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ABSTRACT

Sovereign spreads in the Euro area: Which prospects for a Eurobond?*

In this paper, we provide new evidence on the determinants of sovereign yield spreads and contagion effects in the euro area in order to evaluate the rationale for a common Eurobond jointly guaranteed by euro-area Member States. We find that default risk is the main driver of yield spreads, suggesting small gains from greater liquidity. Fiscal fundamentals matter in the pricing of default risk but only as they interact with other countries' yield spreads; i.e. with the global risk that the market perceives. More important, the impact of this global risk variable is not constant over time, a clear sign of contagion driven by shifts in market sentiment. This evidence points to a discontinuity in the disciplinary role of financial markets. If markets can stay irrational longer than a country can stay solvent, then the role of yield spreads on national bonds as a fiscal discipline device is considerably weakened, and issuing Eurobonds can be economically justified.

JEL Classification:
Keywords: contagion, eurobonds and sovereign debt crisis

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Sovereign Spreads in the EURO Area. Which prospects for a Eurobond?

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1. INTRODUCTION

The dramatic increase in interest rate differentials displayed by the euro sovereign debt crisis, has led economists and policy makers to reconsider the possibility of a European government bond jointly issued and guaranteed by euro-area Member States. The idea that a common Eurobond could offer relief to Member States with weaker fiscal fundamentals, like Italy and Spain, and help solve the debt crisis has emerged in the policy debate and in the media in 2010 and, finally, gained strength in the summer of 2011.

Issuance of a common Eurobond, first analyzed in the Giovannini Group Report (2000), was originally viewed as a strong form of debt management cooperation with the potential of promoting further market integration and greater liquidity. In the wake of the US financial crisis, Eurobond proposals have stressed that a common bond would satisfy the global demand for a risk-free asset and better compete with US Treasuries for the global financial flows in search of a "safe-haven", thereby strengthening the use of the euro as a reserve currency (see e.g. Gros and Micossi 2009, Mayordomo et al. 2009, De Grauwe and Moesen 2009). The euro debt crisis has generated sizeable and highly volatile yield spreads of Member States' bonds on German Bunds. In light of this evidence, a new argument has gained strength: that Eurobonds could provide better

[1] Paper presented at the 55th Panel Meeting of ***Economic Policy*** in October 2011. We thank the editor, Phillip Lane, our discussant Thorsten Beck, two anonymous referees, Bruno Usai and Yian Ma of Mako Investments for their helpful comments.

market access to weaker Member States, by insulating these countries from financial contagion, and lower the risk of crisis propagation (see e.g. Delpla and von Weizsacker 2010, Jones 2010, Juncker and Tremonti 2010, ELEC 2010). On the other hand, Issing (2009) has argued that a common Eurobond is not such a good idea as the "medicine" of a common Eurobond would not cure the fiscal problems of its weakest members, but would instead prolong their reliance on debt, thus taking away the effect of market discipline on their fiscal policies.

In this paper, we first investigate the determinants of interest-rate differentials between euro-area Member States in order to provide the relevant stylized facts on the relative importance of liquidity and default risk. As we find that default risk is the main driver of yield spreads, suggesting small gains from greater liquidity, in the remaining part of the paper we focus on arguments for and against Eurobonds based on their effects on default risk and its redistribution across participating issuers.

A Eurobond jointly guaranteed by euro-area Member States by ensuring market access (and better borrowing conditions) to weaker Member States does not only reduce their risk of default but also the risk of crisis propagation to States with relatively better fundamentals either from contagion or interdependences in the real and financial sectors. In particular, a Eurobond can insulate more fiscally responsible States against the effect of contagion, i.e. a rise in yield spreads (and thus in funding costs) due to a shift in market sentiment. On the other hand, issuance of a common Eurobonds could lower incentives for fiscal adjustment, since it prevents financial market from exerting their disciplinary role through higher interest rates. Hence, the economic rationale for a Eurobond program very much depends on whether yield spreads reflect contagion or the market's efficient assessment of fiscal fundamentals.

To shed light on the relative role of fiscal fundamentals and contagion in the pricing of default risk in yield spreads, and thus in the propagation of the euro debt crisis, we estimate a Global VAR of 10-year yield spreads on Bunds. We find that fiscal fundamentals matter in the pricing of default risk but only as they interact with other countries' yield spreads; i.e. with the global risk that the market perceives. More important, the impact of this global risk variable is not constant over time, a clear sign of contagion driven by shifts in market sentiment. This evidence points to a discontinuity in the disciplinary role of financial markets. If markets can stay irrational longer than a country can stay solvent, then the role of yield spreads on national bonds as a fiscal discipline device is considerably weakened, and issuing Eurobonds can be economically justified.

In light of this evidence, we then discuss and provide new evidence on the other benefits and costs of a Eurobond program. Contrary to the 'safe-haven' argument, we find that German Bunds do not suffer from a lack of liquidity, and thus higher costs, compared to US Treasuries despite a smaller market size. Moreover, insuring the default risk of Member States with weaker fundamentals is not without costs for safer Member States: their expected liabilities will increase and, if the Eurobond did not reach the same

credit quality as German Bunds, an event that we cannot rule out, their borrowing conditions would also worsen.

This suggests that the political opposition to a common issuance program is well motivated and that a Eurobond will never be issued without a renewed aim for a stronger EU political union.

The rest of this paper is organized as follows. In Section 2 we present the relevant stylized facts. Section 3 evaluates the trade-off between market discipline and crisis prevention for a Eurobond backed by joint guarantees in the light of the empirical results of a new nonlinear Global VAR model for yield spreads in the euro area. Section 4 is then devoted to assess the feasibility of a Eurobond program. Finally, Section 5 presents the policy conclusions of our analysis.

2. STYLIZED FACTS

To assess the potential for a European government bond issued by euro-area Member States, we first examine the degree of integration in the European government bond market and its determinants. The relevant stylized facts are on the relative importance of liquidity and default risk premia in determining yield spreads in the euro area, and on the link between fiscal fundamentals and default risk premia priced in yield spreads.

2.1. The Yield Spreads on German Bunds

The European Monetary Union (EMU) brought to life an integrated market for fixed-income government securities in the euro-area. Common euro denomination made bonds issued by euro-area Member States close, but not perfect, substitutes. Figure 1 reports the yields to maturity on 10-year bonds issued by Germany and by three high-yielders: Italy, Portugal, and Spain. The Figure shows that 10-year yields converged significantly, narrowing from highs in excess of 300 basis points in the pre-EMU period to less than 30 basis points about one year after the introduction of the Euro. Yet, bonds issued by euro-area Member States have never been regarded as perfect substitutes by market participants: interest rate differentials never disappeared, and became sizeable during the course of 2008 and 2009. The euro debt crisis in 2010 and 2011 brought about differentials of the same, or even greater magnitude, than those of the pre-euro era.

Insert Figure 1 about here

There are different possible explanations for these interest rate differentials. The first one is credit risk; sovereign issuers that are perceived as having a greater solvency risk, must pay investors a default risk premium. The second explanation is liquidity risk, that is, the risk of having to sell (or buy) a bond in a thin market and, thus, at an unfair price and with higher transaction costs. Small issuers with low volumes of bonds outstanding

and thus small markets must compensate investors with a liquidity premium. Before the introduction of the Euro, also expectations of exchange rate fluctuations and different tax treatment of bonds issued by different countries were relevant. Different tax treatments were eliminated or reduced to a negligible level during the course of the 90s. The introduction of the Euro in January 1999 virtually eliminated the expectations on exchange rate fluctuations, at least until the most recent events that might have induced some positive probability on the event of the collapse of the EMU.[2]

The availability of Credit Default Swaps (CDS) for the more recent part of the sample allows us to measure the default-risk premium component. A CDS is a swap contract in which the protection buyer of the CDS makes a series of premium payments to the protection seller and, in exchange, receives a payoff if the bond goes into default. The difference between a CDS on a Member State bond and the CDS on the German Bund of the same maturity is a measure of the default risk premium of that State relative to Germany. Note that, as clearly discussed in Sturzenegger and Zettelmeyer (2006), CDS is direct measure of the default risk but not of the probability of default, as the price of a CDS depends both on the probability of default and on the expected recovery value of the defaulted bond. Moreover, such measure is not perfect; CDS differentials might also reflect the different liquidity of different sovereign CDSs, as well as counterparty risk (i.e. the risk that the protection seller of the CDS is not able to honor her obligation when the bond goes into default). Their imperfections notwithstanding, CDS differentials provide us with an interesting benchmark to assess what are the main factors driving yield differentials.

Figures 2 and 3 report interest-rate differentials for euro-area Member States (blue line) —i.e. the spreads of 10-year government bond yields on German Bund yields— along with the associated CDS spreads (red line) and the residual non-default component (black line). We group the yield spreads on Bunds and the associated CDS into high yielders (Figure 2) and low yielders (Figure 3).[3]

Insert Figure 2-3 about here

The following facts emerge from the data:

i) There is a clear tendency of all spreads on Bunds in the euro-area to comove, but the nature of the comovement is not constant over time. The CDS spread, i.e. the default risk component of the yield spread, accounts for virtually the entire differential (and its variability) in the case of high yielders over the

[2] For the pre-EMU period expected exchange rate depreciation and risk can be directly identified via the difference between the 10-year Fixed Interest Rate Swaps in local currency by the European countries, as these spreads are immune from sovereign default and liquidity risk. The data show that most of the pre-EMU fluctuations in spreads of high yielders on Bunds are attributable to this component. Since the inception of the Euro 10-year Fixed interest rate swaps differential among Euro area member States are equal to zero by definition.

[3] We do not present data for Cyprus, Malta, Slovenia and Slovakia because times series are not long enough given the short spell of time these countries have spent within the EMU. Data for Luxembourg are also not reported.

whole sample period, whereas it does so in the case of two low-yielders, Belgium and France, only during the euro-debt crisis period.

ii) The non-default component of the yield spread is very small for all Member States with only few exceptions: Finland, the Netherlands, and for France during the global financial crisis. These components are clearly time-varying and fluctuate between around 10 basis points in calm periods and around 50-60 basis points during crises.

iii) The case of Finland where the default risk component is always close to zero, makes it clear that in a global crisis the liquidity premium rises to determine a positive comovement between the Finnish spread and all other euro-area spreads.

iv) For all countries, non-default components are unlikely to reflect expectations of depreciation of the exchange rate. In fact, the data from the euro-debt crisis period suggest that the entire spread for the high-yielders is explained by the default component. Therefore, the event of an EMU collapse has negligible probability in the absence of default of one or more Member States. The evidence of a time varying non- default component not related to expectations of depreciation of exchange rates is consistent with time varying model of the liquidity premia as the one proposed by Acharya and Pedersen(2005) and the empirical evidence on a time-varying liquidity premium the euro area, co-moving with the default risk premium, reported in Beber et al.(2009) and Favero et al. (2010).

There is an important fact about the comovements of interest-rate spreads in the euro area: their interdependence is not constant over time. To illustrate this phenomenon we consider two high-yielders, Greece and Italy, and one low-yielder, Finland. We report in Figure 4 the Greek, the Italian and the Finnish 10-year spreads on Bunds along with the spread between yields on US Baa and Aaa corporate bonds, a variable often used to describe the market attitude toward risk. We consider the full sample 2003-2010 and three subsamples, the low-volatility period (2003-2007), the financial crisis (May 2007-August 2009) and the Greek debt crisis (September 2009-July 2010).

Insert Figure 4 about here

A changing correlation pattern clearly emerges from the data. Over the low-volatility period, Italy and Greece are placed in the same class of risk by the market and their spreads on Bunds are very highly correlated, despite the fact that the two markets are very different in terms of their size and therefore their liquidity. During the financial crisis the credit risk of the two high-yielders diversify. In fact, both the Italian and the Greek spread positively react to the increase in the Baa-Aaa spread but their response is different; the Greek spread widens up to 300 basis points, while the Italian spread peaks at 150. Interestingly, during the financial crisis also the Finnish spread on Bunds

responds slightly to international risk because of an increase in the liquidity premium. Finally, during the Greek crisis, the surge in the interest rate on Greek bonds, not only leads the Greek spread to a value of nearly one-thousand basis points, but it appears to strongly affect the Italian spread that even rises above the US Baa-Aaa spread to reach almost 200 basis points.

This evidence suggests that the major component of yield spreads is default risk, and raises the issue of contagion from default risk. In the next section, we discuss why contagion is crucial to evaluate the potential benefits of a Eurobond, while we defer a formal econometric analysis of contagion to Section 3.3.

3. WHAT TYPE OF EUROBOND?

Several arguments have been put forth in favor of a common European government bond. Earlier proposals stressed that Eurobonds would promote further market integration, greater liquidity and a reduction in liquidity premia, possibly leading to lower borrowing costs. With the advent of the global financial crisis, the idea that a Eurobond could reach the status of a "safe-haven" benchmark competing with US Treasuries for global financial flows and strengthen the use of the euro as an international reserve currency also gained strength. Finally, the introduction of a Eurobond has been advocated as a solution to the euro debt crisis. In these proposals the role of a Eurobond is to ensure market access at better conditions during crises and reduce the risk of crisis propagation from contagion and interdependences. In what follows, we focus on the latter motivation that also involves an assessment of the credit status that a Eurobond would eventually achieve, and thus of the "safe-haven" argument. By contrast, we do not address liquidity issues as our preliminary evidence suggests that the liquidity-premium is a minor component of yield spreads and that the efficiency gains from further market integration are likely to be small. As crisis prevention has become the main concern, we restrict the attention to a particular type of Eurobond, one backed by joint guarantees.

3.1. A common Eurobond backed by joint guarantees

The type of Eurobond that we consider is a single debt instrument issued by a group of euro-area Member States backed by several and joint guarantees: each participating issuer would guarantee the totality of the obligations of the common instrument, thereby making it an indivisible legal object. The debt-service obligations of each participating issuer would be specified in relation to the amount of funding obtained, but the cross-default nature of the joint guarantees would give an investor legal recourse to all the participating issuers, in case that not all the obligations of any issuer were fully met. The issuing entity could be an independent euro debt agency or a newly created EMU Fund

for on-lending to a group of participating euro-area Member States. This type of instrument is the third hypothesis considered in the Giovannini Group Report (2000) and is consistent with the proposals by Boonstra (2010), Delpla (2010), Delpla and von Weizsacker (2010), Jones (2010), Juncker and Tremonti (2010).

The legal nature of such an instrument is different from a bond issued by an EU Institution in that its guarantees are explicit while in the latter case they derive from the EU legal order; i.e. from the legal obligations of the 27 Member States under the EU Treaty, if the EU bond were issued by the European Commission (EC), or from the capital that they subscribe, if it were issued by the EIB.[4] However, since most of the economic arguments in the following analysis also apply to an EU bond, in what follows we shall refer to a Eurobond with explicit joint guarantees by euro-area-only Member States with little loss of generality.[5]

Joint guarantees are needed to reap all of the potential benefits from a commonly issued Eurobond and, in particular, to make it an effective tool of crisis prevention that insulates weaker Member States from contagion. In fact, a commonly issued bond with country-specific shares backed by several guarantees, as those proposed by EPDA (2008) and De Grauwe and Moesen (2009), would not provide much relief to weaker Member States facing a crisis because States with higher credit standings would remain liable only for the interest payments and principal redemption corresponding to their share of the bond, and not for the debt of the other issuers. A bond backed by several guarantees would have a rating reflecting the average of the credit standings of the participating Member States (weighted by their relative shares), and thus would never reach a "safe-haven" status and be held in foreign reserves. More important, as the yield on such bond would average those of participating issuers, a redistributive scheme would have to be devised to offset the higher borrowing costs incurred by creditworthy States making common issuance a zero-sum game except for the uncertain liquidity gains from market integration and the sure costs from complexity and inflexibility (see Favero and Missale 2010).

3.2. Do we need a Eurobond? Crisis prevention vs. Fiscal Discipline

The idea that Eurobonds could offer relief to Member States with weak fiscal fundamentals, like Italy and Spain, and help solve the euro-area debt crisis has emerged

[4] This type of instrument is the fourth proposal in the Giovannini Group Report (2000). Issuance of a common bond by the EIB has been considered by Gros and Micossi (2009) for the purpose of financing a European Financial Stability Fund and by various authors for funding projects envisaged in the Lisbon Strategy (see e.g. Majocchi 2005).

[5] The main difference in the two instruments lies in their legal and political feasibility. Issuance by a European Institution would encounter lower legal obstacles and could be more politically acceptable by fiscally sound Member States but would face stronger opposition by non-euro Member States, which would *de facto* cross guarantee the debt of the participating States (see Goldschmidt 2009). It is worth noting that the EC already funds its Balance of Payments Facility by issuing bonds with a AAA rating.

in the policy debate and in the media over the course of 2010 and, finally, gained strength in August 2011. Indeed, a European government bond backed by the joint and cross guarantees of the participating Member States could ensure market access at better conditions during crises to weaker sovereign issuers and reduce their risk of default. Although, it is tempting to think of a Eurobond as providing insurance against credit risk, the opportunities for risk sharing are slim. First, movements in interest-rate spreads (a proxy for credit spreads) have a strong common component mainly driven by changes in international risk factors. Secondly, in the current situation, Eurobonds would imply a transfer of risk, away from Member States with lower credit standings onto safer issuers, that is unlikely to be reversed in the near future due to the persistence of relative fiscal positions.

Absent risk sharing opportunities, what is then the economic rationale for a common Eurobond? What needs to be argued is that, because a debt crisis in a Member State has negative spillovers to other States' creditworthiness, a common debt backed by joint guarantees (or issued by an EU Institution) would reduce the risk of crisis propagation. If a country's default on its debt increases the probability of default in other countries, either from contagion or interdependences, then preventing a crisis in a Member State with weak fiscal fundamentals may improve debt sustainability in States with sounder finances. If these externalities were significant, the introduction of a Eurobond, by ensuring market access and better borrowing conditions to weaker Member States, could also reduce safer States' exposure to default risk. Put it simply, providing insurance to weaker States would work as insurance for all; it would benefit all participating Member States except, perhaps, the most virtuous ones.

In fact, in the euro area, the probability that a country's crisis propagates to other countries is particularly high because of strong real and financial links. A main channel of transmission is through cross-border holdings of national bonds and increased vulnerability of the European banking system. Another channel is through trade links. Finally, a debt crisis may propagate to other countries because of contagion; i.e. through a rise in yield spreads (and thus higher funding costs) due to a shift in market sentiment and/or risk awareness.

Why then do economists as Issing (2009) and Stark (2011) oppose the introduction of Eurobonds? The most forceful argument against a jointly guaranteed Eurobond is that it would undermine fiscal discipline by removing incentives for sound budgetary policies. At worst, it could create a moral hazard problem in that a Member State may be tempted to free ride on other Members' legal obligations to assume its debt in case of default. In particular, a common Eurobond prevents financial markets from exerting their disciplinary effects through higher interest rates, and undermines the no bailout clause that prohibits a Member State to be liable for or assume the debt obligations of another government. Then, with lower risk of default and lower cost of funding, Member States

would be encouraged to run lax fiscal policies and take up more debt. This would weaken the credibility of the euro-zone as an area of stability and fiscal soundness.[6]

A first argument against Eurobonds is that the cross-default nature of the joint guarantees would undermine the no bailout clause of the EU Treaty (Article 125 TFEU), and heighten the risk of moral hazard. However, to assess the impact of Eurobonds on fiscal discipline one has to ask how effective the no bailout clause is in preventing irresponsible or even opportunistic behavior. In fact, there has always been skepticism as to whether governments would adhere to the no bailout clause given the close financial and economic ties within the euro area and the threat of crisis propagation. After the rescue of Greece, Ireland and Portugal, these doubts are now stronger than ever, and the deterrent role of the no bailout clause has lost much of its credibility.[7] Summing up, bailout expectations and moral hazard will always be a problem. It has to be seen whether it would be wise to further weaken the no bailout principle. For instance, one could argue that with a jointly guaranteed debt the possibility of imposing strict conditionality on financial support, as it now happens with the European Financial Stability Fund (EFSF), would be lost. On the other hand, advocates of Eurobonds as Delpla and von Weizsacker (2010, 2011) contend that the use of Eurobonds would not only be limited but also conditional on the implementation of fiscal adjustment and reforms. Then, the issue is whether to rely on *ex-ante* or *ex-post* conditionality to enforce fiscal consolidation, an alternative that has long characterized the debate over IMF intervention.

Another argument against Eurobonds is that they lower the credit risk premium and thus the interest rate that weaker Member States have to pay on their debts. By preventing financial markets from exerting their disciplinary role, Eurobonds will further reduce the incentives for fiscal adjustment. Interestingly, the argument applies even if issuance of national bonds continued to remain substantial because less default risk would translate into lower interest rates on national bond issues (assuming that their seniority would be the same as Eurobonds). In other words, Eurobonds would cross-subsidize the national bonds of weaker Member States.

The case for relying on the disciplinary effects of widening yield spreads depends on whether financial markets efficiently price risk. In fact, experience shows that market signals, i.e. yield spreads, can be dominated by swings in market sentiment and, more importantly, can remain weak for a long time and then change violently when it is too late to prompt fiscal adjustment.

Hence, the relevant issue to address is whether yield spreads reflect the market's assessment of fiscal fundamentals or contagion, that is, a shift in market sentiment following the emergence of other countries' fiscal distress. The euro-area sovereign debt crisis triggered by the insolvency of Greece, Ireland and Portugal provides an interesting case study. To the extent that the rise in Italian and Spanish spreads just reflects poor

[6] See Issing (2009) for a stand against Eurobonds, Becker (2010) and Berrigan (2010) for a discussion.
[7] The debate on strengthening the Stability and Growth Pact offers further evidence that fiscal discipline cannot rely on the no bailout clause.

fiscal fundamentals, i.e. high debts, low growth and expected budget deficits, the economic rationale for introducing Eurobonds would be weak. A strong case for Eurobonds could instead be made if high yield spreads stemmed from a sudden shift in market sentiment. To the extent that market irrationality and contagion play a greater role than fiscal fundamentals in the pricing of risk, a common Eurobond is a useful instrument to halt the crisis transmission.

To shed light on the determinants of yield spreads and thus on the relative role of fiscal fundamentals and contagion in the propagation of the euro debt crisis, in the next section we estimate a Global VAR of 10-year yield spreads on Bunds.

3.3. The Econometric Evidence

The preliminary data analysis in the introductory section has shown that the main driver of yield differentials in the euro area is default risk and that there is a clear time-varying comovement among differentials. The relevant issue unresolved by the descriptive analysis is the relative weight of fiscal fundamentals and "market sentiment" in the determination of yield spreads. We address this issue within the framework of a Global VAR model for the spreads on Bunds, where the dynamics of each spread is determined by its fundamentals relative to the German ones and a global variable that models the exposure of each country's spread to the other spreads in the euro area in terms of the "distance" between their fiscal fundamentals. We adopt the following specification for a system of ten equations for the 10-year interest-rate spreads on German Bunds for Austria, Belgium, Finland, France, Greece, Ireland, Italy, the Netherlands, Portugal and Spain, using weekly data over the period June 2006-June 2011.

$$\left(Y_t^i - Y_t^{GER}\right) = \beta_0 + \beta_1\left(Y_{t-1}^i - Y_{t-1}^{GER}\right) + \beta_2 E_t\left(b_i - b_{GER}\right) + \beta_3 E_t\left(d_i - d_{GER}\right)$$
$$+ \beta_4\left(Baa_t - Aaa_t\right) + \beta_5\left(Y_t^i - Y_t^{GER}\right)^* + \beta_6\left(Y_{t-1}^i - Y_{t-1}^{GER}\right)^* + u_t^i$$

$$\left(Y_t^i - Y_t^{GER}\right)^* = \sum_{j \neq i} w_{ij}\left(Y_t^j - Y_t^{GER}\right)$$

$$dist_{ij} = 0.5 * E_t\left(b_i - b_j\right)/60 + 0.5 * E_t\left(d_i - d_j\right)/3$$

$$w_{ij}^* = \frac{1}{dist_{ij}} \; if \; dist_{ij} < 1, \; otherwise \;\; w_{ij}^* = 0$$

$$w_{ij} = \frac{w_{ij}^*}{\sum_{j \neq i} w_{ij}^*}$$

The model relates yield spreads on Bunds to local fundamentals and common factors. Local fundamentals are chosen to capture default risk[8]. Following Attinasi et al. (2010), we include the average for a 2-year period of the expected budget balance to GDP ratio (d_i) and debt to GDP ratio (b_i). The expected variables are the European Commission Forecasts, that are released on a bi-annual basis. We include in the model the difference between each country's forecast and the forecast of the same variables for Germany. Our specification is completed by the inclusion of two global risk factors. The first one is an international factor, the US corporate Baa-Aaa spread, computed on the basis of the data made available in the FRED database of the Federal Reserve of St. Louis. The second factor is constructed to deliver country-specific stochastic trends for the impact of other countries' yield spreads, in which the levels of the spreads of all other countries are mapped into the factor by taking into account their "distance" from the country considered, as measured by differences in fiscal fundamentals. We call this factor 'global spread'. For each country, the global spread is determined by a weighted average of the yield spreads in all other countries where the weights are constructed to make the global spread more dependent on the spreads of those countries that are more similar in terms of fiscal fundamentals. The global spread variable is inspired by the construction of global variables in the GVAR modeling approach (see, e.g., Pesaran, Schuermann, Weiner 2004, and Dees, Di Mauro, Pesaran, Smith 2007), where global macro variables are constructed for each country by using trade weights. Using the distance in terms of fiscal fundamentals makes the global variable country-specific and the weights more volatile than in standard GVAR based on trade weights. The time-varying weights, related to the changing forecasts for fiscal fundamentals, have the potential of explaining the changing correlation of spreads discussed in the descriptive data analysis. To illustrate the point we report in Figure 5 the global spreads for a typical low-yielder, the Netherlands, and a typical high yielder, Ireland.

Insert Figure 5 about here

Note that, in the no-crisis period, the global spread variables for the Netherlands and Ireland are very strongly correlated with a very similar mean, while in the wake of a crisis the two global variables diverge as the higher distance of the Netherlands from the high-yielders generates a lower mean and a lower volatility for its global spread.

Our measure of the distance in terms of fiscal fundamentals includes both projections on debt to GDP and deficit to GDP ratios. We have assessed the performance of this specification of distance against a range of alternative specifications. In particular, we have considered alternative measures based on debt only, as some recent proposals on Eurobonds (see Delpla and von Weiszacker 2010) concentrate on debt as the only criterion to identify the credit quality of different bonds. The evidence is that using debt as the only indicator of fiscal fundamentals delivers a global spread variable that

[8] In a baseline version of our model we have also included the Amihud (2002) measure of (il)liquidity used by Acharya and Pedersen (2005) that labels a bond as illiquid if the bond prices move a lot in response to little volumes. However, we excluded this variable from the final specification as it turned out to be always non-significant.

performs much worse than that based on debt and deficit. Figure 6 illustrates this point for the case of Italy by reporting the domestic yield spread together with two alternative measures of the global spread: the one adopted in our model and an alternative one in which the distance is measured only by using the debt-to-GDP ratio.

Insert Figure 6 about here

Figure 6 shows that the global spread based on debt and deficit does a much better job in capturing fluctuations of the domestic yield spread than the global spread based on debt only; the debt measure of the fiscal distance would have put Italy much closer to Greece, Portugal and Ireland in the euro debt crisis than the market has actually done. The debt-to-GDP ratio is one of the pricing variables of bonds but clearly not the only one. Default risk premia depend on fiscal sustainability and fiscal sustainability depends on the level of debt, on how it is financed, and on future primary surpluses.

We have estimated the model over the period 2005-2011 to have a sample that includes three different periods of equal length: the calm period (2005-2007), the financial crisis period (2007-2009) and the euro-debt crisis period (2009-2011) [9].

The results of the estimation reported in Table 1 can be summarized as follows.

i) All spreads are very persistent.

ii) The global spread variables that use non-linearly the fiscal fundamentals are always significant with different impact coefficients. We have assessed the robustness of this result by computing different measures of distance based respectively on debt-only and deficit-only forecasts. The distance based on the weighted average of debts and deficits dominates all alternatives, and the specification based on a measure of distance that depends only on debt is the worst performing one.

iii) The Baa-Aaa spread is in general significant for the low yielders but it is not for the high yielders, with the exception of Ireland.

iv) The linear effect of the fiscal fundamentals is rather weak. Debt and deficit are simultaneously significant only in the case of Greece, while debt has also some marginally significant effect in the case of Portugal and Spain.

v) Panel restrictions cannot be imposed on the system as the coefficients differ importantly across countries.

The evidence reported shows that there is a relationship between yield spreads and fiscal fundamentals, but this is non-linear. Fiscal fundamentals do not matter *per se* but because they determine the sensitivity of the domestic yield spread to other countries' spreads. Fiscal fundamentals are important in the determination of the domestic spread as they define the distance between countries and therefore select the reference group relevant to determine the global spread variable. Countries with sound fiscal fundamentals are immune from the global risk priced in the yield spreads of countries in

[9] The sample period was also chosen to conduct a robustness check using CDS spreads, that are available from our full sample only from 2006 onward.

distress, while weaker Member States are affected by global risk to the extent that they are fiscally closer to troubled countries. In such a framework, markets do have a role as a discipline device as the interdependence among different countries might very well change over time but in a way related to fundamentals. On the other hand, when global risk factors (captured by global spreads) are muted, poor fiscal fundamentals are not priced in domestic yield spreads, which points to a discontinuity in the disciplinary role of financial markets.

The structural stability of the coefficients on the global spread variables is an issue of some relevance: in fact, instability of the impact of the global variable on domestic spreads would imply that episodes of contagion dominate the fundamentals driven interdependence across countries. To investigate this issue we consider first the results of subsample estimation over three periods: the calm period (2005-2007), the financial crisis period (2007-2009) and the euro-debt crisis period (2009-2011). The results, reported in Table 2, show that the coefficients on the global spreads are always statistically significant, but also that there is some evidence of instability, in particular during the euro debt crisis. Using the terminology introduced by Forbes and Rigobon (2002), this evidence shows the presence of contagion in the sense that the interdependence captured by the global trend, i.e. the impact of other countries' spreads through fiscal fundamentals, might not be constant over time. If our specification captures correctly the fundamentals driving the spreads, then the effect of contagion can be used to measure the impact of "market sentiment" in driving yield differentials away from the path consistent with fundamentals.

To measure the effect of contagion we consider a case study for Italy and Spain and estimate a Multivariate GARCH model for the yield spread of each country and the associated global spread. This specification allows for a time-varying conditional variance-covariance between the yield spread of domestic bonds on Bunds and the global spread relevant for each country, and it can be used to generate a time-varying estimate of the impact of the global spread on the domestic spread. In practice, we estimate the following specification:

$$\begin{bmatrix} \left(Y_t^i - Y_t^{GER}\right) \\ \left(Y_t^i - Y_t^{GER}\right)^* \end{bmatrix} = \beta_0 + \beta_1 \begin{bmatrix} \left(Y_{t-1}^i - Y_{t-1}^{GER}\right) \\ \left(Y_{t-1}^i - Y_{t-1}^{GER}\right)^* \end{bmatrix} + \beta_2 E_t \begin{bmatrix} FF_{t-1}^i \\ FF_{t-1}^* \end{bmatrix} + \\ + \beta_3 \left(Baa_t - Aaa_t\right) + H_t^{1/2} \begin{bmatrix} u_t^i \\ u_t^{GR} \end{bmatrix}$$

$$vech\left(H_t\right) = M + Avech\left(u_{t-1} u_{t-1}^{'}\right) + Bvech\left(H_{t-1}\right)$$

$$i = ITA, ESP$$

This specification models the joint process of the yield spread of Italian (or Spanish) bonds on German Bunds and the global spread variable relevant to Italy (or Spain) as a persistent process with a mean determined by the expected fiscal fundamentals (FF^{IT} are the same fundamentals adopted in the system specification while FF^{*} are weighted average of the fiscal fundamentals of other countries with weights determined by the distance from Italy (or Spain) previously defined). The time-varying variance-covariance matrix of residuals, H_t, is modelled as a diagonal BEKK (Engle and Kroner 1995) system. Therefore, the conditional variances, covariances and correlation are allowed to vary over time.

The model provides us with a natural measure of contagion: the dynamic conditional beta in the terminology of Bali and Engle (2010), which is the coefficient determining the effect of a shock in the global spread on the Italian (or Spanish) spread.

$$E\left(u_t^i \middle| u_t^*\right) = \gamma_t u_t^*, \quad \gamma_t = h_{12,t} h_{22,t}^{-1}$$

Variations in the coefficient γ_t reflect a time varying interdependence between the domestic spread and the global spread and they therefore illustrate how contagion affects Italy (and Spain) following a shock to the global spread. The time varying estimate of γ_t^i are reported in Figure 7 along with the estimates obtained from the SUR model.

Insert Figure 7 about here

The Figure displays some evidence of contagion during the global financial crisis that becomes very strong during the euro debt crisis. During both crises the exposure of Italy and Spain to their global spread variables becomes much higher than that predicted on the basis of the distance from other euro-area Member States, as measured by fiscal fundamentals. Note also that the impact of contagion on the domestic yield spreads is very strongly correlated across the two countries. In Figure 8 we provide an estimate of the cost of contagion as measured by the difference between the impact effect of the global spread as estimated in the Multivariate GARCH model and in the constant parameter SUR system.

Insert Figure 8 about here

The estimates show that the effect of contagion in the euro debt crisis is very sizable as it stands at two-hundred basis points in the case of Italy, and at an even higher level in case of Spain.

What does our evidence say on the relative role of fiscal fundamentals and contagion and thus on the trade-off between setting incentives for fiscal discipline and reducing risk of crisis propagation through shifts in market sentiment? Domestic yield spreads do depend on fundamentals, non-linearly, but there is contagion on the top of interdependence. The long-run fluctuations in yield spreads are related to fundamentals,

but such a relation is not constant over time and episodes of contagion can be traced in the data of our sample. This evidence tells us that it is well possible that markets can stay away from the fundamentals driven equilibrium for longer than a country can stay solvent.

Financial markets do set incentives for fiscal discipline but they do so discontinuously; their overreaction to global risk variables is itself an important source of instability and crisis propagation. The efficiency of international financial markets and the role for supranational policy intervention in crisis prevention is a highly debated topic in economics, as witnessed by the huge literature on contagion and the role of the IMF. Our evidence suggests that relying *only* on the disciplinary effects of financial markets to halt a crisis may not be enough as yield spreads are significantly driven by market sentiment.

4. FEASIBILITY

Will a Eurobond ever be issued? The introduction of a common Eurobond backed by the several and joint guarantees of the participating euro-area Member States faces both legal obstacles and strong opposition by safer Member States. The cross-default nature of such guarantees are not only against the spirit but most likely violates the no bailout clause, i.e. the letter of Art 125 of the Treaty on the Functioning of the European Union (TFEU), and may thus require changes in the EU legal infrastructure, either in the Treaty, or in EU legislation. A common Eurobond also faces strong political opposition by Germany and other Member States with sound budgetary policies and low debts. In what follows we examine the costs of Eurobonds for safer issuers that motivate resistance to a common issuance program and the possible benefits that could mitigate such position.

4.1. Political Opposition

Political opposition has two motivations. The first is that a common Eurobond relaxes fiscal discipline and creates a moral hazard problem, as already discussed in Section 3.1. The second, more compelling, problem regards the sharing of the benefits and costs of the program. Member States with the highest credit standings lose from the mutualisation of default risk, in that they assume the credit risk of weaker Member States, while they are likely to gain very little from the greater liquidity of a Eurobond. If such bond did not reach a ‘safe-haven’ status, Member States with sound budgetary polices and low debts could even face higher credit risk premia and borrowing costs. In the best case scenario, a Eurobond jointly guaranteed by all euro-area Member States would have the same credit quality, and risk premium, as the national bonds issued by safer States. But, the latter, while sharing the benefits of enhanced safe-haven status and greater euro-zone financial stability, by assuming the credit risk of the weaker States,

would see their risk exposure increased.[10] Even if their borrowing costs did not change, issuers with no default risk would see their expected liabilities, and thus debt burdens, increase, as they will have to pay in the case a risky issuer defaulted on its obligations.

The cost of a Eurobond issuance program, and its implications for the interest rates to be paid on national bonds, deserve further scrutiny. This is what we do in what follows.

4.2. Borrowing costs with the introduction of a Eurobond

The incentive for participation to common issuance depends, among many other factors, on the borrowing costs that participating Member States would face with the introduction of a commonly guaranteed Eurobond. In turn, such costs will derive not only from the credit standing that the Eurobond would eventually achieve, but also from its impact on the default risk of participating issuers and thus from changes in the credit standing of their national bonds.

The credit standing of Eurobonds would first, and foremost, depend on whether they are *de jure* or *de facto* senior to the outstanding national bonds. In fact, the recent proposal by Delpla and von Weizsacker (2010, 2011) of making Eurobonds (i.e. the Blue Bonds) senior to the debt outstanding and not exchanged (i.e. the Red Bonds), and enforcing limits to their amount, would practically produce Eurobonds without risk. If instead Eurobonds have the same seniority of the old national bonds, evaluating their credit quality is more complicated. In what follows we assume that this must be the case for the simple reason that making the old national bonds junior relative to the Eurobonds would violate the term of the contract specified in national bond covenants, which would amount to an explicit repudiation of past obligations.

Then, under the assumption of equal seniority, and credible joint guarantees, the credit quality of Eurobonds (but not their liquidity) would depend on the credit standings of the Member States that guarantee the bond issues regardless of whether they use Eurobonds for funding.[11] Participation to the common program should, hence, be viewed as the provision of the guarantee.

It is also worth noting that the overall borrowing costs of a participating Member State is likely to be affected even if it does not tap the market with Eurobonds. For instance, if the Eurobonds were not be perceived as safe as German Bunds, the higher risk assumed by Germany in guaranteeing the Eurobond would translate into a higher default risk premium and thus into higher interest rates to be paid by Germany on Bund issues. On the other hand, to the extent that market access under the Eurobond program reduce the default risk of Member States with weaker fundamentals, the latter will face lower risk premia and enjoy better borrowing conditions also on the national segment of their debt.

[10] Issuance by an EU Institution would also be problematic and even more so because EU Member States outside the euro-area would guarantee the Eurobond without sharing its benefits.

[11] A country could guarantee the bond but not obtain the proceeds from its sale; it would be liable for other countries' borrowing and thus bear the risk of their default but no cost in case of repayment.

These considerations immediately suggest that devising a transfer scheme to redistribute the benefits and costs of Eurobond issuance equitably is an almost impossible task. In particular, a redistributive scheme could not rely on market signals, say, on the interest-rate differentials between nationals and Eurobonds, as market prices would inevitably incorporate the risk redistribution induced by the Eurobond program.

It is then clear that Eurobonds should be of the highest credit quality, say, as safe as German Bunds, to have ever a chance to be agreed upon by euro-area Member States and minimize redistribution problems. In particular, an increase in borrowing costs that a Eurobond of lower credit quality would imply, will never be acceptable to Germany on top of bearing the default risk of weaker Member States.

4.3. The credit quality of a Eurobond: A tentative assessment

The credit standing of a Eurobond would reflect the creditworthiness of the participating euro-area Member States, in particular, that of larger economies: France, Germany, Italy and Spain. Under the maintained assumption of equal seniority, the creditworthiness of participating States would depend on their *total debt* outstanding and on their fiscal capacity, i.e. the net present value of their projected primary surpluses. To the extent that countries with stronger fiscal fundamentals, in particular those with larger economies, France and Germany, have excess fiscal capacity to guarantee the Eurobond debt of weaker issuers, the credit standing of Eurobonds would be greater and the default risk premium lower than the weighted average of the credit standings and risk premia of the participating Member States.

While the net present value of future primary surpluses that investors expect cannot be measured, actual data and forecasts on euro-area government debt are available from the EC database. The total debt of euro-area Member States is currently at 89% of GDP, a figure well above the Maastricht 60% limit but still consistent with sustainability from an historical perspective. As shown in Figure 9, the euro area debt-to-GDP ratio also stands well when compared to Japan and the US, two countries that have not been struck by the debt crisis yet.

Insert Figure 9 here

Indeed, the market perception of a default risk on the euro-area debt and thus the debt crisis itself are puzzling when such debt is viewed as the obligation of a single fiscal entity. Why is the euro debt more risky than the US and Japanese debts? There are different answers to this question, among which their different type of holders, and the fact that the latter can be more easily monetized. Two explanations seem more plausible. One is that *potential* fiscal capacity in the US and Japan is greater than in the euro-area because of better growth prospects and lower government spending and tax rates. The other explanation is that the euro-area debt is not backed by the fiscal capacity of a single government, but it is just the sum of the liabilities of different countries that do not have a common fiscal policy, not to speak of a political unity. The decomposition by

ranges of ratings in Figure 9, pointing to the critical share of Italian (S&P A+) and Spanish (S&P AA+) debt, is suggestive of this segmentation.

If the problem is one of potential fiscal capacity, then Eurobonds will hardly reach a better credit quality than the average of the national bonds of participating States. If instead fiscal autarky is the explanation, they could be even safer than US Treasuries, but this would require that a number of problems, from bailout redistribution rules to greater fiscal unity, be effectively addressed.

Further insight on the credit standing that Eurobonds would eventually achieve can be obtained by looking at the bonds issued by the European Investment Bank (EIB) to finance investment projects. EIB bonds are backed by the capital subscribed by EU Member States, have a Aaa rating, and are the debt instruments which come closest to what could be an Eurobond backed by several and joint guarantees.

4.3.1 The interest rate on Eurobonds issued by the EIB

To gain further insight on the potential credit quality of a Eurobond, we look at the performance of EIB debt by constructing, from various EIB bond issues, the interest rate on a synthetic EIB bond with residual term to maturity as close as possible to 10 years. Figure 10 reports the yields on 10-year EIB bonds along with the yields on 10-year German Bunds and the yield on 10-year Finnish bonds. We note first that the yield differential between the EIB bonds and German Bunds climbed from near zero to 100 basis points, over the course of the US financial crisis, to go back to a level of about 30 basis points thereafter. The euro debt crises had initially a very limited impact but, in the heat of the August 2011 crisis, the spread has reached again values around 100 basis points.

Insert Figure 10 here

Interestingly, Figure 10 also shows that, until August 2011, the interest rate on EIB bonds has followed closely that on 10-year Finnish bonds, paying only a small premium over it. As Finnish bonds have no credit risk but very low liquidity, this evidence points to the illiquidity of EIB bonds as the major source of variation for their interest-rate differential with German Bunds and is consistent with the idea that a common Eurobond would pay a very small premium, possibly due to liquidity, with respect to German Bunds. However, in the August 2011 crisis, the interest rate on EIB bonds diverges from that on Finnish bonds showing a premium greater than 50 basis points, a clear sign that investors no longer perceive EIB bonds as safe as Finnish bonds and require a credit risk premium to hold them. This evidence raises serious doubts that in the current crisis a common Eurobond would ever reach the credit quality of German Bunds.

4.3.2 The credit quality of a Eurobond; concluding remarks

Although the euro debt-to-GDP ratio appears sustainable, evidence on the yield spread of EIB bonds suggests that a Eurobond guaranteed by all euro-area Member States may not reach the same credit standing as German Bunds. The emergence of a non-negligible CDS spread of French OATs on Bunds over the euro debt crisis (see Figure 3a) sheds further doubts on this possibility.

There are however two arguments in favor of Eurobonds that we have not considered so far and that deserve attention. The first concerns the credibility effect from the announcement of the program. To the extent that the introduction of a Eurobond signals a political will for greater fiscal unity and cooperation paving the way for a deeper reform of EU fiscal governance, this may lead to a revision in the expected fiscal capacity of the euro area and its debt sustainability.

The second argument is crisis prevention. If a country's default on its debt increases the probability of default in other Member States, either from contagion or interdependences in the real and banking sectors, then halting a debt crisis in weaker Member States might improve debt sustainability in States with relatively better fundamentals. The emergence of a default risk premium on French government bonds is a clear sign that the euro debt crisis is spreading fast even to countries with better credit standings. Indeed, our analysis in section 3.3 shows that the effect of contagion is significant, suggesting that the introduction of a common Eurobond could reduce the risk of crisis transmission to more fiscally responsible States.

Because of the lower risk of crisis propagation, and credibility effects, we cannot exclude that the credit quality of the euro-area debt would improve following the introduction of Eurobonds, and that they will be perceived as safe as German Bunds.

4.4. The gains from a 'safe-haven' Eurobond

The discussion in the previous sections suggests that providing explicit guarantees on a common Eurobond is not without cost for safer Member States. In the best case scenario, their expected liabilities will increase, and if the Eurobond did not reach the quality of their national bonds, their borrowing costs will also increase. This raises two issues. The first is that of a compensation scheme to redistribute the benefits and costs of the common program. Although various proposals have been advanced, from seniority rules (Delpla and von Weizsacker 2010) to indexation to national bond spreads (De Grauwe and Moesen 2009), CDS spreads (Mayordomo et al. 2009) and fiscal parameters (Boonstra 2010, and Gros 2010), their implementation runs against difficulties ranging from costly negotiations, to legal obstacles, to distorted market signals (see Section 4.2). These solutions add to the complexity of a Eurobond program[12]

[12] For a discussion see Favero and Missale (2010).

The second issue is whether liquidity gains can partly compensate safer Member States, in particular Germany, for assuming the risk of weaker Member States. Indeed, it is often argued that a common Eurobond would better satisfy the global demand for a 'safe-haven' asset than German Bunds, if its market size approached that of US Treasuries. The idea is that, since safe German Bunds are in scarce supply, a common Eurobond would attract the demand by international investors and strengthen the use of the euro as international reserve currency. In turn, this would reduce the borrowing costs for all euro-area sovereign issuers.

However, for a Eurobond to reach the international benchmark status of US Treasuries two conditions must be satisfied: i) Eurobonds should be of the same credit quality of German Bunds, and; ii) their market should reach a similar size of the US market, which requires large outstanding volumes to the point of replacing national bonds markets. Nothing ensures that both conditions will be satisfied.

The claim that German Bunds suffer from a lack of liquidity compared to US Treasuries, to which we now turn, also deserves further investigation.

4.4.1 The yield differential between German Bunds and US Treasuries

The descriptive analysis of Section 2 clearly illustrates that the contribution of liquidity to the explanation of euro-area yield spreads over German Bunds is very small except for safe and small issuers, like Finland and the Netherlands. However, this analysis cannot offer hints on the potential gain of liquidity from the full integration of the euro-debt market that a common Eurobond might realize, and thus on the reduction in the funding cost of German (and euro) debt relative to the US debt. In fact, as shown in Figure 11, the euro-area bond market is very close in size to the US market but the German Bund market represents only 23% of the euro-area market and is thus much smaller than the US one.[13]

Insert Figure 11 here

A natural question arises on whether German Bunds have to pay a liquidity premium due to their smaller market size and the lack of international benchmark status that is instead enjoyed by US Treasuries. Answering this question is made easier by the fact the CDS spread between US and Germany is negligible, and so is their relative credit risk premium, but it is made more difficult by the existence of a fluctuating euro-dollar exchange rate. To filter out exchange-rate expectations from the interest-rate differential between German and US bonds, we use the difference between the 10-year Fixed Interest Rate Swaps in euro and in US dollars that is immune from sovereign default and liquidity risks. We report, in the second panel of Figure 11, four series: the 10-year yield spread between US and Germany; the 10-year US-German Asset Swap Spread (defined as the difference between the yield spread and the spread between the 10-year Fixed

[13] Data are taken from the BIS database and refer to the volumes of bonds outstanding with a maturity longer than one year.

Interest Rate Swaps); the US Baa-Aaa spread; the differential between CDS on 10-year US and German bonds.

As shown in Figure 11, in the period preceding the financial crisis the asset swap spread points to a sizeable liquidity premium, around a mean of 40 basis points, paid by German Bunds over US Treasuries. Hence, in the pre-crisis period, a common Eurobond market would have enabled the euro-area market to better compete with the US market as the most liquid market globally.

However, when the financial crisis hits the markets and the Baa-Aaa spread starts fluctuating away from its low-risk period mean, the liquidity premium paid by German Bunds on US Treasuries disappears, and in fact is reversed, shadowing the US Baa-Aaa spread to reach a discount of over 50 basis point at the peak of the crisis. Interestingly, as the Baa-Aaa spread reverts toward its pre-crisis level, the asset swap spread initially seems to converge back toward a small premium but, with the onset of the Greek-debt crisis, it goes back to a discount level, fluctuating initially in the range of 20-30 basis points, to then increase slightly above 50 basis points in the heat of the August 2011 crisis. During the euro debt crisis the US-German Asset Swap spread cannot be explained by the default risk component as the CDS spread indicates that US Treasuries are perceived as less risky than German Bunds. While expected exchange rate fluctuations play a relevant role in the explanation of the yield spread during the financial crisis, when yield differentials and asset swap spreads have the opposite sign, and are negatively correlated, they are remarkably stable in the euro debt crisis.

Hence, while in the pre-crisis period US Treasuries did enjoy the status of the most liquid and safest benchmark globally, they appear to have lost their 'safe-haven' appeal thereafter.[14] In fact, the data tell us that in the two different crises international portfolio shifts generated a discount on German Bunds with respect to US Treasuries, despite the smaller size of the German Bund market.

How should this evidence be interpreted? A first possible explanation is that the financial crisis has generated a flight to safety towards German Bunds that has reversed the pre-crisis situation; interestingly this reversion has lasted over the euro debt crisis, probably due to a portfolio shifts towards German Bunds away from bonds issued by riskier Member States. However, this interpretation is not consistent with the behavior of CDS spreads that would instead justify a flight to quality from German to US bonds.

A second explanation lies in the relative supply increase of US Treasuries that could have required an increase in their proper risk premium to be accommodated in international investors' portfolios.

A third explanation is that, with the outbreak of the crisis, the liquidity of German Bunds has increased, closing the gap with US Treasuries. If this were the case, then there would be no liquidity gain for Germany from a common Eurobond market.

[14] While it would worth looking at traded volumes to better understand the apparent reversal in international benchmark status, data are difficult to find because US Treasuries and German Bunds are mostly traded over the counter.

Whatever is the explanation, what matters for our purposes is that the argument that Germany may still be penalized by a market size much smaller than the US market, and that it could benefit from a common Eurobond market is not supported by the data.[15]

5. POLICY CONCLUSIONS

Should euro-area Governments issue a Eurobond? In this paper we have provided an evaluation of the potential benefits and costs of a Eurobond backed by the several and joint guarantees of euro-area Member States. As default risk is the main driver of interest-rate differentials, the efficiency gains from greater liquidity appear to be small and appealing only to small safe issuers. Contrary to the 'safe-haven' argument, German Bunds do not seem to suffer from a lack of liquidity, and thus higher costs, compared to US Treasuries despite a smaller market size. Moreover, insuring the default risk of Member States with weaker fundamentals is not without costs for safer Member States: their expected liabilities will increase and, if the Eurobond did not reach the same credit quality as German Bunds, an event that we cannot rule out, their borrowing conditions would also worsen. More important, fiscal fundamentals seem to matter in the pricing of credit risk as they determine the sensitivity of domestic yield spreads to other countries' spreads. Countries with weak fiscal fundamentals are affected by the global risk priced in the yield spreads of countries in distress to the extent that they are fiscally closer to the latter. This suggests that financial markets, though discontinuously, have a role as a discipline device. Getting rid of their disciplinary role by allowing market access with a jointly guaranteed Eurobond may not be wise. Italy is a case in point: would fiscal adjustment and budget balance reforms ever be implemented in August 2011 without the pressure of a high BTP-Bund spread?

All in all, issuing a Eurobond does not seem a good idea. Can it be rescued? The answer is yes, and the reason lies in the evidence of substantial contagion effects. We find that fiscal fundamentals *per se* are not significant determinants of yield spreads but only as they interact with other countries' spreads; i.e. with the global risk that the market perceives. When global risk factors are muted, poor fiscal fundamentals are not priced in domestic yield spreads, which points to a discontinuity in the disciplinary role of financial markets. More important, the interdependence captured by the global spread variable, i.e. the impact of other countries' spreads through fiscal fundamentals, is not constant over time, a clear sign of contagion in the definition of Forbes and Rigobon (2002). Then, a shift in market sentiment following the emergence of a country fiscal distress may propagate a debt crisis to relatively safer countries through a rise in yield

[15] A referee made us notice that the fact that the German Bund future was the dominant contract before the Euro and it has quickly become virtually the only future contract on Government Bonds in the Euro plays an important role in determining the very high liquidity of 10-year bunds.

spreads that worsen their borrowing conditions. The effect of contagion for Italy is estimated to be as high as 200 basis points during the August 2011 crisis, while it is even greater in the case of Spain.

Financial markets do set incentives for fiscal discipline but they do so discontinuously; evidence of an overreaction to global risk variables points to shifts in market sentiment as an important source of instability and crisis propagation. If markets can stay irrational longer than a country can stay solvent, then their disciplinary role is considerably weakened, and issuing a Eurobond can be economically justified.

Furthermore, the introduction of a Eurobond, by ensuring market access and better borrowing conditions, would not only reduce the risk of default in weaker Member States but could also avoid the propagation of the crisis to more fiscally responsible States, either from contagion or interdependences in real and financial sectors. Put it simply, providing insurance to States with weaker fiscal fundamentals would work as insurance for all; it would benefit all participating Member States except, perhaps, the most virtuous ones.

However, one may wonder why the Dutch, the Finnish and the German taxpayers should insure the risk of fiscally reckless Member States and even pay for it. In fact, political opposition to a Eurobond is easily understood but fails to realize that alternatives could be worst. Financial assistance to Greece, Ireland and Portugal under the EFSF may turn out to be costlier to euro-area taxpayers in the case these economies will not recover, and EFSF's resources are not enough to rescue Italy and Spain if they defaulted on their debts. The costs of crisis resolution may well be higher than those to be paid for crisis prevention with a Eurobond program. In fact, the consequences of an Italian and Spanish default are unthinkable. Such an event will lead to the collapse of the euro area financial system, a deep recession and a disruption of trade with huge costs for all euro area Member States. Thinking that the taxpayers of fiscally responsible States will not be hit by a crisis of such proportions is a dangerous illusion. The emergence of non-negligible CDSs on the French and German debts is evidence that the market already assigns a probability that the Italian and Spanish debt crisis will spread to countries with better fundamentals.

No doubt, participation to a Eurobond program should be subject to *ex ante* strict conditionality and binding fiscal rules to enforce fiscal discipline and mitigate moral hazard problems, making up for the weakened role of financial markets. Likewise, the problem of an equitable sharing of the costs and benefits of a Eurobond program cannot be dismissed. In fact, advocates of Eurobonds have made various proposals to reinforce fiscal discipline, as well as to redistribute the benefits and costs of Eurobonds. Although such solutions have considerable merit, they miss the main point: efforts to design a perfect Eurobond program will never be enough to convince its opponents that it is a free lunch.

What Europe and the Euro need is a renewed aim for a stronger EU political union. Indeed, it is hard to think of solutions of the euro debt crisis without further steps towards political integration. Sustainability requires institutional changes; for instance, a

new entity in charge of crisis management with independent decision power and some form of fiscal union to address macroeconomic imbalances with a common policy. Indeed, it is easier to think of a common Eurobond as a valuable instrument and the natural byproduct of a common fiscal policy. Unfortunately, a reform of EU fiscal governance takes time while time to halt the crisis is running out very fast. Why then not to think of a Eurobond program as the first step towards greater fiscal integration? No doubt, the introduction of a Eurobond could signal a political will for greater fiscal unity, paving the way for deeper reforms of EU fiscal governance.

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Table 1 – Spreads on Bunds, Seemingly Unrelated Regression, Sample August 2005-August 2011, weekly data

	BG	ESP	FIN	FRA	GRE	IRE	ITA	NL	OE	PT
β_0	0.059	0.057	-0.055	-0.006	-0.234	0.078	0.348	-0.021	-0.025	0.025
	(0.020)	(0.032)	(0.021)	(0.004)	(0.117)	(0.063)	(0.091)	(0.007)	(0.006)	(0.042)
β_1	0.919	0.961	0.888	0.867	0.969	0.972	0.897	0.874	0.926	0.979
	(0.018)	(0.013)	(0.020)	(0.021)	(0.013)	(0.022)	(0.019)	(0.018)	(0.014)	(0.015)
β_2	-0.193	0.118	-0.093	0.032	0.326	0.131	-0.519	-0.025	-0.069	0.767
	(0.060)	(0.079)	(0.045)	(0.029)	(0.178)	(0.131)	(0.146)	(0.024)	(0.065)	(0.245)
β_3	-0.007	-0.013	0.003	-0.000	0.079	-0.005	0.003	0.009	0.000	-0.047
	(0.008)	(0.010)	(0.004)	(0.005)	(0.035)	(0.024)	(0.014)	(0.006)	(0.009)	(0.052)
β_4	0.011	-0.002	0.016	0.016	0.039	0.014	0.002	0.024	0.023	-0.008
	(0.005)	(0.009)	(0.003)	(0.003)	(0.033)	(0.029)	(0.006)	(0.004)	(0.004)	(0.016)
β_5	0.096	0.185	0.059	0.079	0.222	0.207	0.620	0.340	0.403	1.612
	(0.019)	(0.031)	(0.017)	(0.008)	(0.059)	(0.044)	(0.036)	(0.018)	(0.027)	(0.100)
β_6	-0.050	-0.149	-0.028	-0.065	-0.211	-0.203	-0.521	-0.324	-0.386	-1.598
	(0.019)	(0.031)	(0.017)	(0.008)	(0.058)	(0.047)	(0.038)	(0.019)	(0.028)	(0.102)
Adj R - squared	0.98	0.99	0.98	0.98	0.99	0.99	0.99	0.99	0.98	0.99
Mean Dep. Variable	0.43	0.70	0.17	0.21	2.80	1.60	0.76	0.19	0.28	1.15
SE of Regression	0.059	0.097	0.027	0.027	0.329	0.220	0.075	0.021	0.034	0.148

$$\left(Y_t^i - Y_t^{GER}\right) = \beta_0 + \beta_1\left(Y_{t-1}^i - Y_{t-1}^{GER}\right) + \beta_2 E_t\left(b_i - b_{GER}\right) + \beta_3 E_t\left(d_i - d_{GER}\right)$$
$$+ \beta_4\left(Baa_t - Aaa_t\right) + \beta_5\left(Y_t^i - Y_t^{GER}\right)^* + \beta_6\left(Y_{t-1}^i - Y_{t-1}^{GER}\right)^* + u_t^i$$

Table 2 – Spreads on Bunds, Seemingly Unrelated Regression (Spain, Greece, Ireland, Italy, Portugal,), subsample evidence

	ESP			GRE			IRL			ITA			POR		
Sample	2005:08 2007:08	2007:08 2009:09	2009:09 2011:08	2005:08 2007:08	2007:08 2009:09	2009:09 2011:08	2005:08 2007:08	2007:08 2009:09	2009:09 2011:08	2005:08 2007:08	2007:08 2009:09	2009:09 2011:08	2005:08 2007:08	2007:08 2009:09	2009:09 2011:08
β_0	-0.001	-0.608	0.837	0.074	-0.030	-0.399	0.003	0.267	2.200	-0.015	-0.244	0.775	-0.116	0.026	0.222
	(0.028)	(0.203)	(0.251)	(0.029)	(0.101)	(0.781)	(0.019)	(0.167)	(0.615)	(0.076)	(0.569)	(0.216)	(0.039)	(0.027)	(0.333)
β_1	0.801	0.746	0.870	0.908	0.797	0.937	0.938	0.785	0.930	0.856	0.807	0.820	0.843	0.897	0.938
	(0.046)	(0.044)	(0.033)	(0.029)	(0.040)	(0.031)	(0.036)	(0.037)	(0.048)	(0.034)	(0.046)	(0.039)	(0.038)	(0.046)	(0.036)
β_2	0.011	-1.352	-0.275	-0.005	-0.093	0.701	0.013	0.529	-0.027	0.013	0.452	-0.868	-0.044	0.598	1.184
	(0.026)	(0.445)	(0.206)	(0.020)	(0.202)	(0.402)	(0.026)	(0.306)	(0.269)	(0.124)	(0.806)	(0.327)	(0.120)	(0.389)	(0.647)
β_3	0.010	0.104	-0.336	-0.019	-0.062	-0.061	-0.001	-0.077	-0.334	-0.008	-0.058	-0.128	0.011	-0.013	-0.081
	(0.007)	(0.032)	(0.137)	(0.006)	(0.035)	(0.097)	(0.003)	(0.059)	(0.120)	(0.015)	(0.044)	(0.105)	(0.013)	(0.033)	(0.142)
β_4	0.023	0.032	-0.298	-0.069	0.002	0.246	0.002	-0.074	-0.936	0.005	0.030	-0.144	0.111	-0.038	-0.247
	(0.024)	(0.010)	(0.113)	(0.024)	(0.020)	(0.535)	(0.001)	(0.029)	(0.336)	(0.018)	(0.015)	(0.113)	(0.039)	(0.01)	(0.271)
β_5	1.192	0.791	0.180	1.106	1.990	0.219	0.807	2.008	0.191	0.891	0.842	0.610	1.459	1.275	1.755
	(0.143)	(0.055)	(0.053)	(0.101)	(0.108)	(0.102)	(0.055)	(0.156)	(0.071)	(0.076)	(0.061)	(0.04)	(0.207)	(0.074)	(0.185)
β_6	-1.075	-0.623	-0.092	-0.948	-1.453	-0.177	-0.736	-1.156	-0.191	-0.631	-0.754	-0.427	-1.182	-1.070	-1.626
	(0.015)	(0.052)	(0.052)	(0.106)	(0.147)	(0.097)	(0.063)	(0.187)	(0.077)	(0.094)	(0.059)	(0.069)	(0.215)	(0.100)	(0.185)
Adj R - squared	0.83	0.99	0.96	0.96	0.99	0.98	0.95	0.99	0.98	0.96	0.99	0.96	0.89	0.99	0.99
Mean Dep. Variable	0.03	0.45	1.62	0.25	1.11	7.06	-0.02	0.87	3.99	0.23	0.72	1.35	0.12	0.62	3.38
SE of Regression	0.006	0.034	0.162	0.010	0.064	0.574	0.005	0.083	0.351	0.008	0.044	0.122	0.017	0.039	0.252

$$\left(Y_t^i - Y_t^{GER}\right) = \beta_0 + \beta_1\left(Y_{t-1}^i - Y_{t-1}^{GER}\right) + \beta_2 E_t\left(b_i - b_{GER}\right) + \beta_3 E_t\left(d_i - d_{GER}\right)$$
$$+ \beta_4\left(Baa_t - Aaa_t\right) + \beta_5\left(Y_t^i - Y_t^{GER}\right)^* + \beta_6\left(Y_{t-1}^i - Y_{t-1}^{GER}\right)^* + u_t^i$$

Table 2 – Spreads on Bunds,Seemingly Unrelated Regression (Belgium, Finland, France, Netherlands and Austria), subsample evidence

	BEL			FIN			FRA			NL			OE		
Sample	2005:08 2007:08	2007:08 2009:09	2009:09 2011:08	2005:08 2007:08	2007:08 2009:09	2009:09 2011:08	2005:08 2007:08	2007:08 2009:09	2009:09 2011:08	2005:08 2007:08	2007:08 2009:09	2009:09 2011:08	2005:08 2007:08	2007:08 2009:09	2009:09 2011:08
β_0	-0.001 (0.014)	0.058 (0.07)	0.332 (0.090)	-0.019 (0.015)	0.125 (0.065)	0.020 (0.058)	0.014 (0.012)	0.021 (0.009)	0.086 (0.053)	-0.008 (0.012)	-0.002 (0.065)	0.046 (0.026)	0.001 (0.010)	-0.004 (0.018)	0.046 (0.047)
β_1	0.894 (0.041)	0.904 (0.041)	0.820 (0.041)	0.922 (0.035)	0.732 (0.047)	0.788 (0.047)	0.861 (0.035)	0.691 (0.052)	0.777 (0.052)	0.925 (0.031)	0.704 (0.053)	0.867 (0.040)	0.884 (0.038)	0.824 (0.046)	0.715 (0.057)
β_2	0.020 (0.021)	-0.117 (0.252)	-0.473 (0.176)	-0.037 (0.019)	0.230 (0.145)	-0.128 (0.093)	-0.022 (0.043)	-0.054 (0.064)	-0.021 (0.069)	-0.000 (0.011)	-0.001 (0.224)	-0.062 (0.053)	-0.028 (0.024)	0.020 (0.284)	-0.119 (0.141)
β_3	0.003 (0.003)	0.056 (0.041)	-0.082 (0.055)	0.005 (0.004)	0.004 (0.015)	-0.026 (0.013)	0.011 (0.004)	-0.033 (0.013)	-0.025 (0.029)	-0.010 (0.005)	0.003 (0.032)	-0.025 (0.023)	0.009 (0.004)	-0.009 (0.032)	-0.046 (0.039)
β_4	-0.007 (0.0119)	-0.009 (0.010)	-0.087 (0.076)	0.007 (0.013)	0.001 (0.007)	-0.047 (0.024)	-0.013 (0.013)	0.012 (0.006)	-0.013 (0.033)	-0.003 (0.012)	0.011 (0.006)	-0.024 (0.018)	0.000 (0.010)	-0.020 (0.012)	0.023 (0.042)
β_5	0.859 (0.078)	0.791 (0.055)	0.098 (0.029)	0.842 (0.071)	0.543 (0.065)	0.037 (0.020)	0.693 (0.072)	0.389 (0.026)	0.050 (0.012)	0.803 (0.076)	0.710 (0.037)	0.196 (0.021)	0.607 (0.064)	0.841 (0.063)	0.270 (0.037)
β_6	-0.755 (0.086)	-0.623 (0.052)	-0.018 (0.028)	-0.794 (0.077)	-0.327 (0.072)	-0.014 (0.018)	-0.710 (0.073)	-0.286 (0.029)	-0.032 (0.013)	-0.644 (0.080)	-0.567 (0.044)	-0.188 (0.022)	-0.578 (0.071)	-0.612 (0.074)	-0.224 (0.040)
Adj R - squared	0.96	0.99	0.95	0.96	0.98	0.83	0.92	0.99	0.83	0.95	0.99	0.89	0.96	0.99	0.82
Mean Dep. Variable	0.05	0.48	0.78	-0.03	0.29	0.26	0.03	0.25	0.35	0.02	0.30	0.25	0.03	0.41	0.40
SE of Regression	0.006	0.034	0.085	0.006	0.029	0.029	0.006	0.019	0.039	0.005	0.019	0.022	0.005	0.035	0.170

$$\left(Y_t^i - Y_t^{GER}\right) = \beta_0 + \beta_1\left(Y_{t-1}^i - Y_{t-1}^{GER}\right) + \beta_2 E_t\left(b_i - b_{GER}\right) + \beta_3 E_t\left(d_i - d_{GER}\right)$$
$$+ \beta_4\left(Baa_t - Aaa_t\right) + \beta_5\left(Y_t^i - Y_t^{GER}\right)^* + \beta_6\left(Y_{t-1}^i - Y_{t-1}^{GER}\right)^* + u_t^i$$

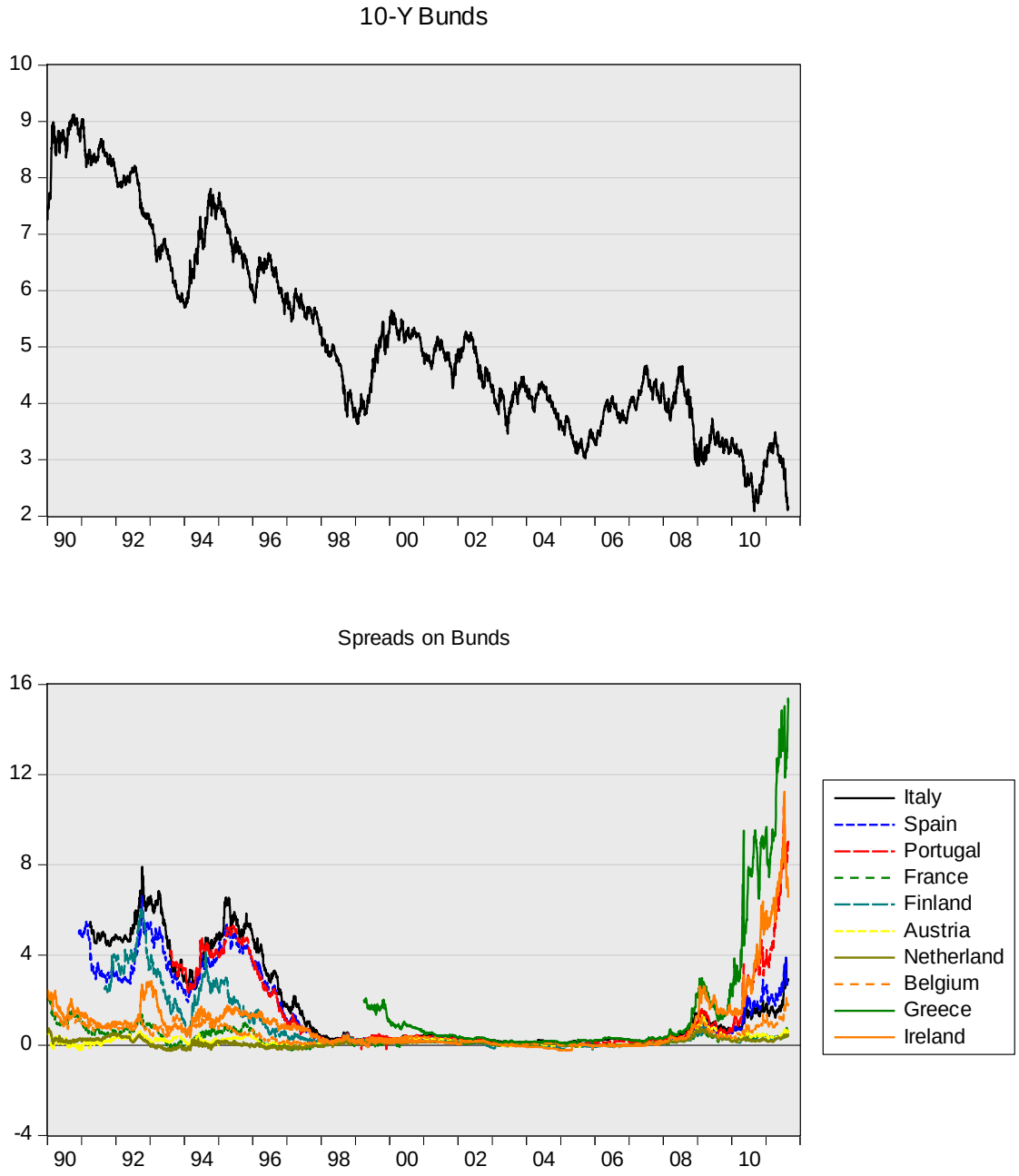


Figure 1. 10-Y Government bond yield spreads in the Euro area Spreads are differences between 10-year yields in % annual terms.
Source: Datastream/Thomson Financial

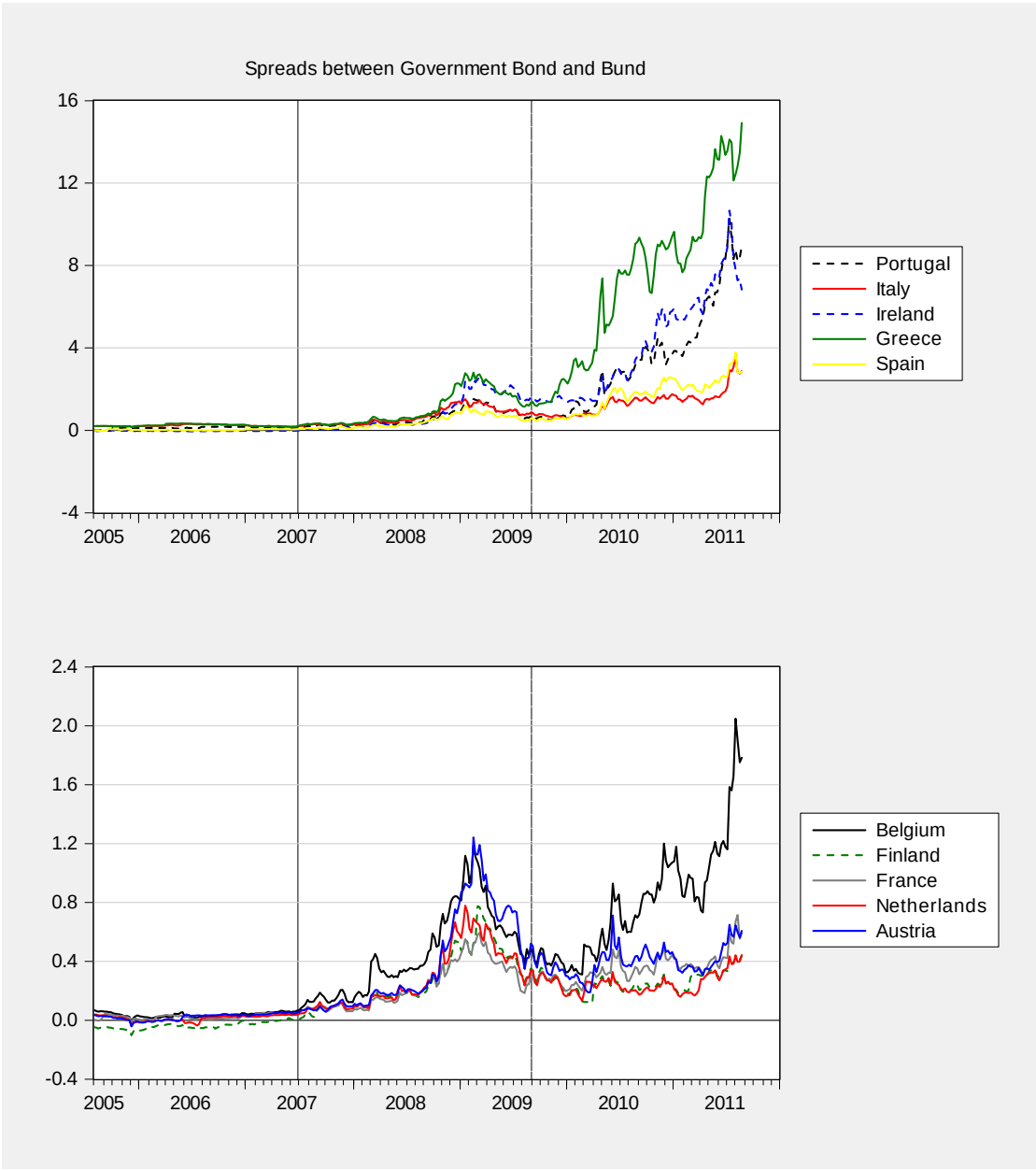


Figure 2. Post-EMU Spreads of Euro area vs. German 10-year bond yields Yield differentials are presented in % annual terms and refer to the 10-year maturity of the term structure of interest rates, the most actively traded maturity in the Eurozone government securities market. German bond yields are taken as the reference
Source: Datastream/Thomson Financial

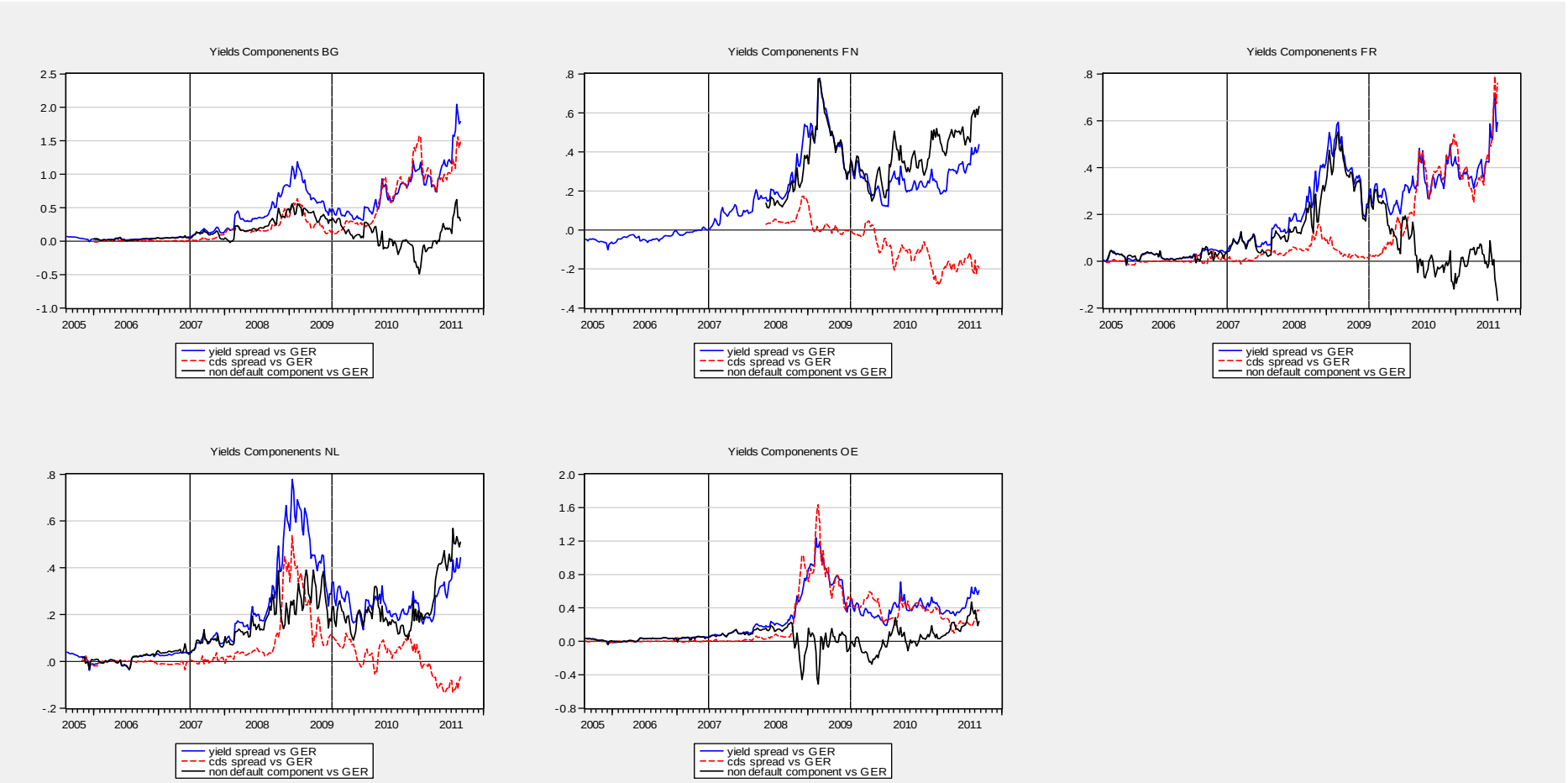


Figure 3a. The default and non default component in yields spreads – Low Yielders

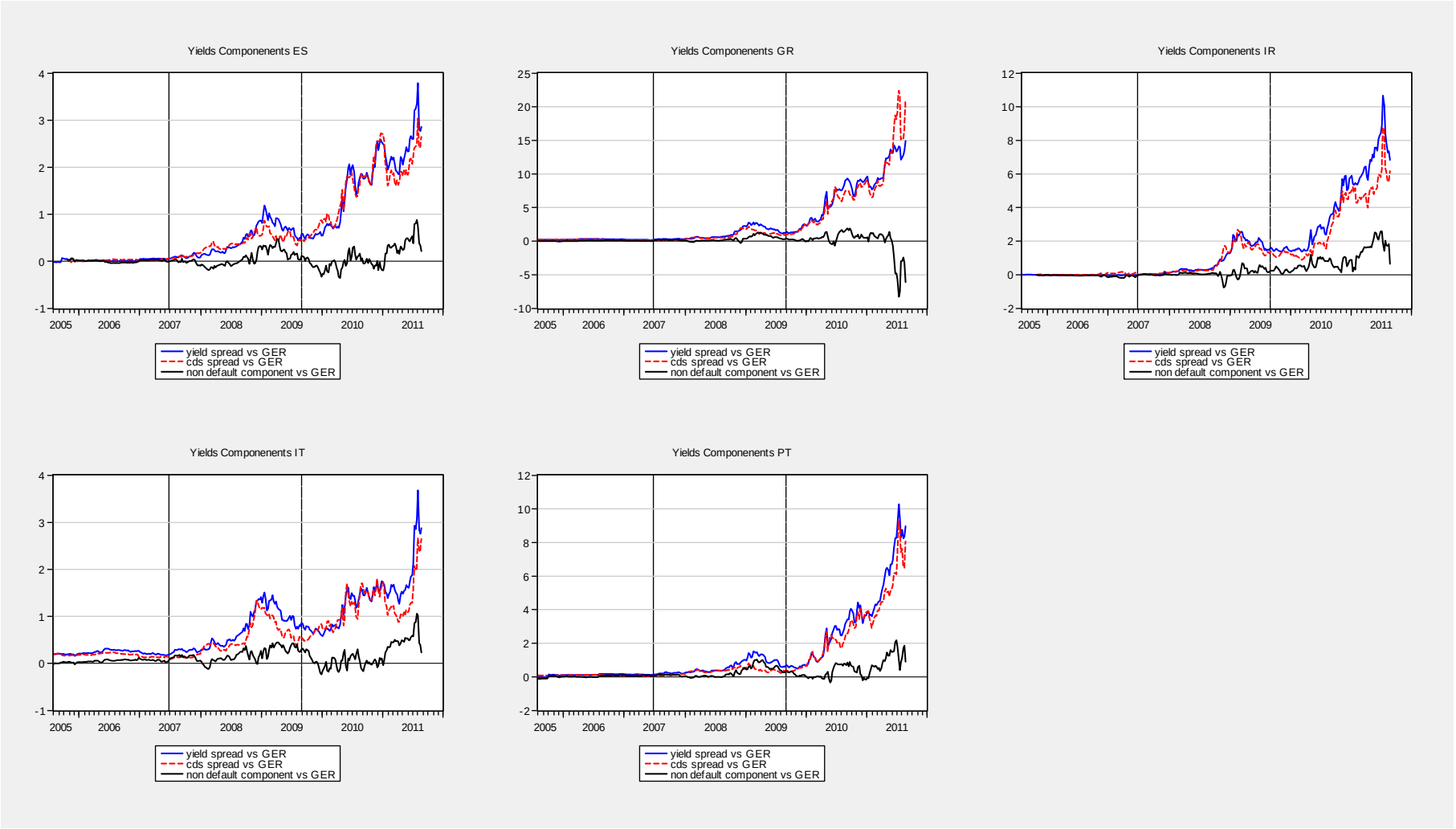


Figure 3b. The default and non default component in yields spreads – High Yielders

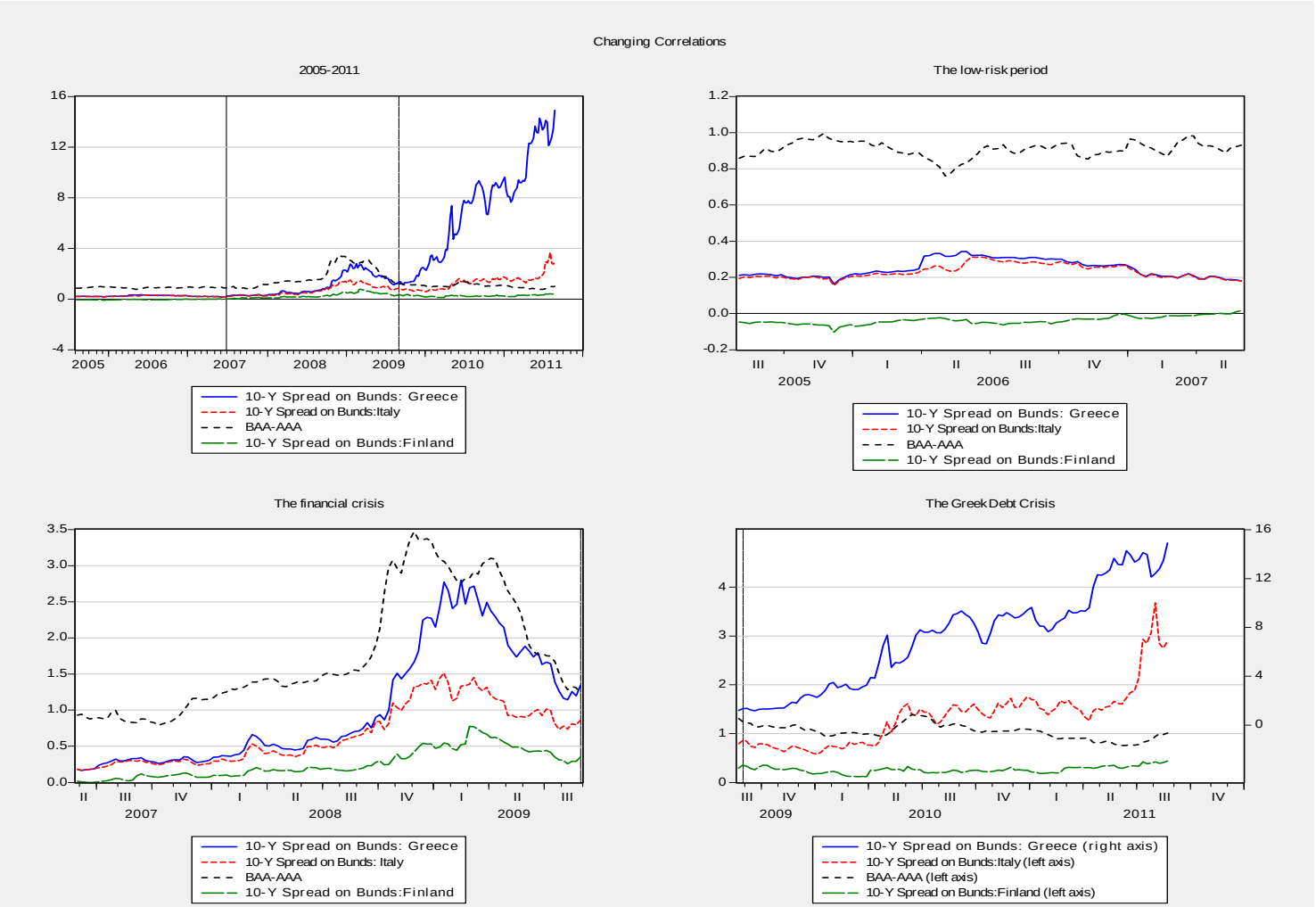


Figure 4. Changing Correlations *Sources*: Datastream/Thomson Financial and our calculations.

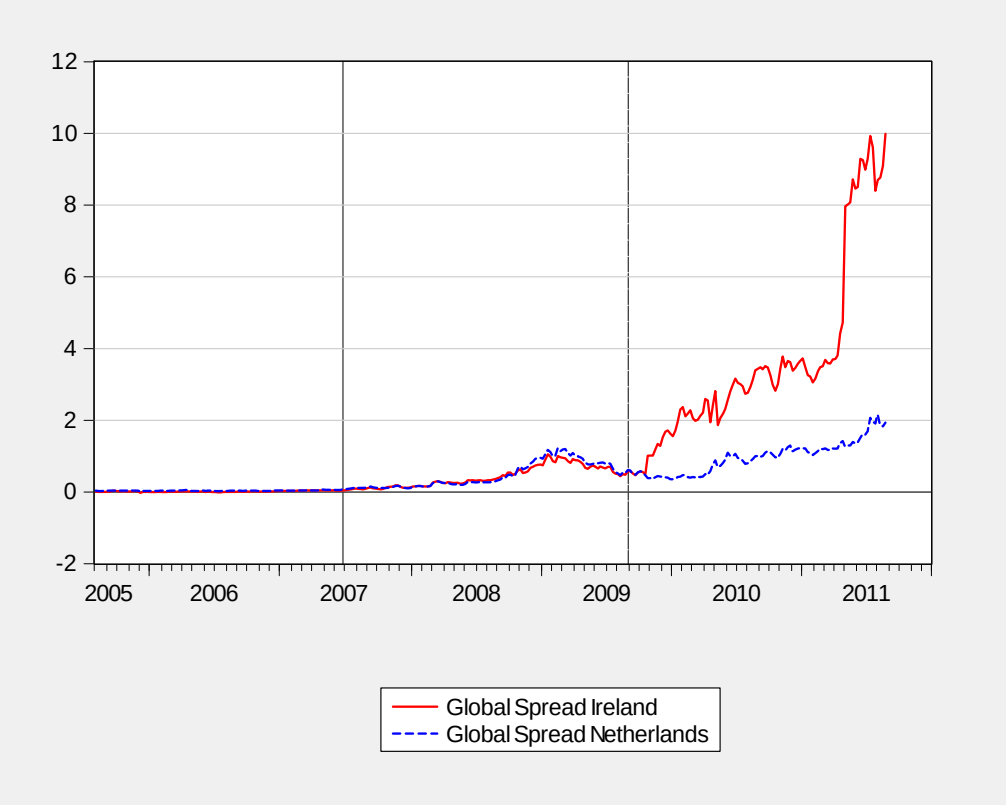


Figure 5. Global Spreads for an high-yielder and for a low-yielder *Sources*: Authors Calculation.

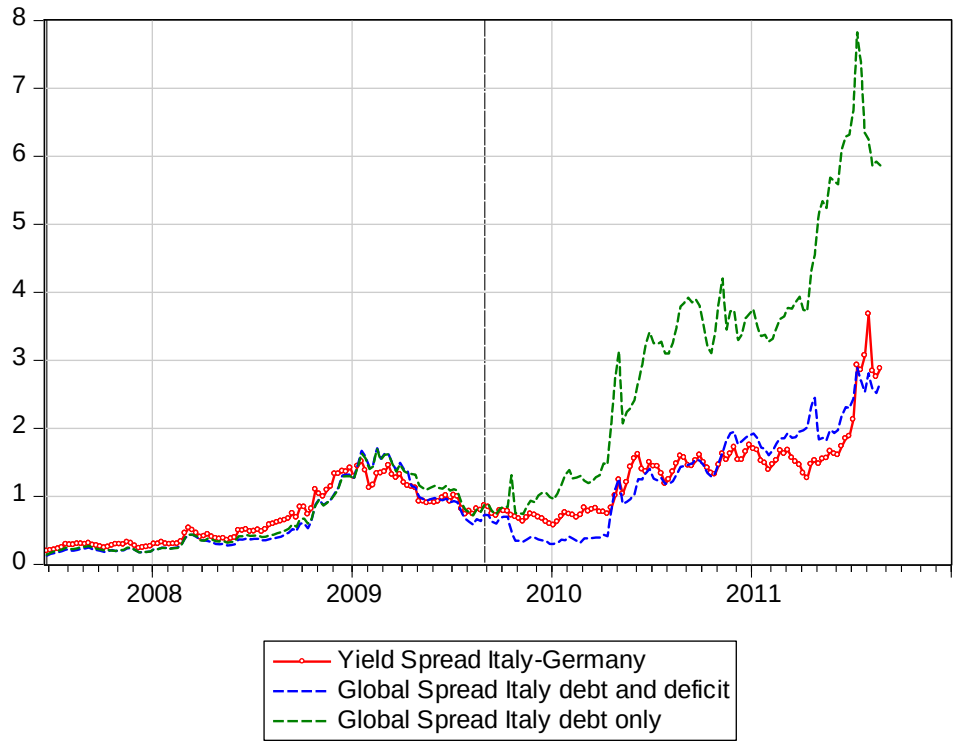


Figure 6. Global Spreads based on different indicators of distance. *Sources*: Authors Calculation.

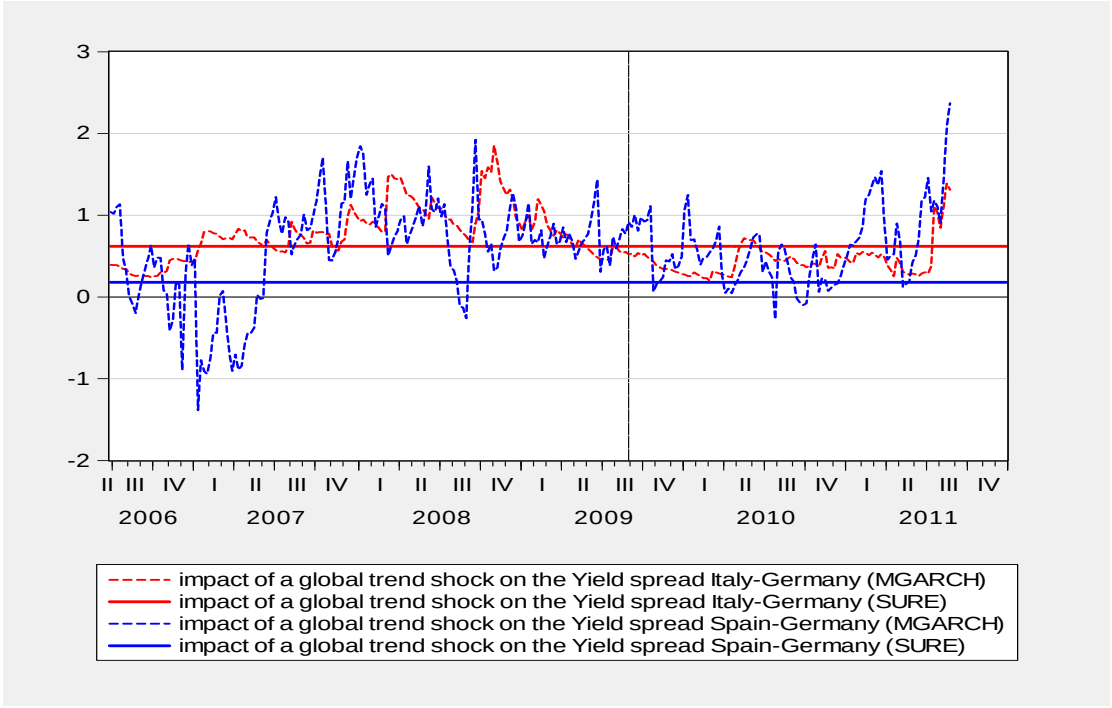


Figure 7. Interdependence and Contagion between the Local spreads and the Global Spreads
Sources: Authors Calculation.

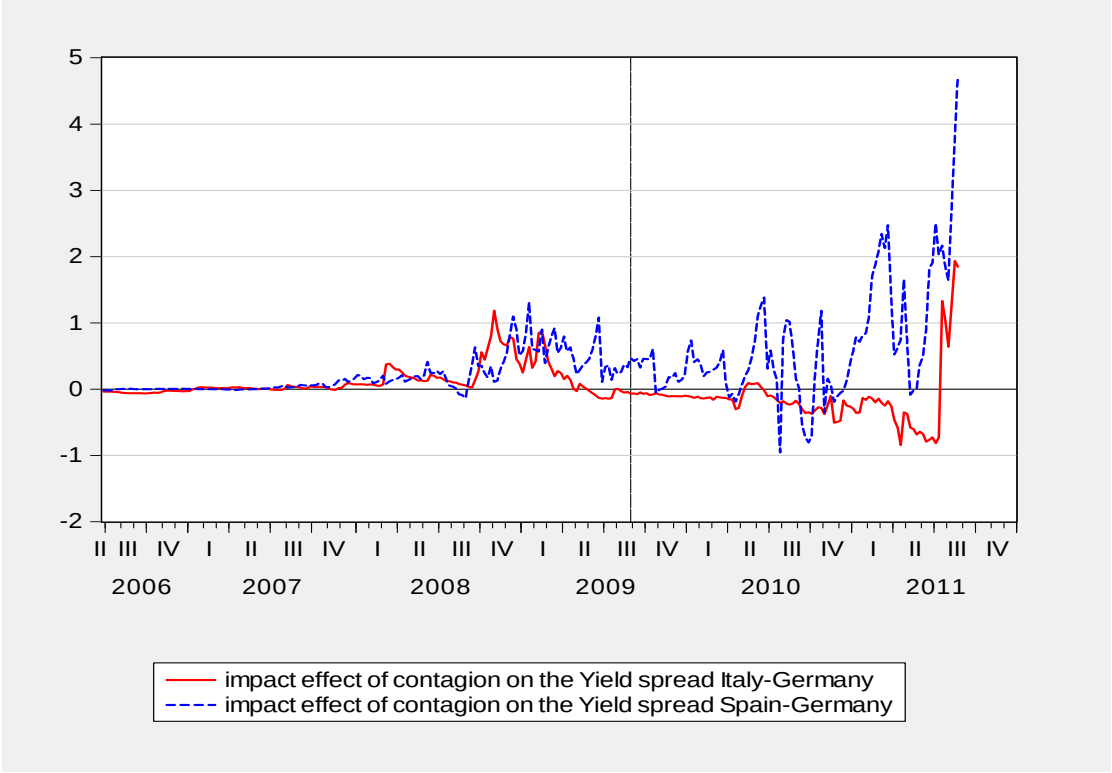


Figure 8. The impact effect of Contagion on local yield

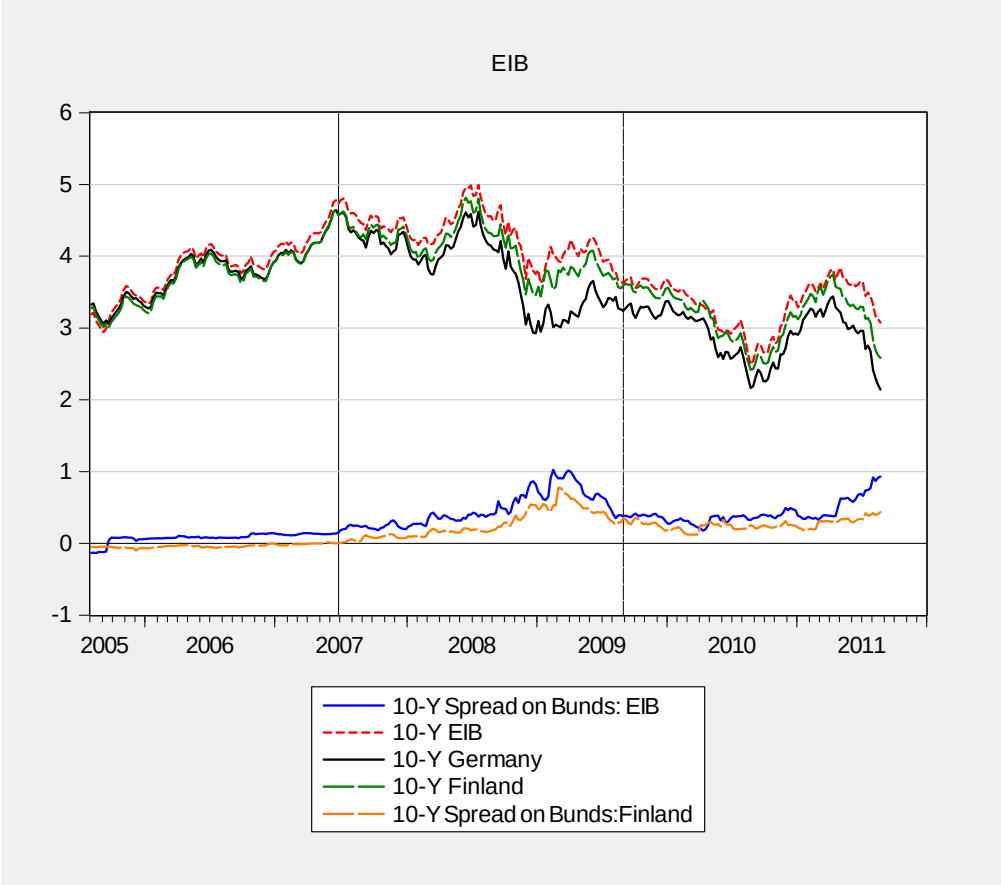


Figure 9. The interest rate on Eurobonds issued by the EIB

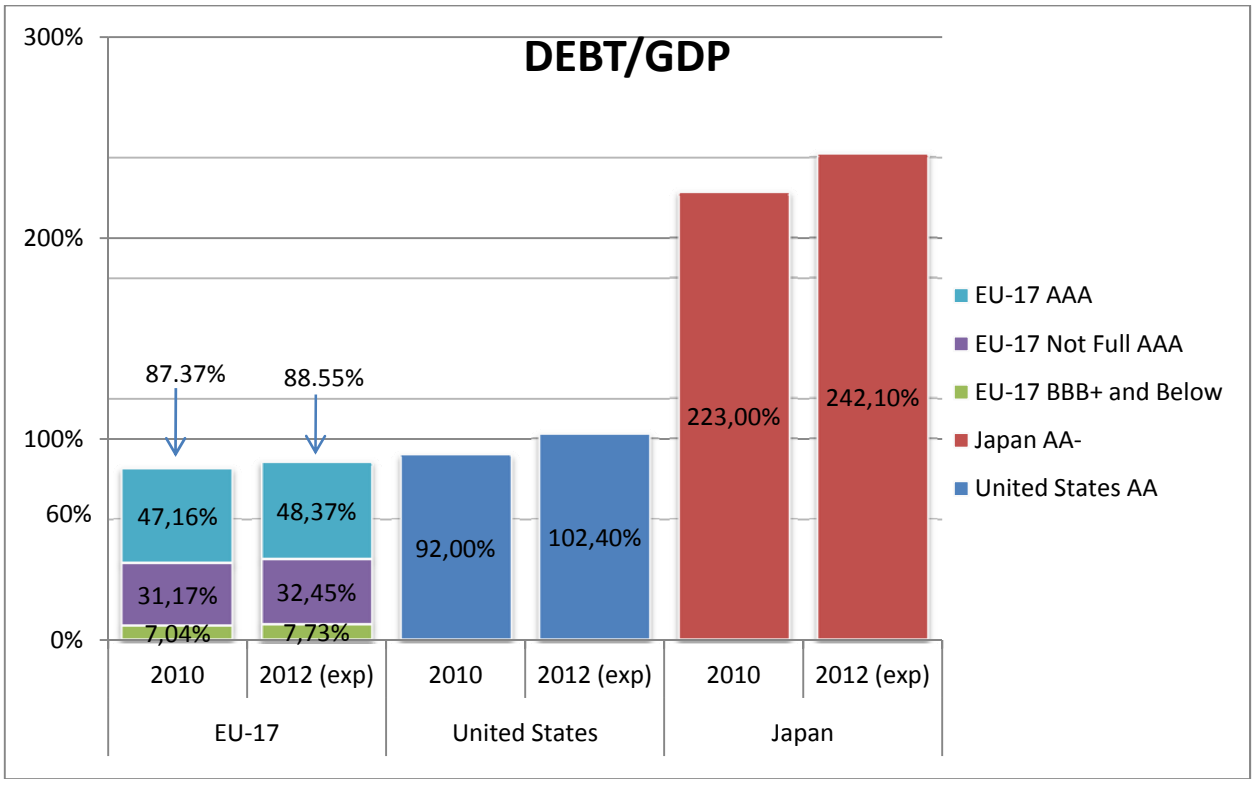
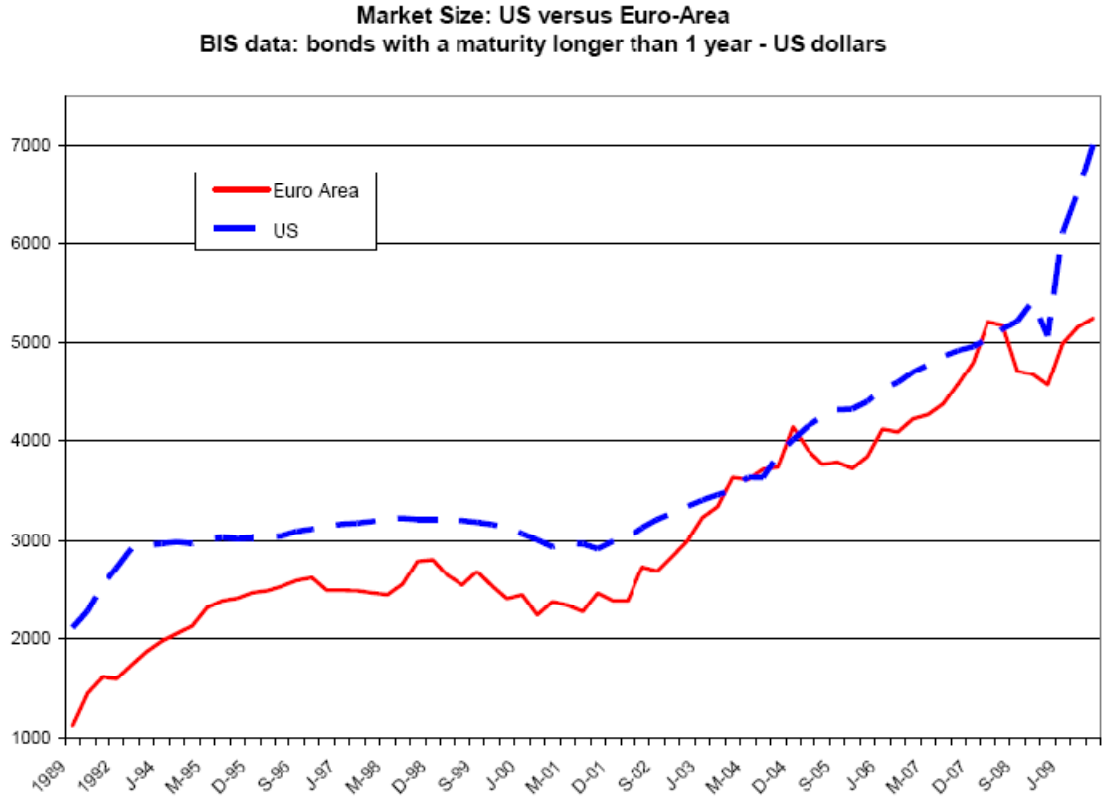


Figure 10. The composition by rating range of euro-area and non-euro area government debt



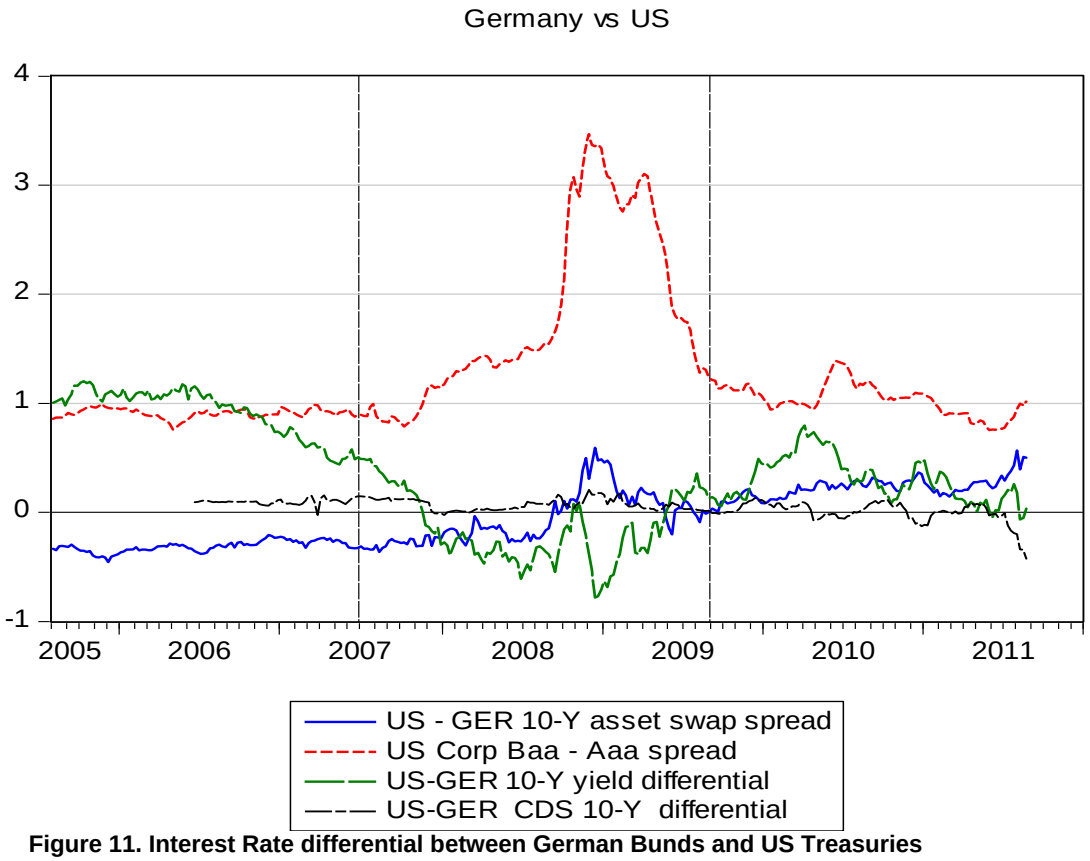


Figure 11. Interest Rate differential between German Bunds and US Treasuries