EMU sovereign spreads and macroeconomic news

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Abstract

We investigate the relationship between macroeconomic news and sovereign spreads in the euro area at weekly frequency. Our focus lies in the role played by macroeconomic announcements. To this aim we augment a standard GARCH model with a synthetic measure for macroeconomic surprises obtained by aggregating deviations between data releases and market expectations on a set of indicators chosen for being closely watched by economic analysts and financial operators. We find that the dissemination of macroeconomic data on the US economy affects the level of sovereign spreads, i.e. the better the news the lower the spreads. Moreover, the dissemination of bad news on the euro area economy affects negatively the volatility, i.e. the worse the news the higher the volatility.

JEL Classifications: G10,G12,G15

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1 Introduction

In recent years the issue of government bond spreads has received increasing attention and in macroeconomic reports edited by leading international economic institutions, sovereign spreads are currently included in the set of short-term indicators employed to monitor the state of national economies. This can be, at least partially, motivated by the dramatic worsening of public finances and the surge in public debt stocks following the financial crisis and the recession that hit the real economy on a global scale. As a consequence, at the level of stock imbalances currently reached, even a small increase of interest rates paid on government bonds implies a significant loss of public resources.

The behaviour of sovereign spreads has been also largely analyzed by the literature. During the last twenty years several works have investigated the financial determinants of sovereign bond yield differentials, but less work has been produced on their macroeconomic determinants. This is at odds with the recent increasing interest among financial operators for the role played by macroeconomic fundamentals, especially after the financial crisis. In particular, market makers look in continuous time the news (the difference between data releases and market expectations) in order to traslate as fast as possible these innovations in the portfolio composition. Currently many investment banks produce some indicator of macroeconomic news and publish them in their newsletters but there are no papers showing their relevance on government bond markets.

The literature before the introduction of euro was marked by contributions of Alesina et al. (1992), Favero et al. (1997) and Lemmen and Goodhart (1999). They conclude that the discrimination among sovereign bonds depends mainly on two factors that are identified respectively in the risk of exchange rate devaluation and the risk of default originated by the possibility that a sovereign state may be not able to reimburse its debt. According to these seminal contributions, sovereign spreads are mainly attributable to investors demands for risk premia.

The introduction of the euro, having substantially removed the risk of an exchange rate devaluation, has been accompanied by a significant narrowing of sovereign spreads. Nonetheless, discrimination across sovereign bonds persisted to a very limited extent in the period following the constitution of the currency area but in the aftermath of the financial crisis sovereign spreads reached, for some euro area countries, historically high levels.

Contributions by Codogno et al. (2003) and by Geyer et al. (2004) find that global risk aversion, i.e. a global common factor, is the main determinant for euro-area bond yield differentials and that country-specific factors have almost no relevance in explaining sovereign spreads dynamics. Public debt affects yields only during periods of increased global risk aversion, while liquidity factors, i.e. the extent of transaction costs implied by a specific market microstructure, play only a minor role.

Beber et al. (2009) and Favero et al. (2010) try to disentangle the relevance of default and liquidity risks in driving sovereign spreads. The former paper finds that credit quality has the main explanatory power but the degree of liquidity of government bonds gains relevance during periods of low aggregate liquidity or in times characterized by high volatility in equity prices or in interest rates. The latter finds that the risk of default of a sovereign state is, as in Codogno et al. (2003), amplified by an international aggregate risk factor thus originating a 'principal component' shared by all euro area countries. The risk of illiquidity reflects idiosyncratic aspects of national sovereign bond markets but interacts negatively with the risk of default. An increase in the aggregate risk factor decreases liquidity premia thus reducing the impact of liquidity factors on sovereign spreads.

The latest widening of spreads and the persistence in their volatility has spurred a renewed attention in the literature that has focused on the determinants of spreads inside the euro area. Many papers have analyzed how the pattern of sovereign spread determination changed during the financial and economic crisis. These works have recognized that after the failure of Lehman Brothers, issuer countries have been more strongly differentiated by investors, on the basis of the state of their fiscal imbalances and macroeconomic fundamentals. For instance, besides the major role played by the global risk aversion, Barrios et al. (2009) find that the combination of high risk aversion and fiscal/macroeconomic imbalances tends to enhance the yields demanded by investors. This fact occurred mainly on the public bonds side, due to the losses generated by bailout plans financed by governments. Along the same line of analysis, Haugh et al. (2009) find supportive results as regards the relevance of fiscal imbalances during periods of increased global risk aversion. A strengthening in the market discipline during the financial crisis has been confirmed by the works of Mody (2009), Manganelli and Wolswijk (2009) and Schuknecht et al. (2010) where it is argued that markets are demanding more fiscal discipline to governments through higher credit risk premia. Lastly, Caceres et al. (2010) find that during the financial crisis the widening of spread is motivated not only by an increased global risk aversion, but also by the contagion of the sovereign debt crisis among euro area countries.

To sum up, the main results are that, at least in the long run, observed spread dynamics can be largely explained by the following three main factors: the risk of default and the degree of liquidity of the government bond market for a given country jointly with the attitude toward risk of international investors, i.e. global risk aversion. Moreover, many empirical analyses have shown that what matters is the interaction between idiosyncratic factors - specific to each country - and global risk aversion, and that this is the reason way the contemporaneous correlation of interest rate spreads is quite high. As a consequence, in many applied studies a single common factor can explain a large part of observed dynamics in interest rate spreads of high-yields countries. This empirical evidence motivates those analyses attempting to understanding the nature of this common global factor and its interactions with others macroeconomic phenomena.

As regards specifically the role played by news and announcements, Afonso and Strauch (2004) show that sovereign spreads are temporarily affected by fiscal policy announcements made by of euro-area policy makers, while Attinasi et al. (2009) concentrate on the impact of announcements of bank rescue packages.

In this work we concentrate on the role played by macroeconomic news, defined as the difference between data releases and market expectations. We intend to give a contribution toward a wider and more systematic comprehension of the data generating process of sovereign spreads level and volatility at weekly frequency. Our sampling frequency includes a minimal number of news-related events per period and at the same time reduces the extent of the temporal aggregation bias that would affect parameter estimates at lower frequencies. Indeed, a systematic analysis regarding the impact of macroeconomic news on euro area government bond markets is missing, even if the relevance of news on asset prices has been largely established in Anderson et al. (2007) [1].

We then investigate the impact of macroeconomic data dissemination on EMU sovereign spreads. To this aim we construct weekly synthetic indicators of macroeconomic news for the Euro area, United States and Japan and a global indicator for the world economy aggregating the news related to a set of statistical indicators chosen for their relevance in driving market confidence. We propose an econometric model for EMU spreads, where our time series of news are explicitly introduced in the model. Our estimates therefore provide a measure of the link between shocks originated by relevant economic information made available to investors and the government bond market.

The main stylized finding of this work is that the level and volatility of EMU sovereign spreads are both affected by US and European macroeconomic news. We find that the dissemination of better-than-expected data on the US economy affects negatively the levels, i.e. the better the news the lower the spreads. Moreover, bad surprises on the euro area economy affects negatively the volatility, i.e. the worse the news the higher the volatility.

The work is organized as follows: in paragraph 2 we illustrate the dataset, in paragraph 3 we describe the methodology followed for obtaining our proxies for macroeconomic news disseminated on the market, in paragraph 4 we present the model, in paragraph 5 we report the empirical evidence obtained from the econometric analysis, and paragraph 6 concludes.

2 The Spreads

We analyze sovereign spreads dynamics in the period 2005-2010 for Belgium, Greece, Ireland, Italy, Portugal and Spain[2]. It is a set of euro area countries characterized by a a rapid and persistent increase of spreads level and volatility in the period following the financial crisis, even if on a different degree and magnitude. In the sequel we follow the standard convention of defining sovereign spreads as the differences between national interest rates paid on government 10 years bonds and the corresponding interest rate paid for 10 years bonds issued by the Federal Republic of Germany. In the first part of the sample sovereign spreads have remained to historically low levels, while

[1] A similar exercise has been realized by Andersen et al. (2005) and by Faust et al. (2007) to investigate over the response of exchange rates and interest rates to macroeconomic announcements.

[2] For a complete description of the sources of data on sovereign spreads as well of other time series in the foregoing analysis, see Appendix A.

starting with the last quarter of 2008, the collapse of Lehman Brothers led to significant widening of spreads for the set of countries included in the analysis. A simple inspection of data (see figures 1-2) reveals that sovereign spreads are characterized by a high degree of persistency and are clearly nonstationary.

As a first step of the empirical analysis, we have investigated over the order of integration of sovereign spreads by implementing the Augmented Dickey-Fuller (1979) and the Philips-Perron (1988) tests. From the p-values associated to the null hypotheses of the tests (Table 1) implemented on levels and on the first-order difference of the time series, we conclude that for all the six countries included in the analysis sovereign spreads are I(1). This calls for an econometric specification where the variable of interest is the first-order difference of sovereign spreads that is I(0), i.e. a stationary process. From figures 1 and 2 it is also evident that weekly changes in sovereign spreads are characterized by the presence of volatility clusters, a quite common fact in the case of financial time-series, where periods of high (low) volatility are followed by periods of high (low) volatility. This evidence has led us to a GARCH model, which allows the modeling of volatility patterns observed on financial markets (Engle, 1982 and Bollerslev, 1986).

3 Macroeconomic News

This work focuses on the impact of macroeconomic data dissemination on government bond markets. In this section we describe the procedure followed to measure the news. As a first step of the analysis, we have identified a set of indicators for macro-areas (United States, Euro area, Japan and World), which we believe being the most influential in driving the mood of investors on financial markets[3]. The definition of the set of indicators largely reflects the classification made by the website of the exchange rate traders community www.forexfactory.com, where economic news are classified as of "high", "medium" and "low" impact on the market. The choice of indicators also reflects the experience gained at the Italian Department of Treasury in monitoring the developments of euro area government bond markets. Following these criteria, for the euro area we have chosen the following six indicators which are closely watched by financial and economic operators and cover the main aspects of the business cycle: the flash estimate of the consumer price index released by Eurostat, the indicator of expected economic growth in the eurozone released by ZEW (Centre for European Economic Research), the indicator of new orders in the manufacturing sector for industries of the eurozone released by Eurostat, the volume of retail sales in the eurozone, released by Eurostat, and the consumer confidence indicator for consumers of the eurozone released by the European Commission. Analogously, for the United States we have considered the following

[3] We have also measured an indicator for macroeconomic news disseminated in Japan as well as in the world economy. It turned out that these two indicators both have no impact on the level and volatility of sovereign spreads in the euro area. These results are not reported but are available on request.

monthly indicators: the level of nonfarm payroll employment, released by the Bureau of Labor Statistics, the volume of core retail sales (excluded autos) released by the Census Bureau, the Purchasing Managers Index (PMI) indicator in the manufacturing sector released by the Institute for Supply Management, the volume of new orders of core durable goods (excluded new orders in the transportation sector) released by the Census Bureau, the index of industrial production released by the Federal Reserve, the number of housing starts released by the Census Bureau, the trade balance released by the Bureau of Economic Analysis and the consumer confidence indicator released by the Conference Board. For Japan, we have selected the industrial production index released by the Ministry of Economy, Trade and Industry, the index of machinery orders released by the Cabinet Office, the trade balance released by the Ministry of Finance, the consumer price index released by the Statistics Bureau and the consumer confidence indicator released by the the Cabinet Office. Lastly, it has been computed a global indicator of news as weighted average of the indicators for United States, Euro Area and Japan[4].

For each of these indicators, we computed the news, i.e. the discrepancy between the statistics released by the aforementioned institutions and the median value of the forecasts prevailing on financial markets and surveyed by Bloomberg. Moreover, given that units of measurement differ across economic variables, following Balduzzi et al. (2001) and Andersen et al. (2003) we converted these absolute news in standardized news.

In detail, let us denote by x_{it}^{j} the announced value on the i-th macroeconomic indicator available for the j area (where j=$\{Euro, Usa, Japan, World\}$) at date t, by $Med(E(x_i))$ the median value of the empirical distribution of forecasts as surveyed by Bloomberg and by $\sigma_{x_i^j}$ its historical standard deviation. Then we have computed a synthetic indicator of standardized macroeconomic news ($News_t^j$) in the j area according to the following formula:

$$News_t^j = \sum_{i=1}^{n_j} \left[\frac{x_i^j - Med(E(x_{it}^j))}{\sigma_{x_i^j}} \right] \tag{1}$$

where as explained in the preceding paragraph, the indicators have been chosen for having a relevant effect on financial markets [5].

Moreover, we have discriminated between positive and negative standardized news in order to assess if there is an asymmetric market reaction following the dissemination of economic news. Thus we have computed indicators for good (${News_t}^j+$) and bad news ($News_t^{j-}$) released at date t for

[4] In order to weight the news of each macro-area, we have employed data on Gross Domestic Product in purchasing power parities.

[5] In figures 3-6 we show the weekly series in relation to the business cycle as proxied by weekly changes of industrial production estimated by linear interpolation of monthly figures.

area j, according to the following formulas:

$$News_t^{j+} = I\left[x_i^j > Med(E(x_{it}^j))\right] \times News_t^j \tag{2}$$

$$News_t^{j-} = I\left[x_i^j < Med(E(x_{it}^j))\right] \times News_t^j \tag{3}$$

where $I[.]$ is the indicator function, i.e. a function that is equal to one if the condition inside square brackets is satisfied (when the announced value is greater than the median forecast) and is equal to zero otherwise (when the announced values is lower than the median forecast)[6]. Lastly, these standardized daily indicators have been converted to a weekly frequency by summing the standardized news registered in a given week.

4 The Model

In order to capture the dynamics and volatility of sovereign spreads changes, we have adopted as an econometric specification, a slightly modified version of the Exponential Generalized Autoregressive Conditional Heteroskedastic Model (EGARCH thereafter) by Nelson (1991). In the proposed model the (stationary) first-order difference of sovereign spreads of a generic country (Δs_t) depends linearly on itself lagged up to the k-th lag, on a set of m regressors ($x_{1t}, x_{2t}, ..., x_{mt}$) which include standard determinants plus the measures of macroeconomic news introduced in the preceding paragraph. The error term (u_t) is split in two components:

$$\begin{aligned} \Delta s_t &= \beta_0 + \beta_1 \Delta s_{t-1} + \beta_2 \Delta s_{t-2} + ... + \beta_k \Delta s_{t-k} + \beta_{k+1} x_{1t} + \beta_{k+2} x_{2t} + ... + \beta_{k+m} x_{mt} + u_t \\ u_t &= \sqrt{h_t} \cdot v_t \end{aligned} \tag{4}$$

In turn, the logarithm of the conditional variance (h_t) evolves according to a EGARCH model and depends also on a set of l regressors($y_{1t}, y_{2t}, ..., y_{lt}$) which are believed to affect the variance of the process, a set that includes the indicators for standardized macroeconomic news, while v_t is an i.i.d. sequence which follows the Generalized Error Distribution (GED thereafter), normalized to

[6] Note that by construction the indicator of good news is always greater or equal to zero, while the indicator of bad news is always lower or equal than zero. In order to simplify the interpretation of the results, in the following we consider the indicator of good news with its (positive) sign, while we consider the indicator of bad news in absolute terms, i.e. without its (negative) sign. By so doing an increase in the (regressor) indicator of bad news corresponds to a situation where operators and analysts are surprised by a state of the economy worse-than-expected.

zero mean and unit variance:

$$\begin{aligned} log(h_t) &= \alpha_0 + \alpha_1 |\frac{u_{t-1}}{\sqrt{h}_{t-1}}| + \gamma_1 log(h_{t-1}) + \delta_1 y_{1t} + \delta_2 y_{2t} + ... + \delta_l y_{lt} \\ f(v) &= \frac{\nu \cdot exp[-(1/2)|v_t/\lambda|^v]}{\lambda^{[(\nu+1)/\nu]}\Gamma(1/\nu)} \end{aligned} \tag{5}$$

where $\Gamma(.)$ is the gamma function and λ is a constant given by:

$$\lambda = \left\{ \frac{2^{-2/\nu}\Gamma(1/\nu)}{\Gamma(3/\nu)} \right\}^{1/2} \tag{6}$$

The main advantage of this parametrization, with respect to other GARCH-type models, is that the variance of the process is constrained by construction to be positive regardless the results of the estimates. Moreover, the GED distribution comprises as a particular case the normal standard distribution (if the GED parameter $\nu = 2$) but it can adapt to distributions characterized by thicker tails than the normal (if the GED parameter $\nu < 2$).

5 The Empirical Application

The model is estimated for Belgium, Greece, Ireland, Italy, Portugal and Spain using as determinants an autoregressive scheme, the Germany 10-year interest rate paid on government bond, a dummy for the financial crisis, global risk aversion, the non-financial iTraxx index, national public debt and our indicators of macroeconomic surprises [7]. From the maximum-likelihood univariate estimates (see Table 2) of this EGARCH-type model it emerged statistical regularities as regards sovereign spread dynamics and volatility.

The first relevant point is that in all the six estimated models the GED parameter is much lower than two, which means that the normality assumption is rejected by data and our distributional hypothesis on the error component is justified.

Second, weekly sovereign spread changes are characterized by a remarkable degree of autocorrelation. Thus, starting from a general model with a sufficiently high number of lags, we have identified the maximum lag of the autoregressive terms entering the model for the conditional mean of the process. It turned out that in all the six models it is sufficient to include just two lags in order to remove any significant autocorrelation left in estimated residuals. According to our estimates, an increase in sovereign spreads in a given week is associated to further increases in the successive week, a phenomenon that is only partially reverted after two weeks and vanishes in the third week.

[7] Data on weekly public debt to GDP ratios have been estimated by linear interpolation of quarterly data. For a complete description of the data see Appendix A

Another empirical finding is that during periods of increasing international interest rates, here summarized by an increase in the long-term interest rate on government bonds issued by the Republic of Germany, the rise of interest rates is only partially transmitted to the countries here considered, bringing about a decrease in sovereign spreads but this effect holds true only when spread reach a certain threshold, i.e. in the period following the financial crisis. This effect is estimated by including in the model the Germany's interest rate interacted with a dummy variable that is equal to one after the collapse of Lehman Brothers and 0 otherwise ($\Delta R_{ger} \times Dummy_{crisis}$). It turns out that this term is always negative and strongly significant. However the extent of the transfer is variable from country to country, varying from around 95% in the case of Greece, to below 50% for Italy.

We have also found that the degree of riskiness of the real sector of the European economy measured by the non-financial iTraxx index[8], significantly affects sovereign spreads, meaning that a worsening of the European outlook brings a lower degree of sustainability of public finances and thus an increase of sovereign spreads. Stated in other terms, there exists a spillover from the riskness of the private sector to the riskness of the public sector of the economy.

Nonetheless we have found that the riskness arising from inside Europe is not the only relevant source of aggregate risk entering the data generating process of sovereign spreads. Indeed our estimates confirm, for three out of six countries, the finding of Codogno et al. (2003), i.e. that the higher the domestic public debt the wider will be the spread in periods of increased global risk aversion, as proxied by the difference between the interest rate paid on BAA corporate bonds and the interest rate paid on Treasury Bills in the United States.

As regards the role played by macroeconomic surprises, our analysis reveals that in all the six countries considered, sovereign spread changes are affected by the diffusion of surprises regarding the state of the US economy. In detail, the diffusion of good (bad) macroeconomic US news brings about a narrowing (widening) of EMU sovereign spreads with the only exception of Spain. In other words, the better the outlook of the global economy, as proxied by the US business cycle, the lower the probability of a scenario characterized by unsustainable public finances. We have also investigated the role of macroeconomic news for the Euro area but we did not find any significant effect.

With regards to the variance equation, we have found that an EGARCH(1,1) allows to capture the persistency of the data generating process for the logarithm of the conditional variance and that no asymmetric terms are significantly different from zero in the aforementioned process.

As regards the determinants of sovereign spreads volatility, our analysis reveals that the financial crisis has been accompanied by an increase in volatility to an extent that is remarkably variable within the set of considered countries. In the aftermath of the financial crisis the conditional log-

[8]The iTraxx is a credit default swap index measuring the price required to hedge against the average risk implied by investment in a set of European stocks

variance of the process has increased of a factor comprised between the value of 0.35, in the case of Italy, to 1.11, recorded in the case of Greece.

Lastly we have found a significant impact of negative macroeconomic surprises related to the state of the euro area economy, which means that the release of bad news brings about an increase in the conditional volatility of spreads and vice-versa. On the opposite, we did not find any significant effect arising from positive surprises on the log-variance of sovereign spreads. This means that financial operators would react asymmetrically when learning about the current state of the European economy. These results thus confirm the existence of a leverage effect for the government bond market. This is a well established empirical regularity and is generally explained on the grounds that a drop in the value of the asset increases the financial leverage, which makes the asset itself riskier and increases its volatility (Beakert and Wu, 2000). Moreover, the asymmetric response of volatility to bad and good surprises is in line with the results obtained by other researchers, who have found that negative surprises increase stock prices volatility more than positive surprises (Hamilton, 1994).

6 Concluding Remarks

We construct weekly time series of macroeconomic news and we apply these indicators in estimates for EMU spreads. The econometric analysis, performed on weekly changes of sovereign spreads in Belgium, Greece, Ireland, Italy, Portugal and Spain, shows that the data generating process is characterized by remarkable regularities for these countries. Indeed, our analysis has found that the EGARCH model provides a satisfactory description of the widening and narrowing of sovereign spreads during the latest financial crisis. As regards the role of macroeconomic announcements, we have found that with the only exception of Spain, positive news on the state of the US economy imply a narrowing of EMU spreads and vice-versa. Macroeconomic surprises on the euro-area business cycle affect the volatility of the series in four out of the six considered countries and are taken into account only to the extent that they are negative surprises.

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Appendix A - The Data

S: sovereign spread of the generic euro area country, computed as the difference between the interest rate paid on the benchmark 10-year government bond issued by a given country and the interest rate paid on the benchmark 10-year government bond issued by the Republic of Germany. Source: Datastream.

R_{GER}: interest rate paid on the benchmark 10-year government bond issued by the Republic of Germany. Source: Datastream.

DU_{CRISIS}: dummy variable that is equal to zero before the collapse of Lehman Brother, occurred on September 15, 2008 and is equal to 1 for all successive dates.

$ITRAXX_{NF}$: non-financials, corporate 10-year iTraxx index. Source: Bloomberg.

$DEBT$: Public Debt of the country, in percentage of Gross Domestic Product. Source: Eurostat. Weekly data have been estimated from data originally available at quarterly frequency by linear interpolation.

GRA_{USA}: global risk aversion, computed as the difference between the interest rate paid on BAA corporate bonds and the interest rate paid on US Treasury Bills. Source: Datastream.

$NEWS_{USA}$: Standardized macroeconomic surprises on the US economy. The methodology followed to construct this aggregate indicator is described in the text. The source of the announcements for the monthly elementary indicators and the associated median forecasts is Bloomberg.

$|NEWS^{-}_{EURO}|$: Negative standardized macroeconomic surprises on the Euro area in absolute value. The methodology followed to construct this aggregate indicator is described in the text. The source of the announcements for the monthly elementary indicators and the associated median forecasts is Bloomberg.

Figures and Tables

Figure 1: 10-year Sovereign Spreads - levels, weekly data

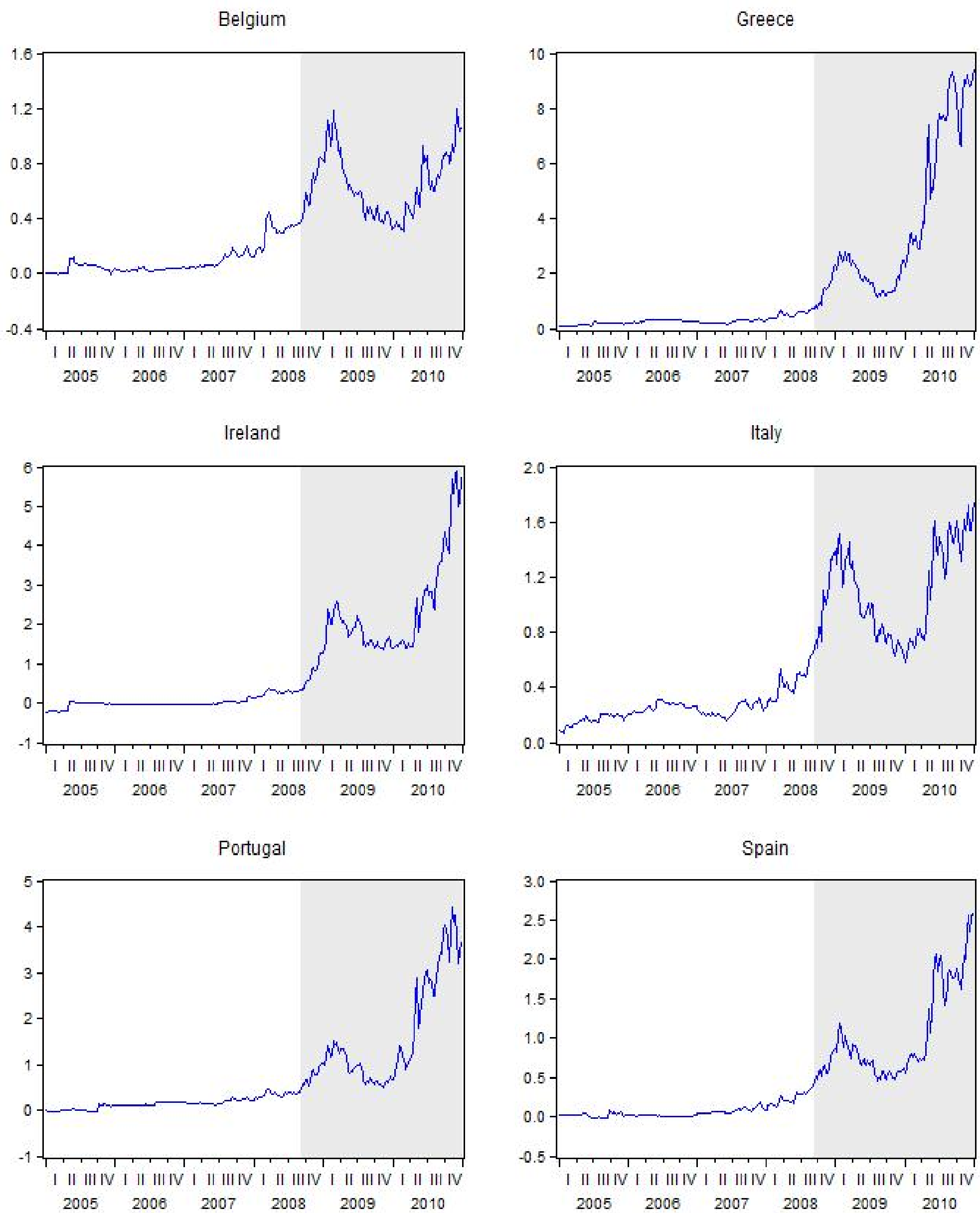

Figure 2: 10-year Sovereign Spreads - changes, weekly data

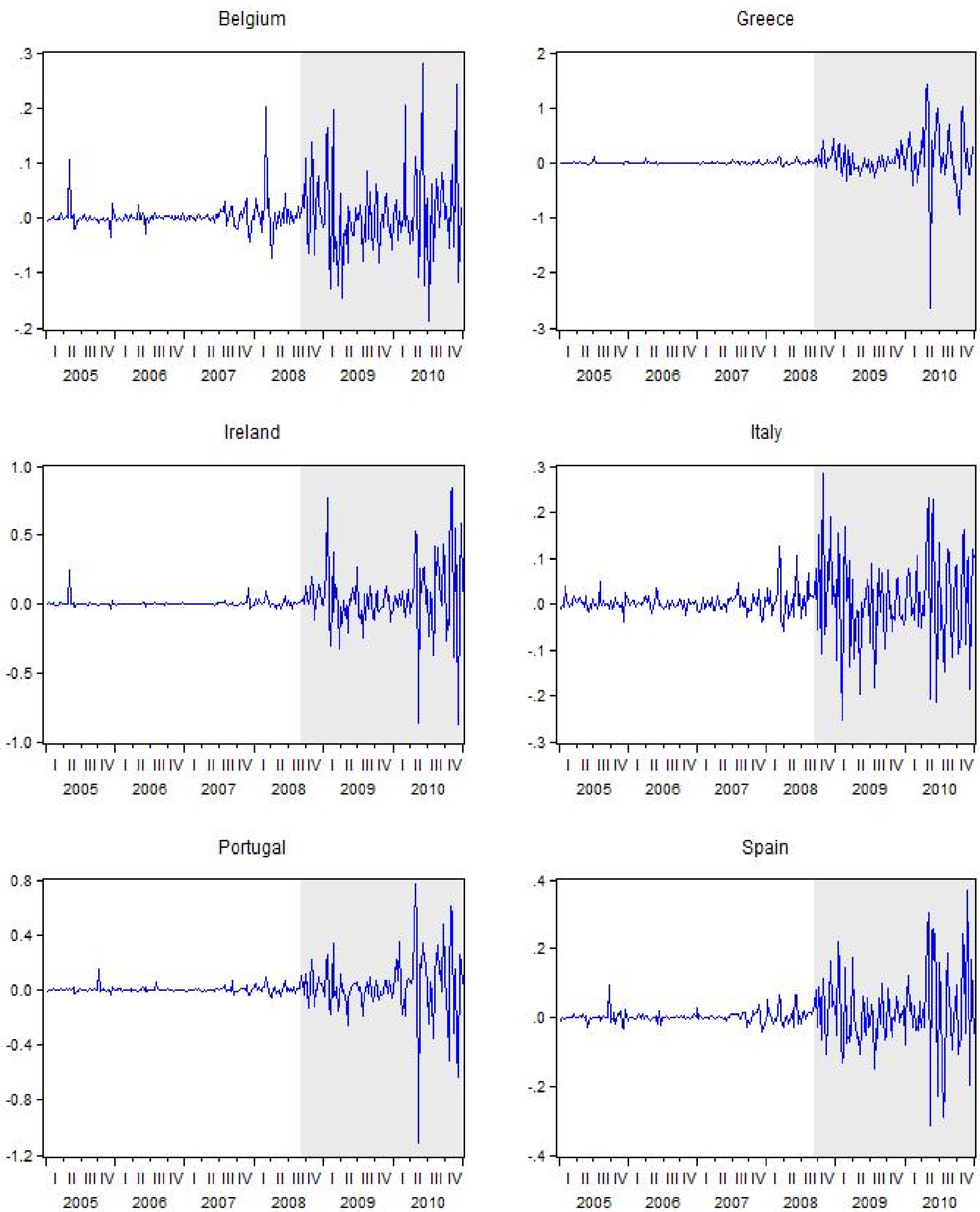

Figure 3: World - Indicator of news and the business cycle, weekly data

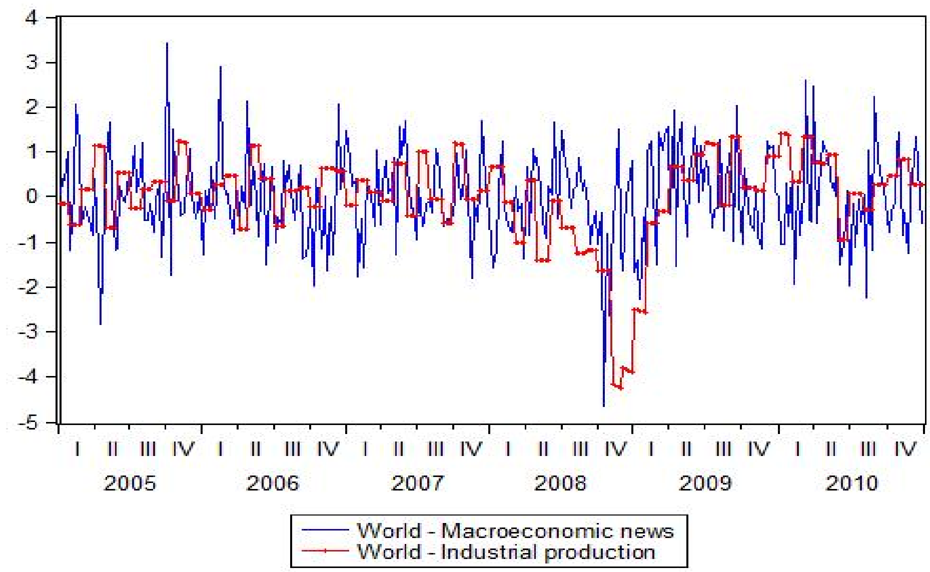

Figure 4: USA - Indicator of news and the business cycle, weekly data

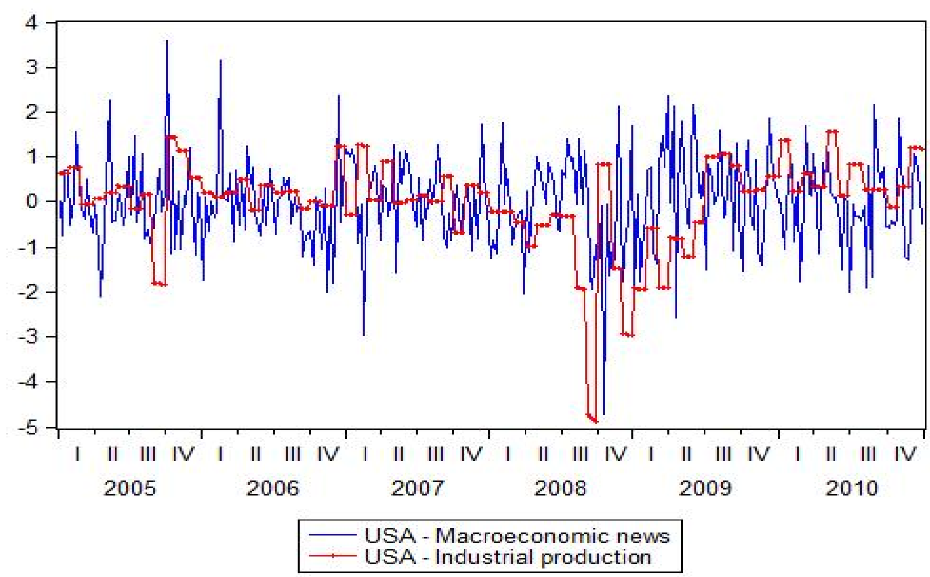

Figure 5: Euro Area - Indicator of news and the business cycle, weekly data

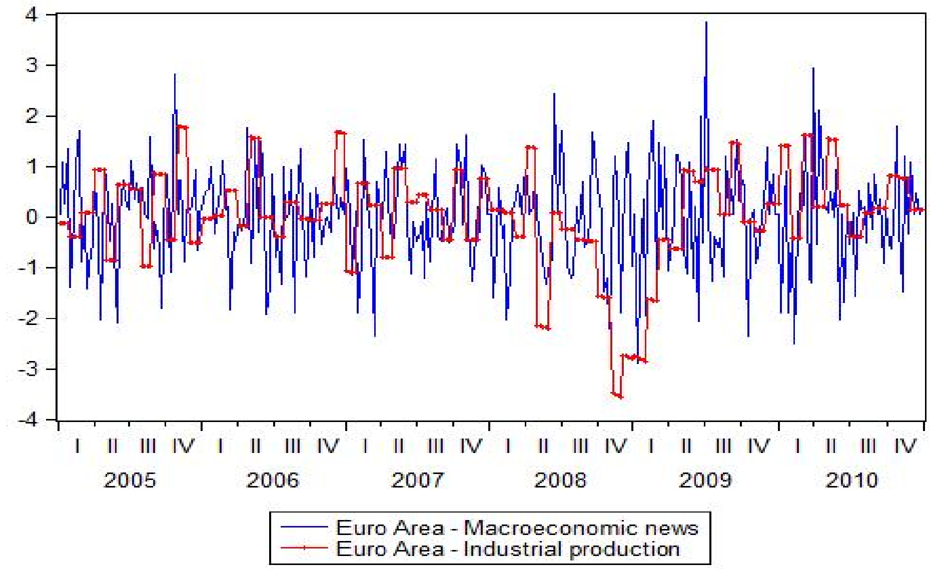

Figure 6: Japan - Indicator of news and the business cycle, weekly data

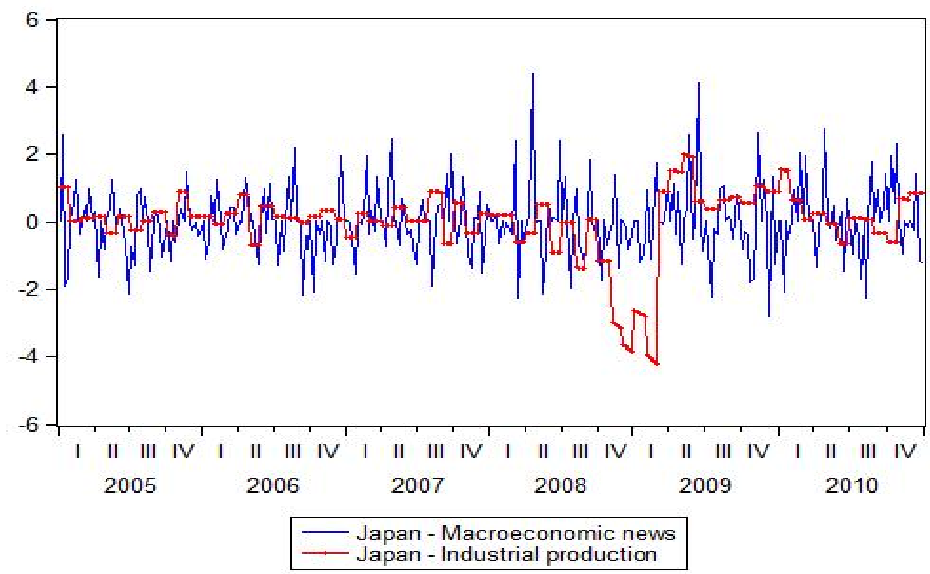

Table 1: Unit Root Tests

Sovereign Spreads				
	Intercept	Trend	ADF	PP
Belgium	Yes	Yes	0.28	0.29
Greece	No	No	1.00	1.00
Ireland	No	No	1.00	1.00
Italy	Yes	Yes	0.48	0.40
Portugal	No	No	1.00	1.00
Spain	Yes	Yes	0.47	0.57

Δ(Sovereign Spreads)				
	Intercept	Trend	ADF	PP
Belgium	No	No	0.00	0.00
Greece	Yes	Yes	0.00	0.00
Ireland	Yes	Yes	0.00	0.00
Italy	No	No	0.00	0.00
Portugal	Yes	Yes	0.00	0.00
Spain	No	No	0.00	0.00

Table 2: EGARCH Models

	Belgium	Greece	Ireland	Italy	Portugal	Spain
ΔS	Spread equation					
Constant	0.000627**	-0.000320	0.00072***	0.000545	0.000663**	0.001152***
	(0.000293)	(0.000550)	(0.000207)	(0.000895)	(0.000281)	(0.000246)
$\Delta S(-1)$	0.140977	0.213347***	0.105469***	0.127912***	0.217875***	0.299045***
	(0.027075)	(0.032278)	(0.023281)	(0.043675)	(0.013449)	(0.027321)
$\Delta S(-2)$	-0.079391***	-0.086821***	-0.022573	-0.125846***	-0.88081***	-0.062774***
	(0.025613)	(0.028387)	(0.022659)	(0.046046)	(0.013451)	(0.023133)
$\Delta R_{GER} \times DU_{CRISIS}$	-0.206687***	-0.0502307***	-0.440399***	-0.531254***	-0.390234***	-0.369577***
	(0.025589)	(0.065972)	(0.021977)	(0.046653)	(0.045441)	(0.022948)
$\Delta ITRAXX_{NF}$	0.078393***	0.171685***	0.077328***	0.187034***	0.095310***	0.072621***
	(0.012655)	(0.017377)	(0.008443)	(0.023288)	(0.005551)	(0.009569)
$\Delta DEBT(-12) \times \Delta GRA_{USA}$	0.000383***	0.000221	0.000989***	0.000151	0.000810***	0.000483**
	(9.82E-05)	(0.000149)	(0.000165)	(0.000172)	(0.000062)	(0.000195)
$NEWS_{USA}$	-0.000494***	-0.001642***	-0.00599***	-0.001579**	-0.000370**	0.000160
	(0.000177)	(0.000469)	(0.000194)	(0.000659)	(0.000146)	(0.000131)
$log(\sigma_t^2)$	Variance equation					
Constant	-1.646178***	-2.180687***	-1.688793***	-1.446525**	-1.416793***	-1.581505**
	(0.510685)	(0.583120)	(0.360558)	(0.582671)	(0.474175)	(0.642484)
$\lvert \frac{u_{t-1}}{\sqrt{h}_{t-1}} \rvert$	0.507648***	0.579924***	0.505962***	0.423497***	0.434328***	0.527519***
	(0.118290)	(0.159581)	(0.108066)	(0.129368)	(0.133703)	(0.150737)
$log(\sigma_{t-1}^2)$	0.870192***	0.793770***	0.871999***	0.868415***	0.874069***	0.853918***
	(0.049872)	(0.065158)	(0.035821)	(0.063077)	(0.052061)	(0.066642)
DU_{CRISIS}	0.449985**	1.108593***	0.707225***	0.359776**	0.573313**	0.622528**
	(0.185118)	(0.374978)	(0.218800)	(0.173241)	(0.250030)	(0.289080)
$\lvert NEWS_{EURO}^- \rvert$	0.296686***	0.272112**	0.455462***	0.091532	0.244092**	-0.088587
	(0.111623)	(0.137056)	(0.120102)	(0.092528)	(0.120052)	(0.134675)
GED Parameter	0.79	0.82	0.71	1.26	0.68	0.74
R-squared	0.22	0.09	0.12	0.54	0.18	0.23

Estimate period: 2005-2010, 300 observations included.
Standard errors in round brackets.
*, ** and *** denote respectively parameters significant at 10%, 5% and 1%.