Short- and long-run behaviour of long-term sovereign bond yields

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Outline

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• The long-run relationship between fiscal variables and long-term interest rates constitutes an important part of policymakers' conventional wisdom.

• Increases in debt and in government deficit ratios may imply an increase in the long-term interest rate, impinging negatively on the credit risk and on the quality of outstanding sovereign debt liabilities.

▷

• Market participants may perceive additional risks stemming from the implied loosening of fiscal stance under such conditions (Alesina et al., 1992, Ardagna et al., 2004), although fiscal policy expectations are not easy to measure (Elmendorf and Mankiw, 1999).

• Other determinants can explain long-run developments of long-term yields: external variables and imbalances, liquidity issues, inflation prospects, growth developments, and possible substitution or demonstration effects from equity capital markets.

• For instance, liquidity risk seems to play a bigger role in times of market unrest (Beber et al., 2009).

• In this study we assess the long-run determinants of real long-term government bond yields for 17 OECD countries (AUT, BEL, DNK, FIN, FRA, DEU, IRL, ITA, LUX, NLD, PRT, SWE, ESP, UK, CAN, JAP, US), for the period 1973-2008.

• We use a dynamic panel approach and test for the existence of cointegration between real long-term interest rates and its potential determinants.

• Resorting to simulation and bootstrap methods we compute appropriate critical values that take into account cross-country dependence.

• We estimate a complete panel error-correction model (PECM) in order to also uncover the short-run parameters and the speed of convergence to the long-run relationship.

Some evidence on fiscal determinants of long-term interest rates

Reference	Data frequency	Sample	Tests performed	Main results
Orr, Edey, and Kennedy (1995)	Quarterly	17 OECD countries (1981:Q1-1994:Q2)	Regression of real interest rates on long-term determinants	Monetary and fiscal variables have a significant influence on the trend of long-term real interest rates
Canzoneri, Cumby and Diba (2002)	Semi-annual	US (1984-2002)	Regression of interest rates spreads on CBO budget surplus projections	Higher projected surpluses imply lower spreads of long-term rates over short-term rates.
Engen and Hubbard (2004)	Annual	US (1976-2003)	Regression of current real 10-year treasury rate on CBO 5-year ahead federal debt or deficit projections	Increases in the expected federal debt-to-GDP ratio increase the current real 10-year Treasury yield.
Heppke-Falk and Hüfner (2004)	Monthly	France, Germany, Italy (Jan:1994-Jul:2004)	SUR estimation	No significant impact of expected deficits on swap spreads over the whole sample.
Faini (2006)	Annual	EMU, except Luxembourg (1979-2002)	3SLS.	An expansionary fiscal policy in one EMU member will have an effect on its spreads, and on the overall level of interest rates for the currency union.
Laubach (2009)	Quarterly	US (1976:Q1-2006:Q2)	OLS. Regress expected future interest rates on CBO and OMB projections for the deficit-to-GDP ratio and the debt-to-GDP ratio 5 years ahead.	1 percentage point increase in the projected deficit ratio (debt ratio) raises long-term interest rates by roughly 25 (3 to 4) basis points.
Afonso (2009)	Semi-annual	14 EU countries, 1998:II–2008:II	Panel analysis for changes in 10-year government debt yields.	10-year yields increase with better growth forecasts, and with decreases in budget balance-to-GDP ratios

- Baseline specification:

$$r_{it} = (i_{it} - \pi_{it}) = \alpha_i + \gamma_i X_{it} + u_{it}$$

r - real long-term government bond yield,

i - nominal long-term government bond yield,

π - inflation rate,

X - set of additional explanatory variables,

$i=1,\ldots, N,$ countries, $t=1,\ldots, T,$ periods,

α_i - individual country effects,

u_{it} - disturbances, follow the standard assumptions.

• If a cointegrating relationship exists for all countries, we estimate (with the Common Correlated Effects estimator, Pesaran, 2006), for each country the cross-section cointegrating regression:

$$r_{it} = (i_{it} - \pi_{it}) = \alpha_i + \gamma_i X_{it} + \mu_1 \bar{r}_t + \mu_2 \overline{X}_t + u_{it}$$

$\bar{r}_t$ and $\overline{X}_t$, cross-section averages of r_i and X_i in t.

• The regression is augmented with the cross-section averages of the dependent variable and the observed regressors as proxies for the unobserved factors.

- Error-correction form:

$$\Delta(i_{it} - \pi_{it}) = \alpha_i + \sum_{j=1}^{p} \beta_j \Delta(i_{it-j} - \pi_{it-j}) + \sum_{j=0}^{p} \theta_j \Delta X_{it-j} + \lambda_i \left[(i_{it-1} - \pi_{it-1}) - \alpha - \gamma X_{it-1} \right] + \varepsilon_{it}$$

λ - speed of adjustment,

β, θ - short-run parameters,

ε_{it} - disturbances, follow the standard assumptions.

- Long-run factors that can be included in X are: government balance and debt ratios, current account balance ratio, inflation expectations, real effective exchange rate, liquidity measures.

• Liquidity (*LIQ*): share of government debt in country *i*, in year *t*, in the overall government debt of the full country sample,

$$LIQ_{it} = Debt_{it} / \sum_{i=1}^{N} Debt_{it}$$

• Inflation surprises (π^e): difference between actual inflation and a 2-year moving average of past inflation.

Data (1)

• 17 Countries: AUT, BEL, DNK, FIN, FRA, DEU, IRL, ITA, LUX, NLD, PRT, SWE, ESP, UK, CAN, JAP, US.

• Period 1973-2008.

Sources

• Long-term interest rate: International Financial Statistics, IMF.
• Inflation: International Financial Statistics, IMF.

• Government debt ratio: European Commission AMECO database.
• Government balance ratio: European Commission AMECO database.
• GDP: European Commission AMECO database.

• Current account balance: Balance of Payments, OECD Economic Outlook.
• Real effective exchange rate: OECD Main Economic Indicators.

Long-term real interest rates
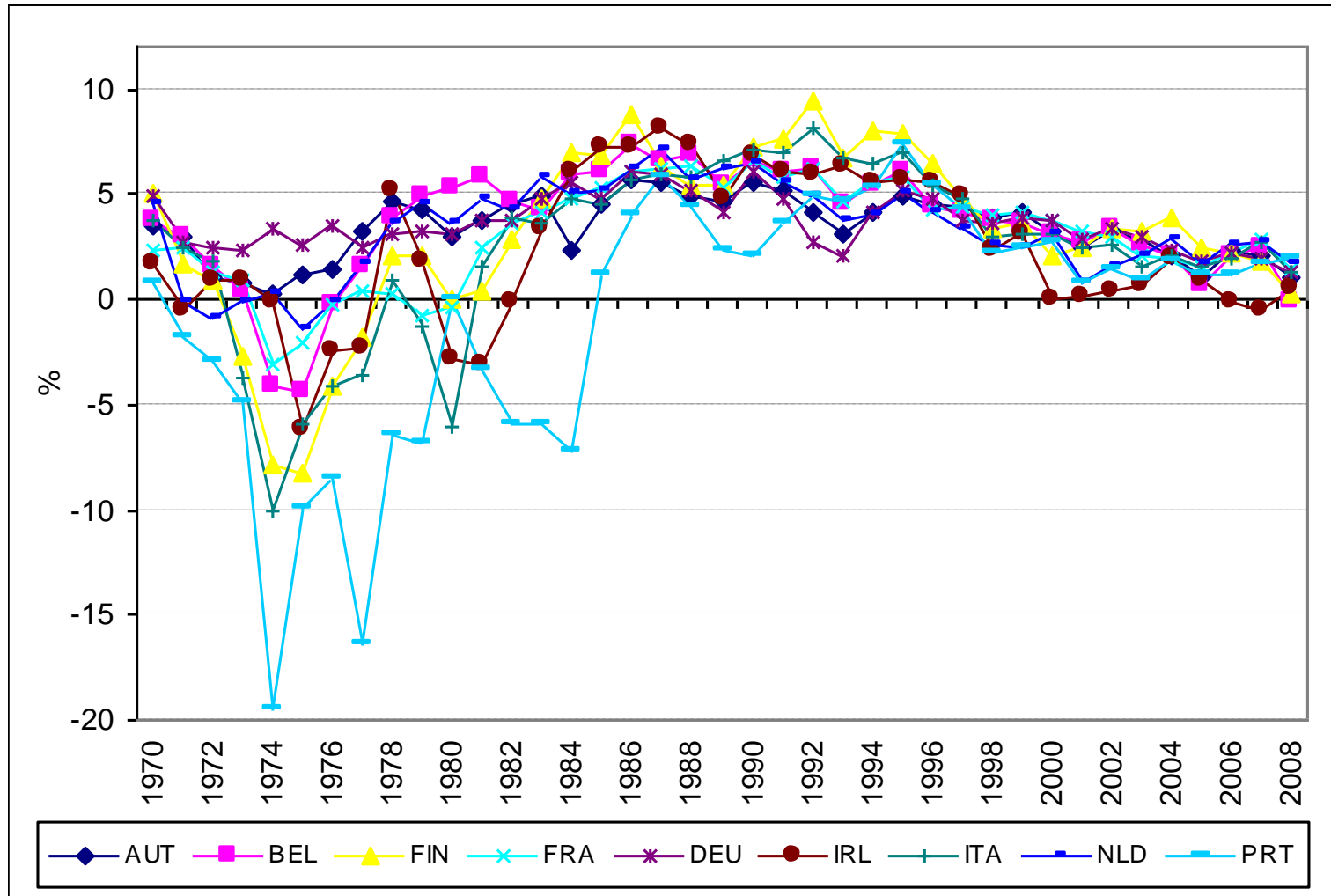
Source: IMF, International Financial Statistics, and authors' calculations.
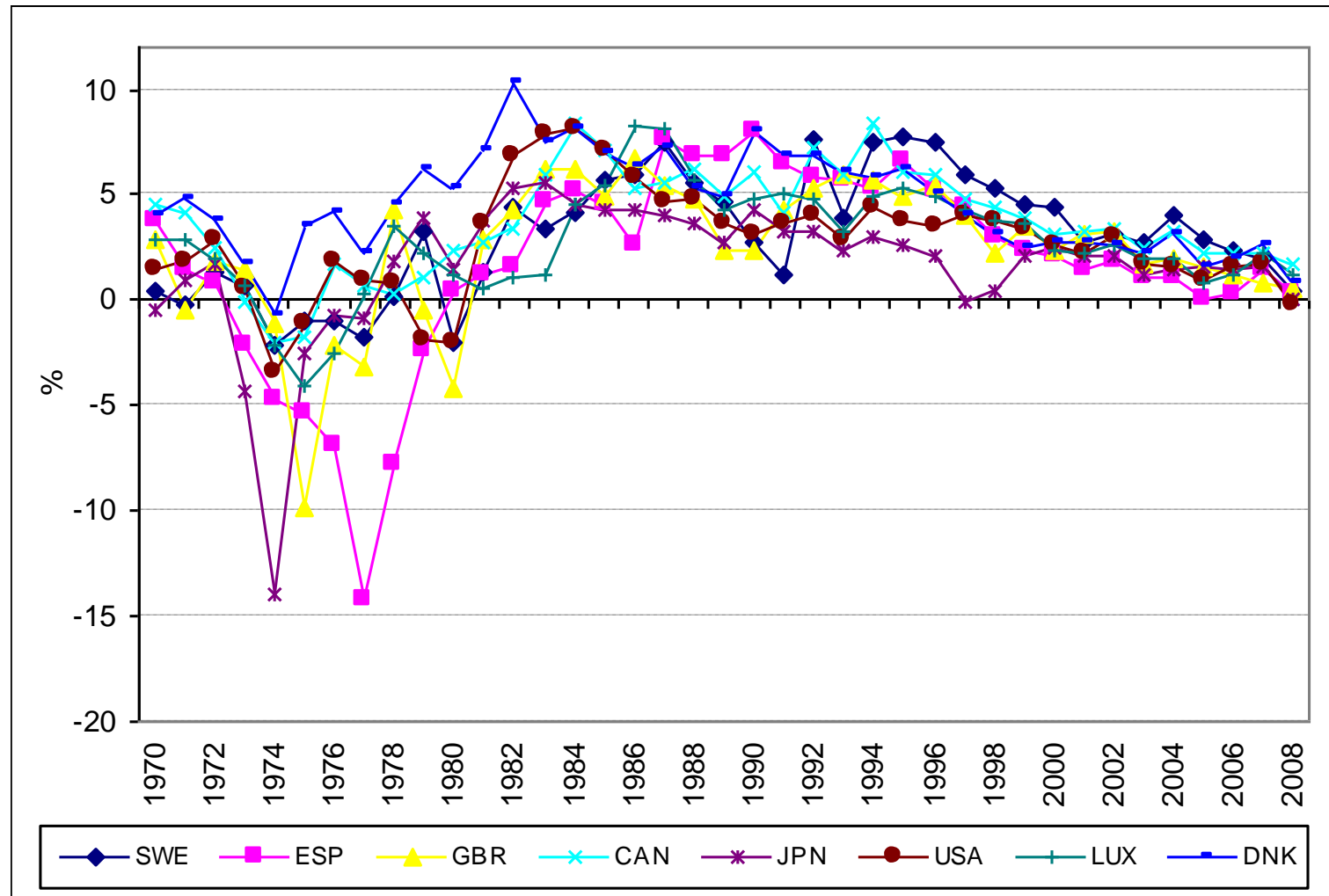
Long-term real interest rates

Source: IMF, International Financial Statistics, and authors' calculations.

Data (4)

Shares of outstanding government debt

	1970	1980	1990	2000	2008
Austria	0.35	0.90	0.94	0.73	0.88
Belgium	2.02	2.90	2.59	1.44	1.54
Canada		3.84	4.45	3.42	3.27
Denmark		0.85	0.86	0.48	0.39
Finland	0.16	0.19	0.20	0.31	0.31
France	7.41	4.48	4.45	4.38	6.63
Germany	4.74	8.97	7.37	6.53	8.17
Ireland	0.26	0.46	0.45	0.21	0.40
Italy	5.10	8.18	10.90	6.90	8.31
Japan	3.06	18.28	21.19	36.70	28.83
Luxembourg	0.04	0.02	0.01	0.01	0.03
Netherlands	2.88	2.56	2.30	1.19	1.73
Portugal		0.30	0.42	0.33	0.55
Spain	0.73	1.16	2.26	1.98	2.16
Sweden	1.18	1.62	1.02	0.76	0.62
UK	12.13	8.93	3.42	3.49	4.71
US	59.93	36.36	37.16	31.15	31.45
	100.00	100.00	100.00	100.00	100.00

Source: European Commission AMECO database and authors' computations.

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• Panel unit root tests of the 1st generation can lead to spurious results (because of size distortions) if there are significant degrees of positive error cross-section dependence, and this is ignored.

• 2nd generation panel unit root tests (allowing for cross-section dependence) are desirable when it has been established that the panel is subject to a significant degree of error cross-section dependence [Pesaran's test, 2004, based on pair-wise correlation coefficients for the residuals for i and j over T].

• Therefore, we use the following 2nd generation unit root tests:
-   Pesaran (2007) [ADF augmented with lagged cross-sectional mean],
-   Smith et al. (2004) [bootstrap tests].

1ˢᵗ: We find evidence of cross-sectional dependence, and reject the null of cross-section independence (test of Pesaran, 2004).

	Real Long-Term Interest Rate (R)				Government Balance Ratio (GBR)			
Test Statistic	p=1	p=2	p=3	p=4	p=1	p=2	p=3	p=4
CD P value	12.21 (0.00)	12.02 (0.00)	11.85 (0.00)	11.54 (0.00)	23.12 (0.00)	22.58 (0.00)	21.45 (0.00)	21.36 (0.00)
	Inflation Surprises (Π^e)				Current Account Balance Ratio (CA)			
Test Statistic	p=1	p=2	p=3	p=4	p=1	p=2	p=3	p=4
CD P value	20.24 (0.00)	17.99 (0.00)	17.78 (0.00)	17.10 (0.00)	32.79 (0.00)	30.47 (0.00)	31.56 (0.00)	32.15 (0.00)
	Liquidity Debt Share (LIQ)				Real Effective Exchange Rate (TCR)			
Test Statistic	p=1	p=2	p=3	p=4	p=1	p=2	p=3	p=4
CD P value	22.32 (0.00)	22.15 (0.00)	21.85 (0.00)	20.76 (0.00)	19.25 (0.00)	18.45 (0.00)	18.35 (0.00)	17.41 (0.00)
	Debt Ratio (DR)							
Test Statistic	p=1	p=2	p=3	p=4				
CD P value	27.12 (0.00)	26.58 (0.00)	25.12 (0.00)	25.16 (0.00)				

Cross-section correlations of the errors in the ADF(p) regressions of real long-term interest rates and potential determinants (1973-2008; N = 17).

2nd: 2nd generation unit root tests: real long-term interest rates and their determinants are non-stationary and I(1) at the 5% level of significance (panel unit root tests of Pesaran (2007).

	Real Long-Term Interest Rate (R)				Government Balance Ratio (GBR)			
Test Statistics	p=1	p=2	p=3	p=4	p=1	p=2	p=3	p=4
CIPS	-1.92	-188	-1.84	-1.96	-2.10	-1.96	-1.72	-1.68
CIPS*	-1.58	-1.52	-1.46	-1.62	-2.09	-1.95	-1.71	-1.68
	Inflation Surprises (Π^e)				Current Account Balance Ratio (CA)			
Test Statistic	p=1	p=2	p=3	p=4	p=1	p=2	p=3	p=4
CIPS	-2.09	-2.07	-1.98	-1.91	-2.20*	-1.90	-1.43	-1.28
CIPS*	-2.08	-2.06	-1.98	-1.91	-2.19*	-1.89	-1.43	-1.28
	Liquidity Debt Share (LIQ)				Real Effective Exchange Rate (TCR)			
Test Statistic	p=1	p=2	p=3	p=4	p=1	p=2	p=3	p=4
CIPS	-1.95	-1.92	-1.90	-2.01	-2.03	-1.99	-1.97	-1.94
CIPS*	-1.93	-1.91	-1.89	-2.01	-2.02	-1.98	-1.97	-1.94
	Debt Ratio (DR)							
Test Statistic	p=1	p=2	p=3	p=4				
CIPS	-1.75	-1.68	-1.82	-1.78				
CIPS*	-1.74	-1.65	-1.82	-1.77				

(1973-2008; N = 17), null: unit root. CIPS – Cross-section augmented Im-Pesaran-Shin test. CIPS* – truncated CIPS test. Critical value of -2.22 at 5%.

3rd: Given that all series are I(1), <u>we test for the existence of panel cointegration</u> between real long-term interest rates and its determinants.

• The Westerlund and Edgerton (2007) bootstrap panel cointegration test [relying on the Lagrange multiplier test of McCoskey and Kao, 1998], makes it possible to <u>accommodate correlation both within and between the individual cross-sectional units</u>.

• This bootstrap test has the advantage of significantly reducing the distortions of the asymptotic test (which is calculated on the assumption of cross-sectional independence of countries).

• The <u>joint null hypothesis is that all countries in the panel are cointegrated</u>. Therefore, in case of non-rejection of the null, we can assume that there is cointegration between real long-term interest rates and the potential determinants contained in *X*.

For the baseline specification

$$r_{it} = (i_{it} - \pi_{it}) = \alpha_i + \gamma_i X_{it} + u_{it}$$

we considered several sets of variables in X:

$X_1 = (\Pi^e, CA, DR),$
$X_2 = (\Pi^e, CA, GBR),$
$X_3 = (\Pi^e, CA, DR, GBR, TCR),$
$X_4 = (\Pi^e, CA, DR, LIQ).$

CA – current account ratio, DR – debt ratio, Π^e – inflation surprises, GBR – government balance ratio, TCR – real effective exchange rate, LIQ – liquidity measure.

Panel cointegration

	LM-stat	Asymptotic p-value	Bootstrap p-value #
$X_1 = (\Pi^e, CA, DR)$	7.430	0.000	0.840
$X_2 = (\Pi^e, CA, GBR)$	7.385	0.000	0.782
$X_3 = (\Pi^e, CA, DR, GBR, TCR)$	14.168	0.000	0.783
$X_4 = (\Pi^e, CA, DR, LIQ)$	9.125	0.000	0.751

Results from the Westerlund and Edgerton (2007) bootstrap panel cointegration test.

Null hyp. (all countries are cointegrated) not rejected at 10%.

There is a long-run relationship between real long-term interest rates and the sets of determinants.

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4th: Given that a cointegrating relationship exists for all countries, we estimate it with the Common Correlated Effect estimation procedure developed by Pesaran (2006).

$$r_{it} = (i_{it} - \pi_{it}) = \alpha_i + \gamma_i X_{it} + \mu_1 \overline{r}_t + \mu_2 \overline{X}_t + u_{it}$$

$$r_{it} = \alpha_i + \gamma_{1i}\Pi^e_{it} + \gamma_{2i}CA_{it} + \gamma_{3i}DR_{it} + u_{it}$$

$$r_{it} = \alpha_i + \gamma_{1i}\Pi^e_{it} + \gamma_{2i}CA_{it} + \gamma_{3i}GBR_{it} + u_{it}$$

$$r_{it} = \alpha_i + \gamma_{1i}\Pi^e_{it} + \gamma_{2i}CA_{it} + \gamma_{3i}DR_{it} + \gamma_{4i}GBR_{it} + \gamma_{5i}TCR_{it} + u_{it}$$

$$r_{it} = \alpha_i + \gamma_{1i}\Pi^e_{it} + \gamma_{2i}CA_{it} + \gamma_{3i}DR_{it} + \gamma_{4i}LIQ_{it} + u_{it}$$

Common Correlated Effects estimation

Country	Π^e		CA		DR		Constant	
	γ_1	t-Stat	γ_2	t-Stat	γ_3	t-Stat	α	t-Stat
Austria	-0.681	-8.012	-0.149	-3.725	-0.011	-3.611	3.962	2.907
Belgium	-0.850	-14.167	-0.045	-2.682	-0.024	-2.600	-0.281	-2.257
Canada	-0.885	-9.725	-0.133	-2.509	-0.032	-2.000	-0.978	-2.736
Denmark	-0.645	-4.778	-0.040	-2.727	0.028	2.000	-1.497	-3.749
Finland	-0.515	-4.769	-0.006	-0.120	-0.045	-1.957	2.222	3.467
France	-0.766	-12.355	-0.176	-3.520	0.049	5.444	-2.234	-3.659
Germany	-0.875	-4.581	0.262	2.148	-0.005	-2.167	-4.331	-4.746
Ireland	-0.726	-8.643	-0.022	-2.759	0.023	2.300	1.573	2.637
Italy	-0.690	-16.429	0.183	2.346	0.121	4.321	-5.388	-3.456
Japan	-0.944	-17.164	-0.109	-2.652	-0.047	-2.611	-3.396	-2.741
Luxembourg	-1.045	-40.192	0.003	0.029	-0.038	-1.267	-3.200	-2.839
Netherlands	-0.779	-10.819	-0.134	-1.523	0.017	3.850	-0.079	-2.034
Portugal	-0.803	-13.164	0.114	3.563	0.001	0.000	-0.995	-3.531
Spain	-0.875	-13.258	0.058	2.784	-0.007	-1.400	5.189	6.163
Sweden	-0.932	-22.732	-0.045	-0.517	-0.140	-5.385	4.017	3.088
UK	-0.806	-14.140	0.051	2.125	0.081	3.375	0.267	2.286
US	-0.407	-2.928	0.010	2.192	0.020	2.176	3.051	5.202

CA – current account ratio, DR – debt ratio, Π^e – inflation surprises.

Common Correlated Effects estimation

Country	Π^e		CA		GBR		Constant	
	γ_1	t-Stat	γ_2	t-Stat	γ_3	t-Stat	α	t-Stat
Austria	-0.668	-9.408	-0.147	-3.675	0.027	2.692	2.397	3.405
Belgium	-0.796	-12.438	-0.142	-2.407	0.015	2.313	1.109	3.391
Canada	-0.821	-8.642	-0.151	-3.283	0.076	2.854	0.680	2.932
Denmark	-0.471	-3.680	-0.008	-2.178	-0.357	-1.812	-0.728	-2.874
Finland	-0.399	-5.182	-0.039	-2.345	-0.200	-2.597	-0.231	-2.486
France	-0.892	-12.389	-0.045	-2.776	-0.100	-2.099	-1.499	-1.669
Germany	-0.992	-6.161	0.137	3.593	0.128	2.422	0.461	2.645
Ireland	-0.699	-8.034	-0.022	-0.564	0.058	2.289	1.909	3.094
Italy	-0.650	-13.000	0.142	2.958	-0.462	-4.200	0.021	2.017
Japan	-0.912	-22.244	-0.081	-1.306	0.114	3.081	0.178	3.231
Luxembourg	-1.021	-30.029	-0.047	-0.758	0.007	0.092	-2.851	-2.589
Netherlands	-0.762	-12.915	-0.028	-0.431	-0.179	-2.210	-0.322	-2.643
Portugal	-0.909	-16.527	0.048	1.455	0.199	4.854	0.234	2.600
Spain	-0.982	-9.627	-0.146	-2.168	0.175	2.869	0.421	2.636
Sweden	-0.990	-14.559	-0.397	-3.970	0.278	3.159	-0.989	-1.169
UK	-0.767	-11.984	-0.004	-0.148	0.068	2.194	0.221	2.795
US	-0.341	-3.217	-0.132	-2.859	-0.118	-2.532	0.868	2.018

CA – current account ratio, GBR – government balance ratio, Π^e – inflation surprises.

Common Correlated Effects estimation

Country	Π^e		CA		DR		LIQ		Constant	
	γ_1	t-Stat	γ_2	t-Stat	γ_3	t-Stat	γ_4	t-Stat	α	t-Stat
Austria	-0.647	-7.890	-0.091	-2.459	0.008	2.400	-0.439	-3.663	-28.650	-2.304
Belgium	-1.063	-18.982	0.145	2.843	-0.031	-2.214	-0.900	-3.180	24.210	2.907
Canada	-0.918	-9.180	-0.139	-2.725	-0.009	-2.600	-5.752	-5.321	-10.417	-0.576
Denmark	-0.707	-4.842	0.090	2.250	0.053	3.359	-0.218	-2.172	41.473	4.401
Finland	-0.536	-6.700	-0.026	-2.667	-0.025	-2.087	-0.263	-3.697	-5.988	-2.528
France	-0.759	-13.316	-0.215	-4.778	0.052	3.250	-1.751	-2.447	-47.188	-4.047
Germany	-0.899	-5.197	0.191	1.201	0.032	2.744	-0.271	-2.362	-14.353	-5.467
Ireland	-0.729	-8.679	0.022	0.786	0.010	2.500	0.420	3.719	-12.185	-3.954
Italy	-0.755	-15.729	0.185	2.569	0.222	5.286	-12.00	-3.087	-36.057	-6.857
Japan	-0.914	-12.694	-0.056	-2.824	-0.042	-3.680	-0.310	-2.314	-26.735	-7.756
Luxembourg	-1.039	-30.559	0.050	0.538	-0.059	-2.458	1.052	3.930	-1.959	-2.053
Netherlands	-0.826	-14.000	-0.126	-2.636	0.015	2.556	-0.159	-1.924	-58.738	-4.485
Portugal	-0.802	-12.935	0.086	2.867	-0.001	-2.100	-1.460	-2.209	16.218	2.074
Spain	-0.950	-20.652	-0.088	-1.846	0.002	2.000	-0.100	-2.632	22.840	3.579
Sweden	-0.846	-15.107	0.006	1.067	-0.149	-5.960	0.059	2.458	34.877	3.864
UK	-0.820	-14.643	0.052	2.080	0.101	2.629	-12.78	-6.423	8.191	5.334
US	-0.522	-3.896	0.030	2.698	-0.024	-3.500	5.151	5.575	-12.222	-3.207

CA – current account ratio, DR – debt ratio, Π^e – inflation surprises, LIQ –liquidity measure.

Results for common correlated effects mean group (CCE-MG) estimations, 17 OECD countries (1973-2008)

	(6a) $X_1 = (\Pi^e,$ CA, DR)	(6b) $X_2 = (\Pi^e,$ CA, GBR)	(6c) $X_3 = (\Pi^e,$ CA, DR, GBR, TCR)	(6d) $X_4 = (\Pi^e,$ CA, DR, LIQ)
Constant	-0.123 (-4.15)	0.110 (3.96)	-0.091 (-5.26)	-6.216 (-5.28)
Π^e	-0.777 (-20.19)	-0.761 (-15.10)	-0.829 (-17.25)	-0.807 (-21.72)
CA	-0.010 (-3.96)	-0.062 (-5.25)	-0.030 (-4.32)	-0.008 (-4.28)
DR	-0.060 (-3.27)		-0.137 (-6.25)	-0.009 (-3.36)
GBR		-0.015 (-3.34)	-0.041 (-2.48)	
TCR			-0.026 (-3.98)	
LIQS				-1.749 (-5.35)

• Real long-term interest rates are positively affected by changes in the <u>debt ratio</u> only in 7 out of 17 countries.

• <u>Inflation</u> has a negative and statistically significant effect on real long-term interest rates in all countries.

• Improvements in <u>external balance</u> reduce real long-term interest rates in 9 countries. The deterioration of the current account can signal a gap between savings and investment pushing upwards long-term interest rates.

• A better (more positive) government <u>budget balance</u> reduces (as expected) the real long-term interest rate in 6 cases.

•An increase in the sovereign <u>liquidity measure</u> contributes to reduce long-term interest rates in 13 cases.

5th: We estimated the complete panel error-correction model (ECM):

$$\Delta(i_{it} - \pi_{it}) = \alpha_i + \sum_{j=1}^{p} \boldsymbol{\beta}_j \Delta(i_{it-j} - \pi_{it-j}) + \sum_{j=0}^{p} \boldsymbol{\theta}_j \Delta X_{it-j} + \lambda_i \left[(i_{it-1} - \pi_{it-1}) - \alpha - \gamma X_{it-1} \right] + \varepsilon_{it}$$

to estimate λ, loading factor (weights or error correction parameters, or speed of adjustment to the equilibrium values), and the short-run parameters β and θ.

• We use the Pooled Mean Group (PMG) approach of Pesaran, Shin and Smith (1999), with long-run parameters obtained with CCE techniques.

PECM (2)

	Δr_{it-2}	$\Delta \Pi^e_{it}$	$\Delta \Pi^e_{it-1}$	ΔCA_{it}	ΔCA_{it-1}	ΔCA_{it-2}	ΔDR_{it}	ΔDR_{it-1}	λ_i
Austria	-0.20 (-2.21)	-0.69 (-7.79)	0.24 (2.91)					0.10 (2.08)	-0.06 (-6.31)
Belgium		-0.69 (-9.34)		-0.05 (-2.25)			0.06 (2.05)		-0.14 (-3.54)
Canada		-0.82 (-11.3)		-0.03 (-2.78)			0.04 (2.64)		-0.10 (-3.36)
Denmark		-0.62 (-6.31)		-0.34 (-1.99)					-0.08 (-2.91)
Finland		-0.51 (-4.35)							-0.10 (-3.12)
France		-0.97 (-4.12)	-0.41 (-2.62)	0.73 (3.94)	0.79 (5.11)		0.04 (4.42)	-0.35 (-3.48)	-0.61 (-4.13)
Germany		-0.97 (-11.7)	0.43 (3.20)	-0.05 (-2.45)	-0.38 (-2.79)		0.06 (2.37)	0.39 (3.37)	-0.14 (-2.95)
Ireland		-0.48 (-4.85)		-0.09 (-2.79)			0.01 (2.58)	0.08 (2.15)	-0.29 (-3.34)
Italy		-0.84 (-22.4)		-0.04 (-3.29)			0.05 (3.31)	-0.14 (-3.37)	-0.14 (-4.83)
Japan		-0.76 (-11.2)		-0.09 (-3.34)	0.27 (2.78)		0.01 (3.19)		-0.29 (-5.36)
Luxembourg		-1.07 (-11.4)		-0.05 (-2.96)			0.06 (2.90)		-0.15 (-3.95)
Netherlands		-0.85 (-16.8)		-0.03 (-2.05)		-0.39 (-3.22)	0.04 (2.17)		-0.09 (-2.38)
Portugal		-0.69 (-9.02)		-0.06 (-2.72)			0.008 (2.56)		-0.20 (-3.37)
Spain		-0.84 (-22.3)		-0.03 (-2.56)			0.0045 (2.70)		-0.11 (-3.14)
Sweden		-0.90 (-9.05)		-0.06 (-2.16)			0.0074 (2.68)		-0.18 (-2.35)
UK		-0.83 (-13.1)		-0.02 (-1.99)					-0.06 (-2.84)
US		-0.50 (-5.39)		-0.16 (-3.28)			0.02 (2.74)		-0.49 (-4.47)

• Government <u>debt ratio</u> shows up in the short-run estimated coefficients with a <u>positive sign</u>, implying an upward pressure on the real interest rate.

• Improvements in the government <u>budget balance</u> contribute to a reduction in the real sovereign yields.

• Real effective <u>exchange rate</u> depreciation movements push up the real interest rate, which may reflect higher exchange risk linked to external imbalances.

• Better <u>current account</u> positions also reduce real interest rates.

• <u>Liquidity</u> proxy is statistically significant in the ECM estimations, implying that liquidity is relevant from a short-term perspective, as before in the long-run estimation results.

- The magnitude of the speed of adjustment across the several error-correction specifications is rather similar.
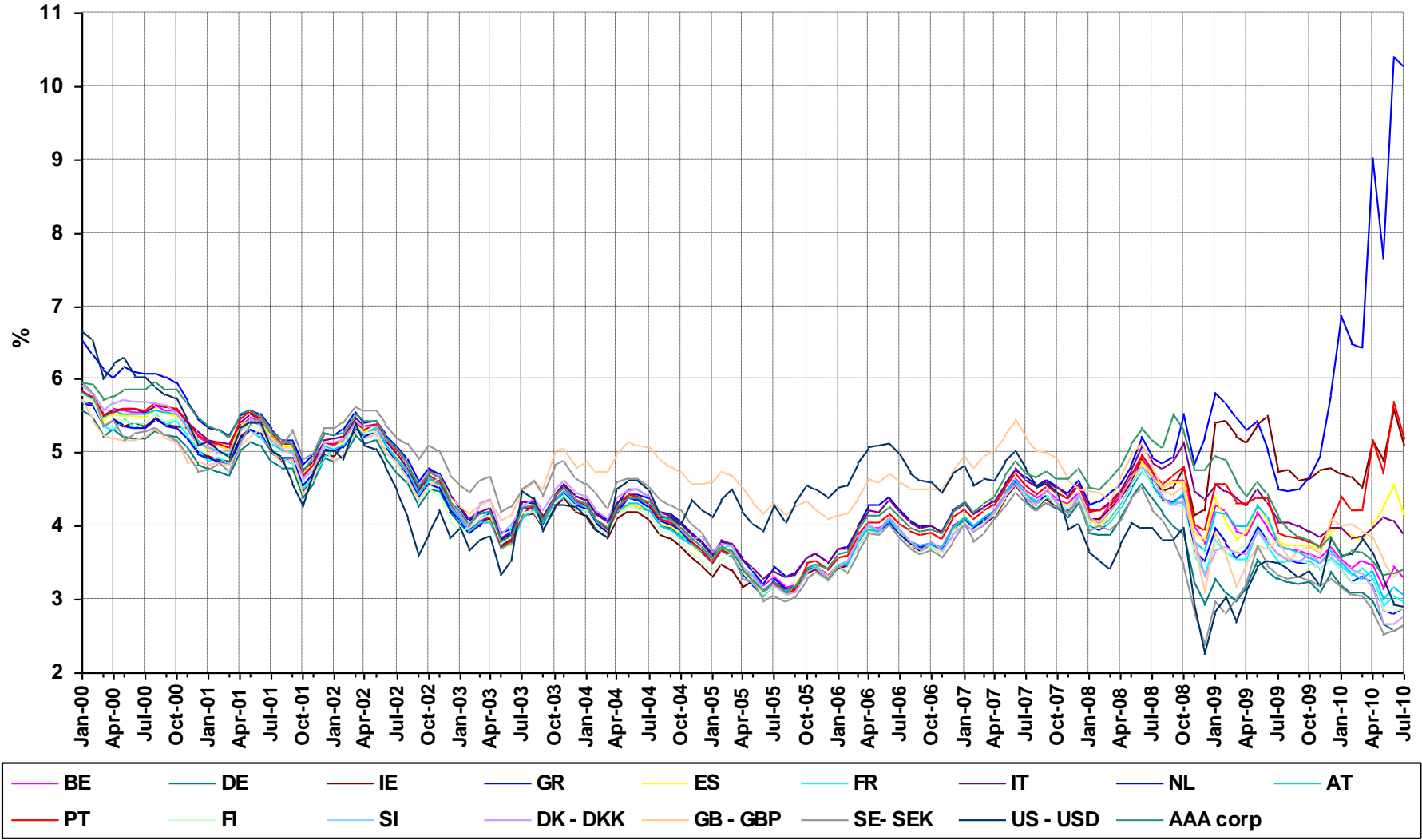
In this paper we:

• Assessed the long-run behaviour of long-term government bond yields for 17 OECD countries (1973-2008).

• Employed a dynamic panel approach to
  i) reflect financial and economic integration and
  ii) to increase the performance and accuracy of the tests.

• Used simulation and bootstrap methods to compute appropriate critical values, that take into account the cross-country dependences in the sovereign bond markets.

• The existence of cross-section dependence, both for the financial, macroeconomic and fiscal variables, provides evidence of integration at the OECD level.

• Having established, with 2nd generation panel unit root tests, that all the series are I(1), we have undertaken an adequate [bootstrap] <u>panel cointegration analysis</u>.

• The results show that in addition to common movements in sovereign yields, and credit and liquidity risk, investors are also aware of such specific factors as <u>inflation, budgetary and current account imbalances, and real effective exchange rates</u>.

• Better government debt and balance positions reduce the real long-term interest rate in almost all countries.

• Additionally, the developments in current account balances also carry some relevant long-run information for real long-term interest rates.
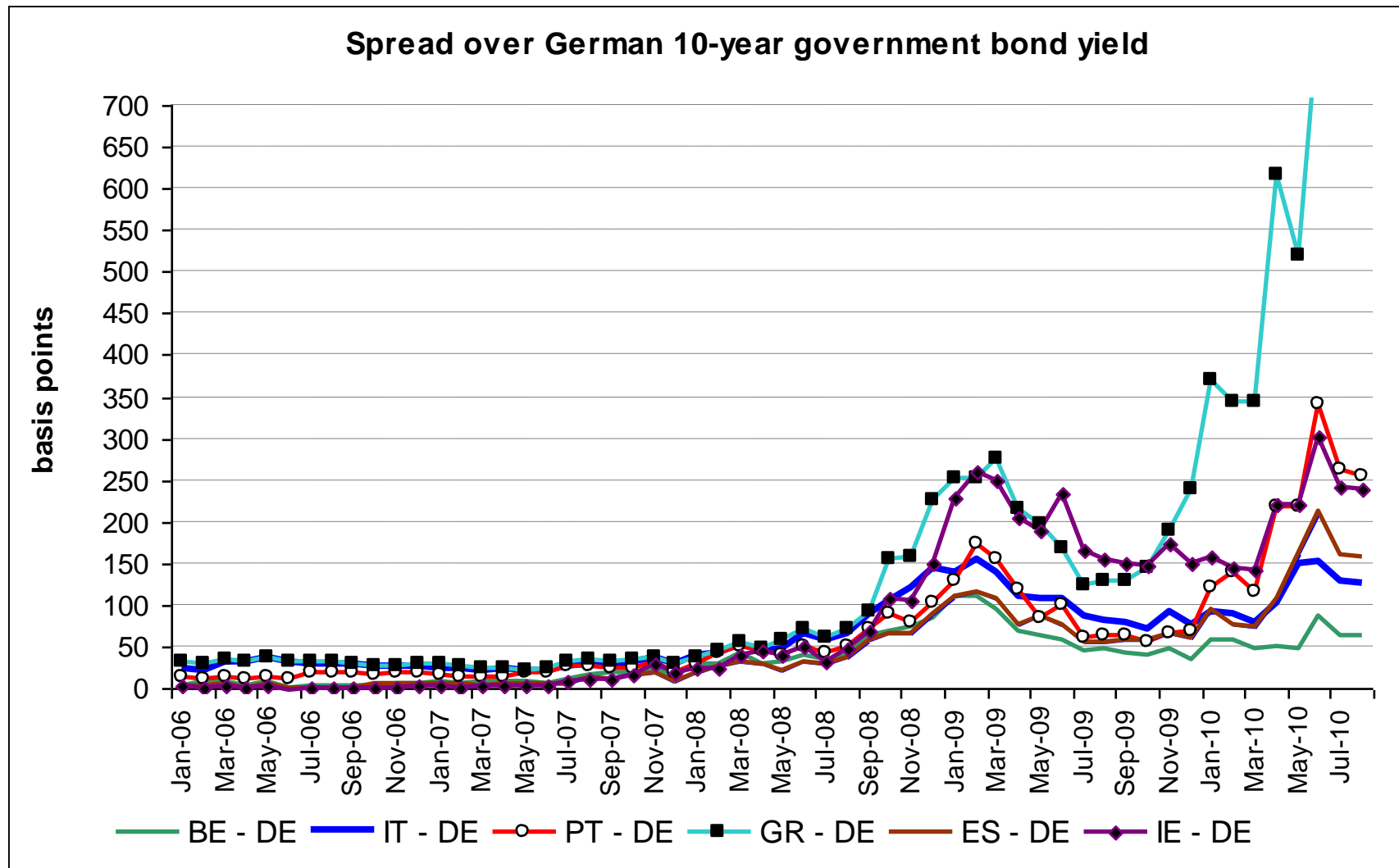
• **Long-term interest rate** – Government Bond Yield, one or more series representing yields to maturity of government bonds or other bonds that would indicate longer term rates, code IFS 61.Z.F. Source: International Financial Statistics, IMF.

• **Inflation** – Consumer Price Index, code IFS 64.XZF. Source: International Financial Statistics, IMF.

• **Government debt ratio** – Debt-to-GDP ratio, code 1.0.319.0.UDGGL. Source: European Commission AMECO database.

• **Government balance ratio** – Budget balance-to-GDP ratio, code 1.0.319.0.UBLGE. Source: European Commission AMECO database.

• **GDP** – GDP at market prices, code 1.0.0.0.UVGD. Source: European Commission AMECO database.

• **Current account balance** – Current Balance as a Percentage of GDP, code CBGDPR. Source: Balance of Payments, OECD Economic Outlook.

• **Real effective exchange rate** – chain-linked index with base period 2005, code CCRETT01.IXOB. Source: OECD Main Economic Indicators.

10-year government bond yield (Jan 1996-Jul 2010)

Legend: BE, DE, IE, GR, ES, FR, IT, NL, AT, PT, FI, SI, DK - DKK, GB - GBP, SE- SEK, US - USD, AAA corp

Source: Datastream.

Spread over German 10-year government bond yield

Source: Reuters.