4759
Level CCR event	-0.0003	-1.0744	-0.0004	-1.2887
Level CCR non event	-0.0005	-1.5259	-0.0002	-0.5536
Distance			0.0000	-0.1048
Trading partners			0.0470	1.2413
Adjacent			-0.0078	-1.0715
Bailout			0.0029	0.6390

Table 7 – Sample comparisons

This table compares the sample composition of the original study made by Ferreira and Gama (2007) and the one we use now in terms of event clustering; as previously mentioned, other differences lie in the number and group of countries and time period.

Our sample				Ferreira and Gama (2007)		
Downgrades in the event date	Occurrences	Percentage		Downgrades in the event date	Occurrences	Percentage
1	27	72.97		1	105	96.33
2	4	10.81		2	4	3.67
3	6	16.22		3	0	2.83
Total	37	100.00		Total	106	100.00

Figure 1 - Sovereign ratings downgrades by S&P

This Figure shows the timeline of sovereign rating downgrades by S&P for the countries selected.

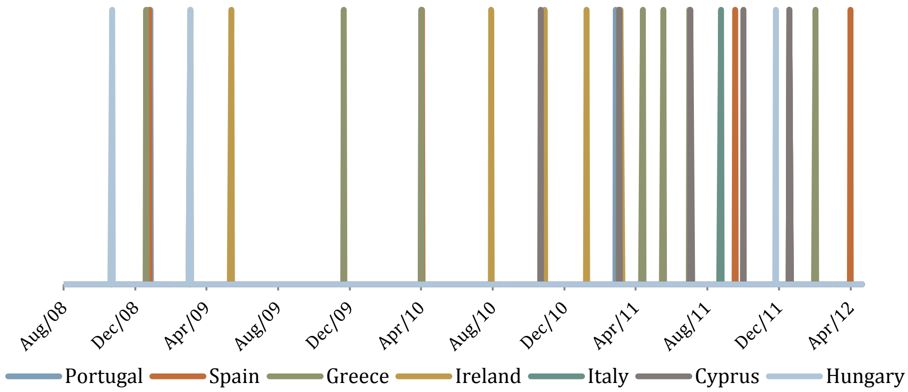


Figure 2 – Event study

This Figure shows the average daily average abnormal returns (Panel A) and cumulative abnormal returns (Panel B) for all the sovereign rating downgrades by S&P for the countries selected in period between 2008 and 2011.

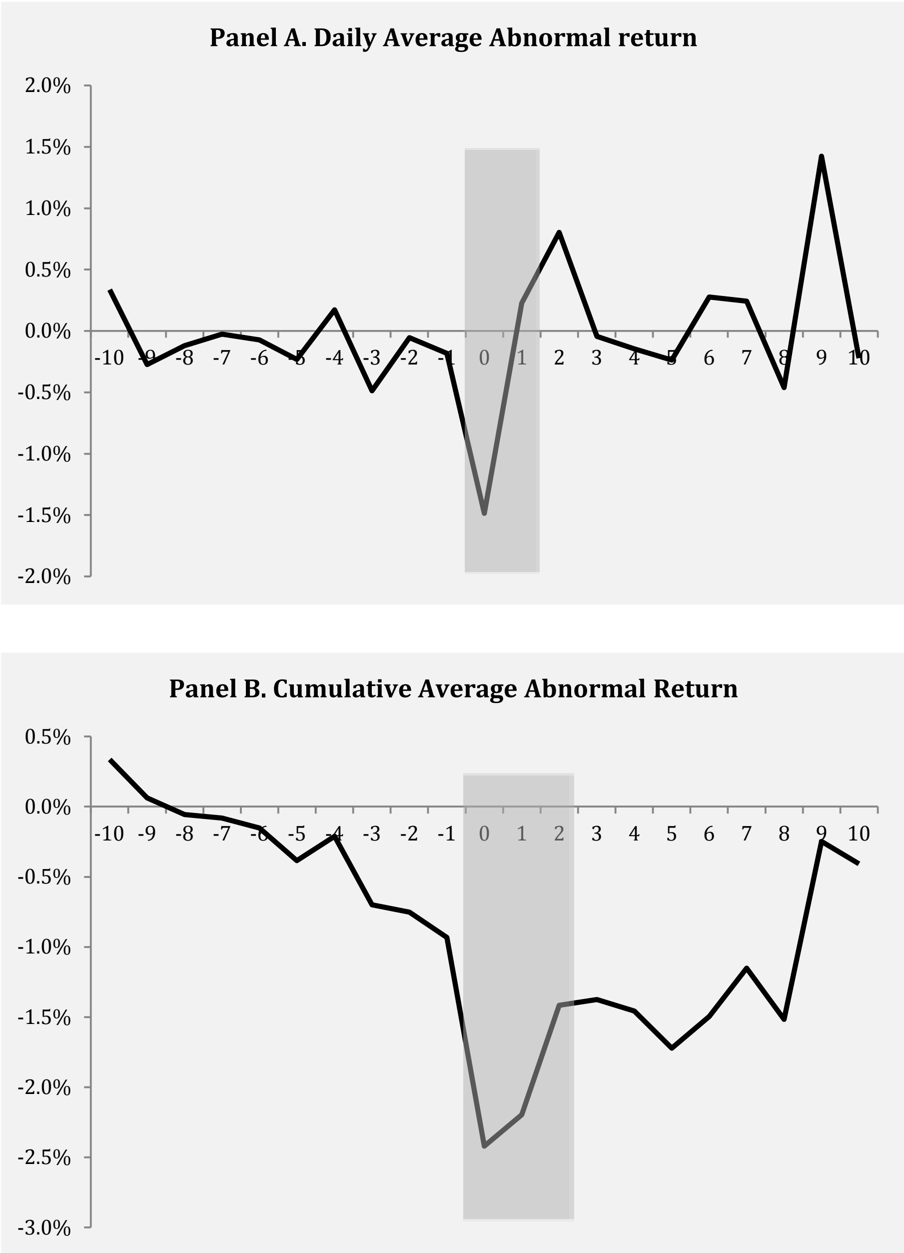
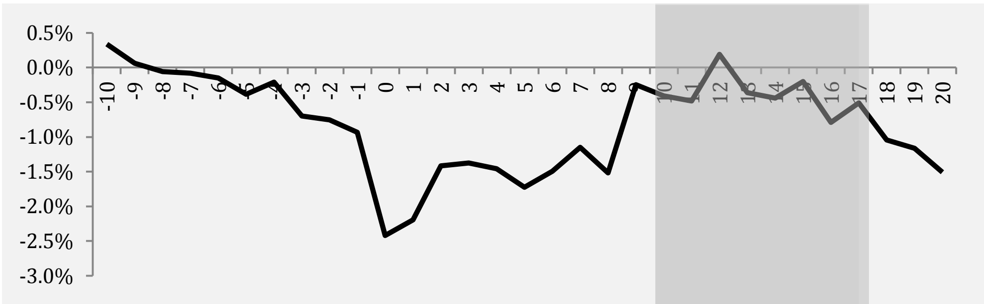


Figure 3 – CAR with different windows

This Figure shows the CAR for all the sovereign rating downgrades by S&P for the countries selected in period between 2008 and 2011.

Panel A: Extended event window (up to 20 days after the event)



Panel B: Extended event window and a 50 days estimation window (up to 20 days after the event)