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Online Appendix for

"The Greatest Carry Trade Ever? Understanding Eurozone Bank Risks"

Viral V. Acharya

Sascha Steffen

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Appendix I. Bank of Cyprus

Table I. Trading in Greek Sovereign Debt

This table reports purchases and sales of Greek sovereign bonds by Bank of Cyprus in the first quarter of 2009. Transactions are shown by ISIN, the residual maturity of the bond, the amounts (in EUR) and the price at which the transaction was executed. Column (6) shows the date of the transaction and column (7) the gain / loss of the transaction. Source: Report by Alvarez & Marsal for the Central Bank of Cyprus.

(1)	(2)	(3)	(4)	(5)	(6)	(7)
ISIN	Residual Maturity	Purchase	Sale	Price	Date	Gain / Loss
GR0002069327	0.5	40,000,000		0.9877	15.01.2009	
GR0002069327	0.5	25,000,000		0.9877	15.01.2009	
GR0002069327	0.5		65,000,000	0.9938	11.03.2009	396,500
GR0114019442	2.4		95,000,000	1.0099	20.03.2009	
GR0114022479	5.5	40,000,000		0.9935	21.02.2009	
GR0114022479	5.5		1,200,000	0.9935	23.01.2009	0
GR0114022479	5.5		3,000,000	0.9940	28.01.2009	1,500
GR0114022479	5.5		2,000,000	0.9990	28.01.2009	11,000
GR0114022479	5.5		5,000,000	1.0100	30.01.2009	82,500
GR0114022479	5.5		4,000,000	1.0098	02.02.2009	65,200
GR0114022479	5.5		2,000,000	1.0098	02.02.2009	32,600
GR0114022479	5.5		500,000	1.0080	02.02.2009	7,250
GR0114022479	5.5		22,300,000	1.0345	23.03.2009	914,300
GR0114022479	5.5	200,000,000		1.0223	31.03.2009	
GRO 124028623	7.3	40,000,000		0.8915	20.02.2009	
GRO 124028623	7.3		40,000,000	0.9035	23.03.2009	480,000
GRO 124031650	10.2	175,000,000		0.9893	04.03.2009	
GRO 124031650	10.2		1,000,000	0.9999	09.03.2009	10,600
GRO 124031650	10.2		2,000,000	1.0005	10.03.2009	22,400
GRO 124031650	10.2		172,000,000	1.0014	13.03.2009	2,081,200
GR0110021236	3	25,000,000		0.9976	10.02.2009	
GR0110021236	3		25,000,000	1.0018	11.03.2009	105,750
GR0512001356	3.9	200,000,000		0.9995	06.02.2009	
GR0512001356	3.9	100,000,000		0.9907	11.03.2009	
GR0512001356	3.9	172,000,000		1.0014	13.03.2009	
XS0372384064	4.2	7,721,000		0.9905	17.03.2009	
		1,024,721,000	440,000,000			4,210,800
	Difference	584,721,000				

Figure I.1

This graph depicts BOC's trading in Greek sovereign bonds from Jan 2009 – Dec 2011. The red lines indicate rating downgrades of Greek sovereign bonds.



Appendix II. Micro-Level Portfolio Evidence

Table II.1 Analysis of Domestic Sovereign Exposures by GIPSI Banks using Micro Level Sovereign Bond Holding Data

Panel A of Table II.1 reports holdings of GIPSI banks in *domestic* sovereign debt at each of the five EBA stress test dates in million Euros. Panel B reports holdings of GIPSI banks in other (non-domestic) GIPSI sovereign debt.

Panel A

	Bond Holdings (Euro millions) in GIPSI countries							
	Greece	Italy	Portugal	Spain	Ireland			
GIPSI banks	Greek Banks	Italian Banks	Portuguese Banks	Spanish Banks	Irish Banks			
March 2010	56,148	144,856	5,176	143,869	5,322			
December 2010	54,447	164,011	10,351	154,793	12,466			
September 2011 ¹⁾	NA	156,043	10,972	143,629	12,455			
December 2011 ¹⁾	NA	147,746	8,180	111,774	12,109			
June 2012 ¹⁾	NA	184,171	10,657	124,385	13,848			

1) Greek banks were excluded from stress tests

Panel B

	Bond Holdings (Euro millions) in GIPSI countries								
	Greece	Italy	Portugal	Spain	Ireland				
	GIPSI Banks but	GIPSI Banks but	GIPSI Banks but	GIPSI Banks but	GIPSI Banks but				
	Non-Greek Banks	Non-Italian Banks	Non-Portuguese Banks	Non-Spanish Banks	Non-Irish Banks				
March 2010	3,950	4,172	7,202	1,774	879				
December 2010	2,904	7,185	5,811	3,567	738				
September 2011		8,039	3,776	3,798	716				
December 2011		6,218	3,697	3,789	690				
June 2012		5,379	4,773	3,422	685				

Table II.2 Analysis of Changes in Sovereign Exposures by Country

This table analyses changes in bond holdings over the 5 stress tests conducted by the European Banking Authority (EBA). These time periods are: (1) March to December 2010, (2) January to September 2011, (3) October to December 2011, and (4) January to June 2012. We report the change in holdings in all GIPSI sovereign bonds separately for domestic vis-à-vis foreign banks as well as the percentage change. Amounts are in million Euro.

	Change in Exposure to Italian Sovereign Debt (EUR million)					% Cha	ange	
Italian Bank	March - Dec 2010	Jan - Sept 2011	Oct - Dec 2011	Jan - June 2012	March - Dec 2010	Jan - Sept 2011	Oct - Dec 2011	Jan - June 2012
No	21,358	-27,685	-19,345	-589	19.26%	-20.84%	-18.43%	-0.86%
Yes	19,155	-7,968	-8,297	36,424	13.22%	-4.86%	-5.32%	24.65%
	Change in 1	Exposure to Spain S		% Cha	ange			
Spanish Bank	March - Dec 2010	Jan - Sept 2011	Oct - Dec 2011	Jan - June 2012	March - Dec 2010	Jan - Sept 2011	Oct - Dec 2011	Jan - June 2012
No	16,762	-11,577	-6,226	-1,758	66.34%	-27.50%	-20.40%	-7.69%
Yes	5,335	7,608	-2,464	12,611	3.68%	4.64%	-1.58%	8.54%
	% Change							
Irish Bank	March - Dec 2010	Jan - Sept 201	Oct - Dec 2011	Jan - June 2012	March - Dec 2010	Jan - Sept 2011	Oct - Dec 2011	Jan - June 2012
No	-5,089	-1,105	-326	-569	-47.49%	-19.34%	-7.18%	-13.56%
Yes	5,292	-10	-346	1,738	99.43%	-0.08%	-2.78%	14.36%
	Change in Ex	posure to Portugues	e Sovereign Debt (E	UR million)		% Cha	ange	
Portuguese Bank	March - Dec 2010	Jan - Sept 201	Oct - Dec 2011	Jan - June 2012	March - Dec 2010	Jan - Sept 2011	Oct - Dec 2011	Jan - June 2012
No	-2,724	-2,408	-1,793	843	-12.04%	-12.07%	-10.35%	6.20%
Yes	5,175	621	-2,792	2,477	99.99%	6.00%	-25.45%	30.28%
	Change in l	Exposure to Greek S	overeign Debt (EUI	R million)		% Cha	ange	
Greek Bank	March - Dec 20100	Jan - Sept 201	Oct - Dec 2011	Jan - June 2012	March - Dec 2010	Jan - Sept 2011	Oct - Dec 2011	Jan - June 2012
No	-5,863	-6,491	-672	-18,121	-15.91%	-20.86%	-2.73%	-90.88%
Yes	-1,701	0	-	-	-93.56%	0.00%	-	-

Table II.3 Changes in GIPSI Sovereign Bond Holdings Surrounding LTROs

This table reports changes in sovereign bond holdings by publicly listed European banks between Dec 31st, 2011 and June 30th, 2012 aggregated to the country level. Changes are reported by bond maturity. $\langle = 3 \rangle$ years ($> 3 \rangle$ years) denotes bonds that have a remaining maturity of below / equal to (greater than) 3 years. For each country, we report changes in all GIPSI sovereign bond holdings.

	GI	PSI	It	aly	Sp	ain	Port	tugal	Ire	land	Gr	eece
	<= 3 years	> 3 years										
AT	-583	-10	-473	-4	-100	1	0	-1	0	0	-10	-8
BE	-940	-555	-137	-232	-814	-189	-4	-3	29	0	-14	-131
CY	-2,672	-2,116	30	-27	0	-5	0	0	7	-56	-2,710	-2,028
DE	-3,063	-283	-48	767	56	-588	21	-134	-36	-26	-3,056	-302
DK	137	130	158	151	-31	8	0	-9	9	-4	2	-16
ES	7,446	5,268	1,531	-2,450	6,032	6,579	-66	1,243	0	0	-51	-104
FR	492	-3,788	4,009	-881	345	231	-403	-1,286	-41	-262	-3,417	-1,589
GB	-3,042	-3,101	-1,468	-1,791	-956	528	-76	56	-22	-109	-520	-1,785
HU	0	0	0	0	0	0	0	0	0	0	0	0
IE	1,511	119	1	15	-30	0	5	-83	1,535	203	0	-16
IT	27,355	7,261	28,643	7,782	-65	-271	-9	-14	-24	-9	-1,190	-227
MT	-2	-2	0	0	0	0	0	1	0	0	-2	-2
NL	-27	-95	230	-187	-319	142	96	-2	-35	-23	2	-26
NO	0	0	0	0	0	0	0	0	0	0	0	0
PT	3,215	36	-1	65	-19	27	3,679	320	34	-4	-479	-372
SE	-27	-51	11	-6	-13	0	0	0	0	0	-25	-45

Appendix III. Results from Multifactor Models

Table III.1

This table contains the results of a pooled OLS regression of banks' stock returns on sovereign bond returns during the Jan 2007 to June 2013 period using various sub-samples of banks. We use the following sub-samples: (1) all GIPSI banks, (2) Italian banks, (3) Spanish banks, (4) all Non-GIPSI banks, and (5) German and French banks. All regressions include ten-year German bond returns as the "funding leg" of the carry trade. All regressions further include all macroeconomic control variables used in model (2) of Panel A of Table 5 (*VSTOXX, TermStructure, BondDefSpread, 1mEuribor, \Delta ESI, \Delta IndProd, \Delta CPI). T-statistics are in parentheses. Standard errors are clustered at bank and quarter level. ***,** and * indicate significance at 1, 5 and 10% levels respectively.*

	(1)	(2)	(3)	(4)	(5)
	GIPSI	Italy	Spain	Non GIPSI	Germany & France
$\hat{\beta}_{Greece}$	0.043***	-0.009	0.006	0.003	0.008
	(3.18)	(-1.53)	(0.70)	(0.37)	(1.30)
$\hat{eta}_{ ext{Italy}}$	0.257***	0.443***	-0.035	0.204**	0.149**
-	(2.62)	(7.47)	(-0.85)	(2.40)	(2.35)
$\hat{\beta}_{ m Portugal}$	0.013	0.045**	0.023*	0.018*	0.038**
Ū.	(0.49)	(2.44)	(1.80)	(1.68)	(2.06)
$\hat{\beta}_{\text{Spain}}$	0.010	0.105*	0.251***	0.024	0.153***
ĩ	(0.14)	(1.90)	(6.23)	(0.36)	(2.75)
$\hat{\beta}_{\text{Ireland}}$	0.145***	0.025	0.034	0.111**	0.111***
	(3.26)	(0.78)	(1.45)	(2.40)	(3.32)
$\hat{\beta}_{\text{Germany}}$	-2.375***	-2.271***	-1.813***	-2.306***	-2.252***
	(-15.98)	(-34.79)	(-35.80)	(-15.72)	(-27.23)
\hat{eta}_{m}	1.544***	1.358***	1.139***	1.334***	1.169***
	(15.62)	(43.04)	(46.12)	(12.93)	(20.51)
\hat{eta}_0	-0.005**	-0.001	-0.003**	-0.001	0.000
	(-2.39)	(-0.46)	(-1.97)	(-0.92)	(0.15)
Ν	31,089	7,713	9,027	39,542	9,186
R^2	46.22%	61.54%	62.54%	43.88%	46.16%

Table III.2. Falsification Tests (Alternative Specifications)

This table reports the results from OLS regressions of daily returns on a value weighted index of EBA Banks (EBA Banks), UK banks (EBA UK Banks), US Banks, macro hedge funds (HFRX Macro), and various country specific industrial indices during the 2007 to 2012 period. There are: MSCI GIPSI, which is an equally weighted index formed from the underlying indices for Italy, Spain and Portugal, MSCI Germany, MSCI Non GIPSI, which is an equally weighted index of the most important countries in Europe other than Germany or the periphery (France, Netherlands, Norway, Denmark and Sweden), and MSCI UK. As market return, we include the Euro Stoxx 600 (STOXX 600) for European indices, the S&P 500 (S&P500) for the US index and MSCI World for the HFRX Macro Hedge Fund index. We also include the Fama-French Factors (SMB and HML). The standard errors were adjusted for heteroscedasticity and auto-correlation using Newey-West with 8 lags. ***,** and * indicate significance at 1, 5 and 10% levels respectively.

	(1)	(2) ED 4	(3)	(4)	(5)	(6)	(7)
	EBA Banks	EBA UK Banks	US Banks	HF KX Macro	MSCI GIPSI	MSCI Germany	MSCI Non GIPSI
\hat{eta}_{Greece}	0.006	-0.002	-0.006	0.001	-0.009	-0.009*	0.001
$\hat{\beta}_{\text{Italy}}$	(0.70) 0.202***	(-0.25)	-0.034	(0.40) -0.039**	(-1.14) -0.173**	(-1.88) 0.091	-0.034
	(3.73)	(1.57)	(-0.43)	(-2.45)	(-2.08)	(1.12)	(-0.64)
$\hat{eta}_{ ext{Portugal}}$	0.013 (0.91)	0.014 (0.65)	0.016 (0.80)	0.013* (1.85)	0.004 (0.17)	-0.034 (-1.35)	-0.021 (-1.34)
$\hat{eta}_{ ext{Spain}}$	0.086* (1.65)	-0.083 (-1.02)	-0.035 (-0.47)	0.026 (1.44)	0.168** (2.17)	-0.042 (-0.57)	0.065 (1.39)
$\hat{eta}_{ ext{Ireland}}$	0.105** (2.48)	0.100 (1.25)	0.001 (0.02)	0.000 (0.03)	0.052 (1.12)	-0.027 (-0.56)	0.020 (0.65)
$\hat{eta}_{ ext{Germany}}$	-2.438***	-1.978***	-1.911***	0.086***	-0.015	-0.080	-0.008
$\hat{eta}_{ m m}$	(-32.30)	(-10.50)	(-18.50) 1.645***	0.005	0.010	0.039	0.304***
Ŷsmb	(22.08) 0.000	(14.61) 0.000	(13.67) -0.000	(0.43) 0.000	-0.000	-0.000	0.000
$\hat{\gamma}_{HML}$	(0.05) 0.001***	(0.79) 0.000* (1.79)	(-0.58) 0.000	(0.88) 0.000	(-0.51) 0.000* (1.02)	(-0.49) 0.000* (1.06)	-0.000
\hat{eta}_0	(4.11) -0.000 (1.42)	(1.78) -0.000 (0.75)	(1.48) 0.000 (0.11)	(0.24) -0.000 (0.72)	-0.000	(1.96) 0.000 (0.43)	-0.000
N	1,591	1,559	1,523	1,523	1,591	1,591	1,591
<i>R</i> ²	78.18%	53.55%	65.95%	1.19%	1.12%	0.63%	13.19%

Appendix IV Factor Loadings and Portfolio Holdings

A. Results from a two-step-procedure

The advantage of the one-step procedure (i.e. the SUR methodology presented in the paper) over a two-step procedure is to avoid a measurement (sampling) error in estimating $\hat{\beta}_{GIPSI}$ and $\hat{\beta}_{Germany}$. The two-step procedure estimates the factor loadings in a first regression and uses these estimates in a second step to analyze their determinants. If the sampling error is not constant across banks, this might induce heteroscedasticity in the second stage regression. More importantly, a possible contemporaneous correlation between the error terms in estimating (1) could induce a correlation among the factor loadings which, in turn, could inflate our t-statistics in the second step. However, the SUR methodology requires a balanced panel restricting the number of time-series observations that can be used in the regressions. Given the limitations of both approaches, this section presents the results from the two-step procedure to further investigate the link between our carry trade estimates and the actual bond holdings from bank disclosures. In a first step, we relate the factor loadings estimated for each bank in the time period 60 days before and 60 days after each reporting date on the sovereign bond holdings scaled by total assets. To visualize this relationship, we plot the factor loadings on the sovereign bond holdings for each reporting date and country separately in Figure IV.1. We use logs for illustration purposes.

The scatterplot shows a positive relationship between factor loadings and portfolio holdings. We estimate regression (3) to analyze how $\hat{\beta}_{GIPSI,i,t}$ varies with actual portfolio holdings in the cross-section of banks. Similar to the one-step-procedure, we scale holdings by total assets (alternatively by book value of equity) to construct a measure that has the same unit of measurement as $\hat{\beta}_{GIPSI,i,t}$ and expect α_{GIPSI} to be positive. A positive value indicates that the sensitivity of banks' equity return is higher if banks have higher actual exposure. α_0 measures other influences on $\hat{\beta}_{GIPSI,i,t}$ which are assumed to be constant across banks.

$$\hat{\beta}_{GIPSIi,t} = \alpha_0 + \alpha_1 \frac{Holdings_{GIPSI,i,t-1}}{Assets_{i,t-1}} + \omega_{i,t} \qquad (3)$$

The results are reported in Table IV.1 Panel A of Table IV.1 shows the result for exposures to Italian and Spanish government bonds. The standard errors are White's heteroscedasticity consistent standard errors. We find that α_{GIPSI} is positive and significant at the one percent level which supports our methodology to infer banks' exposure to sovereign debt through the sensitivity of the banks' equity returns to sovereign bond returns. This result extends to Spanish bonds as investment leg of the carry trade as well as book equity as alternative scaling factor.

We aggregate the monthly MMF holdings data to the quarter and estimate quarterly $\hat{\beta}_{Germany,i}$ using (1). As an example, we chose a carry trade with Italian bonds as the investment leg. We find some variation in the value of $\hat{\beta}_{Germany,i}$ ranging from -3.92 to -0.93. Panel A of Figure 5 explores the relationships between the factor loading estimates and MMF withdrawals graphically.

Figure IV.2 plots time-series betas of Dexia's equity and German government bonds $(\hat{\beta}_{Germany})$ as well as monthly holdings of US MMF (dashed line). The betas were constructed using a multivariate GARCH model with dynamic correlations (Engle, 2002, and Engle and Sheppard, 2001). This plot strikingly shows the co-movement of $\hat{\beta}_{Germany}$ and US MMF withdrawals. Figure 5.B. explores the correlation between $\hat{\beta}_{Germany,i}$ and MMF withdrawals in the cross-section of banks in 2011. This correlation is 0.71 suggesting that US MMF exposure is an important determinant of banks' liquidity problems.

We regress quarterly factor loadings on MMF withdrawals scaled by total assets (using previous MMF exposure and short-term debt as alternative deflators) over the full sample period starting October 2010:

$$\hat{\beta}_{Germany,i,t} = \alpha_2 + \alpha_3 \frac{\Delta MMF_i}{Assets_{i,t-1}} + \omega_{i,t}$$
(4)

We expect $\hat{\alpha}_3$ to be negative. An decrease in MMF over a quarter should make German long-term bond returns more negatively correlated with equity returns resulting in a lower value of $\hat{\beta}_{Germany,i,t}$. Panel B of Table IV.1 reports the results. Our cross-sectional results suggest that banks that experience larger withdrawals from US MMF have more negative factor loadings.¹

B. Real sector exposure

In a second step, we use the data on banks' real sector exposure in each country. One could argue that our factor loadings reflect cross-border investments of internationally active banks rather than exposure to sovereign debt. We construct a new variable Italy-Real/Assets which is the sum of each bank's exposure to firms, the retail sector (including retail real estate) and commercial real estate scaled by total assets. The real sector exposure to Spain is constructed accordingly. Panel C of Table IV.1 reports the results of regressions of our factor loadings estimated 60 days before and after 31 Dec 2010 on real sector and sovereign exposure.

Using Italy as an example, models (1) and (2) show that our factor loadings are positively related to reported sovereign and real sector exposure in separate regressions. Model (3) includes both types of exposures and model (4) excludes Italian banks. Particularly in our sample of non-Italian banks, we find that sovereign holdings explain our factor loadings while real sector exposures are not significantly related to the latter. Interestingly, around this reporting date, we do not find a significant relationship between factor loadings and sovereign holdings among the sample of non-Spanish banks. These findings point to interesting

¹ We also scale MMF changes by book value of equity. Moreover, we repeat all cross-sectional tests using Spanish government bonds as investment leg of the carry trade. The results are qualitatively similar but not reported for brevity.

differences and dynamics between countries and over time. They also suggest that Italian sovereign debt is the primary asset class for banks' investment in carry trades.

Figure IV.1. Factor Loadings and Bond Portfolio Holdings

The graph depicts a scatter plot of Log(Beta) estimated from a cross-sectional regression of stock on 10-year Greek and German government bond returns on Log(Holdings / Assets). Factor loadings are estimated within 60 days before and after the reporting date of the portfolio holdings.







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Figure IV.2. Dexia S.A. – Time Varying Betas and MMF Exposure This graphic shows time-varying betas of Dexia's equity with 10-year German government bond returns estimated using an MGARCH-DCC model and monthly US MMF holdings in Dexia since November 2010.



Table IV.1

Factor Loadings, Portfolio Holdings and Funding Risk

This table contains the results regressing factor loadings $(\hat{\beta}_{\text{Italy.}}, \hat{\beta}_{\text{Spain.}}, \hat{\beta}_{\text{Greece}})$ on sovereign bond holdings. $\frac{Holdings_{GIPSI,i,t-1}}{Assets_{i,t-1}}$ are portfolio holdings by banks of Italian, Spain or Greek government bonds scaled by lagged total assets. Scale variables are total assets (TA) and book value of equity (BV). Factor loadings are estimated 60 days before and 60 days after the reporting date for each bank. Quarterly fixed effects are included. t-statistics based on White's heteroscedasticity consistent standard errors are given in parentheses. ***,** and * indicate significance at 1, 5 and 10% levels respectively.

Panel A. Sovereign bond exposures

	$\hat{\beta}_{GIPSI}$	$\alpha_{i,t} = \alpha_0 + \alpha_1 \frac{H}{dt}$	oldings _{GIPSI,i,t} . Assets _{i,t-1}	$\frac{-1}{2} + \omega_{i,t}$
GIPSI	Ν	$\hat{\alpha}_0$	$\hat{\alpha}_1$	R^2
Scaled by Total Assets				
Italy	194	0.756***	7.845***	7.41%
-		(11.10)	(5.26)	
Spain	194	0.653***	6.161***	4.31%
•		(13.10)	(2.70)	
Scaled by Book Value of Equity				
Italy	194	0.753***	0.468***	6.53%
-		(10.91)	(4.46)	
Spain	194	0.650***	0.372***	4.18%
		(12.96)	(2.66)	

Panel B. Money Market Fund Withdrawals

Panel B reports the results from cross-sectional regressions of factor loadings ($\hat{\beta}_{Germany}$) on measures of US MMF withdrawals of European banks. We use total assets (*TA*), lagged MMF exposure (*MMF*_{*t*-1}) and short term debt (*ST-LVG*) as scale variables. Quarterly fixed effects are included. T-statistics based on White's heteroscedasticity consistent standard errors are given in parentheses. ***,** and * indicate significance at 1, 5 and 10% levels respectively.

$$\hat{\beta}_{Germany.i,t} = \alpha_2 + \alpha_3 \frac{\Delta MMF_{i,t}}{MMF_{i,t-1}} + \omega_{i,t}$$

	Ν	\hat{lpha}_2	\hat{lpha}_3	R^2
$\Delta MMF / MMF_{t-1}$	135	-2.451***	-0.538***	6.54%
		(-33.65)	(2.98)	
$\Delta MMF / Assets_{t-1}$	135	-2.467***	-12.391***	10.81%
		(-34.59)	(3.92)	
$\Delta MMF / ST-Debt_{t-1}$	89	-2.486***	-1.580***	14.51%
		(-31.86)	(3.71)	

Panel C. Non-Sovereign Cross-Border Exposure of Banks

This table reports the results from cross-sectional regressions of factor loadings $(\hat{\beta}_{\text{Italy}}, \hat{\beta}_{\text{Spain}})$ on sovereign bond and real sector holdings of European banks. $\frac{Holdings_{GIPSI,i,t-1}}{Assets_{i,t-1}}$ are portfolio holdings by banks of Italian and Spanish government bonds scaled by lagged total assets. $\frac{Real_{GIPSI,i,t-1}}{Assets_{i,t-1}}$ are real sector holdings by banks in Italy, Spain or Greece scaled by lagged total assets. Real sector exposure is the sum of each banks' exposure to the corporate sector, retail sector and commercial real estate sector. All data are from December 2010 (reporting date) and disclosed in the July 2011 stress tests. t-statistics based on White's heteroscedasticity consistent standard errors are given in parentheses. ***,** and * indicate significance at 1, 5 and 10% levels respectively.

$$\hat{\beta}_{GIPSI,i,t} = \alpha_0 + \alpha_1 \frac{Real_{GIPSI,i,t-1}}{Assets_{i,t-1}} + \alpha_2 \frac{Holdings_{GIPSI,i,t-1}}{Assets_{i,t-1}} + \omega_{i,t}$$

		Ì	Italy		$\widehat{m{eta}}_{Spain}$			
	All	All	All	Non-Italian	All	All	All	Non-Spanish
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$\hat{\alpha}_1$	1.148***		-0.602	4.990	0.657**		-0.808	-3.556
	(4.09)		(-0.63)	(0.73)	(2.66)		(-1.41)	(-0.81)
$\hat{\alpha}_2$		8.565***	12.091	36.248***		6.847***	13.158***	71.094
		(2.95)	(1.52)	(2.81)		(3.53)	(3.37)	(1.39)
$\hat{\alpha}_0$	0.845***	0.807***	0.799***	0.685***	0.691***	0.676***	0.676***	0.625***
	(6.84)	(6.38)	(6.20)	(5.14)	(9.53)	(9.36)	(9.32)	(6.56)
Ν	51	51	51	46	51	51	51	45
R^2	6.01%	8.26%	8.51%	8.47%	6.98%	10.80%	12.17%	5.40%

Panel D. Real sector exposure (March - Dec'10)

	(1)	(2)	(3)	(4)
		$\widehat{oldsymbol{eta}}_{G}$	IPSI	
	All Banks	All Banks	All Banks	Non GIPSI Banks
GIPSI / Assets	2.656***		3.135***	16.897***
	(2.91)		(2.79)	(4.39)
Real - GIPSI / Assets		0.178	-0.160	-2.364***
		(0.99)	(-0.91)	(-5.94)
\hat{eta}_0	1.023***	1.081***	1.048***	0.908***
	(11.17)	(11.57)	(10.67)	(8.27)
Ν	49	51	49	28
<i>R</i> ²	0.12	0.02	0.13	0.25

Table IV.2. Sub-Periods

This table contains the results regressing factor loadings ($\hat{\beta}_{GIPSI}$) on sovereign bond holdings. $\frac{Holdings_{GIPSI,i,t-1}}{Assets_{i,t-1}}$ are GIPSI sovereign bond holdings scaled by lagged total assets. Factor loadings are estimated quarterly. Column (1) reports the results during the March 2010 to June 2012 period during which the European Banking Authority (EBA) conducted 5 stress tests. Column (2) reports regression results for the March to December 2010 period, column (3) for the January to September 2011 period, column (4) for the October to December 2011 period and column (5) for the January to June 2012 period, respectively Quarterly fixed effects are included. t-statistics based on White's heteroscedasticity consistent standard errors are given in parentheses. ***,** and * indicate significance at 1, 5 and 10% levels respectively.

	(1)	(2)	(3)	(4)	(5)
			$\hat{\boldsymbol{\beta}}_{GIPSI}$		
	March'10 - June'12 All Banks	March - Dec'10 All Banks	Jan - Sept'11 All Banks	Oct - Dec'11 All Banks	Jan - June'12 All Banks
GIPSI / Assets	4.317***	2.656***	5.666***	4.065**	2.993**
	(6.59)	(2.91)	(6.00)	(2.16)	(2.41)
\hat{eta}_0	0.585***	1.023***	0.286***	0.562***	0.497***
	(14.04)	(11.17)	(6.47)	(7.10)	(8.00)
Ν	173	49	42	41	41
R^2	0.18	0.12	0.45	0.12	0.12

Panel A. GIPSI sovereign bond exposure

Appendix V Carry Trade Incentives

Table V.1 Moral Hazard and Regulatory Arbitrage

Panel A of Appendix Table V.1 reports the results from OLS regressions of banks' equity returns on Italian / Spanish sovereign bond and 10-year German Bund returns and interaction terms of these returns with various bank characteristics during the 2007 to June 2013 period: Log-Assets, ST-LVG, Loans-Assets, Tier 1 and RWA/Assets. Columns (1) to (4) use Italian sovereign bond returns as carry trade investment exposure. Column (1) reports the results for the full sample and columns (2) and (3) for sub-samples of GIPSI and non-GIPSI banks, and column (4) for the sub-sample of German and French banks, respectively. Columns (5) to (8) use Spanish sovereign bond returns as carry trade investment exposure. Columns (6) and (7) for sub-samples of GIPSI and non-GIPSI banks, and column (8) for the full sample and columns (6) and (7) for sub-samples of GIPSI and non-GIPSI banks, and column (8) for the sub-sample of German and French banks, respectively. Bank characteristics are lagged by 1 year and are also included as separate variables which are omitted for brevity. All regressions further include all macroeconomic control variables used in model (2) of Panel A of Table 5 (*VSTOXX, TermStructure, BondDefSpread, ImEuribor, ΔESI, ΔIndProd, ΔCPI*). T-statistics are in parentheses. Standard errors are clustered at bank and quarter level. ***,** and * indicate significance at 1, 5 and 10% levels respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	
		Exposure to Italian Sovereign Debt				Exposure to Spanish Sovereign Debt			
	All Banks	GIPSI Banks	Non GIPSI Banks	German/French banks	All Banks	GIPSI Banks	Non GIPSI Banks	German/French banks	
$\hat{\beta}_{GIPSI}$	-0.479	1.095	-1.025***	-4.395***	-0.723	0.104	-1.081***	-2.737***	
	(-0.99)	(1.62)	(-3.59)	(-3.26)	(-1.33)	(0.15)	(-2.91)	(-3.88)	
$\hat{eta}_{GIPSIx\ Log-Assets}$	0.052**	-0.036	0.079***	0.488***	0.063***	0.016	0.073***	0.257**	
	(2.06)	(-0.90)	(6.51)	(3.35)	(2.71)	(0.44)	(4.90)	(2.40)	
$\hat{\beta}_{GIPSIx ST-LVG}$	0.809***	1.808***	0.370**	-2.117*	0.691**	1.624***	-0.041	0.179	
	(2.93)	(6.43)	(2.40)	(-1.77)	(2.18)	(7.33)	(-0.22)	(0.18)	
$\hat{eta}_{GIPSIx\ RWA/Assets}$	0.552**	-0.609	0.704***	2.222***	0.624***	0.088	0.593***	1.532***	
	(2.54)	(-1.61)	(4.00)	(3.70)	(3.37)	(0.21)	(2.97)	(3.66)	
$\hat{\beta}_{GIPSIx Tier I}$	-0.034***	-0.045**	-0.008	-0.169**	-0.024	-0.047	0.018	-0.083	
	(-2.88)	(-2.53)	(-0.33)	(-2.29)	(-0.95)	(-1.52)	(0.89)	(-1.26)	
$\hat{eta}_{Germany}$	0.639	-2.116	0.944	16.006***	0.662	-2.223	1.067	15.777***	
	(0.43)	(-1.21)	(1.03)	(7.10)	(0.45)	(-1.21)	(1.27)	(7.03)	
$\hat{eta}_{Germany\ x\ Log-Assets}$	-0.137**	-0.006	-0.171***	-1.230***	-0.141**	-0.008	-0.172***	-1.141***	
	(-2.08)	(-0.06)	(-4.93)	(-5.36)	(-2.12)	(-0.08)	(-4.83)	(-5.07)	
$\hat{eta}_{Germany\ x\ ST-LVG}$	-0.859*	-2.633***	-0.202	-2.247	-0.910*	-2.821***	-0.020	-3.440*	
	(-1.65)	(-5.42)	(-0.63)	(-1.26)	(-1.77)	(-6.37)	(-0.08)	(-1.96)	
$\hat{eta}_{GermanyxRWA/Assets}$	-0.582	2.536**	-1.387***	-9.076***	-0.629	2.522**	-1.409***	-8.888***	
	(-0.67)	(2.76)	(-3.85)	(-5.45)	(-0.73)	(2.42)	(-4.10)	(-5.58)	
$\hat{m{eta}}_{Germany x Tier I}$	-0.079*	-0.122*	-0.044	0.165	-0.076*	-0.104**	-0.059	0.102	
-	(-1.83)	(-2.01)	(-1.00)	(1.22)	(-1.86)	(-2.10)	(-1.54)	(0.75)	
$\hat{eta}_{ m m}$	1.372***	1.477***	1.252***	1.011***	1.375***	1.479***	1.257***	1.024***	
	(16.09)	(21.05)	(22.22)	(7.84)	(16.12)	(20.77)	(22.18)	(7.92)	
$\hat{\beta}_0$	-0.010**	-0.012**	-0.006	0.003	-0.009**	-0.009	-0.005	0.004	
	(-2.48)	(-2.44)	(-1.26)	(0.56)	(-1.97)	(-1.49)	(-1.11)	(0.65)	
N	41,197	20,180	21,017	6,081	41,197	20,180	21,017	6,081	
<i>R</i> ²	0.47	0.49	0.47	0.42	0.47	0.49	0.47	0.42	

Panel B

Panel B of Appendix Table V.1 reports the results from OLS regressions of bank's individual bond holdings on bank characteristics: Log-Assets, Tier 1 and RWA/Assets. Holdings are available during the March 2010 to June 2012 period and are scaled by banks' total assets. Dependent variables are: Italy sovereign holdings over total assets, and Spanish sovereign bond holdings over total assets. Columns (5) to (7) report the results of regressions performed on sub-periods which represent the time periods between the stress tests conducted by the European Banking Authority (EBA). Column (5) reports regression results for the March to December 2010 period, column (6) for the January to December 2011 period, and column (7) for the January to June 2012 period, respectively. All bank characteristics are lagged by 1 year (half-year if available). Standard errors are clustered at the bank level. t-statistics are given in parentheses. ***,** and * indicate significance at 1, 5 and 10% levels respectively.

Dependent Variable: Italy / Assets							
			-		March - Dec 2010	Jan - Dec 2011	Jan - June 2012
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
$\hat{\beta}_{Tier1}$	-0.310***		-0.317***	-0.270***	-0.361**	-0.267*	-0.016
	(-4.42)		(-4.14)	(-3.14)	(-2.22)	(-1.98)	(-0.28)
$\hat{eta}_{RWA/Assets}$		0.031***	0.005	0.021	0.012	0.031	0.006
		(3.19)	(0.49)	(1.36)	(0.53)	(1.24)	(0.33)
$\hat{\beta}_{Log-Assets}$				0.003*	0.003	0.003	-0.000
				(1.74)	(1.30)	(1.28)	(-0.01)
\hat{eta}_0	0.049***	0.000	0.049***	0.004	0.010	-0.002	0.004
	(5.06)	(0.10)	(4.05)	(0.11)	(0.22)	(-0.05)	(0.13)
Ν	180	195	171	171	78	73	20
R^2	0.12	0.03	0.13	0.14	0.15	0.14	0.04

Dependent Variable: Spain / Assets							
			-	-	March - Dec 2010	Jan - Dec 2011	Jan - June 2012
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
$\hat{\beta}_{Tier1}$	-0.179***		-0.087**	-0.031	-0.075	0.025	0.202
	(-4.08)		(-2.26)	(-0.60)	(-0.84)	(0.45)	(0.88)
$\hat{eta}_{RWA/Assets}$		0.036***	0.034***	0.054***	0.042*	0.052**	0.222**
		(3.87)	(3.19)	(3.14)	(1.75)	(2.15)	(2.63)
$\hat{eta}_{Log-Assets}$				0.003*	0.000	0.004**	0.016**
				(1.81)	(0.13)	(2.25)	(2.34)
$\hat{oldsymbol{eta}}_0$	0.030***	-0.008***	0.004	-0.049	-0.005	-0.076**	-0.305**
	(4.47)	(-2.78)	(0.62)	(-1.59)	(-0.10)	(-2.10)	(-2.18)
Ν	180	195	171	171	78	73	20
<i>R</i> ²	0.05	0.08	0.10	0.12	0.11	0.12	0.49

Table V.2.Moral Suasion

This table reports the results from OLS regressions of banks' equity returns on sovereign bond and 10-year German Bund returns. Intervened is an indicator variable equal to 1 if the banks was bailed-out by its government after/during the 2007-2009 financial crisis. Appendix V in the paper provides a list of these banks. All regressions further include all macroeconomic control variables used in model (2) of Panel A of Table 5 (*VSTOXX*, *TermStructure, BondDefSpread, ImEuribor, \Delta ESI, \Delta IndProd, \Delta CPI)*. T-statistics are in parentheses. Standard errors are clustered at bank and quarter level. ***,** and * indicate significance at 1, 5 and 10% levels respectively.

	(1)	(2)	(3)	(4)
	GI	PSI	Non-	GIPSI
$\hat{\beta}_{Greece}$	0.039**	0.013	0.003	-0.004
	(2.66)	(1.05)	(1.17)	(-1.00)
$\hat{\beta}_{\text{Italy}}$	0.260***	0.259**	0.201***	0.078
	(4.73)	(2.46)	(5.71)	(1.21)
$\hat{\beta}_{Portugal}$	-0.003	0.011	0.018**	-0.004
C	(-0.12)	(0.41)	(2.48)	(-0.52)
$\hat{\beta}_{\text{Spain}}$	-0.035	0.069	0.017	0.002
. I	(-0.64)	(0.85)	(0.84)	(0.08)
$\hat{\beta}_{\text{Ireland}}$	0.150***	0.077**	0.109***	0.082***
	(3.62)	(2.28)	(6.44)	(5.85)
$\hat{\beta}_{\text{Germany}}$	-2.315***	-2.321***	-2.271***	-2.230***
	(-17.46)	(-17.80)	(-17.40)	(-16.97)
$\hat{\beta}_{intervened}$	-0.002**	-0.002**	-0.001**	-0.001**
	(-2.37)	(-2.36)	(-2.14)	(-2.19)
$\hat{eta}_{ ext{Intervened x Greece}}$		0.116*		0.053*
		(1.89)		(1.76)
$\hat{\beta}_{\text{Intervened x Italy}}$		-0.000		0.231**
		(-0.00)		(2.62)
$\hat{eta}_{ ext{Intervened x Portugal}}$		0.040		0.012*
0		(1.68)		(1.81)
$\hat{\beta}_{\text{Intervened x Spain}}$		-0.159		0.027
· · · · · r ·		(-1.50)		(0.74)
$\hat{\beta}_{\text{Intervened x Ireland}}$		-0.023		0.038***
		(-0.56)		(3.29)
Ν	34,457	34,457	41,710	41,710
R ²	0.39	0.39	0.44	0.44

Appendix VI Aggregate Data

Figure VI.A. Non-Domestic Government Bond Exposure (BIS Data)

This graph shows the quarterly holdings of GIPSI sovereign debt by non-GIPSI banks since Q4 2010. The data are obtained from the Bank of International Settlement (BIS) who collects all *foreign* sovereign exposures of banks on a quarterly basis starting in Q4 2010. We plot the holdings in Italian and Spanish sovereign debt as well as "Total" GIPSI sovereign holdings which is the sum of Greek, Italian, Portuguese, Spanish and Irish sovereign debt. The left y-axis displays total and Italian holdings. All numbers are in billion Euros.



Figure.VI.B. Domestic Government Bond Holdings (ECB Data)

This graph show the domestic exposure of GIPSI banks. The data are obtained from the European Central Bank who reports domestic sovereign debt exposure on a quarterly basis. All numbers are in billion Euros.



Appendix VI US Banks by Market Capitalization

Institution Name	Ticker	Total Assets (€M)	Market Capitalization (€M)
Wells Fargo & Company	WFC	1,121,006	152,456
JPMorgan Chase & Co.	JPM	1,864,409	140,167
Citigroup Inc.	С	1,468,317	104,907
Bank of America Corporation	BAC	1,697,011	102,725
U.S. Bancorp	USB	277,355	49,141
PNC Financial Services Group, Inc.	PNC	234,724	27,415
Bank of New York Mellon Corporation	BK	277.742	25,317
Capital One Financial Corporation	COF	234.217	25.008
State Street Corporation	STT	170.253	20,979
BB&T Corporation	BBT	141.107	17.159
SunTrust Banks, Inc.	STI	134,551	12.128
Fifth Third Bancorn	FITB	94 714	11 117
M&T Bank Corporation	MTB	64 618	10 371
Northern Trust Corporation	NTRS	72 690	10,571
Regions Financial Corporation	RF	93 416	9.021
KeyCorn	KEV	69 601	7 161
Comerica Incorporated		50,630	5 222
Naw Vork Community Panaorn Inc	NVCP	24 722	4 020
New Tork Community Bancorp, Inc.		54,752 42,740	4,930
First Depublic Depl	EDC	45,740	4,017
	TKU	27,575	5,957
Zions Bancorporation	ZION	42,222	3,588
Hudson City Bancorp, Inc.	HCBK	31,436	3,558
People's United Financial, Inc.	PBCT	23,876	3,440
BOK Financial Corporation	BOKF	21,417	3,335
Cullen/Frost Bankers, Inc.	CFR	17,555	2,922
Signature Bank	SBNY	14,253	2,901
Commerce Bancshares, Inc.	CBSH	17,344	2,887
East West Bancorp, Inc.	EWBC	18,026	2,732
TFS Financial Corporation (MHC)	TFSL	8,678	2,611
SVB Financial Group	SIVB	17,788	2,486
City National Corporation	CYN	21,407	2,462
First Niagara Financial Group, Inc.	FNFG	28,750	2,437
Popular, Inc.	BPOP	28,826	2,220
Prosperity Bancshares, Inc.	PB	11,768	2,106
Hancock Holding Company	HBHC	14,876	2,045
First Horizon National Corporation	FHN	19,637	2,008
BankUnited, Inc.	BKU	9,946	2,006
Associated Banc-Corp	ASBC	18,164	2,004
TCF Financial Corporation	TCB	14,439	1,910
Susquehanna Bancshares, Inc.	SUSQ	14,020	1,809
Fulton Financial Corporation	FULT	13.018	1,780
Bank of Hawaii Corporation	BOH	10.554	1.776
Synovus Financial Corp.	SNV	20.454	1.700
Webster Financial Corporation	WBS	15.692	1.694
Investors Bancorp. Inc. (MHC)	ISBC	10.020	1.637
Valley National Bancorp	VLY	12,507	1,588
UMB Financial Corporation	UMBE	12,255	1,550
CapitalSource Inc	CSE	6 6 1 9	1,550
EverBank Financial Corp	EVER	14 285	1,400
Washington Federal Inc	WAED	10 234	1,405
FirstMerit Corporation	EMER	11 917	1,452
Capitol Federal Financial Inc	CEEN	7 330	1,413
Eirst Citizana BanaSharaa, Inc.	ECNCA	16 660	1,404
First Cluzens Banconales, Inc.	FUNCA	0.262	1,370
F.N.B. Corporation		9,502	1,324
Tustiliark Corporation		9,247	1,309
Texas Capital Bancsnares, Inc.	ICBI	/,819	1,285
Catnay General Bancorp	CATY	8,209	1,236
Bank of the Ozarks, Inc.	UZRK	3,084	1,222
National Penn Bancshares, Inc.	NPBC	6,495	1,213
BancorpSouth, Inc.	BXS	10,451	1,209
First Financial Bankshares, Inc.	FFIN	3,477	1,194
IBERIABANK Corporation	IBKC	10,106	1,157
Umpqua Holdings Corporation	UMPQ	8,967	1,157
PrivateBancorp, Inc.	PVTB	10,434	1,143

Central Bancompany, Inc.	CBCYB	8,254	1,139
International Bancshares Corporation	IBOC	8,989	1,089
Old National Bancorp	ONB	7,548	1,086
First National of Nebraska, Inc.	FINN	12,400	1,076
Wintrust Financial Corporation	WTFC	13,323	1,068
Glacier Bancorp, Inc.	GBCI	5,937	1,065
Sterling Financial Corporation	STSA	7,223	1,053
United Bankshares, Inc.	UBSI	6,487	1,044
MB Financial, Inc.	MBFI	7,324	1,032
First BanCorp.	FBP	10,148	1,001
Westamerica Bancorporation	WABC	3,814	954
Western Alliance Bancorporation	WAL	6,378	939
Northwest Bancshares, Inc.	NWBI	6,238	927
Community Bank System, Inc.	CBU	5,635	923
CVB Financial Corp.	CVBF	4,889	921
Hilltop Holdings Inc.	HTH	5,631	878
PacWest Bancorp	PACW	4,136	841
Park National Corporation	PRK	5,265	838
Home BancShares, Inc.	HOMB	3,297	825
BBCN Bancorp, Inc.	BBCN	4,552	802
First Midwest Bancorp, Inc.	FMBI	6,286	777
Astoria Financial Corporation	AF	12,649	760
National Bank Holdings Corporation	NBHC	4,102	760
NBT Bancorp Inc.	NBTB	5,939	755
Capital Bank Financial Corp.	CBF	5,528	744
First Financial Bancorp.	FFBC	4,954	726
Provident Financial Services, Inc.	PFS	5,608	714
Columbia Banking System, Inc.	COLB	3,827	682
SCBT Financial Corporation	SCBT	4,012	668
First Interstate BancSystem, Inc.	FIBK	5,805	639
Pinnacle Financial Partners, Inc.	PNFP	3,957	638
Beneficial Mutual Bancorp, Inc. (MHC)	BNCL	3,717	635
ViewPoint Financial Group, Inc.	VPFG	2,632	626
Boston Private Financial Holdings, Inc.	BPFH	4,835	609
Flagstar Bancorp, Inc.	FBC	10,217	608
Independent Bank Corp.	INDB	4,464	581