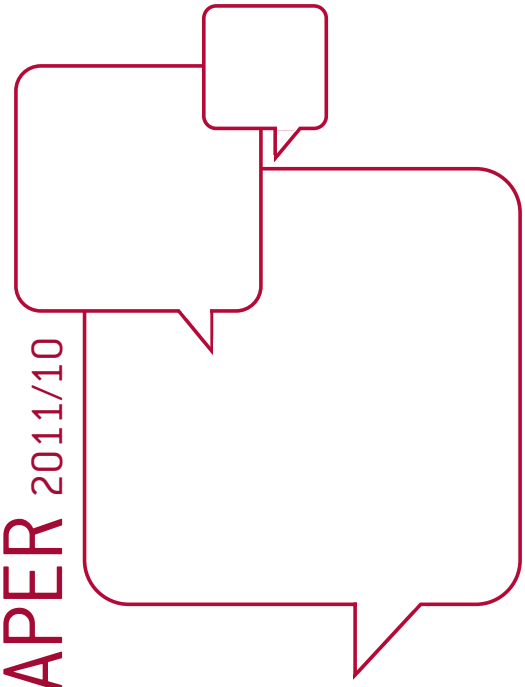

BRUEGEL WORKING PAPER 2011/10

RULES AND RISK IN THE EURO AREA

ANNA IARA* AND GUNTRAM B. WOLFF**

Highlights

- With a unique data set summarising the quality of rules-based fiscal governance in European Union member states, we show that stronger fiscal rules in euro-area members reduce sovereign risk premia, in particular in times of market stress.
- To do so, we develop a model of sovereign spreads that are determined by fiscal institutions in interaction with the level of risk aversion. Estimation of the model confirms the central predictions. The legal basis for the rules, and mechanisms for enforcing them, are the most important dimensions of rules-based fiscal governance.

Keywords: fiscal governance, numerical fiscal rules, sovereign spreads, sovereign risk, euro area
JEL Classifications: E43, E62, G12, H60, H63

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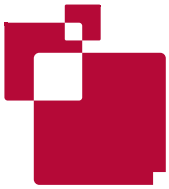

OCTOBER 2011

Rules and risk in the euro area

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Abstract

With a unique data set summarizing the quality of rules-based fiscal governance in EU member states, we show that stronger fiscal rules in euro area members reduce sovereign risk premia, in particular in times of market stress. To do so, we develop a model of sovereign spreads that are determined by the probability of default in interaction with the level of risk aversion. Estimation of the model confirms the central predictions. The legal base of the rules and their enforcement mechanisms are the most important dimensions of rules-based fiscal governance.

Key words: fiscal governance, numerical fiscal rules, sovereign spreads, sovereign risk, euro area
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1 Introduction

Differences in government bond yields have sharply increased in the euro area. Part of this increase can be attributed to developments in public debt (von Hagen et al., 2011) and contingent liabilities related to the banking sector (Gerlach et al., 2010; Ejsing and Lemke, 2011), both evoked by the economic crisis. Besides, the price of government bonds evidently reflects market confidence in governments' commitment towards sustainable fiscal policies. The

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trust of investors in such a commitment may be enhanced by a strong fiscal framework (Fatás, 2010) and the framework may help anchor fiscal policy expectations (Leeper, 2010). Indeed, strengthening national fiscal governance is an important item both of national reform agendas in the euro area [2] and the economic governance reform at the EU level (European Commission, 2010).

We investigate whether national fiscal governance and numerical fiscal rules in particular help contain the interest required on government bonds. Specifically we propose and test a model of sovereign yield spreads that accounts for risk aversion. We argue that fiscal governance has an impact on the sovereign yield spreads by reducing the probability of default. This has a twofold non-linear effect on the sovereign spreads: first, it determines the standard risk premium that compensates for the possibility of default no matter what the extent of risk aversion is. Second, it determines the variance of the payments from the risky bond. Markets will ask for a compensation for assuming the risk associated with this variance; this second component is amplified with risk aversion. Using a unique dataset on fiscal governance in EU member states, we provide empirical support to our model and specifically to the restrictions implied by it. We find strong and economically sizeable effects of the quality of national rules-based fiscal governance on sovereign spreads. We further show that the legal base of the rules appears to be the most important dimension of their effectiveness in containing sovereign risk premia, while the mechanisms to enforce compliance are highly important as well. The type of the bodies in charge of supervising compliance with the fiscal rules, in turn, appears to matter less.

Numerical fiscal rules are defined as permanent constraints on summary indicators of fiscal performance, such as the budget deficit, debt, or a major component thereof (Kopits and Symansky, 1998). They are aimed at reducing the policy failures due to which budget process outcomes tend to be biased towards deficits: namely, the common pool problem of governments without centralised spending powers, the short-term orientation of governments due to short electoral cycles, and the possible short-term orientation of voters. In the EU, fiscal rules further aim at mitigating the incentives for deficits resulting from a common currency.

Empirical research in the past two decades has shed light on the role of numer-

[2] Germany has recently introduced a constitutional rule to limit government debt; other countries - Hungary, Spain, Portugal, and most recently, Italy - have followed suit or are contemplating doing so. After initially embracing this idea, the introduction of a constitutional debt brake has been postponed in France.

ical fiscal rules for sound public finance. While earlier research concentrated on the experience of the US states, sometimes in view of deducting insights for the nascent EMU (von Hagen, 1991; Bayoumi and Eichengreen, 1995; Alesina and Bayoumi, 1996; Bohn and Inman, 1996), the focus of analysis then shifted to Europe. The effectiveness of national fiscal rules with respect to fiscal performance has been shown to depend on the mechanisms established to enforce compliance with the rule (Inman, 1998; Ayuso-i-Casals et al., 2009) and on the type of the rule: budget balance and debt rules appear to outperform expenditure rules (Debrun et al., 2008) and in fulfilling medium-term fiscal plans presented in the Stability and Convergence Programmes of EU members, which is a central plank of EU budgetary surveillance (von Hagen, 2010). The role of fiscal rules in the budgetary process has been scrutinised as well: empirical evidence is not fully conclusive whether fiscal rules serve as commitment devices to effectively tie the hands of governments not to pursue short-sighted and pro-cyclical budgetary policies (Debrun and Kumar, 2007b; Debrun et al., 2008), or whether they merely have a signalling role and remove information asymmetries between governments and the electorate, without changing the behaviour of governments (Debrun and Kumar, 2007a; Debrun, 2006). On the EU level, fiscal rules have been shown to be effective, but to lead to significant creative accounting aimed at their circumvention (von Hagen and Wolff, 2006; Buti et al., 2007). Theoretically, it has been elaborated that supra-national rules are welfare improving relative to merely national regimes, but that they cannot fully eliminate the deficit bias, which calls for strong national rules in addition to the supra-national ones (Krogstrup and Wyplosz, 2010).

The past several years witnessed a surge of research on the impact of fiscal variables on spreads in government bond yields as well. In an international context, a positive relationship between public debt and interest rates has been consistently confirmed (Edwards, 1986; Alexander and Anker, 1997; Lemmen and Goodhart, 1999; Lonning, 2000; Copeland and Jones, 2001; Codogno et al., 2003). In the euro area, sovereign spreads are found to be determined by debt, deficits, and debt-service ratios (Bernoth et al., 2004) as well as by hidden fiscal policy activity, creative accounting practices, and transparency of government budgeting (Bernoth and Wolff, 2008). On the sub-national level, the price of public debt is confirmed to reflect fiscal fundamentals (Schuknecht et al., 2009; Heppke-Falk and Wolff, 2008; Schulz and Wolff, 2009). The impact of risk perceptions has also received significant attention by important research (Codogno et al., 2003; Favero et al., 1997; Barrios et al., 2009) and more recent research has looked into variations in time in the weight of various determinants (Bernoth and Erdogan, 2010).

The impact of fiscal restraints on the cost of public borrowing has been studied by looking at US states. Bayoumi et al. (1995) show that the impact of

constitutional controls on the cost of debt depends on the level of debt: at average levels, the presence of such controls is found to be associated with a reduction of the interest cost by 50 basis points. Eichengreen and Bayoumi (1994) confirm the negative impact of fiscal rules on the cost of government borrowing. Poterba and Rueben (1999) uncover that expenditure, deficit, and debt rules (negatively) as well as tax limitations (positively) impact on state bond yield differentials; debt rules appear to be the least effective. Differentiating this result, Johnson and Kriz (2005) show that revenue limits have a direct impact on state borrowing, while the effect of numerical fiscal rules is indirect via improved credit ratings. For the euro area, Hallerberg and Wolff (2008) reveal that government bond yields are also determined by institutional characteristics of the fiscal process.

Our analysis adds to the body of research in several respects: it is the first to empirically investigate the role of numerical fiscal rules to contain sovereign bond spreads in the euro area specifically, using a rich dataset maintained by the European Commission. It does so in a theory framework that accounts for risk aversion. Specifically, our model implies that the impact of fiscal rules on sovereign spreads is amplified by risk aversion; its predictions are confirmed by the empirical analysis. The impact of five dimensions of rules-based fiscal governance on sovereign spreads is also investigated separately: the legal base of the rules and the mechanisms to foster compliance are found particularly important.

The remainder of the paper is structured as follows. Section 2 outlines our analytical approach and the empirical strategy adopted. Section 3 describes our dataset and the construction of the fiscal rule index in particular. Section 4 presents the panel data estimations and a set of robustness checks. Section 5 concludes.

2 Theory and empirical approach

We investigate the impact of rules-based fiscal governance on risk premia in euro area government bond markets in a simple framework allowing for different attitudes towards risk. Specifically, an investor has an amount of wealth of 1 that she might use to acquire a risk-free bond that pays interest v^*, or alternatively hold a bond of country i that delivers repayment with interest amounting to $1 + v^* + v_i$, but that might default on its debt with probability $i \in [0; 1]$. Against the alternative of holding the asset with zero risk, the sovereign bond of country i will deliver expected additional wealth of

$E(I_i) = -(1+v^*)\theta_i + (1-\theta_i)v_i$. We assume $E(I_i) = 0$: purchasing country i's sovereign bonds is actuarially neutral. This implies for the compensation for the possible event of default:

$$v_i = (1+v^*)\frac{\theta_i}{1-\theta_i} = (1+v^*)\tau_i, \tag{1}$$

where $\tau_i = (\theta_i)/(1-\theta_i)$ is the odds of default.

We further assume that investors' utility functions are twice differentiable and strictly increasing, i.e. $U'(X) > 0$. Risk-averse investors specifically have concave utility functions, i.e. $U''(X) < 0$. From the condition of indifference between purchasing bonds of country i and the certainty equivalent to such activity, the Arrow-Pratt measure of the risk premium i can be established as [3]

$$\pi_i = 0.5\sigma_i^2\rho, \tag{2}$$

where ρ is the coefficient of absolute risk aversion, and σ_i^2 is the variance of outcomes from holding country i's sovereign bonds. The variance, in turn, is

$$\sigma_i^2 \equiv E(I_i^2) - E^2(I_i) = \tau_i(-(1+v^*))^2 + (1-\tau_i)v_i^2 = (1+v^*)^2\tau_i. \tag{3}$$

The risk premium switches signs with the coefficient of risk aversion and is zero in the presence of risk neutrality.

To risk-averse investors, the sovereign bond of country i has to offer an overall excess return s_i over v^* of v_i (this part is to compensate for the possibility of default) topped up by the risk premium π_i (which is to compensate for accepting the risk). Using expressions (1), (2), and (3), s_i becomes

$$s_i = v_i + 0.5\sigma_i^2\rho = (1+v^*)\tau_i + 0.5(1+v^*)^2\tau_i\rho = (1+v^*)\tau_i[1+0.5\rho(1+v^*)]. \tag{4}$$

Equation (4) shows how the excess yield that country i's sovereign bond offers over the risk-free return v^* depends on the probability of default, θ_i and more precisely the odds of default τ_i, which is a nonlinear function of θ_i. In particular, τ_i has an immediate effect via the compensation for the possibility of default, v_i, as well as an effect via the Arrow-Pratt risk premium, that is in fact amplified by the level of risk aversion as well as by the level of risk-free

[3] Specifically, with the amount of wealth of 1 to invest, the risk premium that makes the investor indifferent between purchasing bonds of country i and the certainty equivalent to such activity has to satisfy the equality $E[U(1+I_i)] = U[1+E(I_i) - \pi_i(1, I_i)]$. From here, expression (2) is obtained from applying Taylor approximations to both sides of the above indiffernce condition, using $E(I_i) = 0$ and $E(I_i^2) = \sigma_i^2$, and solving for the risk premium (Copeland et al., 2005).

return, v^*.[4]

As concerns risk aversion specifically, $\partial^2 s_i/\partial\theta_i\partial\rho = 0.5(1-\theta_i)^2 > 0$: the yield spread increases with risk aversion especially in countries with higher default probabilities. For risk neutrality, equation (4) simplifies to the standard approximation equalising the yield spread with the country-specific probability of default: $s_i \approx \tau_i$.

To arrive at our estimating equation, we resort to the standard assumption (Edwards, 1986; Bayoumi et al., 1995, e.g.) that θ_i is a logistic function of a measure Y_i that in turn linearly depends on a set of exogenous regressors X_i, parameters β, and a stochastic error term $\epsilon \sim$ i.i.d.:

$$\theta_i = P(I = (1+v^*)|Y_i) = e^{Y_i}/(1+e^{Y_i}) \tag{5}$$

with $Y_i = X_i'\beta + \varepsilon_i$.

Inserting (5) into (4), taking logs, and rearranging terms results in

$$\ln(s_i) = v^* + X_i'\beta + \ln(1 + 0.5\rho(1+v^*)) + \varepsilon_i' \tag{6}$$

As concerns the determinants of the risk of country i's default, these include the standard determinants of the sovereign debtor's solvency, specifically, the actual levels of debt B_i and the budget balance b_i, as well as institutional characteristics of the country $(C_i, Z_{i,t})$, where C_i summarises such characteristics that are constant over time, and $Z_{i,t}$ is a vector of time-varying characteristics. The solvency of the country will be determined by the future realisations of the budget balance above all; but any systematic bias (such as the deficit bias) of the future fiscal position will be already absorbed by C_i, i.e. $E_t(b_{t+1}|c_i) = \gamma c_i + \nu_{i,t}$ with $E(\nu_i) = 0$, where c_i is part of C_i and cannot be separately identified econometrically. Hence, the set of determinants of the default probability is

$$X_{i,t} = (B_{i,t}, b_{i,t}, C_i, Z_{i,t}). \tag{7}$$

In our approach, rules-based fiscal governance has an impact on sovereign spreads as part of the institutional characteristics $Z_{i,t}$, and as such, by having an impact on the expected probability of default. Fiscal rules can be thought of as affecting the expected probability of default in two ways. First, their very

[4] Dependence from the initial level of wealth (i.e. the amount to invest) of the measure of absolute risk aversion employed in our analysis does not impair our results as we disregard of heterogeneity among investors.

role is to correct for persistent deficit bias, thus improving the expected value of the fiscal balance. Second, they can be expected to reduce the variance of expected future deficits as well. This diminishes the probability of default as sustainability-threatening deficits become less frequent. In our model, all determinants of the default probability have a non-linear impact on the sovereign bond spreads. Calculating back from (6) formulated in logarithms to the levels shows that their impact is amplified by the level of risk aversion ρ. In other words, differences in the quality of rules-based fiscal governance translate into higher differences in sovereign spreads when risk aversion is high. But better rules-based fiscal governance will result in lower sovereign spreads at low levels of risk aversion as well.

In line with the above discussion, in our empirical analysis we regress the logarithm of the euro area countries' sovereign bond spreads, ln_spread, against Germany on the levels of the German Bunds' interest ($yield\_de$), the budget balance ($balance$), debt ($debt$), a measure of the quality of rules-based fiscal governance (fri), and the logarithm of the composite term $(1 + 0.5(1 + v^*))$ as implied in (6), ln_riskav, where ρ is proxied by the spread between US low grade corporate and government bonds or the Chicago Board Options Exchange Market volatility index known as VIX (vix), which is driven by global shocks and can be considered exogenous to euro area bond spreads. Our baseline estimating equation thus becomes

$$\begin{aligned} ln(spread_{i,t}) = \beta_1 yield\_de_t + \beta_2 balance_{i,t} + \beta_3 debt_{i,t} + \beta_4 fri_{i,t} \\ + \beta_5 ln(1 + 0.5\rho_t(1 + yield\_de_t)) + C_i + u_{i,t}. \end{aligned} \tag{8}$$

Note that our model implies that $\beta_1 = \beta_5 = 1$ (see equation (6)).

The fiscal rules index fri is described in detail in the next section. Fiscal rules can be considered exogenous or predetermined to government bond yields. The endogeneity of fiscal rules with respect to fiscal policy outcomes has been explored in empirical research (e.g., Debrun and Kumar (2007a,b)). While certainly at present, national fiscal framework reform debates are driven by the consolidation pressures and high sovereign bond spreads, changes in fiscal governance prior to this crisis have not been connected with bond markets. Indeed, government bond spreads across euro area countries had been too low to fuel institutional debates. Fiscal framework reforms were enacted because of domestic and EU level pressure instead and endogeneity should thus not be an issue. Still, to be sure that our results are not impaired by endogeneity concerns, we check the robustness of our results by excluding the 2009 and 2008 data where the strength of numerical fiscal rules might have been determined by the fanning out of the government bonds yields in the previous year.

We also present estimation results where the fiscal rule index is considered predetermined.

It has been hypothesised that fiscal rules might only be a signal of pre-existing commitment instead of providing genuine constraints to fiscal behaviour. Econometrically, our fiscal rule index might not measure the effect of rules-based fiscal governance on probabilities of sovereign default by directly constraining fiscal activity, but rather capture an omitted variable measuring pre-existing commitment to sound fiscal policies. As we control for country fixed effects, any omitted variable bias can only stem from time-varying commitment to fiscal rectitude that is correlated with changes in rules-based fiscal governance. In the presence of such omitted variable bias, changes in fiscal rules would reflect changes in underlying preferences. Empirically, we cannot exclude this possibility but it appears to be of comparatively minor relevance as preferences typically shift only slowly. In any case, if fiscal rules are introduced or strengthened, this happens in the circumstances in which policy-makers want to reduce the deficit bias. Even if such determination is present among fiscal policy makers, fiscal rules will have a role of co-ordinating behaviour (Drazen, 2002; Weingast, 2005), which goes beyond the role of mere signalling.

Our baseline regressions are augmented by further analysis. We do not only consider the global impact of rules-based fiscal governance on sovereign risk premia but study the impact of its different dimensions, including the legal basis, enforcement etc. Besides we provide robustness analyses with regard to the time period covered, the crisis, and the role of liabilities stemming from bank rescue operations.

3 The dataset

Our empirical analysis is based on a dataset covering 11 euro area countries in the time period of 1999 to 2009. We disregard of the most recent years as 2010 saw more intensive discussions about strengthening rules-based fiscal governance in several euro area countries in the aftermath of the economic and financial crisis. By leaving data of 2010 and 2011 aside, we reduce concerns about the endogeneity of fiscal rules. Luxembourg - with very little public debt until recently - as well as the latest euro area entrants Cyprus, Malta, Slovenia, and the Slovak Republic are not included either. The sovereign bond spreads are expressed in differences to German data, which leaves us with a panel dataset of 10 countries. Germany is chosen as the benchmark country

as the Bund is considered the benchmark bond in the respective bond market (see e.g. Dunne et al. (2007)).

Our dependent variable *ln_spread* is the log of government bond spread against the German Bund of the above euro area members based on the yield of their 10-year on-the-run fixed coupon bonds obtained from Bloomberg. As an indicator of the debtors' repayment capacity - *balance* and *debt* - data on government debt and deficits from Eurostat are employed. The data are measured in per cent of GDP. Annual averages of the seven-to-ten year US corporate bond spread for the rating category BBB from Merrill Lynch against US treasuries is employed as a proxy for average coefficient of absolute risk aversion among investors.

An innovative element of our research is the inclusion of the index of the strength of numerical fiscal rules fri at country level among the regressors. This fiscal rule index has been constructed by the fiscal governance unit of the European Commission's Directorate-General for Economic and Financial Affairs from information on fiscal governance obtained from the EU member states via the Economic Policy Committee of the Ecofin Council of the EU. [5]

The fiscal rule index is based on information on five dimensions describing each fiscal rule in force at the local, sub-national or national level in an EU member state: (1) the statutory base of the rule, (2) room for revising objectives, (3) mechanisms of monitoring compliance with and enforcement of the rule, (4) the existence of pre-defined enforcement mechanisms, and (5) media visibility of the rule. According to a pre-defined scale distinguishing different degrees by which the design of the rule supports its strength along these dimensions, scores are attributed to each of the dimensions for each fiscal rule as shown in Appendix A. To construct the fiscal rule index, these scores are aggregated using weights obtained as averages of 10,000 randomly drawn numbers from a uniform distribution, following the method used by Sutherland et al. (2005). The random weights technique is applied because of the absence of theoretical guidance on the importance of each criterion in the composite index of the strength of fiscal rules. Finally, the indices of the strength of a fiscal rule obtained for each single rule are aggregated to a single comprehensive score per country per year by adding up the indices calculated for each fiscal rule separately, adjusted by the coverage of general government finances by that rule. In the presence of more than one rule covering the same government

[5] This rich dataset is updated annually; it is accessible to the public at `http://ec.europa.eu/economy_finance/db_indicators/fiscal_governance/index_en.htm`.

sub-sector, the second and third rules obtain weights $\frac{1}{2}$ and 1/3 to reflect decreasing marginal benefit of multiple rules applying to the same sub-sector of general government. The design of the index is inspired by Deroose et al. (2006). The index is re-scaled to assume values between 0 (minimum) and 10 (maximum). An improvement of the index is achieved by strengthening one or several existing numerical fiscal rules along either of the above dimensions, by introducing new numerical fiscal rules, or by extending the coverage of general government by existing or new rules. Note that the fiscal rule index only considers if there is a numerical constraint to a budgetary aggregate: it does not take into account however if this constraint is realistically binding in reality (e.g., debt rules allowing for a comparatively high debt level are not binding in low-debt countries).

We also analyse the impact of numerical fiscal rules on sovereign bond spreads considering the five above components separately. To this end we apply the same technique of aggregation as for the composite index. Obviously, no weighting is involved in obtaining this set of sub-indices. Table A in Appendix B shows the unconditional correlation between the components of the global fiscal rule index: correlations between pairs of components are typically high. Country sets of rules that are strong by one dimension tend to be strong along other dimensions as well. The correlation between components 1 and 3 of the overall index (referring to the legal base and the body in charge of monitoring and enforcing compliance with the rule respectively) appear to be particular strong. Components 4 and 5 of the overall index (referring to its enforcement mechanisms and media visibility) appear to be less connected to the overall index than components 1 and 2.

Figure 1 shows the development of rules based fiscal governance in the eleven euro area members of our sample, as measured by the fiscal rules index, 1999 to 2009. The strength of the fiscal rules in force in our country of reference, Germany, has been above average and constant at around 7 throughout the period considered. [6]

The strength of the numerical fiscal rules in force in the other euro area coun-

[6] In the period covered by our sample, Germany has operated "golden" budget balance rules and rules limiting nominal expenditure growth for both the federal government; local governments' budgets have been constrained by debt ceilings and a balance budget rule. In the period considered, the target of the nominal expenditure rule was reformulated, that had no impact on the score of the fiscal rule index, though. Note that the much-debated "debt brake" for the federal government and the Länder will be phased in only from 2011, so the score of the index is unaffected in our sample.

tries ranged between zero (for Greece, that has had no such rule in force) and 9.5 (the Netherlands,[7] unchanged, and Spain as from 2006) and 9.7 (Spain[8] 2003-2005) respectively. Countries with below-average fiscal rule index scores were Ireland, Portugal, and Italy, while the scores of France, Austria, Belgium, and Finland qualified these countries as having stronger fiscal rules than on average. Remarkable changes to the better occurred in the case of France 2006 and 2008 to 2009,[9] as well as Ireland 2004, while the strength of the fiscal rules deteriorated in Finland after 2007 and in Austria in 2009,[10] in particular due to the suspension of rules in force in the course of the economic and financial crisis.

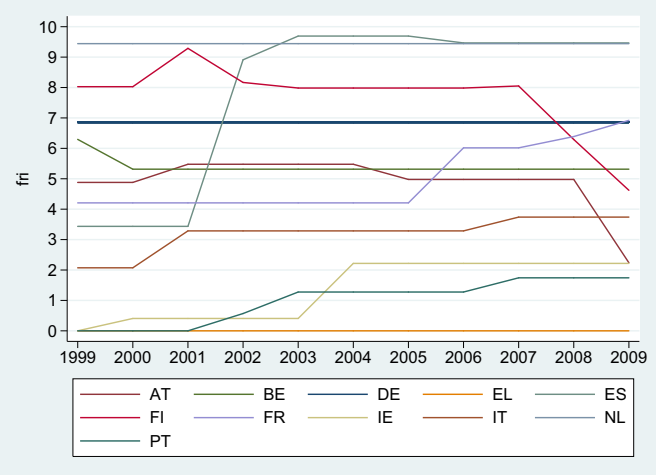


Fig. 1: The fiscal rule index in 11 euro area members, 1999 to 2009

As any index, the index of rules-based fiscal governance applied in our analysis

[7] The Netherlands have been operating a real expenditure ceiling and a rule to allocate windfall revenues applying to all general government.

[8] Until 2002, Spain has operated debt ceilings to local and regional governments. In 2002, a budget-balance rule covering all general government was introduced, which was slightly modified in 2006. In 2003, the rules-based framework was extended by further restrictions on debt applied to regional governments.

[9] In 2006, France introduced a rule to the central government to pre-commit unexpected revenues, and a ceiling to the growth of health expenditure to be established by the parliament. In 2008 the increase of social security debt was made conditional upon an increase in revenues. Finally, since 2009, unexpected revenues were automatically assigned to deficit reduction.

[10] In Finland, a debt rule and budget balance rule applied to the central government were no longer in force after 2007 and 2008, respectively. In Austria, the budget balance rule laid down in the National Stability Pact was replaced in 2009 by a nominal expenditure ceiling for five headings of the general government budget. The main difference between the two approaches is that the more recent nominal expenditure ceiling only covers a fraction of parts of the budget previously covered by the National Stability Pact.

constitutes a simplification of complex reality. Despite measurement errors of which an index of this type will inevitably suffer, we argue that it is a useful approximation of reality. Measurement errors affecting the index should be randomly distributed and therefore not affect the basic estimation results. If anything, attenuation due to measurement errors biases coefficients towards zero. Therefore, any significant result can be confidently regarded to corroborate our hypothesis and provide a lower bound of the true effect.

Turning now to the development of the government bond spreads as compared to German Bund yields in the period under review, these spreads were below 30 basis points for most euro area members, with a slight increase until 2001 and decreasing in the period between 2001 and 2006. Sovereign bond spreads mounted and fanned out in the wake of the economic and financial crisis, with particularly high values of 190 basis points reached on average by Greece and Ireland and values between 40 and 100 basis points for the other euro area members during 2009 (see Figure 2). The ranking of the euro area members by the size of the spread of their bond yields against Germany was broadly constant in the period considered, with France, the Netherlands, and Finland being closer to the benchmark and Greece, Italy, Portugal and Spain being at the higher end of the distribution.

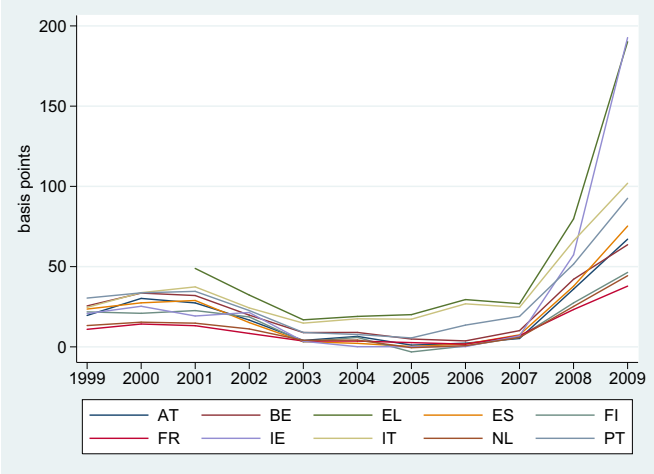


Fig. 2: Sovereign spreads against Bunds in 10 euro area members, 1999 to 2009

In Figure 3 we look at the development of international risk aversion as measured by the spread between low-grade US corporate and government bonds. As can be seen by comparison with Figure 2, euro area government bond spreads have moved in parallel with international risk aversion. In fact, international risk aversion was particularly low in the mid-2000s, when euro area sovereign bond spreads were historically low as well. With the rise of international risk aversion during the economic and financial crisis, sovereign bond spreads increased markedly, too.

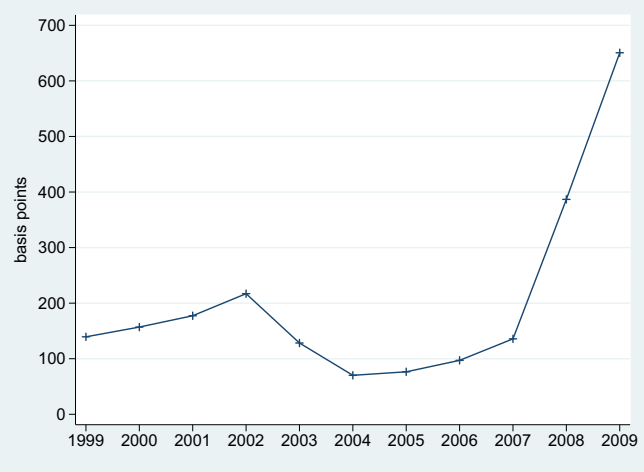


Fig. 3: Merrill Lynch US corporate BBB spread, 1999 to 2009

Table B in Appendix B provides the simple correlations of the main variables applied in our analysis. The unconditional correlation between the quality of fiscal rules and the sovereign bond spreads in our sample is negative.

4 Estimation results

We carry out the empirical estimation of the model outlined in section 2 in a dynamic framework using the Arellano-Bond GMM estimator. As we find significant error autorcorrelation when using a static approach, we prefer to show this dynamic estimator. A dynamic model with two lags is found most appropriate according to the standard tests. The chosen GMM estimator accounts for the potential endogeneity in the level of general government debt, the budget balance, and the level of risk aversion.

Table 1 presents the main results of the estimation of our model. Regression A presents the estimation of our model according to equation 9 above (see section 2). The negative effect of the strength of rules-based fiscal governance on sovereign spreads is clearly confirmed. An increase in the index thus results in a reduction of the sovereign spread relative to Germany.

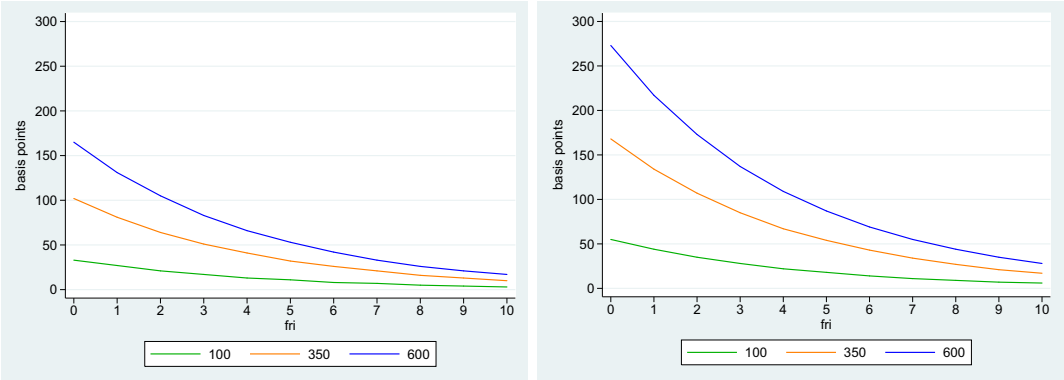
A unit improvement of the rules-based framework lowers the risk premium by around 23 per cent. Due to the log-linearity of our model, the effect on absolute spreads of a change in one determinant depends on the level of the other variables. When the level of risk aversion is high, improving national

	A	B	C	D	E	F	G	H	I	J	K
debt	0.02*	0.03***	0.02	0.03*	0.03	0.02	0.02	0.03**	0.03*	0.02**	0.03
	(0.01)	(0.01)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.01)	(0.01)	(0.01)	(0.02)
balance	−0.18***	−0.14***	−0.18***	−0.15***	−0.17**	−0.11	−0.16***	−0.19***	−0.12***	−0.10*	−0.12*
	(0.05)	(0.05)	(0.04)	(0.05)	(0.07)	(0.10)	(0.05)	(0.05)	(0.02)	(0.04)	(0.06)
ln_riskav	0.90***	0.80***	0.96***	0.88***	0.96***	0.16	1.03***		1.22***	1.18***	0.79***
	(0.13)	(0.15)	(0.13)	(0.13)	(0.11)	(0.34)	(0.11)		(0.14)	(0.11)	(0.15)
yield_de	1.01***	1.08***	1.01***	1.04***	0.98***	1.41***	0.91***	0.94***	0.84***	0.71**	1.33*
	(0.26)	(0.26)	(0.26)	(0.25)	(0.28)	(0.32)	(0.27)	(0.26)	(0.21)	(0.26)	(0.58)
fri	−0.23**	−0.13***	−0.31**	−0.20***	−0.26*	−0.30*	−0.34*	−0.22**	−0.12**	−0.10***	−0.22**
	(0.10)	(0.03)	(0.13)	(0.05)	(0.15)	(0.17)	(0.18)	(0.09)	(0.05)	(0.03)	(0.09)
banksector		0.00**		0.00						0.00	0.00
		(0.00)		(0.00)						(0.00)	(0.00)
borrowing			0.06	0.04							
			(0.07)	(0.06)							
finliabilities			0.01**	0.01*							
			(0.00)	(0.00)							
ln_riskav_vix								1.57***			
								(0.40)			
baspread											0.03**
											−0.01
L.ln_spread	0.20	0.20	0.13	0.12	0.17	0.28	0.11	0.22			
	(0.16)	(0.13)	(0.14)	(0.13)	(0.18)	(0.24)	(0.09)	(0.22)			
L2.ln_spread	−0.39***	−0.33***	−0.37***	−0.31***	−0.42***	−0.42***	−0.34***	−0.53***			
	(0.08)	(0.06)	(0.08)	(0.07)	(0.10)	(0.15)	(0.07)	(0.09)			
N	66	62	66	62	56	49	66	66	105	95	61
FE									yes	yes	yes
years	1999 − 2009	1999 − 2009	1999 − 2009	1999 − 2009	1999 − 2008	1999 − 2007	1999 − 2009	1999 − 2009	1999 − 2009	1999 − 2009	2003 − 2009

Standard errors in parentheses. *, **, *** denote significance at 10, 5, 1 per cent respectively. *fri* is considered predetermined in regression G.

Table 1: Main estimation results

rules-based fiscal governance will have a much stronger effect on sovereign spreads than in times of lower risk aversion. Likewise, a unit increase in the quality of fiscal governance induces a larger decrease of the sovereign spread in a country with higher deficits and public debt. Figure 4 illustrates this dependency. As can be seen, the higher the level of risk aversion, the steeper the slope of the curve relating the sovereign spread to the quality of rules-based fiscal governance (left panel). At the same time, initial spreads are higher and their decline is consequently higher if deficit and debt are high (right panel). In sum, the benefit from improving rules-based fiscal governance will be highest for countries with weaker budgetary positions and in times of higher risk aversion.



(a) debt: 69%, deficit: 2.6%

(b) debt: 80%, deficit: 4%

Fig. 4: Sovereign spreads at different values of the fiscal rule index and risk aversion, (a) sample average and (b) high-deficit, high-debt example

The effects of the other variables are as expected as well. Sovereign spreads of the euro area countries in the 2000-2009 decade is above all determined by the risk-free interest rate and the level of global risk aversion. Increasing the benchmark interest rate by one percentage point leads to a one percent increase of the spread. A reduction in the general government budget deficit by one percentage point results in a decrease of the spread by around 20 per cent, while each percentage point of additional general government debt increases the spread by around two per cent.

Importantly, our estimation results confirm the restrictions of our model: specifically, the coefficient of unity to ln_riskav and $yield\_de$ cannot be rejected. The model thus appears to be in line with the data generating process.

In regressions B to D reported in Table 1 we add further control variables to our basic specification. Regression B adds the bank assets to GDP ratio as

a further control variable. The regression reveals that countries with larger banking sectors typically see larger spreads, confirming the findings of Gerlach et al. (2010). In regression C we include the net borrowing of the entire economy as well as the total net financial liability position of the economy. We find that larger liability positions are associated with higher spreads but net borrowing is not found to be significant. This result holds up in regression D, in which all variables are included simultaneously.

In regressions E and F reported in Table 1, we investigate the robustness of our findings to the time period. Specifically, we shorten the sample by one and two years respectively to exclude the crisis years. Thereby we can avoid our results being purely driven by the last couple of crisis years. The shortened sample is also a way of addressing potential endogeneity concerns, given our argument that prior to the crisis, fiscal governance was not shaped by concerns about sovereign spreads. The regressions presented document the substantial robustness of our results. The coefficient on our fiscal rule index is highly significant in the pre-crisis years as well, and its magnitude is very similar to that found with the full sample. We are thus confident that our results are not driven by recent crisis volatility and that our findings are not impaired by the endogeneity of rules-based fiscal governance quality with respect to sovereign spreads.

Regression G adds further to the investigation of endogeneity: here we consider fri to be predetermined. These results confirm our earlier findings; we obtain a stronger effect of the fiscal rule index.

The final columns of Table 1 present regressions where we depart from the dynamic model, in order to document the robustness of our results to different estimation approaches (regressions I to K). Our central results are again confirmed; all variables keep their sign and their significance. The static approach is also better suited to testing the robustness of our results to potential liquidity effects that might affect sovereign spreads. Specifically, on bid-ask spreads that are conventionally employed to proxy liquidity in sovereign bond markets, we only have data as of 2003 at our disposal, which renders our dataset unsuited to estimating a dynamic model with several lags of the dependent variable. Regression J shows that higher bid-ask spreads, that are a sign of low liquidity, are associated with higher sovereign spreads. The euro area countries where the strength of rules-based fiscal governance was below the average of 5 in 2009 were Finland, Greece, Ireland, Italy, and Portugal; of these, the last four are facing particularly high consolidation pressures. According to the predictions of our model, these countries would have profited most from improving their rules-based fiscal governance. The results from regression A presented in

Table 1 for the year 2009 - when global risk aversion was particularly high - imply the following: in the case of Greece - with a budget deficit of 13.5 per cent and a public debt burden of 115 per cent of GDP - the establishment of a rules-based fiscal governance framework of average quality would have implied a reduction of the sovereign spread by around 130 basis points. Ireland also had a budget deficit of 14 per cent in 2009 but public debt only amounted to 63 per cent of GDP; while its rules based fiscal governance framework was rather weak, with a fiscal rule index value of around 2. According to our predictions, the strengthening of their fiscal governance framework to the average level would have allowed a decline in the risk premium for Irish sovereign bonds by almost 100 basis points. Italy in turn had a rules-based fiscal governance framework in place that was assigned a fiscal rule index value of 3.7, relatively close to the average of 5, but it had a deficit of 5.3 per cent and a public debt level of 115 per cent of GDP in 2009. The enhancement of its rules-based fiscal governance framework to the average level would still have yielded a reduction of its sovereign risk premium by about 30 basis points. Finally, the gain from such institutional improvement for Portugal - with a deficit of 9.4 per cent and public debt of 77 per cent in 2009 - would have been 50 basis points.

Our dataset permits the further study of the different impact of specific characteristics of rules-based fiscal governance on sovereign spreads. As described in section 3, the fiscal rules index is a composite of 5 different dimensions of rules capturing (1) their legal base, (2) the room for setting or revising objectives, (3) the nature of the body that is monitoring compliance with the rule, (4) the enforcement mechanisms and (5) the media visibility of the rule. We study the relevance of these dimensions by performing separate regressions for each of the different sub-indices of the rule in turn, also presenting a regression with all sub-indices included simultaneously.

Table 2 shows these estimation results. Only for three sub-indices do we find a significant effect. The largest effect is found for the legal base of the national fiscal rule. A rule that is enshrined in the constitution will be perceived by markets to be highly effective; strengthening the legal dimension will thus have a strong and highly significant effect on sovereign bond spreads. We also find a highly significant and strong effect of the legal enforcement possibilities attached to the rules. Finally, we also find a significant and strong effect of the media visibility of the rule. In contrast, the nature of the body in charge of monitoring compliance with the rules as well as the room for setting or revising objectives are not found to be significant determinants of the sovereign bond spread. Moreover, we perform a regression in which we include all five sub-indices simultaneously. This regression suffers from the problem of a very high correlation of the sub-indices. In this regression, only the media visibility of the rules remains a significant determinant of sovereign spreads.

	A	B	C	D	E	F
debt	0.02**	0.02*	0.02*	0.02*	0.02*	0.01
	−(0.01)	−(0.01)	−(0.01)	−(0.01)	−(0.01)	−(0.01)
balance	−0.18***	−0.18***	−0.19***	−0.16***	−0.19***	−0.17***
	−(0.05)	−(0.05)	−(0.05)	−(0.05)	−(0.04)	−(0.05)
ln_riskav	0.91***	0.86***	0.90***	0.85***	0.88***	0.82***
	−(0.14)	−(0.14)	−(0.14)	−(0.12)	−(0.15)	−(0.16)
yield_de	1.02***	1.04***	1.05***	0.99***	1.01***	0.94***
	−(0.25)	−(0.27)	−(0.26)	−(0.27)	−(0.22)	−(0.21)
fri_1	−0.23**					−0.11
	−(0.09)					−(0.43)
fri_2		−0.13				0.06
		−(0.12)				−(0.19)
fri_3			−0.12			0.20
			−(0.10)			−(0.38)
fri_4				−0.18***		−0.14
				−(0.05)		−(0.18)
fri_5					−0.20**	−0.24*
					−(0.09)	−(0.13)
L.ln_spread	0.19	0.26	0.22	0.22	0.24	0.26
	−(0.16)	−(0.18)	−(0.16)	−(0.17)	−(0.18)	−(0.18)
L2.ln_spread	−0.40***	−0.38***	−0.43***	−0.32***	−0.42***	−0.32**
	−(0.08)	−(0.07)	−(0.08)	−(0.08)	−(0.10)	−(0.12)
N = 66						
years: 1999 − 2009						

Standard errors in parentheses. *, **, *** denote significance at 10, 5, 1 per cent respectively.

Table 2: Estimation results: fiscal rule sub-indices

The economic literature on determinants of sovereigns spreads is typically based on reduced form analysis, without estimating equations directly derived from a structural model. For the sake of comparability, below we also present estimation results from this more standard approach. This exercise also serves as a confirmation of our results presented above. We specifically estimate the following reduced form equation and its variants with further control variables:

$$\begin{aligned} spread'_{i,t} = \beta_1 risk_t + \beta_2 balance'_{i,t} + \beta_3 risk_t balance'_{i,t} + \beta_4 debt'_{i,t} \\ + \beta_5 risk_t debt'_{i,t} + \beta_6 fri'_{i,t} + \beta_7 risk_t fri'_{i,t} + C'_i + u'_{i,t}, \end{aligned} \quad (9)$$

where $debt'$, $balance'$ and fri' are considered to determine the probability of default in deviation to the benchmark country, Germany, and risk - the US corporate bond spread -measures investors' risk aversion. The spread is considered to be determined by the risk of default and interaction terms between risk aversion and the other variables that allows capturing the possibility that spreads react differently to fundamentals depending on the state of risk aversion. The estimating equation contains country fixed effects c that capture the effect of time-invariant institutional factors; while $u'_{i,t}$ is an error term with standard properties. Variables employed in additional specifications are bid-ask spreads of the respective government bonds to control for the risk that assets cannot be sold quickly; the size of the banking sector in the economy to account for contingent liabilities that might draw on public budgets in the event of bank failures, and the three-year projection of deficits obtained from the Stability and Convergence Programmes of the EU members to consider the role that fiscal policy expectations might play separately from the room for manoeuvre allowed for by the rules-based governance framework.

Table 3 shows the results of our reduced form regression analysis of the determinants of government bond spreads in the euro area. The results confirm the important role of fiscal rules for sovereign risk premia in the euro area. Fiscal rules do not have a significant explanatory role regarding sovereign bond yields as such (regression A). However, they are highly relevant when investors become risk averse (regressions B to E). When global risk aversion increases, countries with better fiscal rules witness lower increases of sovereign bond yields relative to Germany. Also quantitatively, the results show a similar order of magnitude as in the model-based estimations shown above, as illustrated by Figure 5 as well. We also find that a higher ratio of general government debt to GDP significantly enhances sovereign bond yields, as do higher general government budget deficits.

In line with previous research, we find that international risk aversion is an

	A	B	C	D	E	F	G	H	I	J	K	L
$risk$	0.18^{***}	0.14^{***}	0.08^{***}	0.08^{***}	0.08^{***}	0.07^{***}	0.05^{**}	-0.44^{***}	0.08^{***}	0.09^{***}	0.08^{***}	0.10^{***}
	(0.01)	(0.02)	(0.02)	(0.02)	(0.01)	(0.02)	(0.02)	(0.12)	(0.01)	(0.01)	(0.02)	(0.01)
$debt'$	0.93^{***}	0.81^{***}	0.75^{***}	0.56^{***}	0.57^{***}	1.40^{***}	0.97^{**}	-1.24^{***}	0.50^{***}	0.45^{***}	0.73^{***}	0.46^{***}
	(0.24)	(0.22)	(0.18)	(0.20)	(0.18)	(0.44)	(0.39)	(0.41)	(0.09)	(0.10)	(0.19)	(0.11)
$risk * debt'$				0.001^{**}	0.001		0.002^{**}	0.012^{***}		0.00		0.00
				(0.001)	(0.001)		(0.001)	(0.002)		(0.00)		(0.00)
$balance'$			-4.04^{***}	-4.39^{***}	0.69	-3.64^{***}	-1.35	0.82	-1.54^{***}	-1.21^{*}	-4.20^{***}	
			(0.61)	(0.62)	(1.22)	(1.02)	(1.62)	(1.13)	(0.31)	(0.66)	(0.74)	
$risk * balance'$					-0.02^{***}		-0.01^{**}	-0.02^{***}		0.00		
					(0.00)		(0.01)	(0.00)		(0.00)		
fri'	0.75	4.37^{***}	3.90^{***}	2.66^{*}	-0.88	-0.48	-9.32^{***}	1.91	0.41	-0.15	4.07^{***}	0.04
	(1.57)	(1.59)	(1.32)	(1.41)	(1.48)	(2.93)	(3.19)	(2.47)	(0.66)	(0.79)	(1.40)	(0.78)
$risk * fri'$		-0.02^{***}	-0.02^{***}	-0.02^{***}	-0.01^{**}	-0.02^{***}	-0.01	-0.02^{*}	-0.01^{***}	-0.01^{**}	-0.02^{***}	-0.01^{***}
		(0.00)	(0.00)	(0.00)	(0.00)	0.00	0.01	(0.01)	(0.00)	(0.00)	(0.00)	(0.00)
$bidaskspread'$						-357.18^{**}	-193.61					
						(148.26)	(134.16)					
$risk * bidaskspread'$						0.88^{**}	0.54					
						(0.37)	(0.34)					
$bankassets$											-0.01	
											(0.03)	
$E(F3.balance)'$												-0.99^{*}
												(0.59)
N	107	107	107	107	107	69	69	107	97	97	107	97
years	$1999-2009$	$1999-2009$	$1999-2009$	$1999-2009$	$1999-2009$	$2003-2009$	$2003-2009$	$1999-2009$	$1999-2008$	$1999-2008$	$1999-2009$	$1999-2008$
R^2	0.66	0.73	0.82	0.82	0.86	0.87	0.91	0.93	0.85	0.85	0.82	0.81

Standard errors in parentheses. *, **, *** denote significance at 10, 5, 1 per cent respectively.

Table 3: Results from reduced-form estimation

important driver of sovereign bond spreads in the euro area itself. When controlling for differences in liquidity across bond markets by including bid-ask spreads (available as of 2003) among the regressors, we continue to find that fiscal rules play a significant role (regressions F and G). Regression H addresses the fact that in many countries the quality of fiscal rules does not change often: the fiscal rule index might pick up other non-observable time-constant factors in these cases. We control for unobservable time-invariant factors that are evaluated differently at different levels of risk aversion with country fixed effects in interaction with risk along with the country effects in levels. Our findings on fiscal rules are preserved in this highly flexible specification.

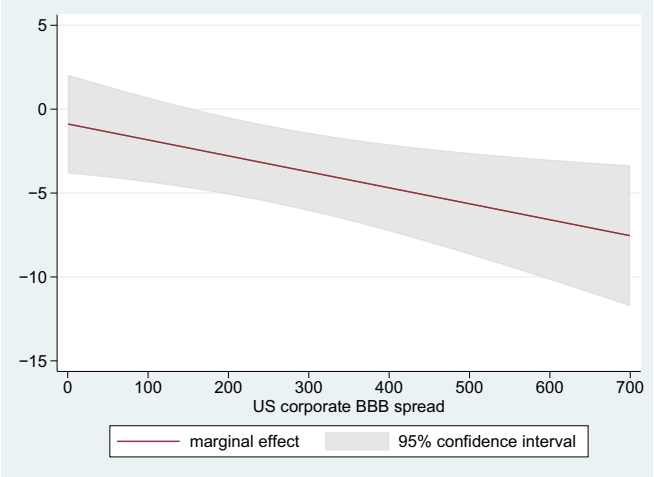


Fig. 5: Marginal effect on fiscal rules on sovereign spreads (table 3, model D)

Regressions I and J omit the year 2009, thereby rendering the regression robust to special effects related to the economic and financial crisis. As argued above, here we can safely consider the quality of rules-based fiscal governance exogenous with respect to government bond yields and their spreads. Qualitatively, the difference to the main specifications presented above is that deficits and debt do not have different impacts on sovereign spreads at different levels of risk aversion. Regression K addresses the role of the banking sector and its potential liabilities to public budgets in the economic and financial crisis by controlling for the size of the aggregate bank assets as a proportion of GDP (relative to Germany). This variable is insignificant; our central results regarding the importance of national fiscal rules for containing sovereign bond yields are again confirmed.

Finally, to rule out the possibility that our fiscal rule index is just a proxy of expectations on the fiscal policy stance but does not shape these, we control for the three year projection of deficits obtained from the Stability and Convergence Programmes of the EU members (regression L). Deficit forecasts

are found to be a significant and quantitatively important determinant of government bond spreads, while our main results remain in place. This implies that rules-based fiscal governance has an important role for the formation of fiscal policy expectations by financial markets beyond short-term expectations embodied in forecasts.

5 Conclusion

The present paper shows the importance of rules-based national fiscal governance for the assessment of sovereign risk by financial markets in the euro area. Stronger fiscal rules turn out to be of great importance to contain sovereign bond spreads in times of elevated market uncertainty in particular. Better fiscal rules can reduce sovereign bond spreads between euro area member states and Germany by 100 basis points and more, depending on global risk aversion and country-specific fiscal fundamentals. Of particular importance is the strength of the legal base of the fiscal rules in force as well as the enforcement mechanisms. Our results are robust to the length of the time period and the measurement of international risk aversion.

According to our model, national fiscal rules exert their beneficial effect on sovereign spreads by reducing the probability of sovereign default, because they correct for the deficit bias and reduce the likelihood of large deficits that might threaten fiscal sustainability. These factors affect expectations of future fiscal outcomes and are especially important in times of higher risk aversion; they come on top of the fact that past realisations of fiscal variables are better on average in countries with stronger rules-based fiscal governance, which again reduces the cost of debt. Overall, our results lend strong empirical support for the strengthening of national rules-based fiscal governance as part of the European economic governance reform agenda. Ultimately it is clear, however, that numerical fiscal rules can only operate as constraints to fiscal policy to the extent that there is commitment to comply with them. In this sense, our research confirms that the existing rules are considered credible devices of governments' commitment to fiscal discipline. Fiscal rules introduced in the future, possibly under external pressure, will be the more effective the stronger the political determination and broader support of society are for the pursuit of fiscal discipline.

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Appendix A Scores assigned to characteristics of fiscal rules

Dimension 1 (fri_1)**:** Legal base of the rule

4 the rule is established by the constitution

3 the rule is based on a legal act (e.g. public finance act, fiscal responsibility law)

2 the rule is based on a coalition agreement or an agreement reached by different general government tiers, but not enshrined in a legal act

1 political commitment by a given authority (central/local government, minister of finance)

Dimension 2 (fri_2)**:** Room for setting or revising objectives

3 there is no margin for adjusting objectives: they are encapsulated in the document underpinning the rule

2 there is some but constrained margin in setting or adjusting objectives

1 there is complete freedom in setting objectives: the statutory base of the rule merely contains broad principles or the obligation for the government or the relevant authority to set targets

Dimension 3 (fri_3)**:** Nature of the body in charge of monitoring respect and enforcement of the rule

The score of this criterion is constructed as a simple average of the two elements below:

Nature of the body in charge of monitoring respect of the rule

3 monitoring by an independent authority (fiscal council, court of auditors or any other court) or the parliament

2 monitoring by the ministry of finance or any other government body

1 no regular public monitoring of the rule (no report systematically assessing compliance)

The score of this sub-criterion is augmented by 1 if there is real time monitoring of compliance with the rule, i.e. if alert mechanisms of risk of non-respect exist.

Nature of the body in charge of enforcing compliance with the rule

3 enforcement by an independent authority (fiscal council or court) or the parliament

2 enforcement by the ministry of finance or other government body

1 no specific body in charge of enforcement

Dimension 4 (fri_4): Enforcement mechanisms of the rule

3 there are automatic correction and sanction mechanisms in case of non-compliance item there is an automatic correction mechanism in case of non-compliance and the possibility of imposing sanctions

2 the authority responsible is obliged to take corrective measures in case of non-compliance or is obliged to present corrective proposals to Parliament or the relevant authority

1 there is no ex-ante defined actions in case of non-compliance

The score of this dimension is augmented by 1 if escape clauses are foreseen and clearly specified.

Dimension 5 (fri_5) : Media visibility of the rule

3 observance of the rule is closely monitored by the media; non-compliance is likely to trigger public debate

2 high media interest in compliance, but non-compliance is unlikely to invoke public debate

1 no or modest interest of the media

Appendix B Additional tables

	fri	fri_1	fri_2	fri_3	fri_4
fri_1	0.95	1.00			
fri_2	0.97	0.91	1.00		
fri_3	0.97	0.90	0.95	1.00	
fri_4	0.93	0.90	0.90	0.84	1.00
fri_5	0.93	0.84	0.86	0.93	0.80

Table A: Correlation across the components of the fiscal rule index

	ln_spread	*yield_de*	*debt*	*balance*	*fri*
yield_de	0.10 (0.29)	1.00			
debt	0.43 (0.00)	−0.07 0.48)	1.00		
balance	−0.52 (0.00)	0.42 (0.00)	−0.46 (0.00)	1.00	
fri	−0.37 (0.00)	−0.07 (0.45)	−0.34 (0.00)	−0.40 (0.00)	1.00
ln_riskav	0.79 (0.00)	0.02 (0.84)	0.09 (0.38)	−0.34 (0.00)	−0.04 (0.69)

p-values in parentheses.

Table B: Correlation across variables employed in the analysis, 1999 to 2009

References

Alesina, A., Bayoumi, T., 1996. The costs and benefits of fiscal rules: Evidence from U.S. States. Working Paper 5614, National Bureau of Economic Research.

Alexander, V., Anker, P., 1997. Fiscal discipline and the question of convergence of national interest rates in the European Union. Open Economies Review 8 (4), 335–352.

Ayuso-i-Casals, J., Hernandez, D. G., Moulin, L., Turrini, A., 2009. Beyond the SGP: Features and effects of EU national fiscal rules. In: Ayuso-i-Casals, J., Deroose, S., Flores, E., Moulin, L. (Eds.), Policy instruments for sound fiscal policies: Fiscal rules and institutions. Palgrave Macmillan, Houndmills, Basingstoke, pp. 204–220.

Barrios, S., Iversen, P., Lewandowska, M., Setzer, R., 2009. Determinants of intra-euro area government bond spreads during the financial crisis. European Economy - Economic Papers 388, Directorate General Economic and Monetary Affairs, European Commission.

Bayoumi, T., Eichengreen, B., 1995. Restraining yourself: The implications of fiscal rules for economic stabilization. Staff Papers - International Monetary Fund 42 (1), 32–48.

Bayoumi, T., Goldstein, M., Woglom, G., 1995. Do credit markets discipline sovereign borrowers? Evidence from the U.S. States. Journal of Money, Credit and Banking 27 (4), 1046–1059.

Bernoth, K., Erdogan, B., 2010. Sovereign bond yield spreads: A time-varying coefficient approach. Discussion paper, DIW Berlin, German Institute for Economic Research.

Bernoth, K., von Hagen, J., Schuknecht, L., 2004. Sovereign risk premia in the European government bond market. Working Paper 369, European Central Bank.

Bernoth, K., Wolff, G. B., 2008. Fool the markets? Creative accounting, fis-

cal transparency and sovereign risk premia. Scottish Journal of Political Economy 55 (4), 465–487.

Bohn, H., Inman, R. P., 1996. Balanced-budget rules and public deficits: Evidence from the U.S. states. Carnegie-Rochester Conference Series on Public Policy 45 (1), 13–76.

Buti, M., Nogueira Martins, J., Turrini, A., 2007. From deficits to debt and back: Political incentives under numerical fiscal rules. CESifo Economic Studies 53 (1), 115–152.

Codogno, L., Favero, C., Missale, A., 2003. Yield spreads on EMU government bonds. Economic Policy 18 (37), 503–532.

Copeland, L., Jones, S., 2001. Default probabilities of European sovereign debt: Market-based estimates. Applied Economics Letters 8 (5), 321–324.

Copeland, T., Weston, J., Shastri, K., 2005. Financial theory and corporate policy, 4th Edition. Pearson Addison Wesley.

Debrun, X., 2006. Tying hands is not commitment: Can fiscal rules and institutions really enhance fiscal discipline? Working Paper 48, Bruegel.

Debrun, X., Kumar, M., 2007a. Fiscal rules, fiscal councils and all that: Commitment devices, signalling tools or smokescreens?, mimeo.

Debrun, X., Kumar, M. S., 2007b. The discipline-enhancing role of fiscal institutions: Theory and empirical evidence. IMF Working Paper 07/171, International Monetary Fund.

Debrun, X., Moulin, L., Turrini, A., Ayuso-i-Casals, J., Kumar, M., 2008. Tied to the mast? National fiscal rules in the European Union. Economic Policy 23 (4), 297–362.

Deroose, S., Moulin, L., , Wierts, P., 2006. National expenditure rules and expenditure outcomes: evidence for EU Member States. Wirtschaftspolitische Blätter 1, 27–42.

Drazen, A., 2002. Fiscal rules from a political economy perspective. Paper prepared for the IMF-World Bank conference on rules-based fiscal policy in emerging market economies, Oaxaca, February 2002, mimeo.

Dunne, P. G., Moore, M. J., Portes, R., 2007. Benchmark status in fixed-income asset markets. Journal of Business Finance & Accounting 34 (9-10), 1615–1634.

Edwards, S., 1986. The pricing of bonds and bank loans in international markets : An empirical analysis of developing countries' foreign borrowing. European Economic Review 30 (3), 565–589.

Eichengreen, B., Bayoumi, T., 1994. The political economy of fiscal restrictions: Implications for Europe from the United States. European Economic Review 38 (3-4), 783–791.

Ejsing, J., Lemke, W., 2011. The Janus-headed salvation: Sovereign and bank credit risk premia during 2008-2009. Economics Letters 110 (1), 28–31.

European Commission, 2010. Proposal for a Council Directive on requirements for budgetary frameworks of the Member States. Brussels, 29 September 2010, mimeo.

Fatás, A., 2010. The economics of achieving fiscal sustainability. Paper pre-

pared for the Academic Consultants Meeting at the Board of Governors, Federal Reserve, April 2010, mimeo.

Favero, C., Giavazzi, F., Spaventa, L., 1997. High yields: The spread on German interest rates. Economic Journal 107, 956–985.

Gerlach, S., Schulz, A., Wolff, G. B., May 2010. Banking and sovereign risk in the euro area. CEPR Discussion Paper, Centre for Economic Policy Research.

Hallerberg, M., Wolff, G., 2008. Fiscal institutions, fiscal policy and sovereign risk premia in EMU. Public Choice 136, 379–396.

Heppke-Falk, K., Wolff, G. B., 2008. Moral hazard and bail-out in fiscal federations: Evidence for the German Länder. Kyklos 61(3).

Inman, R. P., February 1998. Do balanced budget rules work? U.S. experience and possible lessons for the EMU. Working Paper 5838, National Bureau of Economic Research.

Johnson, C., Kriz, K., 2005. Fiscal institutions, credit ratings, and borrowing costs. Public Budgeting and Finance 25 (1), 84–103.

Kopits, G., Symansky, S. A., 1998. Fiscal policy rules. IMF Occasional Paper 162, International Monetary Fund.

Krogstrup, S., Wyplosz, C., 2010. A common pool theory of supranational deficit ceilings. European Economic Review 54 (2), 269–278.

Leeper, E. M., Oct. 2010. Monetary science, fiscal alchemy. Nber working paper, National Bureau of Economic Research.

Lemmen, J. J., Goodhart, C. A., 1999. Credit risks and European government bond markets: A panel data econometric analysis. Eastern Economic Journal 25 (1), 77–107.

Lonning, I., 2000. Default premia on European government debt. Weltwirtschaftliches Archiv 136, 259–283.

Poterba, J. M., Rueben, K., September 1999. State fiscal institutions and the U.S. municipal bond market. In: Fiscal Institutions and Fiscal Performance. NBER Chapters. National Bureau of Economic Research, pp. 181–208.

Schuknecht, L., von Hagen, J., Wolswijk, G., 2009. Government risk premiums in the bond market: EMU and Canada. European Journal of Political Economy 25 (3), 371–384.

Schulz, A., Wolff, G., 2009. The German sub-national government bond market: Structure, determinants of yield spreads and Berlin's foregone bail-out. Journal of Economics and Statistics - Jahrbücher für Nationalökonomie und Statistik 229 (1), 61–83.

Sutherland, D., Price, R., Joumard, I., 2005. Sub-central government fiscal rules. OECD Economic Studies 2005 (2), 13.

von Hagen, J., 1991. A note on the empirical effectiveness of formal fiscal restraints. Journal of Public Economics 44 (2), 199 – 210.

von Hagen, J., 2010. Sticking to fiscal plans: The role of institutions. Public Choice 144, 487–503.

von Hagen, J., Schuknecht, L., Wolswijk, G., 2011. Government bond risk premiums in the EU revisited: The impact of the financial crisis. European

Journal of Political Economy 27 (1), 36–43.
von Hagen, J., Wolff, G., 2006. What do deficits tell us about debt? Empirical evidence on creative accounting with fiscal rules in the EU. Journal of Banking and Finance 30 (12), 3259–3279.
Weingast, B., 2005. The constitutional dilemma of economic liberty. Journal of Economic Perspectives 19 (3), 89–108.