A Case for Europe: the Relationship between sovereign CDS and Stock Indexes.

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Abstract

Year 2010 have witnessed a major European Sovereign Debt crisis. By examining the links between sovereign CDS and stock indexes during the period 2007-2010, for eight European countries, this paper aims to study the lead-lag relationships of the two markets using a Vector Autoregressive model and a Panel data model. We find a major leading role of the stock market during the sample period, but when year 2010 is isolated we find a change in this relationship and a key role of the CDS markets incorporating new information. This increasing role of the sovereign CDS is stronger for countries with high risk spread.

Keywords: sovereign credit risk, sovereign credit derivatives, stock markets, lead-lag relationships.

JEL classification: G15, G14, G20

EFM codes: 330, 350, 440, 630

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1. Introduction

Year 2010 will be known as the year of the European sovereign debt crisis. Since the beginning of the year the sovereign CDS spreads have widened in Western Europe, and by late 2010 we could find countries (like Spain) with CDS premiums higher that some countries in emerging Europe.

During year 2010, as the eurozone's economies became under pressure due to the increasing doubts that some European countries could pull off big reductions in their budget deficits, in the face of stagnating economies, without defaulting or being rescued, the spread of sovereign CDS reached maximum levels. At the same time we assisted to severe falls in the affected countries' stock markets.

Credit Default Swaps are credit protection contracts whereby one party agrees, in exchange for a periodic premium, to make a contingent payment in the case of a defined credit event. For buyers of credit protection, the CDS market offers the opportunity to reduce credit concentration and regulatory capital while maintaining customer relationships. For sellers of protection, it offers the opportunity to take credit exposure over a customized term and earn income without having to fund the position.

Sovereign Credit Default Swaps pay the buyer the face value in exchange for the underlying securities or the cash equivalent should a sovereign nation default on its debt payments. Quoted in basis points per year, a CDS price indicates the cost per year to either buy or sell exposure to the possibility of a sovereign defaulting or restructuring.

The main difference between a sovereign CDS and a corporate CDS is the definition of what constitutes a Credit Event. For a corporate, a credit event is either a bankruptcy, a failure to pay, and sometimes, a restructuring. For Western European sovereigns, bankruptcy is replaced with a moratorium/repudiation.

Following ISDA[2] we can say that it´s important to understand that sovereign CDS are useful for controlling risk for investors and lenders. Sovereign CDS provide effective hedges not only for holders of the government bonds but also for international banks that extend credit to that particular country corporations and banks, for investors in stocks and for entities that have significant real state or corporate holdings in the

[2] International Swaps and Derivatives Association, News Release, March 15, 2010.

country. For many of these participants, the sovereign CDS market is the most effective way of hedging credit risk in the country.

From these words, we can understand that there is a broad set of investors using sovereign CDS. After the 2010 sovereign´s financial storm, ISDA reports that "recent anecdotal evidence indicates that banks with significant credit exposure to entities in Greece have been active purchasers of Greek Sovereign CDS protection".

As the same time that the debt crisis has had an impact in the stock exchanges is out of doubt. If countries like Greece, Ireland, Portugal or Spain should devote increasing parts of their revenues towards external debts, governments will have little amounts of money for investments and development. This is no good for companies and for the future of the countries. Besides citizens and companies will become (and are already becoming) hard-pressed with taxes in order to pay foreign creditors. The amounts of money remaining for consumption and investments will drop leading to declining benefits. The credit risk problem becomes also a market risk problem. We thus enter in a vicious circle that becomes increasingly difficult to break.

In this article we study the lead-lag relationship between sovereign CDS and stock markets for eight European countries during the period 2007-2010. The countries are Greece, Italy, Spain, Portugal Ireland, UK, France and Germany. This is the first paper that looks at such relationship between the two markets representing credit risk and market risk for a country.

Using country specific and panel data we find clear interdependency of these two markets, the stock market generally leading the movement of the CDS markets. We also find that the two way interaction between the stock and CDS markets is stronger when the stock market is in a downturn or when the credit market is in turmoil, in this case the governments' credit market. During the year 2010 and using daily data, we find that CDS markets lead stock markets, reversing the general tendency. The sovereign CDS markets has had an impact on stocks, translating the government's debt crisis to the country' companies.

Besides we study the differences between riskier countries (high CDS premium) and other central European countries (France and Germany). We find that the lead of the CDS markets has been strong for companies with high CDS premium during the year 2010, being a different case for the other two where the stock market maintains its lead.

The rest of the article is structured as follows. We first review the recent research that relates CDS spreads and stocks and explicit our objectives. Next we take an exploratory look at the data and motivate the more formal model. In section 4 we introduce our country specific model and discuss some extensions of the basic model. Section 5 develops the panel data model. Finally we conclude in section 6. Graphs and tables can be found at the end of the paper.

2. Existing Literature and Hypothesis

The link between CDS spreads, bond spreads and equity markets has become recently a fruitful field of studies. The credit derivative market is growing rapidly[3] and following Byström (2005) we can say that the relationships among these three markets are important not only for risk managers using these markets for hedging purposes but to anyone trying to profit from arbitrage possibilities[4].

At a firm level, the close relationship between CDS and bond spreads has been vastly documented and the CDS market has been evidenced to have the lead on the bond market. The bond price would adjust to the CDS price (See for example Norden and Weber (2004), Blanco et al. (2005), Zhu (2006), Forte and Peña (2009)).

The relationship between CDS spreads and equity prices[5] has been discussed in papers by Byström (2005) and Fung et al. (2008) among others. Using a sample of European i-Traxx CDS indexes Byström (2005) finds evidence of firm specific information being embedded into stock prices before it is embedded into CDS spreads. He also finds that stock price volatility is significantly correlated with CDS spreads. Fung et al. (2008) using a VAR (Vector Autoregressive) model and daily index data, find also a leading role of stock market related to CDS market. During the 2007 credit crunch period they find a closer relationship between the stock and CDS markets and an important role of the investment grade CDS incorporating information.

The first paper to incorporate the three markets (assets) in the analysis was Longstaff at al. (2003). Studying lead-lag relationships between weekly single-name CDS spreads

[3] BIS (2009).

[4] One such example is the paper by Figuerola-Ferretti and Paraskevopoulos (2010)

[5] The theoretical link between the credit market and the stock market information was already built by Merton (1974). The value of any credit derivative is linked to the probability of the underlying reference entity being exposed to a credit event at some point in the future, and for entities with traded equity the probability is often estimated using information from the stock market.

changes, corporate bond spreads and stock returns of US firms, they find that both stock and CDS markets lead the bond market. However, in their sample there is no clear lead of the stock market with respect to the CDS market.

One recent study, Norden and Weber (2009), find a definite lead of the stock market relative to the CDS and bond markets. They also find that CDS spread changes Granger cause bond spread changes for a higher number of firms than vice versa. A very interesting result is that the co-movement between CDS market and stock market increases the lower the credit quality. This study uses an early sample, 2000-2002, of companies' CDS, bond and stock data, estimates a vector autoregressive model and examines daily, weekly and monthly lead-lag relationships between markets.

Forte and Peña (2009) constitutes another valuable article in the link among the three assets. In order to investigate which of these markets (assets) leads the credit risk discovery process, they estimate a Vector Error Correction Model (VECM) for a sample of North American and European firms. Their results find that stocks lead CDS and bonds more frequently that the other way round. Besides, it is confirmed the leading role of CDS with respect to bonds.

In this paper we also focus on the study of the links between CDS spreads and market prices, and CDS spreads and return volatilities. However we are pioneers using European sovereign data. This is one of the first papers looking at the relationship between sovereign CDS and stock markets. At a firm level, finance theories suggest that the stock market, being efficient, should have already incorporated information pertaining to the default probability of firms, but what happens at a country level? Strictly speaking we do not have equity for countries, although we could argue that the companies of that country are a proxy for this equity and the credit information about the country should translate to stocks markets. As we already mentioned deteriorating credit quality for a country means that the government will need to raise funds at higher rates. This will cause a domino effect: there will be less money to invest and spend, with high probability taxes will be raised, consumers and companies will face a drop in consumption and investments, and this situation will end up in a drop in the company's profits and a fall in their stock prices.

Analyzing daily prices of sovereign CDS premiums and stock indexes of eight different countries - France, Greece, Germany, Ireland, Italy, Portugal, Spain and UK – during the period from January 2007 until July 2010, this paper contributes to the existing

literature in three ways: first, we study the lead-lag relationship between the two markets (assets) in other to find which market leads the process of pricing new information, if such a lead exists. We use a Vector Autoregressive representation and find a close relationship and a clear interdependency between both markets. Our results confirm the revised previous studies: the stock market mainly takes the lead. The country specific results are robust to the use of panel data.

Our second objective is to test if there has been a change in this relationship during the year 2010, i.e. during the European sovereign debt crisis. We clearly find that during this year CDS markets lead the movements in stock markets reversing the previous tendency. Again panel data confirm the results. So, we find that the general market conditions underlying the credit information flow between the stock and CDS markets are important. This result was also found in Fung et al. (2008). Worsening credit conditions makes this relationship stronger.

Our third goal is to study if there is any difference between countries with lower credit quality and countries with higher credit quality. In other to test this hypothesis we split the sample in two subsamples: countries with worse CDS premiums (Greece, Ireland, Portugal, Spain and Italy) and countries with better CDS premiums (France and Germany). We test this hypothesis with panel data and we do not incorporate UK due to the different currency. Panel data results corroborate previous findings. During the sample period (2007-2010) the stock market lead the process of incorporating new information, but when year 2010 is isolated the reverse information flow in found: the CDS market takes the lead. Similar to Norden and Weber (2009) we find that the co-movement between CDS market and stock market increases the lower the credit quality, in our case sovereign credit quality.

A recent work by Coudert and Gex (2010) looks at the links between sovereign CDS and bonds and their results are much related to ours. Using a sample of sovereigns (and some corporates) the leading role of the CDS markets versus the bond markets is once more confirmed. They find that the CDS market lead has been fuelled by the current crisis, although they find that for countries with low risk the bond market has the lead on the CDS market.

3. An Exploratory Look at the Data

In this study we use daily data of the closing price of the 5-year sovereign CDS data and of the Stock Indexes[6]. The benchmark maturity of sovereign CDS tends to be five years, though contracts of 10 years maturity are also available. We use the mid-points between quoted bid and ask points for the 5-year maturity CDS[7] denominated in USD. The sample contains data for eight European countries: Spain, Portugal, Italy, France, Ireland, United Kingdom, Greece and Germany. Regarding to Stock Index prices the sample contains daily closing price for IBEX 35 (Spain), PSI 20 (Portugal), FTSEMIB (Italy), CAC 40 (France), ISEQ 20 (Ireland), FTSE 100 (United Kingdom), FTSE Athex 20 (Greece) an DAX (Germany).

This sample has been selected in order to contrast our hypotheses. We need a set of risky countries (i.e. countries with a high CDS premium), where we want to find how the relationship between the stocks and the CDS has behaved during and before the 2010 turmoil, and we need safer countries (i.e. countries with lower risk premium) to find out if there is any difference in this relationship. These two subsamples can be found at Table 1.b. at the end of the paper.

Our sample coverage starts at January 2007 and ends at July 2010 and we do analyze three different subsets: January 2007-December 2008; January 2009-December 2009 and finally January 2010-July 2010. Because the behavior of credit markets has been so different during these sub periods we want to look at the intertemporal stability of the co-movement of these markets.

Table 1.a, at the end, exhibits the main descriptive statistics for each country' CDS and stock Index. We can see how the mean and median CDS premium for every country has increased during year 2010. Also daily changes on CDS and stock returns show significant kurtosis and skewness.

We offer Figures 1 and 2 to show some graphical evidence on the movements during the sample periods of the CDS premiums and the Stock Indexes for Spain and Italy. Spreads on the CDS widen when deterioration in credit risk is detected or perceived by the market and tighten when there is less credit risk perceived. We can clearly appreciate how as the CDS Premiums widen (the credit risk increases) the stock indexes fall (market risk also increases). Movements in both markets are opposite.

[6] Provided by Bloomberg.

[7] The 5-Year CDS is more liquid and it is more often used as reference in financial markets.

[insert Figure 1 here]

[insert Figure 2 here]

As one would expect we find a large CDS index spread when the stock market valuation is low and the volatility is high and vice versa.

Table 2 reports the Spearman pair wise rank correlation between the stock index and the sovereign CDS of daily time-series at a country-level. We look at levels as well as percentage changes.

[insert Table 2 here]

The correlation coefficients are found to be significantly different from zero at the 0.10-level in almost all the countries and for each period. As expected, the correlation between sovereign CDS and Stock Indexes are negative and higher when we size the risk and the stock prices in absolute terms. Furthermore when we size the correlation between CDS sovereign change and Stock Index returns we can clearly observe how these correlations have increased in time and become stronger. For almost every country in our sample correlations between stocks indexes returns and CDS spread changes reached maximum levels during year 2010.

In case of the variance, which we estimate with a GARCH (1,1) model, the correlation as expected is positive. As the values of CDS variances increase the values of the Stock Index variances also increase and vice versa. However we find that these correlations in risk are more significant in the case of the countries with higher risk premiums, where we can also observe an increase in the size of the correlation. Germany, France, and UK, although mainly show positive correlations between the risk of both markets, exhibit a more weak link.

Using the Augmented Dickey-Fuller test and the Phillips-Perron test we obtain that the all series in levels are non-stationary, but the first difference series are stationary. This result will allow us to use a VAR model in the next section for the first-difference series[8].

4. A VAR Model: Relationship between Sovereign CDS and Stock Markets

[8] Results are available upon request. Estimating the parameters in a VAR requires that the dependent and independent variables be covariance stationary, meaning that their first two moments exist and are time invariant. If they are not covariance stationary, but their first differences are, a vector-error correction model (VECM) can be used.

In this section, we analyze the intertemporal co-movement of CDS sovereign spreads changes and Stock Index prices. We use the vector autoregressive (VAR) model to analyze the lead-lag relationship between both markets. Previous literature (see Longstaff et al. (2003), Norden y Weber (2009) and Fung et al. (2008)) show that VAR model is appropriate to analyze the co-movement of markets because it captures lead-lag relationships within and between stationary variables in a simultaneous multivariate framework[9].

We estimate the following two dimensional VAR model:

$$R_t = \alpha_1 + \sum_{p=1}^{p} \beta_{1p} R_{t-p} + \sum_{p=1}^{p} \gamma_{1p} \Delta CDS_{t-p} + \varepsilon_{1t} \quad [1]$$

$$\Delta CDS_t = \alpha_2 + \sum_{p=1}^{p} \beta_{2p} R_{t-p} + \sum_{p=1}^{p} \gamma_{2p} \Delta CDS_{t-p} + \varepsilon_{2t}$$

With R_t: stock index return in t,

ΔCDS_t: sovereign CDS spread change in t,

p: lag order index,

ε_t: disturbance term in t.

For the above model specification, the lag structure and the maximum lag order *p* has to be determined. For each country we found the optimal lag computing four information criteria, the final prediction error, Akaike's information criterion, the Hannan-Quinn information criterion and Schwarz's Bayesian information criterion.

Evidence of VAR analysis results for the eight countries with the corresponding optimal lag length is found in Table 3. We split the whole time series sample into three different and non-overlapped subsets to generate a more detailed picture of the relationship

[9] Other authors, like Forte and Peña (2009) apply a VECM to the original series in levels and perform a price discovery analysis. Norden and Weber (2009) also perform a VECM study. In this article we find more meaningful to study the evolution of daily changes and focus on the lead-lag relationships, so we do not study here the price discovery process.

between sovereign CDS and Stock Indexes. Also the estimation for the different time series will serve as robustness tests.

[insert Table 3 here]

The analysis of the entire sample period (2007-2010) suggests that, for all the countries analyzed except for Italy in which CDS market leads stock market and for Ireland where there is no apparent relationship between both markets, results are consistent with a leading role of stock market. If we consider the different time series it is noteworthy that the leading role of the CDS market increases over time.

After fitting a VAR, we want to know whether one variable "Granger-causes" another. A variable *x* is said to Granger-cause a variable *y* if, given the past values of *y*, past values of *x* are useful for predicting *y*. Note that Granger causality is not a causality in a deep sense of the word. It just talks about linear prediction, and we find Granger causality if one thing happens before the other. We may have an unmodeled factor causing the response of x and y, and we will observe Granger causality even though the real causality is different.

There is reciprocal Granger causality for a considerable number of countries, and we can talk about a feedback process. A leading role of the stock exchanges during the whole period can clearly be appreciated. When looking at the different sub periods we appreciate a change in the lead-lag relationship. During year 2009 the leading role of stocks becomes weaker, and finally in year 2010 the CDS market takes the lead in 6 out of the 8 countries. We don't find much feedback process during this year, corroborating the view that the CDS market has become, during the turmoil, the target where information and speculation is rapidly incorporated.

We also note a clear increase in the model R2 when using the 2010 data, indicating the better suitability of this model during last period.

5. Panel Data Model

To test further our results and provide further insight into the relationship of the sovereign CDS and Stock Indexes we estimate a panel data model with the following structure:

$$R_{it} = \alpha_i + \sum_{p=1}^{p} \beta_p R_{t-p} + \sum_{p=1}^{p} \gamma_p \Delta CDS_{t-p} + \varepsilon_{it}$$

[2]

$$\Delta CDS_{it} = \alpha_i + \sum_{p=1}^{p} \beta_p R_{t-p} + \sum_{p=1}^{p} \gamma_p \Delta CDS_{t-p} + \varepsilon_{it}$$

with R_t being the stock index return of country i at time t, ΔCDS_t sovereign CDS spread change of country i at time t, p is the lag order index and ε_{it} is the disturbance term of country i at time t.

Following Nickell (1980) we use a panel model with fixed effects[10]. Norden and Weber (2004) also follow this approach. Panel regressions confirm the previous results: the stock market clearly leads CDS market, which support the view that the stock market is relatively more sensitive to new information and more liquid. However we can observe a strong feedback process. These results are robust to time divisions.

If we divide the panel into two groups: countries with high CDS premium (Greece, Ireland, Spain, Portugal and Italy) and countries with lower risk premium (Germany, France)[11] we realize that the leadership of the CDS markets during 2010 has been exacerbated by the financial turmoil in Southern Europe. We can appreciate a more modest leading role of CDS in the countries with lower spreads.

6. Conclusions

In this paper we have studied the relationship between the Stock Index prices and sovereign CDS market, using daily data from January 2007 to July 2010.

[10] Nickell (1980) shows that for samples with large time series observations and relatively small number of "N" (countries), a panel data model with fixed effects is appropriate. See also Baltagi (2005), Cameron and Trivedi (2005).

[11] We don't include here data from the UK due to the different currency. We would be mixing credit risk and currency risk.

First analyzing the country-specific market co-movements, we find that stock Index returns and sovereign CDS spread changes show significantly negative correlation. Second, Stock index return volatility is also found to be considerably correlated with sovereign CDS spreads movements revealing a close link between both markets. Moreover we find that these correlations are more significant in the case of the countries with higher risk premiums (Italy, Greece, Spain, Italy and Portugal). However countries with lower CDS spreads (France, Germany and UK) show positive but weaker correlations between both markets.

Motivated by the previous literature and these significant correlations, we use a vector autoregression framework to examine the lead-lag relations between the sovereign credit-derivatives and Stock market. We find evidence that changes in Stock price returns lead changes in sovereign CDS spreads during the period (January 2007 to December 2009). In contrast during last period analyzed (January 2010-July 2010) sovereign CDS lead Stock markets.

Finally, in order to provide further insight to these results we estimate a panel data with all the countries and with the two subsamples (countries with higher and lower CDS spreads). Panel regressions confirm the previous results: the stock market clearly leads CDS market, which support the view that the stock market is relatively more sensitive to new information and more liquid. However we can observe a strong feedback process. These results are robust to time divisions.

If we divide the panel into two groups: countries with high CDS premium (Greece, Ireland, Spain, Portugal and Italy) and countries with lower risk premium (Germany, France) we realize that the leadership of the CDS markets during 2010 has been exacerbated by the financial turmoil in Southern Europe. We can appreciate a more modest leading role of CDS in the countries with lower spreads.

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Table 1.a: Descriptive Statistics

For each country we show the main descriptive statistics splitting the sample into two time series: January 2007-July 2010 and January 2010-July 2010. For each country we include six different variables: CDS (sovereign CDS premium), ΔCDS (sovereign CDS premium daily changes), VarCDS (sovereign CDS premium variance calculated with a GARCH (1, 1)), Stock Index, Stock Index daily returns and Stock Index variance (calculated with a GARCH (1, 1) of daily returns.

Spain

	2007-2010						2010					
	CDS	ΔCDS	VarCDS	IBEX	ΔIBEX	VarIBEX	CDS	ΔCDS	VarCDS	IBEX	ΔIBEX	VarIBEX
N	924	923	924	898	897	898	140	140	140	137	137	137
Mean	66,02	0,48%	0,62%	11.957,11	-5,27%	0,04%	165,84	0,50%	0,70%	10.457,73	-0,14%	0,05%
Median	57,32	0,00%	0,27%	11.761,00	6,19%	0,02%	145,11	0,82%	0,48%	10.441,00	0,09%	0,03%
Maximum	274,87	75,55%	30,26%	15.945,70	1348,36%	0,35%	274,87	25,17%	5,74%	12.222,50	13,48%	0,33%
Minimum	2,55	-75,55%	0,08%	6.817,40	-958,59%	0,01%	93,81	-37,04%	0,10%	8.669,80	-6,87%	0,01%
Kurtosis	1,22	26,17	172,60	-1,18	6,74	15,38	-1,16	3,26	19,54	-0,83	9,67	10,04
Skewness	1,17	0,04	11,59	-0,08	0,28	3,64	0,52	-0,60	3,75	0,03	1,16	3,03

Portugal

	2007-2010						2010					
	CDS	ΔCDS	VarCDS	PSI20	ΔPSI20	VarPSI20	CDS	ΔCDS	VarCDS	PSI20	ΔPSI20	VarPSI20
N	924	923	924	905	904	905	140	140	140	137	137	137
Mean	70,94	0,44%	0,52%	9.357,54	-6,17%	0,02%	217,32	0,83%	0,69%	7.646,76	-0,13%	0,03%
Median	47,75	0,00%	0,29%	8.479,32	1,67%	0,01%	192,31	0,35%	0,43%	7.569,25	-0,04%	0,02%
Maximum	450,63	44,58%	5,23%	13.702,03	1019,59%	0,34%	450,63	20,54%	5,23%	8.839,75	10,20%	0,26%
Minimum	4,02	-47,38%	0,10%	5.743,09	-1037,92%	0,00%	81,44	-47,38%	0,13%	6.624,29	-5,51%	0,01%
Kurtosis	4,03	8,71	14,24	-1,40	8,35	23,50	-1,11	8,29	11,96	-0,81	7,28	11,55
Skewness	1,99	0,22	3,38	0,30	0,06	4,36	0,32	-1,19	3,20	0,27	0,93	3,10

Italy

	2007-2010						2010					
	CDS	ΔCDS	VarCDS	FTSEMIB	ΔFTSEMIB	VarFTSEMIB	CDS	ΔCDS	VarCDS	FTSEMIB	ΔFTSEMIB	VarFTSEMIB
N	924	923	924	896	895	896	140	140	140	137	137	137
Mean	71,20	0,32%	0,31%	28.661,61	-9,66%	0,04%	142,70	0,34%	0,43%	21.434,94	-0,11%	0,04%
Median	60,40	0,00%	0,19%	24.344,00	0,03%	0,02%	129,99	0,16%	0,26%	21.501,24	0,14%	0,02%
Maximum	245,88	42,88%	3,85%	44.364,00	1087,42%	0,35%	245,88	19,71%	3,38%	23.811,13	9,93%	0,20%
Minimum	5,58	-43,73%	0,08%	12.621,00	-859,91%	0,00%	89,74	-43,73%	0,10%	18.382,71	-5,40%	0,01%
Kurtosis	-0,59	13,23	24,99	-1,42	5,28	13,36	-0,19	13,19	15,56	-1,13	5,70	6,04
Skewness	0,68	0,18	4,34	0,32	0,17	3,31	0,79	-1,66	3,59	-0,21	0,64	2,36

France

	2007-2010						2010					
	CDS	ΔCDS	VarCDS	CAC	ΔCAC	VarCAC	CDS	ΔCDS	VarCDS	CAC	ΔCAC	VarCAC
N	924	923	924	904	903	904	140	140	140	137	137	137
Mean	26,78	0,40%	1,97%	4.360,93	-6,86%	0,04%	60,55	0,69%	0,62%	3.747,75	-0,09%	0,03%
Median	21,39	0,00%	0,53%	4.038,66	-2,17%	0,02%	60,40	0,33%	0,56%	3.739,46	0,00%	0,02%
Maximum	98,45	136,82%	82,44%	6.168,15	1059,46%	0,38%	98,45	16,46%	1,74%	4.065,65	9,22%	0,19%
Minimum	1,50	-131,06%	0,33%	2.519,29	-947,15%	0,01%	29,69	-15,39%	0,35%	3.331,29	-4,71%	0,01%
Kurtosis	-0,06	33,74	83,81	-1,34	5,87	18,00	-0,97	0,08	5,50	-1,15	5,93	9,48
Skewness	0,95	0,38	7,89	0,23	0,22	3,83	0,24	0,11	1,90	-0,17	0,62	2,85

Greece

	2007-2010						2010					
	CDS	ΔCDS	VarCDS	FTSEAthex20	ΔFTSEAthex20	VarFTSEAthex20	CDS	ΔCDS	VarCDS	FTSEAthex20	ΔFTSEAthex20	VarFTSEAthex20
N	924	923	924	882	881	882	140	140	140	133	133	133
Mean	154,09	0,51%	0,67%	1.709,12	-10,85%	0,06%	537,72	0,76%	0,64%	904,55	-0,28%	0,09%
Median	79,28	0,00%	0,30%	1.558,99	-0,62%	0,04%	419,66	0,20%	0,38%	938,09	-0,53%	0,08%
Maximum	1037,41	59,45%	21,93%	2.841,23	1011,41%	0,39%	1037,41	23,07%	10,50%	1.202,91	9,99%	0,32%
Minimum	5,20	-58,39%	0,20%	667,70	-979,63%	0,00%	247,01	-49,15%	0,21%	667,70	-7,64%	0,03%
Kurtosis	5,07	15,68	95,36	-1,59	220,11%	7,49	-1,32	15,57	63,82	-1,19	0,65	4,62
Skewness	2,23	-0,08	8,27	0,15	-8,11%	2,33	0,48	-2,02	7,30	-0,10	0,29	2,01

Table 1.a continued.

Ireland

	2007-2010						2010					
	CDS	ΔCDS	VarCDS	ISEQ20	ΔISEQ20	VarISEQ20	CDS	ΔCDS	VarCDS	ISEQ20	ΔISEQ20	VarISEQ20
N	720	719	720	924	923	924	140	140	140	140	140	140
Mean	106,28	0,53%	-2,33%	5.086,37	-0,14%	0,05%	181,67	0,34%	-11,65%	3.063,84	-0,02%	0,03%
Median	122,84	0,00%	0,85%	3.464,99	0,00%	0,03%	155,17	0,02%	-11,40%	3.035,84	0,05%	0,02%
Maximum	386,46	315,75%	3,06%	9.981,08	10,00%	0,42%	287,79	26,81%	-8,53%	3.497,17	7,57%	0,14%
Minimum	5,19	-32,69%	-15,50%	1.916,38	-14,00%	0,01%	110,53	-32,69%	-15,50%	2.776,55	-4,58%	0,01%
Kurtosis	-0,74	595,37	-0,37	-1,23	3,79	17,26	-1,22	7,90	-1,17	-0,21	2,31	2,53
Skewness	0,56	23,30	-0,95	0,57	-0,31	3,68	0,53	-0,21	-0,24	0,68	0,15	1,73

United Kingdom

	2007-2010						2010					
	CDS	ΔCDS	VarCDS	FTSE100	ΔFTSE100	VarFTSE100	CDS	ΔCDS	VarCDS	FTSE100	ΔFTSE100	VarFTSE100
N	505	504	505	897	896	897	140	140	140	135	135	135
Mean	77,66	0,29%	0,19%	5.435,46	-2,95%	0,03%	81,42	-0,07%	0,15%	5.366,37	-0,02%	0,02%
Median	79,13	0,00%	0,19%	5.473,48	2,43%	0,02%	80,86	-0,07%	0,12%	5.325,09	0,13%	0,01%
Maximum	164,92	26,91%	2,15%	6.732,40	938,43%	0,32%	94,74	10,37%	0,76%	5.825,01	5,03%	0,06%
Minimum	16,50	-17,74%	0,10%	3.512,09	-926,56%	0,00%	69,31	-14,43%	0,10%	4.805,75	-3,20%	0,00%
Kurtosis	0,49	7,77	74,50	-1,04	5,86	21,51	0,27	3,33	25,49	-1,00	2,26	2,51
Skewness	0,32	0,86	7,35	-0,32	-0,05	4,22	0,30	-0,38	4,36	0,03	0,13	1,64

Germany

	2007-2010						2010					
	CDS	ΔCDS	VarCDS	DAX	ΔDAX	VarDAX	CDS	ΔCDS	VarCDS	DAX	ΔDAX	VarDAX
N	924	923	924	897	896	897	140	140	140	137	137	137
Mean	22,14	0,27%	1,00%	6.187,40	-2,90%	0,03%	38,30	0,30%	0,75%	5.954,22	0,01%	0,02%
Median	19,64	0,00%	0,73%	6.183,49	6,88%	0,02%	40,29	0,11%	0,73%	5.984,75	0,17%	0,02%
Maximum	90,61	114,51%	17,85%	8.105,69	1079,75%	0,27%	56,89	13,73%	0,94%	6.332,10	5,16%	0,06%
Minimum	2,97	-87,86%	0,69%	3.666,41	-743,35%	0,01%	25,18	-11,41%	0,69%	5.434,34	-3,39%	0,01%
Kurtosis	1,17	43,02	78,42	-0,90	6,45	14,65	-0,95	0,96	1,67	-0,67	1,46	2,70
Skewness	1,09	0,63	8,14	-0,13	0,25	3,59	-0,09	0,07	1,51	-0,50	-0,07	1,77

Table 1.b: Average CDS premium

We report CDS average premium for each country in 2010. So we can split the sample into groups: European countries with lower spreads (CDS average premium below 100 p.b) and European countries with higher spreads (CDS average above 100 p.b).

Country	CDS Average 2010
Greece	537,72
Portugal	217,32
Ireland	181,67
Spain	165,84
Italy	142,70
United Kingdom	81,42
France	60,55
Germany	38,30

Table 2: Contemporaneous correlation of country specific time-series

We report Spearman´s rank correlation coefficients ρs, calculated for a pair of country- specific time series (2007 and 2008 year, 2009 year and 2010, stock indexes R, CDS premium CDS, log stock indexes ΔR, spread changes ΔCDS, log stock indexes volatility var ΔR, and CDS premium volatility).

		ρ_s(R,CDS)	ρ_s(ΔR,ΔCDS)	ρ_s(var ΔR,var CDS)
Spain	2007-2008	-0,786**	-0,161**	-0,121**
	2009	-0,632**	-0,356**	0,366**
	2010	-0,814**	-0,507**	0,708**
Portugal	2007-2008	-0,815**	-0,144**	0,200**
	2009	-0,769**	-0,323**	0,309**
	2010	-0,883**	-0,567**	0,672**
Italy	2007-2008	-0,945**	-0,186**	0,402**
	2009	-0,799**	-0,423**	0,317**
	2010	-0,842**	-0,496**	0,718**
France	2007-2008	-0,863**	-0,060	- 0,226**
	2009	-0,854**	-0,271**	0,117
	2010	-0,837**	-0,430**	0,111
Greece	2007-2008	-0,773**	-0,144**	- 0,128**
	2009	-0,705**	-0,426**	0,422**
	2010	-0,926**	-0,576**	0,542**
Ireland	2007-2008	-0,485**	0,051	0,349**
	2009	-0,626**	-0,276**	0,673**
	2010	-0,270**	-0,223**	0,579**
United Kingdom	2007-2008	-0,763**	-0,234**	0
	2009	-0,768**	-0,245**	0,075
	2010	-0,468**	-0,439**	0,285**
Germany	2007-2008	-0,665**	-0,134**	0,142**
	2009	-0,894**	-0,236**	0,263**
	2010	-0,157*	-0,361**	0,086

Table 3: Country-specific lead-lag analysis with VAR model

The country-specific VAR model consists of two-equations with the log stock index return (R_t) and the CDS sovereign spread change (ΔCDS) as dependent variables respectively. In this table, we report the coefficients (Coeff.) and the p-value which reflects if explanatory variable is significantly for each country and for each period. We show the p-value for the Granger causality test (GC) only in the cases in which p is significant at a 10% level.

Spain

	2007-2010				2007-2008				2009				2010			
Dep.Var	R_t		ΔCDS_t		R_t		ΔCDS_t		R_t		ΔCDS_t		R_t		ΔCDS_t	
	Coeff.	p-val.	Coeff.	p-val.	Coeff.	p-val.	Coeff.	p-val.	Coeff.	p-val.	Coeff.	p-val.	Coeff.	p-val.	Coeff.	p-val.
R_{t-1}	-0.059	0.101	-0.573	**0.000**	-0.092	0.045	-0.424	**0.016**	0.044	0.518	-0.992	**0.000**	-0.054	0.613	0.088	0.822
R_{t-2}	-0.069	0.060	-0.271	**0.041**	-0.083	0.073	-0.318	**0.074**	0.021	0.769	-0.553	**0.006**	-0.023	0.821	-0.019	0.960
R_{t-3}	-0.070	0.055	0.080	0.550	-0.085	0.068	-0.019	0.917	-0.094	0.192	0.081	0.689	-0.007	0.947	0.120	0.751
R_{t-4}	0.061	0.093	0.074	0.575	0.118	0.011	0.039	0.827	0.070	0.330	-0.087	0.667	0.051	0.615	-0.129	0.730
ΔCDS_{t-1}	-0.021	**0.028**	-0.240	0.000	-0.009	0.460	-0.363	0.000	-0.005	0.828	-0.046	0.489	-0.074	**0.014**	0.116	0.284
ΔCDS_{t-2}	-0.008	0.397	-0.094	0.010	-0.015	0.240	-0.090	0.067	-0.002	0.923	-0.021	0.001	0.066	**0.027**	-0.196	0.071
ΔCDS_{t-3}	-0.006	0.528	-0.037	0.307	-0.010	0.418	-0.008	0.870	-0.001	0.963	0.175	0.004	-0.047	0.120	-0.103	0.343
ΔCDS_{t-4}	0.015	0.123	0.084	0.017	-0.007	0.554	-0.014	0.768	0.014	0.523	-0.082	0.172	0.100	**0.001**	-0.325	0.004
Const.	-0.00056	0.406	-0.0078	0.002	-0.00081	0.372	0.0104	0.003	0.00080	0.438	0.0037	0.200	-0.00182	0.322	0.0068	0.305
Obs.	836		836		473		473		236		236		127		127	
R^2	0.0197		0.0698		0.0390		0.1230		0.0157		0.1873		0.2061		0.1742	
GC test		0.085		0.000		---		0.074		---		0.000		0.000		---

Portugal

	2007-2010				2007-2008				2009				2010			
Dep.Var	R_t		ΔCDS_t		R_t		ΔCDS_t		R_t		ΔCDS_t		R_t		ΔCDS_t	
	Coeff.	p-val.	Coeff.	p-val.	Coeff.	p-val.	Coeff.	p-val.	Coeff.	p-val.	Coeff.	p-val.	Coeff.	p-val.	Coeff.	p-val.
R_{t-1}	-0.007	0.845	-0.591	**0.000**	0.027	0.557	-0.539	**0.004**	-0.069	0.297	-1.046	**0.000**	-0.327	0.005	1,511	**0.002**
R_{t-2}	-0.048	0.183	-0.113	0.463	-0.036	0.435	-0.254	0.173	0.049	0.468	-0.549	**0.069**	-0.126	0.292	0.419	0.410
R_{t-3}	-0.030	0.408	0.397	**0.010**	-0.005	0.908	0.163	0.385	-0.077	0.253	0.213	0.475	-0.092	0.442	1.014	**0.045**
ΔCDS_{t-1}	-0.019	**0.025**	-0.078	0.031	-0.004	0.143	-0.247	0.000	-0.011	0.457	-0.121	0.058	-0.118	**0.000**	0.622	0.000
ΔCDS_{t-2}	-0.015	**0.073**	-0.045	0.208	-0.020	0.729	-0.109	0.024	-0.002	0.860	-0.032	0.617	0.007	0.803	-0.074	0.555
ΔCDS_{t-3}	-0.007	0.384	0.089	0.013	-0.015	**0.085**	0.082	0.082	0.012	0.397	0.210	0.001	-0.026	0.357	0.071	0.557
Const.	-0.00068	0.199	0.0052	0.023	-0.001	0.206	0.007	0.021	0.0006	0.401	0.003	0.432	0.0011	0.481	0.007	0.259
Obs.	851		851		482		482		240		240		129		129	
R^2	0.0100		0.0341		0.0093		0.0811		0.0211		0.1076		0.1487		0.2424	
GC test		0.051		0.000		---		0.010		---		0.002		0.000		0.005

Italy

	2007-2010				2007-2008				2009				2010			
Dep.Var	R_t		ΔCDS_t		R_t		ΔCDS_t		R_t		ΔCDS_t		R_t		ΔCDS_t	
	Coeff.	p-val.	Coeff.	p-val.	Coeff.	p-val.	Coeff.	p-val.	Coeff.	p-val.	Coeff.	p-val.	Coeff.	p-val.	Coeff.	p-val.
R_{t-1}	-0.025	0.492	-0.100	0.320	-0.090	0.055	0.090	0.507	0.864	0.223	-0.390	**0.001**	0.006	0.959	0.404	0.326
R_{t-2}	-0.050	0.173	-0.145	0.152	-0.118	0.012	-0.277	**0.041**	0.077	0.276	0.060	0.620	-0.201	0.858	0.062	0.876
R_{t-3}	-0.102	0.006	0.123	0.224	-0.158	0.001	0.086	0.529	-0.090	0.207	0.111	0.357	0.034	0.761	0.199	0.619
R_{t-4}	0.117	0.002	0.098	0.331	0.137	0.004	-0.243	**0.076**	0.136	0.056	-0.007	0.952	0.012	0.913	0.122	0.760
ΔCDS_{t-1}	-0.025	**0.061**	0.019	0.603	-0.017	0.279	-0.109	0.020	0.0003	0.994	0.167	0.019	-0.045	**0.177**	0.330	0.005
ΔCDS_{t-2}	-0.009	0.455	-0.002	0.948	-0.031	**0.057**	0.012	0.798	0.032	0.431	0.051	0.458	0.056	**0.093**	-0.151	0.202
ΔCDS_{t-3}	-0.031	**0.018**	0.031	0.387	-0.046	**0.005**	0.112	0.017	-0.067	0.100	0.073	0.288	-0.043	0.195	-0.034	0.775
ΔCDS_{t-4}	0.007	0.583	-0.059	0.103	-0.040	**0.013**	0.019	0.676	0.059	0.131	-0.088	0.183	0.078	**0.015**	-0.118	0.302
Const.	-0.00094	0.153	0.0042	0.021	-0.0012	0.155	0.0059	0.019	0.0001	0.901	0.0002	0.893	-0.001	0.441	0.004	0.447
Obs.	824		824		461		461		236		236		127		127	
R^2	0.0300		0.0105		0.0864		0.0461		0.0460		0.1209		0.1199		0.1311	
GC test		0.044		---		0.004		0.086		---		0.024		0.037		---

Table 3 continued.

France

	2007-2010				2007-2008				2009				2010			
Dep.Var	R_t		ΔCDS_t		R_t		ΔCDS_t		R_t		ΔCDS_t		R_t		ΔCDS_t	
	Coeff.	p-val.	Coeff.	p-val.	Coeff.	p-val.	Coeff.	p-val.	Coeff.	p-val.	Coeff.	p-val.	Coeff.	p-val.	Coeff.	p-val.
R_{t-1}	-0.094	0.007	-0.854	**0.000**	-0.132	0.004	-0.710	**0.056**	-0.014	0.827	-0.886	**0.000**	-0.117	0.214	-0.393	0.173
R_{t-2}	-0.075	0.031	-0.459	**0.051**	-0.117	0.011	-0.369	0.324	0.053	0.437	-0.416	**0.032**	-0.115	0.225	0.357	0.218
R_{t-3}	-0.082	0.019	-0.229	0.333	-0.107	0.020	-0.245	0.514	-0.051	0.461	0.009	0.963	-0.019	0.837	0.599	**0.041**
R_{t-4}	0.086	0.014	-0.207	0.381	0.128	0.006	-0.122	0.744	0.086	0.205	-0.407	**0.035**	-0.138	0.144	0.135	0.641
ΔCDS_{t-1}	-0.006	0.243	-0.371	0.000	-0.004	0.450	-0.412	0.000	0.013	0.575	0.038	0.567	-0.092	**0.002**	0.106	0.255
ΔCDS_{t-2}	-0.003	0.573	-0.181	0.000	-0.003	0.568	-0.219	0.000	0.025	0.265	-0.094	0.142	0.010	0.742	0.039	0.680
ΔCDS_{t-3}	-0.0009	0.859	-0.103	0.005	-0.0007	0.907	-0.139	0.005	0.012	0.576	0.103	0.096	-0.038	0.217	0.138	0.144
ΔCDS_{t-4}	-0.002	0.728	-0.158	0.000	-0.001	0.837	-0.177	0.000	-0.002	0.906	-0.157	0.008	-0.028	0.346	-0.103	0.268
Const.	-0.00083	0.199	0.0091	0.037	-0.0015	0.088	0.0141	0.057	0.0004	0.663	0.0009	0.753	-0.0003	0.796	-0.0064	0.160
Obs.	839		839		475		475		237		237		127		127	
R^2	0.0286		0.1425		0.0584		0.1654		0.0237		0.1538		0.1107		0.0980	
GC test		---		0.003		---		---		---		0.000		0.012		---

Greece

	2007-2010				2007-2008				2009				2010			
Dep.Var	R_t		ΔCDS_t		R_t		ΔCDS_t		R_t		ΔCDS_t		R_t		ΔCDS_t	
	Coeff.	p-val.	Coeff.	p-val.	Coeff.	p-val.	Coeff.	p-val.	Coeff.	p-val.	Coeff.	p-val.	Coeff.	p-val.	Coeff.	p-val.
R_{t-1}	0.053	0.178	-0.549	**0.000**	0.067	0.211	-0.388	**0.068**	- 0.017	0.818	-0.346	**0.009**	0.102	0.405	0.074	0.812
R_{t-2}	-0.091	0.025	-0.206	**0.096**	-0.039	0.485	-0.138	0.534	-0.090	0.232	-0.033	0.808	-0.270	0.025	-0.129	0.673
ΔCDS_{t-1}	-0.015	0.235	-0.227	0.000	-0.003	0.779	-0.398	0.000	-0.064	**0.080**	0.003	0.961	0.002	0.972	0.275	0.026
ΔCDS_{t-2}	0.0006	0.957	-0.164	0.000	0.008	0.487	-0.280	0.000	- 0.009	0.811	0.111	0.090	- 0.050	0.294	-0.193	0.111
Const.	-0.00084	0.336	0.005	0.048	-0.0014	0.165	0.009	0.030	0.00099	0.553	0.00032	0.916	-0.002	0.376	0.0066	0.354
Obs.	697		697		366		366		219		219		112		112	
R^2	0.0127		0.0732		0.0074		0.1745		0.0180		0.0567		0.0515		0.0747	
GC test		---		0.000		---		---		---		0.032		---		---

Ireland

	2007-2010				2007-2008				2009				2010			
Dep.Var	R_t		ΔCDS_t		R_t		ΔCDS_t		R_t		ΔCDS_t		R_t		ΔCDS_t	
	Coeff.	p-val.	Coeff.	p-val.	Coeff.	p-val.	Coeff.	p-val.	Coeff.	p-val.	Coeff.	p-val.	Coeff.	p-val.	Coeff.	p-val.
R_{t-1}	0.022	0.556	0.321	0.102	0.031	0.578	0.0002	0.997	0.021	0.729	1.118	**0.069**	-0.200	0.028	0.458	0.145
R_{t-2}	-0.013	0.727	0.052	0.790	-0.039	0.489	-0.329	0.472	0.042	0.502	0.106	0.864	-0.067	0.461	0.142	0.652
ΔCDS_{t-1}	-0.003	0.647	0.032	0.392	-0.021	0.753	-0.154	0.006	-0.002	0.758	0.036	0.562	-0.073	**0.006**	0.321	0.000
ΔCDS_{t-2}	0.004	0.577	0.008	0.825	0.046	0.509	-0.007	0.901	0.003	0.670	0.014	0.822	0.025	0.339	-0.129	0.165
Const.	-0.0014	0.116	0.0056	0.227	-0.0039	0.015	0.0022	0.084	0.0008	0.502	0.0084	0.488	-0.00009	0.947	0.0029	0.561
Obs.	717		717		316		316		261		261		140		140	
R^2	0.0016		0.0045		0.0046		0.0251		0.0029		0.0131		0.0714		0.0916	
GC test		---		---		---		---		---		---		0.020		---

United Kingdom

	2007-2010				2007-2008				2009				2010			
Dep.Var	R_t		ΔCDS_t		R_t		ΔCDS_t		R_t		ΔCDS_t		R_t		ΔCDS_t	
	Coeff.	p-val.	Coeff.	p-val.	Coeff.	p-val.	Coeff.	p-val.	Coeff.	p-val.	Coeff.	p-val.	Coeff.	p-val.	Coeff.	p-val.
R_{t-1}	-0.027	0.567	-0.233	**0.023**	-0.041	0.701	-0.008	0.964	-0.032	0.627	-0.647	**0.000**	0.089	0.362	-0.236	0.299
R_{t-2}	-0.086	0.073	-0.260	**0.011**	-0.196	0.065	-0.237	0.210	0.047	0.480	-0.397	**0.018**	0.031	0.756	0.065	0.778
R_{t-3}	-0.096	0.045	-0.017	0.867	-0.118	0.268	0.048	0.799	-0.096	0.151	- 0.060	0.722	0.142	0.157	0.205	0.380
R_{t-4}	0.185	0.000	-0.159	0.124	0.208	0.049	-0.222	0.239	0.111	0.100	-0.050	0.770	0.021	0.838	-0.128	0.603
ΔCDS_{t-1}	0.029	0.527	0.031	0.513	0.079	0.186	0.090	0.394	0.022	0.398	-0.009	0.891	0.013	0.745	-0.235	0.012
ΔCDS_{t-2}	-0.004	0.204	0.098	0.041	-0.053	0.389	0.022	0.839	0.042	0.104	0.072	0.276	-0.007	0.865	0.128	0.182
ΔCDS_{t-3}	-0.021	0.871	0.057	0.218	0.007	0.907	-0.004	0.973	-0.018	0.470	0.127	0.043	-0.004	0.915	-0.014	0.886
ΔCDS_{t-4}	0.014	0.342	-0.090	0.057	0.002	0.973	-0.196	0.068	0.011	0.648	-0.041	0.508	0.049	0.215	-0.213	0.021
Const.	-0.00059	0.514	0.0034	0.087	-0.00463	0.250	0.02091	0.004	0.00037	0.702	0.00118	0.630	0.00007	0.945	-0.0023	0.351
Obs.	428		428		88		88		225		225		115		115	
R^2	0.0635		0.0519		0.1406		0.0599		0.0495		0.0983		0.0487		0.1266	
GC test		---		0.017		---		---		---		0.001		---		---

Table 3 continued.

Germany

	2007-2010				2007-2008				2009				2010			
Dep.Var	R_t		ΔCDS_t		R_t		ΔCDS_t		R_t		ΔCDS_t		R_t		ΔCDS_t	
	Coeff.	p-val.	Coeff.	p-val.	Coeff.	p-val.	Coeff.	p-val.	Coeff.	p-val.	Coeff.	p-val.	Coeff.	p-val.	Coeff.	p-val.
R_{t-1}	-0.039	0.260	-0.371	**0.066**	-0.064	0.169	-0.030	0.926	-0.008	0.905	-1.063	**0.000**	-0.071	0.451	0.222	0.462
R_{t-2}	-0.057	0.099	-0.314	0.120	-0.091	0.050	-0.327	0.308	0.029	0.674	-0.110	0.555	-0.121	0.194	0.333	0.263
R_{t-3}	-0.048	0.167	-0.379	**0.062**	-0.071	0.126	-0.516	0.109	0.013	0.849	-0.069	0.709	0.116	0.218	0.470	0.118
R_{t-4}	0.087	0.014	-0.279	0.171	0.105	0.024	-0.301	0.354	0.110	0.106	-0.158	0.384	-0.043	0.652	0.085	0.780
ΔCDS_{t-1}	- 0.002	0.747	-0.218	0.000	0.0006	0.923	-0.259	0.000	-0.006	0.816	0.005	0.934	-0.066	**0.020**	0.374	0.000
ΔCDS_{t-2}	-0.007	0.250	-0.008	0.808	-0.009	0.182	-0.038	0.431	0.041	**0.078**	0.043	0.493	-0.029	0.338	0.080	0.396
ΔCDS_{t-3}	-0.003	0.615	-0.145	0.000	-0.006	0.345	-0.171	0.000	0.014	0.522	0.054	0.350	0.026	0.373	-0.149	0.116
ΔCDS_{t-4}	0.002	0.738	-0.110	0.002	0.0003	0.963	-0.126	0.008	0.0006	0.975	-0.086	0.115	0.006	0.836	0.070	0.444
Const.	-0.00029	0.630	0.0057	0.110	-0.00097	0.261	0.0087	0.147	0.00071	0.535	0.0019	0.545	0.00036	0.753	0.0028	0.442
Obs.	830		830		467		467		236		236		127		127	
R^2	0.0161		0.0721		0.0328		0.0938		0.0260		0.1595		0.0885		0.1963	
GC test		---		0.051		---		---		---		0.000		0.068		---

Table 4: Aggregate lead-lag analysis with fixed-effects panel regressions

For each market (stock and CDS) we estimate fixed panel regressions to study aggregate lead lag relationship across markets. We report coefficients and p-values from fixed-effects models. For each of the two equations in each panel we show the overall R^2 (which is close to the within R^2). We show three tables: first refers to seven countries (we exclude United Kingdom because of its coin which is different from euro), second and third refers to European countries with lower (France and Germany) and higher (Spain, Portugal, Italy, Greece and Ireland) spreads.

All the countries

	2007-2010				2007-2008				2009				2010			
Dep.Var	R_t		ΔCDS_t		R_t		ΔCDS_t		R_t		ΔCDS_t		R_t		ΔCDS_t	
	Coeff.	p-val.	Coeff.	p-val.	Coeff.	p-val.	Coeff.	p-val.	Coeff.	p-val.	Coeff.	p-val.	Coeff.	p-val.	Coeff.	p-val.
R_{t-1}	-0.015	0.270	-0.317	**0.000**	-0.036	0.045	-0.247	**0.004**	0.020	0.424	-0.366	**0.004**	-0.095	0.021	0.262	**0.059**
R_{t-2}	-0.079	0.000	-0.124	**0.054**	-0.125	0.000	-0.230	**0.008**	0.022	0.390	-0.085	**0.504**	-0.099	0.015	0.208	0.134
R_{t-3}	-0.048	0.001	0.054	0.406	-0.079	0.001	-0.110	0.218	-0.023	0.368	0.101	0.427	-0.031	0.446	0.463	**0.001**
R_{t-4}	0.059	0.002	0.012	0.856	0.075	0.002	-0.154	0.084	0.092	0.000	-0.016	0.901	-0.014	0.731	0.346	**0.012**
R_{t-5}	-0.092	0.003	-0.006	0.928	-0.169	0.003	-0.163	0.072	-0.003	0.914	0.229	0.072	0.019	0.642	0.071	0.610
ΔCDS_{t-1}	-0.007	**0.008**	-0.176	0.000	-0.005	0.227	-0.334	0.000	-0.003	0.508	0.018	0.476	-0.077	**0.000**	0.282	0.000
ΔCDS_{t-2}	-0.005	**0.063**	-0.043	0.002	-0.010	**0.012**	-0.131	0.000	0.004	0.456	-0.0003	0.988	0.018	0.134	-0.080	0.052
ΔCDS_{t-3}	-0.003	0.214	-0.030	0.029	-0.009	**0.038**	-0.090	0.000	-0.0008	0.872	0.031	0.217	-0.033	**0.006**	0.017	0.675
ΔCDS_{t-4}	0.005	0.100	-0.085	0.000	-0.005	0.178	-0.127	0.000	0.011	0.030	-0.029	0.243	0.050	**0.000**	-0.144	0.000
ΔCDS_{t-5}	0.000	0.974	-0.033	0.014	-0.002	0.660	-0.066	0.000	0.0008	0.856	-0.022	0.376	-0.019	**0.097**	0.095	0.018
Const.	-0.00088	0.001	0.0065	0.000	-0.002	0.000	0.0096	0.000	0.0007	0.115	0.003	0.211	-0.00094	0.147	0.006	0.011
Obs.	5423		5506		2938		2990		1625		1647		860		869	
R^2	0.0208		0.0369		0.0519		0.1062		0.0118		0.0111		0.0956		0.1477	

European countries with lower spreads

	2007-2010				2010			
Dep.Var	R_t		ΔCDS_t		R_t		ΔCDS_t	
	Coeff.	p-val.	Coeff.	p-val.	Coeff.	p-val.	Coeff.	p-val.
R_{t-1}	-0.040	0.107	-0.632	**0.000**	-0.060	0.430	-0.111	0.655
R_{t-2}	-0.066	0.009	-0.383	**0.003**	-0.077	0.307	0.348	0.164
R_{t-3}	-0.083	0.001	-0.127	0.330	0.042	0.570	0.376	0.129
R_{t-4}	0.094	0.000	-0.231	**0.077**	-0.089	0.242	0.148	0.552
R_{t-5}	-0.090	0.000	-0.241	**0.065**	0.058	0.441	0.058	0.816
ΔCDS_{t-1}	-0.008	**0.074**	-0.324	0.000	-0.073	**0.001**	0.215	0.004
ΔCDS_{t-2}	-0.007	0.171	-0.132	0.000	0.031	0.178	-0.041	0.586
ΔCDS_{t-3}	-0.007	0.195	-0.082	0.002	-0.033	0.144	0.054	0.472
ΔCDS_{t-4}	-0.003	0.581	-0.172	0.000	0.029	0.211	-0.152	0.043
ΔCDS_{t-5}	0.003	0.524	-0.087	0.000	-0.033	0.894	0.135	0.066
Const.	-0.00099	0.034	0.0078	0.001	-0.0009	0.440	0.005	0.171
Obs.	1639		1661		250		252	
R^2	0.0320		0.1117		0.0913		0.1091	

European countries with higher spreads

	2007-2010				2010			
Dep.Var	R_t		ΔCDS_t		R_t		ΔCDS_t	
	Coeff.	p-val.	Coeff.	p-val.	Coeff.	p-val.	Coeff.	p-val.
R_{t-1}	-0.019	0.302	-0.439	**0.000**	-0.083	0.147	0.431	**0.031**
R_{t-2}	-0.121	0.000	-0.190	**0.013**	-0.118	0.040	0.128	0.521
R_{t-3}	-0.048	0.009	-0.023	0.774	-0.083	0.144	0.583	**0.003**
R_{t-4}	0.043	0.022	-0.032	0.686	-0.010	0.858	0.339	**0.086**
R_{t-5}	-0.125	0.000	-0.016	0.841	0.003	0.953	0.171	0.392
ΔCDS_{t-1}	-0.012	**0.005**	-0.197	0.000	-0.078	**0.000**	0.332	0.000
ΔCDS_{t-2}	-0.013	**0.003**	-0.063	0.001	0.011	0.507	-0.104	0.074
ΔCDS_{t-3}	-0.007	0.131	-0.058	0.002	-0.042	**0.012**	0.050	0.389
ΔCDS_{t-4}	0.004	0.398	-0.084	0.000	0.059	**0.000**	-0.162	0.005
ΔCDS_{t-5}	-0.005	0.217	-0.043	0.020	-0.032	**0.050**	0.132	0.021
Const.	-0.0006	0.080	0.006	0.000	-0.0012	0.198	0.006	0.055
Obs.	3070		3131		470		477	
R^2	0.0328		0.0463		0.1153		0.1727	

Figure 1: Daily time series from Spain Sovereign CDS spread vs. IBEX 35 return

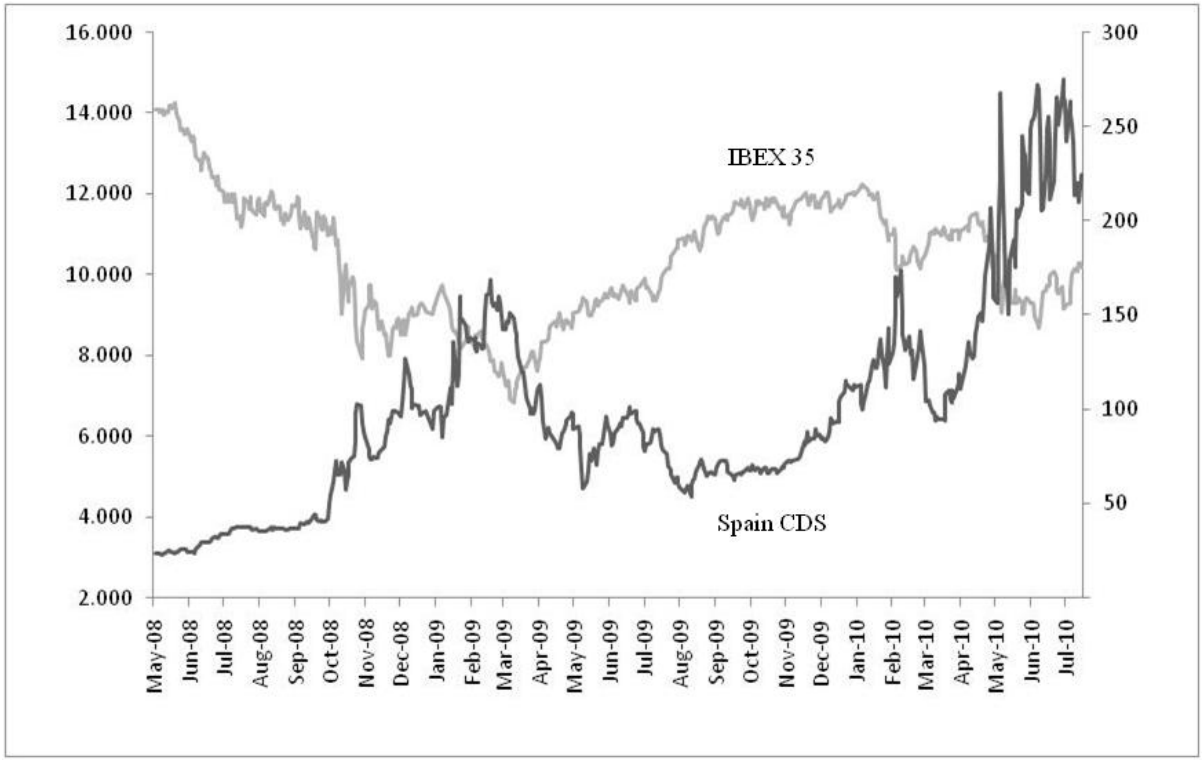

Figure 2: Daily time series from Italy Sovereign CDS spread vs. FTSE MIB return