UNIVERSITY OF MACEDONIA

Interdepartmental Programme of Postgraduate Studies in Economic Science

Master in Economics

Master Thesis

ON THE RELATIONSHIP BETWEEN SOVEREIGN BOND SPREADS AND BOND RATINGS

EVIDENCE FROM THE EUROZONE

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October 2013

The present was submitted in order to obtain Master's Degree in Economic Science with specialization in Applied Economics and Finance.

Abstract

The evolution of a global crisis into a Eurozone crisis lead to major differences between the sovereign bond yields of the European Nations, subsampling them into the core and the peripheral countries. We are looking to find if the ratings, of the three main Credit Rating Agencies, explain any variation of the spreads. Also we are looking for the role of the spreads, passing through some robust tests, in the explaining, the anticipation and generally in the self-fulfilling prophecy.

JEL Classification Numbers: C23, G15, G24, H63.

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1. Introduction

A Eurozone crisis is a fact. This fact has some aspects, before the occurrence of this crisis there was no difference in the yield of the sovereign bond. There was, almost, the same situation for every country. For example an Irish bond or a Greek bond was treated as it was a German one. The investors and generally the market had the same sensibility in the actions of these countries. This changed in 2009, when the crisis made it difficult or impossible for some countries to repay or re-finance their government debt without the assistance of third parties. Additionally, economic growth is slow in the whole of the Eurozone and is unequally distributed across the member states. The sensibility of the investors had changed dramatically. This new situation for the countries, about their inability to repay their debt and the birth of some bailout mechanisms, was a consequence of a highly costly borrowing mechanism. The high cost was the next step after an increase in the spreads of the government bonds. This is a crucial point, some believe the change in spreads occurred from a change in the credit rating and some others believe that is just a change in the investors' «ratings» for the economy (unrelated to fundamentals).

In the case of the change in rating, is necessary to test if the ratings are informative. Is a scenario whether a credit rating change can explain a variation of the spreads, or it cannot. The empirical findings, among a lot researches, had found that the modern role of the Credit Rating Agencies is just a passive role in an interactive world, contributing to the recent global crisis. They just react in the events and could not estimate them.

The agencies provide information that is already available to the investors, losing the ability to inform for something new. So the market has no actually gain from the use of the ratings. This problem is a main aspect for our research, if the ratings provide any information that is not already available via the observed spreads. The observed spreads and the credit ratings, tested if they were capturing the same thing. The results of this research are very telling, showing that the credit ratings have additional information.

Trying to analyze the change in the spreads of bonds, we test if a change occurred that was unrelated to a fundamental reason. A fundamental reason is, for example, a change in the credit rating, a change in the stock index of the country, a change in the exchange rate or a change in volatility index. We try to find if investors' decision is at some degree unrelated to the fundamentals signs. Sometimes exist rumors about the increase of a country's probability of default (increase in the spreads).

We investigate the two possible scenarios, if this rumor is not due to unhealthy economic fundamental conditions or improper government policies, but is due to a consequence of pessimistic expectations of investors and finally this rumor confirmed as it was unavoidable. The other scenario is if this rumor is justified, due to unhealthy economic fundamental conditions or improper government policies and if so –and on what degree- this was anticipated by the markets.

The Credit Rating Agencies had lost their dominance in the market area, the charges had increased after their role in this crisis and were initially criticized for their favorable pre-crisis ratings of insolvent financial institutions, as well as risky mortgage-related securities. But since 2010,

the agencies have focused on U.S. and European sovereign debt and some new balances followed. The systematic watch and analysis for the European market had been puerility till 2010, this is obvious by the fact that no Eurozone country was downgraded by Moody's during the 1999-2008 period and none was upgraded by this agency between 2009 and mid-2013. It is very useful to see the reactions of the market to each of the three, main, rating agencies when the findings of the research did not give us the ability to reject the view that rating agencies add value.

The purpose of this analysis is to examine a relationship between sovereign bond spreads and ratings, which is a main aspect for every government in the world. Through this research we observe the impact –if there is any- of this relationship on the European countries. We also test for some other vital hypothesis, such as self-fulfilling and anticipation ability of the participants.

We continue with the overview of the literature, the data and methodology, the empirical results and close with the conclusions.

2. Literature review

The studying field of sovereign bond spreads and ratings is a field that led to controversial results through the researches. The growing interest for the need to understand this relationship, between spreads and ratings, drove studies in a safari of knowledge. In this road a lot authors took different aspects as given and others as demanded. Some of them tried to explain this relationship via another facts. A lot of these studies aim their interest in the emerging economies, in order to simplify the relationships, and determine the desired results. In this category we could add authors like Agliardi et al (2012), Hanusch et al (2013) or Baldacci et al (2011). Some other studies focused for the role of the credit rating agencies, as the Iyengar (2012), de Haan et al (2011) or Cavallo et al (2012). We present all these studies more analytical in the next pages.

	Title	Author	Keywords	Methodology	Theme
(1)	A new country risk index for emerging markets: a stochastic dominance approach.	Agliardi et al 2012	Nonparametric Stochastic Dominance, Mixed Integer Programming, Sovereign Risk, Emerging economies.	The paper uses consistent Stochastic Dominance efficiency analysis to determine the optimal weights assessing the relative importance of the risk factors for emerging market economies, in order to derive an optimal country risk index.	Via this paper an optimal weighting scheme is proposed to construct economic, political and financial risk indices in emerging markets using an approach that relies on consistent tests for stochastic dominance efficiency. These tests are considered for a given risk index with respect to all possible indices constructed from a set of individual risk factors. Finally, an overall risk index is constructed.
(2)	Short- and long- run determinants of sovereign debt credit ratings.	Afonso et al 2011	Credit ratings, sovereign debt, rating agencies, random effects ordered probit.	This study based on a linear regression for the rating consists of a vector containing time varying variables and a vector of time invariant variables. The rating is a discrete variable and an ordered probit is a natural approach for this type of problem. A set of variables that may determine these sovereign ratings, aggregated in four main areas (Macroeconomic, Government, External and other variables).	This article is about the determinants of sovereign debt ratings from the three main rating agencies, for the period 1995–2005. Using linear and ordered response models, employing a specification that allows it to distinguish between short- and long-run effects, on a country's rating, of macroeconomic and fiscal variables.).

	Title	Author	Keywords	Methodology	Theme
(3)	The credit rating agencies - are they reliable? A study of sovereign ratings.	Iyengar 2012	Credit Ratings, Credit Rating Agencies, Sovereign Ratings, Transparency.	Iyengar used cross-section data from two years, firstly to regress-linearly- the ratings of two agencies, Moody's and S&P's, in order to find if they have any difference. And secondly "run" a linear regression to determine the sovereign ratings, with nine explanatory variables.	The present paper attempts to check the reliability of the sovereign credit ratings provided by international rating agencies to different countries, provide a perception to the lenders about the level of credit risk of the national governments. This is done through comparison of the ratings assigned by the two of the major international rating agencies - Moody's and Standard and Poor's and checking whether the difference is significant and responsive and a regression analysis of the ratings and some of the commonly used indicators by the two agencies to determine the ratings.
(4)	Credit rating agencies in emerging democracies: Guardians of fiscal discipline?	Hanusch et al 2013	Credit rating agencies, fiscal policy, political budget cycles.	In this study trying to answer whether credit rating agencies anticipate and deter governments in emerging democracies from opportunistic borrowing and potential financial crises related to elections, regress the budget balance with seven explanatory variables, including variables for election, ratings, country dummies and some other.	This paper refer to the analyses of budget balances in 18 emerging presidential democracies observed prior to the financial crisis of 2008–2009 show that credit rating agencies induce fiscal discipline in election years, thus reducing incentives for governments to borrow opportunistically for short-term electoral gain.

	Title	Author	Keywords	Methodology	Theme
(5)	Credit rating agencies.	de Haan et al 2011	Credit rating, regulation.	Throughout the theoretical framework of this contribution it has been argued that credit rating agencies play a crucial role in the global financial system, and analyze the regulatory regime needed to limit their role.	This paper critically reviews the debate on CRAs and, in the light thereof, analyses the European regulatory approach to CRAs, thereby combining insights from economics and law. Thereafter, focus on the two main tasks for which CRAs have come under criticism, namely the issuing of sovereign ratings and the rating of structured instruments. Finally, whether and how CRAs should be regulated given their function, focusing on recent European legislation.
(6)	Sovereign credit ratings and financial markets linkages: Application to European data.	Afonso et al 2011	Credit ratings, sovereign yields, rating agencies.	This paper applied a standard event study to analyze how sovereign yields (and CDS) spreads respond to sovereign credit ratings and to credit outlook announcements. Also applied tests for anticipation (already absorbed the information), causality (sovereign yields and CDS spreads in a given country react to rating announcements), contagion (the existence of spillover effects) and persistence (further respond to announcements).	This study use EU sovereign bond yield and CDS spreads daily data to carry out an event study analysis on the reaction of government yield spreads before and after announcements from rating agencies (Standard & Poor's, Moody's, Fitch). Results show: significant responses of government bond yield spreads to changes in rating notations and outlook, particularly in the case of negative announcements.

	Title	Author	Keywords	Methodology	Theme
(7)	Rating agencies, self-fulfilling prophecy and multiple equilibria? An empirical model of the European sovereign debt crisis 2009-2011.	Gärtner et al 2012	Eurozone, crisis, sovereign debt, credit spreads, bond yields, rating agencies, multiple equilibria, self-fulfilling prophecy.	This paper take some steps in the direction of modeling the relationship between the probability of default and interest rate, the decision of a country to default or honor its commitment and the credit spread of a country versus Germany.	The paper explores whether experiences during Europe's sovereign debt crisis support the notion that governments faced scenarios of self-fulfilling prophecy and multiple equilibria. To this end, provides estimates of the effect of interest rates and other macroeconomic variables on sovereign debt ratings, and estimates of how ratings bear on interest rates. Finally detecting a nonlinear effect of ratings on interest rates which is strong enough to generate multiple equilibria.
(8)	Do credit rating agencies add value? Evidence from the sovereign rating business.	Cavallo et al 2012	Ratings, spreads, information economics, event studies.	First the authors try to find if the information in ratings is already reflected in the spread. For this purpose used a simple error in variance model (a correlated and an uncorrelated version). Later on, applied a standard Hausman specification test, estimating an OLS, an IV and an Error Correction model examing the relationship between spreads and ratings.	This paper examines how the debt crisis in several European Union nations has resulted in a set of downgrades in sovereign ratings, sparking a lively debate whether these opinions actually matter. Ratings and bond spreads may both be considered as noisy signals of fundamentals. The study employed a unique dataset of over 75 000 daily observations on emerging countries around rating actions by the three major agencies. In the end it found that ratings do indeed add information, and this finding is robust to a variety of different tests.

	Title	Author	Keywords	Methodology	Theme
(9)	Political and Fiscal Risk Determinants of Sovereign Spreads in Emerging Markets.	Baldacci et al 2011		The paper regress the bond spreads for each country, using some explanatory variables as solvency-liquidity and fiscal vulnerability, with generalized least square estimator with heteroskedasticity. Additional robustness tests by using an instrumental variable estimator, and by using an alternative dynamic specification through the system generalized method of moments estimator.	Using a panel of 46 emerging market economies from 1997 to 2008, this paper investigates the key determinants of country risk premiums as measured by sovereign bond spreads. The results indicate that both political and fiscal factors matter for credit risk in emerging markets.
(10)	The credit ratings game.	Bolton et al 2012	Credit rating agencies, conflicts of interest, ratings shopping.	A theoretical approach with notations of good and bad investments, analyzed in this paper. Regimes with monopoly or duopoly (about the credit rating agencies) and the truth about ratings (inflated or not) have been developed.	This study models competition among CRAs with three sources of conflicts: (1) CRAs conflict of understating risk to attract business, (2) issuers' ability to purchase only the most favorable ratings, and (3) the trusting nature of some investor clienteles. These conflicts create two distortions. First, competition can reduce efficiency, as it facilitates ratings shopping. Second, ratings are more likely to be inflated during booms and when investors are more trusting.

	Title	Author	Keywords	Methodology	Theme
(11)	Structural shifts in credit rating standards.	Alp 2011	Rating, credit rating, rating inflation, rating conservatism, credit rating standard, Dot-Com crash, Sarbanes-Oxley.	This paper estimates an ordered probit model in which it models the ratings as a function of firm characteristics and year indicators. The depended variable of the regression equation used linking firm characteristics to the rating categories. This equation used as explanatory variables cash balances, interest coverage and some others. This equation helped the author apply some tests, as the Wald test or the Robustness tests.	This paper examines the time-series variation in corporate credit-rating standards (i.e., whether the rating agencies become more generous or stringent in rating assignments) from 1985 to 2007. A divergent pattern exists between investment-grade and speculative-grade rating standards from 1985 to 2002 as investment-grade standards tighten and speculative-grade loosen. In 2002, a structural shift occurs towards more stringent ratings. Credit-spread tests suggest that the variation in standards is not completely due to changes in the economic climate. Evidence exists to suggest that loose ratings lead to higher default and lower recovery rates.
(12)	Sovereign credit ratings, market volatility, and financial gains.	Afonso et al 2012	Sovereign ratings, yields, stock market returns, volatility, EGARCH, optimal portfolio, financial gain, risk management, value-at-risk.	This research had an analysis of the impact of sovereign credit rating news on the financial market volatilities using the EGARCH model. Also studied the reaction of equity and bond market volatilities to sovereign rating upgrading and downgrading across the European countries, through fixed effect panel regressions. The next steps were robustness and contagion analysis.	In this research, studying an investigation of the reaction of bond and equity market volatilities in the EU to sovereign rating announcements, using panel analysis with daily stock market and sovereign bond returns. The parametric volatilities are defined using EGARCH specifications. It finds that upgrades do not have significant effects on volatility, but downgrades increase stock and bond market volatility. Contagion is present, with a downgrade increasing the volatility of all other countries.

	Title	Author	Keywords	Methodology	Theme
(13)	Tightening credit standards: The role of accounting quality.	Jorion et al 2009	Credit rating agencies, credit standards, accounting quality, earnings management, value-relevance.	Here there is a modeling of the credit ratings using a set of accounting and financial variables, as risk proxies. A linear regression is obtained in order to connect the variables with the rating scale and its change. Next, the authors' exam the significance of each term of the variables and spill to two sub samples, speculative-grade and investment-grade. In the end there is some re-estimation of the regression equation with some other variables, such as industry variables.	Over the latest 20 years, the average credit rating of U.S. corporations has trended downdrown. The paper reexamines the observed decreases in credit ratings in several ways. First, it shows that this downward trend does not apply to speculative-grade issuers. Second, the analysis of investment-grade issuers suggests that the apparent tightening of standards can be attributed primarily to changes in accounting quality over time. After incorporating changing accounting quality, find no evidence that rating agencies have tightened their credit standards.
(14)	Sovereign credit ratings and spreads in emerging markets: Does investment grade matter?	Jaramillo et al 2011	Credit ratings, sovereign debt, rating agencies, emerging markets.	This research used a model with fixed effects panel regression with robust standard errors. Moreover, it had a vector of time-varying dummy variables for each rating grade, giving more attention to investment-grade ratings. Some robust tests also implied in order to find out any differences in the significance level.	This paper analyses the case where sovereign investment grade status is often associated with lower spreads in international markets. Using a panel framework for 35 emerging markets between 1997 and 2010, this paper finds that investment grade status reduces spreads by 36 percent, above and beyond what is implied by macroeconomic fundamentals. This compares to a 5-10 percent reduction in spreads following upgrades within the investment grade asset class, and no impact for movements within the speculative grade asset class, ceteris paribus.

	Title	Author	Keywords	Methodology	Theme
(15)	Sovereign rating news and financial markets spillovers: Evidence from the European debt crisis.	Arezki et al 2011	Credit ratings, news, spillovers, financial markets.	This paper investigated the effect of rating announcements, hereafter labeled as "rating news", on a specific market i. This approach consists in explaining the return on market by a sequence of impulse dummies characterizing the rating news released at time t. This event study takes into account the potential linkages between markets, considering a VAR framework. Variables are included in levels to allow for the possibility of long-run/cointegration relationships.	This paper examines the spillover effects of sovereign rating news on European financial markets during the period 2007-2010. The 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, the paper also finds evidence that downgrades to near speculative grade ratings for relatively large economies such as Greece have a systematic spillover effects across Euro zone countries.
(16)	Debt Dilution and Sovereign Default Risk.	Hatchondo et al 2011	Sovereign default, endogenous borrowing constraints, long-term debt, debt dilution, overborrowing, Markov perfect equilibrium.	In this research designed a regime, with the options of baseline or the recursive framework (decision on two periods) and a model with or without debt dilution. Considering the probabilities, the gains and the losses of a default.	This paper proposes a modification to a baseline sovereign default framework that allows us to quantify the importance of debt dilution in accounting for the level and volatility of the interest rate spread paid by sovereigns. Default risk falls in part because of a reduction of the level of sovereign debt. But it shows that the most important effect of dilution on default risk results from a shift in the set of government's borrowing opportunities.

	Title	Author	Keywords	Methodology	Theme
(17)	Are rating agencies powerful? An investigation into the impact and accuracy of sovereign ratings.	Kiff et al 2012	Sovereign ratings, credit rating agencies, credit default swap.	The paper tried to assess the impact of sovereign rating events on CDS spreads, mainly with univariate regressions of log spreads on rating categories. Changes in CDS spreads are analyzed within different event windows. The event study results are broadly robust with changes in the event window, controlling the global volatility, account for nonlinear relationships, splitting the sample and disaggregation of announcements for investment/noninvestment grade sovereigns.	Credit Rating Agencies (CRA)'s opinions have an impact in the cost of funding of sovereign issuers and consequently ratings are a concern for financial stability, there is evidence of rating stability failure during the recent global financial crisis. In this study the empirical evidence supports: (i) reform initiatives to reduce the impact of CRAs' certification services; (ii) more stringent validation requirements for ratings if they are to be used in capital regulations; and (iii) more transparency with regard to the quantitative parameters used in the rating process.
(18)	Self-Fulfilling Crises in the Eurozone: An Empirical Test.	De Grauwe et al 2013	Eurozone, Government debt, Interest rate, Self-fulfilling crises, Multiple equilibria, Panel data, Lender of last resort.	In this research the first step was to specify and estimate a fundamentals' based model of the spreads, with variables measuring the sustainability of government debt, among others as RHS variables in the equation. Secondly introduce time variable in order to examine for time dependent movements of the spreads that are unrelated to the fundamentals.	This paper test if a Eurozone country is more fragile and susceptible to self-fulfilling liquidity crises than those are not members of Eurozone. Also present evidence that differences in spreads could not be explained by fundamentals for some peripheral countries. For these countries the investors are more sensitive raising the spreads due to the unhealthy economic past, in contrast with the non-members.

3. Methodology-Data

In order to investigate all the mentioned issues, it was necessary to create a decent dataset. Our decision was an examination in a daily basis, so we collected daily data for all the variables. We collected data not only for the spreads and the ratings, but also for some other macroeconomic variables, like the stock market index, the exchange rate and a volatility index. For the case of the stock market index, for each country was chosen the index that could represent the market more. The exchange rate is the nominal bilateral exchange rate between Euro and US Dollar. As a volatility index this research used the VSTOXX, is a member of a family of indices, aiming to inform the investors about the European volatility. The data was collected for eleven countries of the European Union, having the same currency (the Euro), in order to avoid the exchange rate risk between countries with different currencies. The sample begins in 25/07/2005 (for almost all countries) till 05/07/2013. In this period we create event windows, each window has as its center the day of the change in the credit rating. The transformation of the credit ratings in a numerical way is cited in Table 2. This scale proposed by Afonso et al. (2007).

Table 2. Rating Scale						
Fitch Rating	Number	Moody's Rating	Number	Standard & Poor's Rating	Number	
AAA	21	Aaa	21	AAA	21	Investment Grade
AA+	20	Aa1	20	AA+	20	
AA	19	Aa2	19	AA	19	
AA-	18	Aa3	18	AA-	18	
A+	17	A1	17	A+	17	
A	16	A2	16	A	16	
A-	15	A3	15	A-	15	
BBB+	14	Baa1	14	BBB+	14	
BBB	13	Baa2	13	BBB	13	
BBB-	12	Baa3	12	BBB-	12	
BB+	11	Ba1	11	BB+	11	Speculative Grade
BB	10	Ba2	10	BB	10	
BB-	9	Ba3	9	BB-	9	
B+	8	B1	8	B+	8	
B	7	B2	7	B	7	
B-	6	B3	6	B-	6	
CCC+	5	Caa1	5	CCC+	5	
CCC	4	Caa2	4	CCC	4	
CCC-	3	Caa3	3	CCC-	3	
CC	2	Ca	2	CC	2	
C	2	C	1	SD	1	
DDD	1			D	1	
DD	1					
D	1					

The benchmark model consists of ten days before and ten days after the change in the credit rating. In order to make the data compatible for the analysis between different countries we proceed to a new procedure, rearranging the data. The starting point for every event window of all countries is the same. The transformation consists of taking the next relationship: $y_t = ln(X_t) - ln(X_0)$.

When we have X could be replaced by the variable of spreads, stock index, exchange rate and the volatility index respectively. X_0 is the initial value of the corresponding variable in the beginning of the window and y_t is the variable for the t day of the event window. After this procedure we take some newly- transformed data for each of the event window. In table 3 we see the number of events per rating agency, the summation of these numbers is equal to the total number of event windows for our countries.

Table 3. Number of Events by Rating Agency

	Number of Events	Downgrades	Upgrades
Standard & Poor's	33	31	2
Fitch	27	25	2
Moody's	25	25	0

The three rating agencies adopted different policies for the rating of the European government bonds for the period of the research, in a more analytic way have been developed the Table 4 with the summary statistics for the rating agencies.

Table 4. Summary Statistics			
Variable	Observations	Mean	Standard Deviation
Standard & Poor's			
Rating	693	15	5,942
Spread	693	0,014	0,086
Stock market	693	-0,002	0,027
Exchange rate	693	-0,0002	0,01
VSTOXX	693	-0,006	0,078
Fitch			
Rating	567	13,827	5,222
Spread	567	0,01	0,101
Stock market	567	-0,001	0,029
Exchange rate	567	-0,001	0,008
VSTOXX	567	-0,04	0,111
Moody's			
Rating	525	14,293	5,155
Spread	525	-0,047	0,386
Stock market	525	-0,0008	0,019
Exchange rate	525	0,002	0,008
VSTOXX	525	-0,018	0,059

Firstly we apply a Hausman test in order to find if the ratings add any more information on the current data or it is already available through the spreads. We took the first regression via OLS:

$$y_t = \alpha_o + \alpha_{OLS}*log(spread_t) + \alpha_2*log(vstoxx_t) \qquad (1)$$

and the second regression via IV:

$$y_t = \alpha_o + \alpha_{IV}*(rating_t) + \alpha_2*log(vstoxx_t) \qquad (2)$$

The null hypothesis is that the spread is a sufficient statistic and ratings offer no additional information.

Also we run an Error Correction Model (ECM) for this hypothesis:

1) The OLS:

$$log(spread_{t+1} - spread_t) = \delta o + \delta_{OLS}*log(spread_t) + \delta_2*log(vstoxx_t) + \\ +\delta_3*log(vstoxx_{t+1} - vstoxx_t) \qquad (1)$$

2) The IV:

$$log(spread_{t+1} - spread_t) = \delta o + \delta_{IV}*(rating_t) + \delta_2*log(vstoxx_t) + \\ +\delta_3*log(vstoxx_{t+1} - vstoxx_t) \qquad (2)$$

The next step of this research is the placement of the ratings on the right hide side together with the spreads for every dependent variable:

$$y_t = \alpha_o + \alpha_1*log(spread_t) + \alpha_2*(rating_t) + \alpha_3*log(vstoxx_t)$$

We robust these results, splitting the sample to different event windows, making two new the 11-days event window and the 41-days event window. Also run these regressions for all rating agencies and making some changes in the RHS, for example replace the ratings with the outlook (outlook is also a “product” of the rating agencies with different horizon). For all these different cases we also run the ECM.

4. Empirical Results

4.1 The benchmark model

The beginning point was the application of a Hausman specification test. This test is performed in two steps, as mentioned earlier. From these two steps we collect the estimates, trying to confirm the null hypothesis whether the OLS's estimates are consistent and efficient, whereas IV is consistent but inefficient or the OLS's estimates are inconsistent and the IV still hold the «consistent» nature. In some other point of view this specification test is searching for quantitively same coefficients. In this procedure we instrumented the spreads, so a rejection of the null hypothesis is sign that the spread is not sufficient statistic. Table 6 is the results for the application of the specification test on the baseline data of S&P (for 21 days-window and including upgrades and downgrades events). Before we proceed with the analysis of the above table, just announce that the same exact situation is developed for the rest of the data subsamples, but we will not develop a different table for each of them. We will present them in the same table.

TABLE 5. OLS versus IV (equations)	
	OLS
1)	$\log(spread_{t+1}) = \alpha_o + \alpha_1 * \log(spread_t) + \alpha_2 * \log(vstoxx_t)$
2)	$\log(stock_t) = \beta_o + \beta_1 * \log(spread_t) + \beta_2 * \log(vstoxx_t)$
3)	$\log(exchange\ rate_t) = \gamma_o + \gamma_1 * \log(spread_t) + \gamma_2 * \log(vstoxx_t)$
4)	$\log(spread_{t+1} - spread_t) = \delta_o + \delta_1 * \log(spread_t) + \delta_2 * \log(vstoxx_t) + \delta_3 * \log(vstoxx_{t+1} - vstoxx_t)$
	IV
1)	$\log(spread_{t+1}) = \alpha_o + \alpha_1 * (rating_t) + \alpha_2 * \log(vstoxx_t)$

2)	$\log(stock_t) = \beta_o + \beta_1*(rating_t) + \beta_2*\log(vstoxx_t)$
3)	$\log(exchange\ rate_t) = \gamma_o + \gamma_1*(rating_t) + \gamma_2*\log(vstoxx_t)$
4)	$\log(spread_{t+1} - spread_t) = \delta_o + \delta_1*(rating_t) + \delta_2*\log(vstoxx_t) + \delta_3*\log(vstoxx_{t+1} - vstoxx_t)$

TABLE 6. OLS versus IV (results)

OLS								
subsample	coeff.	[1]	coeff.	[2]	coeff.	[3]	coeff.	[4]
Standard & Poor's (downgrades + upgrades)	α_1	0,868774***	β_1	-0,1614870***	γ_1	-0,0517097***	δ_1	-0,1296520***
		[0,0405812]		[0,0362583]		[0,0151803]		[0,0396054]
Hausman test (ch^2)		-		-		-		-
P-value		-		-		-		-
R-squared		0,79363		0,52417		0,37248		0,13964
P-value(F)		4,30E-237		5,30E-112		1,52E-70		2,48E-22
Akaike criterion		-2555,64		-3529,83		-4637,76		-2591,46
IV								
subsample	coeff.	[1]	coeff.	[2]	coeff.	[3]	coeff.	[4]
Standard & Poor's (downgrades + upgrades)	α_1	0,8279740***	β_1	0,10125	γ_1	-0,1584750***	δ_1	-0,16461
		[0,125347]		[0,219936]		[0,0492786]		[0,120935]
Hausman test (ch^2)		0,361		66,878		53,681		0,279
P-value		0,548		0		0		0,597
R-squared		0,79318		0,10329		0,28094		0,13767
P-value(F)		8,84E-35		0,000019		0,000244		0,008408
Akaike criterion		2174,86		1137,18		41,4		2139,07

Sources: 1)http:// countryeconomy.com, 2)http://www.finance.yahoo.com, 3)http://www.google.com/finance, 4)http://www.tr4der.com, 5)http://fx.sauder.ubc.ca/data.html, 6)http://www.standardandpoors.com, 7)https://www.moodys.com, 8)http://www.fitchratings.com, 9) "Sovereign Rating And Country T&C Assessment Histories", Standard & Poor's Ratings Services January 4 2013, 10)http://www.stoxx.com/index.html

Analyzing these tables, table 5 and table 6, we observe the two different models, respectively the OLS and the IV. The table 5 include the regressions for the two different models and the table 6 show the results of the models. In table 6 every column is a different element, the first column is for the coefficient of spread or rating respectively, when the dependent variable is the spreads tomorrow. The second column describes the same coefficient but now the dependent variable is the stock market index. The third column is developed for the use of exchange rate as a dependent variable. The last column is for the error correction model. Different values when we change the LHS variable. In table 6 we include the results from some tests. The next rows show us the values from a Hausman chi-square test and the *p-values* of them. Next add the values of the R-squared and from the Akaike criterion as a measure about the nature and the abilities of the model . The last two elements are a way in order to compare the different models. Summarizing the results about the table 6 we could accept only the two of the four cases as the null hypothesis is rejected at standard confidence level (10% and below), observe the *p-values* (for the IV estimation) . These four cases are the change in the LHS, mentioned earlier, and instrument the spreads with ratings and then use the Hausman test and its value. This rejection gives us the opportunity to search for other measures as the spread is not a sufficient one.

We expand the table 6, where we had only one subsample of the data, into the table 8 taking and some other interesting subsample, where we make some extra robust tests for the data . We introduce also the results for the Fitch and the Moody's, the other two well-known rating agencies.

Also change the event-window, expanding it to 41 days (per event) and

TABLE 7. Hausman Test, *p-values* (equations)	
	OLS
1)	$\log(spread_{t+1}) = \alpha_o + \alpha_1 * \log(spread_t) + \alpha_2 * \log(vstoxx_t)$
2)	$\log(stock_t) = \beta_o + \beta_1 * \log(spread_t) + \beta_2 * \log(vstoxx_t)$
3)	$\log(exchange\ rate_t) = \gamma_o + \gamma_1 * \log(spread_t) + \gamma_2 * \log(vstoxx_t)$
4)	$\log(spread_{t+1} - spread_t) = \delta_o + \delta_1 * \log(spread_t) + \delta_2 * \log(vstoxx_t) + \delta_3 * \log(vstoxx_{t+1} - vstoxx_t)$
	IV
1)	$\log(spread_{t+1}) = \alpha_o + \alpha_1 * (rating_t) + \alpha_2 * \log(vstoxx_t)$
2)	$\log(stock_t) = \beta_o + \beta_1 * (rating_t) + \beta_2 * \log(vstoxx_t)$
3)	$\log(exchange\ rate_t) = \gamma_o + \gamma_1 * (rating_t) + \gamma_2 * \log(vstoxx_t)$
4)	$\log(spread_{t+1} - spread_t) = \delta_o + \delta_1 * (rating_t) + \delta_2 * \log(vstoxx_t) + \delta_3 * \log(vstoxx_{t+1} - vstoxx_t)$

reducing it to 11 days (per event). For all these subsamples we run the tests for the upgrades, the downgrades and for the whole data.

TABLE 8. Hausman Test, *p-values* (results)								
OLS								
subsample	coeff.	[1]	coeff.	[2]	coeff.	[3]	coeff.	[4]
Standard & Poor's (downgrades + upgrades)	α_1	0,868774***	β_1	-0,1614870***	γ_1	-0,0517097***	δ_1	-0,1296520***
		[0,0405812]		[0,0362583]		[0,0151803]		[0,0396054]
Hausman test (ch^2)		-		-		-		-
p-value		-		-		-		-
R-squared		0,79363		0,52417		0,37248		0,13964

p-value (F)		4,30E-237		5,30E-112		1,52E-70		2,48E-22	
Akaike criterion		-2555,64		-3529,83		-4637,76		-2591,46	
				IV					
subsample	coeff.	[1]	coeff.	[2]	coeff.	[3]	coeff.	[4]	
Standard & Poor's (downgrades + upgrades)	α_1	0,8279740*** [0,125347]	β_1	0,10125 [0,219936]	γ_1	-0,1584750*** [0,0492786]	δ_1	-0,16461 [0,120935]	Rejection rate: 50%
Hausman test (ch^2)		0,361		66,878		53,681		0,279	
p-value		0,548		0		0		0,597	
R-squared		0,79318		0,10329		0,28094		0,13767	
p-value (F)		8,84E-35		0,000019		0,000244		0,008408	
Akaike criterion		2174,86		1137,18		41,4		2139,07	
				OLS					
Standard & Poor's (downgrades)	α_1	0,853950*** [0,0425362]	β_1	-0,139707*** [0,0339059]	γ_1	-0,0502861*** [0,0167650]	δ_1	-0,147891*** [0,0398798]	
Hausman test (ch^2)		-		-		-		-	
p-value		-		-		-		-	
R-squared		0,78133		0,53919		0,36927		0,16014	
p-value (F)		1,20E-214		9,60E-110		1,41E-65		2,48E-24	
Akaike criterion		-2375,12		-3413,34		-4328,31		-2417,06	
				IV					
Standard & Poor's (downgrades)	α_1	0,777101*** [0,149398]	β_1	0,17481 [0,275633]	γ_1	-0,17604 [0,0603675]	δ_1	-0,2076 [0,139008]	Rejection rate: 50%
Hausman test (ch^2)		0,776		70,942		44,558		0,503	
p-value		0,378		0		0		0,478	
R-squared		0,77993		0,05027		0,25957		0,15564	
p-value (F)		2,73E-33		0,000285		0,000608		0,005523	
Akaike criterion		1981,89		877,1		-13,63		1939,96	

				OLS				
Standard & Poor's (upgrades)	α_1	1,06446 ***	β_1	-0,574481 ***	γ_1	-0,0376410 ***	δ_1	0,0653182*
		[0,0221051]		[0,0349783]		[0,0000488525]		[0,0345457]
Hausman test (ch^2)		-		-		-		-
p-value		-		-		-		-
R-squared		0,95433		0,90651		0,53773		0,07779
p-value (F)		7,30E-27		8,51E-21		2,92E-07		0,37392
Akaike criterion		-215,68		-234,78		-377,55		-213,68
				IV				
Standard & Poor's (upgrades)	α_1	0,954788***	β_1	-0,394712 ***	γ_1	-0,0482133 ***	δ_1	-0,06907
		[0,0466670]		[0,00963943]		[0,0120297]		[0,0467336]
Hausman test (ch^2)		3,313		18,8285		1,3912		3,3182
p-value		0,0687		0		0,2382		0,0685
R-squared		0,95294		0,88691		0,5358		0,01351
p-value (F)		-		9,20E-283		-		-
Akaike criterion		-184,75		-216,21		-344,8		-186,46
				OLS				
Fitch (downgrades + upgrades)	α_1	0,874558***	β_1	-0,135650 ***	γ_1	-0,00984	δ_1	-0,134950***
		[0,0450523]		[0,0417345]		[0,0120318]		[0,0432000]
Hausman test (ch^2)		-		-		-		-
p-value		-		-		-		-
R-squared		0,85355		0,29109		0,03312		0,1409
p-value (F)		5,40E-236		7,36E-43		0,000075		1,95E-18
Akaike criterion		-2123,48		-2595,64		-3806,24		-2125,68
				IV				
Fitch (downgrades + upgrades)	α_1	1,33925**	β_1	0,19573	γ_1	0,06838	δ_1	0,29345
		[0,555767]		[0,343274]		[0,0861376]		[0,415501]
Hausman test (ch^2)		37,9504		44,8869		20,2993		44,3027
p-value		0		0		0,00001		0

Rejection rate: 50%

Rejection rate: 100%

R-squared		0,85074		0,11931		0,00817		0,0733
p-value (F)		0,001782		0,680647		0,610629		0,002437
Akaike criterion		1837,9		1359,29		171,94		1770,52
				OLS				
Fitch (downgrades)	α_1	0,851791***	β_1	-0,149369 ***	γ_1	-0,02194	δ_1	-0,157171 ***
		[0,0609252]		[0,0538186]		[0,0151361]		[0,0591233]
Hausman test (ch^2)		-		-		-		-
p-value		-		-		-		-
R-squared		0,8321		0,28514		0,06768		0,16624
p-value (F)		5,50E-203		8,95E-39		1,14E-08		2,03E-20
Akaike criterion		-2050,11		-2404,46		-3517,68		-2051,61
				IV				
Fitch (downgrades)	α_1	24,1838	β_1	25,6792	γ_1	3,51927	δ_1	1,87682
		[1264,23]		[1391,68]		[190,747]		[8,75891]
Hausman test (ch^2)		30,8461		80,9269		11,2203		36,2985
p-value		0		0		0,00081		0
R-squared		0,78864		0,20098		0,04709		0,11678
p-value (F)		0,995669		0,999057		0,998913		0,764477
Akaike criterion		1403,89		1004,25		-44,81		1356,59
				OLS				
Fitch (upgrades)	α_1	0,748815***	β_1	0,0299468 ***	γ_1	0,0260225***	δ_1	-0,263332***
		[0,0638082]		[0,00288532]		[0,00679264]		[0,0600083]
Hausman test (ch^2)		-		-		-		-
p-value		-		-		-		-
R-squared		0,80321		0,38803		0,45252		0,23577
p-value (F)		1,71E-14		0,000069		7,91E-06		0,01583
Akaike criterion		-117,43		-238,83		-352		-116,08

Rejection rate:

100%

				IV				
Fitch (upgrades)	α_1	0,822604***	β_1	-0,0679918***	γ_1	0,0369066*	δ_1	-0,168596**
		[0,0653883]		[0,0161165]		[0,0222812]		[0,0676762]
Hausman test (ch^2)		0,116		4,0199		0,6813		0,2172
p-value		0,73343		0,04497		0,40914		0,64117
R-squared		0,80159		0,10033		0,45243		0,23574
p-value (F)		-		-		2,80E-286		-
Akaike criterion		-28,78		-153,91		-263,91		-30,02
				OLS				
Moody's (downgrades + upgrades)	α_1	0,878974***	β_1	-0,00134	γ_1	0,00176848**	δ_1	-0,125350***
		[0,00289795]		[0,00217462]		[0,000758704]		[0,00963995]
Hausman test (ch^2)		-		-		-		-
p-value		-		-		-		-
R-squared		0,78048		0,33747		0,06343		0,06981
p-value (F)		1,30E-172		2,17E-47		3,74E-08		3,21E-08
Akaike criterion		-305,69		-2832,94		-3599,31		-305,26
				IV				
Moody's (downgrades + upgrades)	α_1	0,886102***	β_1	0,17041	γ_1	0,01532	δ_1	-0,11446
		[0,111338]		[0,155569]		[0,0248414]		[0,107759]
Hausman test (ch^2)		0,0013		114,168		2,5252		0,003
p-value		0,97111		0		0,11204		0,95597
R-squared		0,78048		0,00562		0,02357		0,06978
p-value (F)		1,99E-22		0,007518		0,19972		0,028216
Akaike criterion		4738,69		2108,13		1442,55		4724,2
				OLS				
Moody's (downgrades)	α_1	0,878974***	β_1	-0,00134	γ_1	0,00176848**	δ_1	-0,125350***
		[0,00289795]		[0,00217462]		[0,000758704]		[0,00963995]
Hausman test (ch^2)		-		-		-		-
p-value		-		-		-		-

Rejection rate: 25%

Rejection rate: 25%

R-squared		0,78048		0,33747		0,06343		0,06981
p-value (F)		1,30E-172		2,17E-47		3,74E-08		3,21E-08
Akaike criterion		-305,69		-2832,94		-3599,31		-305,26
				IV				
Moody's (downgrades)	α_1	0,886102*** [0,111338]	β_1	0,17041 [0,155569]	γ_1	0,01532 [0,0248414]	δ_1	-0,11446 [0,107759]
Hausman test (ch^2)		0,0013		114,168		2,5252		0,003
p-value		0,97111		0		0,11204		0,95597
R-squared		0,78048		0,00562		0,02357		0,06978
p-value (F)		1,99E-22		0,007518		0,19972		0,028216
Akaike criterion		4738,69		2108,13		1442,55		4724,2
				OLS				
Moody's (upgrades)	α_1	- -	β_1	- -	γ_1	- -	δ_1	- -
				IV				
Moody's (upgrades)	α_1	- -	β_1	- -	γ_1	- -	δ_1	- -
				OLS				
Standard & Poor's: 5-day window (downgrades + upgrades)	α_1	0,769825*** [0,0667614]	β_1	-0,143728*** [0,0307917]	γ_1	-0,02276 [0,0144995]	δ_1	-0,218431*** [0,0626936]
Hausman test (ch^2)		-		-		-		-
p-value		-		-		-		-
R-squared		0,76998		0,56176		0,2604		0,19539
p-value (F)		1,30E-115		3,22E-65		2,63E-24		7,64E-17
Akaike criterion		-1589,73		-2065,16		-2790,9		-1593,85

Rejection rate:

25%

			IV					
Standard & Poor's: 5-day window (downgrades + upgrades)	α_1	0,598479*	β_1	0,60886	γ_1	-0,16086	δ_1	-0,36807
		[0,325106]		[0,844431]		[0,161398]		[0,343265]
Hausman test (ch^2)		0,873		75,176		16,173		0,531
p-value		0,35002		0		0,00006		0,46635
R-squared		0,75797		0,0004		0,1133		0,18603
p-value (F)		2,69E-14		0,051347		0,070163		0,020664
Akaike criterion		133,13		-409,75		-1082,99		121,04
			OLS					
Standard & Poor's: 5-day window (downgrades)	α_1	0,765499***	β_1	-0,140389***	γ_1	-0,01796	δ_1	-0,222537***
		[0,0683190]		[0,0307665]		[0,0141101]		[0,0635374]
Hausman test (ch^2)		-		-		-		-
p-value		-		-		-		-
R-squared		0,7676		0,56781		0,26622		0,20433
p-value (F)		7,80E-108		2,69E-62		1,91E-23		1,26E-16
Akaike criterion		-1479,89		-1938,8		-2624,29		-1485,1
			IV					
Standard & Poor's: 5-day window (downgrades)	α_1	0,42603	β_1	0,90752	γ_1	-0,13858	δ_1	-0,54095
		[0,649914]		[1,69146]		[0,214568]		[0,720581]
Hausman test (ch^2)		1,794		80,769		6,584		1,172
p-value		0,1805		0		0,01029		0,27906
R-squared		0,70597		0,01205		0,10992		0,18115
p-value (F)		8,89E-09		0,211472		0,059271		0,033517
Akaike criterion		106,81		-422,8		-1042,32		95,7
			OLS					
Standard & Poor's: 5-day window (upgrades)	α_1	0,820692***	β_1	-0,446101***	γ_1	-0,102858***	δ_1	-0,197443***
		[0,0269809]		[0,0249434]		[0,0122950]		[0,0005918]
Hausman test (ch^2)		-		-		-		-

Rejection rate: 50%

Rejection rate: 50%

p-value		-		-		-		-
R-squared		0,85598		0,71112		0,80104		0,21558
p-value (F)		1,01E-08		7,53E-06		2,18E-07		0,213466
Akaike criterion		-119,67		-135,57		-215,1		-117,78
				IV				
Standard & Poor's: 5-day window (upgrades)	α_1	0,914108*** [0,0792150]	β_1	-0,144848** [0,0711467]	γ_1	-0,140665*** [0,00427285]	δ_1	-0,08047 [0,0740144]
Hausman test (ch^2)		0,497		19,783		8,428		0,527
p-value		0,48076		0,00001		0,0037		0,46802
R-squared		0,8535		0,53116		0,79167		0,18511
p-value (F)		3,80E-157		8,30E-146		1,70E-155		9,90E-134
Akaike criterion		-174,01		-203,53		-276,08		-175,96
				OLS				
Standard & Poor's: 20-day window (downgrades + upgrades)	α_1	0,910529*** [0,0341632]	β_1	-0,136498*** [0,0397051]	γ_1	-0,0348539** [0,0152924]	δ_1	-0,0887739*** [0,0338588]
Hausman test (ch^2)		-		-		-		-
p-value		-		-		-		-
R-squared		0,84677		0,10226		0,33535		0,05788
p-value (F)		0		2,39E-32		1,80E-120		2,44E-17
Akaike criterion		-5072,69		-2815,1		-8358,37		-5087,21
				IV				
Standard & Poor's: 20-day window (downgrades + upgrades)	α_1	1,42200*** [0,445947]	β_1	0,58285 [0,458699]	γ_1	-0,14108 [0,104557]	δ_1	0,42376 [0,454847]
Hausman test (ch^2)		90,092		32,248		42,622		91,602
p-value		0		0		0		0
R-squared		0,81679		0,00225		0,21933		0,0235
p-value (F)		7,72E-54		6,00E-09		7,45E-09		0,274201
Akaike criterion		6036,61		8349,54		2796,18		6020466

Rejection rate: 50%

Rejection rate: 100%

				OLS				
Standard & Poor's: 20-day window (downgrades)	α_1	0,911140*** [0,0378145]	β_1	-0,127526*** [0,0459164]	γ_1	-0,0287732* [0,0161815]	δ_1	-0,0883240** [0,0373437]
Hausman test (ch^2)		-		-		-		-
p-value		-		-		-		-
R-squared		0,83094		0,08842		0,3081		0,05551
p-value (F)		0		3,24E-26		3,90E-102		1,31E-15
Akaike criterion		-4717,66		-2578,4		-7797,01		-4733,88
				IV				
Standard & Poor's: 20-day window (downgrades)	α_1	2,44847 [2,28494]	β_1	1,84632 [2,67150]	γ_1	-0,31335 [0,507671]	δ_1	1,48771 [2,34948]
Hausman test (ch^2)		108,929		31,491		39,989		115,928
p-value		0		0		0		0
R-squared		0,72187		0,00238		0,09499		0,02516
p-value (F)		3,32E-08		0,051468		0,00212		0,667275
Akaike criterion		5429,82		7642,48		2415,61		5407,14
				OLS				
Standard & Poor's: 20-day window (upgrades)	α_1	0,916419*** [0,0327881]	β_1	-0,431672*** [0,0841507]	γ_1	-0,0668523*** [0,00100976]	δ_1	-0,0840842** [0,0370084]
Hausman test (ch^2)		-		-		-		-
p-value		-		-		-		-
R-squared		0,94996		0,81629		0,90438		0,0875
p-value (F)		4,20E-52		8,58E-30		5,40E-41		0,06617
Akaike criterion		-375,76		-365,77		-668,16		-374,16
				IV				
Standard & Poor's: 20-day window (upgrades)	α_1	0,51682 [0,818073]	β_1	0,26189 [1,39276]	γ_1	-0,0826729*** [0,0160968]	δ_1	-0,45195 [0,696279]
Hausman test (ch^2)		7,002		21,77		0,359		6,578
p-value		0,00814		0		0,54896		0,01033

Rejection rate: 100%

Rejection rate: 75%

R-squared		0,09506		0,34437		0,89958		0,05959
p-value (F)		-		0		-		-
Akaike criterion		-205,06		-207,65		-491,1		-203,69
				OLS				
Standard & Poor's: without contemporaneous	α_1	0,852112*** [0,0441527]	β_1	-0,144221*** [0,0355742]	γ_1	-0,0489040*** [0,0173508]	δ_1	-0,151425*** [0,0411660]
Hausman test (ch^2)		-		-		-		-
p-value		-		-		-		-
R-squared		0,77353		0,5162		0,35496		0,15915
p-value (F)		1,10E-209		6,80E-103		2,02E-62		3,62E-24
Akaike criterion		-2372,87		-3324,95		-4324,37		-2416,04
				IV				
Standard & Poor's: without contemporaneous	α_1	0,676801*** [0,246076]	β_1	0,46012 [0,554435]	γ_1	-0,239304** [0,114658]	δ_1	-0,3097 [0,231178]
Hausman test (ch^2)		1,943		117,307		49,267		1,706
p-value		0,1633		0		0		0,1915
R-squared		0,76474		0,00655		0,21167		0,14141
p-value (F)		6,02E-29		0,052444		0,011853		0,011466
Akaike criterion		1970,54		912,55		-26,51		1927,08
Rejection rate:		40%		100%		66,66%		40%

Note*:for some subsamples the " R-squared" and " *p-value* (F)", were not available.

Sources: 1)http:// countryeconomy.com, 2)http://www.finance.yahoo.com, 3)http://www.google.com/finance, 4)http://www.tr4der.com, 5)http://fx.sauder.ubc.ca/data.html, 6)http://www.standardandpoors.com, 7)https://www.moodys.com, 8)http://www.fitchratings.com, 9) "Sovereign Rating And Country T&C Assessment Histories", Standard & Poor's Ratings Services January 4 2013, 10)http://www.stoxx.com/index.html

Rejection rate:
50%

These are the *p-values* after the OLS, IV and ECM in all these different subsamples. The last subsample is the baseline data group (of S&P 21

days with upgrades and downgrades) without contemporaneous events, telling that in every event-window only one change in rating is allowed. In the end of every row and every column there is a percentage, this percentage is the rejection rate of the mentioned row or column. The range of these rejection rates are from 25% - 100%. These high rates reinforce the hypothesis that the spreads are not a sufficient statistic and there is still some informational content in the rating that is not captured by the spreads. A regression with both spreads and ratings as variables included in the RHS (right hand side) is the next step, as we saw that spreads and ratings are different. This regression will show us if ratings have informational content, via the existence of significance of the ratings after controlling for the spreads. Table 9 and table 10 were developed for this reason (see the Appendix A for the regressions tests of the table).

TABLE 9. OLS with Event Effects (equations)	
	OLS
1)	$\log(spread_{t+1}) = \alpha_o + \alpha_1 * \log(spread_t) + \alpha_2 * (rating_t) + \alpha_3 * \log(vstoxx_t)$
2)	$\log(stock_t) = \beta_o + \beta_1 * \log(spread_t) + \beta_2 * (rating_t) + \beta_3 * \log(vstoxx_t)$
3)	$\log(exchange\ rate_t) = \gamma_o + \gamma_1 * \log(spread_t) + \gamma_2 * (rating_t) + \gamma_3 * \log(vstoxx_t)$
4)	$\log(spread_{t+1} - spread_t) = \delta_o + \delta_1 * \log(spread_t) + \delta_2 * (rating_t) + \delta_3 * \log(vstoxx_t) + \delta_4 * \log(vstoxx_{t+1} - vstoxx_t)$

TABLE 10. OLS with Event Effects (results)

subsample	coeff.	[1]	coeff.	[2]	coeff.	[3]	coeff.	[4]
Standard & Poor's (downgrades + upgrades)	α_1	0,770296***	β_1	-0,130353***	γ_1	-0,0289524**	δ_1	-0,227636***
		[0,0600243]		[0,0359413]		[0,0117551]		[0,0550295]
	α_2	0,00079	β_2	0,00176	γ_2	0,00108483***	δ_2	0,00061
		[0,0014466]		[0,00155356]		[0,000374184]		[0,00154475]
	α_3	-0,02292	β_3	-0,149202***	γ_3	-0,0494348***	δ_3	0,00683
		[0,0693808]		[0,0369934]		[0,00975464]		[0,0640281]
R-squared		0,83377		0,81353		0,79753		0,29874
p-value(F)		3,00E-230		5,00E-214		2,00E-202		1,00E-31
Akaike criterion		-2639,93		-4113,02		-5355,66		-2.667.154
Standard & Poor's (downgrades)	α_1	0,756316***	β_1	-0,108602***	γ_1	-0,0277353**	δ_1	-0,144553***
		[0,0607936]		[0,0300876]		[0,012246]		[0,0445536]
	α_2	0,0004	β_2	0,0029421**	γ_2	0,00120187**	δ_2	-0,0002
		[0,00140205]		[0,00136261]		[0,00049409]		[0,000501957]
	α_3	-0,02086	β_3	-0,154148***	γ_3	-0,0502359***	δ_3	0,0067
		[0,0704536]		[0,0349773]		[0,0101055]		[0,0520896]
R-squared		0,82344		0,82175		0,79616		0,16079
p-value (F)		2,50E-208		4,70E-207		2,70E-189		1,36E-23
Akaike criterion		-2452,38		-3969,68		-5001,64		-2415,56
Standard & Poor's (upgrades)	α_1	1,01992***	β_1	-0,538696***	γ_1	-0,0563076***	δ_1	0,01581
		[0,034743]		[0,034285]		[0,00998942]		[0,0451118]
	α_2	0,00283	β_2	-0,00462934***	γ_2	0,000273502*	δ_2	0,00286
		[0,00195375]		[0,000597124]		[0,000151609]		[0,00191684]
	α_3	-0,0603	β_3	0,10964**	γ_3	0,00328255**	δ_3	-0,06094
		[0,0824797]		[0,0410401]		[0,00158322]		[0,0857259]
R-squared		0,96233		0,95734		0,70681		0,24054
p-value (F)		8,53E-26		8,46E-25		1,95E-09		0,067118
Akaike criterion		-219,77		-263,73		-392,68		-217,84

Fitch		0,76641***		-0,05729		-0,01315		-0,236819***
(downgrades + upgrades)	α_1	[0,0425993]	β_1	[0,038344]	γ_1	[0,0130628]	δ_1	[0,0435378]
		-0,00434421*		0,00085		-0,00081708*		-0,00444124*
	α_2	[0,00247375]	β_2	[0,00112768]	γ_2	[0,000460815]	δ_2	[0,00251969]
		0,05235		-0,161374***		-0,01708		0,07685
	α_3	[0,0698731]	β_3	[0,0313645]	γ_3	[0,0138381]	δ_3	[0,0712052]
R-squared		0,91722		0,78643		0,68441		0,52152
p-value (F)		3,50E-269		1,50E-159		7,70E-115		3,06E-67
Akaike criterion		-2392,97		-3221,89		-4387,07		-2403,54
Moody's		0,878897***		-0,00318		0,00162336**		-0,125469***
(downgrades + upgrades)	α_1	[0,00320768]	β_1	[0,00247385]	γ_1	[0,000760702]	δ_1	[0,0104786]
		0,00006		0,00135806**		0,00011		0,00009
	α_2	[0,000914184]	β_2	[0,000528371]	γ_2	[0,000194552]	δ_2	[0,000941959]
		0,21726		-0,173281***		-0,0307283*		0,17195
	α_3	[0,192212]	β_3	[0,0263084]	γ_3	[0,0174987]	δ_3	[0,135721]
R-squared		0,78048		0,45581		0,06791		0,06982
p-value (F)		4,60E-171		1,80E-68		5,39E-08		1,29E-07
Akaike criterion		-303,69		-2934,24		-3599,82		-303,27
Standard & Poor's:		0,734428***		-0,168527***		-0,0319864***		-0,277865***
5-day window	α_1		β_1		γ_1		δ_1	
(downgrades + upgrades)		[0,0350942]		[0,0152832]		[0,00594688]		[0,0644529]
		-0,00012		0,000885666***		0,0001		0,00016
	α_2	[0,000457704]	β_2	[0,000247783]	γ_2	[9,97677e-05]	δ_2	[0,00171592]
		0,076271**		-0,139761***		-0,0321139***		0,102066*
	α_3	[0,0385166]	β_3	[0,0167398]	γ_3	[0,00651035]	δ_3	[0,0539453]
R-squared		-		-		-		-
p-value (F)		-		-		-		2,58E-28
Akaike criterion		-1586,68		-2130,12		-2766,58		-1682,72
Standard & Poor's:		0,89382***		-0,1622***		-0,0310375***		-0,108039***
20-day window	α_1		β_1		γ_1		δ_1	
(downgrades + upgrades)		[0,0124494]		[0,0339596]		[0,00346607]		[0,012264]

	α_2	0,00105999* [0,000545464]	β_2	0,00228164*** [0,000655535]	γ_2	0,000459813*** [0,000164909]	δ_2	0,000995606* [0,000546107]
	α_3	0,00325 [0,0133815]	β_3	-0,179137*** [0,0362486]	γ_3	-0,0573141*** [0,00371544]	δ_3	0,0212 [0,0134468]
R-squared		-		-		-		-
p-value (F)		-		-		-		-
Akaike criterion		-5144,87		-2844,39		-8169,52		-5156,19

Note*:for some subsamples the " R-squared" and " *p-value* (F)", were not available.

Sources: 1)http:// countryeconomy.com, 2)http://www.finance.yahoo.com, 3)http://www.google.com/finance, 4)http://www.tr4der.com, 5)http://fx.sauder.ubc.ca/data.html, 6)http://www.standardandpoors.com, 7)https://www.moodys.com, 8)http://www.fitchratings.com, 9) "Sovereign Rating And Country T&C Assessment Histories", Standard & Poor's Ratings Services January 4 2013, 10)http://www.stoxx.com/index.html

The earlier results from the Hausman tests came up with the conclusion that spread was not a sufficient statistic and whether this information gap can be fulfilled from the ratings. We used the ratings as a RHS variable trying to explain the variation in the three macro variables with OLS and ECM models. Our main groups are S&P (21-days window), S&P (21-days window, downgrades), S&P (21-days window, upgrades), Fitch (21-days window), Moody's (21-days window), S&P (11-days window) and S&P (41-days window). For all these groups we run different regression for every macro variable. Our first test is trying to choose what kind of event effects is appropriate. All the necessary tests for the picking the right kind of event effect are developed in the Appendix. The standard errors are reported in parentheses below every point estimate. To make the interpretation easier, we put asterisks next to the coefficients that are statistically significant. It is worth mentioned, that almost in every case, when a rejection occurred in table 8 the corresponding coefficient of

rating is statistical significant in table 10, for example we rejected all the four coefficient in the row of S&P (41-days window) and we can see in table 10 that all the coefficient of ratings of S&P (41-days window) are statistical significant. This is an extra confirmation for the Hausman test, and the probability of the existence of informational content in ratings. In a deeper view we take for every column a different dependent variable and some estimates with the OLS regression. The first column takes as dependent variable the spreads one day after, and having on the RHS the spreads (today), the ratings, and the volatility index. The theory suggested that α should be positive and statistical significant, which is confirmed by the results. This is translated into a positive relationship between an increase in the spread today (i.e., a higher perceived probability of default) with the spreads the day after. A worth-mentioned point is also the positive sign of β, which could tell as that a rise in ratings, i.e. an upgrade will lead to an increase in the spreads tomorrow. But as we observed was not statistical significant. So the ratings of the S&P rating agency cannot explain any variation of the spreads the day after. This is also mentioned by the Hausman test earlier. This is the exact same situation for the Moody's rating agency. The only exception is the Fitch rating agency. Despite their global dominance (Moody's and S&P), this can be explained by the fact that only the Fitch is dual-headquartered in USA and in London, a european city, with Moody's and S&P based in USA. This can be taken as a positive sign by the european market and countries about their relationship with Fitch and their role in this specific market. The third variable in the RHS is the volatility index which is not statistical significant for the spreads the day after, except for the S&P (11-days window) with positive sign, i.e. an increase in the volatility today

leads to an increase in the spreads tomorrow. Next we change the LHS (left hand side) variable to the stock market. The results show a negative relationship between the spreads today with the stock market. An increase in the spreads today leads to a decrease in the stock market, i.e. a rise in the probability of default leads to decrease in the stock market index. On the other hand an increase in the stock market is occurred by an increase in the ratings. Here the volatility index carried out a decrease. Something very interesting is the statistical positive relationship between the volatility index and the stock market index in the case of S&P (21-days window, upgrades), the more volatile the environment the bigger the stock market will be. This is a clear sign of an instable system. The third LHS is the nominal exchange rate of euro to US dollar. A higher probability today, i.e. the spreads today, is correlated negatively depreciating the exchange rate. This can be a sign as a hedging in the fear of default, considering the US dollar a more stable currency. Almost in all subsamples of S&P the ratings have a positive sign in their coefficient, appreciating the exchange rate. This is a very useful tool for the European monetary policy. And also a negative sign for the volatility index, the non-stability leads to a depreciation. The last column for the ECM show negative relationship for spreads (today) and ratings, and positive for volatility index, but insignificant for ratings and volatility index. After taking a general look of table 10 we could not find any major differences from S&P to Moody's (for the same event window). They have almost the same statistical significant and the same signs for their coefficient. This is not the same case for the Fitch. The results from Fitch are different, with some vital changes. Here the rating had negative and statistical significant relationship with spreads tomorrow. Also they are correlated negatively

with the ECM, but in a significant way. Lastly the volatility index had a positive sign in the regression for the spreads the day after, not significant although. In a similar way when we changed the event window we took almost the same results for the S&P (41-days event window) and the S&P (11-days event window) which is more familiar with the results from Fitch. In contrast, for both of them now we have the existence of statistical significance in the ratings for stock market index. For sure we cannot reject the significance and the role of the ratings in the regressions. In a lot of regressions they enter with statistical significance. Table 10, in the end, confirmed the results from the Hausman test where the Fitch agency took the first place in the rejection rates, with the second place went to S&P and Moody's was last. This comes from the table 10 as we saw the greater number of statistical significant coefficient of ratings firstly in Fitch, secondly in S&P and in the end the Moody's. This research was about the european reaction and its conflict with the global, as it was introduced firstly, and the european crises finally. So our main focus concentrated on the field of downgrades, as it was the dominant event during the last years. A graphical representation of this could be the next figure.

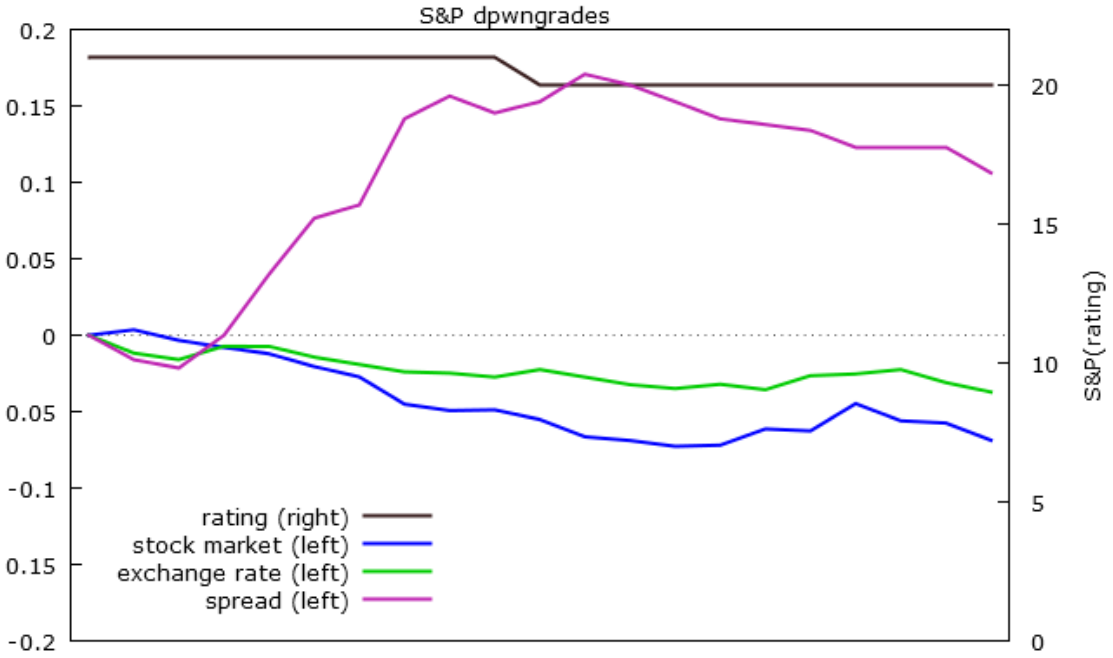


Figure 1. Standard & Poor's downgrades (ratings).

We observe the reactions on the macro variables after a downgrade on the ratings of a government's bond. A decrease in the ratings leads to a similar way for the stock market index and also for the exchange rate, with those change been statistical significant (considering in contrast to their initially scale). We could not say the same thing for the spreads, taking as a measures the ratings, as in the first time they began to fall, continuing with a rise, just before the change in rating they decline again, rise and for the end they had a fall. From the Hausman test and the results of the previous regressions the ratings was not statistical significant when the dependent variable was the spread.

We will introduce some robust tests checking these results. From the past a lot of theories came up in order to explain any differences from the expected and to shed light in this unknown world.

4.2 Change in asset class

One of these theories wanted the changes in asset classes to play a crucial role in the model. First, must determine the change in asset classes' theory. From table 2 we know that we have investment and noninvestment grades, the frontier is the grade of eleven (11), with it and with any number below that we have noninvestment. So we want to test if this kind of nonlinearities in this change of asset classes can explain any variation in the macro variables. We created a dummy that takes the value one (01) when the rating change is between different asset classes and the value zero (0) in the other case. Next we interacted this new variable with the ratings and added in the regression (see Appendix B for the model's test).

TABLE 11. Interaction with Dummy Variable of Change in Asset Class (equations)	
	OLS
1)	$\log(spread_{t+1}) = \alpha_o + \alpha_1 * \log(spread_t) + \alpha_2 * (rating_t) + \alpha_3 * [(rating_t) * (D\ Asset\ Class)] + \alpha_4 * \log(vstoxx_t)$
2)	$\log(stock_t) = \beta_o + \beta_1 * \log(spread_t) + \beta_2 * (rating_t) + \beta_3 * [(rating_t) * (D\ Asset\ Class)] + \beta_4 * \log(vstoxx_t)$
3)	$\log(exchange\ rate_t) = \gamma_o + \gamma_1 * \log(spread_t) + \gamma_2 * (rating_t) + \gamma_3 * [(rating_t) * (D\ Asset\ Class)] + \gamma_4 * \log(vstoxx_t)$
4)	$\log(spread_{t+1} - spread_t) = \delta_o + \delta_1 * \log(spread_t) + \delta_2 * (rating_t) + \delta_3 * [(rating_t) * (D\ Asset\ Class)] + \delta_4 * \log(vstoxx_t) + \delta_5 * \log(vstoxx_{t+1} - vstoxx_t)$

TABLE 12. Interaction with Dummy Variable of Change in Asset Class (results)

subsample	coeff.	[1]	coeff.	[2]	coeff.	[3]	coeff.	[4]
Standard & Poor's (downgrades + upgrades)	α_1	0,76865*** [0,0602537]	β_1	-0,129952*** [0,0357212]	γ_1	-0,0293746** [0,01192]	δ_1	-0,228988*** [0,0551346]
	α_2	0,00109 [0,0015081]	β_2	0,00169 [0,00165019]	γ_2	0,00115949*** [0,000425936]	δ_2	0,00085 [0,00159813]
	α_3	-0,0031 [0,00495333]	β_3	0,00076 [0,00215585]	γ_3	-0,0008 [0,00059024]	δ_3	-0,00254 [0,00611954]
	α_4	-0,02595 [0,0705626]	β_4	-0,148465*** [0,0379205]	γ_4	-0,0502114*** [0,0101048]	δ_4	0,00428 [0,065023]
R-squared		0,83389		0,81359		0,79799		0,29908
p-value (F)		2,40E-229		4,10E-213		8,30E-202		2,46E-31
Akaike criterion		-2638,41		-4111,26		-5355,25		-2665,49
Standard & Poor's (downgrades)	α_1	0,754526*** [0,0612526]	β_1	-0,108529*** [0,0299976]	γ_1	-0,0282497** [0,0124608]	δ_1	-0,245978*** [0,0540567]
	α_2	0,0008 [0,00142275]	β_2	0,00292554* [0,00150813]	γ_2	0,0013188** [0,000583922]	δ_2	0,00076 [0,00139831]
	α_3	-0,00327 [0,00493903]	β_3	0,00013 [0,00226043]	γ_3	-0,00094 [0,000739076]	δ_3	-0,00292 [0,0062502]
	α_4	-0,02376 [0,0714763]	β_4	-0,154029*** [0,03567]	γ_4	-0,0510696*** [0,0104806]	δ_4	0,01283 [0,0646987]
R-squared		0,82358		0,82176		0,7968		0,31191
p-value(F)		1,90E-207		4,40E-206		9,00E-189		1,25E-31
Akaike criterion		-2450,88		-3967,69		-5001,69		-2482,81

Sources: 1)http:// countryeconomy.com, 2)http://www.finance.yahoo.com, 3)http://www.google.com/finance, 4)http://www.tr4der.com, 5)http://fx.sauder.ubc.ca/data.html, 6)http://www.standardandpoors.com, 7)https://www.moodys.com, 8)http://www.fitchratings.com, 9) "Sovereign Rating And Country T&C Assessment Histories", Standard & Poor's Ratings Services January 4 2013, 10)http://www.stoxx.com/index.html

The results above are very telling. No explanatory power for this new term. This is confirmed for the S&P (21-days event window) and also for the S&P (21-days event window, downgrades), [the S&P (21-days event window) was excluded as the interaction term had zero impact at all]. None of the coefficients of this term is statistical significance. This, clear, technical reason -which is unrelated to the informational content of ratings- explains none of the variation of the macro variables. This was a test if a non-fundamental term could have the same role in the regression as the other ones, and this hypothesis rejected leaving unchanged the rest of the terms in the model.

4.3 Change in outlook

We also have the credit outlooks, not only the ratings from the rating agencies. A rating outlook indicates the potential direction of a rating over the intermediate term, typically six months to two years. They reflect financial or other trends that have not yet reached the level that would trigger a rating action, but which may do so if such trends continue. An upgrade is preceded by a positive outlook, and the same for a downgrade. This is not inevitable, but it is the most common, viewing the historic data. Figure 2 is the plot of the distribution of the number of days between a change in the outlook and a change in the rating for the S&P sample.

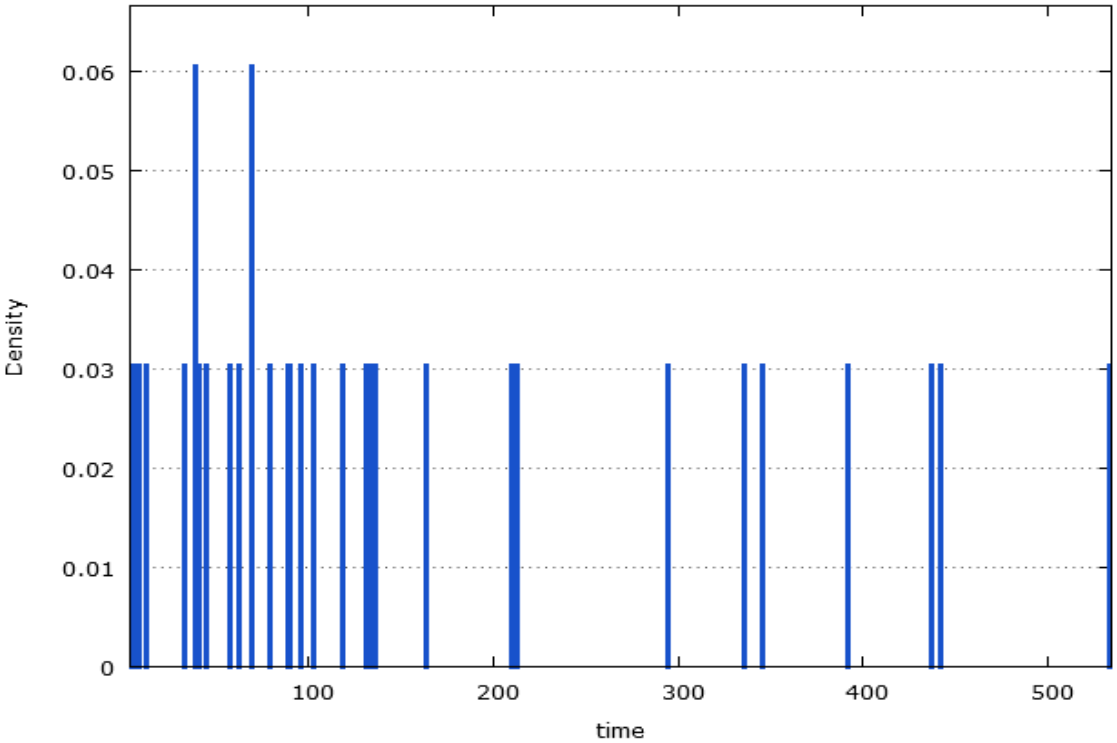


Figure 2. Frequency distribution, Standard & Poor's ratings.

The distribution of the days between the change in the outlook and the change in the ratings although it has 5 days, as minimum number of days for change and 533days, as a maximum number of days for change its mean number of days for the whole sample is 147 days, almost a half a year before the change in rating. Our efforts concentrated replacing the rating variable with the outlook variable, in order to be tested if it can be a measure of anticipation and its impact in the whole model. Some necessary steps needs to be done, one of them is to change the event window. Now the center of the event is the change in the outlook and not the change in the ratings, accordingly we change the rest of the data. The outlook now is a RHS variable, taking only three possible values, -1 if the outlook we have is negative, 0 if the outlook is stable and in the end the value 1 if the outlook is positive.

TABLE 13. Benchmark Regressions Replacing Ratings with Outlooks (equations)	
	OLS
1)	$\log(spread_{t+1}) = \alpha_o + \alpha_1 * \log(spread_t) + \alpha_2 * (outlook_t) + \alpha_3 * \log(vstoxx_t)$
2)	$\log(stock_t) = \beta_o + \beta_1 * \log(spread_t) + \beta_2 * (outlook_t) + \beta_3 * \log(vstoxx_t)$
3)	$\log(exchange\ rate_t) = \gamma_o + \gamma_1 * \log(spread_t) + \gamma_2 * (outlook_t) + \gamma_3 * \log(vstoxx_t)$
4)	$\log(spread_{t+1} - spread_t) = \delta_o + \delta_1 * \log(spread_t) + \delta_2 * (outlook_t) + \delta_3 * \log(vstoxx_t) + \delta_4 * \log(vstoxx_{t+1} - vstoxx_t)$

TABLE 14. Benchmark Regressions Replacing Ratings with Outlooks (results)

subsample	coeff.	[1]	coeff.	[2]	coeff.	[3]	coeff.	[4]
Standard & Poor's (downgrades + upgrades)	α_1	0,565896***	β_1	-0,04076	γ_1	-0,01138	δ_1	-0,433955***
		[0,0591954]		[0,0467417]		[0,0100689]		[0,0601487]
	α_2	0,00166	β_2	-0,01223	γ_2	0,00688845***	δ_2	0,00175
		[0,0166824]		[0,0167349]		[0,00121717]		[0,0165723]
	α_3	0,435942*	β_3	-0,01332	γ_3	-0,0439143*	δ_3	0,444324**
		[0,222311]		[0,191018]		[0,0245061]		[0,212692]
R-squared		0,80115		0,07146		0,62009		0,26438
p-value(F)		1,40E-130		0,106865		3,95E-73		1,02E-16
Akaike criterion		-883,74		-427,8		-3025,24		-881,92
subsample	coeff.	[1]	coeff.	[2]	coeff.	[3]	coeff.	[4]
Standard & Poor's (downgrades)	α_1	0,553126***	β_1	-0,03297	γ_1	-0,00783	δ_1	-0,447356***
		[0,0562624]		[0,0440605]		[0,00657997]		[0,0560989]
	α_2	0,00491	β_2	-0,02037	γ_2	0,00907262***	δ_2	0,00524
		[0,0208767]		[0,0269386]		[0,00134382]		[0,0205362]

	α_3	0,4671* [0,254396]	β_3	0,08442 [0,309569]	γ_3	-0,04498 [0,0297835]	δ_3	0,478703* [0,243612]
R-squared		0,79193		0,06297		0,5615		0,26738
p-value (F)		1,71E-90		0,284537		1,60E-43		2,22E-12
Akaike criterion		-528,76		-199,27		-2161,44		-526,87
Standard & Poor's (upgrades)	α_1	0,802088*** [0,0269124]	β_1	-0,243365*** [0,0687972]	γ_1	-0,113875*** [0,0113456]	δ_1	-0,191681*** [0,0269645]
	α_2	-0,00845224*** [0,00304209]	β_2	-0,00338 [0,0045773]	γ_2	-0,00206009*** [0,000596125]	δ_2	-0,00812223*** [0,00283127]
	α_3	0,166674*** [0,0617442]	β_3	-0,07571 [0,0787395]	γ_3	-0,0382985*** [0,0145308]	δ_3	0,174961*** [0,0516209]
R-squared		0,96616		0,9032		0,88576		0,37947
p-value (F)		3,15E-82		1,29E-55		1,97E-51		5,18E-09
Akaike criterion		-668,2		-812,21		-974,01		-674,72

Sources: 1)http:// countryeconomy.com, 2)http://www.finance.yahoo.com, 3)http://www.google.com/finance, 4)http://www.tr4der.com, 5)http://fx.sauder.ubc.ca/data.html, 6)http://www.standardandpoors.com, 7)https://www.moodys.com, 8)http://www.fitchratings.com, 9) "Sovereign Rating And Country T&C Assessment Histories", Standard & Poor's Ratings Services January 4 2013, 10)http://www.stoxx.com/index.html

From table 14 (Appendix C), with the outlook in the model, we see some changes considering the previous model with the ratings. The impact of the spreads today and the outlook is the same for the spreads tomorrow, but the volatility index has now a positive sign for the relationship with the spreads tomorrow, with statistical significance. For the next macro variable, the stock market the impact is still the same for the spreads today and the volatility index but the change here is the sign of the outlook. The most interesting is that none of the RHS variables is statistical significant for the stock market index. Except the loss of the statistical significance for spreads today for the exchange rate, there is no other change for the

last two macro variables in the comparison with the previous model. If we make a reconsideration of the whole sample and split it to the upgrades and the downgrades, aiming for the first subsample any favourable changes in the outlook and suchlike for the downgrades we can have two more groups. The results for the downgrades are the same with the whole sample, not having anything different worth telling. There is something different for the upgrades, now the outlook correlated negatively with the spreads tomorrow, a positive change in the outlook will reduce the spreads tomorrow. Also a more volatile environment, as it measures from the volatile index, will increase the spreads the day after. These changes in the analysis is statistical significant. A memorable change observed and for the ECM, for the kind of relationship (negative-positive) with the dependent and for the statistical significance. Here the theory is confirmed, telling that the estimates tend to be more significant for the subsample of upgrades in the change of the ratings with the outlooks. In the end, we could say that the use of outlooks improve the impact of the volatility index. Figure 3 and 4 can show us that changes in the outlook are anticipated by the market.

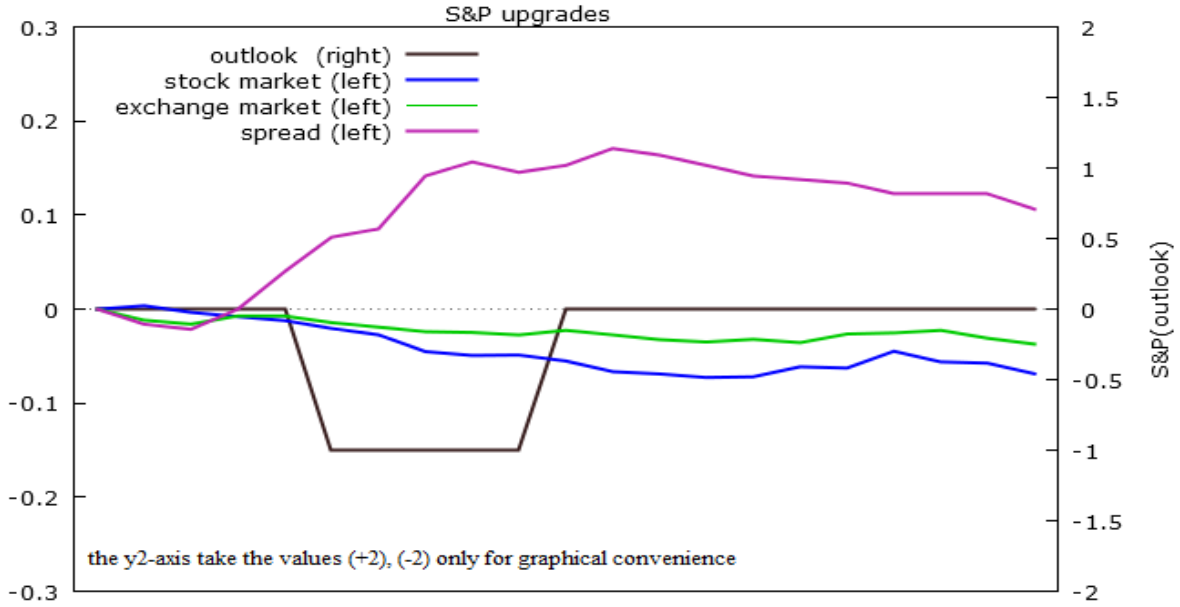


Figure 3. Standard & Poor's upgrades (outlooks).

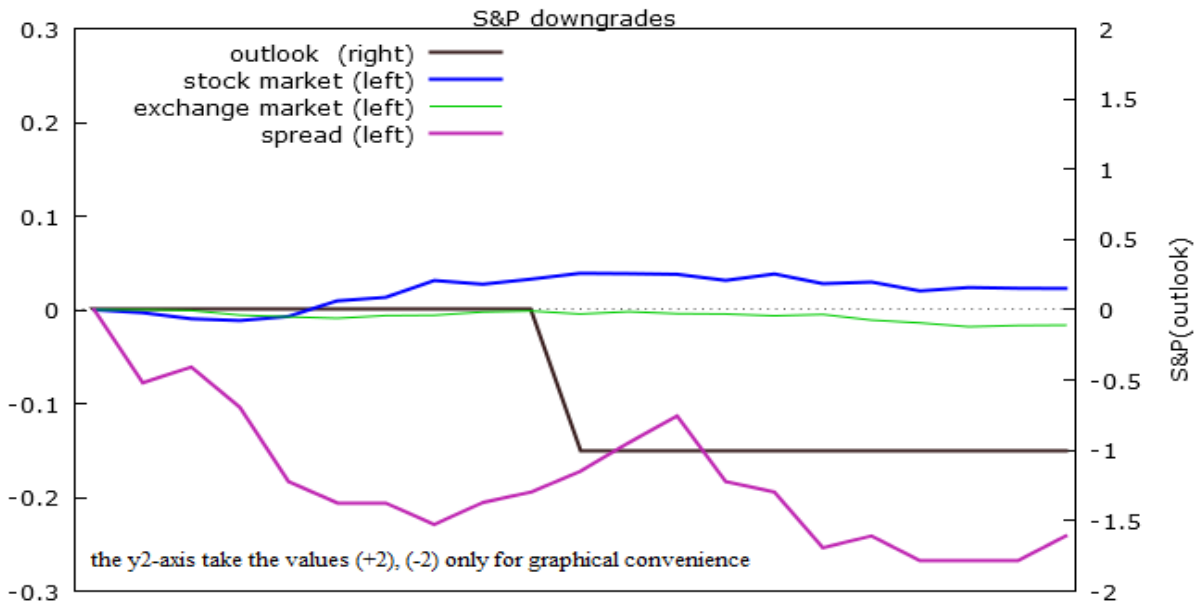


Figure 4. Standard & Poor's downgrades (outlooks).

4.4 Anticipation-First Variant

A vital issue in the field of the credit ratings and outlooks is on what degree –and if so- they are anticipated by the market. It is very interesting if the change has any real impact on the macro variable the exact time it happens and after that or it had already been absorbed any potential change. In order to find out about this phenomenon some theories had been developed. One of them considering the days that an outlook change preceded before a rating change. If the outlook change precedes the rating change by only a reasonably small number of days, then the rating change may not be fully anticipated. If the number of days is bigger than this landmark, it is likely that the rating change is fully anticipated. Also if the number of days precedes by far this landmark, then probably they give little information on the rating change. For this reason we are going to quote two types of test for some different subsamples. First set the three groups of the days between the change in outlook and the change in ratings. Our first landmark is the number of 60 days, the first group is between 0 and 60 days needed for the change in rating to follow the change in outlook. The second landmark is the number of 220 days. So the second group consists of the hypothesis that the needed number of days for the change of rating to follow the change in outlook is between 60 to 220 days. The third group takes all the other possible number of days that is greater than the number of 220 days. The first variant is a new term, we take the logarithm of the number of days that the outlook change preceded from the rating change, interacted it with the rating. This term is used in order to examine the hypothesis that the further the outlook

change precedes the more anticipated the rating change will be. The purpose of the use of the logarithm is an idea to check if this happened in a nonlinear way, i.e. greater number of days leads to less percentage of anticipation. This procedure firstly used in the S&P (21-days event window) and after we split the sample in the S&P (21-days event window, downgrades) and S&P (21-days event window, upgrades). The second use was in a diversification of the sample in the «Core» and in the «Peripheral» groups. The first contains the above countries: Austria, Belgium, France, Finland, Italy, Netherlands, Germany and the second group of peripheral the follow: Ireland, Greece, Portugal and Spain (see Appendix D for test on the models).

TABLE 15. Benchmark Regressions with Anticipation Effect: First Variant (equations)	
	OLS
1)	$\log(spread_{t+1}) = \alpha_o + \alpha_1 * \log(spread_t) + \alpha_2 * (rating_t) + \alpha_3 * \{(rating_t) * [Ln(number\ of\ days)]\} + \alpha_4 * \log(vstoxx_t)$
2)	$\log(stock_t) = \beta_o + \beta_1 * \log(spread_t) + \beta_2 * (rating_t) + \beta_3 * \{(rating_t) * [Ln(number\ of\ days)]\} + \beta_4 * \log(vstoxx_t)$
3)	$\log(exchange\ rate_t) = \gamma_o + \gamma_1 * \log(spread_t) + \gamma_2 * (rating_t) + \gamma_3 * \{(rating_t) * [Ln(number\ of\ days)]\} + \gamma_4 * \log(vstoxx_t)$
4)	$\log(spread_{t+1} - spread_t) = \delta_o + \delta_1 * \log(spread_t) + \delta_2 * (rating_t) + \delta_3 * \{(rating_t) * [Ln(number\ of\ days)]\} + \delta_4 * \log(vstoxx_t) + \delta 5 * \log(vstoxx_{t+1} - vstoxx_t)$

TABLE 16. Benchmark Regressions with Anticipation Effect: First Variant (results)

subsample	coeff.	[1]	coeff.	[2]	coeff.	[3]	coeff.	[4]
Standard & Poor's (downgrades + upgrades)	α_1	0,891474***	β_1	-0,157986***	γ_1	-0,0309921***	δ_1	-0,11619***
		[0,0125417]		[0,0349326]		[0,0034795]		[0,021604]
	α_2	-0,00014	β_2	-0,00259201**	γ_2	-0,00047	δ_2	-0,00023
		[0,00111025]		[0,00111446]		[0,000333516]		[0,00324313]
	α_3	-0,00001	β_3	0,00009	γ_3	0	δ_3	0,00029
		[0,000221052]		[0,000206427]		[6,70373e-05]		[0,00073192]
	α_4	0,0032	β_4	-0,18501***	γ_4	-0,0571835***	δ_4	0,02214
		[0,0134501]		[0,0369599]		[0,00372856]		[0,0235435]
R-squared		-		-		-		-
p-value(F)		-		-		-		-
Akaike criterion		-5074,03		-2839,4		-8184,99		-5903,55
Standard & Poor's (downgrades)	α_1	0,88932***	β_1	-0,135688***	γ_1	-0,02797***	δ_1	-0,113211***
		[0,0131187]		[0,0369491]		[0,00369209]		[0,0128898]
	α_2	-0,00077	β_2	-0,00302174***	γ_2	-0,000788829**	δ_2	-0,00069
		[0,00117276]		[0,00115966]		[0,000373026]		[0,00118872]
	α_3	-0,00001	β_3	0,00008	γ_3	0,00004	δ_3	-0,00002
		[0,000222951]		[0,000207882]		[7,17031e-05]		[0,000226619]
	α_4	0,00118	β_4	-0,184547***	γ_4	-0,058103***	δ_4	0,01985
		[0,0136934]		[0,0383917]		[0,00384563]		[0,0137076]
R-squared		-		-		-		-
p-value (F)		-		-		-		-
Akaike criterion		-4779,36		-2605,16		-7523,23		-4793,53
Standard & Poor's (upgrades)	α_1	0,88277***	β_1	-0,390975***	γ_1	-0,0549219***	δ_1	-0,11684
		[0,0834135]		[0,0786437]		[0,00413052]		[0,0823743]
	α_2	-0,0140961**	β_2	0,0194621*	γ_2	0,00319003**	δ_2	-0,0140941**

		[0,00564897]		[0,0114045]		[0,00151772]		[0,00565598]
	α_3	0,00593156***	β_3	-0,00861975***	γ_3	-0,00102006*	δ_3	0,00595013***
		[0,00212484]		[0,00293537]		[0,000573859]		[0,00215707]
	α_4	-0,0789392**	β_4	0,0862778**	γ_4	-0,0464292***	δ_4	-0,0853615***
		[0,0370342]		[0,0349255]		[0,0135433]		[0,0263058]
R-squared		0,9576		0,88027		0,9122		0,22343
p-value (F)		5,38E-52		1,13E-34		7,61E-40		0.001494
Akaike criterion		-385,36		-396,88		-671,16		-383,38

Note*:for the first two subsamples the " R-squared" and " *p-value* (F)", were not available.

Sources: 1)http:// countryeconomy.com, 2)http://www.finance.yahoo.com, 3)http://www.google.com/finance, 4)http://www.tr4der.com, 5)http://fx.sauder.ubc.ca/data.html, 6)http://www.standardandpoors.com, 7)https://www.moodys.com, 8)http://www.fitchratings.com, 9) "Sovereign Rating And Country T&C Assessment Histories", Standard & Poor's Ratings Services January 4 2013, 10)http://www.stoxx.com/index.html

From the first column of the table 16 we could tell that spreads today correlated positively with the spreads tomorrow. This is the only statistical significant coefficient, the rest are, a negative relationship between the ratings and the spreads tomorrow and a positive one for the interaction term and the volatility index (which on the baseline regression it had a negative sign). The same analysis is reported for the subsamples of downgrades. We have a whole different situation for the subsamples of upgrades. Here the spreads today have a positive sign for the spreads tomorrow, the ratings respectively a negative one, the interaction term correlated positively and the volatility index also negatively. All these are cited with statistical significance. The interaction term enters the regressions with the rest dependent variables with statistical significance. This term can be used in order to evaluate the anticipation effect for these macro variables. The non-existence of some kind of statistical significance for the whole sample is, probably, because the studied period

is mainly in the crises, so countries like Greece or Spain fall into something like a spiral of downgrades. In a very small period they may suffered from one, two or even three downgrades. So there is totally no «time and will» to analyze if and on what degree the market anticipate the events. Also in the horizon of these countries, the monetary, the fiscal and generally the economic side did not have any sign of favourable changes. A noticeable thing is that the sign of interaction term is usually the opposite of the one of the coefficients for rating itself. This suggests that, whatever the impact of rating changes on these macro variables, the more anticipated the event, the smaller the effect.

TABLE 17. Benchmark Regressions with Anticipation Effect: First Variant [(Core-Peripheral), (equations)]	
	OLS
1)	$\log(spread_{t+1}) = \alpha_o + \alpha_1 * \log(spread_t) + \alpha_2 * (rating_t) + \alpha_3 * \{(rating_t) * [Ln(number\ of\ days)]\} + \alpha_4 * \log(vstoxx_t)$
2)	$\log(stock_t) = \beta_o + \beta_1 * \log(spread_t) + \beta_2 * (rating_t) + \beta_3 * \{(rating_t) * [Ln(number\ of\ days)]\} + \beta_4 * \log(vstoxx_t)$
3)	$\log(exchange\ rate_t) = \gamma_o + \gamma_1 * \log(spread_t) + \gamma_2 * (rating_t) + \gamma_3 * \{(rating_t) * [Ln(number\ of\ days)]\} + \gamma_4 * \log(vstoxx_t)$
4)	$\log(spread_{t+1} - spread_t) = \delta_o + \delta_1 * \log(spread_t) + \delta_2 * (rating_t) + \delta_3 * \{(rating_t) * [Ln(number\ of\ days)]\} + \delta_4 * \log(vstoxx_t) + \delta_5 * \log(vstoxx_{t+1} - vstoxx_t)$

TABLE 18. Benchmark Regressions with Anticipation Effect: First Variant [(Core-Peripheral), (results)]

subsample	coeff.	[1]	coeff.	[2]	coeff.	[3]	coeff.	[4]
Standard & Poor's (core)	α_1	0,658271***	β_1	-0,138228***	γ_1	-0,0381989**	δ_1	-0,331491***
		[0,0507466]		[0,016186]		[0,0148607]		[0,0478207]
	α_2	-0,01963	β_2	-0,0191428***	γ_2	0,00137	δ_2	-0,02558
		[0,0345503]		[0,00626061]		[0,00660398]		[0,0335612]
	α_3	0,00579	β_3	0,00417003***	γ_3	0,00046	δ_3	0,00681
		[0,00783529]		[0,00135475]		[0,00143222]		[0,0074808]
	α_4	0,251117**	β_4	-0,180837***	γ_4	-0,0454637***	δ_4	0,30312***
		[0,105703]		[0,0405639]		[0,013211]		[0,115613]
R-squared		0,83086		0,79263		0,59470		0,51335
p-value (F)		1,34E-40		1,54E-35		4,39E-19		4,14E-14
Akaike criterion		-607,21		-856,67		-1010,90		-613,61
Standard & Poor's (peripheral)	α_1	0.765515***	β_1	-0.127386***	γ_1	-0.0303021**	δ_1	-0.235038***
		[0.0654859]		[0.0399412]		[0.0121784]		[0.0588586]
	α_2	-0.00150881	β_2	0.00303204	γ_2	0.00538786**	δ_2	-0.00367848
		[0.0037227]		[0.00356756]		[0.00240496]		[0.00458781]
	α_3	0.00029175	β_3	-0.000239223	γ_3	-0.00105317**	δ_3	0.000728153
		[0.000827107]		[0.000789702]		[0.000483399]		[0.00103575]
	α_4	-0.0422656	β_4	-0.14449***	γ_4	-0.0488059***	δ_4	-0.0103846
		[0.0703588]		[0.037974]		[0.01031]		[0.0630156]
R-squared		0.831782		0.810642		0.827530		0.294334
p-value(F)		4,40E-186		1,80E-172		3,30E-183		5,11E-25
Akaike criterion		-2.089		-3.298		-4.397		-2.114

Sources: 1)http:// countryeconomy.com, 2)http://www.finance.yahoo.com, 3)http://www.google.com/finance, 4)http://www.tr4der.com, 5)http://fx.sauder.ubc.ca/data.html, 6)http://www.standardandpoors.com, 7)https://www.moodys.com, 8)http://www.fitchratings.com, 9) "Sovereign Rating And Country T&C Assessment Histories", Standard & Poor's Ratings Services January 4 2013, 10)http://www.stoxx.com/index.html

In table 18 the last proposal –mentioned above- is also confirmed, in almost every case. For both of subsamples the spreads today have positive sign for spreads tomorrow, the ratings a negative one, the interaction term positive and the volatility index negative (statistical significant for the core countries). For the core countries the more volatile environment has impact on their spreads the day after. This is not observed in the peripheral, because there is a truly chaotic situation of volatility. A change in the volatility index is not statistical significant because they have reached the peak of the volatile. Nothing is steady, and rational. Also these countries had recourse to bailout mechanism in order to be saved, a mechanism that keeps them out of the free market. Something very interesting is the statistical significance of ratings and the interaction term for the exchange rate, for the peripheral countries. Their future included the possibility of default and the confirmation of a way out of the European Union had really some impact on the exchange rate of the union and on the totally monetary policy.

4.5 Anticipation-Second Variant

TABLE 19. Benchmark Regressions with Anticipation Effect: Second Variant (equations)	
	OLS
1)	$\log(spread_{t+1}) = \alpha_o + \alpha_1 * \log(spread_t) + \alpha_2 * (rating_t) + \alpha_3 * [(rating_t) * T1] + \alpha_4 * \log(vstoxx_t)$
2)	$\log(stock_t) = \beta_o + \beta_1 * \log(spread_t) + \beta_2 * (rating_t) + \beta_3 * [(rating_t) * T1] + \beta_4 * \log(vstoxx_t)$
3)	$\log(exchange\ rate_t) = \gamma_o + \gamma_1 * \log(spread_t) + \gamma_2 * (rating_t) + \gamma_3 * [(rating_t) * T1] + \gamma_4 * \log(vstoxx_t)$
4)	$\log(spread_{t+1} - spread_t) = \delta_o + \delta_1 * \log(spread_t) + \delta_2 * (rating_t) + \delta_3 * [(rating_t) * T1] + \delta_4 * \log(vstoxx_t) + \delta_5 * \log(vstoxx_{t+1} - vstoxx_t)$

TABLE 20. Benchmark Regressions with Anticipation Effect: Second Variant (results)

subsample	coeff.	[1]	coeff.	[2]	coeff.	[3]	coeff.	[4]
Standard & Poor's (downgrades + upgrades)	α_1	0,891843*** [0,0125417]	β_1	-0,16015*** [0,0348048]	γ_1	-0,0306345*** [0,00347805]	δ_1	-0,116644*** [0,0219397]
	α_2	-0,00003 [0,000691233]	β_2	-0,00271482*** [0,000764171]	γ_2	-0,00032 [0,000206013]	δ_2	0,00035 [0,000986891]
	α_3	-0,00027 [0,000607083]	β_3	0,00076 [0,000566308]	γ_3	-0,00023 [0,000186582]	δ_3	0,00104 [0,00180084]
	α_4	0,00295 [0,0134366]	β_4	-0,183089*** [0,0368144]	γ_4	-0,0574169*** [0,00372152]	δ_4	0,02198 [0,0240322]
R-squared		-		-		-		-
p-value (F)		-		-		-		
Akaike criterion		-5081,45		-2844,07		-8222,60		-5903,78
Standard & Poor's (downgrades)	α_1	0,889685*** [0,0131105]	β_1	-0,137976*** [0,0367773]	γ_1	-0,0278403*** [0,00369078]	δ_1	-0,112882*** [0,0128825]

	α_2	-0,00051 [0,000761813]	β_2	-0,00320965*** [0,000833695]	γ_2	-0,000515055** [0,000234127]	δ_2	-0,00047 [0,000766487]
	α_3	-0,00048 [0,000614572]	β_3	0,00082 [0,000568517]	γ_3	-0,00015 [0,000195761]	δ_3	-0,00045 [0,000624156]
	α_4	0,00076 [0,0136813]	β_4	-0,181903*** [0,0382275]	γ_4	-0,0583477*** [0,00384269]	δ_4	0,01946 [0,0136971]
R-squared		-		-		-		-
p-value (F)		-		-		-		
Akaike criterion		-4788,10		-2610,00		-7601,77		-4801,15
Standard & Poor's (upgrades)	α_1	0,88277*** [0,0834135]	β_1	-0,390975*** [0,0786437]	γ_1	-0,0549219*** [0,00413052]	δ_1	-0,11684 [0,0823743]
	α_2	0,00111801*** [0,000198866]	β_2	-0,00265 [0,00387539]	γ_2	0,000573629*** [4,58046e-05]	δ_2	0,00116764*** [0,000123192]
	α_3	0,0093611*** [0,00335339]	β_3	-0,0136036*** [0,00463256]	γ_3	-0,00160984* [0,000905655]	δ_3	0,0093904*** [0,00340426]
	α_4	-0,0789392** [0,0370342]	β_4	0,0862778** [0,0349255]	γ_4	-0,0464292*** [0,0135433]	δ_4	-0,0853615*** [0,0263058]
R-squared		0,95760		0,88027		0,91220		0,22343
p-value(F)		5,38E-52		1,13E-34		7,61E-40		0,001494
Akaike criterion		-385,36		-396,88		-671,16		-383,38

Note*:for the first two subsamples the " R-squared" and " *p-value* (F)", were not available.

Sources: 1)http:// countryeconomy.com, 2)http://www.finance.yahoo.com, 3)http://www.google.com/finance, 4)http://www.tr4der.com, 5)http://fx.sauder.ubc.ca/data.html, 6)http://www.standardandpoors.com, 7)https://www.moodys.com, 8)http://www.fitchratings.com, 9) "Sovereign Rating And Country T&C Assessment Histories", Standard & Poor's Ratings Services January 4 2013, 10)http://www.stoxx.com/index.html

Afterwards the table 16 we developed the table 20, with the second variant. This new term follow a very simple procedure, we construct a dummy variable that takes the value 1 if the number of days between the

change in outlook and the change in ratings is greater than the number of 60 days and then multiplied with the ratings. This landmark of 60 days was chosen as it gives us a respect number of highly anticipated events. The results from the table 20, about the second interaction term, are similar with the results for the same subsamples from the table 16, for the first interaction term. Only one – two things are different, now the coefficient of ratings for the spreads tomorrow is negative, and the signs of ratings' coefficient for the spreads tomorrow and the stock market of the upgrades subsample are reversed, losing the significance in the case of stock market index.

TABLE 21. Benchmark Regressions with Anticipation Effect: Second Variant [(Core-Peripheral), (equations)]	
	OLS
1)	$\log(spread_{t+1}) = \alpha_o + \alpha_1 * \log(spread_t) + \alpha_2 * (rating_t) + \alpha_3 * [(rating_t) * T1] + \alpha_4 * \log(vstoxx_t)$
2)	$\log(stock_t) = \beta_o + \beta_1 * \log(spread_t) + \beta_2 * \log(rating_t) + \beta_3 * [(rating_t) * T1] + \beta_4 * \log(vstoxx_t)$
3)	$\log(exchange\ rate_t) = \gamma_o + \gamma_1 * \log(spread_t) + \gamma_2 * (rating_t) + \gamma_3 * [(rating_t) * T1] + \gamma_4 * \log(vstoxx_t)$
4)	$\log(spread_{t+1} - spread_t) = \delta_o + \delta_1 * \log(spread_t) + \delta_2 * (rating_t) + \delta_3 * [(rating_t) * T1] + \delta_4 * \log(vstoxx_t) + \delta_5 * \log(vstoxx_{t+1} - vstoxx_t)$

TABLE 22. Benchmark Regressions with Anticipation Effect: Second Variant [(Core-Peripheral), (results)]

subsample	coeff.	[1]	coeff.	[2]	coeff.	[3]	coeff.	[4]
Standard & Poor's (core)	α_1	0,670299***	β_1	-0,13351***	γ_1	-0,0373927**	δ_1	-0,319215***
		[0,054892]		[0,0154437]		[0,0158653]		[0,0499366]
	α_2	0,00756754*	β_2	-0,00393	γ_2	0,00336042***	δ_2	0,00499
		[0,00416468]		[0,00312741]		[0,000758959]		[0,00430077]
	α_3	0,00096	β_3	0,00555	γ_3	0,00026	δ_3	0,00276
		[0,00734133]		[0,00404208]		[0,00124121]		[0,00732014]
	α_4	0,216599**	β_4	-0,183277***	γ_4	-0,0473679***	δ_4	0,268053**
		[0,101628]		[0,0363757]		[0,00886545]		[0,103554]
R-squared		0,82797		0,78554		0,59372		0,50161
p-value (F)		3,53E-40		1,05E-34		5,03E-19		1,49E-13
Akaike criterion		-605,08		-852,43		-1010,60		-610,61
Standard & Poor's (peripheral)	α_1	0,765784***	β_1	-0,127703***	γ_1	-0,0303761**	δ_1	-0,234736***
		[0,0647862]		[0,0378866]		[0,0127724]		[0,0577251]
	α_2	-0,0026778*	β_2	0,00481431***	γ_2	0,0018953**	δ_2	-0,00345335**
		[0,00144906]		[0,00170278]		[0,000871927]		[0,00151306]
	α_3	0,00389351*	β_3	-0,00452045*	γ_3	-0,00162209*	δ_3	0,004648**
		[0,00208754]		[0,00251279]		[0,000938277]		[0,00232636]
	α_4	-0,04353	β_4	-0,142797***	γ_4	-0,0503745***	δ_4	-0,01083
		[0,0676192]		[0,0360485]		[0,010691]		[0,0601533]
R-squared		0,83227		0,81698		0,81927		0,29701
p-value(F)		2,00E-186		2,20E-176		7,90E-178		2,10E-25
Akaike criterion		-2090,67		-3317,61		-4370,87		-2116,09

Sources: 1)http:// countryeconomy.com, 2)http://www.finance.yahoo.com, 3)http://www.google.com/finance, 4)http://www.tr4der.com, 5)http://fx.sauder.ubc.ca/data.html, 6)http://www.standardandpoors.com, 7)https://www.moodys.com, 8)http://www.fitchratings.com, 9) "Sovereign Rating And Country T&C Assessment Histories", Standard & Poor's Ratings Services January 4 2013, 10)http://www.stoxx.com/index.html

After the results from the table 22 we saw how a very simple procedure came up with some very interesting findings. For the core countries we see only a very few changes in comparison with the other interaction term, but the important changes are for the peripheral countries. The spreads leads to a rise in the spreads tomorrow, a decline in the stock market, depreciation and to a decline in the term of the ECM. A positive change in ratings will lead to a fall for the spreads tomorrow, a positive impact for the stock market, appreciation and also a decline for the term of ECM. The interaction terms reacts exact the same as the spreads, except for the ECM. The volatility index had negative relationship with the stock market index and the exchange rate. In particular, note that interaction's sign is usually the opposite of the one of the coefficients for rating itself, especially when the interaction term is significant. This is a very important model, mainly, for the peripheral countries as it tells us about the anticipated events. The general result is that the closer the change is in outlook and in ratings, i.e. the smaller the number of days, the less anticipated the rating change will be, having as well a significant correlation with the macro variables. This can be a further confirmation for the important role of the ratings.

4.6 Self-fulfilling

Oftentimes the fundamental data describes a situation which is not the real one. Considering the fundamental values we could except to watch a «healthy economy» and the result is different from the excepted. Any possible attempt to analyze this situation with the existing fundamental tools lead to dead end. We see the spreads taking a path that is not the

expected, as it was estimated with the fundamentals values. Then the model become ineffective for a this economy, leading us with blind steps if we concentrate our analysis only on the fundamentals values. This situation can be described with the term of self-fulfilling, something very important –and harmful- for a lot of economies, even the strongest. Self-fulfilling crises is a situation that can lead to movements in the spreads that appear to be unrelated to the fundamental variables of the model. These crises have a mechanism correlated with the role of expectations and especially pessimistic expectations, which are fed from the crisis. As it first introduced by the theory, these pessimistic expectations of the investors occurred only for the government that did not fulfill its commitments, something that is rational on some degree. Nowadays, after the heat of the crises, investors beliefs -the most important element in the system- that the government is unable to honor its commitments, the expectation itself (nowadays the genesis of poor expectations is much more easy than before) and the following behaviors of them as the cost of an international debt crisis are very high, such as stopping purchasing the newly issued government bond or selling the local currency for foreign currency (as this is more stable and safe), will increase cost for the government to adhere to the promised policy. Consequently, a crisis happens when government's inability to maintain the committed policy, as the cost of maintaining the committed policy is very high, the government finds it optimal to abandon the existing policy and ends up justifying investors' pessimism. A good way of testing this hypothesis is by measuring the importance of time-dependent effects on the spreads that are not related to the fundamentals, introducing time dependency in our models. We could test if the time dependent variable is statistical

significant and find out if this can explain the «informational gap» for the model. A gap that is observed between the theoretical and the true values of the economy. This test is the main reason for splitting the samples in the core and peripheral groups, testing for the reaction of the different kind of groups. We want to check separately for the peripheral countries if they had any time dependency, and next for the core countries. The theory, as it was first established, said that a smaller economy is more vulnerable to a self-fulfilling crisis. And on the other hand, a bigger economy is less vulnerable. The existence of the statistical significant for the time depend variable is a sign that the depend variable explained on some degree, by something that is not a fundamental variable. Something that the participants cannot study and dealing with it in advance. This will lead us to the presence of a self-fulfilling crisis. This is a test also if the crisis in Eurozone has a fundamental background or it is just a speculative attack. The next tables will give us a better look for this phenomenon.

TABLE 23. Government Bond Spread Regression with Time Component (equation)	
	OLS
1)	$\log(spread_{t+1}) = \alpha_o + \alpha_1 * \log(spread_t) + \alpha_2 * (rating_t) + \alpha_3 * \log(vstoxx_t) + \sum^{i=40} \alpha_{i+3} * (time\ dummy_{t-i})$

TABLE 24. Government Bond Spread Regression with Time Component (results)

subsample	coeff.	[1]		coeff.	[1]		coeff.	[1]
Standard & Poor's (all)	α_1	0,886107***	Standard & Poor's (core)	α_1	0,814389***	Standard & Poor's (peripheral)	α_1	0,882731***
		[0,022419]			[0,0539755]			[0,0237857]
	α_2	0,00231		α_2	-0,0100635***		α_2	0,00251
		[0,00190953]			[0,00246567]			[0,00195706]
	α_3	0,00101		α_3	0,02871		α_3	-0,00867
		[0,025058]			[0,0425608]			[0,025821]
	α_4	0,00894		α_4	0,02044		α_4	0,00262
		[0,00685129]			[0,0198694]			[0,00646654]
	α_5	-0,00320		α_5	-0,00354		α_5	-0,00661
		[0,00578406]			[0,0157046]			[0,00655666]
	α_6	0,00962		α_6	0,030926***		α_6	0,00116
		[0,00748078]			[0,0106374]			[0,00821144]
	α_7	0,00407		α_7	0,00963		α_7	-0,00086
		[0,00655324]			[0,0110103]			[0,00743629]
	α_8	0,00802		α_8	0,021165*		α_8	0,00130
		[0,00568216]			[0,0111546]			[0,00603529]
	α_9	0,00355		α_9	0,00450		α_9	-0,00024
		[0,00543151]			[0,00936179]			[0,00624322]
	α_{10}	0,00868		α_{10}	0,0152842*		α_{10}	0,00362
		[0,00592283]			[0,00885414]			[0,00668591]
	α_{11}	0,0141822**		α_{11}	0,0372655***		α_{11}	0,00494
		[0,00658006]			[0,0109188]			[0,0065302]
	α_{12}	0,00805		α_{12}	0,00548		α_{12}	0,00477
		[0,00699475]			[0,0118004]			[0,00815701]
	α_{13}	0,01000		α_{13}	0,01943		α_{13}	0,00395
		[0,0063312]			[0,0129404]			[0,00650071]

	-0,00140		-0,01113		-0,00303
α_{14}	[0,0076542]	α_{14}	[0,00738617]	α_{14}	[0,00888548]
	0,0239243**		0,01927		0,02086
α_{15}	[0,0107427]	α_{15}	[0,0132194]	α_{15}	[0,0130581]
	0,0227602*		0,00011		0,0236888*
α_{16}	[0,0118156]	α_{16}	[0,00886482]	α_{16}	[0,0138193]
	0,01052		-0,00148		0,00927
α_{17}	[0,00835435]	α_{17}	[0,00535487]	α_{17}	[0,0101603]
	0,00293		0,01070		-0,00266
α_{18}	[0,00725205]	α_{18}	[0,0113421]	α_{18}	[0,00817237]
	0,00554		0,0304677**		-0,00423
α_{19}	[0,00907955]	α_{19}	[0,0152236]	α_{19}	[0,00976108]
	0,00399		0,0173608**		-0,00330
α_{20}	[0,00762622]	α_{20}	[0,00736754]	α_{20}	[0,00868552]
	0,0151503**		0,0188964**		0,00971
α_{21}	[0,00680412]	α_{21}	[0,00821177]	α_{21}	[0,00768855]
	0,0121823**		-0,00004		0,0101998*
α_{22}	[0,00554183]	α_{22}	[0,0132184]	α_{22}	[0,00608185]
	0,00978187**		0,00041		0,00707
α_{23}	[0,00488828]	α_{23}	[0,0119659]	α_{23}	[0,00513519]
	-0,00228		0,00400		-0,00848
α_{24}	[0,00653401]	α_{24}	[0,00834244]	α_{24}	[0,0070476]
	-0,00578		-0,00934		-0,00634
α_{25}	[0,00631386]	α_{25}	[0,0085538]	α_{25}	[0,00745459]
	0,00186		0,0272751***		-0,00539
α_{26}	[0,00643813]	α_{26}	[0,0100231]	α_{26}	[0,00693724]
	0,00256		0,0119185**		-0,00118
α_{27}	[0,00538682]	α_{27}	[0,00598381]	α_{27}	[0,00631779]
	0,00416		0,0156898**		-0,00009
α_{28}	[0,00649254]	α_{28}	[0,0069872]	α_{28}	[0,00760599]

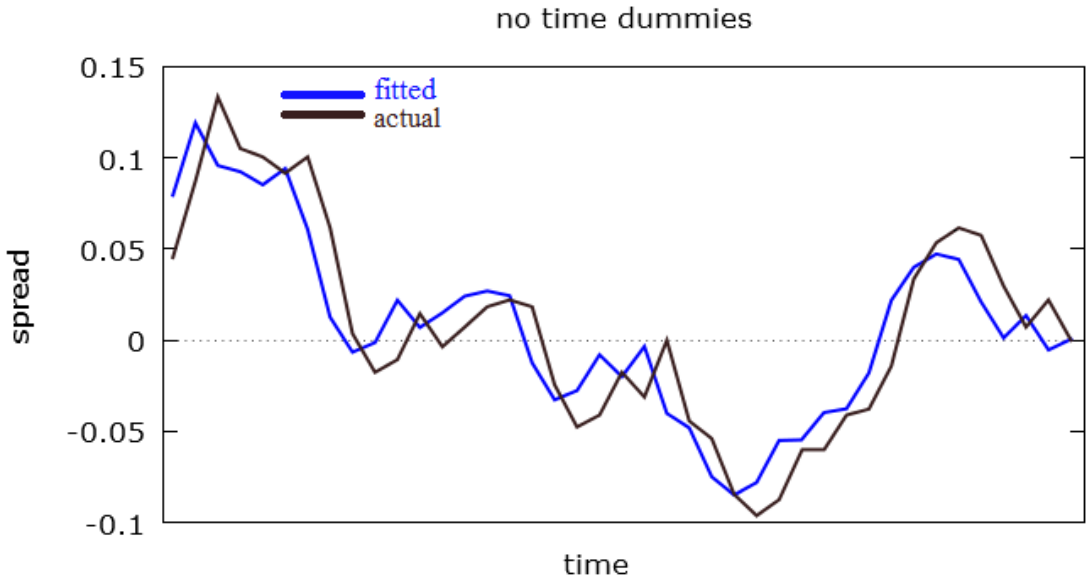
	0,00620		0,0130716*		0,00285
α_{29}	[0,00602366]	α_{29}	[0,00689491]	α_{29}	[0,00692897]
	0,00098		0,00346		-0,00133
α_{30}	[0,0051123]	α_{30}	[0,0117845]	α_{30}	[0,00543205]
	-0,00107		-0,01246		-0,00006
α_{31}	[0,00535909]	α_{31}	[0,0107175]	α_{31}	[0,00606025]
	0,00272		0,00657		0,00054
α_{32}	[0,00498907]	α_{32}	[0,00825833]	α_{32}	[0,0056348]
	0,00387		0,00609		0,00226
α_{33}	[0,00446417]	α_{33}	[0,0134359]	α_{33}	[0,00464142]
	0,00312		0,00831		0,00098
α_{34}	[0,00508086]	α_{34}	[0,00650856]	α_{34}	[0,00595537]
	0,00532		-0,00295		0,00648
α_{35}	[0,00519522]	α_{35}	[0,0126338]	α_{35}	[0,00544281]
	0,00722		0,00467		0,00725
α_{36}	[0,00551946]	α_{36}	[0,0130435]	α_{36}	[0,0059538]
	0,0123153***		0,0138591*		0,011486**
α_{37}	[0,00415347]	α_{37}	[0,00765734]	α_{37}	[0,00468192]
	0,00828038*		0,020909***		0,00499
α_{38}	[0,00451193]	α_{38}	[0,00542747]	α_{38}	[0,00511292]
	0,00519		0,0156119**		0,00253
α_{39}	[0,0045957]	α_{39}	[0,00628101]	α_{39}	[0,00526602]
	0,00708		0,0279961***		0,00210
α_{40}	[0,00454364]	α_{40}	[0,00821787]	α_{40}	[0,00468588]
	0,00981278**		0,0271339***		0,00559
α_{41}	[0,0042787]	α_{41}	[0,00710847]	α_{41}	[0,00450923]
	0,00421		0,0125741*		0,00214
α_{42}	[0,00388226]	α_{42}	[0,00645719]	α_{42}	[0,00433701]
	0,0106787**		0,0211768***		0,00796
α_{43}	[0,00439125]	α_{43}	[0,00776543]	α_{43}	[0,00494368]

R-squared	0,91916	0,91924	0,92220
p-value(F)	0	1,25E-84	0
Akaike criterion	-5848,43	-1167,09	-4713,57

Sources: 1)http:// countryeconomy.com, 2)http://www.finance.yahoo.com, 3)http://www.google.com/finance, 4)http://www.tr4der.com, 5)http://fx.sauder.ubc.ca/data.html, 6)http://www.standardandpoors.com, 7)https://www.moodys.com, 8)http://www.fitchratings.com, 9) "Sovereign Rating And Country T&C Assessment Histories", Standard & Poor's Ratings Services January 4 2013, 10)http://www.stoxx.com/index.html

From table 24(Appendix E) we conclude that in all three cases spreads today correlated positively with the spreads tomorrow, i.e. an increase in the probability of default today will lead to an increase in the probability of default tomorrow. The ratings are only statistical significant in the case of the core countries, with an increase in them will reduce the spreads tomorrow. The others RHS for the rest of the cases are not significant. We choose the expand event window in order to exam the hypothesis of self-fulfilling. First for the whole sample, we see three coefficients to be significant that are not established in a systematic way (creating a time-chain). This is not the same for the other three coefficients just before the event of the rating change. This mini group of time variables affects the spreads before the change in ratings, increasing the probability of default tomorrow, i.e. the spreads tomorrow. The same phenomenon is observed a little before the end of the event window, still increasing the spreads tomorrow. In these two stages we had an impact on the spreads that is unrelated to the fundamentals values, increasing the spreads. For the core countries the situation is a little bit different. We have four chronicle eras with a systematic approach of the time dependency. The first one is near the beginning, the second and the third before and after - respectively - the rating change and the last one before the close of event window. Before the real rating change the spreads move in time unrelated to the fundamentals forces driving the yields. Also the statistical significance of

the time dummies after the center of the event window, i.e. the day of rating change, confirms the upper theory. The last chronicle era is still important, as in the end of the event window we observe a worth-mentioned change in the spreads unrelated to the fundamentals. For the peripheral countries, using this model, we have different circumstances. We have statistical significant coefficients before the rating change, unrelated among them, and a last one somewhere before the end of the event window. The differences between the results for the core and the peripheral countries show a new piece of the map, the crisis in Eurozone hit all the countries, some of them hard and some of them not. For some of them it was reasonable and for some was irrational. For some of them it was expected (considering their sin history) and for some of them it was not. For the peripheral countries this crisis was the result after the years of bad fiscal policy and generally deteriorating the fundamentals. This is not the case for the core countries, their yields in spreads had a lot of time dependency mainly because of the market's sentiments. The investors fear about the future of the European Union affects the core countries negatively, deteriorating the position of the country even if this could not be supported by the fundamentals.



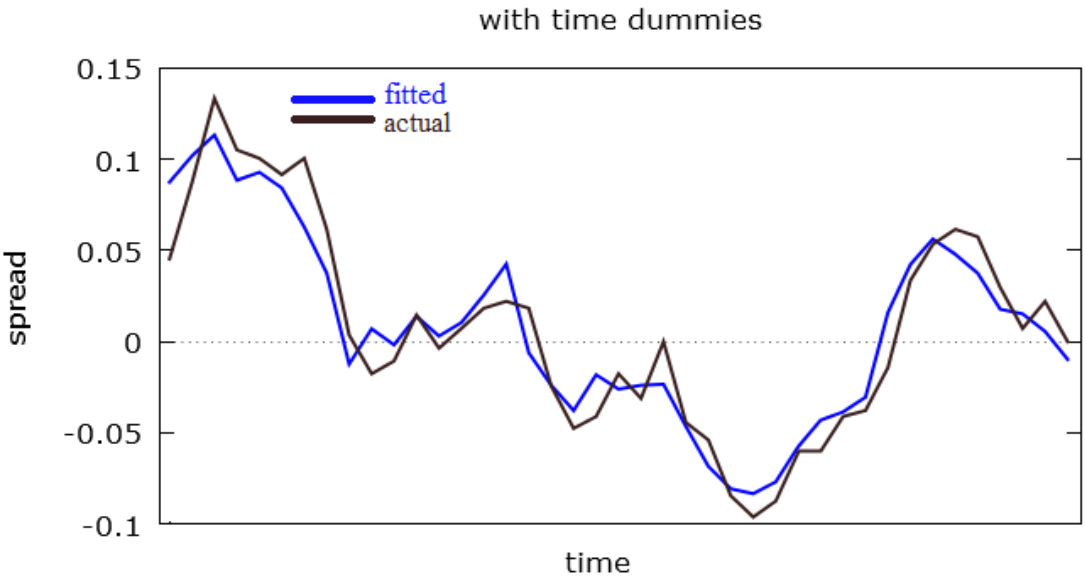


Figure 5. Simulated (with and without times dummies) and observed spreads in core countries

Figure 5 shows the simulated spreads obtained from the models with and without dummies, together with the observed spreads for the core countries. We observe that the model without the time dummies fails to fit as well as the one with time dummies. This confirms our previous results, i.e. part of the increases in the spreads in the core countries is the result of time dependent movements in sentiments that were independent from the underlying fundamentals.

5. Conclusions

The relationship between spreads and ratings or in other way the relationship between a government (as an issuer) and a rating agency (as a judge) went into a path that had played a big part into the recent global crisis (which transformed later on a European one). A Credit Rating Agency supposed to provide information about a government bond on time and not after the occurrence of the credit events. This is the scenery for the European market, but after our tests we could say that ratings add information. The kind of information depends on the agency. The empirical results suggest that the Standard & Poor's and Moody's credit ratings are useful for decisions and analysis on the field of the stock markets and for the exchange rates, and generally for monetary reasons. For the ratings of the Fitch agency, they are useful for analysis in the field of spreads, because the market recognize their "personal experience" as they headquartered in London. All these are confirmed by the rejection rates of the Hausman test. We proceed with some others tests, their results are very informative. No explanatory power for pure technical reasons, as a change in an asset class. The use of outlooks instead of ratings favors only the subsample of upgrades, which is the same situation and for the results from the table of the first variant of the anticipation term. The choice of core-peripheral subsamples is beneficial when we exam the impacts from the use of the second variant of the anticipation term, when the more anticipated the event is the less impact it will have after the day of the change in the credit rating. A crucial sector is the self-fulfilling field. The presence of a change in the spreads that is unrelated to a

fundamental reason is observed for the whole sample and especially for the core countries. We had changes in the spreads of a government bond of one of the core countries that cannot be explained by the economic situation of the country and is time-dependent. These circumstances lead to a deterioration of the Eurozone, at the same time when the peripheral countries activate bailout mechanism in order to be saved, waiting for good news of the big European economies. The environment cannot be explained just by the examination of the relationship between spreads and ratings, as it is more complex and had some speculative attacks. It is unquestionable although, ratings are informative for countries in the Europe.

APPENDIX

Appendix A

In this section are listed the test about the choice of the kind of events, pooled-fixed-random for the table 6. Check for the intercept and the variance of the group in order to choose the appropriate model for our regressions. The rest of the subsamples follow the same procedure as the one described for the S&P (21-days event window).

i. S& (21-days event window):

Diagnostics: assuming a balanced panel with 33 cross-sectional units

observed over 21 periods

Fixed effects estimator

allows for differing intercepts by cross-sectional unit

slope standard errors in parentheses, p-values in brackets

const:	-0.0096165	(0.019182)	[0.61632]
log_spr_:	0.7703	(0.0273)	[0.00000]
S_P_number:	0.00079493	(0.0013759)	[0.56363]
log_voxx_:	-0.022923	(0.02981)	[0.44219]

33 group means were subtracted from the data

Residual variance: 0.810454/(693 - 36) = 0.00123357

Joint significance of differing group means:

F(32, 657) = 4.95879 with p-value 2.227e-016

(A low p-value counts against the null hypothesis that the pooled OLS model

is adequate, in favor of the fixed effects alternative.)

Breusch-Pagan test statistic:

LM = 115.131 with p-value = prob(chi-square(1) > 115.131) = 7.36652e-027

(A low p-value counts against the null hypothesis that the pooled OLS model

is adequate, in favor of the random effects alternative.)

Variance estimators:

between = 0.000249475

within = 0.00123357

theta used for quasi-demeaning = 0.514758

Random effects estimator

allows for a unit-specific component to the error term

(standard errors in parentheses, p-values in brackets)

const:	-0.0018981	(0.006765)	[0.77912]
log_spr_:	0.80944	(0.0239)	[0.00000]
S_P_number:	0.0001531	(0.00045104)	[0.73438]
log_voxx_:	-0.01652	(0.026342)	[0.53078]

Hausman test statistic:

H = 14.8021 with p-value = prob(chi-square(3) > 14.8021) = 0.00199382

(A low p-value counts against the null hypothesis that the random effects

model is consistent, in favor of the fixed effects model.)

ii. S&P (21-days event window, downgrades):

Residual variance: 0.793804/(651 - 34) = 0.00128655

Joint significance of differing group means:

F(30, 617) = 4.8752 with p-value 3.96614e-015

Breusch-Pagan test statistic:

LM = 104.038 with p-value = prob(chi-square(1) > 104.038) = 1.98492e-024

Variance estimators:

between = 0.000258559

within = 0.00128655

theta used for quasi-demeaning = 0.513229

Hausman test statistic:

H = 13.5656 with p-value = prob(chi-square(3) > 13.5656) = 0.00356016

iii. S&P (21-days event window, upgrades):

Residual variance: 0.0103492/(42 - 5) = 0.000279707

Joint significance of differing group means:

F(1, 37) = 4.57627 with p-value 0.0390822

Breusch-Pagan test statistic:

LM = 0.00102988 with p-value = prob(chi-square(1) > 0.00102988) = 0.974399

Omitting group means regression: insufficient degrees of freedom

iv. Fitch (21-days event window):

Residual variance: 0.43879/(567 - 30) = 0.000817114

Joint significance of differing group means:

F(26, 537) = 13.5941 with p-value 6.82817e-044

Breusch-Pagan test statistic:

LM = 573.801 with p-value = prob(chi-square(1) > 573.801) = 8.36633e-127

Variance estimators:

between = 0.000522969

within = 0.000817114

theta used for quasi-demeaning = 0.727232

Hausman test statistic:

H = 26.2029 with p-value = prob(chi-square(3) > 26.2029) = 8.64866e-006

v. Moody's (21-days event window):

Residual variance: 16.162/(525 - 28) = 0.0325192

Joint significance of differing group means:

F(24, 497) = 1.04363 with p-value 0.407239

Breusch-Pagan test statistic:

LM = 1.55433 with p-value = prob(chi-square(1) > 1.55433) = 0.212497

Variance estimators:

between = 0.000343936

within = 0.0325192

theta used for quasi-demeaning = 0

Hausman test statistic:

H = 21.3312 with p-value = prob(chi-square(3) > 21.3312) = 8.98529e-005

vi. S&P (11-days event window):

Residual variance: 0.170182/(363 - 36) = 0.000520433

Joint significance of differing group means:

F(32, 327) = 5.4755 with p-value 1.40719e-016

Breusch-Pagan test statistic:

LM = 140.686 with p-value = prob(chi-square(1) > 140.686) = 1.88483e-032

Variance estimators:

between = 0.000279297

within = 0.000520433

theta used for quasi-demeaning = 0.588421

Hausman test statistic:

H = 1.43088 with p-value = prob(chi-square(3) > 1.43088) = 0.698313

vii. S&P (41-days event window):

Residual variance: 0.987771/(1353 - 36) = 0.000750016

Joint significance of differing group means:

F(32, 1317) = 31.3571 with p-value 6.50276e-138

Breusch-Pagan test statistic:

LM = 4676.69 with p-value = prob(chi-square(1) > 4676.69) = 0

Variance estimators:

between = 0.000625431

within = 0.000750016

theta used for quasi-demeaning = 0.828977

Hausman test statistic:

H = 1.62607 with p-value = prob(chi-square(3) > 1.62607) = 0.653493

Appendix B

i. S&P (21-days event window):

Residual variance: 0.809894/(693 - 37) = 0.00123459

Joint significance of differing group means:

F(32, 656) = 4.93958 with p-value 2.74327e-016

Breusch-Pagan test statistic:

LM = 116.585 with p-value = prob(chi-square(1) > 116.585) = 3.53831e-027

Variance estimators:

between = 0.000257958

within = 0.00123459

theta used for quasi-demeaning = 0.522604

Hausman test statistic:

H = 14.2305 with p-value = prob(chi-square(4) > 14.2305) = 0.00659449

ii. S&P (21-days event window, downgrades):

Residual variance: 0.7932/(651 - 35) = 0.00128766

Joint significance of differing group means:

F(30, 616) = 4.85571 with p-value 4.83766e-015

Breusch-Pagan test statistic:

LM = 105.359 with p-value = prob(chi-square(1) > 105.359) = 1.01901e-024

Variance estimators:

between = 0.000268098

within = 0.00128766

theta used for quasi-demeaning = 0.521761

Hausman test statistic:

H = 13.042 with p-value = prob(chi-square(4) > 13.042) = 0.0110724

Appendix C

i. S&P (21-days event window):

Residual variance: 3.12173/(441 - 24) = 0.00748616

Joint significance of differing group means:

F(20, 417) = 5.80928 with p-value 1.83799e-013

Breusch-Pagan test statistic:

LM = 13.232 with p-value = prob(chi-square(1) > 13.232) = 0.000275211

Variance estimators:

between = 0.000351252

within = 0.00748616

theta used for quasi-demeaning = 0

Hausman test statistic:

H = 101.097 with p-value = prob(chi-square(3) > 101.097) = 9.02797e-022

ii. S&P (21-days event window, downgrades):

Residual variance: 3.07041/(315 - 18) = 0.0103381

Joint significance of differing group means:

F(14, 297) = 5.92856 with p-value 2.76174e-010

Breusch-Pagan test statistic:

LM = 8.75486 with p-value = prob(chi-square(1) > 8.75486) = 0.00308778

Variance estimators:

between = 0.000508643

within = 0.0103381

theta used for quasi-demeaning = 0.0162074

Hausman test statistic:

H = 72.3966 with p-value = prob(chi-square(3) > 72.3966) = 1.30907e-015

iii. S&P (21-days event window, upgrades):

Residual variance: 0.0318208/(126 - 9) = 0.000271973

Joint significance of differing group means:

F(5, 117) = 9.77552 with p-value 7.98113e-008

Breusch-Pagan test statistic:

LM = 5.50874 with p-value = prob(chi-square(1) > 5.50874) = 0.0189217

Variance estimators:

between = 1.17691e-005

within = 0.000271973

theta used for quasi-demeaning = 0

Hausman test statistic:

H = 49.9049 with p-value = prob(chi-square(3) > 49.9049) = 8.37053e-011

Appendix D

First Variant:

i. S&P (21-days event window):

Residual variance: 0.986637/(1353 - 37) = 0.000749724

Joint significance of differing group means:

F(32, 1316) = 33.3041 with p-value 3.0499e-145

Breusch-Pagan test statistic:

LM = 4987.8 with p-value = prob(chi-square(1) > 4987.8) = 0

Variance estimators:

between = 0.00068797

within = 0.000749724

theta used for quasi-demeaning = 0.836968

Hausman test statistic:

H = 5.08082 with p-value = prob(chi-square(4) > 5.08082) = 0.279104

ii. S&P (21-days event window, downgrades):

Residual variance: 0.940162/(1271 - 35) = 0.000760649

Joint significance of differing group means:

F(30, 1236) = 31.7282 with p-value 7.87588e-131

Breusch-Pagan test statistic:

LM = 4416.54 with p-value = prob(chi-square(1) > 4416.54) = 0

Variance estimators:

between = 0.000672334

within = 0.000760649

theta used for quasi-demeaning = 0.833885

Hausman test statistic:

H = 4.44993 with p-value = prob(chi-square(4) > 4.44993) = 0.348526

iii. S&P (21-days event window, upgrades):

Residual variance: 0.0365419/(82 - 6) = 0.000480814

Joint significance of differing group means:

F(1, 76) = 4.43592 with p-value 0.0384918

Breusch-Pagan test statistic:

LM = 0.573552 with p-value = prob(chi-square(1) > 0.573552) = 0.448851

Omitting group means regression: insufficient degrees of freedom

i. S&P (21-days event window, core):

Residual variance: 0.0508202/(126 - 10) = 0.000438105

Joint significance of differing group means:

F(5, 116) = 2.38414 with p-value 0.0424524

Breusch-Pagan test statistic:

LM = 1.99211 with p-value = prob(chi-square(1) > 1.99211) = 0.15812

Variance estimators:

between = 3.98481e-006

within = 0.000438105

theta used for quasi-demeaning = 0

Hausman test statistic:

H = 12.7199 with p-value = prob(chi-square(4) > 12.7199) = 0.0127285

ii. S&P (21-days event window, peripheral):

Residual variance: 0.747358/(567 - 31) = 0.00139432

Joint significance of differing group means:

F(26, 536) = 4.03651 with p-value 2.80721e-010

Breusch-Pagan test statistic:

LM = 51.7785 with p-value = prob(chi-square(1) > 51.7785) = 6.21275e-013

Variance estimators:

between = 0.000225265

within = 0.00139432

theta used for quasi-demeaning = 0.457093

Hausman test statistic:

H = 14.7294 with p-value = prob(chi-square(4) > 14.7294) = 0.00529675

Second Variant:

i. S&P (21-days event window):

Residual variance: 0.986538/(1353 - 37) = 0.000749649

Joint significance of differing group means:

F(32, 1316) = 32.9074 with p-value 9.29636e-144

Breusch-Pagan test statistic:

LM = 4910.86 with p-value = prob(chi-square(1) > 4910.86) = 0

Variance estimators:

between = 0.000678533

within = 0.000749649

theta used for quasi-demeaning = 0.835846

Hausman test statistic:

H = 5.44836 with p-value = prob(chi-square(4) > 5.44836) = 0.244306

ii. S&P (21-days event window, downgrades):

Residual variance: 0.939858/(1271 - 35) = 0.000760403

Joint significance of differing group means:

F(30, 1236) = 31.2993 with p-value 2.70912e-129

Breusch-Pagan test statistic:

LM = 4344.1 with p-value = prob(chi-square(1) > 4344.1) = 0

Variance estimators:

between = 0.000662999

within = 0.000760403

theta used for quasi-demeaning = 0.832747

Hausman test statistic:

H = 4.64797 with p-value = prob(chi-square(4) > 4.64797) = 0.32536

iii. S&P (21-days event window, upgrades):

Residual variance: 0.0365419/(82 - 6) = 0.000480814

Joint significance of differing group means:

F(1, 76) = 4.43592 with p-value 0.0384918

Breusch-Pagan test statistic:

LM = 0.573552 with p-value = prob(chi-square(1) > 0.573552) = 0.448851

Omitting group means regression: insufficient degrees of freedom

i. S&P (21-days event window, core):

Residual variance: 0.0516873/(126 - 10) = 0.00044558

Joint significance of differing group means:

F(5, 116) = 3.71341 with p-value 0.00373409

Breusch-Pagan test statistic:

LM = 0.531639 with p-value = prob(chi-square(1) > 0.531639) = 0.465919

Variance estimators:

between = 1.60314e-005

within = 0.00044558

theta used for quasi-demeaning = 0

Hausman test statistic:

H = 19.2218 with p-value = prob(chi-square(4) > 19.2218) = 0.000710885

ii. S&P (21-days event window, peripheral):

Residual variance: 0.745196/(567 - 31) = 0.00139029

Joint significance of differing group means:

F(26, 536) = 4.27807 with p-value 3.61941e-011

Breusch-Pagan test statistic:

LM = 57.7213 with p-value = prob(chi-square(1) > 57.7213) = 3.02017e-014

Variance estimators:

between = 0.000239499

within = 0.00139029

theta used for quasi-demeaning = 0.474235

Hausman test statistic:

H = 16.1795 with p-value = prob(chi-square(4) > 16.1795) = 0.00278753

Appendix E

i. S&P (41-days event window):

Residual variance: 0.986691/(1353 - 36) = 0.000749196

Joint significance of differing group means:

F(32, 1317) = 33.3763 with p-value 1.5324e-145

Breusch-Pagan test statistic:

LM = 4999.18 with p-value = prob(chi-square(1) > 4999.18) = 0

Variance estimators:

between = 0.000665724

within = 0.000749196

theta used for quasi-demeaning = 0.834324

Hausman test statistic:

H = 5.02555 with p-value = prob(chi-square(3) > 5.02555) = 0.169936

ii. S&P (41-days event window, core):

Residual variance: 0.11817/(246 - 9) = 0.000498607

Joint significance of differing group means:

F(5, 237) = 36.5864 with p-value 1.0482e-027

Breusch-Pagan test statistic:

LM = 458.566 with p-value = prob(chi-square(1) > 458.566) = 9.86263e-102

Variance estimators:

between = 0.000509863

within = 0.000498607

theta used for quasi-demeaning = 0.84556

Hausman test statistic:

H = 6.80477 with p-value = prob(chi-square(3) > 6.80477) = 0.0783877

iii. S&P (41-days event window, peripheral):

Residual variance: 0.853805/(1107 - 30) = 0.000792762

Joint significance of differing group means:

F(26, 1077) = 26.7415 with p-value 6.43579e-098

Breusch-Pagan test statistic:

LM = 2925.14 with p-value = prob(chi-square(1) > 2925.14) = 0

Variance estimators:

between = 0.000563778

within = 0.000792762

theta used for quasi-demeaning = 0.814807

Hausman test statistic:

H = 13.9363 with p-value = prob(chi-square(3) > 13.9363) = 0.00299315

Appendix F

This is the figure that shows the simulated spreads obtained from the models with and without dummies together with the observed spreads for the peripheral countries. No big differences are observed.

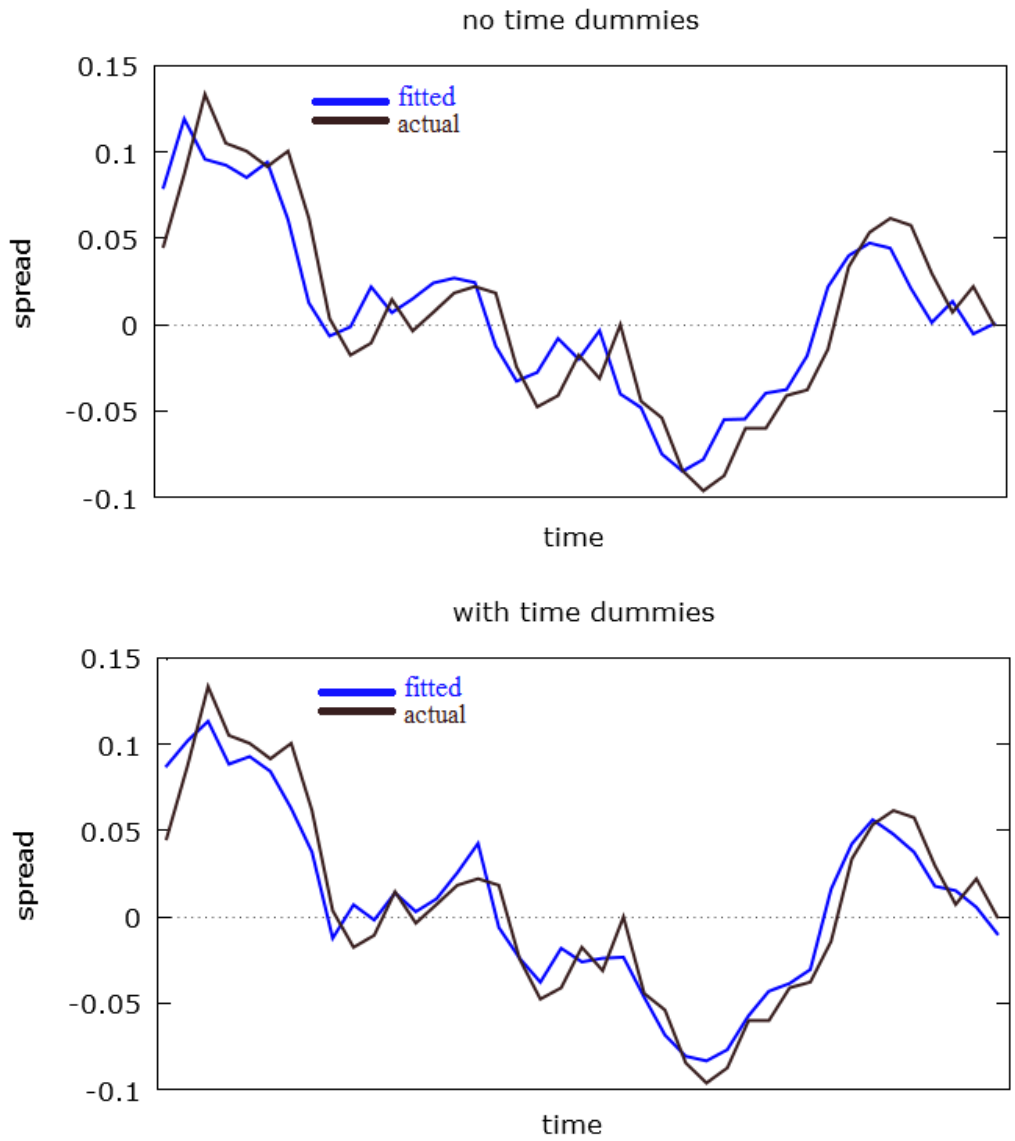


Figure 6. Simulated (with and without times dummies) and observed spreads in peripheral countries

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