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EUROPEAN SOVEREIGN BAILOUTS, POLITICAL RISK AND THE ECONOMIC CONSEQUENCES OF MRS. MERKEL

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The European economy was hit by a confidence shock in 2009 when the Greek government of Papandreou discovered the true amount of public deficit. The subsequent loss of trust in European fiscal governance reduced financial markets' willingness to lend to indebted governments. The European Union established the Financial Stability Facility to support debt-ridden states but without lasting success. The continuously rising Greek bond yields suggest that the information transmitted from political leaders did not reduce investors' risk perceptions. We develop a theoretical framework, in which financial market participants do not know the real rate of return on Greek assets but infer it from the signals emitted by informed European governments. Based on a unique news dataset, we investigate the impact of good and bad news from the European institutions on the Greek interest spread. The results demonstrate that the noise around the European decision-making process substantially raised the bailout cost.

Keywords: Sovereign debt bailout; Euro Area; Greek crisis; political communication; Garch models.

JEL Classification: D82, E61, F36, C58, G15, H63

1. Introduction

While still suffering the consequences of the Lehman bankruptcy, the Eurozone[1] was hit by a second shock in late 2009 when the newly elected Papandreou government in Greece revealed the real figures of the Greek public deficit. Political uncertainties about the willingness to bail out distressed sovereign debtors continuously increased in the following years, thereby pushing the Euro Area, and ultimately even the European Union, to the brink of collapse. For instance, while Chancellor Angela Merkel at first rejected a proposal to provide a bailout for Greece, the German government ultimately

[1] Throughout the text, we use the words Eurozone and Euro Area as the epicenter of the sovereign debt crisis while when talking about institutions and governments we refer to the European Union as a whole.

agreed to the European Financial Stability Facility (EFSF), which was in fact a bailout fund. In addition, repeated conflicts between the French and the German government about how to address the European sovereign debt crisis sent contradicting signals to the market participants. Ambiguous statements announced by political leaders in the EU could have easily enhanced economic uncertainty and investors' risk perception and therefore raised the costs of Greek bonds. Even though the member states ultimately arrived at a joint policy stance and provided financial support to Greece, the noise around the European decision-making process is likely to have contributed to the rise of bond yields.

It is the goal of this paper to evaluate the consequences of uncertainty underlying the political communication on the Greek bailout process. To do so we first develop a theoretical framework, according to which governments are the informed agents who know the real conditions of the Greek bailout. By contrast, market participants receive their knowledge from media statements and news coverage, which influence their risk perceptions. To test our model we collect news statements from the political leaders of the European Union between 2008 and 2011. By distinguishing between good and bad news, we show that noise and uncertainty surrounding political communication have significantly raised the costs of the Greek bailout.

We argue that the costly repercussions of the uncertain European decision-making process are, first of all, a governance problem to which financial market participants have responded. Because, by definition, nation state governments first serve their national constituencies, they will seek to limit the exposure of national tax payers to potential losses from defaults. Hence, an uncooperative discourse, characterized by arbitrary and fluctuating political statements, dominates the crisis communication in the EU. Financial market participants interpret these discourses as a heightened risk of default, which reduces their willingness to hold risky Greek assets. The consequence is that yields shoot up, because there is a growing excess supply of bonds in the secondary market. Hence, the costs of bailouts depend significantly on the political and institutional setup of the European Union. As long as intergovernmental policy making dominates, diverging statements and ambiguous political signals on bailout issues are almost inevitable.

In Sec. 2, we describe the communication problem and its relation with the European debt crisis, based on which we then develop a formal model in Sec. 3. The model follows the literature in assuming that financial market participants do not know the real rate of return on Greek assets, but infer it from the signals emitted by informed governments; we show that when the signal is emitted with noise, the perceived risk raises together with the bailout cost. We then test the theoretical model in the subsequent sections by investigating the impact of good and bad political news on the daily Greek interest spread. Section 4 describes the unique news dataset and explains the data collection and analysis techniques. Section 5 discusses the econometric model and the relevant variables and presents the estimates based on a Garch model for the impact of political uncertainty on the Greek yield spread before we conclude in Sec. 6.

2. Political Communication and Its Effects on the Euro Area Debt Crisis

Prior to the euro crisis, markets were thought to discipline member states with large or excessive deficits (Codogno *et al.*, 2003). This turned out to be wrong. From the beginning of monetary union until the Lehman crisis, sovereign bond yields in the Euro Area moved together with minimal spreads. During this time some governments, like Greece, did not face hard budget constraints imposed by markets and they borrowed more than allowed under the Stability and Growth Pact. Others, like Ireland and Spain enjoyed a property bubble fueled by low interest rates that filled their treasury. However, with the bankruptcy of the Lehman Brothers, followed by the revelation of excessive borrowing in Greece, the sovereign bond spreads of many Southern European members suddenly shot up to levels that, if they persisted, would make sovereign debt unsustainable. While markets were first negligent to default risks, they now panicked. Greece was the first to be cut off from market liquidity and later Ireland and Portugal followed.

Generally, good crisis management should reassure markets, avoid panics and concentrate on fixing fundamentals, such as excessive public debt and regional competitive imbalances. By contrast, bad management signals uncertainty among policy makers, confuses observers and generates panic. Crisis management in the EU was no absolute failure, but nonetheless, it triggered uncertainty and confusion as political resistance to bailing out these states was initially high. To what extent did their behavior relax or fuel the rising tensions on the financial markets? It is the goal of this section to discuss the role of political communication and its potential impact on financial market behavior.

Various studies have highlighted the significance of communication on the movement of financial markets: For instance, Blinder *et al.* (2008) show that communication is a powerful part of central banks' instruments. Their main argument is that statements from central bankers about potential policy adjustments change the expectations of market participants who adjust their behavior accordingly. Thus, proper communication can help achieve central banks' macroeconomic objectives. Certainly, communication is not an easy instrument as authorities may transmit unintended messages. One famous example of such miscommunication is when former European Central Bank (ECB) President Wim Duisenberg hinted in October 2000 that there would be no further central bank intervention to support the euro. His statement led to an immediate depreciation of the euro (Blinder *et al.*, 2008).

While Blinder *et al.* (2008) focus on the role of communication by central banks, other academics investigate the effect of media reporting on financial market activity. For instance, Brooks *et al.* (1999) study the effect of news about the macroeconomic performance of the Australian economy. They show that announcements of current account data have significant effects on a large set of financial market variables. Moreover, partitioning the announcements into good and bad news, they find that only bad news has a significant impact. The finding that bad news tend to have a stronger and more significant impact on market activity than positive news is recurrent in the literature. Also Tetlock (2007) shows that high media pessimism brings about a downward pressure on stock market prices whereas the reverse is not the case. One argument is that investors are loss-averse, which leads to an asymmetric perception of media news (e.g., Dräger, 2009). Although negative news tends to have a stronger effect than positive ones, unusually high and low media pessimism both have an effect on market volatility (Tetlock, 2007). In other words, market transactions tend to increase with extreme market sentiments. While these authors focus on diverse aspects of communication, they generally share the assumption that communication is a powerful instrument, which influences financial market activity.

A variety of studies investigate the impact of media reporting on financial market movements, yet, no study has, to our knowledge, addressed the specific link between communication and bond yields. In our case, political communication is the main concern, which refers to the information provided by governments and political leaders of the European Union regarding the Greek bailout package. Certainly, during times of economic stability, information about potential policy adjustments may matter less than for instance, announcements about future economic conditions such as inflation or interest rate expectations (Mosley, 2000). However, the European sovereign debt crisis drew attention to the potential default risk of some member states. As Greece was at the brink of default, investors were likely to give more attention to the actions and the statements of the political leaders than to macroeconomic data. Will authorities provide financial assistance to bail out the indebted country or will financial market participants experience investment losses in case of default? That was their question.

In other words, the communication by political leaders in the European Union is likely to influence investors' risk perceptions and influence their decisions to buy and hold Greek bonds. However, the European decision-making process differs in significant ways from the domestic political arena. Although economically the Euro Area accounts for a single currency, the political process is far more decentralized and characterized by intergovernmental bargaining. This institutional particularity is likely to increase the noise surrounding the decision-making process for the Greek bailout.

In the beginning of the year 2009, the European authorities embarked upon a discussion about if and how to bail out Greece. Although the governments of the Euro Area ultimately intervened to stabilize the markets, the crisis management was surrounded by a great amount of uncertainty about the willingness of the Members States to provide financial assistance to Greece. Politicians, journalists and academics made divergent claims about Greece's membership in the monetary union. The German government, which had a particular role as the *économie dominante* in the European Union, also emitted inconsistent signals. Sometimes they emphasized their support for Greece and other times, they seemed to prefer to expel Greece from European

Monetary Union[2] rather than commit taxpayers' money "to bail out lazy southerners."[3] The key question is whether communication from European political leaders influenced the behavior of financial market participants during the crisis by lowering or increasing market uncertainty. In the next section, we introduce our theoretical framework in more detail.

3. The Model

Inspired by Calvo (1999) and Grossman and Stiglitz (1980), we propose a model for the Euro Area, where all public sector borrowing is financed by issuing bonds. Private markets hold a portfolio of two assets, risky and riskless government bonds. For linguistic convenience, we will call the risky bonds "Greek" and the riskless "German". For risky bonds the return varies with different states of the world. To keep things simple, we look at the comparative statics of one period, where decisions are influenced by previous realizations and future expectations. Furthermore, we do not distinguish between domestic and foreign investors and assume that macroeconomic data like growth and inflation perspectives are one but not the only component of demand for holding bonds. In the econometric estimates, we cover these factors by adding an economic news variable (*ECON*).

When deciding how much of these bonds they will keep in their optimal portfolios, private investors use all publicly available information. If the supply of risky Greek bonds exceeds what markets are willing to hold at given prices, the excess supply will push bond prices down and yields up, unless other governments or the EU "bailout" Greece. By bailout, we mean a non-market intervention with the purpose of stabilizing bond prices and yield spreads. In the context of the Euro Area, the intervening authorities are a syndicate of governments or a lender of last resort like the ECB or the EFSF. We will refer to these authorities alternatively as "governments" or "the Union." While bond prices vary in private markets, bailouts are modeled as bond purchases at par.[4]

The purpose of the bailout is to prevent a fall in bond prices that could destabilize the banking system. Falling bond prices would not only damage banks' balance sheets, but generate yield spreads between risky and risk-free assets that may make Greek debt unsustainable. Thus, yield spreads depend on investment decisions made by private operators and on bailout decisions made by governments. Governments have privileged information about Greece's macroeconomic variables and policies, especially fiscal policies (i.e., the supply of bonds) and monetary policy (i.e., the supply of liquidity to banks). This assumption reflects the close cooperation within the European institutions (Council, Commission and the ECB).

[2] See Chancellor Merkel's declaration in: Deutscher Bundestag – 17. Wahlperiode – 30. Sitzung. Berlin, March 17, 2010, p. 2719.

[3] See http://www.tagesspiegel.de/politik/merkel-fordert-einheitliches-rentenalter-in-europa/4187960.html.

[4] This is equivalent to saying that the Union lends money directly to the Greek government.

Because of asymmetric information, the private sector takes decisions after observing what governments reveal about their intended policies. In the European Union, policy decisions are the result of messy negotiations between member states and with European authorities. They often reflect compromises and/or the preferences of the most powerful government(s). These compromises are easily challenged by domestic opposition within member states, or by other member states, and as a consequence the communication about public policies is frequently disturbed by noise (signaling errors). The higher the noise, the larger is the uncertainty among investors about government's intended policies. Investors are risk averse, so that higher uncertainty lowers the willingness of the private sector to hold risky assets.

Let $\bar{B}_i$ and $\bar{X}_i$ denote the given total supply of safe German and risky Greek bonds respectively. The bonds are held by investors in the private sector P or by Union governments G. The total supply of riskless German assets is $\bar{B} = \sum_i^{P,G} \bar{b}_i$, *for* $i = \{P, G\}$ and of risky Greek assets it is $\bar{X} = \sum_i^{P,G} \bar{x}_i$.

The individual investor's budget constraint satisfies:

$$px_i + b_i = \bar{b}_i + p\bar{x}_i. \tag{1}$$

The price of risky assets in terms of the safe asset is p. Hence, the price of German assets is always equal to one. The return for safe German assets is ρ and for risky Greek assets r_t. Thus, future wealth of actor i is:

$$W_i = \rho b_i + rpx_i. \tag{2}$$

The demand of assets is determined by the optimal portfolio allocation at given prices p_t. The change of the relative bond price p is a negative function of the excess supply of bonds:

$$\Delta p = p(\bar{X} - x_P(p_t) - x_G), \quad \text{with } p' < 0. \tag{3}$$

Changes in bond prices determine the bond spread, which is $r/p - \rho$, and the extra return required for holding a risky bond in the private sector's portfolio at given prices is $r - \rho p$.

We will assume that the private market's asset allocation is dependent, *ceteris paribus*, on the relative bond price p, but the Union will bail out Greece's risky assets at face value. Following Grossman and Stiglitz (1980) we assume an exponential utility function for wealth:

$$V(W_i) = -e^{-\beta W_i}, \tag{4}$$

where $\beta > 0$ is the coefficient for absolute risk aversion. Before we determine the optimal portfolio, we need to discuss the returns on assets. We take the return on riskless German assets as given and model the return on risky Greek assets as a stochastic process:

$$r_t = s_t + \varepsilon_t, \tag{5}$$

where s_t is the function of a set of fundamental economic parameters, such as capital productivity, the debt ratio, deficits, growth, and competitiveness, all of which determine jointly the solvability of Greek bonds. Thus, s_t is the accurate signal for the return on Greek bonds given the state of economic fundamentals and ε_t is a white noise error. We assume that s and ε are normally distributed $s \sim \mathrm{N}(\bar{s}, \sigma^2)$, $\varepsilon \sim \mathrm{N}(0, \nu^2)$. It follows that $s - \rho p$ is the extra return required for holding Greek bonds, given full knowledge of the economic policies pursued by the Union.

Proposition 1. *Uncertainty in the private sector is higher than for governments.*

Proof. Insiders in governments do not know ε_{t+1}, but s_t and the two respective distributions, while private operators do not know ε_{t+1} or s_t but only the distributions of s and ε (see Enders, 1995). It follows that the expected return for governments from bailing out Greece is $E_t(r_{t+1}|G) = s_t$ and the expected return for the private market of holding Greek bonds is $E_t(r_{t-1}|P) = \bar{s}$. The forecast error variance for governments is:

$$E_t[(r_{t+1} - s_t)^2] = E_t(\varepsilon_{t+1}^2) = \sigma^2. \tag{6}$$

If we assume[5] momentarily that $\{s_t\}$ is a stationary AR(1) process such as $s_t = a_0 + a_1 s_{t-1} + \varepsilon_t$, with mean $\bar{s} = \frac{a_0}{1-a_1}$ and $0 < a_1 < 1$, the error variance for the private sector will be:

$$E_t[r_{t+1} - \bar{s}]^2 = \frac{\sigma 2}{1 - a_1^2}, \tag{7}$$

which is larger than the forecast error for governments because $(1 - a_1^2) < 1$. The private sector could improve its investment performance if it knew the model s_t by which governments decide to bail out Greece. However, the $\{s_t\}$ process is based on confidential information available to governments while private investors only know actual realizations of r_t. They could try to obtain information from past realizations which would improve on the unconditional error variance by calculating the conditional variance of the risky return as:

$$\mathrm{Var}(r_{t+1}|r_t) = E_t(r_{t+1} - a_0 - a_1 r_t)^2 = E_t(\varepsilon_{t+1}^2). \tag{8}$$

The question for private operators is then: What drives the error process $\{\varepsilon_t\}$? Given the messy governance of the Euro Area, there will be lots of noise and uncertainty as to what governments will actually do. One may, therefore, model the conditional variance of the return on Greek bonds as a multiplicative conditionally heteroskedastic process first proposed by Engle (1982):

$$\varepsilon_t = \kappa_t \sqrt{\alpha_0 + \alpha_1 \varepsilon_{t-1}^2}, \tag{9}$$

where $\{\kappa_t\}$ is a white noise process with $\sigma_t^2 = 1$, κ_t and ε_t are independent from each other and α_0 and α_1 are constants such that $\alpha_0 > 0$ and $0 < \alpha_1 < 1$. In this case, the

[5] The argument that follows does not depend on this assumption, but it simplifies the argument and exposition.

error sequence $\{\varepsilon_t\}$ still has the unconditional mean of zero, the constant variance ν^2 and the errors are uncorrelated. However, the conditional variance of the error process is now dependent on the past history of ε_{t-1}:

$$E(\varepsilon_t^2|\varepsilon_{t-1}) = \alpha_0 - \alpha_1\varepsilon_{t-1}^2. \tag{9a}$$

If previous periods' errors were large, the conditional variance in t will also be large and the private sector has a noisy perception of risky returns. The conditional variance of the error term can be estimated by a GARCH (q, p) model from the observed data; it captures alternating periods of tranquillity and volatility.

It follows from Eqs. (8) and (9a) that the conditional variance of the risky returns from Greek assets will go through periods of high volatility, depending on the nature and occurrence of shocks that hit the system. So far our system says nothing about how these shocks are generated. However, while the return s_t is known to policy makers (in fact their policies largely generate it), the forecast errors in the private sector must reflect political noise. When statements made by political leaders are clear and credible, markets will understand what governments will do and they will adjust their own strategies. By contrast, if the signals from governments are unclear, confused and contradictory, private investors will hesitate to take risky Greek bonds into their deposit for fear of making errors. Thus, there is an additional risk factor for holding Greek bonds that is purely political and unrelated to the risk in economic fundamentals. We will refer to this as "political risk."

If the errors were normally distributed and investors were risk neutral, shocks should not affect the return on Greek assets. However, risk adverse investors will ask for a premium that compensates them for holding risky assets. To assess that risk, they look at past errors, so that the conditional variance becomes the measure of noise. In this case, the rate of return that reflects fundamentals must be augmented by the political risk premium, which can be assumed to be an increasing function in the conditional variance of $\{\varepsilon_t\}$. For heteroskedastic political shocks, the return should be higher in periods of large noise and uncertainty. This political risk premium can then be estimated as an ARCH-M process (see Engle *et al.*, 1987):

$$s_t = s_t^* + \delta h_t, \tag{10}$$

where s_t^* is the risky return based on fundamentals (which may change over time, but, given our static framework, we take as exogenously set) and δh_t the political risk premium caused by noise in government communication. $h_t = \alpha_0 + \alpha_1\varepsilon_{t-1}^2$ stands for the conditional variance of the error process (9) and $\delta > 0$ is a coefficient that measures the impact of noise on the rate of return. □

Proposition 2. *The larger the political noise, the larger is the need for bailouts.*

Proof. We re-write Eq. (5) as:

$$r_t = s_t^* + \delta\, h_t + \varepsilon_t \tag{5a}$$

and maximize public and private investors' utility function (4) for holding risky bonds (see Grossman and Stiglitz, 1980). If the private portfolio is negatively related to the noise function for given bond prices, and Greek bond supply is fixed, then the Union has to absorb the excess supply of Greek bonds.

First, we determine the optimal portfolio for European authorities for bailing out Greece. By assumption the bailout price for the Greek bonds is always at par;[6] the optimal portfolio for governments must therefore satisfy

$$x_G = \frac{s_t^* - p\rho}{\beta \nu^2} \tag{11}$$

and $p = 1$ in (11). Hence, the optimal bailout portfolio is proportional to the extra return that would be required if bond holders had the insider knowledge of governments. If the two returns were identical, the extra return would be zero, which would imply that Greek assets are no riskier than German assets. Governments would not have to intervene in the bond market because private investors would buy up all the newly issued public debt at market determined prices.

However, private investors do not know s_t^* and they will therefore seek to infer its value from governments' will to bail out Greece. But the information about policies is subject to noise when policy makers make contradictory declarations. After a while the noise may subside and the effective actions by governments may become clearer to markets, but in the meantime private investors will either request a political risk premium or they reduce the share of risky Greek bonds in their portfolio.

One way to model this investment behavior under uncertainty is to assume that private investors discount the value of government bailouts by the political risk premium that is generated by noisy governments. We can describe this discounted variable as:

$$\tilde{x} = x_G - z, \tag{12}$$

such that $z = x_G - (\frac{1}{1+\mu})x_G = (\frac{\mu}{1+\mu})x_G$, for $\mu = \frac{\delta h_t}{s*_t}$, where z represents the noise variable. The higher δh_t, the louder the noise and the larger the risk premium.

Combining (11) and (12), we get:

$$x_P = \frac{s_t^*}{s_t^* + \delta h_t} \frac{s_t^* - p\rho}{\beta \nu^2}. \tag{13}$$

The portfolio of private market operators will shrink when the political noise δh_t increases. Remember that δh_t is the conditional variance, which exhibits heteroskedastic clusters of high and low uncertainty. Furthermore, if markets have a long memory, the negative effects of noisy political communication can be rather persistent. If bond prices are to remain stable, bailout intervention is required to absorb the excess supply of Greek bonds. Hence, the excess supply, which is the difference between total Greek bond

[6] A fixed haircut ratio could be added to the model without changing its basic structure.

issuance and the optimal portfolio of private markets at a given price p_t and noise h_t is:

$$\hat{x}_G = \bar{X} - x_P(p_t, \delta h_t). \tag{14}$$

Because $x_P(p_t)$ falls, as the political noise δh_t increases, larger bailouts are necessary at given levels of Greek bond prices. □

Proposition 3. *Bond prices will fall as public borrowing and political noise increase unless governments bail out Greece.*

Proof. Inserting (13) into (14) and solving for p_t yields:

$$p_t = \frac{1}{\rho}\frac{s_t^{*2} - (s_t^* + \delta h_t)(\bar{X} - x_G)\beta\nu^2}{s_t^*}. \tag{15}$$

Bond prices fall when the supply of risky Greek assets increases:

$$\frac{\partial p_t}{\partial \bar{X}} = \frac{-\beta\nu^2(s_t^* + \delta h_t)}{\rho s_t^*} < 0. \tag{16}$$

They also fall with higher political noise:

$$\frac{\partial p_t}{\partial \delta h_t} = \frac{-(\bar{X} - x_G)\beta\nu^2}{\rho s_t^*}. \tag{17}$$

This expression is negative for $(\bar{X} - x_G) > 0$, meaning that the Union does not bail out the full excess supply. If the Union buys all Greek bond supply, bond prices are stable, even if the political noise increases.

The results in (16) and (17) are important when the private banking system is holding a substantial share of risky Greek bonds in its portfolio. For in that case, the losses in the bond market could destabilize banks' balance sheets and cause bank runs. Hence, governments may have to set a lower floor for bond prices in order to avoid financial crashes. Assuming this floor price is $\hat{p}$, the necessary bailout amount is $\hat{x}_G = \bar{X} - x_P(\hat{p}, \delta h_t)$ and only reducing the political noise or the Greek borrowing requirements can reduce the need for the Union to buy risky Greek bonds. A strategy to minimize government bailouts must therefore aim at reducing deficits and communicate clearly and coherently.

We will now estimate the impact of political miscommunication on Greek bond spreads. We take the communication of the German position through Chancellor Angela Merkel statements as a proxy for political noise. The reason is that Germany is the dominant player in the Euro economy and Mrs Merkel's declarations have frequently created uncertainty about Germany's commitment to support Greece or the euro. □

4. The Media-Based Variables: Data Description

Our independent variables are based on a unique set of media data that contains information about political opinions and actions as well as about economic announcements of the Greek economy between January 2008 and September 2011.

The data were published by Dow Jones International News, a real time newswire focussing on business, financial and economic news from around the world. Its coverage involves foreign exchange, capital markets, and political news so that it is a crucial source of information for financial market participants about the economic and political conditions in Greece.

We focus on Greece as it was the epicenter of the Euro Area debt crisis and the first to need financial assistance. As such Greece provides a suitable case to test the impact of media news on the interest spread between Greek and German government bonds. To assess the responsiveness of bond ratings to positive and negative news, we extracted news data from the Dow Jones International News through FACTIVA and coded the material with the software program MAXQDA. The coding of the variables is based on a codebook in line with the standards of a qualitative content analysis (Mayring, 2008). It comprises all details regarding the search specifics and the coding guidelines for allocating text passages to the respective categories. It includes key words for finding important media articles and coding details for determining the tone of the article. High levels of coding accuracy and robustness of the data was achieved by repetitive sampling and coding.

In the coding guidelines, we distinguish between two political and one economic news category; they capture statements, opinions and actions with regard to the Greek bailout. With respect to the political category, we differentiate between the impact of news from the European institutions as such and from representatives of the German government. Due to the dominant role of Germany in the intergovernmental decision-making process of the bailout, we regarded the distinction between the two political variables as suitable. The following provides an overview of the independent variables that we generated from the Dow Jones International News Bulletin:

(1) *European institutions variable* (*EU*): Captures news from European institutions. It is a binary variable with the value of one if European news are reported on a day and zero otherwise.

   (1.1) *EUB*: Support/solution is rejected or opposed.
   (1.2) *EUU*: Support/solution is postponed or uncertain.
   (1.1) *EUG*: Support/solution is implemented or supported.

(2) *German Government variable*: Captures news statements from representatives of the German government, above all from Chancellor Angela Merkel.

   (2.1) *Germany*: A binary variable with a value of one if news is reported on a day and zero otherwise.
   (2.2) *FrGermany2W*: Captures the average number of statements over the previous two weeks.

(3) *Economic Variable* (*ECON*): Captures news from the three main rating agencies (S&P, Moody's and Fitch). It is a binary variable, which takes on the value of one when news from the rating agencies is reported on a day and zero otherwise.

We designed the European and the German variables to capture political aspects that influence investors' risk perceptions for holding Greek bonds. The *EU* variable includes statements from informed representatives of the European Commission, the Parliament, the European Central Bank as well as the heads of the member states about their support for cooperation and financial aid. For instance, the statement "European Union officials insist there won't be a bailout for Greece..." (DJ March 17, 2010) is coded as negative whereas the claim that "European Central Bank President Jean-Claude Trichet sees no reason to doubt the solidity of other euro-zone countries after Greek's debt crisis..." (DJ January 29, 2010) is coded as positive due to their expected negative and positive effects on the interest spread. By contrast, *Germany* specifically controls for when the German government participates in the discussion. We further constructed a variable indicating the frequency, with which German news circulate as the effect of recurrent signals may be different than those of sporadic ones. The frequency is measured by the average numbers of statements over the previous two weeks.[7]

To control for the effect of economic news on the interest spread, we designed the economic variable *ECON*, which documents the news releases of the three major rating agencies, S&P, Moody's and Fitch. The rating agencies integrate past and present aspects of economic growth and unemployment of various actors and are therefore a powerful way to measure wide-ranging economic sentiments. Initially, we distinguished between a pessimistic and a positive outlook coding a downgrading of Greek bonds as negative whereas a stable or good outlook or a potential upgrading was coded as positive. However, in all but one case the data of the *ECON* variable belong to the negative category so that it basically captures the effect of bad news. The media-extracted categories were consequently transformed into categorical variables to allow for a better interpretation of their impact on bond ratings. More specifically, for each variable we build a dummy indicating whether the Dow Jones database releases corresponding news on a certain day. The distribution of these variables is summarized in Table 1. From the beginning of 2008 until the end of September 2011, we recorded statements from rating agencies on 45 and from the European institutions on 156 days. As noted above the *ECON* variable mainly captures negative news effects whereas the German data are mostly classified as positive and as such reflect good news. The good–bad continuum is more evenly distributed for the *EU* variable. Table 1 shows that although the category "good" dominates, "uncertain" and "bad" news are also present on numerous days.

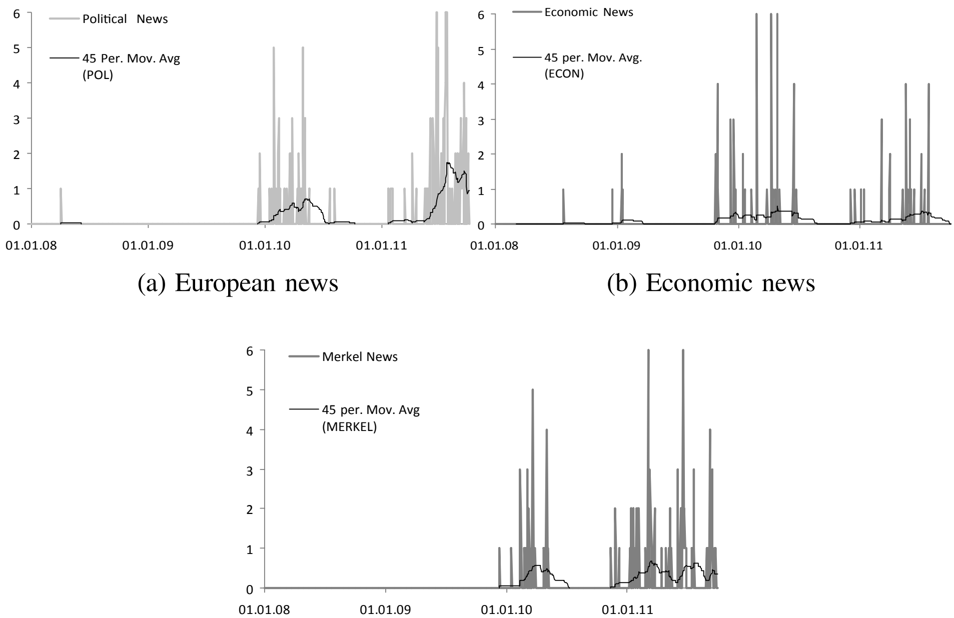
In Fig. 1, we plot the distribution of the three news categories, European, German and economic over time: The similarities of the timings are striking, above all between the European and the German news as they exhibit similar strong concentrations in specific time periods. For all three categories the media coverage frequency picks up in

[7] We experimented with several time lags but opted for the two weeks period due to its better performance in the estimates.

Table 1. Distribution of the news variables from 01/1/2008 to 30/09/2011.

	ECON	Germany	EUG	EUU	EUB
0	934	900	919	936	926
1	45	79	60	43	53

Source: Dow Jones International News (accessed through Factiva Search Engine).



(a) European news

(b) Economic news

(c) German news

Source: Dow Jones International News (accessed through Factiva Search Engine).

Figure 1. Timing and frequency of media statements.

December 2009. During this period, Greece's bonds were downgraded by Fitch to BBB+. Shortly thereafter, Papandreou outlined the reforms with which his government planned to cut the public deficit. Among others, he proposed to cut social security spending by 10%, to impose a 90% tax on private bankers' bonuses, to fight tax evasion and corruption and drastically overhaul the pension system. The situation in Greece kept deteriorating in the following year: In February 2010 Papandreou announced further austerity measures and in April 2010 he started talks about financial support with the EU. The media coverage remained dense until mid-May 2010, when the European Union agreed on the first bailout package.

The first bailout package provided a short period of tranquility. The EFSF, which issues bonds and is backed by the members' guarantees, aimed to safeguard financial stability in Europe by providing financial assistance to Euro Area member states. Among others, it provides loans to countries with financial difficulties, it can intervene in the debt markets and recapitalize financial institutions. Yet, the phase of tranquillity did not last long: end of 2010 the news coverage picked up once more and has not come to a halt.

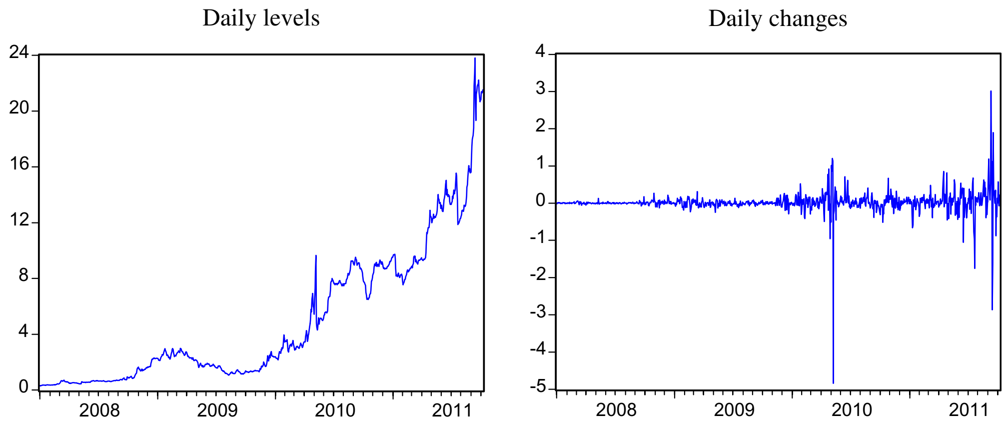
Since the beginning of 2011, the news has oscillated between negative and positive information. Bad news has mainly been transmitted by the rating agencies. Greece sovereign bonds have continuously been lowered to junk status as the economic outlook has not recovered and default risk kept increasing. Yet, it is not only economic news that can be classified as bad. Also a substantial amount of political news can be grouped into that category (Table 1). In fact, almost two thirds of the European news is classified as bad or uncertain. It means that financial support was postponed, rejected or disapproved of by European political actors. Yet, these actors also provided a substantial amount of information, which signaled their willingness to provide financial support to Greece and to keep it in the Euro Area. In sum, the news signals released to uninformed financial market participants were ambiguous, which enhances uncertainty and risk perceptions. It therefore seems crucial to disentangle the effects of uncertainty underlying the decision-making process and the Greek bailout cost. Do good and bad news from political actors significantly affect the interest rate spread in the Eurozone as investors change their preferences respectively? If yes, how do ambiguous signals from European political actors influence the behavior of market participants?

In the following section, we further discuss the role of positive and negative news and their influences on the interest spread. The news variables, *ECON*, *EU* and *Germany* and *FrGermany2W* are introduced in the estimates as a direct determinant of the interest rate spread (the real rate of return s_t) and indirectly as a determinant of the volatility (the noise h_t). We first describe the dependent variable before elaborating the estimations strategy employed in this project.

5. Effect of Political and Economic News on Greek's Spread

5.1. *Data and descriptive statistics*

Our dependent variable is the Greek interest rate spread, which is the difference between the Greek and German interest rates on 10 years bonds; the data are from Bloomberg. The evolution of the Greek interest rate spread and its daily changes are shown in Fig. 2. Volatility started to increase modestly with the global financial crisis in the last quarter of 2008 but accelerated when Papandreou's government uncovered the real situation of Greek public finances, leading to the bailout on May 10, 2010. The bailout had the immediate effect of reducing the spread by 500 base points, as the



Source: Bloomberg.

Figure 2. Interest rates spread between the Greek and German 10 year bonds.

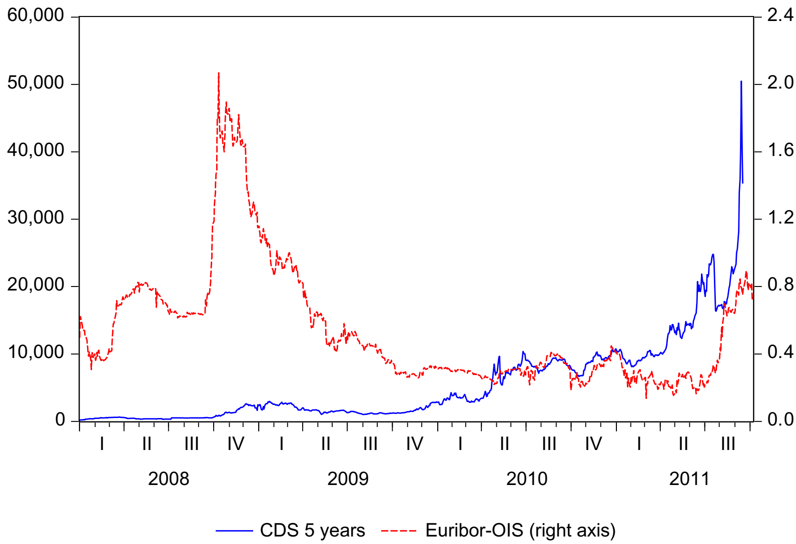
second panel of Fig. 2 demonstrates. Yet, the smoothing effect of the bailout was not of lasting nature and the spread continued to rise despite of the political efforts of the EU and the IMF to provide financial guarantees. Finally, the speculative attacks starting in July 2011 caused the spread to rise to over 20% in mid-September.

Together with the variables described in Sec. 4 (Germany, *FrGermany2W, ECON, EUB, EUU, EUG*), we introduce as regressors a measure of credit risk (*spread_3m*) given by the spread between the three months Euribor and the three months Overnight Index Swap (OIS) (Mc Andrews *et al.*, 2008; Schwarz, 2010; Taylor and Williams, 2008) and the 5 years Credit Default Swap (CDS) as measure of sovereign default risk (Schwarz, 2010). Their evolution over the period 2008–2011 is shown in Fig. 3 where we can see that the CDS follows closely the pattern of the Greek spread. As to the credit risk measure, it first increased strongly during the global financial crisis and then stabilized until the second quarter of 2010. After that the measure reflects the start of the sovereign debt crisis first in Greece and then in Spain and Italy also due to speculation attack by the markets.

5.2. *Econometric strategy*

In this section, we set up the econometric strategy in order to test whether there is a significant noise effect of a news announcement about the profitability of Greek 10 year bonds. According to the model developed in Sec. 3, governments know the real rate of return on Greek assets while the private sector can only infer it from the signal emitted by the informed agents. Due to a noise component, the perceived rate of return on Greek assets by private investors is biased downward, causing fire sales which lead to increasing interest rate spreads and therefore to a higher risk of default.

Recalling the relation between relative bond prices and interest rate spreads $Spread = r/p - \rho$ and by substituting Eq. (17) into the spread equation, its change can



Source: Bloomberg.

Figure 3. 5 years Credit Default Swaps and Euribor-OIS 3 months spread.

be expressed as a function of the accurate signal of the profitability of Greek bonds s_t, the supply of Greek assets, the noise variable h_t and a vector of controls X:

$$\Delta Spread = f(s, h, X), \tag{18}$$

with $\frac{\delta f}{\delta s} > 0$; $\frac{\delta f}{\delta h} > 0$; $\frac{\delta f}{\delta X} > 0$.

The effect described above can be estimated by financial econometrics models, which allow studying the behavior of high frequency series characterized by a strong noise component and by a time varying variance. The latter is a measure of the volatility of a time series and in the analysis of portfolio selection represents an important variable to be predicted. The most popular tool for predicting financial volatility is the class of autoregressive conditional heteroskedasticity models (ARCH) introduced by Engle (1982). From this seminal work, a number of models arose in order to better capture the different features of financial data. In order to investigate, the effect of explicit political and economic news on the Greek spread we need a model where volatility has a direct effect on the mean of the spread. The ideal solution, as suggested by Eq. (10), is Mean-GARCH specification (Engle *et al.*, 1987), where volatility enters directly into the mean equation.

An additional desired characteristic of the model is the possibility to allow for asymmetry in the response to economic news. Several models, such as the Exponential-GARCH (Nelson, 1990; Engle and Ng, 1993) or the Asymmetric-GARCH (Engle, 1990), have been developed in order to allow for this feature. Ding *et al.* (1993) propose an Asymmetric Power Arch model (A-PARCH) in order to account for the common finding in the empirical financial literature of high serial correlation between the absolute asset returns and their power transformations. This class of models has been frequently studied in order to test their applicability to financial data (He and Teräsvirta, 1999; Brooks *et al.*, 2000; Mittnik and Paolella, 2000; Giot and Laurent, 2004) and to compare it with other models (Karanasos and Kim, 2006). As it is often the case with high frequency financial time series, the error distribution has fatter tails so that the assumption of normality of the residuals is rejected (see Fig. A.1 in the Appendix). This feature makes the A-PARCH model particularly useful as the variance in standard ARCH models has better explanatory power only when errors are normally distributed (Brooks *et al.*, 2000). The A-PARCH representation allows us to avoid the imposition of a specific form on the variance term as the power parameter δ of the standard deviation is estimated within the model so that asymmetric effects — if present — are captured together with the potentially significant serial correlation of the power transformation of the residuals. Further, it nests different models, including the GARCH-in-mean specification and the asymmetric GARCH so that the best representation will be decided by the estimated parameters. The augmented A-PARCH mean equation for the Greek spread over the German Bund is the following:

$$\Delta Spread_t = X_t'\theta + \lambda\sigma_t^\delta + e_t, \tag{19}$$

where σ^δ is the delta power of the standard deviation, X' is a vector of exogenous determinants of the spread and e_t is the error term. The variance equation of the PARCH (Ding *et al.*, 1993) is expressed as function of a constant term, q lags of the dependent variable (the GARCH structure) and p lags of the news from the previous periods. In order to capture asymmetries up to order r between positive and negative news, the latter term is expressed as difference between the absolute error and its real value, weighted by the asymmetry parameters γ_i:

$$\sigma_t^\delta = \omega + \sum_{j=1}^{q}\beta_j\sigma_{t-j}^\delta + Z_t'\varphi + \sum_{i=1}^{p}\alpha_i(|e_{t-i}| - \gamma_i e_{t-i})^\delta, \tag{20}$$

where $\delta > 0$, $|\gamma_i| \leq 1$ for $i = 1\ldots r$, $\gamma_i = 0$ for all $i > r$, and $r \leq p$. Z' is a vector of exogenous or predetermined volatility determinants. The system of Eqs. (19) and (20) is estimated via Maximum Likelihood with a backcasting parameter for the MA term equal to 0.7; the GARCH structure is $p = 2$ and $q = 1$ as this is the structure that maximizes the information criteria. The A-PARCH model will be estimated assuming fat tails, described by a Student-t distribution for the error term (Beine *et al.*, 2002; Chuang *et al.*, 2007; Zhu and Galbraith, 2011) with the number of degrees of freedom (i.e., the tails' width) to be estimated by the model.

As already mentioned, regressors in the mean equation must be exogenous while the variance equation allows for predetermined variables. Statements from the German government as well as news about the EU support are potentially endogenous as their occurrence can be an effect of the increasing spread; at the same time CDSs and sovereign spreads may influence each other. In order to select the proper specification, we test the existence of a reverse causality using Granger causality test. If a variable is not Granger caused by the spread growth then it is introduced in the mean equation, while for weakly endogenous variables we need to test whether they can be treated as predetermined. In order to do so we use the *C*-test for instruments' validity in Instrumental Variables regression. More specifically, if the first lag of a weakly endogenous variable is a valid instrument then the variable can be assumed to be predetermined and it is added to the variance equation. Test results are shown in Tables A.1 and A.2 where we can see that the only weakly exogenous variables (Table A.1) are the credit risk measure and the economic news variable. Among the other variables Germany and *FrGermany2w*, together with the *CDS* and *EUU* are predetermined while *EUG* and *EUB* are endogenous and hence excluded from the regression. In order not to lose information from this variable we further tested a variable *EU* given by the pooling of the three variables. In this case, the variable can be considered predetermined.

The expected sign for the *Germany* variable is positive as it introduces uncertainty about the real value of the Greek bonds and a similar behavior is expected for the news from the EU institutions; *ECON* is expected to increase the average spread because it includes only negative or uncertain news. In order to control for exogenous shocks we introduce in the variance equation a dummy for the global financial crisis following the Lehman bankruptcy (*Lehman*) activated for the period from 9/15/2008 to the 6/30/2009 and the explosion of the Greek sovereign *debt crisis* (activated from the 5/10/2010 on).

5.3. *Results*

Estimation results are shown in Table 2, where we report the outcomes for the mean equation in the upper panel and we show volatility determinants in the lower panel together with the delta parameter and the degrees of freedom of the error distribution. The first 5 columns report the results for the period 1/01/2008 to 9/30/2011, which covers the period before the global financial crisis up to the worsening of the debt crisis. The choice of the time span is based also on econometric issues as an ARCH model with daily data should have around 1,000 observation in order to guarantee stability of the results. The following columns (6 to 9) restrict the initial part of the sample to the 6/30/2009 in order to focus on the debt crisis only.

Although the explanatory power of the estimates is low, we find significant results for the signal variables in all cases. The significance of the Garch term indicates that volatility has a direct impact on spread's changes. The estimated number of degrees of freedom for the error distribution is always around 3.3 with the whole sample and 2.8 in the restricted one, indicating the presence of particularly fat tails. The most important result is the significance of the *Germany* dummy. The effect on volatility[8] is

[8] The resulting conditional variance is shown in Fig. A.2 in the appendix.

Table 2. Power-GARCH estimates of the volatility of the Greek's spread over the German Bund.

	Mean Equation								
	1	2	3	4	5	6	7	8	9
GARCH	0.255	0.280	0.290	0.271	0.318	0.251	0.344	0.275	0.392
	[0.079]***	[0.085]***	[0.099]***	[0.087]***	[0.100]***	[0.115]**	[0.129]***	[0.117]**	[0.157]**
Δ(spread(− 1))	0.224	0.219	0.227	0.226	0.212	0.203	0.197	0.209	0.176
	[0.026]***	[0.025]***	[0.029]***	[0.028]***	[0.028]***	[0.036]***	[0.038]***	[0.036]***	[0.037]***
Δ(spread_3m)	0.151	0.154	0.154	0.156	0.159	0.284	0.193	0.237	0.208
	[0.033]***	[0.036]***	[0.039]***	[0.036]***	[0.039]***	[0.194]	[0.211]***	[0.188]	[0.205]
Δ(spread_3m(− 1))	0.016	0.023	0.015	0.022	0.024	0.344	0.323	0.220	0.206
	[0.028]	[0.031]	[0.032]	[0.031]	[0.034]	[0.200]	[0.203]	[0.201]	[0.210]
ECONGR	0.024	0.024	0.025	0.024	0.025	0.043	0.046	0.038	0.043
	[0.009]**	[0.009]**	[0.009]***	[0.009]***	[0.008]***	[0.021]**	[0.022]**	[0.021]	[0.023]*
C	0.002	0.001	0.001	0.001	0.001	−0.002	−0.006	−0.003	−0.007
	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.004]	[0.004]	[0.004]	[0.004]**

Table 2. (*Continued*)

	Variance Equation								
	1	2	3	4	5	6	7	8	9
Germany	0.082	0.084	0.081	0.070	0.067	0.091	0.055	0.075	0.064
	[0.026]***	[0.026]	[0.027]***	[0.025]***	[0.026]***	[0.034]***	[0.025]**	[0.032]**	[0.030]**
FrGermany2w	−0.004	−0.004	−0.004	−0.004	−0.004	−0.004	−0.002	−0.004	−0.004
	[0.001]***	[0.001]***	[0.001]***	[0.001]***	[0.001]***	[0.002]***	[0.001]*	[0.001]***	[0.002]**
EUU	0.027	0.034	0.053			0.076	0.085		
	[0.031]	[0.030]	[0.037]			[0.044]*	[0.042]**		
EU				0.037	0.058			0.092	0.106
				[0.018]**	[0.022]***			[0.027]**	[0.039]***
Δ(CDS 5y)	0.060	0.060	0.060	0.060	0.064	0.084	0.062	0.077	0.094
	[0.017]***	[0.017]***	[0.018]***	[0.017]***	[0.018]***	[0.025]***	[0.023]***	[0.031]***	[0.030]***
sigma	0.793	0.810	0.934	0.826	0.839	0.903	1.278	0.849	1.128
	[0.145]***	[0.144]***	[0.153]***	[0.134]***	[0.144]***	[0.160]***	[0.163]***	[0.127]***	[0.161]***
Lehamn		0.003	0.005	0.003	0.007				
		[0.002]	[0.002]**	[0.002]*	[0.003]***				
debt crisis			0.010		0.013		0.011		0.018
			[0.004]**		[0.005]***		[0.005]***		[0.007]**
T-DIST. DOF	3.206	3.259	3.352	3.238	3.348	2.853	2.989	2.749	2.734
	[0.357]***	[0.372]***	[0.390]***	[0.369]***	[0.386]***	[0.415]***	[0.447]***	[0.381]***	[0.374]
Adjusted R^2	0.003	0.000	0.012	0.005	0.008	−0.006	−0.012	−0.044	0.011
Obs.	967	967	967	967	967	576	576	576	576

Note: Standard errors in brackets; * significant at 10% level; **significant at 5% level; ***significant at 1% level.

positive confirming the impact of incoherent and contradictory communication as developed in our theoretical model. *FrGermany2W* is significant and with a negative sign, indicating that the noise of a news announcement decreases with more frequent statements. In other words, when the German Chancellor makes a statement its meaning is confusing, but subsequently clarified. News about the worsening of the economic situation has the expected positive effect on mean spread changes although the impact is only two and a half base points. The low effect of the economic conditions (i.e., debt rating) can be explained by the fact that markets are already aware of developments well before the rating agencies officially certify their existence, so that political news are the novel information for the investors. News of uncertain EU support (*EUU*) is not significant while when the pooled variable is introduced (EU in columns 4 and 5), its impact is significantly positive and around six base points (column 5). Finally, the two crisis dummies (*Lehman* and *debt crisis*) have the expected positive and significant impact on volatility and the impact of the global financial crisis is stronger than that of the Greek debt crisis. The latter effect is probably due to the fact that we are controlling for other variables, which are specific to the sovereign debt crisis. The results are robust to the restriction of the estimation sample, although the credit risk variable loses its significance and the effect of economic news, despite being stronger, is only significant at 10%. As to the volatility determinants, the effect of German news is basically unchanged while that of the news from the EU institutions increases its size and significance.[9]

Summing up, the econometric analysis validates, i.e., does not reject, the theoretical assumption of a detrimental noise effect of announcements from both the German government and EU institutions regarding political solutions to the Greek problem. By taking the estimates in column 9, political uncertainty increases the volatility by 17 base points and its effect on the mean spread change through the Garch term is 6.6 points in the short run and 8 in the long run.[10]

6. Conclusions

While the euro is in its deepest crisis since its creation in 1999, a policy debate is ravaging across Europe about the usefulness of public debtor bailouts. We have argued that such bailouts are necessary to prevent a banking crisis, which would have devastating consequences for the real economy and employment. However, the costs of such bailouts depend significantly on the political and institutional setup. As long as

[9] We further tried specifications with additional lags of the regressors, both in the mean and variance equation, but they turned out to be insignificant.

[10] The short run impact is given by $0.17 \times 0.39 = 0.066$ while the long run one equals $0.066/(1 - 0.17) = 0.079$.

intergovernmental policy making dominates, coordination failure on bailout issues is nearly inevitable. The reason is that in monetary union, bailout funds are a common resource good, which makes cooperative solutions hard to achieve: It is in the interest for each member state to withhold its own financial contribution.[11] The turning point is only reached, when the system itself is under threat.

Our study has revealed evidence for a significant political risk, which substantially increases bailout costs. The estimates suggest that Germany's uncooperative attitude and uncertainty from the EU institutions have increased the spread's volatility by six base points. All in all, these two sources of uncertainty caused an average daily increase in volatility by 16 base points. If the European Union wishes to avoid such unnecessary cost, it must eliminate the institutional source of political noise and uncooperative behavior and set up a fiscal union that centralizes fiscal policy control at the European level. A centralized European economic government could minimize these costs by eliminating collective action problems and reducing the communicative noise and uncertainty in the bailout process. By contrast, the cost of decentralized governance shows up in the high yield differentials on sovereign debt between deficit countries and the benchmark German Bund, in the need for larger bailouts and the higher risk of bank failure. A more direct influence over European budget policies may not only be necessary to save the euro, it may also be cheaper for tax payers.

Appendix

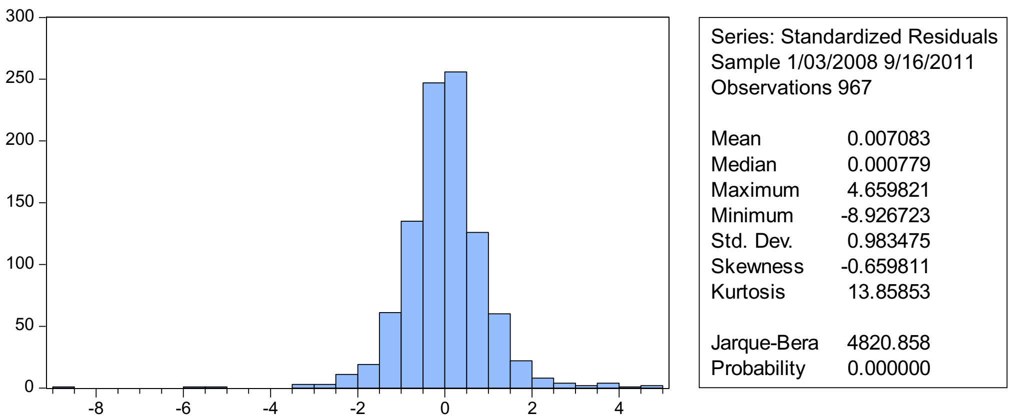


Figure A.1. Standardized residuals of the APARCH specification (column 5 in Table 2).

[11] For the theory behind this statement see Colligon (2003).

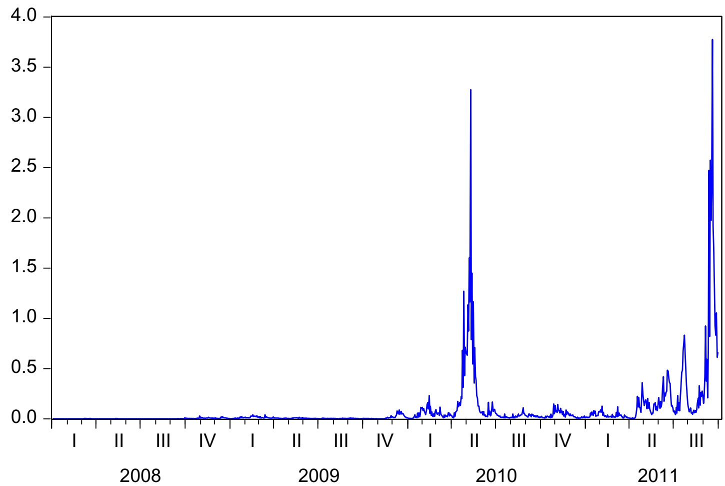


Figure A.2. Conditional variance from the APARCH specification (column 5 in Table 2).

Table A.1. Granger causality tests.

Null Hypothesis	Obs	*F*-Statistic	*P*-Value
Δspread does not Granger Cause Δ(spread_3m)	971	0.44	0.949
Δspread does not Granger Cause Δ(CDS_5y)	956	18.72	0.000
Δspread does not Granger Cause Germany	966	2.69	0.001
Δspread does not Granger Cause ECON	966	0.49	0.921
Δspread does not Granger Cause EU	966	3.59	0.000
Δspread does not Granger Cause FrGermany2w	970	2.24	0.023
Δspread does not Granger Cause EUB	966	2.33	0.030
Δspread does not Granger Cause EUG	966	3.30	0.003
Δspread does not Granger Cause EUU	966	4.87	0.000

Table A.2. Test of predeterminedness.*

	Value	*P*-Value
Germany	0.73	0.391
FrGermany2w	0.61	0.434
EU	2.23	0.136
Δ(CDS_5y)	2.61	0.104
EUG	10.70	0.001
EUU	0.46	0.500
EUG	4.76	0.029

Note: *Test of the validity of the first lag as instrument in a IV regression based on the difference in Hansen *J* statistics.

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