



# Fiscal and financial determinants of Eurozone sovereign spreads

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## ABSTRACT

The relationship between fiscal and financial euro area indicators and sovereign yield spreads has changed after the start of the financial crisis. Increased financial volatility has magnified the impact of fiscal conditions as drivers of sovereign risk, has widened the set of macroeconomic determinants, and has caused substantial interactions between fiscal and financial variables.

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## 1. Introduction

In the build-up phase of the global crisis, being part of the European monetary union shielded countries with weakest fundamentals against perverse shocks to public finance and economy. After two years of countercyclical public deficits, fiscal sustainability has become the main policy issue for the weakest Eurozone countries, and a challenge for the future of the European single currency.

Though the long-term driver of sovereign risk (i.e., fiscal solvency) has a structural macroeconomic nature, the short-/medium-term credibility of fiscal policy stance plays a fundamental role: a sudden loss of credibility quickly translates into higher sovereign-risk premium embedded in bond yields, pumping up debt service. Any adverse shock to future government expenditures and revenues may flaw fiscal credibility. In turn, a potentially large number of structural macroeconomic conditions may affect sovereign risk, and cause sovereign debt crises (Reinhart and Rogoff, 2011).

The growing and vast literature on the determinants of sovereign yield spreads corroborates the view that both financial

and structural variables drive (Eurozone) sovereign risk, though to our knowledge a thorough analysis identifying the relevant structural variables, as well as their interplay with financial variables, is still lacking.

The aim of this note is to show that the financial crisis has had a substantial impact on the composition of variables that drive bond yield spreads, the magnitude of their impact, and the nature of the relationship linking fiscal determinants and yield spreads.

## 2. Data and methodology

We want to empirically single out what have been the major determinants of low-frequency (i.e., quarterly) movements of bond yield spreads in the euro area since the beginning of the EMU. We use quarterly data because we are mainly interested in changes of spreads that are likely to affect debt service, and fiscal sustainability of public liabilities. For the same reason, we focus on yield spreads of bonds with 10-years initial maturity which are the staple of public debt management in the considered countries. To do so, we estimate the following static panel data model with fixed effects by Feasible GLS:

$$s_{it} = \beta'_1 \cdot \mathbf{Y}_{it} + \beta'_2 \cdot \mathbf{Z}_{it} + \beta'_3 \cdot (\mathbf{Z}_{it}^* \otimes \mathbf{Y}_{it}^*) + \beta'_4 \cdot (d_t \cdot \mathbf{Y}_{it}) + \beta'_5 \cdot (d_t \cdot \mathbf{Z}_{it}) + \epsilon_{it} \quad (1)$$

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**Table 1**  
Estimation results.

Regression	A	B	C	D	E
Debt-to-GDP > 1	<b>0.008434</b> ***	<b>0.003513</b> *	<b>0.002913</b> **	<b>0.021538</b> ***	<b>0.007723</b> ***
Debt-to-GDP < 1	<b>0.011601</b> ***	<b>0.005048</b> **	0.001724	<b>0.012012</b> *	
German Debt-to-GDP < 1	<b>0.042153</b> ***	<b>−0.029021</b> ***	0.010199	<b>−0.256941</b> ***	<b>−0.018329</b> **
Cycl. Adj. Net Lending	<b>−0.01934</b> ***	<b>−0.013537</b> ***	−0.004198	<b>−0.028037</b> *	<b>−0.016541</b> ***
MFI debt	−0.000169	0.000303	−0.000452	<b>0.001907</b> *	
MFI loans corporations	<b>0.000526</b> ***	−0.000227	5.79E−05	0.000517	
MFI loans households	<b>−0.000472</b> ***	0.000167	<b>0.000244</b> **	<b>−0.001014</b> **	
MFI loans foreign debtors	<b>0.000798</b> **	<b>0.000419</b> *	0.000167	0.001017	<b>0.000921</b> ***
Expected GDP growth 3–5 yr	−0.02038	<b>−0.016103</b> *	−0.018096	<b>−0.142777</b> ***	<b>−0.02876</b> ***
Real effective exchange rate	0.00246	<b>−0.002724</b>	−0.004113	<b>−0.054298</b> **	
Repo rate	<b>0.058534</b> ***	<b>0.046301</b> ***	<b>0.033634</b> ***	<b>−0.17165</b> ***	<b>0.059822</b> ***
Variance Euribor-Repo	<b>9.047119</b> ***	<b>−1.643585</b> *	<b>−3.622647</b> ***	<b>7.228381</b> ***	
Variance Euro Stoxx	<b>0.000124</b> ***	2.81E−05	−6.47E−06	<b>0.000306</b> ***	
Variance spread	<b>7.003149</b> ***	−1.009988	<b>−4.129583</b> ***	<b>4.882702</b> ***	
D*Debt-to-GDP > 1					<b>0.00355</b> ***
D*German Debt-to-GDP < 1					<b>−0.166006</b> ***
D*Cycl. Adj. net lending					<b>−0.011587</b> ***
D*MFI Loans households					<b>−0.00013</b> ***
D*Real effective exchange rate					<b>0.014472</b> ***
D*Repo rate					<b>−0.216432</b> ***
D*Variance Euribor-Repo					<b>7.390355</b> ***
D*Variance Euro Stoxx					<b>0.000248</b> ***
D*Variance spread					<b>5.272176</b> ***
Sample	Full	Pre-crisis	Stable	Crisis	Full
Adjusted R-squared	0.722216	0.730221	0.734881	0.843276	0.833146

\* Significant at the 10 percent level.

\*\* Significant at the 5 percent level.

\*\*\* Significant at the 1 percent level.

where  $s_{it} = r_{it} - r_{dt}$  is country- $i$ 's spread, with  $r_{it}$  the bond yield of country  $i$ , and  $r_{dt}$  the yield of the corresponding bond issued by Germany, that is the safest issuer of the euro area (Bernoth and Erdogan, 2010);  $\epsilon_{it}$  is the (possibly autocorrelated) residual term<sup>1</sup>;  $\mathbf{Y}_{it}$  is the set of  $(k \times 1)$  macroeconomic variables, potentially including all variables that may influence country- $i$ 's fiscal position;  $\mathbf{Z}_{it}$  is the set of  $(m \times 1)$  financial variables, including volatilities and liquidity measures. To keep the notation as simple as possible, we use the subscript  $t$  for both regressors and the dependent variable; however, it is worth noticing that the subscript  $t$  for regressors denotes the last day of quarter  $q$ , while the subscript  $t$  for the dependent variable denotes day one of quarter  $q + 1$ .

In our starting model, we include a wide set of macroeconomic and financial variables.<sup>2</sup> To catch the impact of changing financial conditions on the role of macroeconomic variables, we introduce an interaction term ( $\mathbf{Z}_{it}^* \otimes \mathbf{Y}_{it}^*$ , where  $\mathbf{Z}_{it}^*$  is  $(p \times 1)$  vector including a subset of  $p \leq m$  financial variables,  $\mathbf{Y}_{it}^*$  is a  $(q \times 1)$  vector including a subset  $q \leq k$  of macroeconomic variables, and  $\otimes$  is the Kronecker product). We include time dummies ( $d_t = 1$  for  $t = 2007Q3, \dots, 2009Q4$ ) to test for a potential switch in the

magnitude of the impact of macroeconomic ( $d_t \cdot \mathbf{Y}_{it}$ ) and financial ( $d_t \cdot \mathbf{Z}_{it}$ ) variables on spreads.<sup>3</sup>

Our sample includes quarterly data from 2000Q1 to 2009Q4 for the 12 countries which originally formed the euro area, excluding Luxembourg and including Greece.<sup>4</sup> Because of a lack of data availability, our sample does not cover the first year of EMU. The choice of 2009Q4 as the end date aims at excluding observations that are largely affected by bailouts of Greece, Portugal, and Ireland and by ECB interventions on sovereign bond markets.

### 3. Results

Our model (Models A–D in Table 1) has been estimated for the full sample, the pre-crisis (before 2007Q2) period, the stability period (2002Q1–2007Q2) and the crisis period (2007Q3–2009Q4), respectively. Model E shows results after inclusion of interaction terms and time dummies to account for a switch due to the financial crisis. Our results are twofold.

First, a number of fiscal and financial indicators have driven the yield spreads throughout the sample (Models A–D). On the fiscal side, we find that: both long- and short-term debt-to-GDP ratios are significant, though the former has had a larger quantitative impact; German debt is negatively correlated with sovereign spreads; budget deficit has been a driver of spreads, except in the 2002–2007 period; and higher expected growth rates and real exchange rate depreciation have had a significative downward impact on sovereign spreads. On the financial side, the ECB repo rate turns out to be robustly significant across samples. However, while in the pre-crisis period an increase in the repo rate has had

<sup>1</sup> A more general model of bond yield spreads should also take into consideration an autoregressive term. However, the persistency of spreads drops significantly as the frequency of data lowers (Attinasi et al., 2009; Ceceres et al., 2010; Gerlach et al., 2010). Thus, we ignore the lagged term, but we correct the estimated parameters standard error to compensate for the potential autocorrelation of the residuals.

<sup>2</sup> Government debt and debt structure by maturity and instruments, both in euro and GDP shares (source: Eurostat), interest payments on debt (source: OECD), real effective exchange rate (source: IMF), expected growth in the next two years and in the next 3 to 5 years (source: IFO WES), net lending and borrowing by national account sectors (source: national accounts), cyclically adjusted net lending and primary balance (source: OECD), international investment position in terms of assets and liabilities (source: IMF), monetary and financial institutions (MFI) external and internal assets and liabilities (source: ECB), Euribor and ECB main refinancing operation rate (source: ECB), and Euro Stoxx index (source: Datastream).

<sup>3</sup> Such an assumption is consistent with the narrative analysis of the financial crisis, and has proven robust against sensitivity tests we conducted with alternative timing hypotheses.

<sup>4</sup> Austria, Belgium, Finland, France, Germany, Ireland, Italy, The Netherlands, Portugal, and Spain. Greek yields in 2000 include also a small exchange rate premium, given that Greece joined the euro area in 2001.

an upward impact on spreads, the relationship is reversed after the start of the financial crisis. This may indicate that ECB policy rate cuts, during the acute phase of the crisis, have been considered by financial markets as signals of worsened financial and real conditions. Risk measures (the volatility of the Euribor-Repo rate spread, of the bond yield spreads, and of the Euro Stoxx index) turn out to be significant, with a time-varying relationship with sovereign spreads (except for Euro Stoxx volatility): a negative sign in the pre-crisis period, pointing to a premium for yields of relatively risky countries, has been replaced by a strong positive sign in the crisis period, indicating a flight-to-quality effect, similar to what is documented at higher frequencies (Beber et al., 2009).

Second, we find clear signs of a potential regime switching after 2007Q2 (Model E). Most interaction dummies are significant implying that the impact of our explicative variables on sovereign spreads has changed. Model E has also been augmented with interaction terms between the variables included in the model and the country-specific variance of sovereign spreads to identify potential nonlinearities due to the presence of idiosyncratic risk components. Results show a significant interaction for: short-term debt, MFI debt, MFI loans to corporations, MFI loans to foreign debtors, variance of Euribor-repo rate spread, and variance of Euro Stoxx. These significant interactions, all positively signed, indicate the presence of nonlinear effects in addition to the switch in the regime of parameters: the higher the idiosyncratic risk, the higher the debt-refinancing cost due to greater short-term debt or banking exposure towards riskier sectors; global risk factors have had a larger impact on countries with higher idiosyncratic risk.

#### 4. Conclusions

We have empirically analyzed the impact of a wide set of macroeconomic and financial indicators on the dynamics of euro-area sovereign spreads from 2000 to 2009. A number of determinants turn out to have had a significant impact throughout the sample. However, and most interestingly, we find evidence that the relationship is time-varying, with substantial nonlinear effects: first, the impact of the main drivers of yield spreads has increased after the start of the financial crisis; second, after the financial

crisis, the impact of these drivers is magnified by the financial markets' uncertainty.

The aim of the paper is to highlight the main determinants in the build-up phase of the sovereign bond yield crisis. Partly as a consequence of this choice, the empirical analysis has a number of limitations: (i) the role of nonlinearities has been explored using only interaction terms between fiscal and financial fundamentals; (ii) contagion effects, particularly important in the most recent phase of the sovereign crisis, have not been included; (iii) no role has been given to uncertainty and the possibility that virtuous countries may be trapped in a bad equilibrium; and (iv) the relevance of implicit liabilities, in particular of the exposure of the banking sector, has not been fully developed. A more rigorous and satisfactory analysis would then require: (i) a more systematic analysis of non-linearities, which would allow us to endogenously determine the timing and the magnitude of the breaks; (ii) including time- and cross-country dependence, thereby allowing for the possibility of spillover and contagion effects; (iii) including some measure of economic and political uncertainty, à la (Baker et al., 2012); and (iv) extending the analysis to the period 2010–2012. These developments are in our research agenda.

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