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Working Papers

22 | 2010

DETERMINANTS OF SOVEREIGN BOND YIELD SPREADS IN THE EURO AREA IN THE CONTEXT OF THE ECONOMIC AND FINANCIAL CRISIS

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October 2010

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BANCO DE PORTUGAL

Edition

Economics and Research Department

Av. Almirante Reis, 71-6th

1150-012 Lisboa

www.bportugal.pt

Pre-press and Distribution

Administrative Services Department

Documentation, Editing and Museum Division

Editing and Publishing Unit

Av. Almirante Reis, 71-2nd

1150-012 Lisboa

Printing

Administrative Services Department

Logistics Division

Lisbon, September 2010

Number of copies

170

ISBN 978-989-678-046-3

ISSN 0870-0117

Legal Deposit no. 3664/83

Determinants of sovereign bond yield spreads in the euro area in the context of the economic and financial crisis*

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October, 2010

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Abstract

This paper aims to identify the determinants behind the different evolution of sovereign bond yields in euro area countries for the period of the current crisis. Up to the time of the collapse of Lehman Brothers, global risk premium was the main driver of spreads. Afterwards, the relevance of idiosyncratic factors increased. Although liquidity premiums played a larger role in the months following September 2008, as the financial crisis spilled over into a strongly deteriorating macroeconomic environment, the importance of country credit risk factors increased. In the first five months of 2010, heterogeneity in sovereign credit risk premiums and a further increase in global risk aversion were, to a large extent, the determining factors behind the evolution of spreads.

Keywords: Euro area; Sovereign spreads; Credit risk; Liquidity; Global risk

JEL classification numbers: E43, G12, G15.

*The authors are grateful to Isabel Gameiro, Carlos Santos and João Sousa for their most helpful comments. The analyses, opinions and findings of this paper represent the views of the authors, which are not necessarily those of Banco de Portugal. Authors' e-mail: lsbarbosa@bportugal.pt; smcosta@bportugal.pt.

1 Introduction

The economic and financial crisis that started in mid-2007 has had an unprecedented impact on the euro area government bond market. Although differing from country to country, sovereign yield spreads to German bonds have been much higher than in the period preceding the start of the third stage of Economic and Monetary Union.

The widening of sovereign bond yield spreads took place against a background of deteriorating public finances in several countries, as well as an increase in risk aversion and a deterioration in liquidity conditions in international financial markets. This suggests the evolution of spreads to Germany reflected both an increase in country credit risk and liquidity premiums and, that the increase in such premiums is a result of the interaction between common and idiosyncratic factors. The purpose of this study is to identify such factors' contribution to the different evolution of government bond yields in euro area countries in the current crisis.

The sample period is from early 2007 to May 2010. In order to ensure the robustness of the results, we measured the spread determinants using a reasonably comprehensive set of variables usually found in the literature. Sovereign credit risk was evaluated both on macroeconomic and financial market variables. In the case of liquidity, we have calculated several indicators using trade and quotes data from the MTS platforms for the specific bonds used in the construction of the yield spreads. We have also calculated several indirect liquidity indicators related with the relative size of each country's sovereign bond market and liquidity risk. Finally we have endeavoured to capture the co-movements in spreads by variables generally used to proxy the risk premium in international financial markets.

According to the results, euro area sovereign spreads in the period under analysis may be explained by the risk premium in international financial markets, as well as by idiosyncratic factors related with sovereign credit risk and the liquidity characteristics of domestic government bond markets. There has been a change in the relative importance of each of these factors in explaining the spreads since the beginning of 2007. This situation resulted both from the evolution of spread determining factors and changes in spreads' sensitivity to them. In the period prior to the collapse of Lehman Brothers, euro

area sovereign spreads were mainly driven by the international risk premium. With the deepening of the economic and financial crisis, factors specific to each economy increased in relevance. Initially, the increase in spreads was largely due to liquidity premiums. However, as the financial crisis spilled over into a strongly deteriorating macroeconomic environment, there was an increase in the importance of country credit risk factors. In the first five months of 2010, the heterogeneity of sovereign credit risk premiums and a further increase in global risk aversion were major determining factors behind the evolution of spreads.

This paper is organized as follows: section 2 describes the euro area sovereign determinants and reviews the literature; section 3 provides a descriptive analysis of the data used; the econometric results are presented in section 4; and, finally, section 5 includes the main conclusions.

2 Euro area sovereign bond yield spread determinants

In the euro area, given the single monetary policy and the relative integration of national bond markets, long term sovereign yield spreads mainly reflect differences related to issuers' credit risk and the liquidity of securities. The economic literature has, accordingly, attached particular importance to the breakdown of spreads between credit risk and liquidity premiums.

The credit risk premium of a security corresponds to the compensation demanded by investors to cover the risk of future cash flows being different from those agreed, due to default. This premium depends on each issuer's idiosyncratic factors, which determine the level of risk, as well as on the risk premium in the financial markets. This risk premium, in turn, is determined by the degree of investors' risk aversion and by the global uncertainty prevailing in international financial markets. Therefore, in terms of credit risk, sovereign bond yield spreads should be related with each country's public finances sustainability indicators and with risk indicators in international financial markets. In times of lower risk appetite, as in the current economic and financial crisis, the global risk premium tends to increase. This fact, *per se*, contributes to an increase in the yield spreads of countries which the market assesses as having a higher default risk in comparison to lower

risk countries. In situations of the deterioration of a country's default risk, the increase in the global risk premium also amplifies the impact of this deterioration on spreads.

Regarding liquidity, the return demanded by investors is expected to be lower for bonds that can be traded quickly, at low cost and without major price changes. Differences in liquidity among national securities may reflect several factors, such as the value of outstanding amounts, the time elapsed since their issue, whether they are eligible for delivery in the futures market, as well as the degree of efficiency in primary and secondary markets in which they are traded. The liquidity premium included in the price of each bond should contain a component associated with the security's expected level of liquidity, and a compensation for unanticipated changes in liquidity (liquidity risk). This last component depend both on factors that specifically affect the future liquidity of the security, as well as on the global liquidity demand conditions prevailing in international markets. In times of increased macroeconomic uncertainty and greater volatility in financial markets, there is a higher likelihood of the need to unwind an investment position quickly. This should increase the demand for assets that can be traded at low cost. In these periods, higher liquidity risk contributes to an increase in liquidity premiums, suggesting the existence of a positive correlation between liquidity and credit risk premiums.

A breakdown of sovereign yield spreads into components determined by credit quality and related to liquidity is not easy to perform empirically, as these characteristics are not directly observable and are not completely independent. Additionally, the relative importance of credit and liquidity risks tends to change over time in line with structural changes in economies, as well as their cyclical position and, consequently, the risk premium in international financial markets.

Table 1 presents a summary of the empirical results for euro area sovereign bond yield spreads organized by the sample period.

A robust finding in the literature is that euro area sovereign yield spreads are largely determined by a common factor. This factor, which is interpreted as the global risk appetite, is usually measured by credit risk premium indicators on corporate bonds and uncertainty in international financial markets. Empirical results also support the relevance of governments' creditworthiness in determining the spreads. This conclusion is relatively

independent from the variables used to measure country credit risk, namely variables related with public finances, credit ratings or information from financial markets, such as Credit Default Swaps (CDS).[1] In the case of liquidity, the evidence is mixed. Bernoth *et al.* (2006) and Schuknecht *et al.* (2010) conclude that liquidity is not a significant determinant of sovereign yield spreads in euro area countries. Codogno *et al.* (2003) and Sgherri and Zoli (2009) also indicate a very limited effect of liquidity. In turn, Gómez-Puig (2006), Beber *et al.* (2009), Schwartz (2009), Ejsing and Sihvonen (2009), Attinasi *et al.* (2009), Barrios *et al.* (2009), Haugh *et al.* (2009) and Gerlach *et al.* (2010) find liquidity effects, which in some cases are quantitatively limited and only relevant for some countries. In most of these papers, liquidity is measured by indicators based on transaction costs (bid/ask spreads), trading volumes or bonds' outstanding amounts. Schwartz (2009) uses a different liquidity measure, which consists of the yield spread between bonds issued by KFW and German government bonds, and obtains a higher liquidity impact on euro area sovereign spreads than usually found in the literature.[2] According to Schwartz (2009), this indicator captures the pricing of liquidity risk, *i.e.* the compensation that investors demand for the possibility that market liquidity will worsen in the future.

The literature on euro area sovereign spreads has also focused on the identification of changes in the relative importance of the determining factors over time.

In the first years after the introduction of the single monetary policy, given the reduced levels of yield spreads, the main question was the extent to which investors were no longer discriminating government bonds by credit and liquidity risks. The empirical results for the period suggest that credit risk has continued to play a role as a yield spread determinant. This situation may, firstly, reflect the perception that euro area countries could reach an unsustainable fiscal situation despite the existence of the Stability and Growth Pact and the excessive deficit procedure and, secondly, the Maastricht Treaty's "no bail-out clause". Regarding liquidity, the results are mixed. While Bernoth *et al.* (2006) conclude that liquidity has ceased to have an impact on the determination of

[1] A Credit Default Swap is a financial derivative that allows investors to hedge credit risk, *i.e.* protect themselves against the possibility of a debt default.

[2] KFW is a banking group owned by the German State that aims to promote economic, social and ecological development. KFW's bonds are explicitly guaranteed by the German government and have several characteristics similar to German sovereign bonds, particularly in terms of taxes, issuance policy and investors base. In this context, KFW's yield spread against German government bonds should essentially reflect a liquidity premium.

spreads, the results of Gómez-Puig (2006) suggest that the relevance of liquidity in the markets has increased with EMU.

In turn, the most recent literature focuses on the impact of the current economic and financial crisis. The empirical evidence for this period suggests an increase in the importance of domestic factors, namely country credit risk and, to a lesser extent, liquidity factors (*e.g.* Barrios *et al.* (2009), Ejsing and Sihvonen (2009) and Mody (2009)). The results found by Mody (2009) suggest that, at the beginning of financial market turmoil, *i.e.* in the second half of 2007 and early 2008, spreads were largely determined by common factors. During this period, the increases in international risk aversion lead to flight-to-quality movements to German bonds. After the problems experienced by Bear Stearns in mid March 2008, the different degrees of vulnerability of national financial sectors contributed to a differentiation in yield spreads in euro area countries. The impact of financial sector risk on sovereign risk increased in the period following the collapse of Lehman Brothers. The results of Ejsing and Lemke (2009), Attinasi *et al.* (2009) and Gerlach *et al.* (2010) suggest that the vulnerabilities of national banking sectors and governments' rescue packages contributed to a risk transfer from the financial to the public sector. After September 2008, country credit risk, in particular when evaluated by public finance indicators, appears to have been a major underlying factor behind changes in the yield spreads of euro area countries (Mody (2009), Sgherri and Zoli (2009), Barrios *et al.* (2009) and Schuknecht *et al.* (2010)). According to Caceres *et al.* (2010), in this period the risk of contagion among euro area countries was also a relevant factor in determining the spreads.

3 Description and analysis of the data

The first part of this section presents the data used in this study and discusses the potential problems related with their interpretation. In the second part a brief analysis of data is carried out as an introduction to the econometric analysis of the following section.

3.1 Data Description

In line with the previous section, the variables included in the model for euro area sovereign spreads aim to capture the price of risk in international financial markets, sovereign credit risk premiums and liquidity premiums.

The countries under analysis are the first twelve countries joining the euro area, with the exception of Luxembourg. The sample period runs from January 2007 to the end of 2009 or mid May 2010, depending on the variables included in the specifications. This period includes a similar number of observations before and after the collapse of Lehman Brothers, which helps the analysis of possible changes in the model determining sovereign spreads given the current economic and financial crisis. The variables for each country are defined in differences against Germany. The option of using Germany as the reference country is justified by the fact that German government bonds have reinforced their safe heaven and benchmark status during the current crisis, as a consequence of their relatively high credit quality and liquidity.[3]

The yields on government bonds were calculated using the data from the MTS electronic trading platforms for securities with a residual maturity of around 5 and 10 years.[4]

Two types of alternative variables were used to measure country risk premiums: sovereign CDS premiums and macroeconomic variables. The CDS data have the advantage of being available at a daily frequency, but must be carefully interpreted given that they can be misleading measures of country credit risk premiums, particularly in the current context. Changes in liquidity conditions in financial markets may impact on CDS premiums thus leading to possible under/over estimates of sovereign risk premiums.[5] Additionally, movements in sovereign CDS premiums may not only reflect changes in the assessment of the credit quality of the underlying country, but may also reflect changes in global risk perception prevailing in financial markets.[6] In these conditions, the use of macroeconomic variables, in addition to their usefulness in providing greater insight on credit risk deter-

[3] One factor often mentioned as a determinant for the higher liquidity of German bonds is the existence of a highly efficient and liquid derivatives market on these securities (EUREX stock exchange), which is not the case for government bonds of other euro area countries. The results found by Ejsing and Sihvonen (2009) confirm the importance of this factor and suggest that its impact on sovereign spreads has increased over the current crisis.

[4] The methodology used for the construction of all indicators obtained from the MTS database is described in the Annex 1.

[5] See Buhler and Trapp (2009) and Alexopoulou *et al.* (2009).

[6] According to the results of Alexopoulou *et al.* (2009), based on data up to October 2008, the common risk factors have greatly increased their contribution to the CDS premiums of European firms during the current crisis.

mining factors, is important for evaluating the robustness of the results obtained from CDS data. The macroeconomic indicators considered were related to public finances and the external position of each country. In particular, we constructed monthly series based on forecasts released by the European Commission (EC), IMF and OECD, which aim to reflect the one-year-ahead forecast at any point of time. These series correspond to a weighted average of the most recent forecasts for the current and the following years provided by the three institutions and are calculated by the following formula:

$$x_{i,j}^{one-year-ahead} = (x_{i,j}^{EC,j} + x_{i,j}^{IMF,j} + x_{i,j}^{OECD,j}) \left(\frac{12 - i + 1}{12} \right) + (x_{i,j}^{EC,j+1} + x_{i,j}^{IMF,j+1} + x_{i,j}^{OECD,j+1}) \left(\frac{i - 1}{12} \right)$$

in which: $x_{i,j}^{EC,j+1}$, $x_{i,j}^{IMF,j+1}$ and $x_{i,j}^{OECD,j+1}$ are the most recent forecasts available in month i of year j for x at year *j+1* released by the EC, IMF and OECD, respectively.

The use of these indicators instead of observed data appears to be more suitable for explaining sovereign yield spreads in the current crisis, a period which has been characterized by frequent reassessments of country credit risk.

Bond liquidity premiums are relatively difficult to evaluate empirically. On the one hand, there is no consensual measure for liquidity in the literature. Empirical applications for gauging liquidity focus on several alternative indicators, which aim to capture its different dimensions. On the other, obtaining representative data on the liquidity of government bonds is also hindered by the fact that these securities are traded in several markets, including non-organized markets for which no data are available. In the particular case of euro area government bonds, many studies construct liquidity measures from the MTS database, given the high weight of these platforms in the secondary market trading of European government bonds. In this study, we have used several alternative measures to assess liquidity premiums.

Based on quotes and trade data from the MTS platforms for the period 2007-2009, we obtained several liquidity indicators, expressed in relation to Germany. These included measures of transaction costs (bid/ask spread - *ba*), volumes available for trade (average volume of proposals posted at the best bid and ask prices - *depth*; and maximum volume of proposals for the best three prices - *max*), transactions (trading volume - *vol*; and number of transactions - *trs*), as well as the ratio between transaction costs and the

volume available for trade (ask-side market depth - *adepth*).[7] In general, the indicators based on trade data (*trs* and *vol*) are more representative of market liquidity conditions than those calculated from quotes. Nevertheless, given that quotes on MTS platforms are binding, the quality of these data is also relatively good. Another reason to use the quotes data is that they are available for a larger number of days, given the significant decline in the number of transactions in the crisis period.[8]

The liquidity indicators constructed from the MTS database have the advantage of representing direct measures for the liquidity of the securities under analysis. However, they also have the disadvantage of being highly dependent on the representativeness of MTS platforms in the overall market. This situation is particularly relevant in the crisis period, when unorganized over-the-counter markets have increased their importance vis-à-vis electronic platforms.[9] During this period there have also been several regulatory changes which may have contributed to a reduction of the MTS market share in several countries.[10]

In order to overcome the distortions associated with changes in market structure, the liquidity premiums were also assessed using measures not related with a specific market infrastructure (indirect liquidity measures). Given that information and transaction costs may decline with the dimension of the market, the relative size of each country's government bond market was used as a liquidity premium proxy. This indicator was based on the outstanding amounts of long term euro-denominated debt securities issued by euro area central governments, published by the ECB. Additionally, as a proxy for the price of liquidity risk, *i.e.* the risk that liquidity may deteriorate in the future, we calculated the yield spreads between the 5 and 10 years bonds issued by KFW and German bonds with similar maturities, in line with the approach adopted by Schwartz (2009).

Finally, the risk premium in international financial markets was assessed by the first principal component of a set of variables, for the euro area and the United States, usually found in the literature as measures of risk premiums in corporate bond markets and

[7] Details on the construction of liquidity measures are presented in the Annex 1.

[8] In 2007, the number of days with transactions was, on average, around 70 per cent of the number of days with proposals. In 2008, this proportion decreased to around 40 per cent at the end of the year. In 2009, the number of days with transactions increased progressively reaching a yearly average of 60 per cent.

[9] The greater difficulty in performing transactions on large amounts on the electronic platforms without greatly affecting the prices appears to have contributed for this change.

[10] Since 2008, several euro area countries have been allowing primary dealers to fulfil their quote obligations on electronic platforms other than MTS.

uncertainty in financial markets. The input variables were BBB corporate bond spreads, several CDS indices for financial and non-financial sectors and stock and bond markets implied volatilities.[11]

3.2 Analysis of the evolution of spreads and explanatory variables

Throughout the current crisis, there have been substantial changes in the path of sovereign bond spreads in euro area countries. In the months following the collapse of Lehman Brothers, there was a significant widening of sovereign spreads (Figure 1). Between the second quarter of 2009 and early summer, spreads moved generally downwards. Since October 2009, the disclosure of a significant deterioration in Greece's public finances generated substantial concerns over their sustainability, which spilled over to other euro area countries with weaker macroeconomic positions. In Greece, Portugal and, to a lesser extent, Ireland, Spain and Italy, spreads were significantly up in first half 2010. Although there was also an increase in other countries' spreads, they did not exceed the levels recorded in the months following the bankruptcy of Lehman Brothers.

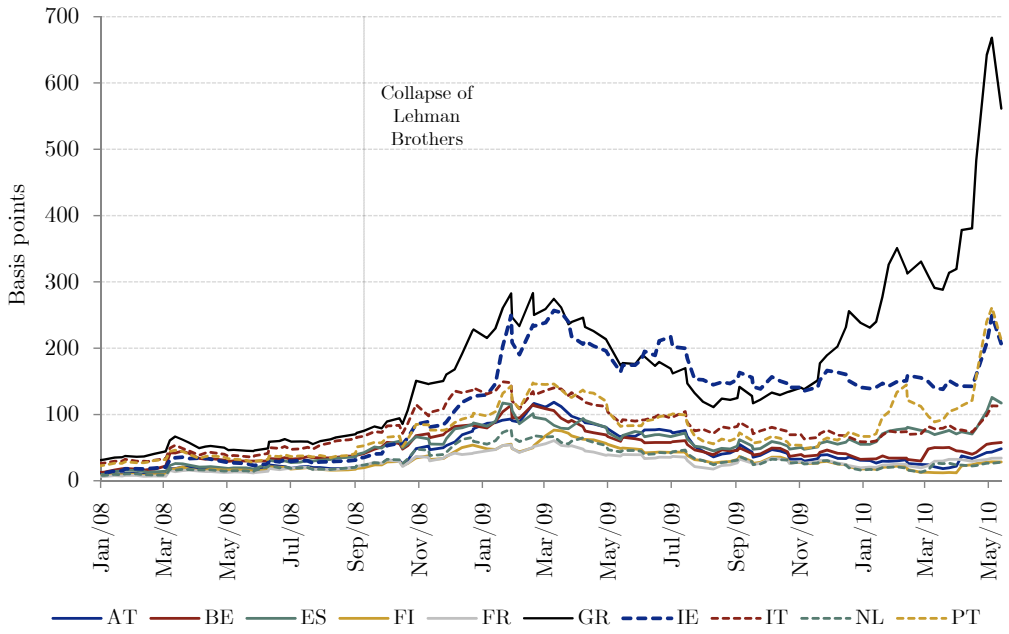
The principal components of spreads and their determinants were calculated for the purpose of evaluating the relevance of common factors to the path of these variables. The first principal components of the yield spreads, of the differences with Germany in CDS premiums and in bid/ask spreads explain, at least, about 75 percent of the respective variances in the period 2007 to 2009.[12] The major importance of the first principal components suggests that the evolution of sovereign risk and liquidity premiums may, to a large extent, be determined by a single common factor. Indeed, in the sample period, the first principal components of yield spreads, of CDS premiums and of bid/ask spreads defined against Germany are highly correlated either between each other or with the international financial markets global risk indicator or even with the KFW indicator, designed to capture liquidity risk.

In the period under review, there appears to have been a change in the relevance of

[11] The option to compute the principal components derived from the fact that there is a certain variability in the estimation results obtained from the individual variables. The first principal component explains about 85 percent of the variance of these variables.

[12] In the case of the MTS liquidity variables referring to quantities, the first principal components explain lower proportions, pointing to the greater importance of idiosyncratic factors. This may be explained by a higher sensitivity of quantities to changes in market structure or to different market making rules in the domestic MTS platforms.

Figure 1: 10 year euro area government bond yield spreads to Germany

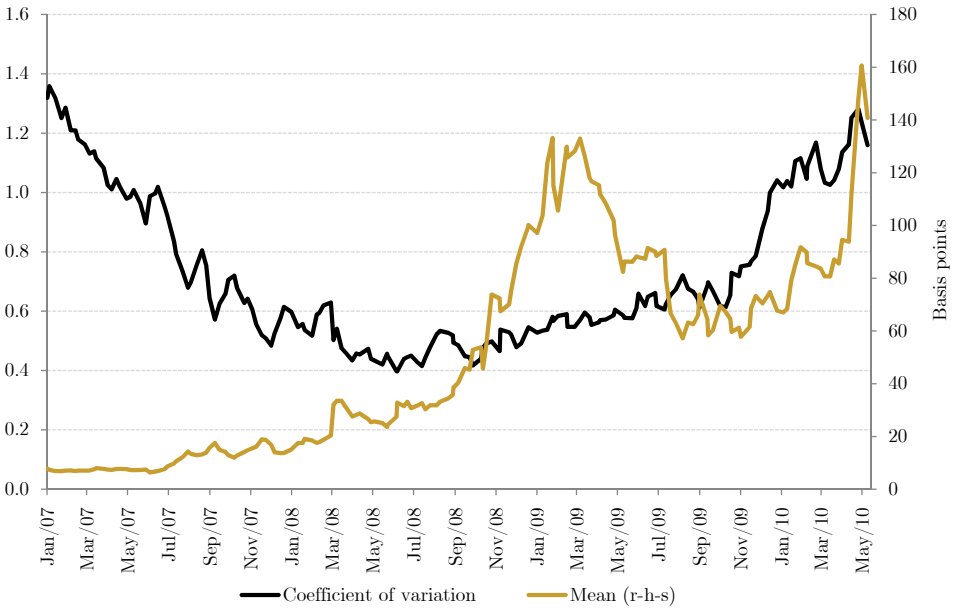


Source: Thomson Reuters.

common factors explaining the spreads. To illustrate the evolution of the dispersion of country spreads, Figure 2 presents the yield spreads coefficient of variation. In the period before the current crisis, this coefficient tended to move downwards, which is in line with the idea that the high liquidity prevailing in international financial markets contributed to a lower level of risk differentiation. The fact that this downward trend continued through the first two months of 2008 suggests that, at the beginning of the crisis, the increase in global risk aversion led to a flight to the government bond markets in general.[13] Between the liquidity problems with the Bear Stearns investment bank, in mid March, and until September 2008, German bonds appear to have benefited from flight-to-quality movements, but there is no evidence of significant differentiation among bonds of other euro area countries. The increase in spreads observed in this period should, accordingly, have mainly been determined by the reduction in risk appetite in financial markets. The coefficient of variation increased, however, from late 2008 and, more markedly so, from late October 2009, which suggests an increase in the importance of idiosyncratic factors. The increased relevance of these factors took place in a context of the deteriorating outlook

[13]There was an increase in trading volumers on MTS platforms in this period.

Figure 2: Mean and dispersion of 10 year euro area government bond yield spreads to Germany



Source: Thomson Reuters.

for public finances, initially due to the support measures for the financial system and economic stimulus plans, and later to the economic recession of 2009. These developments suggest that, at least, part of the idiosyncratic spreads movements were associated with a deterioration in credit quality in several countries. Indeed, the largest increases in spreads since the onset of the financial crisis, and especially since late 2009, occurred in countries with an adverse macroeconomic situation at the onset of the crisis and/or where it has deteriorated significantly afterwards (Figure 3 and Figure 4).

Figure 3: Public deficit and euro area government bond yield spreads

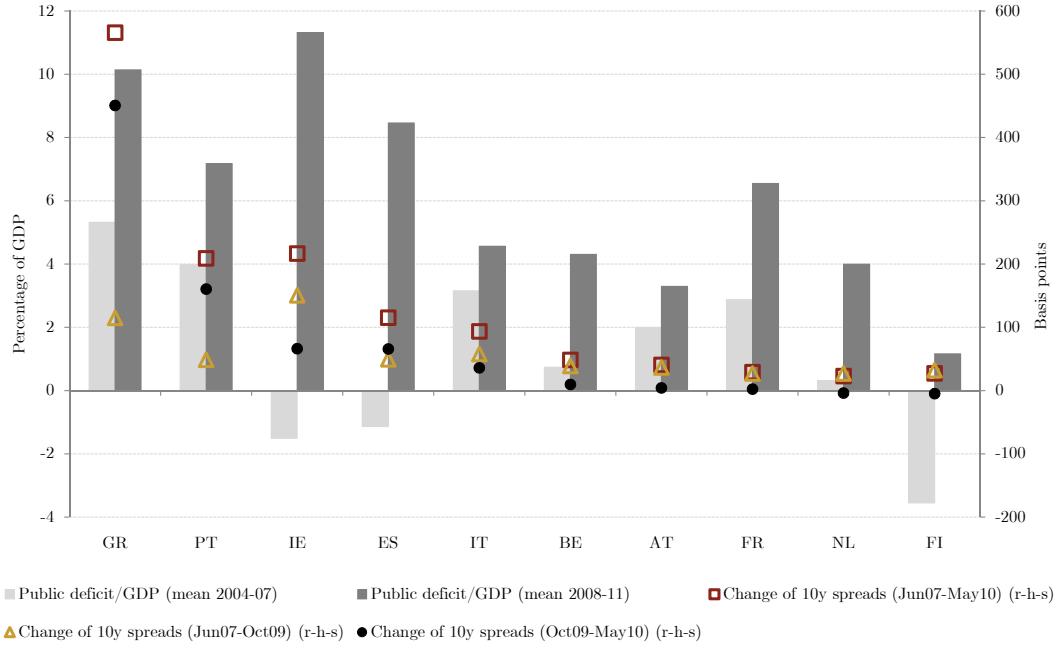
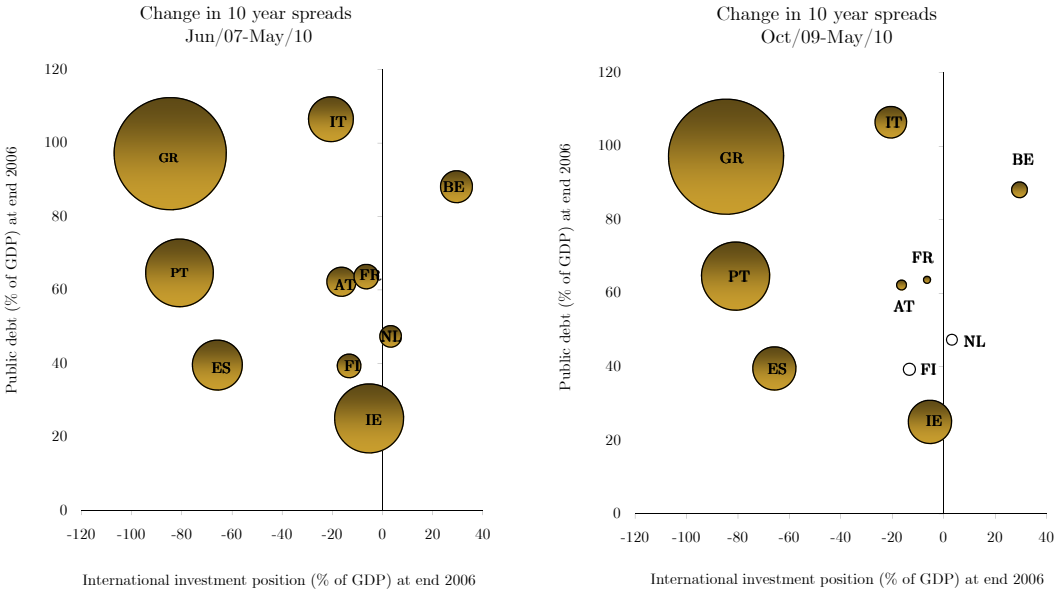


Figure 4: Macroeconomic imbalances and spreads evolution$^{(a)}$



Sources: ECB, European Commission and Thomson Reuters.
Note: (a) Circle area = Change in 10 year government bond spread (unfilled circles correspond to negative values).

4 Econometric Results

The first part of this section presents the estimated results for euro area sovereign bond spreads, when credit risk premiums are measured by the sovereign CDS spreads. Although the data are available daily, the volatility of the series in several periods justifies the use of weekly averages. In the second part of the section, we present specifications in which credit risk is measured by macroeconomic variables, using monthly data. In both approaches, the liquidity premium and risk premium in international financial markets are evaluated using the variables outlined in the previous section. The estimates were performed for the period 2007-2009. In the last part of this section, the specification for the monthly spreads has been re-estimated for a longer period, including data up to mid May 2010.

Both equations were estimated using a panel data approach (unbalanced panel). This solution appears to be more appropriate to the small size of the sampling period, particularly in the specifications based on monthly data. The characteristics of the data raise several econometric problems. In addition to heterogeneity across countries (a typical problem in cross section), the temporal dimension of the data and the (spatial) correlation between countries must be taken into account, particularly given the single monetary policy. The econometric method applied is the Pooled OLS, in which the variance and covariance matrix of the residuals is obtained on the basis of the Driscoll and Kraay (1998) approach. This method makes it possible to correct heteroscedasticity and simultaneously to obtain robust residuals for temporal and country correlations.[14,15]

4.1 Credit risk premium measured by CDS

Equation (1) corresponds to the specification for the sovereign bond yield spreads of ten euro area countries against Germany, for the period 2007-09, with data based on weekly averages.

[14]The estimates were made in the STATA econometric programme, applying the command xtcss - Regression with Driscoll-Kraay standard errors.

[15]Given the temporal dimension of data, the impact of persistence in spreads was evaluated with the estimation of regressions that include among the explanatory variables the lag of spreads (applying FGLS estimation methods for panel data, correcting heteroskedasticity and autocorrelation of residuals). In these specifications, although the lagged term is significant, the conclusions concerning the impact of sovereign credit risk, liquidity risk and global risk remained broadly unchanged.

$$spread_{i,t}^{m} = c + \beta_1 cds_{i,t}^{m} + \beta_2 liq_{i,t}^{m} + \beta_3 pr_t + \beta_4 lb + \beta_5 C_i + \beta_6 mat_{i,t}^{m} + \beta_7 Dm + u_{i,t}^{m} \quad (1)$$

In this equation, i and t represent the country and the time period, respectively, while m corresponds to the bonds' residual maturity (5 and 10 years). The variables *spread, cds* and *liq* are, respectively, the sovereign bond yield, the CDS premium and the liquidity indicator, all defined relative to Germany. The six MTS liquidity indicators are included alternatively in the specification. The variable *pr* is a proxy for the risk premium in international financial markets. *lb* corresponds to a dummy that takes the value 1 in the period following the collapse of Lehman Brothers. C represents the country dummies, which make it possible to take into account the differences in the average spread for each country, which are not justified by the remaining variables. *mat* represents the difference between the average residual maturity of the bonds of country i and German bonds.[16] Finally, the dummy *Dm* takes the value 1 for bonds with a residual maturity of 10 years.

Table 2 presents the estimated results of equation (1). The first six columns include the results when bonds with a residual maturity of 5 and 10 years are simultaneously used in the estimation. The remaining columns display the results for each maturity individually. The fact that the coefficients of CDS spreads and financial markets risk premium indicator are statistically significant and positive suggests the importance of credit risk and risk aversion in international financial markets in determining sovereign yield spreads. In the case of liquidity indicators, there is some evidence of their relevance in explaining the spreads for a residual maturity of 5 years. Namely, *depth, max, adepth* and *vol* have the expected signals and are statistically significant.

Given the relevance of the common component in the path of CDS premiums identified in the previous section, it is important to assess to what extent the significance of *cds* does not stem solely from this component. The previous specifications have therefore been re-estimated replacing the CDS spreads by the residuals obtained in auxiliary regressions performed for each country, in which the endogenous variable is the CDS spread and the explanatory variables are a constant term and the first principal component of the CDS

[16] This variable aims to control the effects arising from the fact that the yields for each maturity were based on bonds with differences in their residual maturity (albeit within a limited range), and from the fact that there are changes in the bonds used throughout the series. The alternative of having estimated yields with constant maturity would not have been a better solution given that, for some periods, there are many days with missing observations and the data is highly volatile.

spreads. According to the results, presented in Table 3, CDS residuals are statistically significant, which confirms the relevance of idiosyncratic factors related with credit risk for the determination of sovereign bond yield spreads. In general terms, there is an increase in liquidity indicator coefficients. For bonds with a maturity of 10 years, *max, trs* and *vol* are now statistically significant. The global risk factor coefficient has also increased and remains significant. These developments are in line with the positive correlations between the common component of CDS spreads, the common component of liquidity indicators and the risk premium in financial markets indicator.

The interaction between sovereign credit risk premiums, liquidity premiums and global risk is further corroborated by the results of regressions that include, as an alternative to the MTS variables, the indicator of liquidity risk *kfw* (Table 4). When *kfw* is included in the regressions the global risk indicator loses statistical significance. Additionally, in the specifications with the CDS residuals the t-ratio of *kfw* is higher than with CDS spreads.

To identify possible changes in the relation between the sovereign spreads and the respective determinants arising from the crisis, equation (1) was re-estimated to include the interaction terms between the dummy *lb* and the variables related with global risk, sovereign credit risk and liquidity. The results, which are presented in Table 5, confirm the relevance of global risk aversion for the determination of spreads.[17] In the regressions with the CDS spread, its impact has not changed with the deepening of the crisis. However, in the regressions with the CDS residual, there is some evidence of an additional impact on spreads. With regard to sovereign credit risk, the results suggest an increase in its contribution with the deepening of the crisis. In the regressions with the CDS residuals, the fact that only the interaction term is significant suggests that prior to the collapse of Lehman Brothers spreads were not significantly determined by idiosyncratic credit risk factors. The results for liquidity are not conclusive.

In short, the above analysis suggests that an increase in the global risk premium in financial markets has a positive and significant impact on euro area government bond yield spreads. This global risk premium presents a co-movement with variables that capture the common evolution in credit and liquidity risk premiums, which suggest it might

[17]The conclusions for the regressions with the interaction terms do not change when maturities of 5 and 10 years are estimated separately.

have affected such premiums. The econometric results also support the relevance of the idiosyncratic factors in determining credit and liquidity risk premiums and suggest that markets penalised more countries with higher sovereign credit risk after mid September 2008. The results based on MTS indicators point to a higher impact of liquidity on 5 year maturity than on 10 year maturity.

4.2 Credit risk premium measured by macroeconomic variables

4.2.1 Data up to end 2009

In this subsection sovereign credit risk is measured by macroeconomic variables instead of CDS spreads. Macroeconomic data are not affected by changes in liquidity conditions or by changes in the risk premium in financial markets. This approach therefore enables us to evaluate the robustness of the importance of country credit risk, as measured by CDS spreads, found in previous specifications.

The path of credit risk premiums in euro area countries is likely to have reflected not only developments in economies over time, but also the baseline position concerning macroeconomic imbalances. Therefore, in addition to macroeconomic forecasts, explanatory variables also include the international investment position and public debt, as a percentage of GDP, at the end of 2006, *i.e.* in the period preceding the beginning of the sample.

In this context, we tested several specifications. We found evidence that the initial macroeconomic situation of each economy is relevant in determining the average level of spreads. We also noted that changes in spreads over time are related to the outlook for the public finances. Table 6 displays the results of the estimation of equation (2).

$$spread_{i,t}^{m} = c + \beta_1 so_{i,t} + \beta_2 iip_i^{06} + \beta_3 div_i^{06} + \beta_4 share_i^{06} + \beta_5 liq_{i,t}^{m} + \beta_6 pr_t + \beta_7 lb + \beta_8 Dm + u_{i,t}^{m} \quad (2)$$

In addition to the previously defined variables, $so_{i,t}$ corresponds to the forecast in t (for the one-year-ahead period) of the fiscal balance, as a percentage of GDP, for country i against Germany. div_i^{06} and iip_i^{06} respectively represent the differentials with Germany in the public debt and international investment position of country i at the end of 2006 (both as a percentage of GDP). Finally, $share_i^{06}$ represents the relative size of the public

debt market in country i in late 2006, defined in comparison to Germany.

The fact that the coefficient of fiscal balance is negative and statistically significant indicates that a deterioration in the outlook for the fiscal balance in comparison to Germany leads to an increase in the spread. The public debt and international investment position coefficients are also significant, suggesting that the differences between the average levels of spreads in the various countries are related to macroeconomic imbalances. Countries which, in late 2006, already had higher public debt ratios or poorer international investment positions should have noted, only taking these effects into account, an average level of spreads higher than countries with a more favourable macroeconomic position. In the case of liquidity indicators, the results suggest that the size of the long term government bond market has a favourable impact on the average level of spreads.[18] For the MTS variables, the indicators based on quotes data (*ba*, *depth, max* and *adepth*) are generally significant and have the expected signals. The fact that the indicators associated with transactions (*vol* and *trs*) are not significant may possibly be due to the fact that, in months with a low level of trading activity, the monthly averages do not correctly reflect market liquidity. The results confirm the higher relevance of liquidity for bonds with a residual maturity of 5 years. The risk premium in financial markets coefficient remains positive and statistically significant.

In line with the approach for weekly data, Table 7 presents the results of equation (2) when the cross-terms with the dummy *lb* are included. These results confirm the sharper impact of the macroeconomic situation in the period following the bankruptcy of Lehman Brothers. The results even suggest that the outlook for fiscal balances only began to affect yield spreads with the deepening of the crisis. With regard to liquidity, when measured by $share^{06}$, there is evidence of an increased effect. The conclusions based on MTS variables are still not clear. The interaction term for the risk premium in financial markets suggests that in the period of deepening of the crisis there were no significant changes in the way in which risk aversion in financial markets affected spreads.

Figure 5 compares the levels of observed spreads with those estimated for the period

[18]The variable corresponding to the evolution over time of each country's share of the euro area long term government bond market (defined relative to Germany) also presents a negative and significant coefficient when included in the equation (2), as an alternative to $share^{06}$. However, the results with this variable are unstable, which may suggest they are also capturing sovereign credit risk effects. In fact, changes in the sovereign debt outstanding amounts in the current crisis were largely determined by increased public sector borrowing requirements.

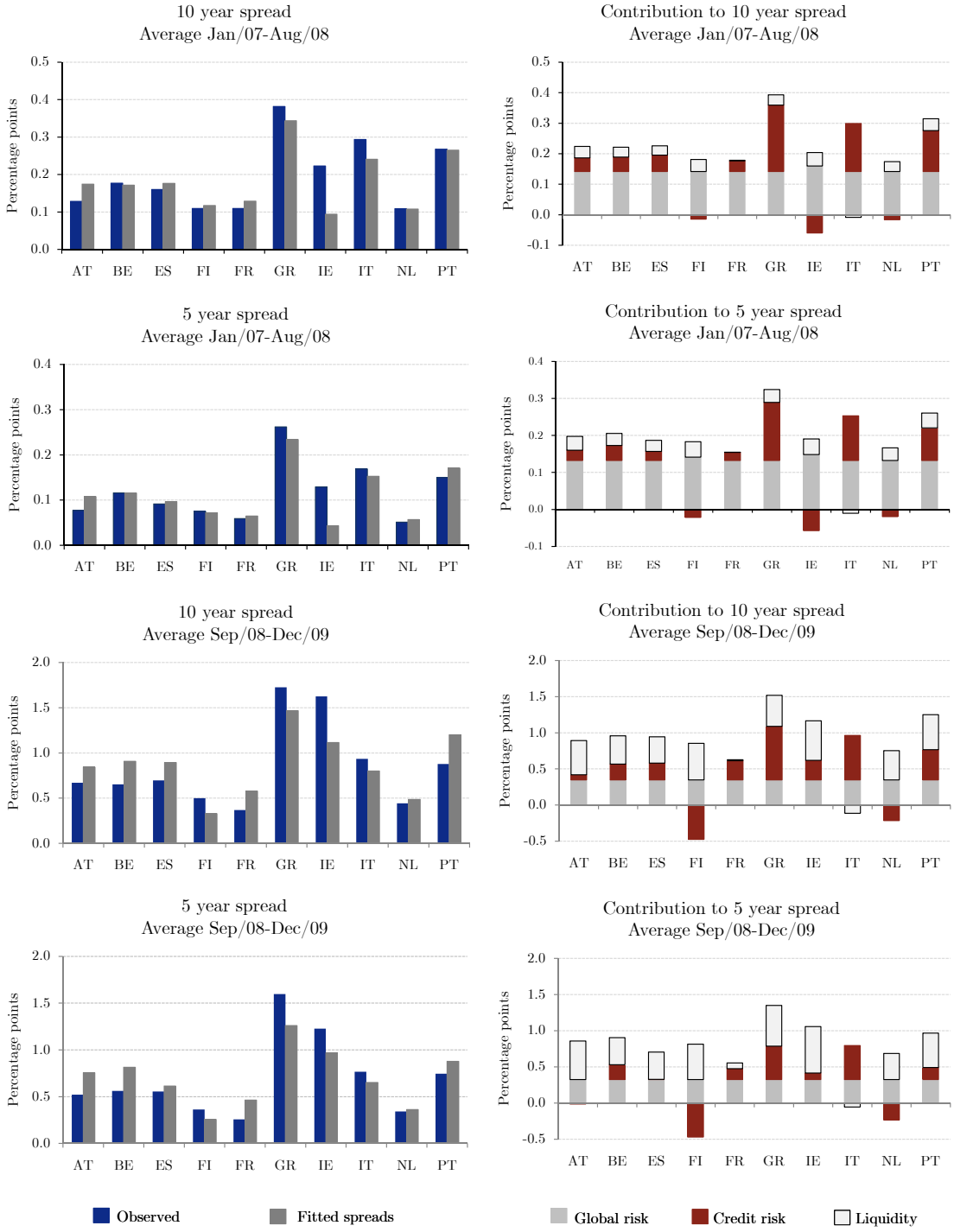
before and after the bankruptcy of Lehman Brothers. It also provides a breakdown of estimated spreads by their determinants. The estimated figures capture relatively well the levels of spreads, both in the period prior to and after the collapse of Lehman Brothers.[19] With regard to the breakdown of spreads, the results illustrate the reduction of the relative importance of the global risk factor during the economic and financial crisis. Although in absolute terms this variable's contribution to the level of spreads has increased from about 15 bp to about 35 bp, in relative terms it declined, on average, from around 70 per cent to around 50 per cent. The contributions made by credit risk and liquidity premiums increased both in absolute terms in the period following the bankruptcy of Lehman Brothers. In most countries the liquidity premium increased in comparison to credit risk premium.

Figure 6 provides a breakdown of changes in spreads for different periods. Between January 2007 and August 2008, the increase in spreads was determined by increased risk aversion in financial markets. In the months following the bankruptcy of Lehman Brothers, the risk premium in financial markets continued to contribute to a widening of spreads, although it was no longer the main factor behind changes in spreads. In that period, most countries witnessed a significant increase in the liquidity premium and, to a lesser extent, in the credit risk premium. The narrowing of spreads recorded between March and September 2008 reflected a reduction in the risk premium in international financial markets, as well as slight reductions in liquidity premiums. These developments were, however, partially offset by an increase in sovereign risk premiums in most countries. In the last quarter of 2009, country credit risk explained the increases in spreads. In general, the evolution of liquidity premiums was more relevant for changes in spreads of bonds with maturities of 5 as opposed to 10 years, while credit risk contribution was higher for 10 year maturity bonds.

To sum up, the results based on macroeconomic data up to the end of 2009 confirm that, while in the period before the collapse of Lehman Brothers global risk aversion was the main factor determining the spreads, with the deepening of the crisis there was an increase in the relevance of idiosyncratic factors.

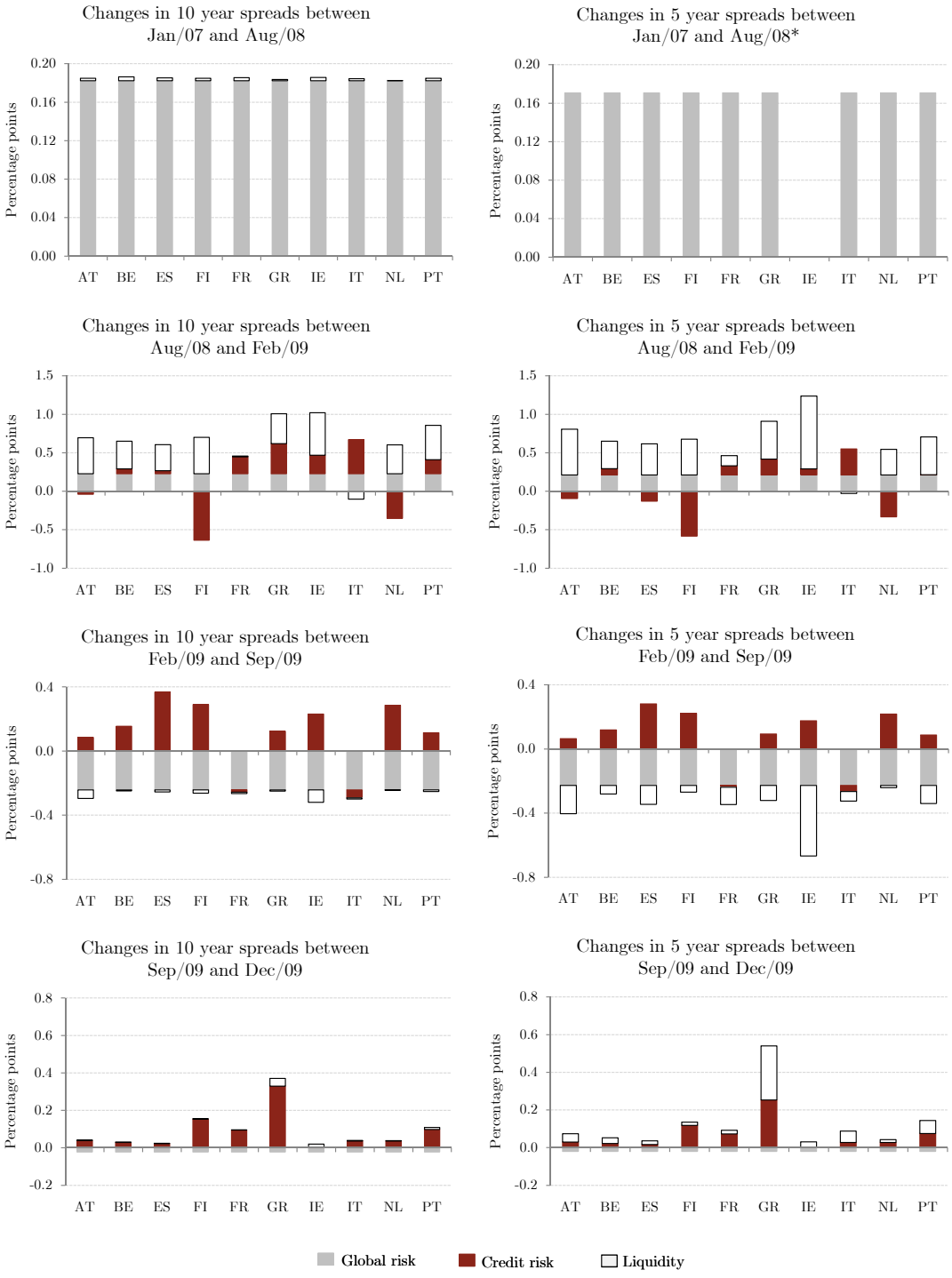
[19] The chart is based on the results of Table 7 for the specification (4) when maturities of 5 and 10 years are estimated separately. The use of the alternative specifications does not lead to significant differences in the results.

Figure 5: Fitted government bond yield spreads



Sources: ECB, European Commission, IMF, MTS, OECD and authors' calculations.

Figure 6: Determinants of changes in government bond yield spreads



Sources: ECB, European Commission, IMF, MTS, OECD and authors' calculations.
Note:* There are no MTS Data for Irish 5 year maturity bonds in January 2007.

4.2.2 Data up to March 2010

The analysis performed in section 3 suggests that the widening in euro area sovereign spreads recorded from late 2009 was related with an increase in the importance of country specific factors and, in particular, the increased possibility of default by several countries. This period of renewed turbulence in euro area sovereign bond markets was largely triggered by the perception that Greece's public finances were on an unsustainable path. These concerns spilled over rapidly to other euro area countries such as Portugal, Ireland, Italy and Spain, with a poorer level of economic performance, giving rise to some concerns over the stability of the euro area as a whole.

In this subsection we have re-estimated the previous specifications for a sample period extended to May 2010. The cut-off date was May 9, in order to exclude possible effects arising from the Eurosystem's purchases of euro area government debt securities in the secondary market, under the Securities Market Programme. As we do not have MTS data for 2010, liquidity premiums are measured only by the variable $share^{06}$, while yield spreads are calculated using the yields on benchmark bonds with residual maturities of 5 and 10 years provided by Thomson Reuters (which do not differ significantly from the yields obtained from the MTS database). The exclusion of MTS variables does not change the conclusions for the period 2007-09.

The results based on data up to May 2010 are given in Table 8. In addition to the previously defined variables, $lb*$ corresponds to a dummy with the value 1 for the period between the collapse of Lehman Brothers and October 2009, while nov takes the value 1 for the subsequent period. In line with previous subsections, the table also includes a specification containing the interaction terms with the temporal dummies. In the regression without these cross terms, all variables have the expected signals and are statistically significant. The results of the specification with the cross terms confirm that spreads' sensitivity to country factors has changed in the current crisis. Both in the case of macroeconomic variables, which aim to capture sovereign credit risk, and the liquidity variable the coefficients of cross terms with the dummy nov are higher than those of the cross terms with the dummy $lb*$. This result confirms the analysis in section 3, which suggested that there had been an increase in the impact of each economy's specific factors

since the end of 2008, and, more sharply so, since October 2009. In turn, the impact of the risk premium in financial markets remained unchanged until October 2009, increasing thereafter.

5 Final Remarks

Euro area government bond spreads to Germany, noted since early 2007, can largely be explained by differences between countries regarding the creditworthiness of national governments, liquidity in domestic bond markets, as well as by the risk premium in international financial markets. This latter factor is strongly correlated with the principal components of the sovereign CDS premiums and of the bid/ask spreads, defined in comparison to Germany, as well as with an indicator of the liquidity risk in euro area bond markets. This situation suggests that the decline in risk appetite in international financial markets noted during the current crisis has amplified the credit and liquidity risk premiums of euro area bonds against Germany. After the deepening of the crisis in September 2008, idiosyncratic factors have increased their effect on spreads reflecting both the adverse developments in sovereign credit risk and deteriorating liquidity conditions, but also the fact that markets have gone to penalize more the interest rates of countries with major macroeconomic imbalances and/or less liquid sovereign debt markets. The increase in sovereign credit risk premiums has been more marked in countries whose fiscal balance outlook has deteriorated more and/or in countries which, prior to the onset of the crisis, already had higher public debt ratios and poorer international investment positions. In turn, there has been a greater increase in liquidity premiums in countries with smaller public debt markets.

In the period before the collapse of Lehman Brothers, the risk premium in financial markets accounted, on average, for around 70 percent of euro area sovereign bond yield spreads. Since September 2008, the indicators for country differences in terms of credit quality and liquidity have played a more important role in determining the yield spreads. These indicators, as a whole, accounted for around 50 per cent of the average level of spreads noted between September 2008 and December 2009. Differences between countries in terms of liquidity were particularly important in explaining the increase in yield spreads

in the months following the collapse of Lehman Brothers. In turn, idiosyncratic credit risk factors appear, to a large extent, to explain the increase in spreads at the end of 2009. In the first five months of 2010, the evolution of spreads was largely determined by greater heterogeneity in sovereign credit risk premiums, together with a further increase in risk aversion in financial markets. In general, the evolution of liquidity premiums were more relevant for changes in spreads of 5 year maturity bonds, while credit risk contribution was higher for the 10 year maturity bonds.

References

Alexopoulos, I., Andersson, M. and Georgescu, O. M. (2009), "An empirical study on the decoupling movements between corporate bond and CDS spreads", *ECB Working Paper*, No. 1085.

Attinasi, M-G., Checherita, C. and Nickel, C. (2009), "What explains the surge in euro area sovereign spreads during the financial crisis of 2007-09?", *ECB Working Paper*, No. 1131.

Barrios, S., Lewandowska, P. M. and Setzer, R. (2009), "Determinants of intra-euro area government bond spreads during the financial crisis", *European Economy Economic Papers*, No. 388.

Beber, A., Brandt, M. W. and Kavajecz, K. A. (2009), "Flight-to-Quality or Flight-to-Liquidity? Evidence from the Euro-Area Bond Market", *Review of Financial Studies*, 22, 925-57.

Bernoth, K., von Hagen, J. and Schuknecht, L. (2006), "Sovereign Risk Premia in the European Government Bond Market", SFB/TR 15 *Governance and the Efficiency of Economic Systems Discussion Papers*, No. 151.

Bollen, N. P. and Whaley, R. (1998), "Are Teenies Better?", *Journal of Portfolio Management*, 25:10-24.

Buhler, W. and Trapp, M. (2009), "Time-Varying Credit Risk and Liquidity Premia in Bond and CDS Markets", Centre for Financial Research, *Working paper*, No. 09/13.

Caceres, C., Guzzo, V. and Segoviano, M. (2010), "Sovereign spreads: global risk aversion, contagion or fundamentals?", *IMF Working paper*, No. 10/120.

Codogno, L., Favero, C. and Missale, A. (2003), "Yield spreads on EMU government bonds", *Economic Policy*, 18 (37).

Driscoll, J. C. and Kraay, A. C. (1998), "Consistent Covariance Matrix Estimation with Spatially Dependent Panel Data", *Review of Economics and Statistics*, 80, pp. 549-560.

Ejsing, J. W. and Sihvonen, J. (2009), "Liquidity premia in German government bonds", *ECB Working Paper*, No. 1081.

Ejsing, J. W. and Lemke, W. (2009), "The Janus-headed Salvation. Sovereign and

bank credit risk premia during 2008-09", *ECB Working Paper*, No. 1127.

Favero, C., Pagano, M and von Thadden, E-L (2008), "How does liquidity affect government bond yields?", Centre for Economic Policy Research, *Discussion Paper*, No. 6649.

Gerlach, S., Alexander, S. and Guntram, G. B. (2010), "Banking and sovereign risk in the euro area", Deutsche Bank, *Discussion Paper*, No. 09/2010.

Geyer, A., Kossmeier, S. and Pichler, S. (2004), "Measuring systemic risk in the EMU Government yield spreads", *Review of Finance*, 8, pp. 171-197.

Gómez-Puig, M. (2006), "Size matters for liquidity: Evidence from EMU sovereign yield spreads", *Economics Letters*, 90, pp. 156-162.

Haugh, D., Ollivaud, P. and Turner, D. (2009), "What Drives Sovereign Risk Premiums? An Analysis of Recent Evidence from the Euro Area", *OECD Economics Department Working Paper*, No. 718.

Longstaff, F. A., Mithal, S. and Neis, E. (2005), "Corporate Yield Spreads: Default Risk or Liquidity? New Evidence from the Credit-Default Swap Market", *The Journal of Finance*, Vol. LX, No. 5.

Manganelli, S. and Wolswijk, G. (2009), "What Drives Spreads in the Euro Area Government Bond Market?", *Economic Policy*, 24 (58), pp. 191-240.

Mody, A. (2009), "From Bear Stearns to Anglo Irish: How Eurozone Sovereign Spreads Related to Financial Sector Vulnerability", *IMF Working Paper*, No. 09/108.

Schwarz, K. (2009), "Mind the Gap: Disentangling Credit and Liquidity in Risk Spreads, Department of Finance", The Wharton School, University of Pennsylvania, *Working paper*.

Schuknecht, L., von Hagen, J. and Wolswijk, G. (2010), "Government bond risk premiums in the EU revisited the impact of the financial crisis", *ECB Working Paper*, No. 1152.

Sgherri, S. and Zoli, E. (2009), "Euro Area Sovereign Risk During the Crisis", *IMF Working Paper*, No. 09/222.

Annex 1

Indicators computed from the MTS database

The MTS platforms are the main electronic trading system for the secondary wholesale market trading of European bonds. In these platforms there are two types of market participants: primary dealers and dealers. The primary dealers are required to formulate two-way proposals on a given number of bonds. Primary dealers may also formulate proposals on any other bonds and issue orders for proposals submitted by other participants. Dealers can only issue orders for proposals formulated by the primary dealers. The euro area government bonds can be traded in the EuroMTS and in the domestic MTS markets. In the EuroMTS only benchmark bonds are admitted to trading (bonds that satisfy some requirements in terms of principal amount outstanding and number of primary dealers), while in MTS domestic markets the entire curve of the respective government securities can be traded.

MTS database contains high frequency (tick-by-tick) trade and quote data both on EuroMTS and MTS domestic markets. For quotes, the data include the three best bid and ask proposals (price and quantity) at each moment for each security. The trade data include prices and quantities effectively traded. Based on this information, we constructed several liquidity indicators: difference between the best bid and ask prices as a percentage of the average quoted price (*ba* - bid/ask spread) (1); average volume available for trade, in million euros, at best bid and ask prices (*depth*) (2); maximum volume, in million euros, within quantities available for the three best bid and ask prices (*max*) (3); the ratio of the difference between the best ask price and the average price on the volume available for sale at that price (*adepth* - ask-side market depth) (4); trading volume in millions of euros (*vol*); and number of transactions (*trs*).[20]

$$ba = \left[\frac{pask_1 - pbid_1}{(pask_1 + pbid_1)/2} \right] \tag{1}$$

[20] Other indicators computed were: the liquidity index (Bollen and Whaley (1998)); an indicator similar to adepth but based on bid quotes data; the average volume of daily transactions; and the effective bid/ask spread. The results for these indicators are not included in the paper as they have never been statistically significant in explaining government bonds yield spreads or proved to be redundant in relation to the other liquidity indicators included in the estimations.

$$depth = \frac{volask_1 + volbid_1}{2} \tag{2}$$

$$\max = \max(volask_1, volask_2, volask_3, volbid_1, volbid_2, volbid_3) \tag{3}$$

$$adepth = \frac{[pask_1 - (pask_1 + pbid_1)/2]}{volask_1} \tag{4}$$

in which: $pask_1$, $pask_2$ and $pask_3$ correspond to the 1^{st}, 2^{nd} and 3^{rd} highest ask prices, $pbid_1$, $pbid_2$ and $pbid_3$ correspond to 1^{st}, 2^{nd} and 3^{rd} lowest bid prices, while $volask_i$ and $volbid_i$ are volumes of proposals associated with these prices.

The bid/ask spread captures transaction costs and increases in periods of reduced liquidity. By contrast, the indicators based on quantities available for trade (*depth* and *max*), as well as the volume and the number of transactions (*vol* and *trs*) are expected to increase in periods of higher liquidity. Finally, *adepth* should increase when liquidity declines. This indicator combines price and volume data and is particularly useful when the two types of information give mixed signals (for example, when bid/ask spreads are low, but the market may not be liquid enough for the transaction of large volumes).

The previous indicators were constructed with data from the MTS domestic markets, for fixed coupon governments bonds denominated in euros and with benchmark status. By using only fixed-coupon bonds we minimized the distortions that would have arisen from the inclusion of bonds with different characteristics, such as variable interest rate, bonds generated by coupon-stripping programs or inflation-linked bonds. Additionally, the use of benchmark bonds ensures that only the most liquid bonds were used, which also increases the degree of comparability between different securities. Finally, we decided to use domestic markets data because, for the same bond, the average traded volume and the number of transactions were higher in these markets than in the EuroMTS, and the bid/ask spreads were very similar in both markets.[21]

The indicators for daily transactions - *vol* and *trs* - correspond, respectively, to the sum of traded volumes and number of transactions recorded each day. In turn, the indicators

[21]The *trs* and *vol* indicators were also computed as the sum of domestic platforms and EuroMTS data. However, the econometric results did not differ from the indicators calculated with only domestic markets data.

using quotes - *ba, depth, max* and *adepth* - were calculated for each intra-day observation and then converted into daily data using the median, in order to eliminate outliers. The same procedure was applied to compute daily yields for each bond. The average prices implicit in the best bid and ask quotes at each moment $((pask1+pbid1)/2)$ were converted using daily median values, which were then used with other characteristics of the same bond to compute the yields-to-maturity.

Finally, in order to obtain representative liquidity indicators and yields for maturities of 5 and 10 years, we computed for each country the averages daily data of bonds with a daily residual maturity in the 4-6 or 9-11 year ranges, respectively. This aggregation increases the number of daily observations, particularly during periods of low liquidity in the markets and has the additional advantage of mitigating effects arising from the behaviour of a particular bond.[22] The final government bond yields we have obtained do not differ significantly from those released by Thomson Reuters. This confirms that the maturity intervals adopted in the aggregation of data were reasonable.

[22] A preliminary analysis showed the series obtained presented a similar trend to those computed with smaller ranges, but with less missing observations.

Table 1: Panel A - Summary of empirical results for euro area sovereign bond yield spreads: results for the pre-crisis period

Paper	Sample[a]	Variables				Conclusion: main spread determinants
		Endogenous	Sovereign credit	Liquidity[b]	Global risk	
Goméz-Puig (2006)	Jan/96-Dec/01 (daily) EA11 excluding GR	10y against DE	Ratings	bid/ask spreads; outstanding volume of bonds	-	Credit risk and liquidity. The importance of liquidity increased after the EMU.
Bernoth et al. (2006)	1993-2005 EA11 + United Kingdom, Sweden and Denmark	Spread against DE or US at issuance date	Public finances	Outstanding amount of bonds	Corporate bond spreads (US)	Credit risk. Liquidity premiums vanished with the start of the EMU for euro-denominated debt market. Global risk has impact on bonds denominated in USD but not on bonds denominated in DEM (EUR).
Geyer et al. (2004)	Jan/99-May/02 (Weekly) AU, BE, DE, ES and IT	2-9y against DE	Current account and business cycle variables	Spread between 4y yields of bonds with different issue size; on-the-run/off-the-run yield spread	Corporate bond spreads (EA) and swap spread (Germany)	Global risk. No significant impact of macroeconomic or liquidity-related variables.
Codogno et al. (2003)	Dec/95-Oct/02 (monthly); 2002 (daily) EA11 excluding GR	10y against DE	Public finances; CDS	Trading volume, turnover ratio, number of transactions, bid/ask spread (MTS)	Corporate bond and swap spreads (US)	Global risk. In some countries, spreads are explained by the interaction between the global risk and debt-to-GDP ratios. Liquidity factors play a smaller role.
Favero et al. (2008)	Jan/02-Dec/03 (daily) EA11 excluding GR and IE	10y against DE and 5y against FR	-	bid/ask spread (MTS)	Swap spread (US)	Global risk. Liquidity differentials are priced only for a sub set of countries and the interaction of liquidity with the global risk is always negative when significant. When the interaction term is not included, liquidity becomes insignificant.
Beber et al. (2009)	Apr/03-Dec/04 EA excluding IE	3,5,7,10y against swaps	CDS	bid/ask spread, depth, liquidity index (MTS)	-	Credit risk and liquidity. The bulk of spreads is explained by credit risk, though liquidity plays a non-trivial role for low credit risk countries and in periods of market stress.

(a) EA11 corresponds to the first 11 euro area countries, excluding Luxemburg, i.e. Austria (AU), Belgium (BE), Germany (DE), Spain (ES), Finland (FI), France (FR), Greece (GR), Ireland (IE), Italy (IT), the Netherlands (NL), and Portugal (PT).

(b) MTS means that the liquidity indicators were based on the MTS database. See Annex 1 for further details on these indicators.

Table 1: Panel B - Summary of empirical results for euro area bond spreads: including the crisis period

Paper	Sample [a]	Variables				Conclusion: main spread determinates
		Endogenous	Sovereign credit	Liquidity [b]	Global risk	
Schwartz (2009)	Apr/07-Mar/08 (daily) EA 11 excluding AU, FI, IE and NL	2, 5 and 10y against DE	CDS	Yield spread between bonds issued by KFW and German government; liquidity index	-	Credit risk and liquidity. Larger impact of liquidity on spreads than previously found in the literature.
Manganelli and Wolswijk (2009)	Jan/99-Apr/08 (monthly) EA11	10y against DE	Ratings	Liquidity premium determined endogenously based on AAA bonds	Swap spread (USA)	Spreads have a positive relation with short term interest rates, which have an effect on credit and liquidity premiums. A deterioration of country credit quality increases the sensitivity of spreads to interest rates. In addition to short term interest rates, international risk aversion continues to play a role in determining the spreads.
Ejsing and Sihvonen (2009)	Jan/06-Sep/08 (daily) DE and FR	2, 5 and 10y against DE	CDS	bid/ask spread, depth, liquidity index (MTS); average issue size; dummy for bonds deliverable for German futures contracts	-	Before the onset of crisis all variables, excluding the MTS liquidity indicators, were significant. After Jul/07, all variables are significant and their impact on spreads increased considerably.
Ejsing and Lemke (2009)	Jan/08-Jun/09 (weekly) EA11 excluding FI	CDS 5y	-	-	iTraxx non financial corporations	Bank and sovereign CDS premiums are explained by a common risk factor. After Oct/08, with the financial rescue package, the sensitivity of bank CDS premiums to the common risk factor declined, while the sensitivity of sovereign CDS premiums increased.
Moody (2009) [c]	Jan/06-Jan/09 (weekly and monthly) EA11	10y against DE	Public debt	-	CDS banks (US)	Weekly changes in spreads: before Jul/07 no obvious determinants; Jul/07-Mar/08 (Bear Stearns) global factors; Mar/08-Sep/08 differentiation in spreads led by outlook for the financial domestic sector; After Sep/08 in countries with long term erosion of competitiveness the influence of public debt ratios on the changes in spreads increased.
Sgherri and Zoli (2009)[c]	Jan/01-Mar/09 (monthly) EA11	10y against DE	Public finances outlook	Market value of long term government bonds denominated in EUR	Principal component	Global risk. Since Oct/08, the sensitivity of sovereign spreads to projected debt changes and, in several countries, to the solvency of the national banking system has increased. Liquidity plays a significant, albeit quite limited, role in explaining spreads.
Attinasi et al. (2009)[c]	Jul/07-Mar/09 (weekly and monthly) EA11	10y against DE	Public finances outlook	Size of government bond market; trading volume	Corporate bond spreads (US)	Global risk, but also credit and liquidity risks. The announcement of bank rescue packages has an impact on spreads, through a transfer of risk from the banking sector to government. However, the size of the rescue package does not have a statistically significant effect.
Barrios et al. (2009)	Mar/03-Apr/09 (weekly and quarterly) EA11 excluding FI and IE	10y against DE	Public finances; CDS	bid/ask spreads (MTS)	Principal component	Global risk. Credit risk and liquidity appear to be smaller but non-negligible drivers of spreads and their effect increased with the crisis. The combination of high risk aversion and large current account deficits tend to magnify the impact of deterioration of the public finances on spreads.
Schuknecht et al. (2010)	1991- mid May/09 EA11 + United Kingdom, Sweden and Denmark	Spread against DE or US at issuance date	Public finances	Size of the issuance	Corporate bond spreads (US) and short term interest rate	After Sep/08: markets penalize fiscal imbalances much more strongly; the impact on spread due to higher general risk aversion also increased; liquidity remains insignificant
Haugh et al. (2009)	Dec/05-Jun/09 (quarterly at six monthly intervals) EA11	10y against DE	Public finances	outstanding amounts of bonds	Corporate bond spreads (US)	Global risk, credit risk and liquidity. The impact of credit risk and liquidity on spreads is amplified by the interaction with general risk aversion.
Caceres et al. (2010)[c]	mid-2005/early-2010 (daily) EA11 excluding FI	10y against swaps	Public finances	-	Estimated global risk aversion index	Global risk, credit risk and contagion effects between countries.
Gerlach et al. (2010)	Jan/99-Feb/09 (weekly) EA11	10y against DE	Public finances outlook; size and equity ratio of the banking sector	bid/ask spread	Corporate bond spreads (US)	Global risk is the main driver. It also plays an indirect role through its interaction with the size and the structure of national banking sectors. Credit risk (based on debt levels and forecasts of future fiscal deficits) is also a significant determinant of spreads. Liquidity is priced in sovereign bond markets but its quantitative importance is small.

(a) EA11 corresponds to the first 11 euro area countries, excluding Luxemburg, i.e. Austria (AU), Belgium (BE), Germany (DE), Spain (ES), Finland (FI), France (FR), Greece (GR), Ireland (IE), Italy (IT), the Netherlands (NL), and Portugal (PT).
(b) MTS means that the liquidity indicators were based on the MTS database. See Annex 1 for further details on these indicators.

(c) Other variables included: Mody (2009) – Ratio of the financial sector equity index divided by the overall equity index (to capture each economy's financial sector outlook) and yield on the Bund (to capture flight-to-quality movements); Sgherri and Zoli (2009) – Expected Default Frequencies of the median financial institution in each country, projected growth and current account imbalances; Attinasi et al. (2009) - Announcement dates of banking rescue packages, amount provided for banks recapitalization and government guarantees; and Caceres et al. (2010) - probability of distress of a country conditional on other countries (to capture contagion).

Table 2: Results of spreads estimation in the period 2007-2009: credit risk measured by CDS

	All bonds						10 year residual maturity bonds						5 year residual maturity bonds					
	(1)	(2)	(3)	(4)	(5)	(6)	(1)	(2)	(3)	(4)	(5)	(6)	(1)	(2)	(3)	(4)	(5)	(6)
cds	0.854***	0.851***	0.848***	0.851***	0.873***	0.872***	0.867***	0.862***	0.859***	0.868***	0.890***	0.889***	0.834***	0.844***	0.826***	0.807***	0.860***	0.859***
	(24.64)	(24.09)	(23.45)	(24.58)	(28.41)	(28.35)	(21.27)	(21.06)	(20.91)	(21.20)	(24.25)	(24.25)	(21.49)	(21.49)	(20.32)	(18.36)	(24.63)	(24.60)
pr	0.0308***	0.0308***	0.0309***	0.0306***	0.0312***	0.0311***	0.0243**	0.0241**	0.0246**	0.0242**	0.0265**	0.0264**	0.0355***	0.0374***	0.0367***	0.0355***	0.0362***	0.0361***
	(4.21)	(4.18)	(4.21)	(4.15)	(4.13)	(4.12)	(2.76)	(2.69)	(2.66)	(2.72)	(3.08)	(3.07)	(5.07)	(5.61)	(5.65)	(5.04)	(5.21)	(5.20)
lb	0.0849**	0.0913***	0.0896***	0.0850**	0.0871**	0.0875**	0.158***	0.162**	0.166***	0.157***	0.158***	0.159***	0.0133	0.0205	0.0179	0.0167	0.0119	0.0119
	(2.87)	(3.13)	(3.00)	(2.88)	(2.70)	(2.72)	(4.47)	(4.72)	(4.78)	(4.45)	(4.37)	(4.38)	(0.43)	(0.66)	(0.58)	(0.55)	(0.37)	(0.37)
mat	0.0874***	0.0877***	0.0867***	0.0868***	0.0738***	0.0735***	0.0531**	0.0533**	0.0535**	0.0532*	0.0438	0.0432	0.0899***	0.0917***	0.0855**	0.0883***	0.0726***	0.0737***
	(5.41)	(5.49)	(5.42)	(5.35)	(3.82)	(3.83)	(2.91)	(2.89)	(2.92)	(2.90)	(1.68)	(1.66)	(5.16)	(5.06)	(4.51)	(5.28)	(3.80)	(3.83)
Dmat	0.0858***	0.0841***	0.0800***	0.0853***	0.0936***	0.0940***												
	(6.43)	(6.06)	(4.99)	(6.35)	(6.97)	(7.01)												
ba	-0.00533						-0.0117*						0.0551					
	(-1.01)						(-1.95)						(0.89)					
depth		-1.612						-0.852						-2.978**				
		(-1.63)						(-0.67)						(-2.88)				
max			-0.641						-0.696						-2.178**			
			(-1.37)						(-1.27)						(-3.12)			
adepth				0.0000528						-0.000134						0.00139**		
				(0.40)						(-1.39)						(2.28)		
trs					-0.00106						-0.000660						-0.00193	
					(-1.28)						(-0.87)						(-1.47)	
vol						-0.176						-0.112						-0.316*
						(-1.56)						(-1.09)						(-1.85)
constant	0.0320	0.0207	0.0256	0.0309	0.0579	0.0585	0.164**	0.152**	0.143**	0.162**	0.194**	0.195**	0.00314	-0.00678	-0.000427	0.00698	0.0265	0.0276
	(1.28)	(0.83)	(1.01)	(1.23)	(2.05)	(2.09)	(4.49)	(4.29)	(4.21)	(4.40)	(3.98)	(4.01)	(0.11)	(-0.23)	(-0.02)	(0.24)	(0.90)	(0.95)
country dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	3066	3066	3066	3066	2479	2479	1534	1534	1534	1534	1237	1237	1532	1532	1532	1532	1242	1242
R-sq	0.902	0.902	0.902	0.902	0.911	0.911	0.913	0.913	0.913	0.913	0.927	0.927	0.898	0.899	0.900	0.899	0.902	0.902

Notes: The table presents the estimated coefficients and the respective significance levels (*** 1%, ** 5% and * 10%). The t-statistics are presented in brackets. *cds* represents the CDS premium; *pr* corresponds to the risk premium in international financial markets; *lb* is a dummy for the period after the collapse of Lehman Brothers; *mat* corresponds to a maturity variable; *Dmat* has the value 1 for bonds with 10 year residual maturity; *ba, depth, max, adepth, trs* and *vol* correspond to liquidity indicators based on MTS data. The variables for each country are defined in differences against Germany.

Table 3: Results of spreads estimation in the period 2007-2009: credit risk measured by CDS residuals

	All bonds						10 year residual maturity bonds						5 year residual maturity bonds					
	(1)	(2)	(3)	(4)	(5)	(6)	(1)	(2)	(3)	(4)	(5)	(6)	(1)	(2)	(3)	(4)	(5)	(6)
u_cds	0.800***	0.801***	0.792***	0.787***	0.839***	0.837***	0.828***	0.829***	0.827***	0.823***	0.879***	0.877***	0.737***	0.771***	0.742***	0.684***	0.794***	0.793***
	(28.58)	(27.95)	(27.50)	(24.83)	(34.35)	(34.28)	(21.78)	(21.53)	(21.93)	(20.62)	(23.59)	(23.56)	(22.90)	(24.84)	(24.63)	(18.85)	(28.20)	(28.13)
pr	0.0764***	0.0770***	0.0768***	0.0755***	0.0783***	0.0781***	0.0716***	0.0718***	0.0728***	0.0712***	0.0755***	0.0754***	0.0756***	0.0821***	0.0795***	0.0734***	0.0813***	0.0810***
	(6.33)	(6.32)	(6.40)	(6.33)	(6.68)	(6.67)	(5.88)	(5.84)	(5.76)	(5.87)	(6.47)	(6.46)	(5.96)	(6.54)	(6.55)	(5.82)	(6.48)	(6.47)
lb	0.285***	0.296***	0.296***	0.283***	0.297***	0.298***	0.345***	0.353***	0.364***	0.343***	0.348***	0.348***	0.221***	0.238***	0.228***	0.215***	0.243***	0.242***
	(6.90)	(7.17)	(7.35)	(6.93)	(7.20)	(7.23)	(9.24)	(9.79)	(9.93)	(9.27)	(8.70)	(8.73)	(4.85)	(4.86)	(4.91)	(4.88)	(5.10)	(5.12)
mat	0.0418*	0.0436*	0.0422*	0.0406*	0.0258	0.0254	0.00522	0.00573	0.00692	0.00535	-0.00270	-0.00350	0.0340	0.0363	0.0281	0.0337	0.0122	0.0142
	(1.84)	(1.94)	(1.89)	(1.78)	(0.97)	(0.96)	(0.18)	(0.20)	(0.24)	(0.19)	(-0.08)	(-0.10)	(1.25)	(1.25)	(0.96)	(1.38)	(0.38)	(0.45)
Dmat	0.108***	0.106***	0.0927***	0.107***	0.114***	0.115***												
	(9.25)	(8.59)	(6.11)	(9.03)	(9.39)	(9.45)												
ba	0.00874						-0.000203						0.150					
	(1.14)						(-0.04)						(1.54)					
depth		-2.729**						-1.579						-4.109**				
		(-2.26)						(-1.07)						(-2.79)				
max			-1.780***						-1.727*						-3.606**			
			(-3.03)						(-2.12)						(-4.69)			
adepth				0.000429						0.000139						.00317***		
				(1.50)						(0.84)						(4.25)		
trs					-.00203**						-0.00179*						-0.00308*	
					(-2.53)						(-2.13)						(-2.13)	
vol						-0.327**						-0.284*						-0.513**
						(-2.77)						(-2.41)						(-2.49)
constant	0.221***	0.205***	0.204***	0.217***	0.261***	0.261***	0.390***	0.375***	0.344***	0.385***	0.426***	0.426***	0.173***	0.170**	0.170***	0.173***	0.228***	0.229***
	(7.25)	(6.56)	(7.40)	(7.33)	(7.46)	(7.53)	(9.83)	(9.87)	(10.26)	(9.82)	(8.77)	(8.80)	(5.00)	(4.64)	(5.24)	(5.51)	(5.86)	(5.93)
country dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	3066	3066	3066	3066	2479	2479	1534	1534	1534	1534	1237	1237	1532	1532	1532	1532	1242	1242
R-sq	0.853	0.854	0.855	0.854	0.871	0.871	0.873	0.874	0.875	0.874	0.899	0.899	0.838	0.837	0.841	0.844	0.843	0.844

Notes: The table presents the estimated coefficients and the respective significance levels (*** 1%, ** 5% and * 10%). The t-statistics are presented in brackets. *u_cds* represents the CDS residuals from auxiliary regressions; *pr* corresponds to the risk premium in international financial markets; *lb* is a dummy for the period after the collapse of Lehman Brothers; *mat* corresponds to a maturity variable; *Dmat* has the value 1 for bonds with 10 year residual maturity; *ba, depth, max, adepth, trs* and *vol* correspond to liquidity indicators based on MTS data. The interaction terms between dummy *lb* and the other variables are identified by *_lb* at the end of the variable name. The variables for each country are defined in differences against Germany.

Table 4: Results of spreads estimation in the period 2007-2009: credit risk measured by CDS and CDS residuals.

Regressions with kfw

	credit=cds		credit=u_cds	
	(1)	(2)	(1)	(2)
credit	0.845***	0.838***	0.804***	0.799***
	(25.60)	(24.00)	(28.00)	(27.40)
pr	-0.0162		0.0205	
	(-1.92)		(1.54)	
kfw	0.00593***	0.00435***	0.00707***	0.00909***
	(9.57)	(7.08)	(5.44)	(7.72)
lb	0.0840**	0.0715**	0.282***	0.301***
	(3.78)	(3.68)	(8.29)	(10.04)
mat	0.0830***	0.0826***	0.0389	0.0378
	(5.54)	(5.54)	(1.94)	(1.89)
Dmat	0.0629***	0.0694***	0.0809***	0.0730***
	(7.20)	(8.44)	(7.38)	(5.15)
constant	-0.172***	-0.107***	-0.0261	-0.102***
	(-6.01)	(-4.83)	(-0.53)	(-4.81)
country dummies	Yes	Yes	Yes	Yes
N	3066	3066	3066	3066
R-sq	0.913	0.912	0.869	0.867

Notes: The table presents the estimated coefficients and the respective significance levels (*** 1%, ** 5% and * 10%). The t-statistics are presented in brackets. *cds* represents the CDS premium; *u_cds* represents the CDS residuals from auxiliary regressions; *pr* corresponds to the risk premium in international financial markets; *lb* is a dummy for the period after the collapse of Lehman Brothers; *mat* corresponds to a maturity variable; *Dmat* has the value 1 for bonds with 10 year residual maturity; *kfw* is the spreads of KFW bonds. The variables for each country are defined in differences against Germany.

Table 5: Results of spreads estimation in the period 2007-2009: credit risk measured by CDS and CDS residuals

Regressions with interaction terms with time dummy

	credit =cds						credit=u_cds					
	(1)	(2)	(3)	(4)	(5)	(6)	(1)	(2)	(3)	(4)	(5)	(6)
credit	0.330**	0.320**	0.316**	0.323**	0.290*	0.314**	0.233	0.217	0.204	0.212	0.233	0.260
	(2.39)	(2.27)	(2.13)	(2.34)	(1.86)	(2.09)	(1.51)	(1.42)	(1.34)	(1.34)	(1.34)	(1.56)
credit_lb	0.511***	0.522***	0.516***	0.514***	0.566***	0.538***	0.552***	0.550***	0.549***	0.561**	0.592***	0.558**
	(3.95)	(4.03)	(3.92)	(3.95)	(3.89)	(3.87)	(3.84)	(3.87)	(3.93)	(3.84)	(3.66)	(3.61)
pr	0.0313***	0.0367***	0.0374***	0.0323***	0.0375***	0.0363***	0.0459***	0.0512***	0.0521***	0.0467***	0.0507***	0.0507***
	(5.20)	(6.11)	(5.70)	(5.68)	(5.64)	(5.65)	(8.02)	(10.86)	(11.39)	(8.57)	(11.02)	(11.14)
pr_lb	0.0104	0.00455	0.00378	0.00912	0.00787	0.00980	0.0439**	0.0389*	0.0340	0.0421*	0.0447**	0.0448**
	(0.99)	(0.42)	(0.31)	(0.86)	(0.83)	(1.03)	(2.13)	(1.89)	(1.64)	(2.05)	(2.29)	(2.27)
ba	0.163						0.175					
	(1.66)						(1.61)					
ba_lb	-0.169*						-0.168					
	(-1.72)						(-1.54)					
depth		-2.275***						-2.315***				
		(-3.23)						(-3.60)				
depth_lb		2.667						-5.436				
		(0.69)						(-1.21)				
max			-0.459						-0.799*			
			(-0.96)						(-1.86)			
max_lb			-0.187						-2.851*			
			(-0.16)						(-1.90)			
adepth				0.00243						0.00257		
				(1.70)						(1.59)		
adepth_lb				-0.00241						-0.00218		
				(-1.69)						(-1.35)		
trs					-0.0000320						-0.000371	
					(-0.06)						(-0.76)	
trs_lb					-0.00565**						-0.00777**	
					(-2.39)						(-2.76)	
vol						-0.0620						-0.101
						(-0.93)						(-1.54)
vol_lb						-0.421						-0.745*
						(-1.54)						(-2.05)
mat	0.0824***	0.0839***	0.0828***	0.0819***	0.0671***	0.0655***	0.0428*	0.0458**	0.0458**	0.0418*	0.0272	0.0248
	(5.77)	(5.87)	(5.72)	(5.70)	(3.95)	(3.90)	(1.98)	(2.13)	(2.14)	(1.92)	(1.09)	(1.00)
Dmat	0.0930***	0.0912***	0.0904***	0.0928***	0.107***	0.106***	0.104***	0.107***	0.100***	0.104***	0.115***	0.116***
	(6.83)	(6.99)	(5.71)	(6.83)	(8.00)	(7.99)	(8.57)	(8.72)	(6.67)	(8.47)	(9.40)	(9.50)
lb	0.0206	0.00841	0.00819	0.0168	0.00640	0.00418	0.315***	0.310***	0.319***	0.309***	0.324***	0.317***
	(0.74)	(0.30)	(0.27)	(0.62)	(0.26)	(0.17)	(7.43)	(7.70)	(7.32)	(7.43)	(7.86)	(7.51)
constant	0.0824*	0.0889**	0.0990**	0.0858*	0.129***	0.129***	0.168***	0.170***	0.177***	0.169***	0.213***	0.218***
	(2.58)	(2.97)	(3.28)	(2.77)	(4.00)	(4.01)	(7.12)	(8.71)	(8.92)	(7.63)	(8.47)	(8.74)
country dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	3066	3066	3066	3066	2479	2479	3066	3066	3066	3066	2479	2479
R-sq	0.910	0.910	0.909	0.909	0.921	0.920	0.863	0.863	0.864	0.864	0.884	0.883

Notes: The table presents the estimated coefficients and the respective significance levels (*** 1%, ** 5% and * 10%). The t-statistics are presented in brackets. *cds* represents the CDS premium; *u_cds* represents the CDS residuals from auxiliary regressions; *pr* corresponds to the risk premium in international financial markets; *lb* is a dummy for the period after the collapse of Lehman Brothers; *mat* corresponds to a maturity variable; *Dmat* has the value 1 for bonds with 10 year residual maturity; *ba, depth, max, adepth, trs* and *vol* correspond to liquidity indicators based on MTS data. The interaction terms between dummy *lb* and the other variables are identified by *_lb* at the end of the variable name. The variables for each country are defined in differences against Germany.

Table 6: Results of spreads estimation in the period 2007-2009: credit risk measured by macroeconomic variables

	All bonds						10 year residual maturity bonds						5 year residual maturity bonds					
	(1)	(2)	(3)	(4)	(5)	(6)	(1)	(2)	(3)	(4)	(5)	(6)	(1)	(2)	(3)	(4)	(5)	(6)
so	-0.0475***	-0.0521***	-0.0512***	-0.0372**	-0.0552***	-0.0551***	-0.0569***	-0.0591***	-0.0601***	-0.0464**	-0.0647***	-0.0645***	-0.0338**	-0.0442***	-0.0405**	-0.0237*	-0.0455**	-0.0455**
	(-3.36)	(-4.38)	(-4.03)	(-2.84)	(-3.88)	(-3.92)	(-3.91)	(-5.04)	(-4.75)	(-3.25)	(-4.41)	(-4.49)	(-2.37)	(-3.57)	(-3.05)	(-1.95)	(-3.18)	(-3.20)
div_06	0.00403***	0.00425***	0.00480***	0.00413***	0.00399**	0.00365**	0.00389**	0.00395**	0.00439**	0.00412**	0.00378**	0.00328**	0.00397**	0.00459**	0.00566***	0.00388**	0.00423**	0.00397**
	(3.02)	(3.04)	(3.31)	(3.17)	(2.79)	(2.71)	(3.10)	(3.07)	(3.14)	(3.27)	(2.67)	(2.51)	(2.87)	(3.02)	(3.66)	(2.95)	(2.85)	(2.83)
iip_06	-0.00169***	-0.00159***	-0.00156***	-0.00181***	-0.00173***	-0.00166**	-0.00175***	-0.00160***	-0.00149***	-0.00195***	-0.00180***	-0.00167***	-0.00136**	-0.00158**	-0.00161***	-0.00146**	-0.00166**	-0.00166**
	(-3.82)	(-3.62)	(-4.08)	(-3.67)	(-3.63)	(-3.51)	(-4.53)	(-4.23)	(-4.90)	(-4.20)	(-4.22)	(-3.90)	(-3.08)	(-3.11)	(-3.56)	(-2.95)	(-3.09)	(-3.09)
pr	0.0583***	0.0710***	0.0702***	0.0517**	0.0712***	0.0736***	0.0562***	0.0663***	0.0684***	0.0491**	0.0680***	0.0718***	0.0464**	0.0761**	0.0716***	0.0458*	0.0743***	0.0758***
	(3.53)	(4.19)	(4.51)	(3.43)	(4.21)	(4.16)	(3.37)	(3.76)	(4.08)	(3.15)	(4.28)	(4.21)	(2.70)	(4.35)	(4.57)	(3.09)	(4.10)	(4.09)
share_06	-0.0112**	-0.0142**	-0.0127**	-0.0101**	-0.0123***	-0.0133***	-0.0121**	-0.0141***	-0.0125**	-0.0107**	-0.0127**	-0.0140***	-0.00889**	-0.0143**	-0.0130**	-0.00873*	-0.0118**	-0.0127**
	(-2.87)	(-3.16)	(-3.14)	(-2.89)	(-3.03)	(-3.18)	(-3.06)	(-3.33)	(-3.27)	(-3.05)	(-3.16)	(-3.45)	(-2.39)	(-2.99)	(-3.05)	(-2.66)	(-2.80)	(-2.80)
ba	0.239***						0.150***						0.690***					
	(6.30)						(5.76)						(3.99)					
depth		-13.30**						-17.51						-12.54**				
		(-2.28)						(-2.12)						(-2.31)				
max			-5.048**						-5.760**						-6.472***			
			(-2.84)						(-2.32)						(-3.30)			
adepth				0.00605***						0.00437***						0.0117***		
				(10.12)						(8.81)						(12.12)		
vol					-0.598						-0.558						-0.868*	
					(-1.72)						(-1.64)						(-1.97)	
trs						0.00141						0.00169						0.00186
						(1.10)						(1.41)						(0.51)
Dmat	0.0966***	0.104***	0.0694**	0.0889***	0.129***	0.122***												
	(4.04)	(4.02)	(2.63)	(3.48)	(5.34)	(5.48)												
lb	0.247***	0.309***	0.289***	0.242***	0.259***	0.254***	0.300***	0.402***	0.377***	0.298***	0.314***	0.304**	0.189**	0.236***	0.212**	0.176***	0.205**	0.205**
	(4.40)	(5.63)	(5.83)	(5.01)	(3.73)	(3.51)	(5.54)	(8.06)	(9.42)	(6.18)	(4.82)	(4.30)	(3.27)	(3.32)	(2.97)	(3.40)	(2.63)	(2.60)
constant	-0.0285	-0.0815	-0.00957	-0.0315	-0.0149	-0.0355	0.0442	-0.0309	0.0211	0.0355	0.0765	0.0489	-0.00782	-0.0459	0.0304	-0.0104	0.0279	-0.00199
	(-0.49)	(-0.89)	(-0.14)	(-0.57)	(-0.23)	(-0.52)	(0.80)	(-0.33)	(0.28)	(0.66)	(1.42)	(0.85)	(-0.17)	(-0.51)	(0.51)	(-0.21)	(0.42)	(-0.03)
N	710	710	710	710	696	696	355	355	355	355	343	343	355	355	355	355	353	353
R-sq	0.665	0.662	0.665	0.707	0.652	0.650	0.675	0.681	0.686	0.709	0.680	0.679	0.680	0.644	0.655	0.738	0.622	0.620

Notes: The table presents the estimated coefficients and the respective significance levels (*** 1%, ** 5% and * 10%). The t-statistics are presented in brackets. *so* corresponds to the fiscal balance forecast; *div_06* corresponds to the public debt at end 2006; *iip_06* corresponds to the international investment position at end 2006; *pr* represents the monthly average of the risk premium in the international financial markets; *share_06* represents the relative size of the public debt market at end 2006; *ba, depth, max, adepth, vol* and *trs* correspond to the monthly average of the liquidity indicators based on MTS data; *Dmat* has the value 1 for bonds with 10 year residual maturity; *lb* is a dummy for the period after the collapse of Lehman Brothers. The variables for each country are defined in differences against Germany.

Table 7: Results of spreads estimation in the period 2007-2009: credit risk measured by macroeconomic variables
Regressions with interaction terms with time dummy

	All bonds						10 year residual maturity bonds						5 year residual maturity bonds					
	(1)	(2)	(3)	(4)	(5)	(6)	(1)	(2)	(3)	(4)	(5)	(6)	(1)	(2)	(3)	(4)	(5)	(6)
so	-0.00240	-0.00383	-0.00330	-0.00237	-0.00301	-0.00322	-0.00457	-0.00612*	-0.00486	-0.00456	-0.00520*	-0.00574*	0.000841	-0.000885	0.00317	0.000593	-0.00000402	0.0000245
	(-1.17)	(-1.71)	(-1.38)	(-1.20)	(-1.42)	(-1.56)	(-1.64)	(-1.91)	(-1.51)	(-1.73)	(-1.87)	(-2.16)	(0.59)	(-0.50)	(1.76)	(0.39)	(-0.00)	(0.01)
so_lb	-0.0946***	-0.0716***	-0.0815***	-0.0810***	-0.102***	-0.103***	-0.101***	-0.0740***	-0.0842***	-0.0881***	-0.110***	-0.111***	-0.0842***	-0.0664***	-0.0827***	-0.0676**	-0.0951***	-0.0956***
	(-7.70)	(-6.62)	(-7.41)	(-6.36)	(-8.69)	(-8.88)	(-7.64)	(-6.02)	(-6.64)	(-5.69)	(-9.01)	(-9.82)	(-5.29)	(-6.32)	(-6.18)	(-4.59)	(-7.05)	(-6.87)
div_06	0.00220***	0.00217***	0.00220***	0.00220***	0.00226***	0.00220***	0.00245***	0.00237***	0.00253***	0.00242***	0.00246***	0.00234***	0.00200***	0.00207***	0.00264***	0.00202***	0.00210***	0.00209***
	(7.25)	(7.41)	(5.73)	(7.58)	(6.69)	(6.58)	(15.19)	(17.13)	(14.44)	(17.63)	(12.29)	(11.93)	(4.43)	(4.80)	(6.00)	(4.57)	(4.60)	(4.56)
div06_lb	0.00833***	0.00751***	0.00836***	0.00793***	0.00868***	0.00799***	0.00777***	0.00671***	0.00752***	0.00768***	0.00835***	0.00735***	0.00838***	0.00808***	0.00843***	0.00740***	0.00918***	0.00863***
	(6.72)	(6.18)	(6.35)	(6.05)	(6.26)	(5.60)	(6.57)	(6.89)	(6.35)	(6.49)	(5.27)	(4.40)	(5.20)	(5.23)	(5.43)	(4.14)	(6.59)	(6.24)
iip_06	-0.00107***	-0.00105***	-0.00107***	-0.00107***	-0.00110***	-0.00107***	-0.00131***	-0.00125***	-0.00128***	-0.00130***	-0.00131***	-0.00126***	-0.000851***	-0.000853***	-0.000953***	-0.000860***	-0.000878***	-0.000880***
	(-7.66)	(-7.58)	(-7.28)	(-7.53)	(-7.11)	(-7.05)	(-10.20)	(-10.97)	(-10.64)	(-9.80)	(-9.34)	(-9.35)	(-5.67)	(-5.34)	(-6.91)	(-5.52)	(-5.54)	(-5.49)
iip06_lb	-0.00161**	-0.00170**	-0.00100*	-0.00176**	-0.00170**	-0.00170**	-0.00134**	-0.00151*	-0.000429	-0.00162**	-0.00146**	-0.00147***	-0.00154	-0.00193**	-0.00141*	-0.00157	-0.00195*	-0.00196*
	(-2.43)	(-2.38)	(-1.76)	(-2.40)	(-2.39)	(-2.37)	(-2.54)	(-2.19)	(-0.99)	(-2.49)	(-2.54)	(-2.40)	(-1.77)	(-2.42)	(-1.91)	(-1.83)	(-2.19)	(-2.23)
pr	0.0448***	0.0523***	0.0526***	0.0452***	0.0517***	0.0520***	0.0461***	0.0562***	0.0588***	0.0456***	0.0552***	0.0557***	0.0399***	0.0486***	0.0490***	0.0427***	0.0481***	0.0483***
	(6.76)	(8.53)	(8.47)	(6.59)	(8.94)	(8.73)	(5.28)	(7.15)	(7.04)	(4.88)	(7.34)	(7.28)	(9.68)	(10.17)	(11.32)	(8.91)	(11.72)	(11.21)
pr_lb	0.0447	0.0431	0.0307	0.0339	0.0514	0.0589*	0.0348	0.0278	0.00764	0.0248	0.0400	0.0525	0.0472	0.0578**	0.0493*	0.0360	0.0605*	0.0651*
	(1.44)	(1.48)	(1.03)	(1.12)	(1.72)	(1.97)	(0.99)	(0.79)	(0.23)	(0.70)	(1.31)	(1.72)	(1.51)	(2.29)	(1.85)	(1.27)	(2.02)	(2.23)
share_06	-0.00180***	-0.00222***	-0.00209***	-0.00198***	-0.00174***	-0.00196***	-0.00174***	-0.00228**	-0.00190***	-0.00187***	-0.00191***	-0.00232***	-0.00170***	-0.00233***	-0.00210***	-0.00200**	-0.00154***	-0.00149***
	(-4.14)	(-4.28)	(-4.40)	(-4.38)	(-4.37)	(-4.81)	(-4.12)	(-4.37)	(-3.92)	(-4.41)	(-4.80)	(-5.77)	(-3.89)	(-4.54)	(-4.54)	(-4.33)	(-3.65)	(-3.37)
share_06_lb	-0.0236***	-0.0274***	-0.0235***	-0.0211***	-0.0259***	-0.0265***	-0.0244***	-0.0265***	-0.0234***	-0.0218***	-0.0266***	-0.0269***	-0.0210**	-0.0281***	-0.0235***	-0.0189**	-0.0250***	-0.0262***
	(-4.76)	(-5.73)	(-4.88)	(-4.74)	(-5.51)	(-4.97)	(-5.58)	(-7.79)	(-5.73)	(-5.68)	(-6.37)	(-5.63)	(-3.23)	(-4.52)	(-4.17)	(-3.36)	(-4.65)	(-3.96)
ba	0.235**						0.275**						0.307**					
	(2.43)						(3.05)						(2.41)					
ba_lb	-0.0732						-0.168						0.120					
	(-0.67)						(-1.83)						(0.48)					
depth		-0.815						-1.793						-1.571**				
		(-1.06)						(-1.65)						(-2.95)				
depth_lb		-59.19***						-70.41***						-55.05**				
		(-3.96)						(-4.61)						(-3.06)				
max			-0.206						-0.881*						-1.415***			
			(-0.37)						(-2.27)						(-4.72)			
max_lb			-12.55**						-14.96***						-9.161**			
			(-3.85)						(-4.13)						(-2.67)			
adepth				0.00399**						0.00515***						0.00374*		
				(2.81)						(3.41)						(2.19)		
adepth_lb				0.000573						-0.00173						0.00489**		
				(0.38)						(-1.10)						(2.40)		
vol					-0.191						-0.0872						-0.430**	
					(-1.46)						(-0.73)						(-2.68)	
vol_lb					-1.371*						-1.714**						-1.756	
					(-2.02)						(-3.09)						(-1.28)	
trs						-0.000341						0.000398						-0.00210*
						(-0.52)						(0.64)						(-2.25)
trs_lb						0.00473						0.00285						0.00766
						(0.89)						(0.76)						(0.46)
Dmat	0.101***	0.136***	0.116***	0.0949***	0.131***	0.123***												
	(4.37)	(4.23)	(3.93)	(3.81)	(5.42)	(5.70)												
lb	-0.232**	-0.228**	-0.104	-0.210*	-0.248**	-0.310**	-0.166	-0.106	0.0175	-0.145	-0.175*	-0.258**	-0.260*	-0.327**	-0.211	-0.244*	-0.301*	-0.363*
	(-2.19)	(-2.39)	(-1.12)	(-2.06)	(-2.31)	(-2.45)	(-1.81)	(-1.38)	(0.22)	(-1.62)	(-2.15)	(-2.73)	(-1.92)	(-2.47)	(-1.76)	(-1.89)	(-2.06)	(-2.01)
constant	0.105***	0.105***	0.119***	0.107***	0.118***	0.117***	0.182***	0.203***	0.210***	0.178***	0.214***	0.207***	0.119***	0.134***	0.146***	0.124***	0.155***	0.152***
	(4.83)	(4.42)	(4.76)	(4.62)	(6.06)	(6.11)	(7.08)	(9.29)	(8.58)	(6.53)	(10.77)	(10.37)	(8.67)	(7.34)	(8.35)	(7.78)	(9.41)	(8.96)
N	710	710	710	710	696	696	355	355	355	355	343	343	355	355	355	355	353	353
R-sq	0.762	0.794	0.775	0.786	0.769	0.767	0.765	0.807	0.791	0.785	0.791	0.787	0.770	0.794	0.770	0.805	0.753	0.750

Notes: The table presents the estimated coefficients and the respective significance levels (*** 1%, ** 5% and * 10%). The t-statistics are presented in brackets. *so* corresponds to the fiscal balance forecast; *div_06* corresponds to the public debt at end 2006; *iip_06* corresponds to the international investment position at end 2006; *pr* represents the monthly average of the risk premium in the international financial markets; *share_06* represents the relative size of the public debt market at end 2006; *ba, depth, max, adepth, vol* and *trs* correspond to the monthly average of the liquidity indicators based on MTS data; *Dmat* has the value 1 for bonds with 10 year residual maturity; *lb* is a dummy for the period after the collapse of Lehman Brothers. The interaction terms between dummy *lb* and the other variables are identified by *_lb* at the end of the variable name. The variables for each country are defined in differences against Germany.

Table 8: Results of spreads estimation in the period 2007- May 2010: credit risk measured by macroeconomic variables

	All bonds	
	(1)	(2)
so	-0.0831***	-0.00158
	(-3.62)	(-0.80)
so_lb*		-0.107***
		(-7.99)
so_nov		-0.232***
		(-4.92)
div_06	0.00806**	0.00259***
	(2.64)	(8.79)
div06_lb*		0.00966***
		(5.87)
div06_nov		0.0283***
		(3.42)
iip_06	-0.00325**	-0.00108***
	(-2.53)	(-9.42)
iip06_lb*		-0.00146**
		(-2.18)
iip06_nov		-0.00777**
		(-2.37)
share_06	-0.0204***	-0.000809
	(-2.93)	(-1.35)
share_06_lb*		-0.0291***
		(-4.89)
share_06_nov		-0.0520***
		(-3.51)
pr	0.0759***	0.0518***
	(4.03)	(7.81)
pr_lb*		0.0439
		(1.35)
pr_nov		0.457***
		(3.51)
lb*	0.223**	-0.283**
	(2.57)	(-2.30)
nov	0.494**	-0.569**
	(2.73)	(-2.29)
Dmat	0.0679***	0.0587**
	(2.98)	(2.50)
constant	-0.182	0.161***
	(-1.34)	(6.79)
N	798	798
R-sq	0.454	0.693

Notes: The table presents the estimated coefficients and the respective significance levels (*** 1%, ** 5% and * 10%). The t-statistics are presented in brackets. *so* corresponds to the fiscal balance forecast; *div_06* corresponds to the public debt at end 2006; *iip_06* corresponds to the international investment position at end 2006; *pr* represents the monthly average of the risk premium in the international financial markets; *share_06* represents the relative size of the public debt market at end 2006; *Dmat* has the value 1 for bonds with 10 year residual maturity; *lb** is a dummy for the period between the collapse of Lehman Brothers and October 2009; *nov* is a dummy for the period after November 2009. The interaction terms between the time dummies and the other variables are identified by *_lb** and *_nov* at the end of the variable name. The variables for each country are defined in differences against Germany.

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