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Abstract

This paper analyses the effects of newspaper coverage of macro news on the spread between the yield on the 10-year German Bund and on sovereign bonds in eight countries belonging to the euro area (Belgium, France, Greece, Ireland, Italy, the Netherlands, Portugal and Spain) using daily data for the period 1999-2014. The econometric analysis is based on the estimation of a VAR-GARCH model. The results can be summarized as follows. Negative news have significant positive effects on yield spreads in all PIIGS countries but Italy before September 2008; markets respond more to negative news, and their reaction has increased during the recent financial crisis. News volatility has a significant impact on yield spread volatility, the effects being more pronounced in the case of negative news and bigger in the most recent crisis period, especially in the PIIGS countries. Further, the conditional correlations between yield spreads and negative news are significant and positive, and their increase in absolute value during the financial crisis (especially in the PIIGS countries) indicates a higher sensitivity of yield spreads to negative releases.

JEL-Code: C320, F360, G150.

Keywords: news, yield spreads, volatility spillovers, VAR-GARCH model.

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1 Introduction

The issue of how macroeconomic news affect financial markets has become increasingly important in recent years. In particular, the European sovereign debt crisis that started in September 2009, when the Greek government revealed that the country's public deficit would be considerably higher than originally forecast, has generated a lot of interest in the linkages between news and bond yields. After the initial difficulties encountered by Greece, the crisis quickly spread to other EMU economies, specifically Ireland, Italy, Portugal and Spain (a group of countries now collectively known as PIIGS), and both the European Financial Stabilisation Mechanism (EFSM) and the European Financial Stability Facility (EFSF) were created to help economies with huge fiscal imbalances and facing liquidity and solvency constraints.

Since interest rates are forward-looking, and under the Efficient Market Hypothesis (EMH), only unanticipated news should affect asset prices. In the case of a bond, the price equals the present value of all expected future cash flows from the asset discounted at an appropriate rate. According to the Fisher hypothesis, the corresponding yield can be decomposed into a real interest rate and an expected inflation component, both conditional on the available information set. A news release represents a change in the information set which can affect the yield on (and therefore the price of) the bond. Various empirical studies have been carried out for the US bond markets. For instance, Gurkaynak et al. (2005) provide evidence that long-term interest rates respond to the unexpected component of macro news releases and monetary policy announcements; in their opinion, an explicit inflation target would therefore be useful to stabilize inflation expectations. Papers using high-frequency data include Balduzzi et al. (2001) and Andersen et al. (2005), both finding a significant impact of news on US Treasury bond futures contracts; related studies are those by Brenner et al. (2009), who report that US news releases increase conditional bond return volatility, and Jiang et al. (2013), who find that trades and orders increase after macro announcements. However, since daily price changes are the sum of intra-day changes, the effect should also be significant at the daily frequency. For instance, Liebermann (2011) finds an impact, especially of soft (i.e. survey-based variables) rather than hard data (nominal and real variables) on US nominal Treasury bond yields at this frequency. Altavilla et al. (2013) report that announcements explain a larger percentage of bond yield fluctuations at the quarterly than the daily frequency, which suggests that macro news have a persistent effect on bond yields.

For the emerging economies, Andritzky et al. (2005) find evidence that bond markets respond mainly to announcements of changes in international ratings; Robitaille and Roush (2006) report that FOMCs leading to higher US interest rates also increase Brazil's bond spread. A few studies analyse corporate bonds as well: for instance, Huang and King (2007) provide evidence that macro announcements mainly affect high-yield corporate bonds.

Only a few papers have focused on euro member states. Andersson et al. (2006) analyse intra-day data on German bond futures over the period 1999-2005 and conclude that these react more strongly to US than to domestic and euro area news releases. A more comprehensive recent study by Beetsma et al. (2013) examines the effects of news on interest rate spreads vis-à-vis Germany in various countries belonging to the euro area.[1] The news variable

[1] Caporale et al. (2014) focus instead on the effects on stock returns in eight countries belonging to the euro area and find that positive (negative) news have significant positive (negative) effects in all cases.

is taken from the newsflash of Eurointelligence, an Internet-based service. The analysis is conducted for both 5- and 10-year bonds and uses pooled least squares. The results suggest that more news normally increases the spread in the PIIGS countries, and that the effects are stronger for bad news and during the debt crisis period; further, the size of the spillovers is related to cross-border bank holdings, and consequently these are stronger among PIIGS countries.

The present paper contributes to this literature by estimating a bivariate VAR-GARCH(1,1) model to examine the effects of both positive and negative news on yield spreads vis-à-vis the German Bund, which is used as a benchmark; the analysis is carried out for 10-year sovereign bonds issued by eight EMU countries, namely Belgium, France, Greece, Ireland, Italy, the Netherlands, Portugal and Spain, over the period 04/1/1999-28/3/2014, at a daily frequency. As a robustness check. bivariate models are also estimated to analyse the impact of positive and negative news separately. Compared to Beetsma et al. (2013), the analysis covers a considerably longer sample, and considers linkages not only in the first (mean spillovers) but also in the second moments (volatility spillovers).

The layout of the paper is as follows. Section 2 outlines the econometric modelling approach. Section 3 describes the data and presents the empirical findings. Section 4 summarises the main findings and offers some concluding remarks.

2 The model

We represent the first and second moments of yield spreads and news indices using a VAR-GARCH(1,1) process.[2] In order to account for the possible effects of the 2008 financial crisis, we include a dummy variable (denoted by *) with a switch on 15 September 2008, i.e. on the day of the collapse of Lehman Brothers. The second subsample therefore also includes the public debt crisis which started in 2009 but whose seeds can be found in the banking crisis dating back to 2008. In its most general specification the model takes the following form:

$$\mathbf{x}_t = \boldsymbol{\alpha} + \boldsymbol{\beta}\mathbf{x}_{t-1} + \gamma\mathbf{f}_{t-1} + \mathbf{u}_t \tag{1}$$

where $\mathbf{x}_t = (Spread_t, PositiveNews_t\ (NegativeNews_t))$ and $\mathbf{x}_{t-1}$ is a corresponding vector of lagged spreads. We control for financial market shocks by including in the mean equation stock market returns, $\mathbf{f}_{t-1} = (Stock\,\mathrm{Re}\,t_{t-1})$. The residual vector $\mathbf{u}_t = (e_{1,t}, e_{2,t})$ is bivariate and normally distributed $\mathbf{u}_t \mid I_{t-1} \sim (\mathbf{0}, H_t)$ with its corresponding conditional variance-covariance matrix given by:

$$H_t = \begin{bmatrix} h_{11t} & h_{12t} \\ h_{12t} & h_{22t} \end{bmatrix} \tag{2}$$

The parameter vector of the mean return equation (1) is defined by the constant $\boldsymbol{\alpha} = (\alpha_1, \alpha_2)$, and the autoregressive term, $\boldsymbol{\beta} = (\beta_{11}, \beta_{12} + \beta_{12}^* \mid \beta_{21}, 0)$, which allows for mean spread effects from positive (negative) (β_{12}) news. Furthermore, $\gamma = (\gamma_{11} \mid 0)$ is the vector of control parameters, i.e. domestic financial market shocks that appear in the first equation only. The parameter matrices for the variance Equation (2) are defined as C_0, which is

[2] The model is based on the GARCH(1,1)-BEKK representation proposed by Engle and Kroner (1995).

restricted to be upper triangular, and two unrestricted matrices A_{11} and G_{11}. Therefore, the second moment[3] will take the following form:

$$H_t = C_0' C_0 + A_{11}' \begin{bmatrix} e_{1,t-1}^2 & e_{2,t-1} e_{1,t-1} \\ e_{1,t-1} e_{2,t-1} & e_{2,t-1}^2 \end{bmatrix} A_{11} + G_{11}' H_{t-1} G_{11} \tag{3}$$

where

$$A_{11} = \begin{bmatrix} a_{11} & 0 \\ a_{21} + a_{21}^* & a_{22} \end{bmatrix}; G_{11} = \begin{bmatrix} g_{11} & 0 \\ g_{21} + g_{21}^* & g_{22} \end{bmatrix}$$

Equation (3) models the dynamic process of H_t as a linear function of its own past values H_{t-1} and past values of the squared innovations $\left(e_{1,t-1}^2, e_{2,t-1}^2\right)$. The parameters of (3) are given by C_0, which is restricted to be upper triangular, and the two matrices A_{11} and G_{11}. Each of the latter two has two zero restrictions since we are focusing on volatility spillovers (causality-in-variance) from positive (negative) news volatility before (a_{21}) and after the crisis ($a_{21} + a_{21}^*$). The BEKK model guarantees by construction that the covariance matrix in the system is positive definite. Furthermore, the conditional correlations between spread and positive (negative) news will be given by:

$$\boldsymbol{\rho}_{12,t} = h_{12,t} / \sqrt{h_{11,t}} \sqrt{h_{22,t}} \tag{4}$$

Given a sample of T observations, a vector of unknown parameters θ and a 2×1 vector of variables $\mathbf{x}_t$, the conditional density function for model (1) is:

$$f\left(\mathbf{x}_t | I_{t-1}; \theta\right) = (2\pi)^{-1} \left|H_t\right|^{-1/2} \exp\left(-\frac{\mathbf{u}_t' \left(H_t^{-1}\right) \mathbf{u}_t}{2} \right) \tag{5}$$

The log-likelihood function is:

$$L = \sum_{t=1}^{T} \log f\left(\mathbf{x}_t | I_{t-1}; \theta\right) \tag{6}$$

where θ is the vector of unknown parameters. The standard errors are calculated using the quasi-maximum likelihood method of Bollerslev and Wooldridge (1992), which is robust to the distribution of the underlying residuals.

3 Empirical results

3.1 Data

We use daily data (from Bloomberg) for eight countries (Belgium, France, Greece, Ireland, Italy, The Netherlands, Portugal and Spain) for the period 04/1/1999 - 28/3/2014, for a total of 3808 observations. Daily spreads are defined as the difference between 10-year domestic sovereign bond yields and the yield on the German Bund. Furthermore, we control for financial market shocks by including stock market returns. We define daily returns as the

[3] The parameter (a_{21}) in Equation (3) measures the causality effect of positive (negative) news volatility, whereas ($a_{21} + a_{21}^*$) measures the possible effect of the 2008 financial crises.

logarithmic differences of domestic bond yields. We consider news coverage of four macro economic data series, i.e. GDP, unemployment, retail sales and durable goods. The average number of stories about unemployment and GDP is very similar, and they account for the majority of news articles, whereas there is less coverage of retail sales and durable goods releases. The index we use does not distinguish between different types of macro news, since the focus of this study is on analysing the effects of positive and negative macro news respectively as reported and interpreted by the media.[4] The daily positive (negative) news index is defined as follows:

$$\begin{aligned} \text{positive (negative) } \textit{news index} &= ln[e + \textit{domestic positive (negative) news} \\ &\quad + \textit{international positive (negative) news}] \end{aligned} \tag{7}$$

Both domestic and international (within the euro area) news are used to deal with the issue of national newspaper stories about the status of the economy potentially being politically biased (Birz and Lott, 2013). The descriptive statistics, presented in Table 1, show that on average the number of positive news releases is bigger than that of negative ones, with the exception of Belgium. However, since the onset of the 2008 crisis, negative news releases have become more frequent in all countries but Belgium and the Netherlands. The shift has been particularly marked for the PIIGS countries, that have been hit most severely by the crisis. Furthermore, the average number of stories, either negative or positive, has increased substantially since 2008, with the press capturing the growing interest of investors in the state of the economy: sovereign bonds, regarded as the safest and arguably risk-free investment, have been perceived as a much riskier asset as a result of weak macroeconomic fundamentals. In addition, the news index volatility, in particular for positive news, has increased substantially after the crisis. Finally, since 2008 there has been an increase in domestic sovereign bond yield spreads vis-a-vis the German Bund in all countries (Figure 1). This evidence supports the inclusion of a switch dummy in the model specification.

Please Insert Table 1 and Figures 1 and 2

3.2 Discussion of the Results

In order to test the adequacy of the models, Ljung–Box portmanteau tests were performed on the standardized and squared residuals. Overall, the results indicate that the VAR-GARCH(1,1) specification captures satisfactorily the persistence in spreads and squared spreads in all cases. Causality effects in the conditional mean and variance vary in magnitude and sign across countries. Note that the sign of the coefficients on cross-market volatilities cannot be determined. The estimates of the parameters of the VAR-GARCH(1,1) model as well as the associated robust standard errors and likelihood function values are presented in Tables A1-A8. The results are summarized in Table 2. We select the optimal lag length of the mean equation using the Schwarz information criterion.

We test for mean and volatility spillovers by placing restrictions on the relevant parameters; in particular, the following null hypotheses are tested: (*i*) Positive (Negative) news affect

[4] Neutral and mixed news, which have been found not to be significant in previous studies, have not been considered given the aim of this paper.

the spreads before the 2008 crisis ($\beta_{12} = 0$); (*ii*) Positive (Negative) news affect the spreads after the 2008 crisis ($\beta^*_{12} = 0$); (*iii*) Positive (Negative) news volatility affects spreads volatility before the 2008 crisis ($a_{21} = g_{21} = 0$); and finally (*iv*) Positive (Negative) news volatility affects spreads volatility after the 2008 crisis ($a^*_{21} = g^*_{21} = 0$).[5]

Please Insert Tables 2-3 and Figure 3-4

The following points are noteworthy. Concerning the effects of negative news on bond spreads (β_{12}), we find positive and significant causality at the standard 5% significance level for France, Greece, Ireland and Portugal. The biggest estimated coefficients are those for Ireland and Portugal, with values equal to 0.7576 and 0.7725, respectively. The post-September 2008 results indicate the presence of significant causality effects at the standard 5% significance level for all eight countries. The estimated coefficients (β^*_{12}) are particularly high for Greece, Ireland, Italy, Portugal and Spain with values equal to $6.6801, 0.9096, 1.8098, 4.2196$ and 2.3811 respectively. In the case of Greece, the estimate of the parameter measuring the causality effect is one hundred times bigger in the second subsample.

As for the effects of positive news on yield spreads, there appears to be negative and significant causality at the standard 5% significance level only for France, Italy, Netherland and Portugal. The largest coefficient (in absolute value) is the one for Netherlands (-0.0776). The post-September 2008 results imply no significant spillover effect for any country. Overall, we find that negative news have bigger effects (in absolute value) than positive news in all countries considered. This pattern has been reinforced by the recent crisis.

The nature of the model allows us to control and test for the presence of reverse causality, i.e. the effects of bond spread behaviour on the number of positive and negative news stories, but we do not find any statistically significant evidence for it.

Concerning the conditional variance equations, the estimated "own-market" coefficients are statistically significant and the estimates of g_{11} suggest a rather high degree of persistence. The estimates suggest that positive and negative news volatility has a significant impact on yield spread volatility (note that the sign cannot be established), with the exception of negative news in France. The magnitude of the causality effect (measured by a_{21}) is bigger (in absolute value) for negative than for positive news volatility in all countries examined but France. Furthermore, there is evidence of the 2008 crisis affecting the causality-in-variance dynamics. In particular, the post-crisis negative news volatility effect substantially increased at least for the PIIGS countries, especially in Greece and Portugal, with ($a_{21} + a^*_{21}$) being equal to 0.0666 and 0.1437 respectively, compared to the pre-September 2008 period, when the corresponding values were 0.0285 and 0.0616. Also, the exogenous variable considered is statistically significant for all eight countries, the estimated coefficients indicating a negative γ_{11} effect.

Finally, there is also evidence of co-movement between yield spreads and the news index, as shown by the conditional correlations obtained from the VAR-GARCH(1,1) model (Figure 2). In particular, the conditional correlations between negative news and yield spreads are generally positive. The upward shift in pairwise correlations (between yield spreads and negative news) is quite evident for the PIIGS countries after 2008, especially in the case of Ireland and Portugal, which suggests that bond markets in economies under pressure

[5] Joint restrictions (*iii*) and (*iv*) are tested by means of Wald test.

were particularly sensitive to negative news. Summary (mean and variance) statistics for the conditional correlations, pre- and post- September 2008, are reported in Table 3. The means are positive for all eight countries pre-September 2008. Interestingly, in the second subsample conditional correlations have substantially higher mean values (with the exception of the Netherlands), especially in the case of the PIIGS countries, where they at least doubled.

3.3 Robustness Check

To check robustness (Birz and Lott, 2013) we also consider the difference between negative and positive news indices. The causality-in-mean effect of news is significant especially after September 2008, except for Belgium and the Netherlands, whereas the causality-in-variance spillovers are found to be significant in both sub-periods, with the exception of Belgium, although they are bigger in the post-September 2008 one. The conditional correlations and summary statistics are shown in Figure 3. They suggest a positive correlation (on average) for all countries, except in the Netherlands, in the post- September 2008 period, with values higher for the PIIGS countries. In the first sub-period, the mean value of the correlations is negative in the case of the Netherlands, although it has the highest standard deviation. These findings corroborate the previous evidence both in terms of co-movements and spillovers effects, although the estimated values are different at times. The Netherlands stands apart in terms of causality patterns and contemporaneous dynamics and would need further investigation.

4 Conclusions

This paper has analysed the effects of macro news on the spread between the yield on the 10-year German Bund and on sovereign bonds in eight countries belonging to the euro area (Belgium, France, Greece, Ireland, Italy, Netherlands, Portugal and Spain) using daily data for the period 1999-2014. As in Beetsma et al. (2013), it uses newspaper coverage of macro news as a proxy for the way investors interpret news releases, which is a key factor determining their response. However, unlike that study, it models both mean and volatility spillovers, and it controls for the global financial crisis by allowing for exogenous financial shocks. The econometric analysis is based on the estimation of a VAR-GARCH(1,1) model with a BEKK representation which is ideally suited to testing for both mean and volatility linkages between macro news and bond spreads. The results can be summarised as follows. Negative news have significant positive effects on yield spreads in all PIIGS countries but Italy before September 2008; markets respond more to negative news, and their reaction has increased during the recent financial crisis. News volatility has a significant impact on yield spreads volatility, the effects being more pronounced in the case of negative news and bigger in the most recent crisis period, especially in the PIIGS countries. The exogenous factor considered, i.e. stock market returns, has the expected negative effect on yield spreads. Finally, the conditional correlations between yield spreads and negative news are significant and positive, and their increase in absolute value during the financial crisis (especially in the PIIGS countries) indicates a higher sensitivity of yield spreads to negative releases. Overall, our findings confirm the important role played by macro news reported in the press in determining sovereign bond yields. Although mean spillovers had already been examined by Beetsma et al. (2013), our analysis provides new evidence on the existence of causality linkages between news volatility and yield spread volatility; of particular interest is the finding that the latter have become even more responsive to the former during the recent financial crisis: the linkages between real sector news and financial markets have clearly become stronger in the euro area in the new financial environment (especially for the peripheral members of EMU), which should be taken into account in the debate on EU-wide macroprudential regulations.

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5 Appendix

Please Insert Tables A1-A8, and Figures 3-4 about here

Table 1: Descriprive statistics. Daily spreads are the difference between domestic 10 years bonds and the 10 years German Bund. News counts refer to domestic and international (within the Euroarea) media coverage. Please note that descriptive statistics refer to raw daily data (story counts). The sample size covers the period 04/1/1999-28/3/2014, for a total of 3808 observations.

	Pre 2008					Post 2008				
	Mean	S.D.	Skew.	Kur.	JB	Mean	S.D.	Skew.	Kur.	JB
	10 yrs Bond Spreads vis a vis German Bond									
Belgium	0.17	0.14	1.03	4.21	580	0.99	0.55	1.50	5.13	784
France	0.08	0.07	1.25	5.39	1214	0.57	0.30	1.40	4.64	609
Greece	0.41	0.35	2.13	7.82	4204	10.89	9.08	1.34	4.28	511
Ireland	0.07	0.16	1.63	9.70	5624	3.53	2.06	0.81	2.72	157
Italy	0.27	0.15	3.01	16.94	2336	2.26	1.23	0.54	2.22	103
Nether.	0.09	0.08	1.33	7.71	2966	0.34	0.13	0.94	3.48	218
Portugal	0.21	0.15	0.91	4.69	623	4.79	3.31	0.54	2.27	98
Spain	0.13	0.14	1.03	4.21	582	2.41	1.36	0.34	2.31	54
	Mean	S.D.		Min	Max	Mean	S.D.		Min	Max
	Positive News									
Belgium	0.06	0.43		0	9	0.41	3.91		0	102
France	0.38	0.81		0	9	1.27	5.14		0	104
Greece	0.02	0.04		0	2	1.07	5.74		0	91
Ireland	0.02	0.07		0	2	0.38	1.92		0	57
Italy	0.26	0.34		0	6	0.68	4.38		0	77
Nether.	0.06	0.31		0	5	0.47	3.20		0	74
Portugal	0.03	0.06		0	2	0.46	3.18		0	74
Spain	0.09	0.15		0	4	0.71	4.64		0	77
	Negative News									
Belgium	0.08	0.39		0	7	0.26	2.73		0	98
France	0.28	1.26		0	18	1.49	3.83		0	101
Greece	0.01	0.25		0	5	1.42	4.26		0	106
Ireland	0.01	0.26		0	4	0.67	3.31		0	102
Italy	0.05	0.91		0	9	0.83	3.41		0	108
Nether.	0.05	0.45		0	8	0.15	1.03		0	25
Portugal	0.01	0.31		0	7	0.61	2.73		0	77
Spain	0.01	0.48		0	8	1.11	3.66		0	104

Table 2: Summary results for conditional mean and conditional variance equations

	Pre 2008			Post 2008		
	Negative	Positive	Neg-Pos	Negative	Positive	Neg-Pos
	Mean spillovers between News and Spread					
Belgium				x		
France	x	x	x	x		x
Greece	x		x	x		x
Ireland	x			x		x
Italy		x		x		x
Nether.		x		x		
Portugal	x	x		x		x
Spain	x			x		x
	Causality in Variance spillovers between News and Spread					
Belgium	x	x		x	x	
France		x	x		x	x
Greece	x	x	x	x	x	x
Ireland	x	x	x	x	x	x
Italy	x	x	x	x	x	x
Nether.	x	x	x	x	x	x
Portugal	x	x	x	x	x	x
Spain	x	x	x	x	x	x

Table 3: Conditional Correlations Summary. Conditional correlations between spread and negative (positive) news index are given by: $\rho_{12,t}= h_{12,t}/\sqrt{h_{11,t}}\sqrt{h_{22,t}}$.

	Pre 2008		Post 2008	
	Mean	S.D.	Mean	S.D.
Bond Spreads and Negative News Index				
Belgium	0.0632	0.1605	0.1652	0.1956
France	0.0612	0.2512	0.1912	0.2723
Greece	0.0432	0.1235	0.0534	0.4732
Ireland	0.0415	0.2216	0.2365	0.1231
Italy	0.0542	0.1861	0.1954	0.3013
Netherlands	0.1601	0.1301	0.0398	0.1707
Portugal	0.0433	0.0922	0.2044	0.2272
Spain	0.1511	0.2632	0.2911	0.2354
Bond Spreads and (Negative - Positive) News Index				
Belgium	0.0012	0.1313	0.0476	0.1472
France	0.0001	0.2151	0.0353	0.2317
Greece	0.0501	0.0925	0.1212	0.1291
Ireland	0.0302	0.1041	0.1221	0.1283
Italy	0.0121	0.1773	0.1231	0.1851
Netherlands	−0.1012	0.2659	−0.1002	0.2032
Portugal	0.0121	0.1263	0.1713	0.1810
Spain	0.0122	0.1306	0.2542	0.2051

Table A1: Estimated VAR-GARCH(1,1) model for Belgium. The number of positive (negative) newspaper headlines index is defined as follows: positive (negative) news index = ln[e+domestic positive (negative) news + international positive (negative) news]. Standard errors (S.E.) are calculated using the quasi-maximum likelihood method of Bollerslev and Wooldridge (1992), which is robust to the distribution of the underlying residuals. The parameters not statistically significant at the 5% level are not reported. $\mathrm{LB}_{Spread(10)}$ and $\mathrm{LB}^2_{Spread(10)}$ are respectively the Ljung-Box test (1978) of significance of autocorrelations of ten lags in the standardized and standardized squared residuals. The parameter β_{12} measures the causality effect of positive (negative) news on the yield spread whereas .a_{21} measures the causality- in-variance effect of positive (negative) news. The effect of the 2008 financial crisis on the yield spread is measured by $(\beta_{12}+\beta^*_{12})$, whereas $(a_{21}+a^*_{21})$ captures the effects on spread volatilities. The covariance stationarity condition is satisfied by all the estimated models, all the eigenvalues of $A_{11}\otimes A_{11}+G_{11}\otimes G_{11}$ being less than one in modulus. Note that in the conditional variance equation the sign of the parameters cannot be determined.

	Negative		Positive		Negative - Positive	
	Coeff.	S.E.	Coeff.	S.E.	Coeff.	S.E.
			Conditional Mean Equation			
α_1	0.0462	0.0033	0.0571	0.0035	0.3141	0.0115
α_2	1.0135	0.0025	1.0211	0.0054	−0.0029	0.0019
β_{11}	0.0178	0.0032	−0.1213	0.0389	0.3374	0.1251
β_{12}						
β^*_{12}	0.5380	0.0114				
β_{21}						
γ_{11}	−0.0004	0.0002	−0.0001	0.0001	−0.0007	0.0004
			Conditional Variance Equation			
c_{11}	−0.0007	0.0004	−0.0006	0.0002	−0.0047	0.0022
c_{12}	−0.0149	0.0030	−0.0186	0.0068	0.0162	0.0049
c_{22}	−0.0066	0.0015	−0.0049	0.0178	−0.0001	0.0001
g_{11}	0.7698	0.0434	0.8907	0.0146	0.7211	0.1015
g_{21}	0.0669	0.0201	0.0154	0.0055		
g^*_{21}	−0.0773	0.0272	−0.0267	0.0109		
g_{22}	−0.9590	0.0063	0.9531	0.0095	−0.9777	0.0095
a_{11}	0.6780	0.0571	0.4770	0.0273	0.7111	0.1018
a_{21}	0.0531	0.0274	−0.0218	0.0080		
a^*_{21}	0.0887	0.0412	0.0511	0.0229		
a_{22}	0.2145	0.0253	0.2386	0.0332	0.1846	0.0411
LogLik		5486.8179		5246.7762		2086.4309
$LB_{Spread,(10)}$	3.112		2.137		1.143	
$LB^2_{Spread,(10)}$	2.456		1.998		2.224	
$LB_{News,(10)}$	4.442		3.142		3.643	
$LB^2_{News,(10)}$	3.996		2.167		5.443	

Figure 1: Domestic 10 years Bond Spread vs German Bond.

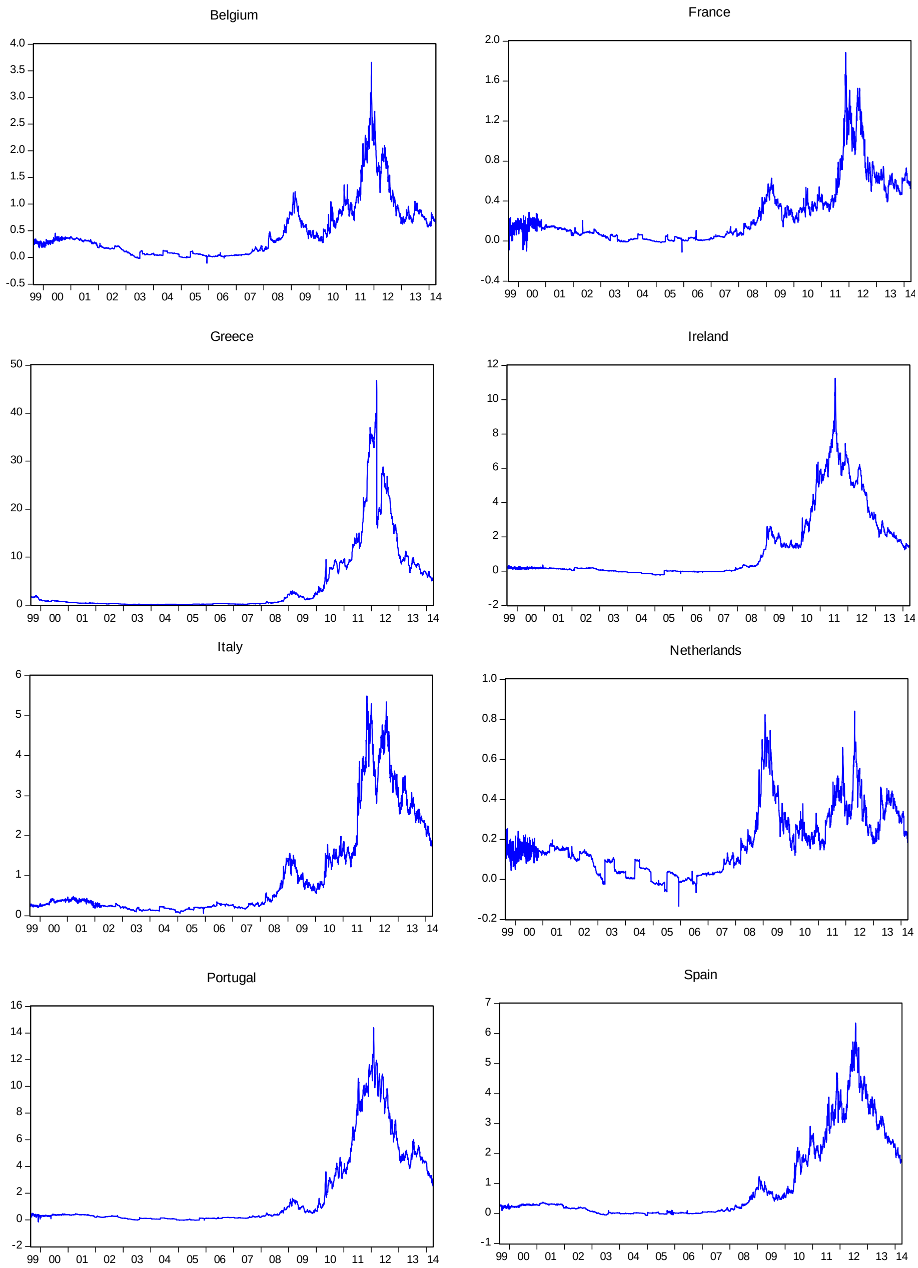

Figure 2: Difference between Negative and Positive News Index. The number of positive (negative) newspaper headlines index is defined as follows: positive (negative) news index = ln[e+domestic positive (negative) news + international positive (negative) news].

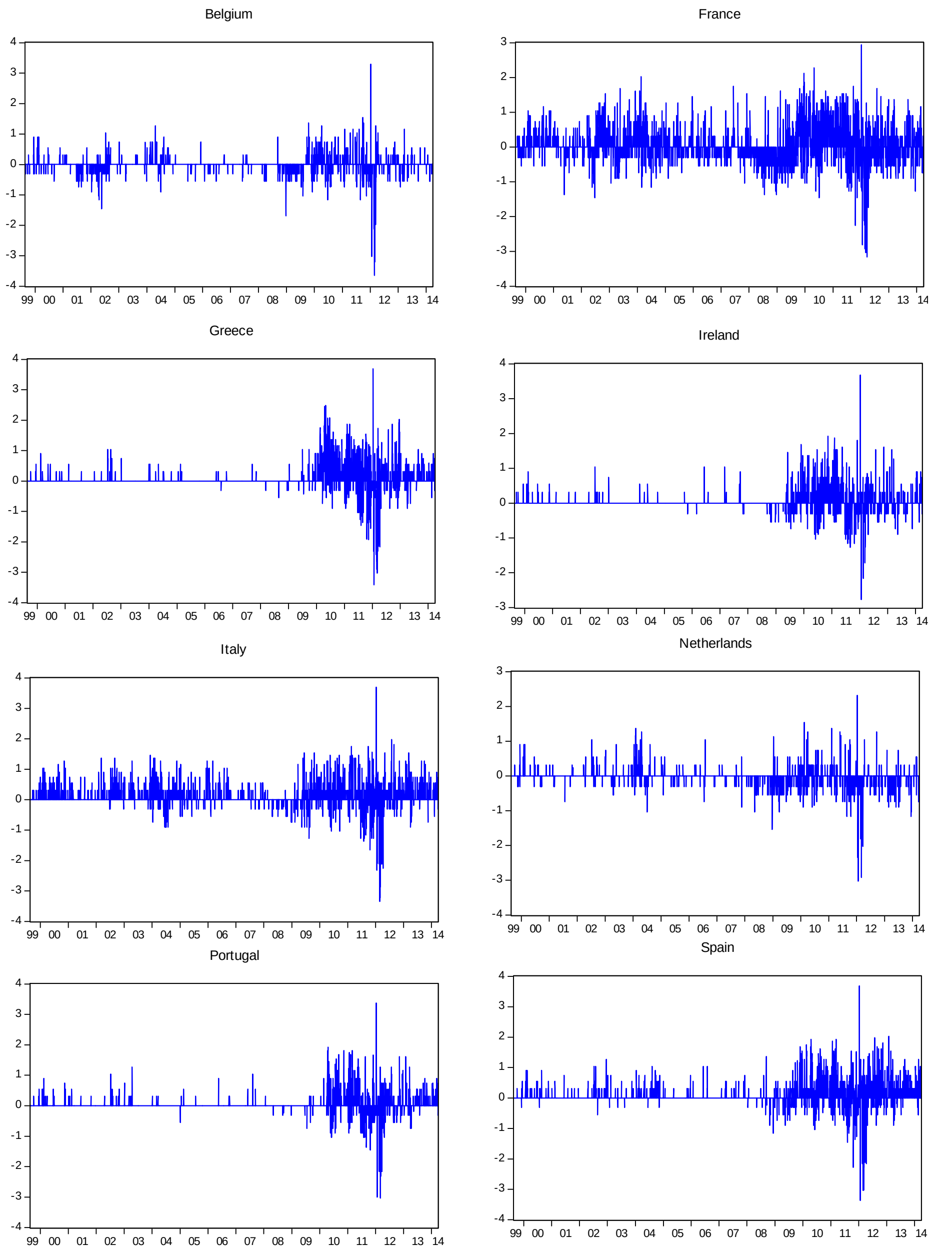

Figure 3: VAR-GARCH(1,1) Conditional Correlations between Bond Spreads and Negative News Index

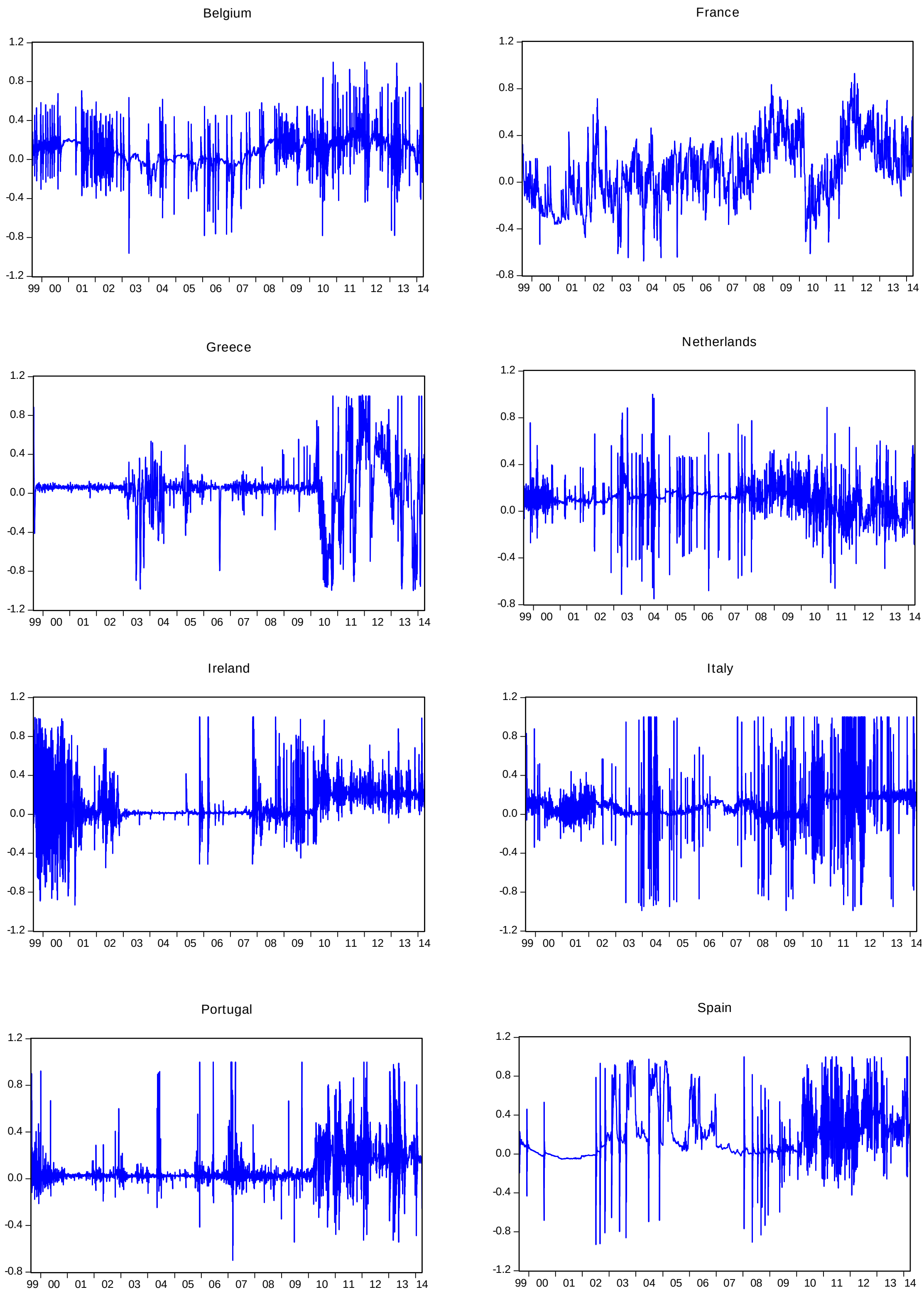

Figure 4: VAR-GARCH(1,1) Conditional Correlations between Bond Spreads and (Negative - Positive) News Index

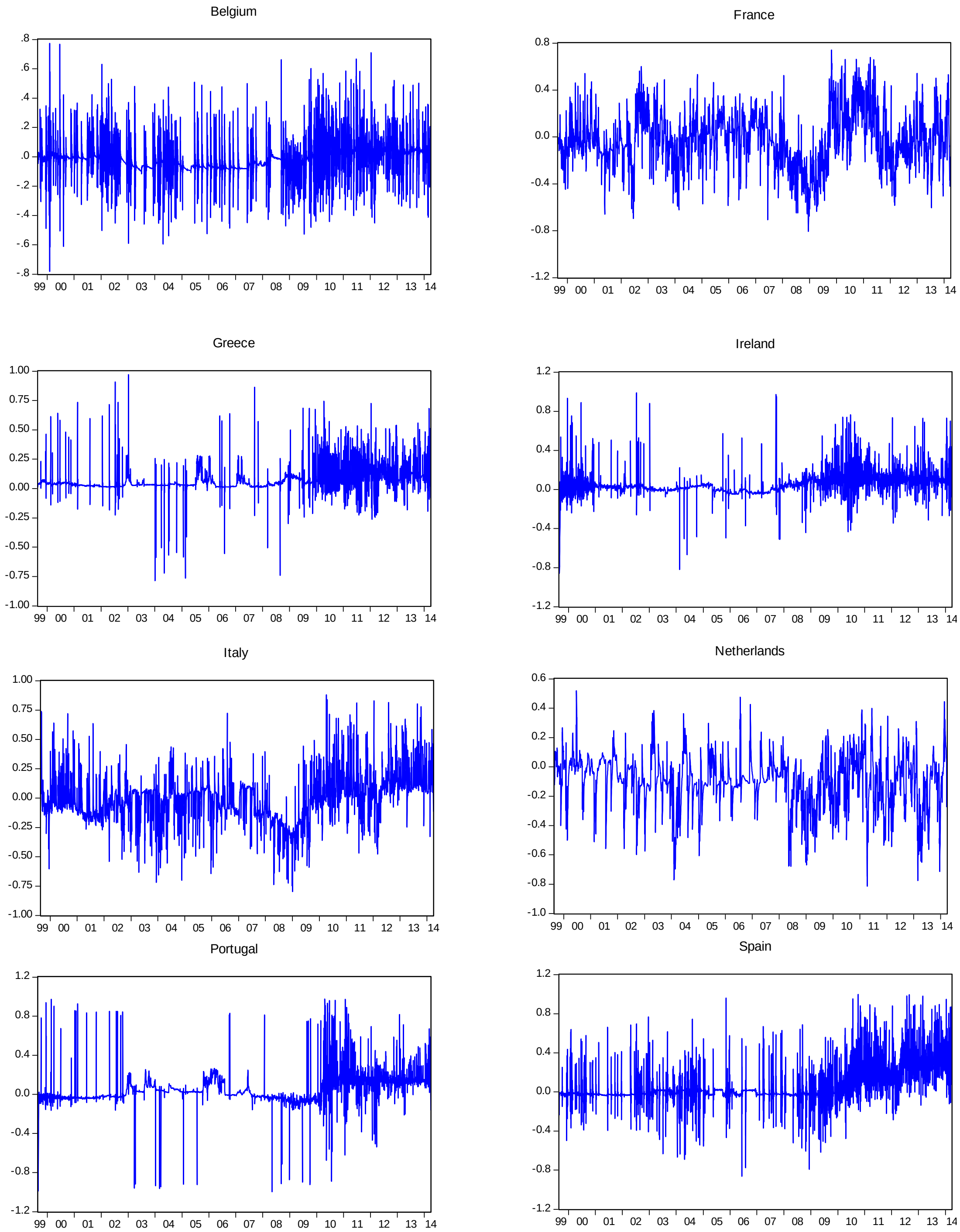

Table A2: Estimated VAR-GARCH(1,1) model for France.

	Negative		Positive		Negative - Positive	
	Coeff.	S.E.	Coeff.	S.E.	Coeff.	S.E.
			Conditional Mean Equation			
α_1	0.0507	0.0031	0.0495	0.0026	0.0462	0.0007
α_2	1.0778	0.0081	1.0762	0.0076	0.0295	0.0095
β_{11}	-0.0737	0.0087	0.0296	0.0112	0.0460	0.0034
β_{12}	-0.0035	0.0012	-0.0021	0.0018	0.0027	0.0011
β^*_{12}	0.2852	0.0135			0.0972	0.0147
β_{21}						
γ_{11}	-0.0001	0.0001	-0.0001	0.0001	-0.0001	0.0001
			Conditional Variance Equation			
c_{11}	-0.0012	0.0003	0.0009	0.0004	0.0012	0.0002
c_{12}	0.0001	0.0124	-0.0066	0.0232	0.0071	0.0057
c_{22}	0.0208	0.0058	0.0251	0.0087	0.0316	0.0068
g_{11}	-0.8653	0.0258	0.8951	0.0163	-0.7372	0.0312
g_{21}			0.0168	0.0013	-0.0370	0.0104
g^*_{21}			-0.0520	0.0165	0.0497	0.0370
g_{22}	-0.9771	0.0051	0.9727	0.0084	-0.9800	0.0037
a_{11}	0.5213	0.0455	0.4629	0.0307	0.6910	0.0361
a_{21}			0.0009	0.0003	-0.1141	0.0555
a^*_{21}			0.1026	0.0416		
a_{22}	0.1974	0.0198	0.1935	0.0242	0.1798	0.0154
LogLik		4668.6300		4402.8454		1936.7286
$LB_{Spread,(10)}$	3.332		3.673		4.442	
$LB^2_{Spread,(10)}$	4.423		3.996		3.782	
$LB_{News,(10)}$	4.119		2.885		3.885	
$LB^2_{News,(10)}$	2.659		1.993		2.886	

Table A3: Estimated VAR-GARCH(1,1) model for Greece.

	Negative		Positive		Negative - Positive	
	Coeff.	S.E.	Coeff.	S.E.	Coeff.	S.E.
			Conditional Mean Equation			
α_1	0.0795	0.0005	0.0278	0.0005	0.2181	0.0009
α_2	1.0043	0.0001	1.0042	0.0001	0.0043	0.0014
β_{11}	0.1137	0.0445	0.0829	0.0078		
β_{12}	0.0671	0.0007			0.0071	0.0026
β_{12}^*	6.6801	0.0254			1.1388	0.1385
β_{21}						
γ_{11}	-0.0004	0.0002	-0.0007	0.0002	-0.0004	0.0002
			Conditional Variance Equation			
c_{11}	-0.0011	0.0004	0.0019	0.0004	0.0031	0.0004
c_{12}	0.0001	0.0001	-0.0001	0.0001	0.0081	0.0040
c_{22}	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
g_{11}	0.6681	0.0308	0.9509	0.0579	0.9733	0.0449
g_{21}	0.0154	0.0052	0.0344	0.0101	0.0028	0.0011
g_{21}^*	-0.0305	0.0061	-0.0161	0.0063	-0.0042	0.0021
g_{22}	0.9104	0.0226	0.4384	0.1211	0.9845	0.0041
a_{11}	0.8010	0.0304	-0.3761	0.1377	-0.2831	0.1490
a_{21}	0.0285	0.0032	0.0189	0.0086	0.0102	0.0041
a_{21}^*	0.0381	0.0051	-0.0028	0.0007	-0.0057	0.0025
a_{22}	0.1576	0.0253	0.4307	0.1584	0.1267	0.0159
LogLik		7038.6525		6565.7693	5676.8021	
$LB_{Spread,(10)}$	5.442		4.701		3.238	
$LB^2_{Spread,(10)}$	4.862		3.956		2.031	
$LB_{News,(10)}$	3.995		3.667		3.659	
$LB^2_{News,(10)}$	4.001		4.054		2.228	

Table A4: Estimated VAR-GARCH(1,1) model for Ireland.

	Negative		Positive		Negative - Positive	
	Coeff.	S.E.	Coeff.	S.E.	Coeff.	S.E.
			Conditional Mean Equation			
α_1	-0.5936	0.0268	-0.0342	0.0172	-0.0273	0.0024
α_2	1.0042	0.0001	1.0041	0.0003	0.0051	0.0018
β_{11}	0.1001	0.0072	0.0880	0.0341	0.0633	0.0022
β_{12}	0.7576	0.0267				
β^*_{12}	0.9096	0.1163			0.3271	0.1586
β_{21}						
γ_{11}	-0.0004	0.0002	-0.0001	0.0001	-0.0001	0.0001
			Conditional Variance Equation			
c_{11}	-0.0023	0.0006	-0.0022	0.0009	0.0008	0.0005
c_{12}	-0.0001	0.0001	0.0058	0.0024	-0.0596	0.0098
c_{22}	-0.0001	0.0001	0.0001	0.0378	-0.0001	0.3050
g_{11}	-0.8840	0.0164	-0.8343	0.0420	-0.8256	0.0661
g_{21}	-0.0178	0.0086	-0.0354	0.0055	0.0750	0.0236
g^*_{21}	0.0219	0.0062	-0.0706	0.0130	-0.0322	0.0105
g_{22}	0.8137	0.0697	0.8942	0.0384	0.5709	0.0929
a_{11}	0.4984	0.0405	0.5637	0.0620	0.2512	0.2536
a_{21}	-0.0463	0.0157	-0.0093	0.0045	0.1416	0.0192
a^*_{21}	0.1104	0.0299	-0.0237	0.0106	-0.0531	0.0166
a_{22}	0.4327	0.0827	-0.2649	0.0564	0.1915	0.0466
LogLik		7534.6744		6546.5535		1894.9771
$LB_{Spread,(10)}$	2.003		4.337		4.442	
$LB^2_{Spread,(10)}$	4.661		2.923		4.006	
$LB_{News,(10)}$	3.009		1.009		3.775	
$LB^2_{News,(10)}$	3.870		3.774		2.881	

Table A5 Estimated VAR-GARCH(1,1) model for Italy.

	Negative		Positive		Negative - Positive	
	Coeff.	S.E.	Coeff.	S.E.	Coeff.	S.E.
			Conditional Mean Equation			
α_1	0.1943	0.0685	0.2718	0.0114	0.2392	0.0070
α_2	1.0029	0.0019	1.0102	0.0015	0.0512	0.0078
β_{11}	−0.3163	0.0022	−0.0241	0.0098	−0.4332	0.0076
β_{12}			−0.0282	0.0111		
β_{12}^*	1.8098	0.0334			0.2786	0.1047
β_{21}						
γ_{11}	−0.0008	0.0004	−0.0001	0.0001	−0.0002	0.0001
			Conditional Variance Equation			
c_{11}	−0.0019	0.0016	0.0020	0.0007	0.0056	0.0019
c_{12}	−0.0302	0.0046	−0.0148	0.0130	−0.0013	0.0137
c_{22}	−0.0001	−0.0001	0.0041	0.0371	−0.0208	0.0054
g_{11}	0.7701	0.0324	0.8606	0.0578	0.8399	0.0801
g_{21}	−0.1174	0.0562	0.0185	0.0063	0.0545	0.0143
g_{21}^*	0.1302	0.0487	−0.0081	0.0039	−0.0723	0.0177
g_{22}	0.7928	0.1101	0.9418	0.0197	0.9812	0.0053
a_{11}	−0.2124	0.0291	0.5616	0.1088	0.5657	0.1195
a_{21}	−0.4135	0.0307	−0.0086	0.0034	−0.0635	0.0126
a_{21}^*	−0.0112	0.0041	−0.0106	0.0031	0.0846	0.0127
a_{22}	0.0597	0.0413	−0.2858	0.0471	0.1745	0.0230
LogLik		3948.3381		4722.7848		2482.7376
$LB_{Spread,(10)}$	5.021		3.662		3.448	
$LB^2_{Spread,(10)}$	4.772		4.227		2.552	
$LB_{News,(10)}$	4.018		2.991		2.893	
$LB^2_{News,(10)}$	3.118		3.034		3.771	

Table A6: Estimated VAR-GARCH(1,1) model for the Netherlands.

	Negative		Positive		Negative - Positive	
	Coeff.	S.E.	Coeff.	S.E.	Coeff.	S.E.
			Conditional Mean Equation			
α_1	0.1260	0.0093	0.1723	0.0294	0.1325	0.0044
α_2	1.0205	0.0032	1.0154	0.0032	-0.0087	0.0077
β_{11}	0.0534	0.0055	0.0975	0.0087	-0.1963	0.0045
β_{12}			-0.0776	0.0310		
β_{12}^*	0.1388	0.0036				
β_{21}						
γ_{11}	-0.0002	0.0001	-0.0001	0.0001	-0.0001	0.0001
			Conditional Variance Equation			
c_{11}	-0.0035	0.0007	0.0038	0.0018	-0.0024	0.0011
c_{12}	0.0147	0.0031	-0.0127	0.0031	0.0054	0.0310
c_{22}	0.0003	0.0003	0.0001	0.0001	0.0209	0.0064
g_{11}	-0.7027	0.0277	-0.7283	0.0520	0.8903	0.0276
g_{21}	0.1291	0.0227	-0.1199	0.0524	0.0437	0.0213
g_{21}^*	0.0675	0.0098	0.7174	0.2001	0.0561	0.0235
g_{22}	0.9731	0.0091	0.9763	0.0069	0.9663	0.0117
a_{11}	0.7424	0.0345	0.7034	0.0593	0.4645	0.0568
a_{21}	-0.0992	0.0447	0.0697	0.0231	-0.0995	0.0431
a_{21}^*	0.5596	0.1787	-0.4747	0.1150	-0.1110	0.0536
a_{22}	0.1585	0.0257	0.1472	0.0264	0.2149	0.0369
LogLik		7644.3692		7171.9845		5598.7501
$LB_{Spread,(10)}$	5.008		3.529		3.229	
$LB^2_{Spread,(10)}$	4.309		4.703		4.031	
$LB_{News,(10)}$	2.881		2.661		4.447	
$LB^2_{News,(10)}$	3.118		3.069		4.229	

Table A7: Estimated VAR-GARCH(1,1) model for Portugal.

	Negative		Positive		Negative - Positive	
	Coeff.	S.E.	Coeff.	S.E.	Coeff.	S.E.
			Conditional Mean Equation			
α_1	-0.6373	0.0305	0.1865	0.0019	0.1156	0.0018
α_2	1.0042	0.0001	1.0042	0.0002	0.0087	0.0027
β_{11}	0.2398	0.0034	0.0234	0.0045	0.5268	0.0022
β_{12}	0.7725	0.0304	-0.0474	0.0024		
β^*_{12}	4.2196	0.0223			0.0981	0.0445
β_{21}						
γ_{11}	-0.0005	0.0001	-0.0001	0.0001	-0.0008	0.0003
			Conditional Variance Equation			
c_{11}	-0.0045	0.0007	0.0032	0.0009	-0.0017	0.0011
c_{12}	-0.0001	0.0001	0.0001	0.0001	-0.0590	0.0026
c_{22}	-0.0001	0.0001	0.0001	0.0001	-0.0429	0.0113
g_{11}	0.6635	0.0133	0.8307	0.0378	-0.6046	0.0505
g_{21}	-0.0908	0.0177	0.0262	0.0033		
g^*_{21}	0.0461	0.0153	-0.0741	0.0124		
g_{22}	-0.1941	0.0171	-0.8514	0.0393	0.8112	0.0372
a_{11}	0.1716	0.0359	0.4698	0.0848	0.2689	0.0401
a_{21}	0.0616	0.0201	-0.0404	0.0167	0.0234	0.0023
a^*_{21}	0.0821	0.0139	-0.0052	0.0001	0.0612	0.0097
a_{22}	0.3584	0.0878	-0.0738	0.0356	0.0734	0.1279
LogLik		9044.0492		8694.7023		1441.2402
$LB_{Spread,(10)}$	3.973		4.024		3.661	
$LB^2_{Spread,(10)}$	3.447		3.669		4.895	
$LB_{News,(10)}$	4.024		3.098		3.502	
$LB^2_{News,(10)}$	4.553		2.884		2.908	

Table A8: Estimated VAR-GARCH(1,1) model for Spain.

	Negative		Positive		Negative - Positive	
	Coeff.	S.E.	Coeff.	S.E.	Coeff.	S.E.
			Conditional Mean Equation			
α_1	0.2718	0.1249	0.0104	0.0041	0.0157	0.0007
α_2	1.0046	0.0001	1.0037	0.0004	0.0195	0.0053
β_{11}	0.0622	0.0098	0.2376	0.1092	-0.0598	0.0245
β_{12}	0.0912	0.0308				
β_{12}^{*}	2.3811	0.0256			0.5677	0.0648
β_{21}						
γ_{11}	-0.0002	0.0001	-0.0002	0.0001	-0.0002	0.0001
			Conditional Variance Equation			
c_{11}	0.0011	0.0003	-0.0016	0.0003	-0.0016	0.0003
c_{12}	-0.0023	0.0009	0.0058	0.0015	0.0075	0.0319
c_{22}	-0.0001	0.0089	-0.0001	0.0001	0.0162	0.0176
g_{11}	-0.6612	0.0246	0.6039	0.0558	0.8841	0.0456
g_{21}	-0.0020	0.0005	0.0221	0.0026	0.0426	0.0211
g_{21}^{*}	0.0249	0.0087	0.0001	0.0001	-0.1178	0.0259
g_{22}	0.9885	0.0029	-0.9505	0.0148	0.9752	0.0080
a_{11}	0.7872	0.0237	0.8207	0.0457	-0.5256	0.0654
a_{21}	0.0852	0.0022	0.0727	0.0079	0.0361	0.0088
a_{21}^{*}	0.1074	0.0176	-0.0213	0.0102	0.0234	0.0045
a_{22}	0.1701	0.0281	-0.1288	0.0528	0.1877	0.0295
LogLik		7128.5917		6563.4154		1458.7436
$LB_{Spread,(10)}$	4.661		4.330		3.033	
$LB^2_{Spread,(10)}$	4.209		3.929		4.221	
$LB_{News,(10)}$	3.601		2.996		4.009	
$LB^2_{News,(10)}$	2.559		2.973		2.099	