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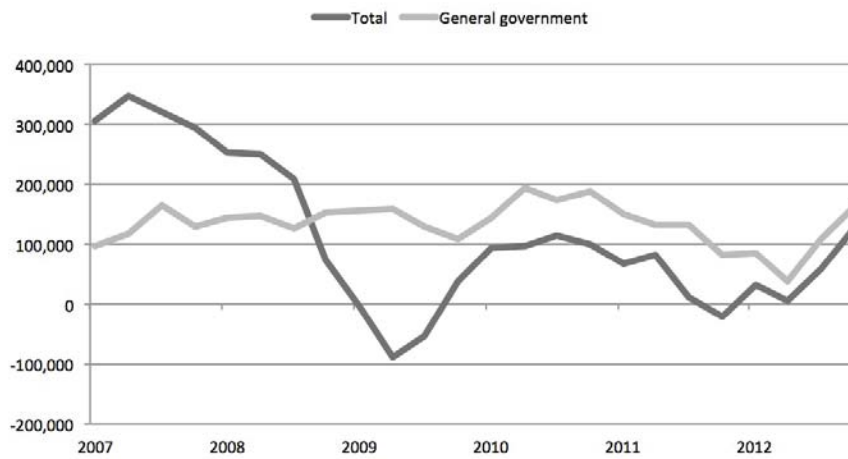
Capital inflows and euro area long-term interest rates

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Note: This Working Paper should not be reported as representing the views of the European Central Bank (ECB). The views expressed are those of the authors and do not necessarily reflect those of the ECB

Figure 4: Euro area debt securities liability flows
(4-quarter moving sums, 2007Q1–2012Q4)



Source: ECB.

Table 1: Foreign ownership of US and euro area debt securities

		Euro area	United States
All issuers	Outstanding	9,690	20,341
	of which foreign owned	2,571	4,732
	(in percent of outstanding)	(26.5)	(23.3)
	(in percent of GDP)	(31.1)	(35.5)
Total Government	Outstanding	4,353	9,044
	of which foreign owned	995	2,711
	(in percent of outstanding)	(22.9)	(30.0)
	(in percent of GDP)	(12.0)	(20.4)
Treasury	Outstanding		3,321
	of which foreign owned		1,727
	(in percent of outstanding)		(52.0)
	(in percent of GDP)		(13.0)
Agencies	Outstanding		5,723
	of which foreign owned		984
	(in percent of outstanding)		(17.2)
	(in percent of GDP)		(7.4)
Corporates	Outstanding	5,337	11,297
	of which foreign owned	1,576	2,021
	(in percent of outstanding)	(29.5)	(17.9)
	(in percent of GDP)	(19.1)	(15.2)

Source: Treasury Department et al. (2008, 2012) and ECB.

Note: Amounts in domestic currency unless otherwise indicated at end-June 2006.

Table 2: Cointegration tests

One lag				
Unrestricted cointegration rank test (Trace)				
No. cointegration relations	Eigenvalue	Trace statistic	0.05 critical value	<i>p</i> -value
None*	0.295	54.319	47.856	0.010
At most 1	0.139	22.216	29.797	0.287
Unrestricted cointegration rank test (Maximum Eigenvalue)				
No. cointegration relations	Eigenvalue	Trace statistic	0.05 critical value	<i>p</i> -value
None*	0.295	32.103	27.584	0.012
At most 1	0.139	13.761	21.131	0.385
With trend				
Unrestricted cointegration rank test (Trace)				
No. cointegration relations	Eigenvalue	Trace statistic	0.05 critical value	<i>p</i> -value
None*	0.374	80.981	63.876	0.001
At most 1	0.176	38.349	42.915	0.133
Unrestricted cointegration rank test (Maximum Eigenvalue)				
No. cointegration relations	Eigenvalue	Trace statistic	0.05 critical value	<i>p</i> -value
None*	0.374	42.631	32.118	0.002
At most 1	0.176	17.603	25.823	0.408

Note: * denotes rejection of the hypothesis at the 0.05 level.

Table 3: VECM results - benchmark model

Cointegration equation	i_{t-1}^l	i_{t-1}^s	π_{t-1}^e	FH_{t-1}
	1	-0.247	-0.434	0.128
		[-4.840]	[-4.564]	[11.524]
Error correction	Δi^l	Δi^s	$\Delta \pi^e$	ΔFH
α	-0.230	0.161	0.074	-0.063
	[-2.932]	[3.232]	[1.245]	[-0.422]
Δi_{t-1}^l	0.316	0.101	0.014	-0.491
	[2.921]	[1.483]	[0.170]	[-2.393]
Δi_{t-1}^s	0.194	0.297	-0.034	0.383
	[1.187]	[2.861]	[-0.273]	[1.236]
$\Delta \pi_{t-1}^e$	-0.036	-0.087	-0.129	0.090
	[-0.256]	[-0.971]	[-1.202]	[0.337]
ΔFH_{t-1}	0.146	0.018	0.028	-0.035
	[2.595]	[0.505]	[0.659]	[-0.330]

Note: t -statistics in brackets.

Table 4: Impact of foreign holdings on long-term interest rates – March 2000 to June 2006

	FH variable	Scale	Coefficient	Initial	Final	Total Impact
This study	FH bonds	GDP	0.128	17.99	30.08	-1.548
Bandholz et al. (2009)	FH Treas	Outst	0.070	35.25	52.00	-1.173
Beltran et al. (2013), lower bound	FOH Treas	Outst	0.046	18.54	36.53	-0.828
Beltran et al. (2013), upper bound	FOH Treas	Outst	0.063	18.54	36.53	-1.133
Bertaut et al. (2009)	FOH Treas + Agenc	Outst	0.062	9.09	18.67	-0.875

Source: Authors' calculations. Initial is the stock in March 2000, final is the stock in June 2006, total impact is the coefficient times the change in the stock from March 2000 to June 2006.

Table 5: Cointegration tests

Domestic holdings model				
Unrestricted cointegration rank test (Trace)				
No. cointegration relations	Eigenvalue	Trace statistic	0.05 critical value	<i>p</i> -value
None*	0.302	55.110	47.856	0.009
At most 1	0.138	22.009	29.797	0.298
Unrestricted cointegration rank test (Maximum Eigenvalue)				
No. cointegration relations	Eigenvalue	Trace statistic	0.05 critical value	<i>p</i> -value
None*	0.302	33.101	27.584	0.009
At most 1	0.138	13.654	21.131	0.394
Foreign and domestic holdings model				
Unrestricted cointegration rank test (Trace)				
No. cointegration relations	Eigenvalue	Trace statistic	0.05 critical value	<i>p</i> -value
None*	0.316	84.111	69.819	0.002
At most 1*	0.271	49.105	47.856	0.038
At most 2	0.127	20.072	29.797	0.418
Unrestricted cointegration rank test (Maximum Eigenvalue)				
No. cointegration relations	Eigenvalue	Trace statistic	0.05 critical value	<i>p</i> -value
None*	0.316	35.006	33.877	0.037
At most 1*	0.271	29.003	27.584	0.032
At most 2	0.127	12.451	21.132	0.504
Foreign and domestic holdings model - Corporate AAA				
Unrestricted cointegration rank test (Trace)				
No. cointegration relations	Eigenvalue	Trace statistic	0.05 critical value	<i>p</i> -value
None*	0.313	72.181	69.819	0.032
At most 1	0.275	41.368	47.856	0.177
Unrestricted cointegration rank test (Maximum Eigenvalue)				
No. cointegration relations	Eigenvalue	Trace statistic	0.05 critical value	<i>p</i> -value
None	0.313	30.813	33.877	0.111
At most 1	0.275	26.393	27.584	0.070
Foreign and domestic holdings model - Corporate AA				
Unrestricted cointegration rank test (Trace)				
No. cointegration relations	Eigenvalue	Trace statistic	0.05 critical value	<i>p</i> -value
None*	0.324	72.697	69.819	0.029
At most 1	0.268	40.570	47.856	0.203
Unrestricted cointegration rank test (Maximum Eigenvalue)				
No. cointegration relations	Eigenvalue	Trace statistic	0.05 critical value	<i>p</i> -value
None	0.324	32.127	33.877	0.080
At most 1	0.268	25.620	27.584	0.087

Note: * denotes rejection of the hypothesis at the 0.05 level.

Table 6: VECM results - domestic holdings

Cointegration equation	i_{t-1}^l	i_{t-1}^s	π_{t-1}^e	DH_{t-1}
	1	-0.149	-0.725	0.177
		[-2.133]	[-5.892]	[9.241]
Error correction	Δi^l	Δi^s	$\Delta \pi^e$	ΔDH
α	-0.083	0.124	0.087	-0.456
	[-1.297]	[3.180]	[1.900]	[-2.614]
Δi_{t-1}^l	0.213	0.102	-0.008	0.784
	[1.917]	[1.518]	[-0.097]	[2.594]
Δi_{t-1}^s	0.023	0.275	-0.104	0.524
	[0.128]	[2.541]	[-0.814]	[1.078]
$\Delta \pi_{t-1}^e$	-0.108	-0.087	-0.142	0.098
	[-0.737]	[-0.981]	[-1.349]	[0.247]
ΔDH_{t-1}	0.050	0.002	0.009	-0.188
	[1.388]	[0.084]	[0.341]	[-1.911]

Note: t -statistics in brackets.

Table 7: VECM results - foreign and domestic holdings

	i_{t-1}^l	i_{t-1}^s	π_{t-1}^e	FH_{t-1}	DH_{t-1}
Cointegration equation 1	1	-0.259	-0.430	0.126	-
		[-5.527]	[-4.767]	[13.493]	-
Cointegration equation 2	1	-0.163	-0.730	-	0.175
		[-2.480]	[-6.020]	-	[10.481]
Error correction	Δi^l	Δi^s	$\Delta \pi^e$	ΔFH	ΔDH
α^1	-0.776	0.113	-0.168	-0.389	1.029
	[-3.985]	[0.869]	[-1.090]	[-1.014]	[1.815]
α^2	0.460	0.045	0.201	0.260	-1.163
	[3.054]	[0.449]	[1.691]	[0.878]	[-2.656]
Δi_{t-1}^l	0.322	0.096	0.016	-0.458	0.597
	[3.082]	[1.381]	[0.192]	[-2.226]	[1.960]
Δi_{t-1}^s	0.044	0.277	-0.092	0.343	0.448
	[0.267]	[2.539]	[-0.713]	[1.064]	[0.941]
$\Delta \pi_{t-1}^e$	-0.025	-0.084	-0.121	0.104	-0.075
	[-0.188]	[-0.932]	[-1.130]	[0.389]	[-0.190]
ΔFH_{t-1}	0.157	0.016	0.033	0.022	-0.353
	[2.779]	[0.422]	[0.734]	[1.196]	[-2.144]
ΔDH_{t-1}	-0.016	0.005	-0.005	-0.118	-0.076
	[-0.455]	[0.210]	[-0.182]	[-1.663]	[-0.724]

Note: t -statistics in brackets.

Table 8: VECM results - foreign and domestic holdings, corporate yields

Panel A: Corporate AAA yields					
Cointegration equation	i_{t-1}^l	i_{t-1}^s	π_{t-1}^e	FH_{t-1}	DH_{t-1}
	1	-0.399	-0.530	0.147	-0.007
		[-9.362]	[-6.996]	[4.656]	[-0.181]
Error correction	Δi^l	Δi^s	$\Delta \pi^e$	ΔFH	ΔDH
α	-0.015	0.264	0.045	-0.016	-0.033
	[-0.266]	[9.947]	[1.071]	[-0.146]	[-0.209]
Panel A: Corporate AA yields					
Cointegration equation	i_{t-1}^l	i_{t-1}^s	π_{t-1}^e	FH_{t-1}	DH_{t-1}
	1	-0.417	-0.608	0.116	0.029
		[-9.892]	[-8.097]	[3.768]	[0.750]
Error correction	Δi^l	Δi^s	$\Delta \pi^e$	ΔFH	ΔDH
α	-0.001	0.266	0.049	-0.019	-0.074
	[-0.019]	[9.789]	[1.154]	[-0.180]	[-0.464]

Note: t -statistics in brackets.

Table 9: VECM - alternative models

Panel A: model with trend					
Cointegration equation	i_{t-1}^l	i_{t-1}^s	π_{t-1}^e	FH_{t-1}	β^t
	1	-0.298	-0.336	0.235	-0.018
		[-5.628]	[-3.356]	[3.563]	[-1.646]
Error correction	Δi^l	Δi^s	$\Delta \pi^e$	ΔFH	
α	-0.249	0.178	0.056	-0.171	
	[-3.015]	[3.403]	[0.888]	[-1.098]	
Δi_{t-1}^l	0.336	0.086	0.019	-0.433	
	[3.060]	[1.230]	[0.231]	[-2.084]	
Δi_{t-1}^s	0.183	0.300	-0.002	0.503	
	[1.152]	[2.979]	[-0.013]	[1.673]	
$\Delta \pi_{t-1}^e$	-0.035	-0.089	-0.124	0.114	
	[-0.247]	[-0.996]	[-1.151]	[0.427]	
ΔFH_{t-1}	0.159	0.008	0.027	-0.018	
	[2.811]	[0.221]	[0.621]	[-0.164]	
Panel B: ARDL					
Cointegration equation	i_{t-1}^l	i_{t-1}^s	π_{t-1}^e	FH_{t-1}	
	1	-0.202	-0.047	0.131	
		[-2.115]	[-0.232]	[6.530]	
Error correction	Δi^l				
α	-0.260				
	[-3.287]				
Δi_{t-1}^l	0.272				
	[2.469]				
Δi_{t-1}^s	0.071				
	[0.434]				
$\Delta \pi_{t-1}^e$	0.035				
	[0.243]				
ΔFH_{t-1}	0.133				
	[2.429]				

Note: t -statistics in brackets.

Table 10: VECM results with control variables

Panel A: US long-term interest rates				
Cointegration equation	i_{t-1}^l	i_{t-1}^s	π_{t-1}^e	FH_{t-1}
	1	-0.111	-0.560	0.078
		[-2.991]	[-7.051]	[8.169]
Error correction	Δi^l	Δi^s	$\Delta \pi^e$	ΔFH
α	-0.439	-0.018	0.112	0.001
	[-8.419]	[-0.380]	[2.089]	[0.011]
Δi_{t-1}^l	0.054	0.116	0.029	-0.488
	[0.681]	[1.635]	[0.356]	[-2.361]
Δi_{t-1}^s	-0.008	0.443	-0.043	0.341
	[-0.081]	[4.763]	[-0.404]	[1.257]
$\Delta \pi_{t-1}^e$	-0.083	-0.077	-0.145	0.092
	[-0.804]	[-0.827]	[-1.363]	[0.339]
ΔFH_{t-1}	0.090	0.022	0.034	-0.035
	[2.195]	[0.591]	[0.810]	[-0.331]
i_{t-1}^{US}	0.285	0.050	-0.030	-0.023
	[9.499]	[1.851]	[-0.973]	[-0.295]
Panel B: industrial production and VIX				
Cointegration equation	i_{t-1}^l	i_{t-1}^s	π_{t-1}^e	FH_{t-1}
	1	-0.270	-0.453	0.151
		[-4.977]	[-4.443]	[9.725]
Error correction	Δi^l	Δi^s	$\Delta \pi^e$	ΔFH
α	-0.276	0.135	0.075	-0.143
	[-3.632]	[2.695]	[1.274]	[-0.975]
Δi_{t-1}^l	0.295	0.114	0.037	-0.475
	[2.812]	[1.657]	[0.453]	[-2.350]
Δi_{t-1}^s	0.155	0.312	0.011	0.350
	[0.990]	[3.022]	[0.094]	[1.160]
$\Delta \pi_{t-1}^e$	-0.042	-0.070	-0.131	0.081
	[-0.304]	[-0.776]	[-1.214]	[0.305]
ΔFH_{t-1}	0.134	0.017	0.028	-0.081
	[2.299]	[0.442]	[0.610]	[-0.723]
IP	-0.008	-0.001	0.004	-0.007
	[-2.476]	[-0.397]	[1.673]	[-1.160]
VIX	0.001	-0.000	0.001	0.005
	[0.407]	[-0.016]	[0.314]	[1.126]

Note: t -statistics in brackets.

Table 11: VECM results - US model

Cointegration equation	$i_{t-1}^{l,US}$	$i_{t-1}^{s,US}$	$\pi_{t-1}^{e,US}$	FH_{t-1}^{US}
	1	-0.126	-0.469	0.088
		[-3.227]	[-2.936]	[8.318]
Error correction	$\Delta i_{t-1}^{l,US}$	$\Delta i_{t-1}^{s,US}$	$\Delta \pi_{t-1}^{e,US}$	ΔFH_{t-1}^{US}
α	-0.169	0.158	0.148	0.254
	[-2.098]	[3.499]	[4.002]	[1.476]
$\Delta i_{t-1}^{l,US}$	0.228	-0.000	-0.100	-0.185
	[1.723]	[-0.003]	[-1.651]	[-0.653]
$\Delta i_{t-1}^{s,US}$	0.228	0.460	-0.155	-0.787
	[1.354]	[4.880]	[-2.009]	[-2.189]
$\Delta \pi_{t-1}^{e,US}$	0.133	-0.021	-0.084	0.185
	[0.623]	[-0.174]	[-0.860]	[0.407]
ΔFH_{t-1}^{US}	0.095	-0.010	0.021	-0.002
	[1.643]	[-0.302]	[0.789]	[-0.020]

Note: t -statistics in brackets.

Table 12: Cointegration tests - model with US rates

One lag				
Unrestricted cointegration rank test (Trace)				
No. cointegration relations	Eigenvalue	Trace statistic	0.05 critical value	<i>p</i> -value
None*	0.480	237.419	159.530	0.000
At most 1*	0.427	177.280	125.615	0.000
At most 2*	0.356	126.032	95.754	0.000
At most 3*	0.293	85.544	69.819	0.002
At most 4*	0.247	53.593	47.856	0.013
At most 5	0.195	27.506	29.797	0.090
Unrestricted cointegration rank test (Maximum Eigenvalue)				
No. cointegration relations	Eigenvalue	Trace statistic	0.05 critical value	<i>p</i> -value
None*	0.480	60.139	52.363	0.007
At most 1*	0.427	51.247	46.231	0.013
At most 2*	0.356	40.488	40.078	0.045
At most 3	0.293	31.951	33.877	0.083
Three lags				
Unrestricted cointegration rank test (Trace)				
No. cointegration relations	Eigenvalue	Trace statistic	0.05 critical value	<i>p</i> -value
None*	0.555	237.180	159.530	0.000
At most 1*	0.433	164.266	125.615	0.000
At most 2*	0.387	113.220	95.754	0.002
At most 3	0.230	69.222	69.819	0.056
Unrestricted cointegration rank test (Maximum Eigenvalue)				
No. cointegration relations	Eigenvalue	Trace statistic	0.05 critical value	<i>p</i> -value
None*	0.555	72.915	52.363	0.000
At most 1*	0.433	51.045	46.231	0.014
At most 2*	0.387	43.998	40.078	0.017
At most 3	0.230	23.498	33.877	0.493

Note: * denotes rejection of the hypothesis at the 0.05 level.

Table 13: VECM results - global model

Panel A: no lag								
	i_{t-1}^l	i_{t-1}^s	π_{t-1}^e	FH_{t-1}	$i_{t-1}^{l,US}$	$i_{t-1}^{s,US}$	$\pi_{t-1}^{e,US}$	FH_{t-1}^{US}
Cointegration equation 1	1	-0.543 [-10.071]	-0.680 [-6.918]	0.179 [14.208]	-	-	-	-
Cointegration equation 2	-	-	-	-	1	-0.060 [-7.327]	-0.079 [-3.269]	0.004 [1.832]
Cointegration equation 3	1	-	-	-	2.933 [34.712]	-	-	-
Error correction	Δi^l	Δi^s	$\Delta \pi^e$	ΔFH	$\Delta i^{l,US}$	$\Delta i^{s,US}$	$\Delta \pi^{e,US}$	ΔFH^{US}
α^1	-0.084 [-1.801]	0.055 [1.657]	0.182 [6.768]	-0.017 [-0.196]	-0.053 [-0.758]	0.103 [2.628]	0.041 [1.189]	0.243 [2.580]
α^2	0.481 [2.302]	-0.321 [-2.165]	-0.128 [-1.055]	-0.016 [-0.041]	0.176 [0.558]	0.898 [5.072]	0.060 [0.391]	-0.578 [-1.363]
α^3	-0.114 [-2.283]	0.082 [2.320]	0.053 [1.838]	-0.001 [-0.012]	-0.061 [-0.815]	-0.209 [-4.956]	-0.008 [-0.206]	0.134 [1.321]
Panel B: one lag								
	i_{t-1}^l	i_{t-1}^s	π_{t-1}^e	FH_{t-1}	$i_{t-1}^{l,US}$	$i_{t-1}^{s,US}$	$\pi_{t-1}^{e,US}$	FH_{t-1}^{US}
Cointegration equation 1	1	-0.476 [-7.139]	-0.211 [-4.700]	0.129 [14.553]	-	-	-	-
Cointegration equation 2	-	-	-	-	1	-0.098 [-3.179]	-0.595 [-5.062]	0.116 [11.030]
Cointegration equation 3	1	-	-	-	4.267 [6.096]	-	-	-
Error correction	Δi^l	Δi^s	$\Delta \pi^e$	ΔFH	$\Delta i^{l,US}$	$\Delta i^{s,US}$	$\Delta \pi^{e,US}$	ΔFH^{US}
α^1	-0.498 [-4.230]	0.074 [0.823]	0.062 [0.820]	-0.396 [-1.724]	-0.347 [-1.860]	-0.098 [-0.943]	0.049 [0.544]	0.345 [1.490]
α^2	0.157 [2.287]	-0.013 [-0.253]	0.063 [1.429]	0.266 [1.991]	0.015 [0.140]	0.215 [3.543]	0.121 [2.307]	0.214 [1.587]
α^3	0.017 [2.536]	-0.004 [-0.762]	0.005 [1.246]	-0.000 [-0.009]	-0.004 [-0.402]	0.000 [0.070]	0.003 [0.628]	-0.034 [-2.572]

Note: t -statistics in brackets. Short-run coefficients not reported.

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