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What Drives Sovereign Risk Premiums? An Analysis of Recent Evidence from the Euro Area

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WHAT DRIVES SOVEREIGN RISK PREMIUMS? AN ANALYSIS OF RECENT EVIDENCE FROM THE EURO AREA

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ABSTRACT/RÉSUMÉ

What drives sovereign risk premiums? An analysis of recent evidence from the euro area

This paper analyses recent large movements in the yield spread for sovereign bonds as between Germany and other euro area countries. While the general increase in risk aversion that has characterised the financial crisis is an important factor on its own, it is found that this has also magnified the importance of fiscal performance, in particular as measured by the ratio of debt service to tax receipts and expected fiscal deficits. Moreover, there is evidence to suggest that such effects are non-linear, so that incremental deteriorations in fiscal performance lead to ever larger increases in the spread. These findings imply that financial market reaction could become an increasingly important constraint on fiscal policy for some countries, a feature which was much less apparent in the years prior to the financial crisis when general risk aversion was abnormally low.

JEL Classification: E43; E62; G12.

Keywords: Bond market; debt; deficit; fiscal policy; government bonds; interest rates.

* * * * *

Quels sont les déterminants des primes de risque des États ? Une analyse récente de la zone euro

Cet article analyse les récents mouvements importants des écarts de taux des obligations d'État des pays de la zone euro avec l'Allemagne. L'augmentation généralisée de l'aversion au risque qui a accompagné la crise financière est un facteur important en soi. L'article montre en outre que ce phénomène a amplifié l'impact des performances budgétaires, en particulier quand elles sont mesurées par le ratio du service de la dette aux recettes fiscales et par les déficits budgétaires anticipés. De plus, ces effets se révèlent non linéaires, ce qui se traduit par le fait que les détériorations supplémentaires des performances budgétaires amènent à des augmentations toujours plus importantes des écarts de taux. Ces résultats suggèrent que les réactions des marchés financiers pourraient devenir une contrainte de plus en plus importante à la politique budgétaire de certains pays, une caractéristique qui était beaucoup moins visible durant les années antérieures à la crise où l'aversion générale au risque était anormalement basse.

Classification JEL : E43; E62; G12.

Mots clés: marché obligataire; dette; déficit budgétaire; politique budgétaire; obligations d'État ; taux d'intérêt.

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WHAT DRIVES SOVEREIGN RISK PREMIUMS? AN ANALYSIS OF RECENT EVIDENCE FROM THE EURO AREA

by

David Haugh, Patrice Ollivaud, and David Turner[1]

Introduction

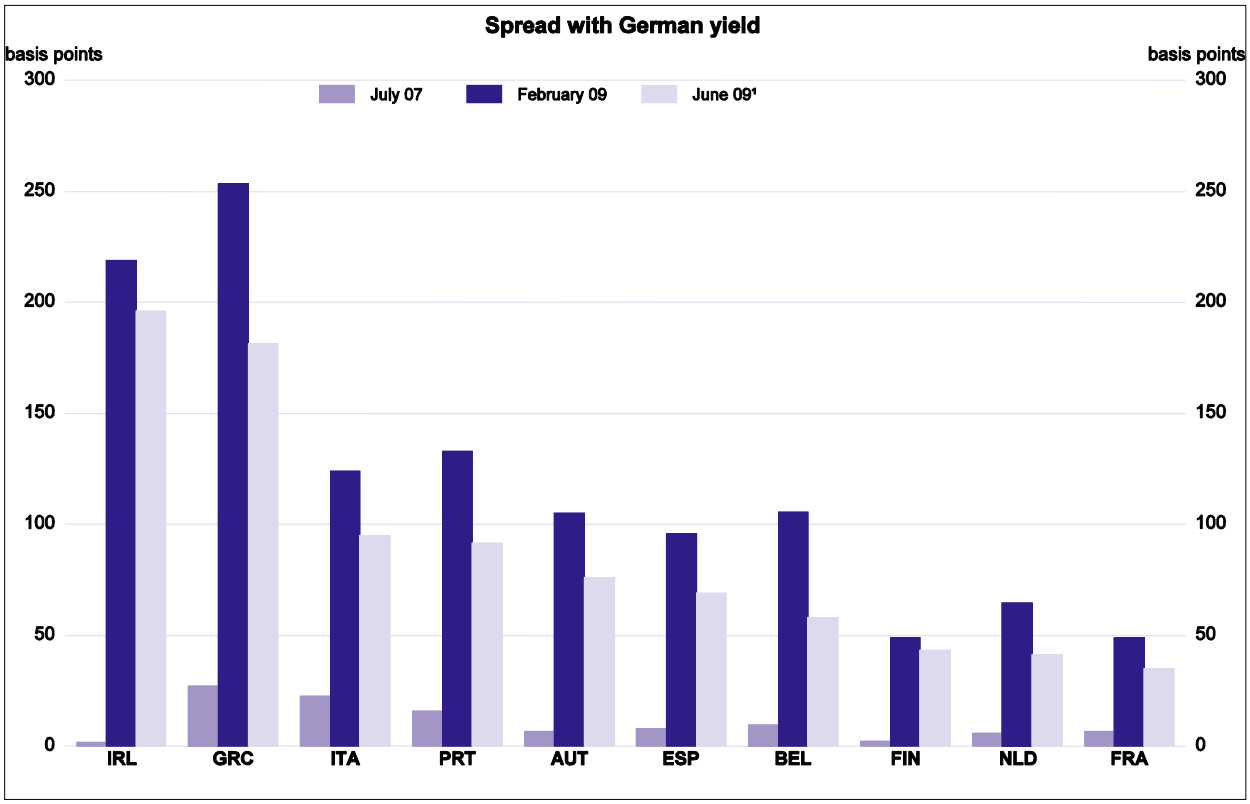
1. The response of financial markets to fiscal imbalances is particularly important when many countries are simultaneously experiencing a rapid deterioration in their fiscal positions due to automatic stabilisers. Given the large size of government debt relative to GDP in many OECD countries, increases in government bond rates could impose a serious constraint on future fiscal choices due to higher debt servicing costs.

2. The large widening in government bond spreads in the euro area since the onset of the financial crisis in August 2007 provides an opportunity to re-examine the role that fiscal conditions may play in explaining yield differentials (Figure 1). Focusing on government bond spreads in the euro area since the advent of the single currency has the advantage of controlling for some of the difficult-to-measure factors that influence spreads outside a currency union, including expected exchange rate movements and exchange rate risk, expected inflation and central bank credibility. Consequently it is easier to identify liquidity and credit risk premia acting on spreads, where a presumption is that the latter is sensitive to the scale of fiscal imbalances.

3. The next section reviews the literature on the drivers of long-term sovereign interest rates generally and spreads between euro area countries more specifically. This informs the empirical approach to model euro area government bond spreads detailed in section 3. This is followed by a discussion of the results and the policy implications in the current conjuncture.

1. The authors would like to thank participants at an internal OECD seminar for comments and suggestions and Anne Eggimann for secretarial assistance. All remaining errors remain the responsibility of the authors.

Figure 1. Euro area 10-year government bond spread with Germany



1. Data till 24 June 2009.

Source: Datastream.

Determinants of interest rate spreads on long-term sovereign bonds: a brief review of the literature[2]

4. An important determinant of the differences in long-term interest rates across countries is the variation in the risk premium that investors demand for holding these assets, which can include both liquidity and credit risk components. Liquidity tends to vary inversely with the size of the market. In large bond markets, investors can trade quickly and face a lower risk that prices will change due to individual transactions and therefore will demand less compensation in terms of the yield. The credit risk component is the extra yield required to offset the expected higher loss from some non-zero probability of less than full repayment. It is important to note that credit risk encompasses all situations where the borrower would not be able to fully repay the loan under the initially agreed conditions. [3] It may depend on investor assessments of the fiscal position as this affects the sustainability of the debt (*i.e.* whether it will continue to grow faster than national income or not) and the likelihood of repayment.

2. This section draws heavily from "The Effectiveness and Scope of Fiscal Stimulus" in OECD (2009), *OECD Interim Economic Outlook*, Paris.

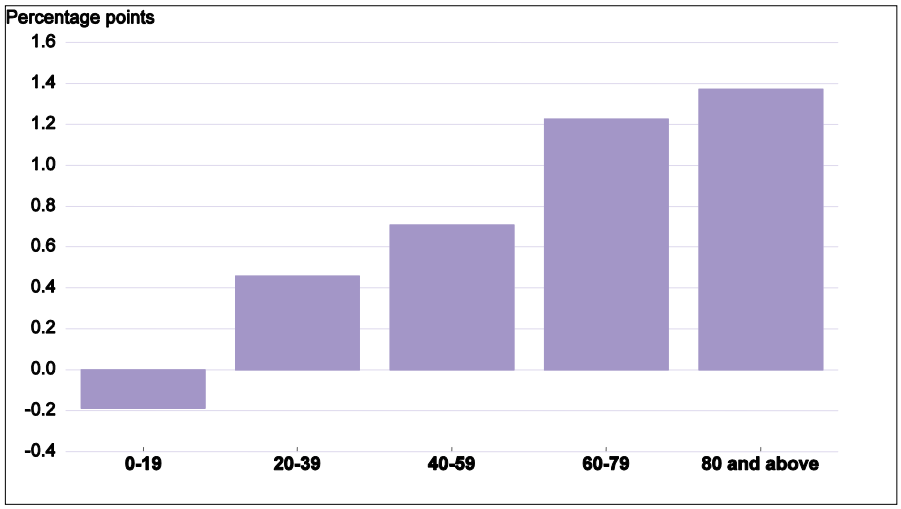
3. More generally, creditors also face the risk that governments may choose to inflate away part of their debt burden. This risk is common across the countries of the euro area since they have a common currency, so a change in inflation expectations may help explain changes in the level of interest rates across the euro area but not the spreads within the euro area.

Recent evidence relating to OECD countries linking fiscal imbalances and interest rates

5. The empirical evidence regarding the effect of fiscal imbalances on interest rates is both mixed and controversial. However, the spread between a measure of long and short-term interest rates across all OECD countries since the mid-1990s is positively correlated with government indebtedness (Figure 2). Moreover, an increasingly common finding in the literature is that expected, rather than current, fiscal deficits have an effect on long-term interest rates on government bonds (Table 1). For example, Laubach (2003) finds that a 1 percentage point increase in expected fiscal deficits in the United States increases interest rates on ten-year government bonds by about 25 basis points. There is also some evidence that interest rate effects are non-linear and tend to be greater at higher levels of indebtedness. Such non-linear effects are also found in Bayoumi *et al.* (1995) among US states and by Conway and Orr (2002) and O'Donovan *et al.* (1996) for the major OECD countries. Bayoumi *et al.* (1995) using a sample of US states find that government debt levels affect state spreads *versus* New Jersey (the benchmark) in a non-linear way. At the mean level of debt, the interest rate rises by 23 basis points per percentage point increase in the ratio of debt to state product; at one standard deviation above the mean debt level, the increase is 35 basis points; at 25% above the highest debt level in the sample, the estimates implied full credit rationing.

Figure 2. Higher government debt tends to raise long-term interest rates

Spread between long-term and short-term interest rates versus gross government debt in % of GDP



Note: Bars represent average across all OECD countries for which data are available over the period 1994 to 2008. Short-term interest rates are typically rates on 3-month Treasury bills and long-term interest rates those on 10-year government bonds.

Source: OECD Economic Outlook 85 database.

Table 1. Estimated impact of fiscal variables on interest rates

Reference	Countries	Fiscal variables[1]	Estimated effects on long-term interest rates in basis points (bps)
Studies that focus on flow fiscal variables			
Thomas and Wu (2009)	United States	A 1% point increase in projected fiscal deficit in 5 years	30-60 bps
Bernoth et al (2006)	14 EU countries	A debt -service ratio 5% above Germany's	32 bps (Spread vis-à-vis Germany, post-EMU period, some non-linear effects)
Dai and Philippon (2005)	United States	A 1% point increase in fiscal deficit lasting 3 years	20-60bps
Ardagna et al (2007)	16 OECD countries	A 1% point deterioration in primary balance	10 bps
Laubach (2003)	United States	A 1% point increase in projected fiscal deficit	25 bps
Literature review by Gale and Orzag (2003)	United States	A 1% point increase in projected fiscal deficit	40-50 bps
Literature review by Gale and Orzag (2002)	United States	A 1% point increase in projected fiscal deficit	50-100 bps (macro models) 50 bps (others)
Canzeroni, Cumby and Diba (2002)	United States	A 1% deterioration in projected fiscal balance, 5 to 10 year ahead	41-60 bps (Spread of 10-year yield over 3-month)
Linde (2001)	Sweden	A 1% deterioration in fiscal balance	25 bps after 2 years (Domestic-foreign long-term interest differential)
Reinhart and Sack (2000)	19 OECD countries	A 1% deterioration in fiscal balance in current and next years	9 bps (yield)
	G7		12bps (yield)
Orr, Edey and Kennedy (1995)	17 OECD countries	A 1% point deterioration in fiscal balances	15 bps
Studies that focus on stock fiscal variables			
Chinn and Frankel (2005)	Germany, France, Italy, UK and Spain	A 1% increase in current net debt	5-8 bps
		A 1% increase in net public debt ratio projected 2 years ahead	10-16 bps
	USA	A 1% increase in current or projected net debt	5 bps over period 1998-2002, but obscured when extended to 2004
Ardagna et al (2007)	16 OECD countries	Public debt	non-linear
Engen and Hubbard (2004)	United States	A 1% point increase in debt ratio	3 bps (with ranges)
Laubach (2003)	United States	A 1% point increase in projected debt ratio	4 bps
Chinn and Frankel (2003)	Germany, France, Italy, Japan, Spain UK and USA	A 1% increase in net public debt ratio projected 2 years ahead	3-32 bps (individual country) 7-12 bps (European interest rates)
Codogno et al (2003)	9 EMU countries	Debt-to-GDP ratio	Small and significant effects on spreads for Austria, Italy and Spain
Conway and Orr (2002)	7 OECD countries	A 1% point increase in net public debt	Less than 1 bps (Real 10-year bond yields, starting from zero net debt) 1.5 bps (Real 10-year bond yields, starting from 100% net debt)
O'Donovan, Orr and Rae (1996)	7 OECD countries	A 1% point increase in net public debt	Less than 1 bps (Real 10-year bond yields, starting from zero net debt) 2 bps (Real 10-year bond yields, starting from 100% net debt)
Ford and Laxton (1995)	9 countries	A 1% point increase in world net public debt	14 - 49 bps (Real 1-year bond yields)
	World		15 -27 bps (Real 1-year bond yields)

1. All changes are expressed in relation to GDP unless otherwise specified.
Source: OECD.

Recent evidence relating to euro area countries linking fiscal imbalances and interest rates

6. Recent studies relating to the euro area also suggest that fiscal variables also have a role in explaining spreads, although their preferred form varies across studies and with the estimation period, suggesting their role may be changing over time and especially since the beginning of EMU. An important limitation of these studies is that they at most only partially incorporate the current financial crisis and so either do not include the recent widening in spreads in their estimation at all or only partially. The evidence presented by Codogno *et al*. (2003) on the role of debt ratios is mixed: no indebtedness effects are detected for ten euro zone countries, but for Austria, Spain and Italy the effect of general risk aversion interacts with the debt-to-GDP ratios to explain the spreads. Bernoth *et al.* (2006) find that since the start of EMU in 1999, fiscal imbalance effects are better captured by a measure of debt service (debt payments to current revenue) than either the debt-to-GDP ratio or the deficit-to GDP ratio. Moreover, they find evidence that the effect of debt service on spreads is non–linear. The authors point out that this measure has the advantage that it allows for the fact that different countries have varying ability to raise taxes from a given value of GDP (for example, due to the varying extent of the grey/black economy as well as differences in tax system efficiency), whereas using GDP as the denominator of a ratio will miss such effects. Furthermore, they claim since it is not a Maastricht treaty variable used to monitor government fiscal positions, the market may place more confidence in it because it is perhaps less open to manipulation by euro member governments.

7. There is also some evidence suggesting that following EMU the role of the *expected* fiscal deficits may be more important in explaining risk premiums incorporated in sovereign bond yields. Heppke-Falk and Huefner (2004) find that after 1999 the *expected* budget deficit is significant in explaining the risk premium on German and French sovereign bonds (but not in the Italian case), although over their whole sample of 1994-2004 no effect was found.

8. Liquidity may also play a role in the interest rate differentials and the size of the effect is controversial. Codogno *et al*. (2003) find that liquidity has a role in explaining interest rate differentials but that this effect is usually dominated by general risk aversion (except for France). Bernoth *et al*. (2006) find that, while liquidity (measured as the ratio of a country's bonds outstanding to total euro area bonds outstanding) has historically had a role in explain spreads, this effect is no longer apparent following EMU. Schuknecht *et al*. (2008) also could not find a significant role for their liquidity measure (issue volume) in explaining spreads. In contrast, Manganelli and Wolswijk (2009) find that liquidity can explain nearly half the spread when interest rate levels are high. More generally, they find in normal times (their data sample runs from March 1999 to April 2008) that there is a positive link between interest rate levels and sovereign spreads in the euro zone.

9. Following the start of the financial crisis, government exposure to weakness in the financial sector may have also become a factor in explaining sovereign spreads in the euro area. Mody (2009) finds that exposure to financial sector weakness was not an important determinant of sovereign spreads prior to the collapse of Bear Sterns in March 2008. However, as the financial crisis progressed and an increasingly explicit link was established between financial sector distress and public sector bailouts, a country's vulnerability to financial sector frailty became a progressively important determinant of spreads.

The empirical approach to modelling euro area spreads

10. To assess the determinants of spreads, a simple panel model of the spread between the yield on ten-year sovereign bonds between ten euro area countries and Germany is estimated over the period December 2005 to June 2009 using data calculated in quarterly averages at six monthly intervals (*i.e.* the

December 2005 quarter followed by the June 2006 quarter and so on).[4] The explanatory variables are expressed as differences between the value of the variable for each of the ten euro area countries and those for Germany.

11. A general-to-specific approach is adopted, commencing with a general equation encompassing a range of explanatory variables on the basis of previous empirical work and theory. Variables initially used in the general equation to proxy for investor assessments of credit risk include various measures of government indebtedness (both the gross and net debt-to-GDP ratios, as well as a debt service ratio measured as the ratio of interest payments on government debt to current government revenue), expected future fiscal deficits over the next five years (proxied by successive *Economic Outlook* forecasts)[5] and a bi-variate "fiscal track record" indicator which takes a value of unity if a country has a history of running large fiscal deficits over a prolonged period and zero otherwise.[6] The general degree of risk aversion is also reflected by using a measure of the euro area corporate bond spread. In addition, the possible effect on spreads arising from expected future public pension expenditures is examined. Finally, the ratio of a country's outstanding euro denominated long-term government bonds to euro-area-wide total outstanding government bonds of the same type is included to provide a proxy for liquidity (see Annex 1 for further details of the data used and sources). This results in the following general specification:

$$S_{it} = \beta_0 + \delta_0\rho_t + \beta_1' X_{it} + \beta_2'\rho_t X_{it} + \beta_3'\gamma_{it}X_{it} + \beta_4'\rho_t Y_{it} + \beta_5'\gamma_{it}Y_{it} + \varepsilon_{it}$$

where S_{it} is the difference between the 10 year government bond yield for country i and Germany at time t, ρ_t is a measure of general risk aversion at time t, γ_{it} is a binary measure of the track record of country i at time t, X_{it} is a column vector containing one or more of the fiscal performance and liquidity variables, Y_{it} is column vector containing one or more of the fiscal performance variables squared, and β_1 β_5' are row vectors of coefficients.

12. Interaction terms between both the general risk aversion and fiscal track record variables, on the one hand, and the other fiscal variables, on the other hand, are included to test whether either general risk aversion or a poor fiscal track record tends to amplify the effects of fiscal variables. Both linear and quadratic terms are tested to examine whether the effect of various variables including the debt service ratio may have a non-linear effect on spreads as suggested by previous work. The equations are estimated using two stage least squares. In particular the US corporate bond spread is used to instrument for the euro area corporate spread (the proxy for general risk aversion) to reduce the likelihood that the risk variable is endogenous to the dependant variable.

4. The euro area countries in the sample include Austria, Belgium, Finland, France, Greece, Ireland, Italy, Netherlands, Portugal and Spain.

5. The first two years of the five- year projection are based on the country desk projections. The subsequent three years are obtained from the *Economic Outlook Medium Term Baseline.*

6. More specifically, a poor fiscal track record is determined by the following simple rules: by default a country has a good track record. For a country to switch from a good track record to a poor track record requires three consecutive years of a fiscal balance below -3% of GDP and no previous record of halving a fiscal deficit to below -3% of GDP in less than three years or five consecutive years of a fiscal balance below -3%. For a country to switch from a poor track record to a good track record requires three consecutive years of a fiscal balance above -3% of GDP and a previous record of halving a fiscal deficit to below -3% in less than three years or five consecutive years of a fiscal balance above -3%.

Empirical results

13. Several alternative equations are presented (Table 2).[7]

Table 2. Determinants of bond spreads in the euro area

	Equation 1		Equation 2		Equation 3		Equation 4	
	Coefficient	t statistic	Coefficient	t statistic	Coefficient	t statistic	Coefficient	t statistic
Constant	-1.08	-0.32	0.71	0.29	2.81	1.31	2.37	1.20
Risk[2]	3.31	9.18	1.84	5.70	1.71	5.60	1.73	6.18
Track record*debt service[3]	3.29	2.31	1.63	1.56				
Expected fiscal balance[4]					-2.60	-2.38	-2.76	-2.75
Risk*expected fiscal balance	-0.49	-6.46	-0.45	-8.18	-0.28	-3.03	-0.23	-2.69
Risk*debt service squared[5]	0.02	3.07	0.04	7.74	0.05	12.66	0.04	11.4
Risk*illiquidity[6]			0.04	7.99	0.04	8.69	0.04	8.17
Risk*pension[7]							0.14	3.74
Adjusted R^2	0.83		0.92		0.91		0.93	

1. Estimation Period: 2005 Q4 - 2009 Q2. Frequency: 6 monthly. Countries: Austria, Belgium, Finland, France, Greece, Ireland, Italy, Netherlands, Portugal and Spain.
2. Yield spread between high yield corporate bonds and government bonds.
3. Track record equals 1 if the country has a history of sustained fiscal deficits greater than 3% of GDP otherwise 0.
4. Average of the OECD forecast for the fiscal balance as a percentage of GDP in the following 5 years.
5. Gross government interest payments divided by current government receipts.
6. One divided by the share of the euro denominated long-term government securities market
7. Change in pension expenditure as a share of GDP between 2010 and 2050.

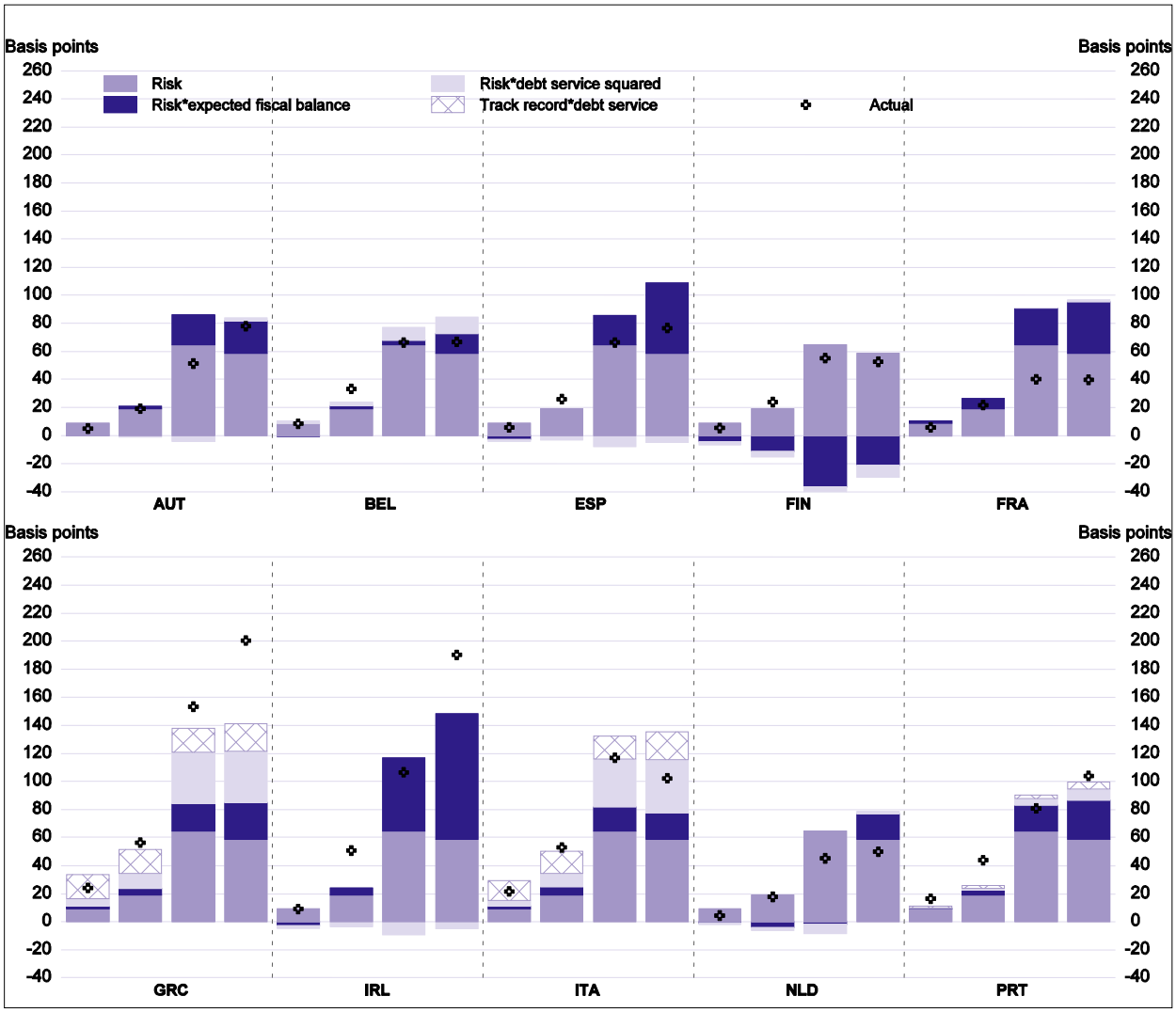
Source: OECD Economic Outlook 85 database, OECD calculations, Datastream, BIS, ECB, EC, Greece Growth and Stability Programme January 2009

14. The key development in the estimation period is a substantial widening of spreads since the onset of the financial crisis in the middle of 2007. Equation 1 is able to explain this general pattern of relative upward movements in spreads since the beginning of the crisis (Figure 3). The preferred measure of indebtedness is the debt service ratio, which follows similar findings to those of Bernoth *et al*. (2006) who argue that the debt service ratio is closer in concept to measures of borrower quality used in corporate finance and allows for the fact that countries differ in their ability to raise taxes from a given volume of GDP and so focuses on the constraint that high debt burdens impose on annual budgetary flows. The influence of the debt-service ratio is non-linear, another finding common to Bernoth *et al.* (2006), and is amplified by both a poor fiscal track record and the degree of general risk aversion. Thus, for a country with initial debt service ratio and expected deficit differentials with Germany equal to the average of the euro area countries in the sample at June 2009, and for June 2009 levels of risk aversion, successive one standard deviation (3 percentage point) increases in the debt-service ratio are predicted to result in an increase in the spread of 16, 40, 71 and 107 basis points, while for a country with a poor fiscal track record the increases would be 28, 62, 102 and 149 basis points. Higher expected future deficits are also important in explaining movements in spreads during 2008-09, particularly in the case of Ireland which has experienced a substantial widening in its spread, although current levels of debt and debt service remain relatively moderate relative to Germany.

7. Results from the initial general equation including liquidity and pension terms that was estimated are in Annex 2.

Figure 3. Contributions to spreads (Equation 1)

2007q2, 2008q2, 2008q4, 2009q2



Note: Equation estimated over the period 2005q2 – 2009q2. See table 2 for details.

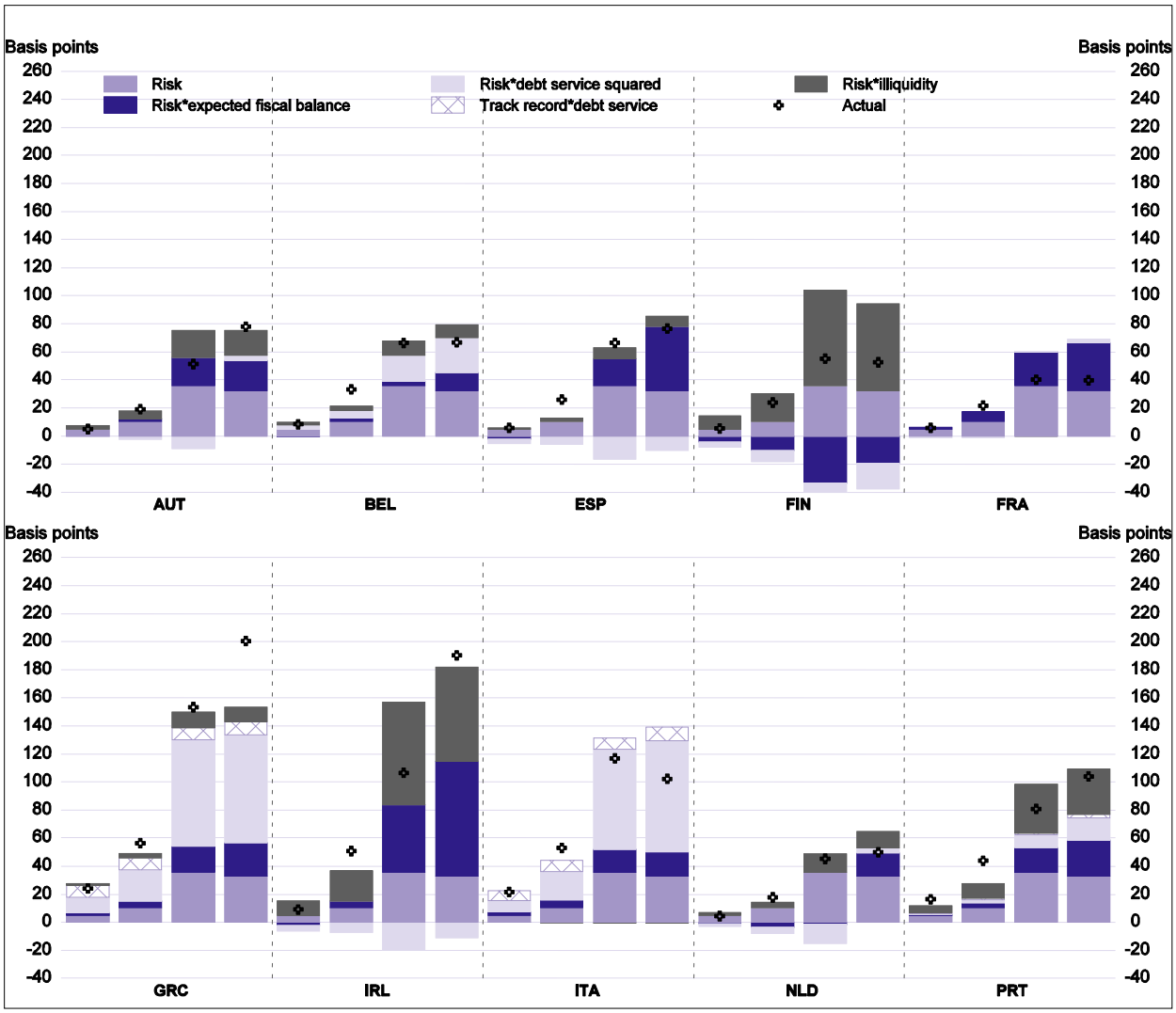
Source: Datastream; and OECD calculations.

15. Liquidity may also help to explain some of the movements in spreads not accounted for by fiscal imbalance variables. The size of the coefficient on the stand-alone risk aversion term declines once an illiquidity term is present in the equation. The significance of the track record term also declines. Equation 2, which includes an illiquidity term, has an improved fit compared to Equation 1 and suggests that France and Italy may benefit notably from their relatively large bond markets compared with the smaller euro-area countries. Holding all else constant, in the June 2009 quarter greater liquidity accounted on average for a lower spread of around 30 basis points in these markets compared to the smaller euro area

countries.[8] In the case of Ireland and Finland, the results suggest that it accounted for around 60 basis points of the difference (Figure 4).[9]

Figure 4. Contributions to spreads (Equation 2)

2007q2, 2008q2, 2008q4, 2009q2



Note: Equation estimated over the period 2005q2 – 2009q2. See Table 2 for details.

Source: Datastream; and OECD calculations.

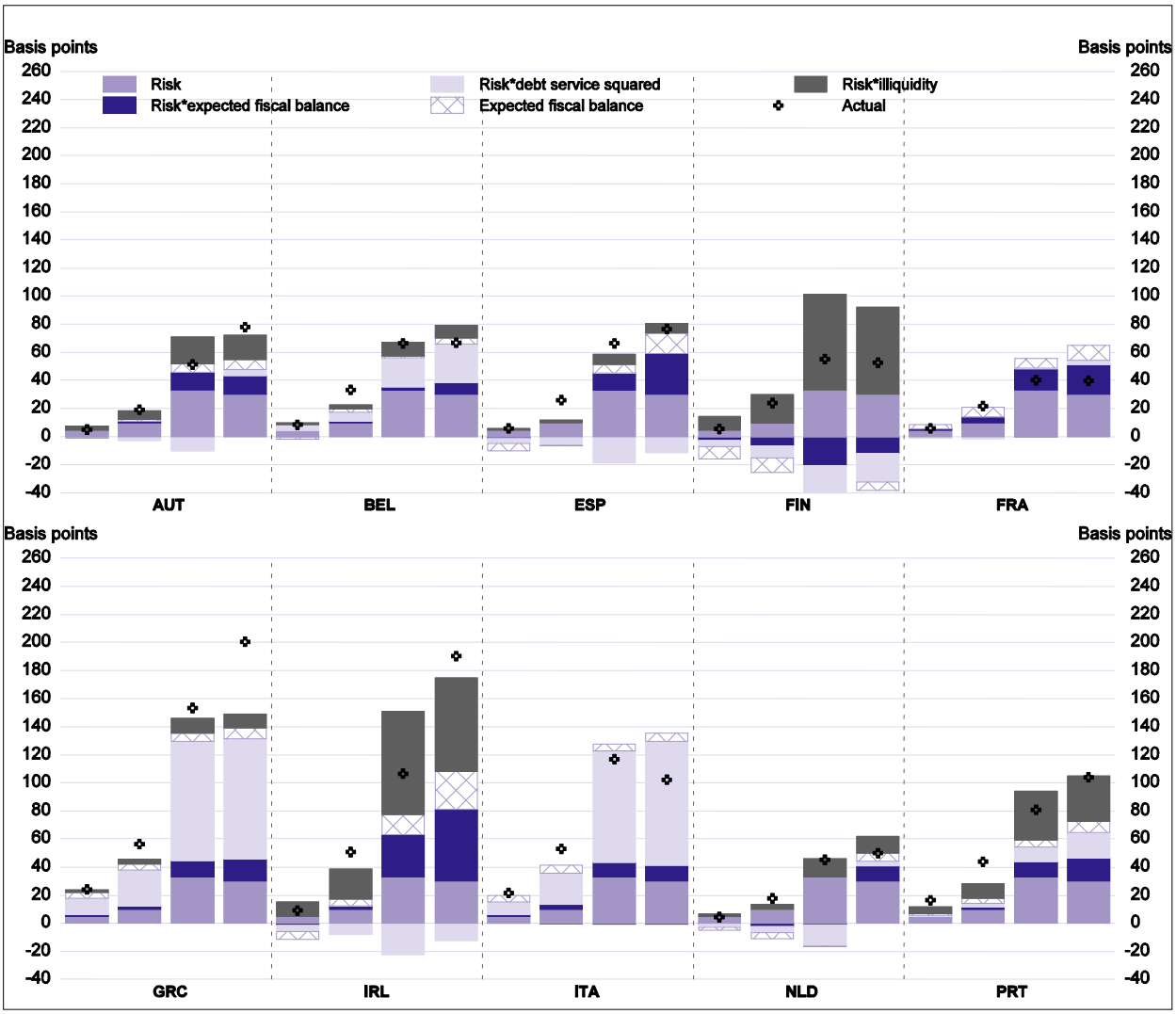
8. Average for Austria, Belgium, Finland, Greece, Ireland, Netherlands and Portugal.

9. The illiquidity variable (measured as the reciprocal of the country's share of the euro area bond market) is non-linear so that illiquidity rises faster as a country's share of the bond market approaches zero. Exploratory testing found that introducing non-linearity in the illiquidity term improved the explanatory power of the overall model.

16. As an alternative to Equation 2, Equation 3 includes a term for the fiscal balance on its own as well as interacted with general risk aversion. Equation 3 no longer includes the track record term.[10] This further lowers the coefficient on the stand-alone risk term and implies that at least some part of the influence of the expected fiscal balances on spreads is independent of general risk aversion but otherwise the results are similar to Equation 2 (Figure 5).

Figure 5. Contributions to spreads (Equation 3)

2007q2, 2008q2, 2008q4, 2009q2



Note: Equation estimated over the period 2005q2 – 2009q2. See table 2 for details.

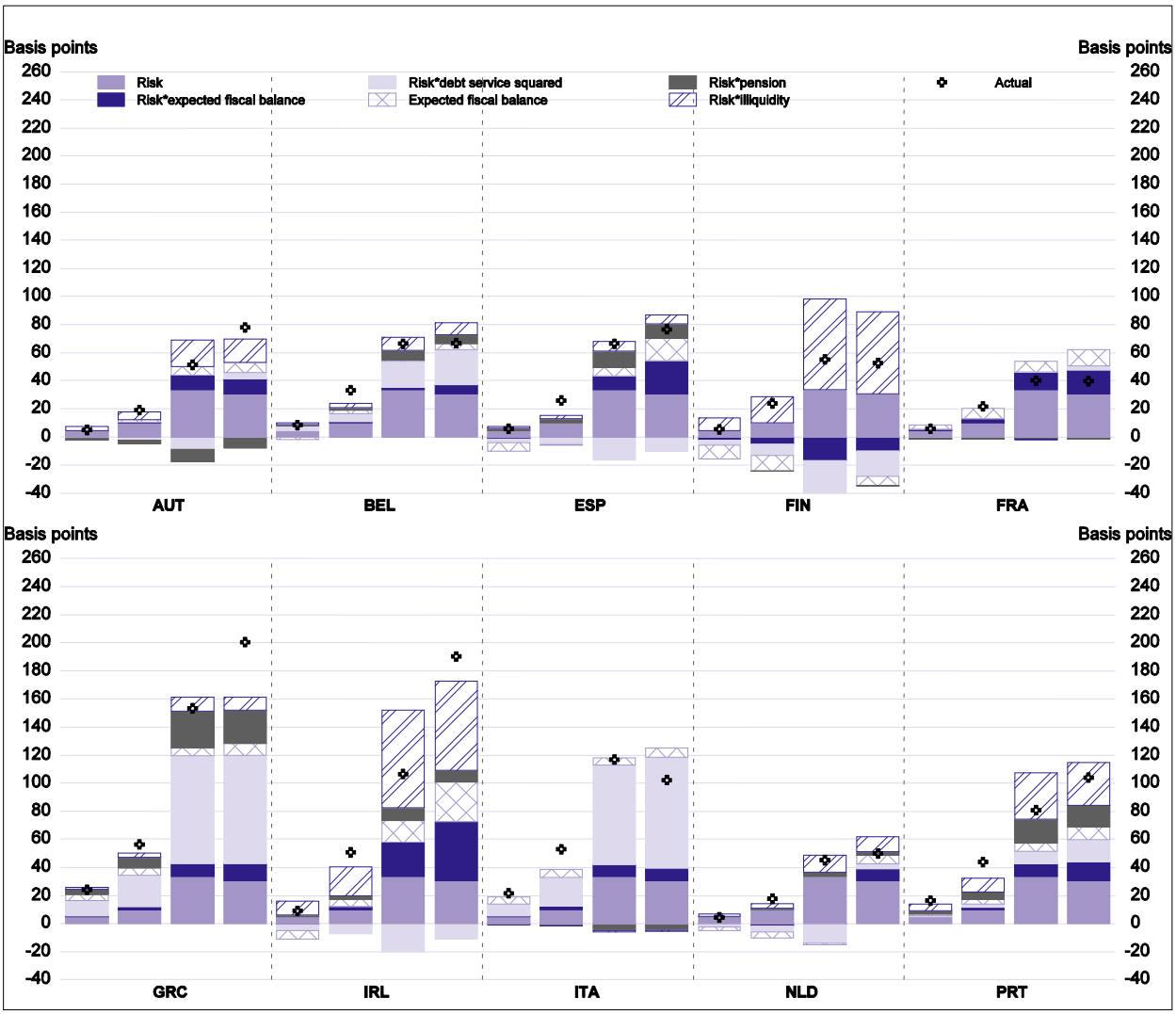
Source: Datastream; and OECD calculations.

10. The stand-alone expected fiscal term and track record interacted with the debt service ratio terms are both insignificant at the 5% level when both are present in the equation. However, their t-statistics rise notably once the other term is dropped from the equation. The significance of the track record term rises still further when the estimation period is shortened.

17. Equation 4 includes terms for both illiquidity and the expected change in pension expenditure from 2010 to 2050 as a proportion of GDP (Figure 6). Once the pension term is present in the equation, the track record term is no longer significant in the equation. The addition of the pension expenditure term slightly improves the overall fit of the equation. Along with the liquidity term, the pension term may help to explain why the Greek spread may have increased markedly more than the Italian one in recent times despite both countries having similar debt-service ratios and expected future deficits. Greece's future pension liabilities are expected to increase by 12 percentage points of GDP between 2010 and 2050

Figure 6. Contributions to spreads (Equation 4)

2007q2, 2008q2, 2008q4, 2009q2



Note: Equation estimated over the period 2005q2 – 2009q2. See table 2 for details.

Source: Datastream; and OECD calculations.

compared with 0.7 percentage point for Italy over this period. According to the equation, this would explain around 30 basis points of the difference in the spreads.[11] Overall, the expected future fiscal deficit and the non-linear debt service ratio terms interacted with risk aversion appear to be the most robust explanatory factors of the relative movement in spreads. They remain consistently correctly signed and highly significant in all equations and robust to the inclusion of varying controls and different estimation periods.

18. In summary, the equations suggest that an increase in expected fiscal deficits is likely playing a large role in the increase in spreads across all countries and particularly Ireland. Relatively high debt-service ratios are also strongly contributing to spreads in Italy, Greece and, to a lesser extent, in Belgium and Portugal. Liquidity appears to be substantially lowering the spreads of Italy and France *vis-à-vis* the other countries. Expected increases in future pension expenditure are contributing to higher spreads, particularly for Greece, but also to a lesser extent for other countries including Ireland, Portugal, Belgium and Spain.

19. The equations include interaction terms that are the combined effect of the change in a variable (*e.g.* the expected fiscal deficit) and the amplification of the effect that this variable has on spreads by increased general risk aversion. When investors become more risk-averse they will discriminate more keenly so that factors such as the debt-service ratio lead to a much wider dispersion of spreads. In order to better isolate these two effects, the change in the spread between June 2007 (prior to the crisis) and June 2009 is broken down into the effect of the change in the fiscal performance variables (the expected fiscal deficit and the debt service ratio) holding risk aversion constant and vice versa (Figure 7).[12]

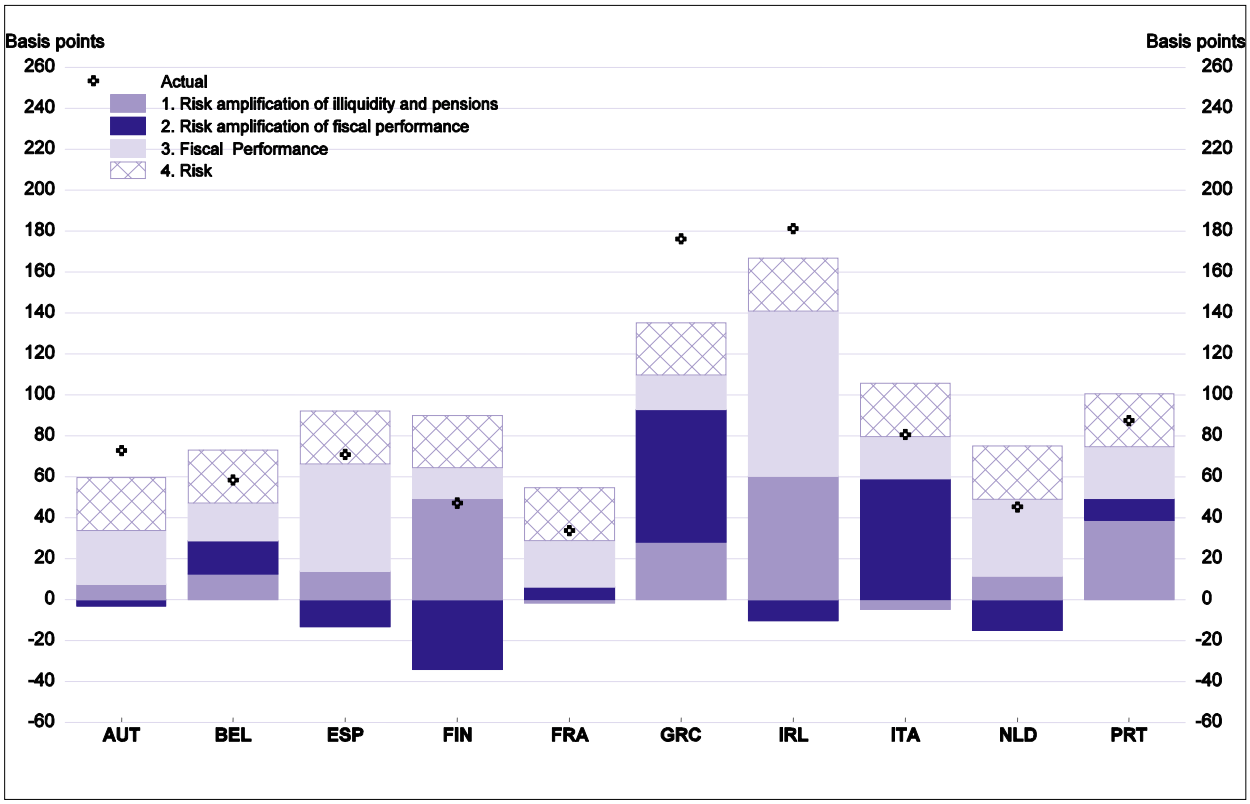
20. The decomposition shows that, particularly in the case of Spain and Ireland, where there was a sharp relative deterioration in the fiscal position from June 2007 to June 2009, the change in the fiscal position holding risk constant did make a notable contribution to the increase in the spread. Elsewhere, the relative fiscal position did not change as much but countries were rewarded or punished more for those positions as risk aversion increased. Countries where the risk amplification of fiscal performance (notably their high debt-service ratios) made a large contribution to increasing the spread include Greece and Italy, while the benefit to Finland from its relatively good fiscal performance grew as risk aversion increased. Because the illiquidity and pension expenditure variables are held constant over the estimation period, their contribution to the change in the spread is due entirely to their increasing importance in a more risk averse environment. This effect is relatively large in Finland and Ireland (due to illiquidity), Greece (pensions), and Portugal (illiquidity and pensions).

21. The equations do not fully explain recent movements in spreads and some mysteries remain. For example, the equations cannot fully explain the run-up in Greek spreads and the equations tend to over-predict French spreads. Based on the idea that information asymmetries may be important especially in explaining the higher spreads of smaller countries and previous findings in the literature, some additional terms to capture exposure to the financial sector, possible interest rate level effects and additional size effects beyond those with associated liquidity were tried. None of these terms were

11. A change of expenditure over such a long period of time (40 years) may not directly affect the government's capacity to repay a ten year bond holder, but it may affect bond-holder's general perceptions of the government's fiscal management capability.

12. The isolated effect of each variable is calculated by cumulating over the period June 2007 to June 2009 the marginal effects of the change in that variable (*e.g.* the expected fiscal deficit) from the previous six-month period holding the other variable (*e.g.* risk) constant.

Figure 7. Decomposition of the change in the spread June 2007 to June 2009 (Equation 4)



Note: Equation estimated over the period 2005q2 – 2009q2.

1. The cumulative marginal effect of changes in risk holding illiquidity and expected changes in pension expenditure constant.
2. The cumulative marginal effect of changes in risk holding the debt service ratio and expected fiscal balance constant.
3. Fiscal performance is the effect of cumulative marginal changes in the expected fiscal balance and the debt service ratio holding risk constant.
4. Risk is the effect of the stand-alone risk term.

Source: Datastream; and OECD calculations.

correctly signed and significant and/or robust to the estimation period. [13] In the case of the level of interest rates the sign changed depending on the estimation period. This may be because, although a positive link may exist between interest rates and spreads in normal times, this breaks down during periods of high risk aversion when sovereign interest rate levels fall due to a "flight to quality" but the spreads actually rise.

13. Size was measured by GDP relative to Germany. For the June 2005 to March 2009 period, an equation was estimated including the relative exposure of the countries to Eastern and Central European banks (measured as the country's banking assets in the region as percentage of current government revenue) multiplied by general risk aversion. Over the estimation period from June 2005 to March 2009 the term was correctly signed and mildly significant (at the 15% level). The overall fit of the equation was similar to Equation 4 but it improved the fit for Austria, for which bank exposure explained around an extra 20 basis points of the spread in the March quarter. This exposure also had a role in explaining the Greek and Belgian spreads (around 5-10 basis points of the March quarter spread). However the term does not appear to be robust to estimation period.

Concluding Remarks

22. The results indicate that differing fiscal policies and particularly their effect on future deficits and the debt service ratio do have an important role in explaining bond yield spreads in the euro area. This may have been obscured prior to the financial crisis that began in the middle of 2007 because of abnormally low general risk aversion. Indeed, it is important to note that the effect of each of the fiscal variables on the yield spreads is amplified by its interaction with general risk aversion. This in turn suggests that OECD governments will face greater financial market discipline in coming years than they were used to prior to the crisis because general risk aversion is likely to be higher.

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ANNEX 1:
DATA SOURCES AND DESCRIPTION

Variable	Description	Source
Spread	Difference between the yield on 10 year government bonds and the yield on German 10 year bonds	OECD MEI and Datastream
Risk	High yield corporate bonds (Merrill Lynch indices) yield less government bond yields (10-year benchmark bonds)	Datastream
Illiquidity	One divided by the share of total outstanding euro denominated long-term government securities (excluding equities) issued in the euro area	ECB
Expected Fiscal Balance	Government net lending (National accounts definition) as percentage of GDP. Forecast average for the following 5 years	OECD Economic Outlook 85 Database
Pension Expenditure	Projected change in pension expenditure as a percentage of GDP from 2010 to 2050	GRC: Stability and Growth Programme, Jan 2009, Other countries: EC (2006)
Debt Service	Ratio of Gross Interest Payments to Current Government Revenue	OECD Economic Outlook 85 Database
Gross Government Debt	Gross Government Financial Liabilities (National Accounts definition) as a Percentage of GDP	OECD Economic Outlook 85 Database
Net Government Debt	Net Government Financial Liabilities (National Accounts Definition) as a Percentage of GGDP	OECD Economic Outlook 85 Database
Exposure to CEE banking sector	Total banking assets in Central and Eastern European countries as a percentage of current government revenue	Bank of International Settlements and OECD Economic Outlook 85 Database

source: OECD

ANNEX 2:
GENERAL EQUATION RESULTS

	Coefficient	t statistic
Constant	2.91	0.65
Risk[2]	1.75	4.08
Risk*track record[3]	-2.47	-3.12
Debt service[4]	18.89	1.36
Expected fiscal balance[5]	-5.30	-2.88
Gross debt ratio[6]	0.09	0.17
Net debt ratio[7]	-0.24	-1.44
Illiqudity[8]	0.06	0.41
Pension[9]	2.79	2.38
Debt service squared	-1.46	-1.29
Risk*debt service	-0.49	-0.67
Risk*expected fiscal balance	-0.09	-0.69
Risk*gross debt ratio	-0.04	-0.81
Risk*net debt ratio	0.01	0.36
Risk*illiquidity	0.03	2.88
Risk*pension	0.04	0.51
Risk*debt service squared	0.01	2.76
Track record*debt service	45.88	1.31
Track record*expected fiscal balance	-7.24	-1.22
Track record*gross debt ratio	-5.08	-2.83
Track record*net debt ratio	5.08	2.70
Track record*debt service squared	-2.06	-0.99
Adjusted R^2	0.94	

1. Estimation Period: 2005 Q4 - 2009 Q2. Frequency: 6 monthly. Countries: Austria, Belgium, Finland, France, Greece, Ireland, Italy, Netherlands, Portugal and Spain. 80 observations , estimated using two stage least squares

2. Yield spread between high yield corporate bonds and government bonds.

3. Track record equals 1 if the country has a history of sustained fiscal deficits greater than 3% of GDP otherwise 0.

4. Gross government interest payments divided by current government receipts.

5. Average of the OECD forecast for the fiscal balance as a percentage of GDP in the following 5 years.

6. General government gross financial liabilities as a percentage of GDP

7. General government net financial liabilities as a percentage of GDP

8. One divided by the share of the euro denominated long-term government securities market

8. Change in pension expenditure as a share of GDP between 2010 and 2050.

Source: OECD Economic Outlook 85 database, OECD calculations, Datastream, BIS, ECB, EC, Greece Stability & Growth Prog. Jan. 2009

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