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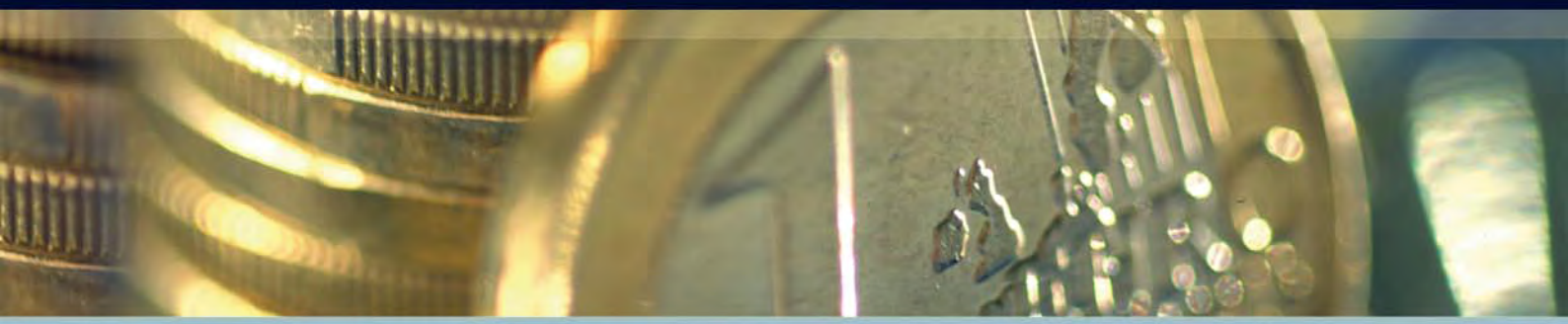

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Rules and risk in the euro area: does rules-based national fiscal governance contain sovereign bond spreads?

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Abstract: The strengthening of national fiscal frameworks, including numerical fiscal rules, has recently been proposed as an important part of the economic governance reform of the EU. The strength of numerical fiscal rules can be described along the dimensions of their statutory base, the room to revise budgetary objectives, provisions for their monitoring and enforcement, and their media visibility. With a unique data set summarizing the quality of national fiscal rules along these dimensions, we show that stronger fiscal rules in euro area member states reduce sovereign risk. According to our estimates, yield spreads against Germany of countries with relatively weak fiscal rules could be up to 100 basis points lower if they upgraded their numerical fiscal rules. The legal base turns out to be the most important dimension for the perceived effectiveness of the rules. The effectiveness of the correction and enforcement mechanisms turns out to be very important as well, while the role of the bodies in charge of monitoring and enforcing compliance is somewhat smaller. Overall, national fiscal rules are found to be beneficial for market assessments of governments' ability and willingness to timely service debt: they could thus provide an effective way to implement fiscal discipline.

Keywords: fiscal governance, numerical fiscal rules, sovereign risk, government bond spreads, euro area

JEL classification: E43, E62, G12, H60, H63

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1 Introduction

The ongoing economic and financial crisis has put public budgets world-wide under extraordinary strain. Large public spending packages designed to support domestic consumption and the financial sector coincided with sizeable drops of public revenue and resulted in soaring public debt in many countries. The members of the euro area experienced an increase of public debt from 66 per cent of GDP in 2007 to 79 per cent in 2009 on average. At the same time, differences of government bond yields relative to German bonds have increased markedly in euro area members. A part of the increase in these spreads can be attributed to different developments in explicit debt (Schuknecht, von Hagen and Wolswijk, 2010) and government liabilities due to potential banking liabilities (Gerlach, Schulz and Wolff, 2010; Ejsing and Lemke, 2010).

Going beyond these factors, investors' expectations regarding the credibility of the commitment of governments to ultimately correct unsustainable fiscal policies could be a further central determinant of increased sovereign spreads. In the wake of rising bond spreads and increasing fiscal difficulties, several governments in the euro area are currently contemplating the introduction of stronger fiscal rules to increase confidence in the sustainability of public finances. Germany recently introduced a constitutional rule, the "debt brake", to limit government debt. France, one of the largest euro area countries, is currently concerned about preserving the AAA rating of its debt and about the yield of its sovereign bonds relative to Germany.[1] The introduction of a debt brake is therefore deliberated in France as well.[2] Moreover, the strengthening of fiscal frameworks at a national level has received particular attention in the euro area in view of the difficulties to effectively enforce European fiscal rules. A legislative proposal to strengthen numerical fiscal rules at EU member states' level has been made by the European Commission (ibid., 2010a) on September 29, 2010.[3]

The present paper investigates whether national numerical fiscal rules can contribute to containing the interest required on government bonds. Based on a unique dataset on fiscal governance in EU member states, we show that stronger numerical fiscal rules contribute to lower government bond spreads, in particular in periods of higher risk aversion of market participants. In particular the legal base turns out to be the most

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[1] See, for example, the interview with Christine Lagarde, the French minister of finance, in the *Financial Times* of 23 August 2010, http://www.ft.com/cms/s/0/d1b79676-ae16-11df-bb55-00144feabdc0.html The French prime minister Francois Fillon voiced concerns in this regard as well (see *Le Monde* of 10 June 2010).

[2] Going further, stronger fiscal rules might even reduce short-term consolidation needs as they might increase investors' trust, thereby allowing for a more gradual fiscal exit (Fatás, 2010).

important dimension for the perceived effectiveness of the rule. The stronger the statutory base establishing national fiscal rules (that may vary between mere party coalition agreements and constitutional law), the lower risk premia will be. But also the enforcement mechanisms of the rules turn out to be important while the body in charge of the supervision of compliance with the fiscal rule appears to be somewhat less important. Our results thus show that rules become the more credible to market participants the stronger their binding character is, and the more effectively they can be enforced.

Numerical fiscal rules are a central part of the institutional setting of countries that shapes countries' budgetary policies. They 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). Such constraints are aimed at reducing the policy failures due to which budget process outcomes tend to be biased towards deficits. This includes in particular the common pool problem of governments without centralised spending powers and the short-term orientation of governments due to short electoral cycles and possibly the short-term orientation of voters as well. In the EU, fiscal rules further aim at mitigating the incentives for deficits resulting from a common currency. In an important recent contribution, Krogstrup and Wyplosz (2010) study theoretically the implications of supra-national and national fiscal rules. They find that a supra-national fiscal rule is welfare improving relative to a national rule, while a supra-national rule alone does not fully eliminate the deficit bias. Their results thus lend support to strengthening national alongside supra-national fiscal rules.

Empirical research of the past two decades has shed light into the role of numerical 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 (e.g. von Hagen, 1991; Bayoumi and Eichengreen, 1994; Alesina and Bayoumi, 1996; Bohn and Inman, 1996), the undertaking of the EMU fostered the adoption of fiscal rules in EU member states and the EU and shifted the focus of empirical research to Europe. The effectiveness of national fiscal rules to shape fiscal performance has been shown to crucially depend on the mechanisms established to enforce compliance with the rule (Inman, 1996; Ayuso-i-Casals, Gonzalez Hernandez, Moulin and Turrini, 2009), as well as on the type of the rule, where budget balance and debt rules appear to outperform expenditure rules (Debrun, Moulin, Turrini, Ayuso-i-Casals and Kumar, 2008). Taking the institutional characteristics of the rules into account, fiscal rules are also found instrumental for the initiation of lasting fiscal consolidations (Larch and Turrini, 2008). Recent research has also scrutinized the role of fiscal rules in the budgetary process: they can serve as commitment devices to tie governments' hands that are tempted to pursue

[3] The ideas have been developed in earlier communications of the European Commission (ibid., 2010b, 2010c) and have been supported by the European Central Bank (ibid., 2010).

short-sighted and pro-cyclical budgetary policies (Debrun and Kumar, 2007a, Debrun et al., 2008). Alternatively, they can fulfil the role of signalling tools meant to remove information asymmetries between governments and the electorate (Debrun and Kumar, 2007b; Debrun, 2007). European fiscal rules have further been shown to be effective, but to lead to significant creative accounting to circumvent them at the same time (von Hagen and Wolff, 2006; Buti, Nogueira Martins and Turrini, 2006). Finally, the fulfilment of fiscal plans by EU governments – a central plank of EU budgetary surveillance – is found to hinge on the stringency of fiscal rules among others (von Hagen, 2010).

The past several years witnessed a surge of research interest in the impact of fiscal variables on government bond spreads. In an international context, Alexander and Anker (1997), Lemmen and Goodhart (1999), Lonning (2000), Copeland and Jones (2001) and Codogno, Favero and Missale (2003) consistently confirm a positive relationship between public debt and interest rates. Bernoth, von Hagen and Schuknecht (2004) study the bond market of euro area member states during 1991-2002 and find that debt, deficits and debt-service ratios all have a positive impact on sovereign bond spreads. Schuknecht, von Hagen and Wolswijk (2009) analyse regional government debt and show that regions also pay higher risk premia when fiscal fundamentals are weak. Investigating the German sub-national bond market in detail, Heppke-Falk and Wolff (2008) and Schulz and Wolff (2009) find weak evidence of market reaction to fiscal fundamentals. Bernoth and Wolff (2008) document that sovereign bond markets in the EU also react to hidden fiscal policy activity and creative accounting practices. Moreover, they uncover that governments of countries with better transparency performance pay lower premia on government debt. Focusing on the period during the global financial crisis of 2007, Barrios, Iversen, Lewandowska and Setzer (2009) underline the impact of general risk perception on government bond spreads and document an increased relevance of domestic fiscal variables. Bernoth and Erdogan (2010) highlight the time-varying nature of sovereign risk.

Empirical research has also studied the impact of fiscal restraints on the borrowing cost of US states in particular. Bayoumi, Goldstein and Woglom (1995) show that the impact of constitutional controls on US state borrowing depends on the level of public debt; at average debt 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, while debt rules appear to be the least effective in this respect. Differentiating this result, Johnson and Kriz (2005) show that revenue limits have a direct impact on state government borrowing, while the effect of expenditure, budget balance, and debt rules is indirect via improved credit ratings. In the euro area context, Hallerberg and Wolff (2008) show that fiscal institutions play an important role for government bond yields. The quality of fiscal governance and

in particular the budget process is found to be a significant determinant of sovereign spreads. Moreover, they highlight that controlling for this institutional quality is important when assessing the impact of EMU on sovereign bond pricing in the euro area. Our study uses a unique dataset compiled by the European Commission on numerical fiscal rules and assesses the much-debated importance of national numerical fiscal rules for sovereign risk in the euro area.

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

2 Theory and empirical approach

To investigate the effects of fiscal rules and fiscal policy on risk premia in euro area government bond markets, we depart from a simple no-arbitrage condition, in which an investor has the choice between a risk-free and a risky asset, both issued in the ongoing budget year $t = 0$, and maturing in $t = 1$. The risk-free asset bears an interest of r^*. The creditor of the risky asset of country i with interest r_i faces a default probability $\theta \in]0; 1[$. Under risk-neutrality, the no-arbitrage assumption requires that expected returns on both assets be equal:

$$1 + r^*_t = (1 - \theta_{t+1})(1 + r_{i,t}) \qquad (1),$$

which approximately implies

$$r_{i,t} - r^*_t = \theta_{t+1} .$$

The empirical literature on sovereign bond spreads has elaborated that the price of sovereign risk systematically varies with international credit risk (Favero, Giavazzi and Spaventa, 1997 and Codogno, Favero and Missale, 2003), which implies variations in the level of risk aversion. To cater for such variation and allow for risk-averse investors, we introduce a time-varying scaling factor $\alpha_t \geq 1$ to the above approximation, where $\alpha_t = 1$ describes the case of risk-neutrality:

$$r_{i,t} - r^*_t = \alpha_t \theta_t .$$

The difference between the yields is thus proportional to the risk θ_t of the debtor's default; it is the larger the higher the level of risk aversion.

The risk of default of country *i* in $t = 1$, in turn, is a function of expectations on standard determinants of the sovereign debtor's solvency, such as the level of debt *B*, and the budget balance *s*, as well as institutional characteristics of the country that can be considered time-invariant, c_i, such as the transparency of public accounting and the extent to which budgetary procedures are conducive to fiscal stability and sustainability:

$$\theta_{i,t} = \xi\,(E_t(B_{i,t+1}),\, E_t(s_{i,t+1}),\, c_i) \qquad (2).$$

The expected value of debt in the next period equals its actual realization as it can be obtained from current debt and deficit observed in time t, i.e. $E(B_{t+1}) = B_{t+1} = B_t + s_t$.[4] Sovereign spreads are thus a function of the scaling factor reflecting the level of risk aversion, present debt and deficit, and expectations of future deficits:

$$r_{i,t} - r^*_t = f\,(\alpha_t, B_{i,t}, s_{i,t,} E_t(s_{i,t+1}), c_i) \qquad (3).$$

Among the arguments of *f*, α can be proxied by standard measures of international risk such as the spread between US low grade corporate and government bonds, or the Chicago Board Options Exchange Market volatility index known as VIX conventionally employed to measure the fear of market participants of volatility. Information on $B_{i,t}$ and $s_{i,t,}$ is readily available. Deficit forecasts $E(s_{i,t+1})$ however are endogenous with respect to the bond spreads. A straightforward instrument would be the variable on contemporary deficits $s_{i,t}$. Indeed, $s_{i,t}$ will pick up the effect of expected deficits on the risk of default as well, but this effect can not be identified in separation from its direct effect on debt. As concerns the functional form of our regression equation, we adopt a flexible approach based on linearity, allowing for interactions between the variables proxying the arguments of ξ and *a*.

What is the contribution of rules-based fiscal governance to the evaluation of sovereign default risk? The very role of numerical fiscal rules is to constrain realisations of fiscal outcomes: they hence reduce the range of values that fiscal deficits may assume. Accordingly, fiscal rules play a crucial role in the formation of expectations on fiscal outcomes and of future deficits $E(s_{i,t+1})$ in particular: they reduce the range of values that deficits can be expected to assume. While the mean forecast error in budget balance forecasts should be zero, the variance of forecast errors in countries with numerical fiscal rules should be lower as compared with countries without such rules or with only weak rules. In other words, rules-based domestic budgetary frameworks render the estimator of budget deficits on which the forecast is based more efficient. This will not be relevant for risk-neutral investors. The reduction of the deficit forecast error variance will become important in times of elevated risk aversion, when the willingness to accept uncertainty is

[4] This equation ignores stock-flow adjustments.

reduced. Moreover, the constraints imposed by numerical fiscal rules will be more likely to become binding in times of higher uncertainty or negative shocks that are characterised by higher risk aversion. Hence, our prediction is that effective domestic fiscal rules constraining deviation from balanced budgets[5] are the more important in reducing sovereign bond spreads the more risk-averse investors are.

We test this hypothesis by the inclusion of a fiscal rule index *fri* measuring the stringency of rules-based fiscal governance in the regression. The index is included both separately and in interaction with the risk aversion indicator among the regressors. We further control in our regressions for liquidity risk, i.e. that the assets cannot be sold quickly in the markets, employing bid-ask spreads of the respective government bonds *bas* to this end. With an indicator of risk aversion *risk*, the stock of public debt and the general government balance as percentage of GDP *debt* and *bal* respectively, the fiscal rule index *fri* and country fixed effects *c*, our baseline estimating equation thus becomes

$$r_{i,t} = \beta_1 risk_t + \beta_2 bas_{i,t} + \beta_3 risk_t\, bas_{i,t} + \beta_4\, debt_{i,t} + \beta_5\, risk_t\, debt_{i,t} + \\ + \beta_6\, bal_{i,t} + \beta_7\, risk_t\ bal_{i,t} + \beta_8\, fri_{i,t} + \beta_9\, risk_t\, fri_{i,t} + c_i + u_{i,t} \qquad (4),$$

where all terms except *risk* are measured in deviation to the benchmark country, Germany; $u_{i,t}$ is an error term with the usual properties.

The endogeneity of fiscal rules with respect to fiscal policy outcomes has been explored in empirical research (e.g. Debrun and Kumar, 2007a; ibid., 2007b). Our research benefits from the advantage that the fiscal rules can be considered exogenous or predetermined to government bond yields. While certainly at present, national fiscal framework reform debates are driven by the consolidation pressures and high sovereign bond spreads, changes in fiscal governance have not been connected with bond markets in the time period of our sample as 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 for the robustness of our results to the exclusion of the 2009 data where the strength of numerical fiscal rules might have been pre-determined by the fanning out of the government bonds yields in the previous year. In turn, measures of common risk, including the US corporate bond spread, are driven by global shocks and are thus also exogenous to euro area bond spreads.

Our baseline regressions are amended by further analysis. We do not only consider the global impact of rules-based fiscal governance on sovereign risk premia but study the

[5] Fiscal rules may constrain different budgetary aggregates; but most serve the ultimate goal of stability and/or sustainability.

impact of its different dimensions in separation as well. Besides we provide robustness analyses with regard to the time period covered and the sovereign debt crisis in particular, the role of liabilities stemming from bank rescue operations, the frequency of our data, and the choice of some indicators. The data employed in our analysis are described in the next section in more detail.

3 The dataset

Our empirical analysis is based on a dataset covering 11 euro area countries in the time period of 1999 to 2009 respectively 2010. 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. The country specific variables are expressed in differences to German data, which leaves us with a panel dataset of 10 countries.

Our dependent variable is the 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. Bid-ask spreads obtained from the EuroMTS indices platform are used to control for liquidity risk in sovereign bond markets. We also provide robustness checks using the data set of Gerlach et al. 2010, where yields and bid-ask spreads are derived from information on the individual on-the-run bonds provided by Bloomberg. As an indicator of the debtors' repayment capacity, data on government debt and deficits from the Ameco dataset are employed. As a general measure of investors' willingness to take on risk, we employ the seven-to-ten year US corporate bond spread for the rating category BBB from Merrill Lynch against US treasuries. Financial data are available at a very high frequency. However, as the fiscal and institutional data are only available at quarterly respectively annual frequency, we average the financial data to annual frequency. We further provide robustness checks with financial data averaged at quarterly frequency and quarterly fiscal data stemming from the Trimeco dataset of the European Commission.

The innovative element of our research is the inclusion of the index of the strength of numerical fiscal rules at country level in our analysis. This fiscal rule index has been constructed by the fiscal policy 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.[6]

[6] 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.

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. Box 1 shows how the index is computed based on different characteristics of fiscal rules.

Box 1 Scores assigned to characteristics of fiscal rules by 5 dimensions

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 enforcement of 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

4 there are automatic correction and sanction mechanisms in case of non-compliance

3 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

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, Price and Joumard (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 of single fiscal rules adjusted by the coverage of general government finances by that rule. In the presence of more than one rule covering the same government sub-sector, the second, third and forth weaker rules obtain weights ½, 1/3, and ¼, 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, Moulin and Wierts (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 1 shows the 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.

Table 1 Correlation across the components of the fiscal rule index

	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

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 2010 (data in 2010 are preliminary). 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.[7] The strength of the numerical fiscal rules in force in the other euro area countries ranged between zero (for Greece, that has had no such rule in force) and 9.5 (the Netherlands,[8] unchanged, and Spain as from 2006) and 9.7 (Spain[9] 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,[10] as well as Ireland 2004, while the strength of the fiscal rules deteriorated in Finland after 2007 and in Austria in 2009,[11] in particular due to the suspension of rules in force in the course of the economic and financial crisis.

[7] 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.

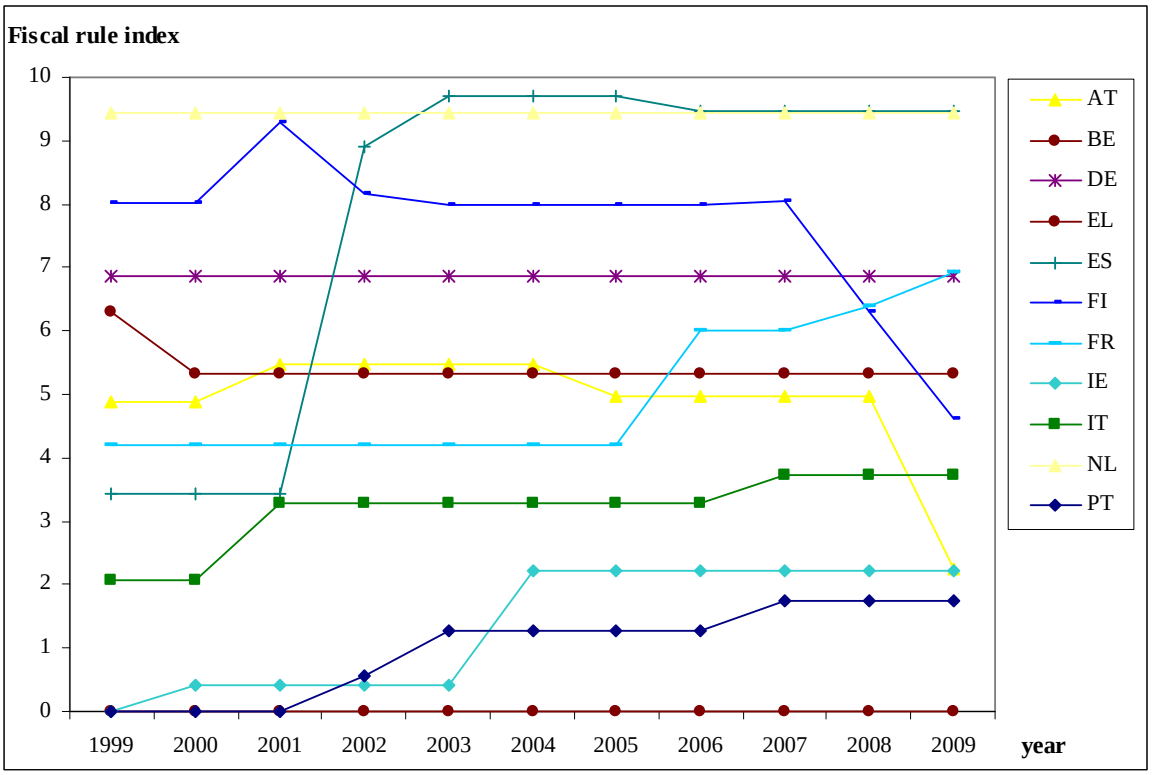
[8] The Netherlands have been operating a real expenditure ceiling and a rule to allocate windfall revenues applying to all general government.

[9] 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.

[10] 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.

[11] 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.

Figure 1 The fiscal rule index in 11 euro area members, 1999 to 2009



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.

Figure 2 Sovereign bond spreads in 10 euro area members, 1999 to 2009

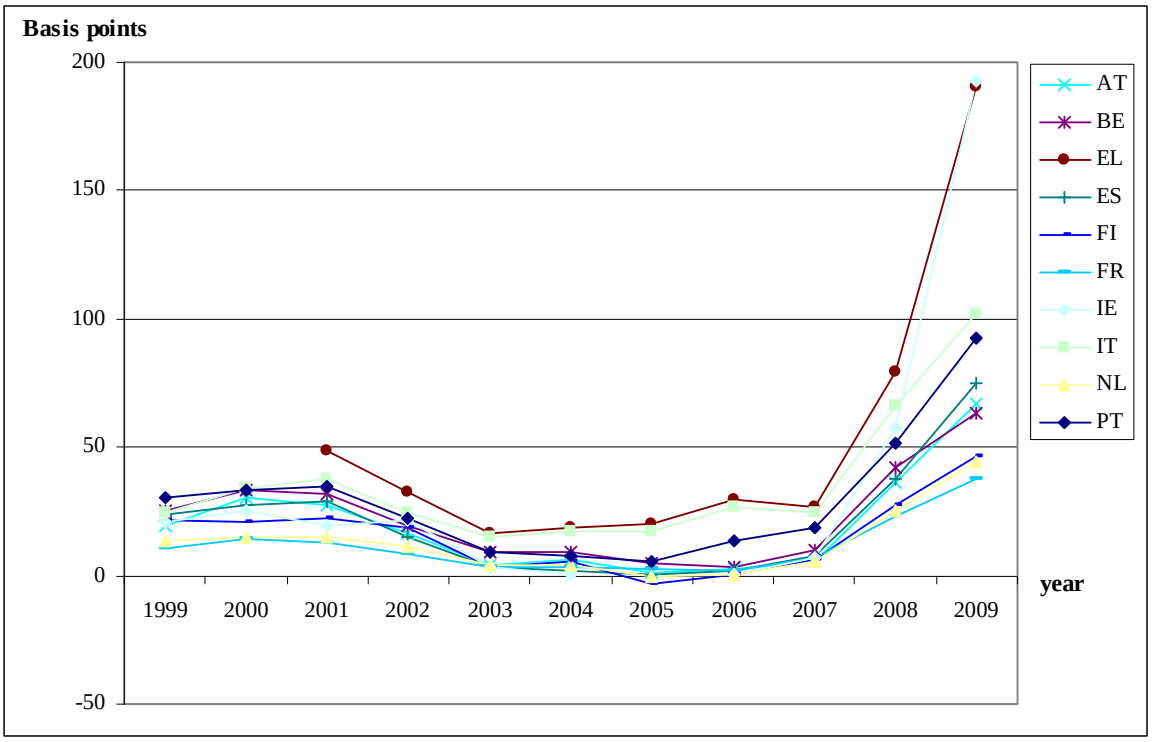
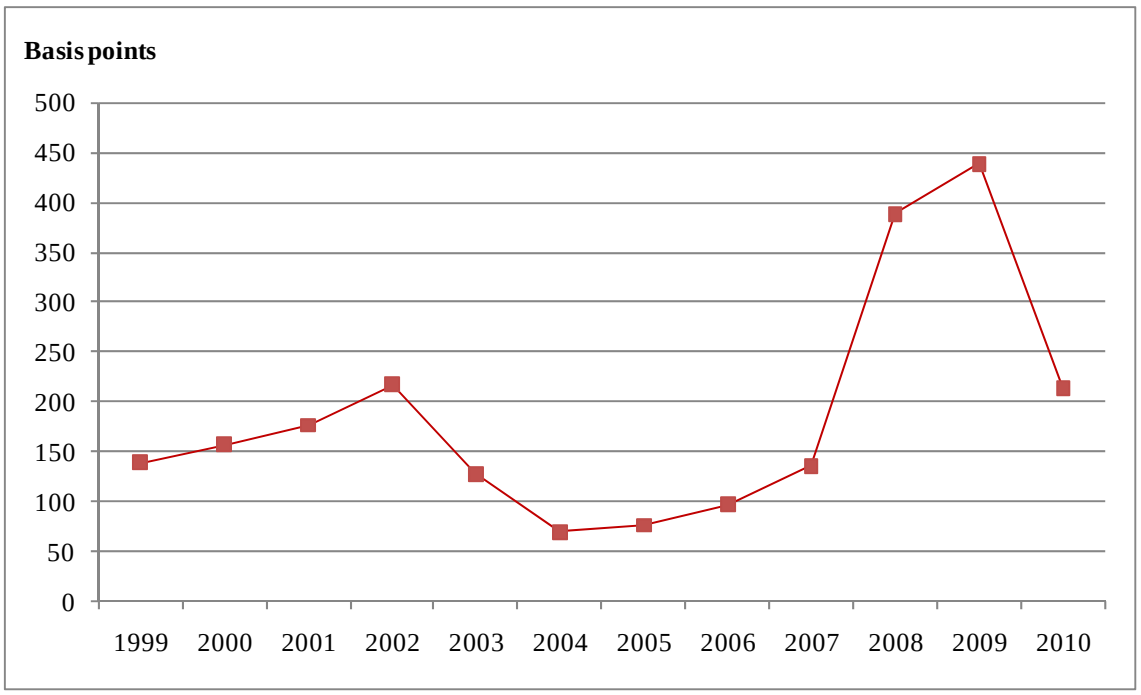


Figure 3 Spread between low grade US corporate and government bonds (*uscorp*), 1999 to 2010



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, *uscorp*. 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.

Table 2 Correlation across variables employed in the analysis, 1999 to 2009

	r	*risk*	*fri*	*risk*fri*	*bal*	*debt*
risk	0.75 ***	1.00				
	(0.00)					
fri	-0.31 ***	-0.03	1.00			
	(0.01)	(0.79)				
*risk*fri*	-0.66 ***	-0.39 ***	0.74 ***	1.00		
	(0.00)	(0.00)	(0.00)			
bal	0.74 ***	0.57 ***	-0.44 ***	-0.52 ***	1.00	
	(0.00)	(0.00)	(0.00)	(0.00)		
debt	0.29 **	0.06	-0.47 ***	-0.36 ***	0.43 ***	1.00
	(0.01)	(0.63)	(0.00)	(0.00)	(0.00)	
bas	0.71 ***	0.79 ***	-0.08	-0.45 ***	0.57 ***	-0.07
	(0.00)	(0.00)	(0.52)	(0.00)	(0.00)	(0.55)

Note: p-values in parentheses.

Table 2 provides the simple correlations of the variables applied in our analysis. High correlations of around 0.75 can be observed between the indicator of international risk aversion, *uscorp*, and the bid-ask-spread, and between the fiscal rule index and its interaction with *uscorp*.

4 Estimation results

4.1 Main results

Table 3 shows the baseline results of our regression analysis of the determinants of government bond spreads in the euro area. The results document an important role of fiscal rules in explaining sovereign risk in the euro area. Fiscal rules do not have a significant explanatory role regarding sovereign bond yields as such (regression C). However, they are highly relevant when investors become risk averse as implied by our analytical framework. As regression D documents, when global risk aversion increases, countries with better fiscal rules witness lower increases of sovereign bond yields relative to Germany.

Figure 4 illustrates how the effect of fiscal rules depends on the level of international risk aversion. When international risk aversion rises, stronger fiscal rules are increasingly important to reduce sovereign risk: their marginal benefit increases with *uscorp*. This effect is statistically significantly at a 5 per cent level when *uscorp* exceeds 155 basis points.

These effects are also economically meaningful. Suppose that Greece, a country with no fiscal rule in place to date, had fiscal rules of similar quality as Germany. When risk aversion peaked at a spread of 750 basis points in 2009, risk premia required on its bonds would have been 55 basis points lower. Better fiscal rules can thus effectively reduce sovereign bond spreads in times of marked turbulences in international markets. Similarly, the quality of Irish fiscal rules could be significantly improved relative to Germany: this would imply a lowering of the sovereign bond yields by up to 40 basis points. For Portugal, at the culmination of the international crisis during 2009, yields could have been by up to 50 basis points lower according to our estimates, had it enhanced the quality of its rules to the level of Germany's. In contrast, the quality of fiscal rules in Spain contributed to the comparatively low level of sovereign bond yields in Spain in 2009.

In line with previous research, we also find that international risk aversion – as measured by *uscorp* – is an important driver of sovereign bond spreads in the euro area in itself. We also find that the ratio of general government debt to GDP significantly enhances sovereign bond yields throughout (regressions B to M). In regression E, we add an interaction effect between *uscorp* and the debt to GDP ratio and find that with increasing international risk aversion, countries with high debt levels are increasingly punished by financial markets as well.

General government budget deficits are also found to strongly shape differences in sovereign bond yields in normal times. When we further add an interaction effect between *uscorp* and the budget balance (regression F), the budgetary position has a sizeable effect depending on the level of risk aversion while the interaction between risk aversion and debt levels becomes insignificant. When risk aversion is high, markets thus punish countries with large deficits more, while the pricing of differences in levels of debt does not change with risk aversion.

In regression G, we extend the sample to include also observations of 2010.These results should be considered with caution as the fiscal rules data are preliminary and the other data are based on forecasts respectively in case of the financial variables the first 5 months of available data. Given this caveat, a number of results stand out. First, the estimated effect of fiscal rules remains robustly in place despite the huge uncertainty in

Table 3 Main estimation results

Variable	A	B	C	D	E	F	G	H	I	J	K	L	M
uscorp	0.19 ***	0.18 ***	0.14 ***	0.08 ***	0.08 ***	0.08 ***	0.07	0.08 ***	0.08 ***	0.06 **	0.07 ***	0.05 **	-0.44 ***
	(0.02)	(0.01)	(0.02)	(0.02)	(0.02)	(0.01)	(0.04)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.12)
FRI		0.75	4.37 ***	3.90 ***	2.66 *	-0.88	5.58	4.00 ***	-1.14	-10.22 ***	-0.48	-9.32 ***	1.91
		(1.57)	(1.59)	(1.32)	(1.41)	(1.48)	(3.54)	(1.34)	(3.05)	(3.19)	(2.93)	(3.19)	(2.47)
*uscorp**FRI			-0.02 ***	-0.02 ***	-0.02 ***	-0.01 **	-0.02 **	-0.02 ***	-0.02 ***	-0.004	-0.02 ***	-0.01	-0.023 *
			(0.00)	(0.00)	(0.00)	(0.00)	(0.01)	(0.00)	(0.00)	(0.005)	0.00	0.01	(0.012)
balance				-4.04 ***	-4.39 ***	0.69	-5.27 ***	-3.99 ***	-4.29 ***	-0.93	-3.64 ***	-1.35	0.82
				(0.61)	(0.62)	(1.22)	(1.61)	(0.62)	(1.03)	(1.62)	(1.02)	(1.62)	(1.13)
debt		0.93 ***	0.81 ***	0.75 ***	0.56 ***	0.57 ***	1.57 ***	0.76 ***	1.63 ***	1.03 **	1.40 ***	0.97 **	-1.24 ***
		(0.24)	(0.22)	(0.18)	(0.20)	(0.18)	(0.47)	(0.18)	(0.45)	(0.40)	(0.44)	(0.39)	(0.41)
*uscorp**balance						-0.02 ***				-0.02 ***		-0.01 **	-0.02 ***
						(0.00)				(0.01)		(0.01)	(0.00)
*uscorp**debt					0.001 **	0.001				0.002 **		0.002 **	0.012 ***
					(0.001)	(0.001)				(0.001)		(0.001)	(0.002)
debt²								-0.002					
								(0.003)					
bid-ask spread									-13.50	14.15	-357.18 **	-193.61	
									(42.29)	(38.20)	(148.26)	(134.16)	
*uscorp**bid-ask spread											0.882 **	0.542	
											(0.366)	(0.336)	
N	107	107	107	107	107	107	117	107	69	69	69	69	107
r2	0.60	0.66	0.73	0.82	0.82	0.86	0.42	0.82	0.86	0.91	0.87	0.91	0.93

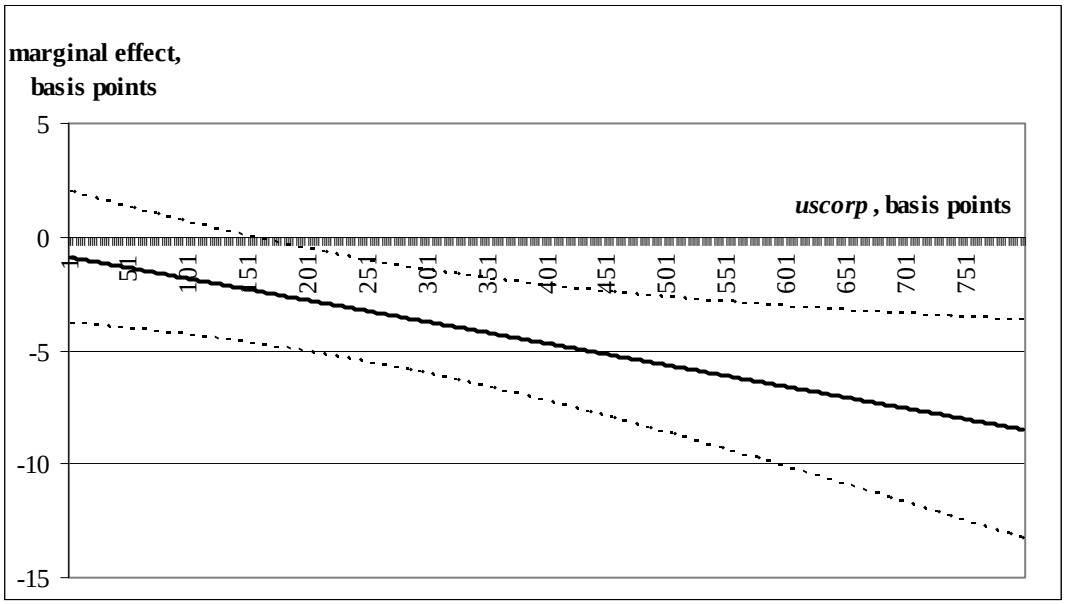
Estimation with panel fixed effects. Standard errors in parentheses. Time period: 1999-2009 (107 observations), 1999-2010 (117 observations), 2003-2009 (69 observations).

Regression M is with panel fixed effects in interaction with *uscorp* .

the euro area sovereign bond market. Second, the variance explained by the model drops significantly, highlighting non-linear developments in the bond market in the eurozone in 2010 in particular. Third, public debt and deficits are punished much more significantly when 2010 data are taken into account as well.

We have further included a quadratic term of the debt to GDP ratio (regression H), in order to allow for nonlinearities in the increase of the risk of default with higher levels of debt resulting from interest payments. We do not find, however, any evidence of such non-linearity. We also control for differences in liquidity across bond markets by employing bid-ask spreads to this end. Unfortunately, this measure of liquidity is only available as of 2003. We continue to find a significant role for fiscal rules (regressions I to L). While the interaction effect in this shorter sample becomes insignificant in some specifications, fiscal rules become significant determinants of sovereign risk in levels, with the marginal effect only slightly differing from the marginal effects obtained above when risk aversion is high. We also allow for an interaction term between liquidity risk and risk aversion, thereby permitting markets to value liquidity differently in different states of the economy (Regression K and L). This does not, however, change the results. Our results are therefore robust to controlling for this measure of liquidity.

Figure 4 Marginal effect of fiscal rules on sovereign bond spreads



Note: The figure shows the marginal effect of fiscal rules on sovereign bond spreads as a function of international risk aversion measured by *uscorp*, based on regression F shown in table 3. Dotted lines indicate the 95% confidence interval. Source: authors' calculation.

We further address the fact that in many countries the quality of fiscal rules moves only rarely: the fiscal rule index and its interaction might pick up other non-observable time-constant factors in these cases. To control for non-observable time-constant factors

that vary with the level of overall risk, we employ country fixed effects in interaction with *uscorp* along with the country effects in levels (regression M). This implies that sovereign risk premia may increase more strongly with risk aversion when countries have bad unobserved characteristics. Our findings on the relation between fiscal rules and sovereign spreads are preserved in this highly flexible specification as well.

4.2 What characteristics of fiscal rules matter most?

To assess the relative importance of the different characteristics of national fiscal rules for reducing sovereign risk, we compare the effects of the components making part of the fiscal rule index, namely the legal base of the rule, the room for setting or revising objectives, the nature of the body in charge of monitoring respect and enforcement of the rule, its enforcement mechanisms, and its media visibility. Table 4 first shows estimation results using the above components of the fiscal rule index one by one (estimations D1 to D5). All components are found significant in reducing sovereign risk in times of higher uncertainty. However, the size of the effect differs across the characteristics of the rule. The legal base of the fiscal rules turns out to be particularly relevant: the marginal effect of an improvement is largest. Besides, the stringency of the enforcement mechanisms attached to the rules is also found to be quantitatively important. The separate dimensions of national fiscal rules are highly correlated, though (see table 1): countries with fiscal rules well anchored in law, for example, also tend to have strong enforcement provisions for their rules. To account for such correlation, the last regression includes all components of the fiscal rules index simultaneously. Now, the legal base of the rules in force is found to be the only characteristic to significantly – and sizeably – contribute to the reduction of sovereign bond spreads. A stronger legal base of the rules in force is found to be associated with lower risk also in times of relatively low international risk aversion.

The economic effects are sizeable. Our analysis implies that a strengthening of the legal base of the rules in force in a country where this characteristic of the rules is weak to the level of the German rules (before the introduction of the constitutional debt brake) could reduce sovereign risk premia by almost 100 basis points in times of severe market turbulence.[12]

Table 4 compares the size of the effect of the components for the regressions in which the components are introduced one by one. For convenience, the first column

[12] At *uscorp* = 750, the marginal effect of the legal base of the numerical fiscal rules is -12.4. In terms of the legal base of the rules, Greece scores -7.4, signaling its weakness in comparison to Germany (note that our regressors are defined as differences to German values). This implies that Greece could experience an improvement in its sovereign bond spreads by -12.4*7.4 = -91.8 upon the introduction of numerical fiscal rules with similarly strong legal base as the German ones.

replicates the coefficient of the interaction term between the respective component and *uscorp*. The coefficient related to the legal base is the strongest. The second column

Table 4 Estimation results with components of the fiscal rule index

Variable	D	D1	D2	D3	D4	D5	D6
uscorp	0.08 ***	0.06 ***	0.11 ***	0.11 ***	0.13 ***	0.00	-0.04
	0.02	0.02	0.01	0.01	0.01	0.03	0.08
FRI	3.90 ***						
	1.32						
uscorp *FRI	-0.02 ***						
	0.00						
FRI1		3.46 **					-10.08 **
		1.40					4.85
uscorp *FRI1		-0.02 ***					-0.03 *
		0.00					0.02
FRI2			4.06 ***				5.17
			1.23				3.88
uscorp *FRI2			-0.02 ***				-0.02
			0.00				0.02
FRI3				3.24 ***			3.39
				1.09			4.45
uscorp *FRI3				-0.02 ***			0.03
				0.00			0.02
FRI4					3.41 ***		0.65
					1.24		2.67
uscorp *FRI4					-0.02 ***		0.01
					0.00		0.01
FRI5						3.96 ***	4.78
						1.32	4.70
uscorp *FRI5						-0.02 ***	-0.01
						0.00	0.01
balance	-4.04 ***	-4.18 ***	-4.02 ***	-4.09 ***	-3.90 ***	-4.08 ***	-4.29 ***
	0.61	0.61	0.61	0.61	0.65	0.61	0.62
debt	0.75 ***	0.72 ***	0.73 ***	0.73 ***	0.79 ***	0.84 ***	0.88 ***
	0.18	0.18	0.18	0.19	0.19	0.18	0.21
N	107	107	107	107	107	107	107
R^2	0.82	0.81	0.82	0.82	0.80	0.81	0.84
marginal effect of FRI_i							
at *uscorp* =500	-6.15	-7.12	-4.79	-4.73	-5.72	-5.45	-24.71

presents the point estimate of the marginal effect of an improvement of the fiscal rule index components when international risk aversion reaches relatively high levels (*uscorp* = 500). Again, the largest marginal effect is found for the aggregate strength of the statutory base of the set of numerical fiscal rules in force. We investigate the equality of the coefficients of the interaction effects between *uscorp* and the components of the fiscal

rule index respectively by means of a Hausman test: columns 3 to 7 of table 4 show the p-values attached to the test statistics. These tests confirm the statistical difference between some of the estimated coefficients, underlining that different characteristics of numerical fiscal rules in force do matter for the containment of sovereign bond yields to different degrees. The strictness of the rule (as captured by the legal base, the room to revise objectives and the enforcement possibilities) are found to be similarly important while they are statistically significantly different from the effects of the differences in the body in charge of the supervision of the rule. Independent fiscal councils with monitoring functions – while effective – appear to impress the markets significantly less than strong constitutional limits or tough enforcement mechanisms.

Table 5 Dimensions of the fiscal rule index: marginal effects, equality of coefficients

	coefficient of interaction effect with *uscorp*	marginal effect at *uscorp* = 500	Hausman test – H_0: $\beta_1 = \beta_2$ p-values				
			FRI	FRI1	FRI2	FRI3	FRI4
FRI	-0.020	-6.15					
FRI1	-0.021	-7.12	0.61				
FRI2	-0.018	-4.79	0.02	0.21			
FRI3	-0.016	-4.73	0.00	0.05	0.06		
FRI4	-0.018	-5.72	0.44	0.43	0.81	0.40	
FRI5	-0.019	-5.45	0.43	0.50	0.46	0.09	0.81

4.3 Robustness checks

We supplement the basic analysis presented above by a number of robustness checks. First, we assess the robustness of our results against the consideration of a set of specific factors: the effects of the crisis materialising in 2009 specifically, the burdens of support to the banking sector on public authorities and the critical features of Ireland in particular, and the role of expectations on the fiscal policy stance as measured by deficit forecasts (table 6). Excluding the data of 2009 renders the regression robust to the special crisis effects and has the additional advantage that we can safely consider the quality of rules-based fiscal governance to be exogenous with respect to government bond yields and their spreads. Before 2009, debates on the reform of fiscal governance were not influenced by sovereign bond spreads, that were comparatively small. Second, we provide a set of regressions with variables at quarterly frequency where available, to establish the invariance of our results to the level of aggregation in time (table 7). Third, we use a different data set of sovereign bond yields available from Gerlach et al. (2010), which provides us with a longer data set on liquidity as measured by bid-ask spreads in particular (table 8). Finally, we repeat our regressions using a measure of international risk aversion other than the US corporate bond spreads (table 9).

Table 6 first shows the robustness of our results with respect to potential effects of the crisis impacting on public budgets and crisis-related market risk aversion in 2009 (regressions D', N, F''): our central result regarding the beneficial effects of better fiscal rules remains in place when we exclude the 2009 data from the sample. Next, to cater for governments' support of the banking sector and the potential liabilities resulting from it, we include the size of the aggregate bank assets as a proportion of GDP (relative to Germany) among our regressors (regression O). We further run a regression without the observations on Ireland to avoid that our results are spuriously driven by the high degree of bank vulnerability that coincides with a comparatively low quality of fiscal rules in force (regression F"). These robustness checks all leave our central results regarding the importance of national fiscal rules for containing sovereign bond yields unaltered.

Table 6 Robustness checks: time period, banking sector, deficit forecasts

Variable	D'	N	F''	O	F'''	P
uscorp	0.08 ***	0.10 ***	0.09 ***	0.08 ***	0.09 ***	0.10 ***
	(0.01)	(0.01)	(0.01)	(0.02)	(0.01)	(0.01)
FRI	0.41	-0.74	-0.15	4.07 ***	-0.93	0.04
	(0.66)	(0.63)	(0.79)	(1.40)	(1.40)	(0.78)
*uscorp*FRI*	-0.01 ***		-0.01 **	-0.02 ***	-0.01 **	-0.01 ***
	(0.00)		(0.00)	(0.00)	(0.00)	(0.00)
balance	-1.54 ***	-1.61 ***	-1.21 *	-4.20 ***	0.27	
	(0.31)	(0.34)	(0.66)	(0.74)	(1.12)	
debt	0.50 ***	0.52 ***	0.45 ***	0.73 ***	0.37 **	0.46 ***
	(0.09)	(0.09)	(0.10)	(0.19)	(0.18)	(0.11)
uscorp *balance			0.00		-0.01 ***	
			(0.00)		(0.00)	
uscorp *debt			0.00		0.00 *	0.00
			(0.00)		(0.00)	(0.00)
E(F3.balance)						-0.99 *
						(0.59)
bankassets				-0.01		
				(0.03)		
N	97	97	97	107	97	97
R^2	0.85	0.82	0.85	0.82	0.86	0.81

Estimation with panel fixed effects. Standard errors in parentheses. Time period: 1999-2008 (estimations D', N, F", P), 1999-2009 (estimations O and F'"). Data on Ireland excluded from estimation F'".

Finally, to better capture the developments of fiscal fundamentals in the near future, we add the three-year-ahead deficit forecasts obtained from the stability and convergence programmes of the EU members (regression P). Deficit forecasts are found to be a significant and quantitatively important determinant of government bond spreads, while our main results are again confirmed. Rules-based fiscal governance thus plays an important role for the formation of expectations by financial markets in the longer run specifically. Even when we control for the effects of expectations on fiscal policy for a period of 3 years ahead, sound domestic rules-based fiscal governance has a significant

and quantitatively important risk-reducing effect by reducing uncertainty affecting expectations on the fiscal deficit, as well as better anchoring longer term expectations.

Financial market data come at a very high frequency and are typically available on a daily or even hourly basis. At the same time, the institutional measures are rather stable and move annually at most. To assess whether the results presented above with annual data are not just a statistical artefact of aggregating financial market data to an annual frequency, we carry out the regression analysis using the financial data aggregated at higher frequency such as to better reflect their variation. Hourly (financial) and annual (institutional) data do not match well, because much of the information reflected in the annual data is de facto available to the decision-makers in financial markets long before the release of data updates. As a compromise between loosing variation from aggregating financial data and accepting measurement error from institutional data, we aggregate the financial market data to a quarterly frequency and choose the quarterly Trimeco release of the government statistics data instead of the annual Ameco series respectively, while the annual data on fiscal rules remains unchanged.

Table 7 presents the first set of our robustness results. Our previous findings are essentially confirmed. Again, the interaction between risk aversion and the fiscal rules index is an important determinant of sovereign spreads. The effect is also quantitatively comparable to our baseline results.

Table 7 Robustness checks with quarterly data

	A'	**B'**	**C'**	**D''**	**I'**	**I''**
uscorp	0.18 ***	0.17 ***	0.13 ***	0.11 ***	0.09 ***	0.06 ***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
FRI		1.98	5.35 ***	2.15 ***	0.18	-0.70
		(1.37)	(1.48)	(0.69)	(1.87)	(1.39)
*uscorp*FRI*			-0.02 ***	-0.02 ***	-0.02 ***	-0.02 ***
			(0.00)	(0.00)	(0.00)	(0.00)
balance (quarterly)				-2.16	-2.17	
				(0.58) ***	(0.82) ***	
balance (annual)						-4.35 ***
						(0.39)
debt		1.51 ***	1.41 ***	0.57 ***	1.15 ***	1.70 ***
		(0.21)	(0.20)	(0.09)	(0.22)	(0.20)
bid-ask spread					60.91 ***	43.53 ***
					(17.26)	(14.66)
N	448	448	448	394	229	259
R^2	0.32	0.40	0.43	0.77	0.85	0.89

Note: Estimation with panel fixed effects. Standard errors in parentheses.
Time period: 1999-2009 (regressions A' to D''), 2003-2009 (regressions I' and I'').

Table 8 Robustness checks with Gerlach et al. (2010) data

	Q	R	S	I'''
uscorp	0.19 ***	0.18 ***	0.18 ***	0.11 ***
	(0.02)	(0.01)	(0.01)	(0.01)
FRI			0.37	3.76 ***
			(1.77)	(1.40)
*uscorp*FRI*				-0.02 ***
				(0.00)
balance				-3.19 ***
				(0.70)
debt		0.94 ***	0.95 ***	0.66 ***
		(0.26)	(0.27)	(0.20)
bid-ask spread	3.26	4.44	4.62	0.23
	(4.19)	(3.95)	(4.06)	(3.11)
N	105	105	105	105
R^2	0.74	0.77	0.77	0.88

Note: Estimation with panel fixed effects. Standard errors in parentheses.
Time period: 1999-2009 .

As a next set of estimates to investigate the robustness of our findings, table 8 shows the regression results using the data set on sovereign bond yields computed by Gerlach et al. (2010). This data set extends over a longer time horizon, covering the years 1999 to 2009. Moreover, information on bid-ask spreads has been gathered specifically from the very same bonds from which the yield information is obtained. The original data set is available at weekly frequency which we have aggregated to annual data to render results comparable with our main regressions.

Table 9 Robustness checks with measuring risk aversion by *VIX*

	A''	B''	C''	D'''	I''''
uscorp	2.51 ***	2.43 ***	1.86 ***	1.08 ***	0.90 ***
	(0.20)	(0.21)	(0.22)	(0.18)	(0.26)
FRI		2.02	8.97 ***	8.17 ***	4.68
		(1.62)	(2.02)	(1.48)	(3.03)
*vix** FRI			-0.29 ***	-0.28 ***	-0.29 ***
			(0.06)	(0.04)	(0.05)
balance				-4.65 ***	-4.79 ***
				(0.51)	(0.93)
debt		0.40	0.35	0.43 **	1.06 **
		(0.26)	(0.23)	(0.17)	(0.41)
bid-ask spread					-0.04
					(34.67)
N	107	107	107	107	69
R^2	0.62	0.64	0.71	0.85	0.88

Note: Estimation with panel fixed effects. Standard errors in parentheses.
Time period: 1999-2009 (regressions A"-D'"), 2003-2009 (I'").

The results again confirm our previous findings. We find a highly significant interaction effect between *uscorp* and the fiscal rule index, underscoring that in times of elevated market risk aversion, countries clearly benefit from more stringent and effective fiscal rules. The magnitude of the effects obtained with the Gerlach et al. (2010) data is also very similar to our first set of results.

Finally, we re-estimate our regression model employing a different measure of international risk aversion than the US corporate bond spread, namely the Chicago Board Options Exchange Market volatility index, *VIX*. Table 9 presents these estimation results. Our main findings are again corroborated: the choice of the measure of international risk aversion does not drive our results.

5 Conclusion

The present paper documents 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. Under extreme circumstances, better fiscal rules can reduce sovereign bond spreads between euro area member states and Germany by as much as 80 to 100 basis points according to our estimates. Of particular importance is the strength of the legal base of the fiscal rules in force. Countries operating rules with stronger legal foundations obtain lower risk premia, with beneficial effects potentially reaching up to 100 basis points. The stringency of the enforcement mechanisms of national fiscal rules further turns out to be comparatively important for the effectiveness of the rules in view of reducing sovereign risk premia as well. Our results are robust to the level of aggregation of the data in time, the length of the time period, and the measurement of international risk aversion, and they are not flawed by the impact of the financial crisis 2009 and by burdens to public finance resulting from liabilities of the banking sector either.

We argue that national fiscal rules have their beneficial effect by reducing the uncertainty of market expectations of fiscal variables. This is specifically important in times of higher risk aversion, which often coincide with higher uncertainty or negative shocks. Overall, our results lend strong empirical support to the recently debated policy proposals that the strengthening of national fiscal rules should be an integral part of the European economic governance reform. National fiscal rules can thereby contain sovereign risk by increasing trust in the sustainability of public finances in addition to their direct contribution on better fiscal outcomes.

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