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Risk assessment on euro area government bond markets: The role of governance quality

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Abstract

Since the announcement of the outright monetary transactions program (OMT), government bond yield spreads have decreased substantially but have not fallen to pre-crisis levels. This paper argues that the debt-to-GDP ratio has become less relevant as a determinant for government bond spreads, while financial markets have become more concerned about the willingness and capability to cooperate with the institutions that conduct the adjustment programs since the announcement of OMT. This paper links the willingness and capability to cooperate to political stability and quality of governance, for which indicators are available from the World Bank. By means of a time-varying coefficient approach, it can be shown that the coefficient for a composite World Bank indicator on the quality of governance has outpaced other possible determinants of government bond spreads since the announcement of OMT.

JEL classification: C32, G12, E43, E62

Keywords: euro area, bond spreads, debt crisis, OMT, time-varying coefficients, good governance, default risk

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1 Introduction

During the euro area debt crisis, yield spreads increased substantially. Risk perception and risk assessment changed. This has been interpreted as wake-up-call contagion; see, e.g., Beirne and Fratzscher (2013), Giordano et al. (2013) and von Hagen et al. (2013). Several authors found that typical determinants, such as the debt-to-GDP ratio, explained much of the variation in the spreads, particularly after the outbreak of the crisis.¹

The change in risk perception is regarded as evidence for multiple interest rate equilibria by several authors such as Aizenman et al. (2013), Beirne and Fratzscher (2013) and De Grauwe and Ji (2013). The concept of multiple interest rate equilibria on government bond markets was introduced by Calvo (1988). High debt levels make bond markets more vulnerable to multiple interest rate equilibria (Gros 2012). Thus, the debt-to-GDP ratio may have a dual function. Given expectations, it is a natural candidate to determine the equilibrium interest rate; furthermore, the debt-to-GDP ratio may also affect the dynamics of market participants' expectations. Thus, the observation that the debt-to-GDP-ratio was a highly informative determinant of government bond spreads is reasonable.

In July 2012, the European Central Bank (ECB) announced the Outright Monetary Transactions program (OMT), which so far has not been enacted. It was announced with the main argument that OMT would increase the effectiveness of monetary policy.² According to OMT, the ECB is willing to buy government bonds from a distressed country as long as the country participates in an adjustment program and cooperates in terms of fiscal and economic policy with the institutions that manage the adjustment program. This intervention may hinder multiple interest rate equilibria from becoming explosive because the ECB could step in as the lender of last resort when the fiscal capacities of the other rescue funds are limited. Accordingly, after the announcement of OMT, government bond spreads declined, but they did not return to pre-crisis levels, at which time, they were almost zero.

The remaining government bond spreads may be attributed to some remaining uncertainty. First, a trial regarding it continued in the German constitutional court until mid 2016. Thus, there was some uncertainty about the legal status of the program and about the systemic situation of the euro area. Second, the ECB as a lender of last resort does not guarantee all public debt securities, but it steps in when an adjustment program is ongoing. However, the adjustment program can contain private sector involvement, as was the case in the second program for Greece. Finally, the

¹See among others Costantini et al. (2014).

²Compare Falagiarda and Reitz (2015) regarding the effects of unconventional monetary policy on government bond markets.

ECB named conditions for the application of OMT, which are by and large the adoption of the conditions of an adjustment program. Uncertainty remains about whether a government will be willing or able to cooperate. The discussion about “ownership” within the adjustment programs during the euro area debt crisis illustrates this issue. While the term “ownership” is not clearly defined, it comprises issues related to the public acceptance of reform policies and the capabilities to enforce reform programs effectively in countries that undergo adjustment programs; see, e.g., Bird and Willett (2004). Accordingly, the “ownership” debate touches on the willingness and capability to cooperate with the institutions that manage the rescue funds.

Since the announcement of OMT diminished doubts about the fiscal capacity of the rescue funds, the issue of willingness and capability to cooperate with the institutions that manage the rescue funds may have received relatively more attention, and this attention has brought the quality of governance and political stability into focus for assessing government bond markets. The role of the quality of governance can be regarded as twofold. While the “ownership” debate focuses on the cooperation with rescue funds and stresses that the quality of governance is important for successful cooperation, a high quality of governance may also support fiscal sustainability. The recent studies of Bursian et al. (2015) and Bergmann et al. (2016) showed that trust in the government and a high quality of governance can be very beneficial for reaching sustainable public finances beyond the adjustment programs in cooperation with rescue funds. Obviously, both aspects are strongly interwoven.

Additionally, Benito et al. (2016) find that variables that are meant to measure the quality of governments can also explain government bond yields in a cross-section of some OECD and BRICS countries. They also find that the results of a pre-crisis sample (2008) are much stronger than those in a post-crisis year (2012). Although the study of Benito et al. (2016) is based on very few observations, it provides the first evidence that financial markets consider the quality of governance as relevant for risk assessment and that this assessment may vary over time.

Here, I want to analyze the role of the quality of governance for government bond yield spreads during the debt crisis in the euro area. This may be particularly interesting, as the announcement of OMT has presumably changed bond market dynamics. For this purpose, a time-varying coefficient model for government bond yield spreads in the euro area is specified. In addition to several variables that are typically regarded as determinants of government bond spreads, such as the debt-to-GDP ratio, I include a variable that measures willingness and capability to perform adjustment programs effectively and to cooperate with the rescue funds. For this purpose, I use the governance indicators provided by the World Bank. The data comprise respondents from various backgrounds, such as enterprises and citizens and are based on surveys conducted by several institutions, such as survey

institutes or think tanks. Indicators are reported in six categories ranging from matters of political stability to corruption. The indicators as a whole shall give an impression regarding the quality of governance.

Model estimates show that the coefficient of the debt-to-GDP ratio increased substantially during the crisis and dominated all other determinants. The steady increase was interrupted by the beginning of the second adjustment program for Greece that ended speculations about an uncontrolled default of Greece at that time. Afterwards, the coefficient increased again until the announcement of OMT. After this announcement, spreads decreased for almost all government bonds and with them, the coefficients of all relevant determinants such as the debt-to-GDP ratio, the current account balance or the outstanding amount of debt securities. There is a single exception, namely, the governance indicator. Its relevance increased. I interpret the evidence that markets have particularly focused on the quality of governance and political stability since the announcement of OMT as the assessment of market participants about the willingness and capability to cooperate with the institutions that run the rescue funds and to effectively conduct adjustment programs.

The remainder of the paper is structured as follows: Section 2 discusses possible determinants for government bond spreads – among them, the variable that shall reflect the quality of governance. Section 3 presents the econometric model. The results are given in Section 4. Section 5 presents several robustness checks. Section 6 discusses the structural link between the quality of governance and the evaluation of government bond markets in the euro area after the OMT announcement. Section 7 concludes.

2 Determinants of government bond spreads

In this study, government bond yields from ten member state of the euro area are considered as spreads to yields from German bunds (Figure 1).³ Because these countries issue their debt predominantly in the same currency, risks due to exchange rate movements can be ruled out. When spreads for the same currency area are considered, risks due to the variation of inflation can also be neglected.

The remaining risks of government bonds are typically divided into liquidity risks and default risks. Different variables are considered as proxies for these two risks. Liquidity risks are often measured by bid-ask-spreads from recent bond auctions. However, this variable is not considered in this study. This is done because, first, there has been little evidence in several studies, e.g.,

³The panel includes mature and rather large members of the euro area, namely, France, Italy, Spain, the Netherlands, Belgium, Austria, Finland, Greece, Portugal, and Ireland.

Aßmann and Boysen-Hogrefe (2012), that this is a highly influential variable. Second, several euro area countries participated in an adjustment program during the considered time span. While the adjustment program occurs, financing needs are mostly covered by loans from rescue funds including those of the International Monetary Funds (IMF), the European Financial Stability Facility (EFSF), or the European Stability Mechanism (ESM). Accordingly, there were only infrequent or even no auctions that could provide information through bid-ask-spreads. Instead, I include only the outstanding amount of government debt securities provided in monthly frequency by the ECB. This variable reflects the potential market size. The corresponding coefficient is expected to have a negative sign because liquidity risks should be lower in larger markets. Because the estimation is done with weekly data, the monthly value is assumed for all weeks that have at least three working days in the corresponding month.

To capture default risks, the debt-to-GDP ratio is considered. The expected sign for the corresponding coefficient is positive. Furthermore, the budget balance relative to GDP, GDP growth and the current account balance relative to GDP are included as covariates. The expected signs for the corresponding coefficients are all negative. For all four variables, I employ forecasts rather than historical values. Forecasts have been applied before in Attinasi et al. (2009), Aßmann and Boysen-Hogrefe (2012), and Costantini et al. (2014). Forecasts were obtained from the European Commission, which provides forecasts for all variables considered two to four times per year. Note that the forecasts of the European Commission are used as proxies for market expectations about the respective variables. I assume that financial markets consider forecasts for the current year as decisive until the spring forecast becomes available. Afterwards, forecasts for the following year are assumed to be relevant. Furthermore, forecasts are linearly interpolated to mimic the forecast revision process, in which additional information becomes available over time. Interpolation also reflects a gradual shift in the forecast horizon.⁴

In addition to variables typically used as determinants for government bond spreads, I include a variable that reflects the quality of governance. This choice is reasonable because the quality of governance may give general information about the capabilities to cope with economic crises and the sustainability of public finance. Furthermore, it may capture the willingness and capability to cooperate with the institutions that manage the adjustment programs and rescue funds. The latter may have been particularly important since the OMT was announced by the ECB. Afterwards, doubts about the fiscal capacity of rescue funds were diminished, and it became relatively more important that the government of a potentially distressed country is willing and able to cooperate

⁴Preliminary analysis showed that interpolation between forecasts compared to maintaining forecast values until new figures became available has only a slight impact on the results.

with these institutions; otherwise, it would be at least uncertain that the ECB would function as a lender of last resort. A proxy for this political willingness and capability to cooperate is not directly available. However, the World Bank provides several indicators regarding governance for 215 economies. The data set contains yearly data for the years 1996 through 2014. It has been applied in Bergmann et al. (2016) to analyze the impact of governance on fiscal sustainability. It comprises six indicators: ‘voice and accountability’, ‘political stability and absence of violence’ (short: ‘political stability’), ‘government effectiveness’, ‘regulatory quality’, ‘rule of law’, and ‘control of corruption’. As Ivanova et al. (2003) analyzed the success of IMF programs and underlined the role of the political economy, stressing that a multitude of political conditions can affect the success of IMF programs, I do not include just a single one of these governance indicators but take the mean and form a combined governance indicator in the main scenario. The expected sign of the corresponding coefficient is negative, as better quality of governance should reduce risks.

An overview of all the data applied as potential determinants of government bond spreads in this paper is given in table 1. The data are shown in figure 2. For some countries and variables, the impact of the crisis is obvious, such as the gross debt-to-GDP ratio in Italy or Greece. However, relative changes are much smaller than those of the spreads. For some countries there is little variation over time for almost all regressors, such as the Netherlands or Austria. All regressors are quite persistent over time. This is particularly true for the gross debt-to-GDP ratio, the outstanding amounts of government debt securities and the governance indicator. An exceptional case is the jump in the data on outstanding amounts of government debt securities in late 2010. This is due to an increase in German debt securities related to bank rescue measures.

Finally, in many studies variables that are meant to capture fluctuations in risk perception are included. Typically, the US corporate spread between high- and low-ranked corporations is applied to measure for risk perception on financial markets. Because the time variation of risk perception is modeled explicitly in the model outlined in the previous section, this paper does not include this variable or other proxy variables for risk perception.

3 Model with time-varying coefficients

Several papers address time variation in the determinants of government bond spreads. Bernoth et al. (2012) and Beirne and Fratzscher (2013) apply dummy variables to control for possible structural breaks in the risk assessment of market participants. Aßmann and Boysen-Hogrefe (2012), Bernoth and Erdogan (2012), and Ludwig (2014) apply time-varying coefficient models. This paper follows Aßmann and Boysen-Hogrefe (2012). The main idea of the modeling approach here is that markets

newly assess the risk in each period and that risk perception could fluctuate. Time-varying coefficients monitor the changes in risk perception and risk assessment. This is also closely related to the model in Bernoth and Erdogan (2012), who use a non-parametric approach. The parametric model to capture time-variation in the determinants of government bond spreads is as follows:

$$y_{i,t} = \beta_t X_{i,t} + \varepsilon_{i,t}, \quad \varepsilon_{i,t} \sim N(0, \sigma_t^2), \quad (1)$$

where $y_{i,t}$ denotes the return difference between country i 's bonds and German government bonds in period t . For each period t , equation (1) represents a simple linear models. The vector $X_{i,t}$ contains relevant variables for bond pricing of country i in period t and a constant. As the number of countries in this analysis is limited, cross sectional inference about β_t in form of a linear regression for each point in time is prohibited. The inclusion of the time dimension for the purpose of inference on the coefficients in t is needed. This is done by assuming that the parameters β_t follow a random walk:

$$\beta_t = \beta_{t-1} + u_t, \quad u_t \sim N(0, \Sigma_t). \quad (2)$$

Note that β_t is a vector and the coefficient for a particular variable is denoted as $\beta_{k,t}$ in the following ($k \in \{1, \dots, K\}$). $K - 1$ is the number of covariates as $\beta_{1,t}$ represents the constant. For simplicity, we assume Σ_t to be diagonal. Thus, the model contains variance parameters only. Pure contagion that goes beyond wake-up-call contagion is not modeled specifically because this is not in the scope of this paper. While wake-up-call contagion effects should be captured in the time-variation of the coefficients β_t , pure contagion is captured by changes in the time-varying constant and the time variation of the error variance. The time-varying coefficients β_t reflecting the judgment of market participants are estimated through a Kalman Smoother.

By considering a time-varying constant as well as a time-varying error variance, the model implicitly mimics the direct impact of time-varying global factors, while time-varying coefficients can gauge the impact of global factors on the evaluation of determinants such as the debt-to-GDP ratio or liquidity variables. Finally, the monitoring of β_t at each point in time allows to directly assess the relevance of different determinants.

As it is one goal to follow the judgments of market participants even in rather volatile times, the model assumes time-varying variances for both the errors $\varepsilon_{i,t}$ as well as u_t . For both, ARCH-type specifications are considered. In case of the errors $\varepsilon_{i,t}$, it takes the following form

$$\sigma_t^2 = \alpha_0 + \alpha_1 \frac{1}{I} \sum_{i=1}^I \varepsilon_{i,t-1}^2, \quad (3)$$

while the variance of each $u_{t,k}$ is assumed to follow its own ARCH process

$$\sigma_{k,t}^2 = \gamma_{k,0} + \gamma_{k,1} u_{k,t-1}^2. \quad (4)$$

The modified Kalman-Filter that allows for ARCH effects in otherwise linear state-space models is proposed by Harvey et al. (1992).⁵

The left-hand side variables are the government bond spreads of the ten largest euro area countries with respect to German bunds (figure 1). Maturity is 10 years. The model is applied to weekly data. The frequency of some determinants is much lower. From a methodological viewpoint, combining slow moving variables on the right-hand side with higher frequent variables on the left hand side is no problem in a time-varying coefficient model. However, the differing frequencies could impact the reliability of the results if determinants were only measured in a low frequency while their “unmeasured” variation in between is quite strong. This could induce some kind of errors-in-variables problem.⁶ However, persistence in the low frequent variables seems to be quite high. It is plausible that variables such as the quality of governance, the debt level, and forecasts of the debt level move slowly. In sum, the risk that results are heavily influenced by some kind of errors-in-variables problem seems rather small.

4 Empirical results

The estimation is done for the time period from January 2005 until the end of December 2014. All variables are in difference or in relation to German data. Before estimation, the right-hand side variables were standardized over the entire panel. Table 2 presents the point estimates of the model parameters, namely parameters of the variance equations (3) and (4). The first column shows estimates for α_0 and α_1 , i.e., the parameters for the ARCH equation of the error term. The other columns correspond to the ARCH equations that govern the variance process of the respective time-varying parameters. The first row shows the estimated constant of the ARCH equations and the second row the persistence parameters. Estimates are obtained via Maximum Likelihood. Because of possible multimodality estimated standard errors may not be valid and are therefore not reported. To cope with multimodality, several starting values have been tried. Time-variation of coefficients does not vary substantially between local modes.

With the beginning of the financial crisis and the onset of the Great Recession, government bond spreads began to rise in the euro area. This was accompanied by rising absolute values of the coefficients for almost all possible determinants. Figure 3 shows the estimates of the time-varying coefficients and the 2σ confidence bands. The results are presented for all six determinants under

⁵King et al. (1994) provide an extension where they allow for GARCH effects. Preliminary analysis showed that ARCH effects are preferable compared to GARCH effects in this exercise. Details about the modified Kalman-Filter and the modified Kalman-Smoother can also be found in Aßmann and Boysen-Hogrefe (2012).

⁶Note that in the classical errors-in-variables setup estimates are biased towards zero.

consideration. The increase of the absolute values of the coefficients can be interpreted as a rise in risk perception (wake-up-call contagion) or in risk aversion. Under the “new” conditions of the crises, the determinants of government bond spreads are assessed differently, and variations in these risk factors are translated in larger spreads. Therefore, it is not surprising that some time variation, particularly for the very relevant determinants, resembles the variation of spreads.

The results in detail show that in the early phase of the debt crisis, GDP growth and the current account balance were not or only mildly relevant (figure 4). The absolute values of the coefficients for the budget balance, for the outstanding amount of government debt securities and particularly for the debt-to-GDP ratio steadily increased. Between 2011 and 2012, in particular, the relevance of the outstanding amount of government debt securities and the debt-to-GDP ratio intensified dramatically. Budget balance and GDP growth lost importance at the same time. The absolute value of the coefficient for the governance variable increased slowly over the entire period until 2012.

After the start of the second adjustment program for Greece, which included the private sector involvement and thus an abrupt change in the debt sustainability assessment, the absolute values of most coefficients decreased sharply, but they partly increased again until the announcement of OMT. After the announcement of OMT, several coefficients decreased again; the coefficient of the debt-to-GDP ratio decreased, not as sharply as after the second adjustment program for Greece, but steadily and permanently.

In contrast to the other determinants, the absolute value of the coefficient for the governance indicator began to rise after the announcement of OMT until mid-2013. Existing government bond spreads can be largely explained by differences in the quality of governance in this period. Afterwards the absolute value of this coefficient decreased slightly but became the most relevant variable in this period, as the coefficients for the outstanding amount and the debt-to-GDP ratio declined even faster. In 2014, with the new tensions in Greece, the coefficient of the governance variable slightly increased again. The budget balance also became relevant, although with a counterintuitive sign. The robustness checks show that this was mainly driven by Greece. Without Greece, the coefficient for the budget balance was close to zero. Greece was driving these results because at least forecasts for its budget balance improved substantially in the latter years of the sample. The forecasted budget balances were better than for many other countries in the euro area in that period. At the same time, government bond spreads remained the highest among all countries considered.

5 Robustness checks

In the regression above, I implicitly made the assumption that the governance indicator is exogenous and not influenced by bond spreads. While it seems reasonable that sharply deteriorating bond spreads can cause substantial reactions of fiscal policy, which on their own can negatively influence the political stability, it appears less likely that a contemporaneous impact from spreads movements had an effect on the governance indicator. However, because the governance indicator is interpolated, repercussions from rising spreads cannot be ruled out, although I would assume that the effects are rather small. Thus, I run a regression that does not include the contemporaneous governance indicator but the governance indicator from the previous year. The results are shown in figure 5. The results are mostly the same as those in the main scenario. This reflects that the governance indicator is not very dynamic over time.

Furthermore, it might be argued that the results were driven only by the most troubled country, namely, Greece. The negotiations between Greece and the institutions were accompanied by substantial disagreements, and the quality of governance was particularly low in Greece according to the World Bank data. For this reason, I ran a regression where Greece was excluded. The results show that the relevance of the debt-to-GDP ratio declined after 2012. The decline quickened after the announcement of OMT (figures 6). After the announcement of OMT, the relevance of the governance indicator increased particularly compared to the other variables. In mid 2013, the absolute value of the coefficient slightly declined. The coefficient for the governance indicator recovered later in 2014 when Greek bond spreads increase again. This might be interpreted as a further episode of wake-up-call contagion. In sum, the results are very similar to the main baseline results.

It may also be argued that results are driven by the specific model and estimation methods. To check for this argument, I run a simple linear regression where time-variation is reached with a rolling window approach.⁷ Thus, the model in Equation 1 is simplified to

$$y_{i,t} = \beta X_{i,t} + v_{i,t}, \quad v_{i,t} \sim (0, \sigma^2), \quad (5)$$

and repeatedly estimated. Window size is fixed to 20 observations in time. Time-varying relevance of the variables is given in figure 7. The general pattern can also be found in applying that approach. The political soundness variable gains importance after the OMT event while debt-to-GDP ratio, which was dominant before, becomes less important.

Overall, some of the results of the robustness checks are slightly weaker than in the baseline scenario. However, the results exhibit the same direction and underline the change in relative importance of the determinants of government bond spreads after the announcement of OMT, namely,

⁷Note that Ludwig (2014) also applies a rolling window approach.

the decrease of the relevance of debt-to-GDP ratio and the increase of the relevance of the governance indicator.

Finally, I checked the impact of the different sub-indicators. For this purpose, the governance indicator is replaced by one of its sub-indicators. This is done for all sub-indicators. Figure 8 shows the time-varying coefficients in all six cases and for comparison the result for the governance indicator, which is the mean of the six sub-indicators. In all cases, the coefficient is or becomes significantly negative after the announcement of OMT. However, the pattern before OMT varies. While the coefficient for the ‘political stability’ and for the ‘control of corruption’ became negative quite early and remained significant, the coefficient for ‘government effectiveness’ became insignificant at the peak of the crisis (2011/2012) and thereby shows almost the same pattern as the mean (governance indicator). Because ‘government effectiveness’ may represent the sub-indicator that provides the closest outlook of how effectively adjustment programs can be implemented and because the fit of this model variant according to the likelihood is the highest among all seven variants, the results strongly back those presented in the main scenario. The coefficients for ‘rule of law’ and for ‘voice and accountability’ were significantly positive in the years 2011 and 2012 and thus show a counterintuitive sign. The huge swings in government bond yields and the impact of the ‘voluntary hair cut’ with Greek bonds at that time may explain this strange finding. However, the positive, high and significant coefficient for ‘regulatory quality’ until the aftermath of the OMT announcement can hardly be explained, as the positive sign had already set in years before the debt crisis reached its peak. The estimates for the model with ‘regulatory quality’ as a variable on the right-hand side exhibits a much lower log likelihood value (-12.2) than the results for the governance indicator (195.5) or for the best fitting model, which incorporates ‘government effectiveness’ (620.7). Thus, the model with the indicator ‘regulatory quality’ fits the data much worse than model variants that show reasonable results.

6 Role of the quality of governance on euro area government bond markets

The governance indicator may reflect the willingness and capability to cooperate with the institutions that conduct the adjustment programs: first, the adjustment programs requested by the institutions can induce pressures that can only be managed by a sound political system, and, second, the governance should exhibit some quality to be able to execute effectively the adjustment policies. The relative role of this variable increased after the means of the rescue funds were (indirectly) enhanced by the announcement of OMT and the danger of multiple interest rate equilibria (at least

the perceived danger) diminished. It should be noted that the governance indicator was also relevant in some time periods before the announcement of OMT, and, of course, the willingness and capability to cooperate with the institutions were relevant in that period, too. However, they might have been outshined by other arguments, e.g., the limited financial capabilities of the rescue funds, which in turn may have led to a more important role of a country's debt position.

The willingness and the capability to cooperate with the institutions is closely related to the concept of "ownership", which is discussed in several papers.⁸ "Ownership" is not just concerned with the position of the current government (willingness in a narrow sense), but with the broader political sphere. Thus, issues such as political stability and the effectiveness of the political system are interwoven, e.g., Ivanova et al. (2003) argue that political stability and an effective political system are important for the success of IMF adjustment programs.

Furthermore, there is evidence that the quality of governance is not just important for the cooperation with international institutions that can act as lender of last resort, but also for the sustainability of public finance and for the capability to cope with a substantial economic crisis. Bergmann et al. (2016), who also use the data set on governance from the World Bank, show that government efficiency does improve fiscal soundness. Bursian et al. (2015) find that the population's trust in the government positively affects success in fiscal adjustments. Furthermore, Pappa et al. (2015) show that high levels of corruption and tax fraud can cause ineffectiveness and more adverse effects of austerity measures.

Pappa et al. (2015) provide empirical evidence that bad governance is particularly damaging by enhancing the often discussed regression in Blanchard and Leigh (2013), where GDP forecast errors of the IMF are regressed on measures for planned fiscal consolidation. Blanchard and Leigh (2013) discuss the forecast errors of the IMF made in the years 2010 and 2011 made for countries in Europe. The forecast errors are regressed on the planned fiscal consolidation measured as the expected change in the structural budget balance. They find a strong correlation between forecast errors and planned consolidation and argue that this shows that the IMF underestimated the fiscal multiplier for these periods. Pappa et al. (2015) enhance the simple regression in Blanchard and Leigh (2013) with measures for corruption and for the shadow economy and obtain a better fit. It can be concluded that fiscal consolidation was particularly harmful when tax evasion was high.

Here, I follow the approach in Pappa et al. (2015) but replace their indicator that focuses on the shadow economy and corruption by the broader indicator on governance. The fit is obviously increased against the baseline from Blanchard and Leigh and slightly increased against the best per-

⁸Definitions of "ownership" can be found in Khan and Sharam (2001) or Bird and Willett (2004). "Ownership" and the adjustment programs during the euro area debt crisis are discussed in Boysen-Hogrefe and Stolzenburg (2015).

forming model in Pappa et al., which reaches an R^2 of 0.61 (Table 3). This result backs the argument that the quality of governance is important for the ability to cope with crises. Thus, governance and political stability can also be predictors for the success of possible adjustment programs as they help to overcome the crisis.

Finally, one cannot distinguish the cause for the relevance of the quality of governance in the euro area's particular situation, whether it is the willingness to cooperate or the capability to manage severe economic crises. Structural issues of this type are left for future research. However, analysis shows that markets evaluate the quality of governance and political stability positively, i.e., government bond spreads can be largely explained by differences in the quality of governance, at least after the announcement of OMT ended deep concerns about multiple interest rate equilibria.

7 Conclusion

This paper analyzes the time-varying relevance of determinants for government bond spreads in the euro area. Special attention is paid to the announcement of OMT by the ECB and the role of the quality of governance in its aftermath. After the announcement of OMT, government bond spreads declined but did not return to pre-crisis levels. While the OMT makes the ECB into some type of lender of last resorts, there is still uncertainty over whether the ECB will play this role. In particular, the willingness and capability to cooperate with the institutions that conduct the adjustment programs can be uncertain and may vary among countries in the euro area. A governance indicator constructed from World Bank data acts as a proxy for willingness and capability to cooperate. A major result of the paper provides evidence that the quality of governance is considered on government bond markets, in particular after the announcement of OMT. Model estimates show that the debt-to-GDP ratio gained relevance for the assessment of government bond markets during the debt crisis, which is in line with the idea of multiple interest rate equilibria. After the second adjustment program for Greece and the announcement of OMT, a turnaround followed. The coefficient for the debt-to-GDP ratio and for most of the other determinants declined. However, the coefficients for the governance indicator even slightly increased and stayed at high levels.

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References

- [1] Aizenman, J., M. M. Hutchison, and Y. Jinjark, 2013. What is the Risk of European Sovereign Debt Defaults? Fiscal Space, CDS Spreads and Market Pricing of Risk. *Journal of International Money and Finance* 34, 37-59.
- [2] Aßmann, C., Boysen-Hogrefe, J., 2012. Determinants of government bond spreads in the euro area in good times as in bad. *Empirica* 39, 341-356.
- [3] Attinasi, M.-G., C. Checherita-Westphal, and C. Nickel, 2009. What explains the surge in euro area sovereign spreads during the financial crisis of 2007-09? ECB Working Paper No. 1131.
- [4] Beirne, J., Fratzscher, M., 2013. The pricing of sovereign risk and contagion during the European sovereign debt crisis. *J. Int. Money Finance* 34, 60-82.
- [5] Benito, B., M.-D. Guillamon, and F. Bastida, 2016. The Impact of Transparency on the Cost of Sovereign Debt in Times of Economic Crisis. *Financial Accountability & Management* 32(3), 309-334.
- [6] Bergmann, U.M., M.M. Hutchison, and S.E. Hougaard Jensen, 2016. Promoting sustainable public finances in the European Union: The role of fiscal rules and government efficiency. *European Journal of Political Economy* 44, 1-19.
- [7] Bernoth, K., J. von Hagen, and L. Schuknecht, 2012. Sovereign Risk Premiums in the European Government Bond Market, *Journal of International Money and Finance* 31(5), 975-995.
- [8] Bernoth, K., Erdogan, B., 2012. Sovereign bond yield spreads: a time varying coefficient approach. *J. Int. Money Finance* 31, 639-656.
- [9] Bird, G., and T. D. Willett, 2004. IMF Conditionality, Implementation and the New Political Economy of Ownership. *Comparative Economic Studies*, 46(3), 423-450.
- [10] Blanchard, O., and D. Leigh, 2013. Growth Forecast Errors and Fiscal Multipliers. IMF Working Paper WP/13/1.
- [11] Boysen-Hogrefe, J., and U. Stolzenburg, 2015. Rettungsprogramme und Ownership – Irland, Portugal und Griechenland im Vergleich. *Wirtschaftsdienst* 95(8), 534-540.
- [12] Bursian, D., A. J. Weichenrieder, and J. Zimmer, 2015. Trust in government and fiscal adjustments. *International Tax and Public Finance* 22(4), 663-682.

- [13] Calvo, G.A., 1988. Servicing the Public Debt: The Role of Expectations. *American Economic Review*, Vol. 78, No. 4, pp. 647-661.
- [14] Costantini, M., Fragetta, M., and M. Giovanni, 2014. Determinants of sovereign bond yield spreads in the EMU: An optimal currency area perspective. *European Economic Review* 70, 337-349.
- [15] De Grauwe, P., and Y. Ji, 2013. Self-fulfilling crises in the Eurozone: An empirical test. *Journal of International Money and Finance* 34, 15- 36.
- [16] Doornik, J., and M. Ooms, 2008. Multimodality in GARCH regression models. *International Journal of Forecasting* 24(3), 432-448.
- [17] Falagiarda, M., and S. Reitz, 2015. Announcements of ECB Unconventional Programs: Implications for the Sovereign Spreads of Stressed Euro Area Countries, *Journal of International Money and Finance* 53, 276-295.
- [18] Giordano, R., Pericoli, M., Tommasino, P., 2013. Pure or Wake-up Call Contagion? Another Look at the EMU Sovereign Debt Crisis. *International Finance*
- [19] Gros, D., 2012. A simple model of multiple equilibria and default. CEPS Working Document No. 366.
- [20] Harvey, A., Ruiz, E., Sentana, E., 1992. Unobserved component time series models with Arch disturbances. *Journal of Econometrics*, Vol. 52, pp. 129-157.
- [21] Ivanova, Anna ; Mayer, Wolfgang ; Mourmouras, Alex ; Anayotos, George C., 2003. What Determines the Implementation of IMF-Supported Programs? Working Paper No. 03/8, IMF.
- [22] Khan, S. and M. S. Sharam, 2001. IMF Conditionality and Country Ownership of Programs, IMF Working Paper, No. 01/142.
- [23] King, M., Sentana, E., Wadhvani, S., 1994. Volatility and Links between National Stock Markets. *Econometrica*, Vol. 62, No. 4, pp. 901-933.
- [24] Ludwig, A., 2014. A unified approach to investigate pure and wake-up-call contagion: Evidence from the Eurozone's first financial crisis. *Journal of International Money and Finance* 48, 125-146.
- [25] Pappa, E., Sajedi, R., and E. Vella, 2015. Fiscal consolidation with tax evasion and corruption. *Journal of International Economics* 96, S56-S75.

- [26] von Hagen, J., Schuknecht, L., Wolswijk, G., 2011. Government bond risk premiums in the EU revisited: the impact of the financial crisis. *Eur. J. Polit. Econ.* 27, 36-43.

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Tables and Figures

Table 1: Data sources and data transformations

Variable	Source	Original frequency	Frequency link	Transformation
Government bond yields	via Reuters Thomsen Datas-tream	weekly	–	in differences to yields of German Bunds
Outstanding amount of government debt securities	ECB data ware house	monthly	all weeks of the month are set to monthly value	relative to German federal government debt securities
GDP growth ^a	EU Commission: various staff forecasts	mainly biannual	interpolation between forecasts	in differences to German figures
Current account balance relative to GDP ^a	EU Commission: various staff forecasts	mainly biannual	interpolation between forecasts	in differences to German figures
Budget balance relative to GDP ^a	EU Commission: various staff forecasts	mainly biannual	interpolation between forecasts	in differences to German figures
Gross debt to GDP ratio ^a	EU Commission: various staff forecasts	mainly biannual	interpolation between forecasts	in differences to German figures
Governance	World Bank	annual	all weeks of the year are set to annual value	in differences to German figures

a:Forecasts for the following year.

Table 2: Parameter estimates

	Error variance	Constant	GDP growth	Current account	Budget balance	Gross debt	Outstanding amount	Politics
α_0/γ_0	7.42E-09	6.96E-05	2.82E-08	4.43E-11	4.40E-07	3.81E-09	4.47E-07	1.04E-05
α_1/γ_1	0.478	0.353	0.308	0.170	0.218	0.308	0.295	0.075

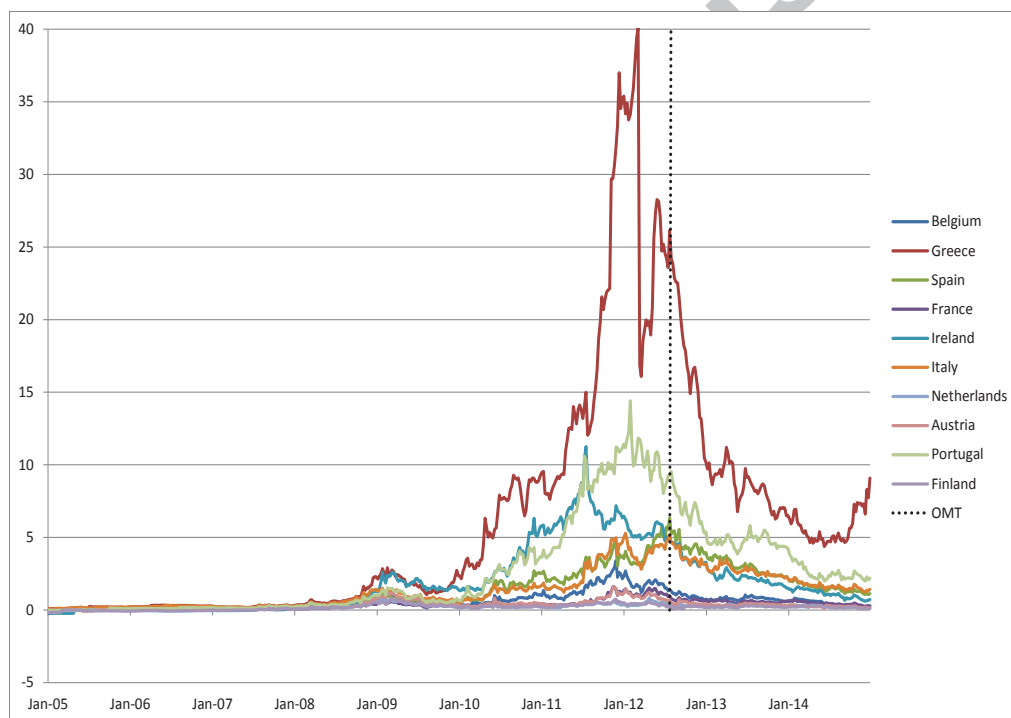
Note: Maximum likelihood estimates are obtained by a constrained numerical optimization via MATLAB routine `fmincon`. The likelihood shows multimodality. This hinders standard methods from delivering standard errors for parameter estimates, compare Doornik and Ooms (2008). Several starting values have been tried. Time-variation of coefficients does not vary substantially between local modes.

Table 3: Political soundness and fiscal multipliers during the debt crisis

	Baseline	Additional	Interaction
Planned fiscal consolidation	-1.095*** <i>0.255</i>	-0.884*** <i>0.240</i>	-2.224*** <i>0.401</i>
Governance		1.556* <i>0.807</i>	
Cross term			1.146*** <i>0.358</i>
Constant	0.775* <i>0.391</i>	-1.124 <i>1.053</i>	1.099*** <i>0.347</i>
Observations	26	26	26
R ²	0.496	0.566	0.651
adjusted R ²	0.475	0.528	0.621

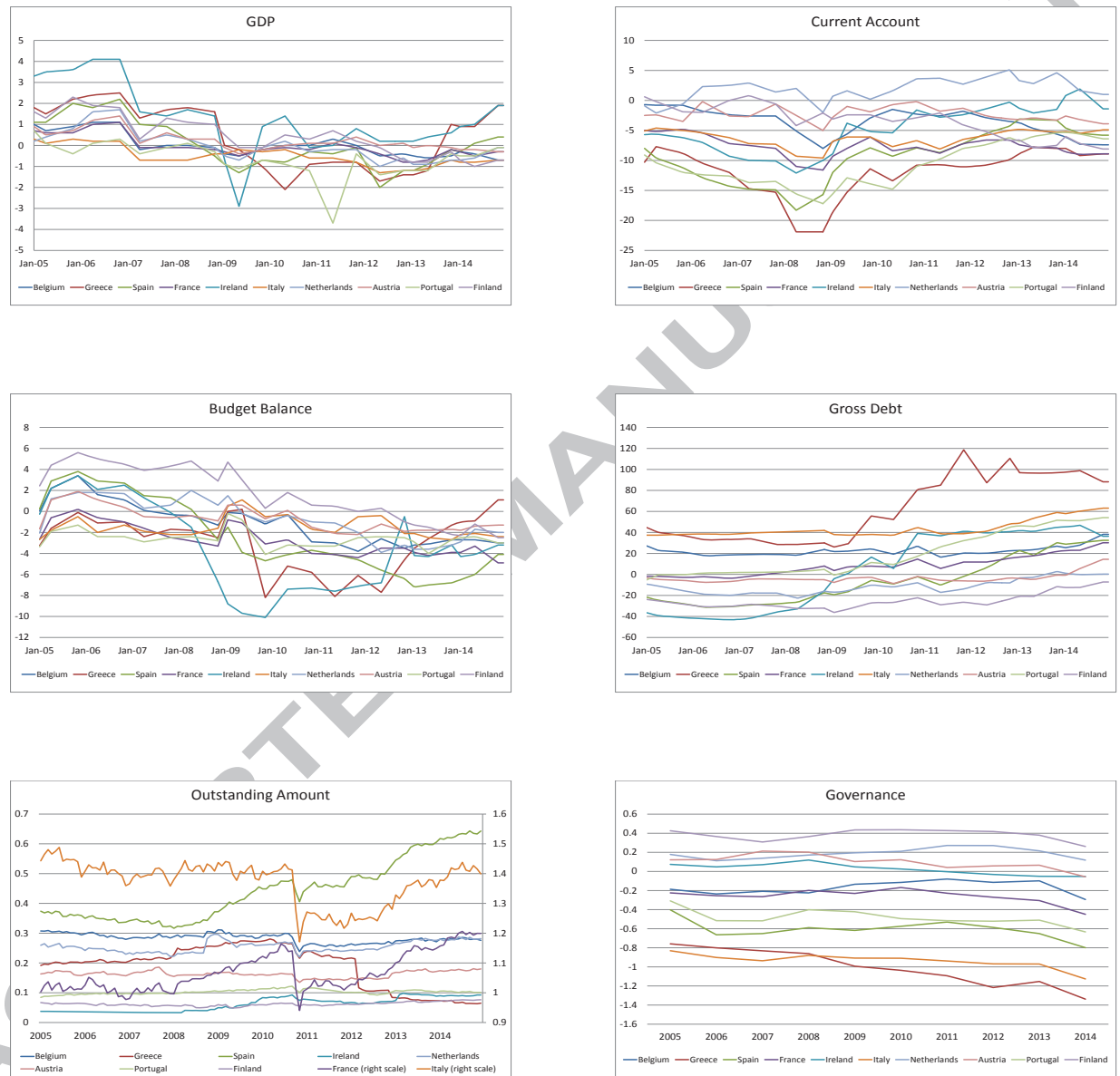
Note: Baseline: Main regression from Blanchard and Leigh (2013); GDP forecast errors (IMF forecasts) from 2010 and 2011 are explained via envisaged changes in structural budget balance (planned fiscal consolidation). Additional: Governance indicator for 2009 is added to baseline. Interaction: Cross term (governance indicator \times planned fiscal consolidation) is added to baseline.

Figure 1: Government bond yield spreads



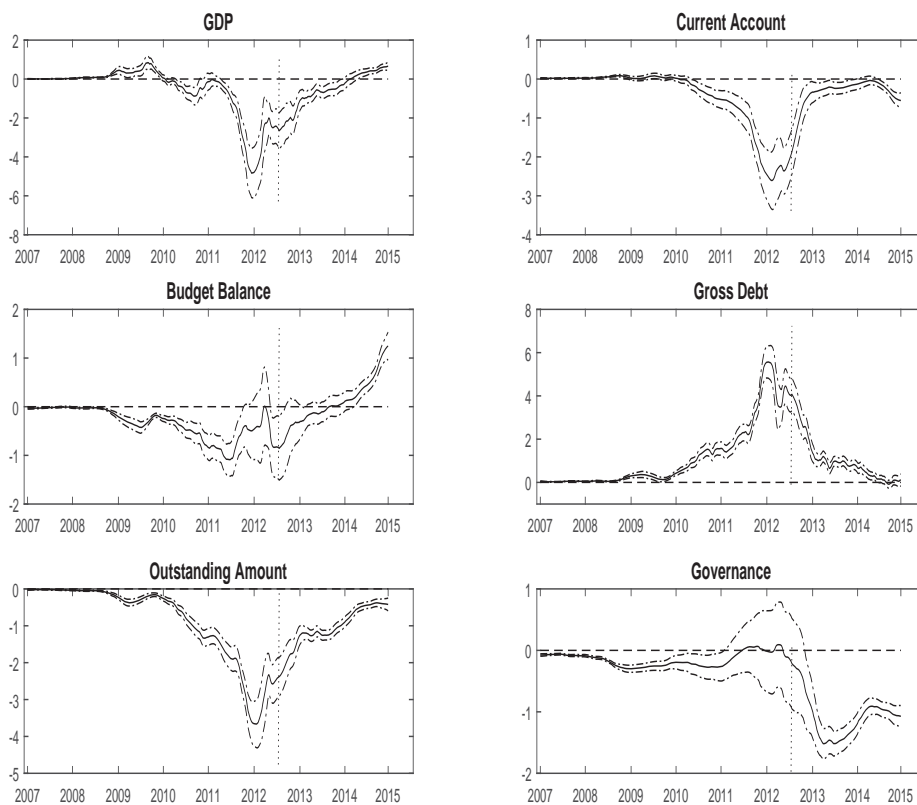
Note: Differences to yields of German bunds in percentage points. Weekly data. OMT: Week of announcement of the OMT by the ECB.

Figure 2: Determinants of government bond spreads: data



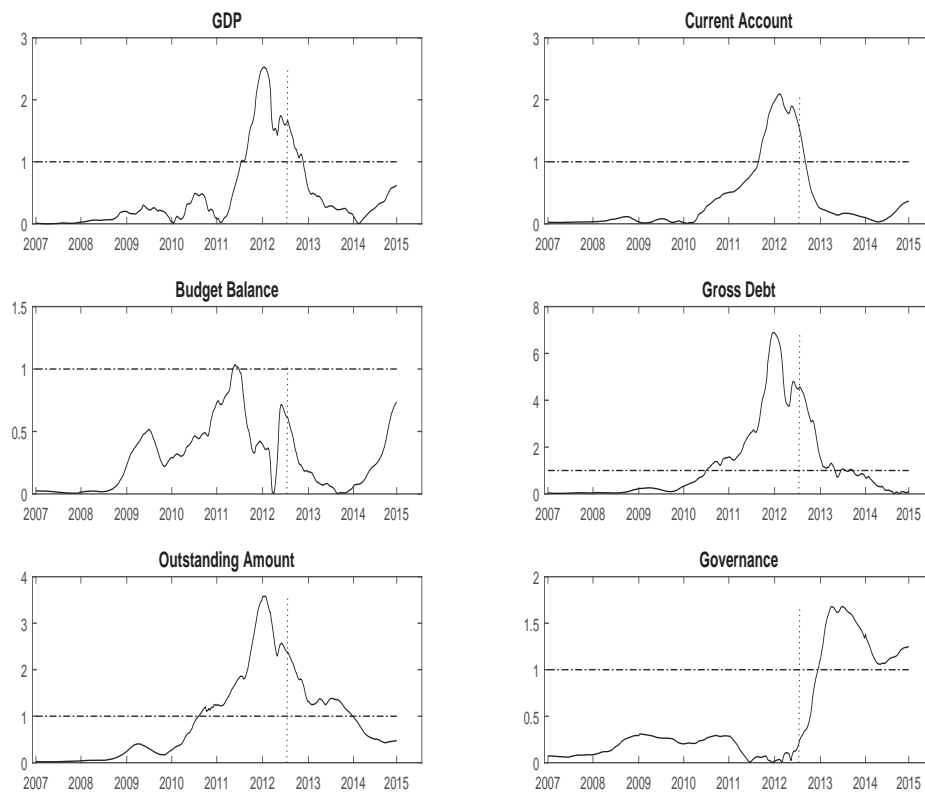
Note: GDP: Growth rates in difference to German figures, forecasts from the European Commission, interpolated, weekly frequency. Current account: relative to GDP, in difference to German figures, forecasts from the European Commission, interpolated, weekly frequency. Budget Balance: relative to GDP, in difference to German figures, forecasts from the European Commission, interpolated, interpolated, weekly frequency. Gross debt: relative to GDP, in difference to German figures, forecasts from the European Commission, interpolated, weekly frequency. Outstanding amount: government debt securities in Euro relative to the outstanding amount of debt securities issued by the German Federal government, data from the ECB, monthly frequency. Governance: indicator comprising all six sub-indicators from the World Bank data base on governance indicators, yearly frequency.

Figure 3: Determinants of government bond spreads: estimated mean of time-varying coefficients



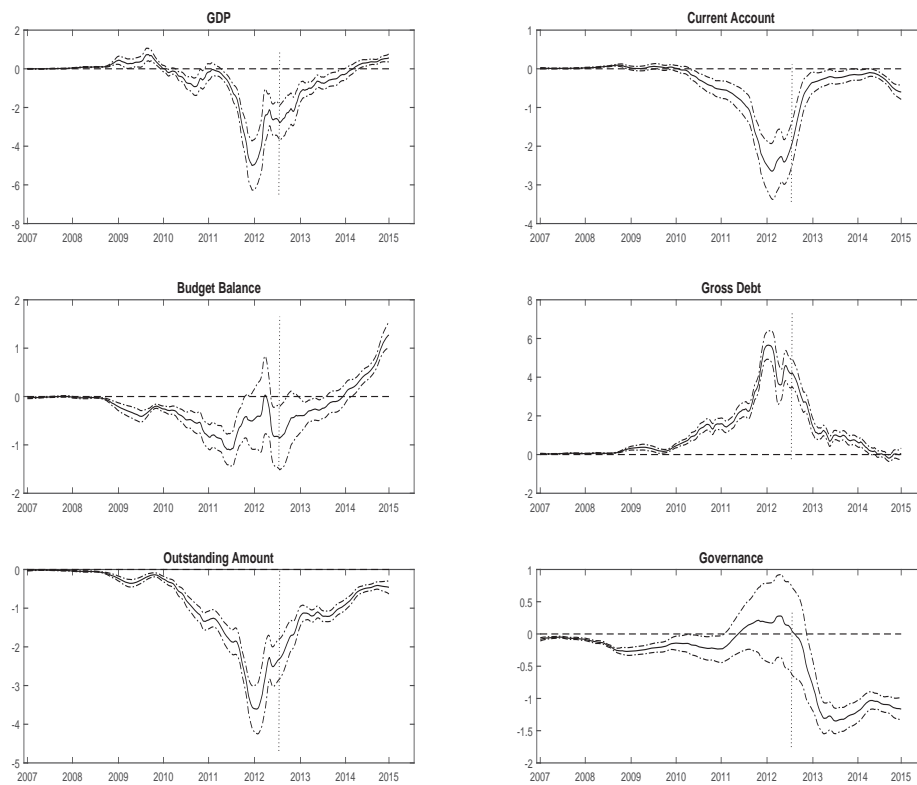
Note: Smoothed β_t : straight line; dashed lines: 2σ confidence bands. Dashed vertical line: announcement of OMT. Upper left panel: GDP growth; upper right panel: current account relative to GDP; middle left panel: budget balance relative to GDP; middle right panel: debt to GDP ratio; lower left panel: outstanding amount of debt securities; lower right panel: governance indicator.

Figure 4: Relevance of the determinants of government bond spreads



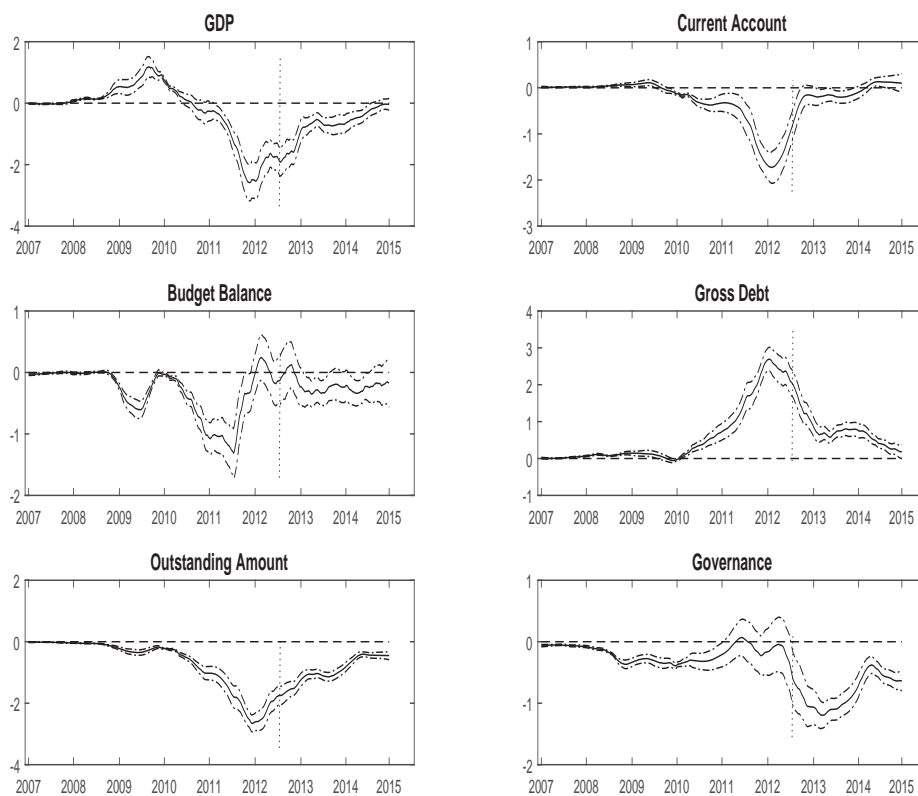
Note: Absolute value of time-varying coefficient times standard deviation in the cross section for each period. Dashed vertical line: announcement of OMT. Upper left panel: GDP growth; upper right panel: current account relative to GDP; middle left panel: budget balance relative to GDP; middle right panel: debt to GDP ratio; lower left panel: outstanding amount of debt securities; lower right panel: governance indicator.

Figure 5: Determinants of government bond spreads: estimated mean of time-varying coefficients – lagged governance variable



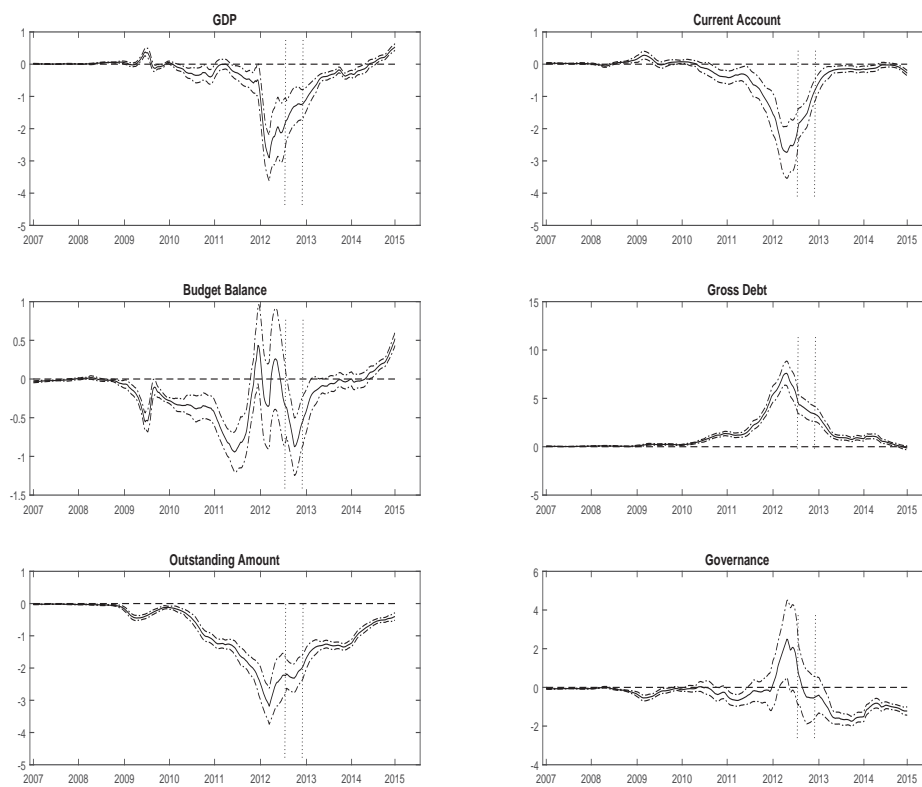
Note: Smoothed β_t : straight line; dashed lines: 2σ confidence bands. Dashed vertical line: announcement of OMT. Upper left panel: GDP growth; upper right panel: current account relative to GDP; middle left panel: budget balance relative to GDP; middle right panel: debt to GDP ratio; lower left panel: outstanding amount of debt securities; lower right panel: governance indicator.

Figure 6: Determinants of government bond spreads: estimated mean of time-varying coefficients – without Greece



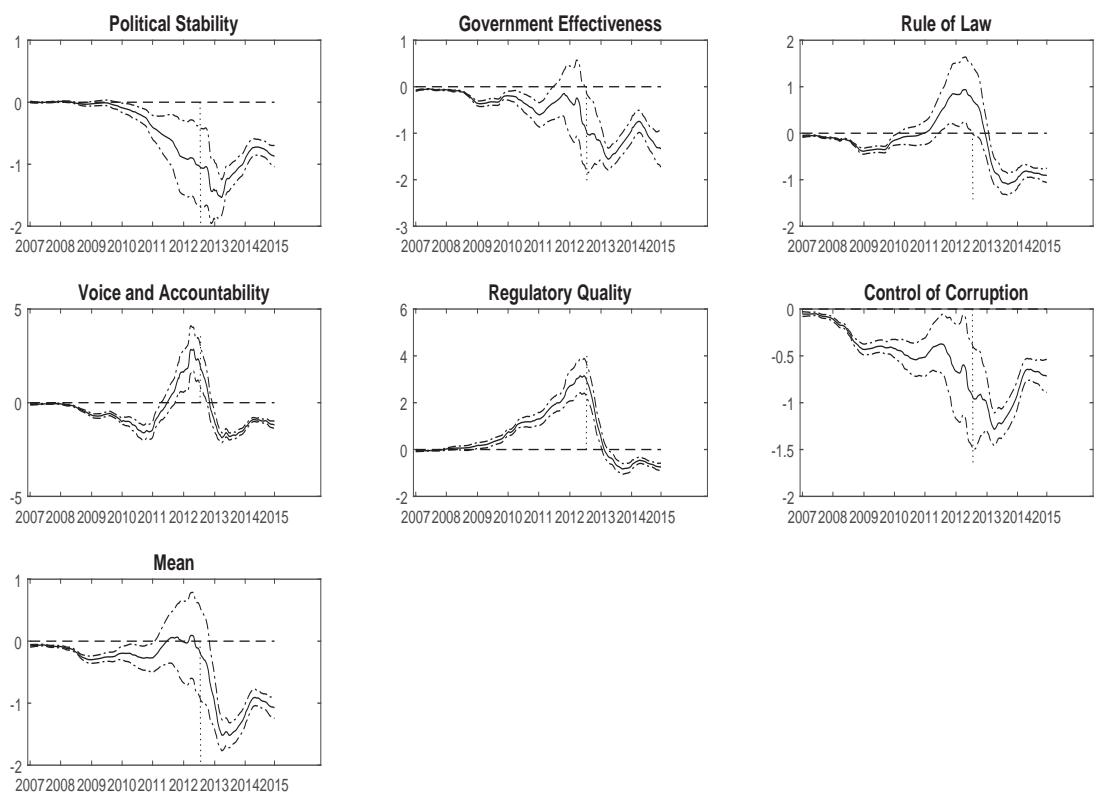
Note: Smoothed β_t : straight line; dashed lines: 2σ confidence bands. Dashed vertical line: announcement of OMT. Upper left panel: GDP growth; upper right panel: current account relative to GDP; middle left panel: budget balance relative to GDP; middle right panel: debt to GDP ratio; lower left panel: outstanding amount of debt securities; lower right panel: governance indicator.

Figure 7: Relevance of the determinants of government bond spreads – rolling window



Note: Absolute value of time-varying coefficient times standard deviation in the cross section for each period. First dashed vertical line: announcement of OMT. Second dashed vertical line: announcement of OMT plus window size. Upper left panel: GDP growth; upper right panel: current account relative to GDP; middle left panel: budget balance relative to GDP; middle right panel: debt to GDP ratio; lower left panel: outstanding amount of debt securities; lower right panel: governance indicator.

Figure 8: Results for the six sub-indicators



Note: Smoothed β_t : straight line; dashed lines: 2 σ confidence bands. Dashed vertical line: announcement of OMT.

Highlights

- Determinants of government bond spreads in the euro area are assessed.
- Indicator for governance quality is added as possible determinant.
- Debt-to-GDP is most important in the midst of the debt crisis.
- Markets put high weight on governance quality especially after the announcement of OMT.