

For Online Publication

Online Appendix for

“The Greatest Carry Trade Ever? Understanding Eurozone Bank Risks”

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Appendix I. Case Studies: Dexia SA and Bank of Cyprus

In this section, we provide brief examples of two non-peripheral European banks that heavily invested in carry trades and eventually defaulted: Dexia SA and Bank of Cyprus. We describe their trading behavior, as well as the costs when these trades fail: losses through sales of bonds at lower prices, losses through mark-to-market of trading portfolios, an increase in short-term funding costs, less collateral for private repo markets, and losses through hedges that went wrong.

1.1. Dexia SA

In October 2011, Dexia SA (Dexia)¹ was bailed out because of carry trades that went wrong (see the quote of Dexia's current CEO at the start of the paper): Dexia built a proprietary bond portfolio amounting to €203 billion at the end of 2008 (about 32% of its balance sheet), searching for higher yields compared to their significantly less profitable municipal lending business.² These investments were financed in short-term wholesale markets. The bond exposure was mainly to fixed rate bonds and Dexia hedged the interest rate risk using credit derivatives. Effectively, Dexia was short German bunds in the total return swap market betting on an increase in bund yields.

Dexia sold part of its portfolio in 2011 and incurred losses of about €2.6 billion. At the same time, it wrote down 75% of its Greek sovereign bond holdings due its private sector involvement. The losses on the exposure to Greek sovereign debt amounted to €3.4 billion. Moreover, Dexia incurred substantial mark-to-market losses on its remaining bond portfolio. Consequently, Dexia's Tier 1 ratio fell to 7.56% at end of 2011 and its book equity even became negative. Both Moody's and S&P placed Dexia's ratings under review for possible downgrade

¹ Dexia SA was formed in 1996 through a merger of Crédit Local (France) and Crédit Communal (Belgium).

² Holding a large amount of securities given Dexia's funding imbalances was even encouraged by rating agencies: "Dexia's widely diversified funding base and the liquidity reserve provided by its large securities portfolio offset its reliance on wholesale capital markets" (S&P Ratings Direct, May 22, 2008).

in spring 2011. Between April and June 2011, €22 billion in unsecured short-term funds were withdrawn and its U.S. dollar position was impacted first. Figure 2. shows that U.S. MMF reduced their holdings of Dexia's commercial papers and repos within a few months in spring 2011 from about \$10 billion to zero.

[Figure 2]

Dexia lost about €40 billion in short-term funding within six months in the second half of 2011. An additional €6 billion in unsecured short-term funding was withdrawn during the July - September 2011 period, and another €6 billion after Moody's announcement of placing the group's long- and short-term rating under review for possible downgrade on October 3, 2011. Moreover, the group lost commercial deposits of €7 billion in the fourth quarter of 2011.³ Consequently, Dexia needed to rely increasingly on central bank funding, which reduced the amount of available collateral for further repo transactions.⁴

The European Commission explicitly addressed its concerns with respect to the large amount of sovereign debt in Dexia's portfolio and the use of interest rate derivatives, which "probably requires significant collateral for Dexia, which may reduce its eligible collateral base for financing from the central banks or in the interbank repo market" (EC, 2010).⁵

Dexia's derivative positions put even more pressure on short-term liquidity. Between June and September 2011, Dexia had to post €15 billion cash collateral due to the fall in interest

³ The 1-year CDS spread of the banking subsidiary Dexia Crédit Local. The CDS spread increased within a few weeks after June 2011 from 200 bps to 1,000 bps, reflecting its rise in short-term funding costs, as well as the market's expectation of Dexia's default probability over the next year.

⁴ The ratio of repurchase agreements with the ECB over total repurchase agreements almost doubled between 2010 and 2011.

⁵ Dexia held a portfolio of GIPSI sovereign bonds amounting to €26.1 billion as of March 31, 2010 consisting mainly of Italian bonds (€17.6 billion) and Greek government bonds (€3.7 billion). The size of the sovereign bond portfolio corresponds to almost three times its book equity. Importantly, Dexia has kept the positions unchanged since then.

rates. On October 7, 2011 Dexia incurred an additional €16 billion margin call but was unable to post the collateral.⁶

1.2. Bank of Cyprus

The bailout of Cyprus to rescue its two failing banks, Bank of Cyprus (BOC) and Cyprus Popular Bank, provides the most recent example of how aggressive yield chasing by banks in the form of investing in risky sovereign debt brings an entire country to the verge of financial collapse. A recent investigation by the Cypriot central bank into the activities of BOC documents a premeditated trading in Greek sovereign bonds by BOC.

[Table I]

Table I reports the purchases of Greek sovereign bonds by ISIN in 2009:Q1. Buying and selling the same ISIN within the same quarter suggests active trading, rather than holding sovereign bonds to manage liquidity risk. Importantly, trades with the same ISIN have frequently occurred with the same counterparty. The report mentions Deutsche Bank, Barclays, and Société Générale SA as the most important European trading partners, which indicates that this behavior was prevalent across European banks.⁷

[Figure I.2]

Figure I.2 shows the Greek sovereign bond holdings over the January 2009 to December 2011 period. BOC purchased about €2 billion Greek government bonds in 2010,

⁶ Dexia was eventually bailed out by the governments of Belgium, France, and Luxembourg. The government assured debtholders as well as swap counterparties that they would not incur any losses in order not to trigger a default event. This is similar to September 2008, when the U.S. government bailed out American International Group (AIG). Also in the case of Dexia, governments were concerned with massive losses that had to be booked by the (unidentified) counterparties, emphasizing the systemic importance of Dexia. It was bailed out a third time in November 2012 and the European Commission extended an additional €85 billion refinancing guarantee to restructure Dexia in December 2012.

⁷ Figure II in the Internet Appendix II shows the Greek sovereign bond holdings over the January 2009 to December 2011 period. BOC purchased about €2 billion Greek government bonds in 2010, increasing its holdings to about €2.4 billion (A&S, 2013) when Greece was downgraded further and rescue packages made a default of Greece more likely. The data published by the EBA shows a consistent increase in Greek bond exposure. BOC actually kept their holdings up to the private sector involvement in late 2011.

increasing its holdings to about €2.4 billion (A&S, 2013) when Greece was downgraded further and rescue packages made a default of Greece more likely. The data published by the EBA shows a consistent increase in Greek bond exposure. BOC actually kept their holdings up to the private sector involvement in late 2011.

Internal emails from BOC executives reveal the motives behind these trades. The non-performing loan portfolio eroded the capital of the firm. BOC thus purchased Greek government bonds to pursue an “absolute yield” strategy to deliver net interest income and “relative value” strategy to take advantage of selling opportunities to generate gains around reporting dates (“window dressing”). They invested in the highest yielding bonds including longer maturity inflation-linked bonds. Hedges were put in place to swap longer dated bonds onto floating rates and maintain BOC’s target duration.

ECB repo funding was not driving the banks’ decision to do the carry trades. “We have no reliance on ECB borrowing because (a) we borrow and invest in liquid bonds and (b) alternatively, we could have utilized our USD cash, swap them into Euro, and invest in such assets. Moreover, we could utilize undrawn (but uncommitted money-market lines) amount to EUR 500 million [...] The reason we used repos is because the cost was lower.” ECB funding improves the profitability of the trades and made them still look attractive while private repo markets were already rejecting the collateral: “Almost no bank accepts Greek government bonds as repo collateral for 1 year. Those that do, impose very high haircuts... The cost of repoing Greek government bonds for 3 months is around 0.7%.”

Total losses as a result of BOC’s Greek government bond holdings amounted to €1.9 billion on November 16, 2012: €910 million relates to the costs of restructuring due to the Private Sector Involvement (PSI) program; €562 million relates to mark-to-market adjustments on the new bonds; €48 million relates to transfers from available for sale (AFS) reserves; €399 million relates to the costs of unwinding the hedges related to the bonds.

Overall, these are two illuminating examples documenting the widespread and active use of carry trades and the associated costs when the downside scenario materializes.

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) ISIN	(2) Residual Maturity	(3) Purchase	(4) Sale	(5) Price	(6) Date	(7) 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
	<u>Difference</u>	584,721,000				

Figure I.1. Dexia Stock Price and U.S. Money Market Mutual Fund Holdings (October 2010 – September 2011)

This graphic shows Dexia’s stock price and commercial paper and repo holdings of U.S. money market mutual funds over the October 2010 to September 2011 period.

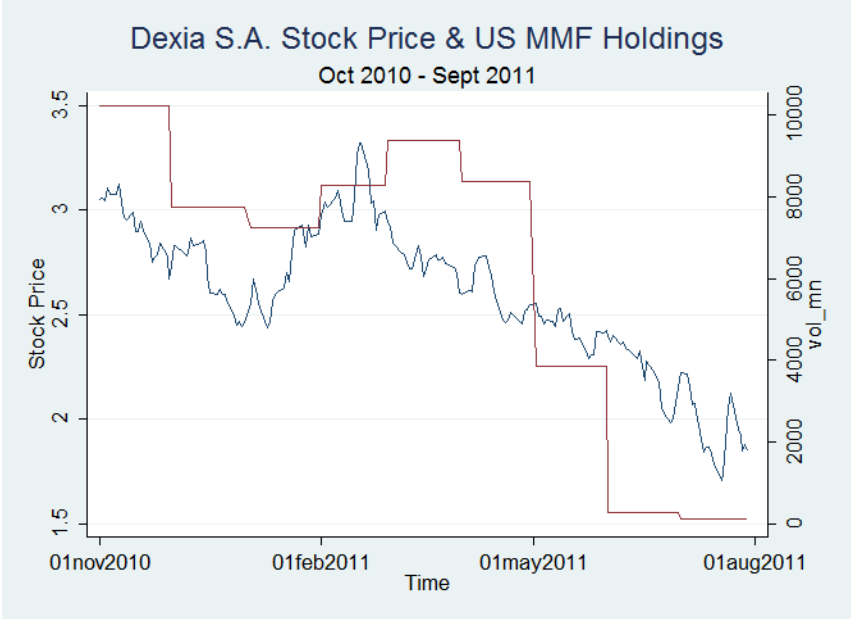
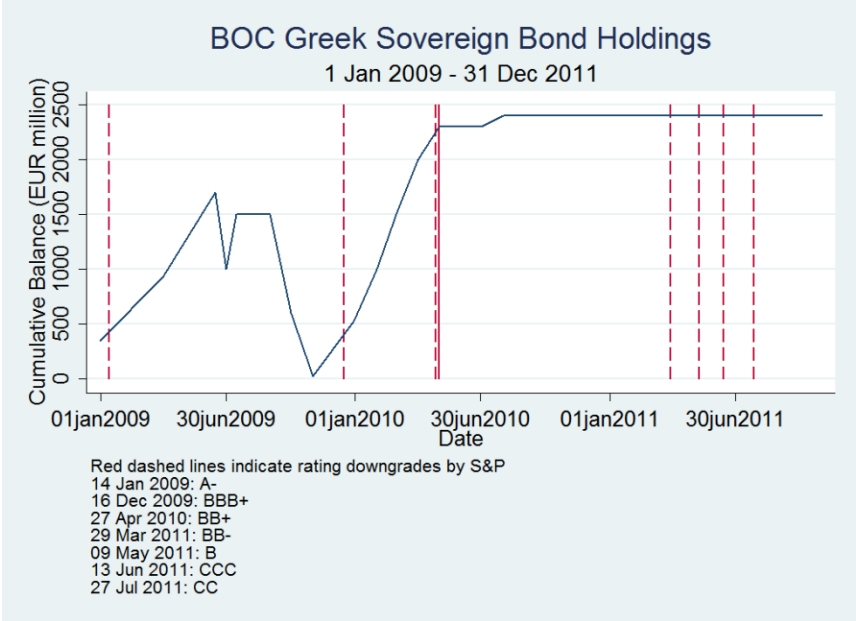


Figure I.2

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 GIIPS Banks using Micro Level Sovereign Bond Holding Data

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

Panel A

<i>GIIPS banks</i>	Bond Holdings (Euro millions) in GIIPS countries				
	Greece	Italy	Portugal	Spain	Ireland
	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 GIIPS countries				
	Greece	Italy	Portugal	Spain	Ireland
	GIIPS Banks but Non-Greek Banks	GIIPS Banks but Non-Italian Banks	GIIPS Banks but Non-Portuguese Banks	GIIPS Banks but Non-Spanish Banks	GIIPS Banks but 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 GIIPS 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)					% Change			
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 Exposure to Spain Sovereign Debt (EUR million)					% Change			
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 in Exposure to Irish Sovereign Debt (EUR million)					% Change			
Irish 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	-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 Exposure to Portuguese Sovereign Debt (EUR million)					% Change			
Portuguese 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	-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 Exposure to Greek Sovereign Debt (EUR million)					% Change			
Greek 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	-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 GIIPS 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. <= 3 years (> 3 years) denotes bonds that have a remaining maturity of below / equal to (greater than) 3 years. For each country, we report changes in all GIIPS sovereign bond holdings separately as well as changes in total GIIPS sovereign bond holdings.

	GIIPS		Italy		Spain		Portugal		Ireland		Greece	
	<= 3 years	> 3 years	<= 3 years	> 3 years	<= 3 years	> 3 years	<= 3 years	> 3 years	<= 3 years	> 3 years	<= 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 the return of a value-weighted GIIPS Sovereign Bond Index and 10-year German Bund returns during the January 2007 to June 2013 period using various subsamples of banks. We use the following subsamples: (1) all GIIPS banks, (2) all non-GIIPS, Eurozone banks, (3) German and French banks, and (4) non-Eurozone EU 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*, *ImEuribor*, Δ *ESI*, Δ *IndProd*, Δ *CPI*, Δ *FX-Rate*, Δ *EUR/USD*). All regressions include country fixed effects. *T*-statistics are in parentheses. Standard errors are clustered at bank and quarter level. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	(1)	(2)	(3)	(4)
	GIIPS	Non-GIIPS Eurozone Banks	German & French Banks	Non-Eurozone EU Banks
$\hat{\beta}_{Greece}$	0.040*** (3.08)	0.004 (0.45)	0.008 (0.78)	0.003 (0.41)
$\hat{\beta}_{Italy}$	0.226** (2.38)	0.232* (1.67)	0.148 (1.03)	0.179*** (3.15)
$\hat{\beta}_{Ireland}$	0.125*** (3.01)	0.109* (1.91)	0.107** (2.18)	0.092*** (2.67)
$\hat{\beta}_{Portugal}$	0.020 (0.72)	0.040*** (4.53)	0.037** (1.99)	0.003 (0.26)
$\hat{\beta}_{Spain}$	0.019 (0.29)	0.110 (1.20)	0.149** (2.05)	-0.049 (-1.19)
$\hat{\beta}_{Germany}$	-2.239*** (-14.86)	-2.502*** (-11.45)	-2.230*** (-6.65)	-2.074*** (-14.48)
$\hat{\beta}_m$	1.491*** (14.56)	1.424*** (8.81)	1.164*** (5.82)	1.233*** (12.37)
$\hat{\beta}_0$	-0.006*** (-3.00)	-0.003* (-1.95)	-0.000 (-0.15)	0.000 (0.39)
<i>N</i>	33,329	16,866	9,186	22,676
<i>R</i> ²	43.42%	43.21%	46.19%	45.63%

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 GIIPS, which is an equally weighted index formed from the underlying indices for Italy, Spain and Portugal, MSCI Germany, MSCI Non GIIPS, 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)	(3)	(4)	(5)	(6)
	HFRX					
	EBA Banks	US Banks	Macro	MSCI GIIPS	MSCI Germany	MSCI Non GIIPS
$\hat{\beta}_{Greece}$	0.006 (0.70)	-0.006 (-1.56)	0.001 (0.40)	-0.009 (-1.14)	-0.009* (-1.88)	0.001 (0.31)
$\hat{\beta}_{Italy}$	0.202*** (3.73)	-0.034 (-0.43)	-0.039** (-2.45)	-0.173** (-2.08)	0.091 (1.12)	-0.034 (-0.64)
$\hat{\beta}_{Portugal}$	0.013 (0.91)	0.016 (0.80)	0.013* (1.85)	0.004 (0.17)	-0.034 (-1.35)	-0.021 (-1.34)
$\hat{\beta}_{Spain}$	0.086* (1.65)	-0.035 (-0.47)	0.026 (1.44)	0.168** (2.17)	-0.042 (-0.57)	0.065 (1.39)
$\hat{\beta}_{Ireland}$	0.105** (2.48)	0.001 (0.02)	0.000 (0.03)	0.052 (1.12)	-0.027 (-0.56)	0.020 (0.65)
$\hat{\beta}_{Germany}$	-2.438*** (-32.50)	-1.911*** (-18.50)	0.086*** (2.79)	-0.015 (-0.22)	-0.080 (-0.62)	-0.008 (-0.12)
$\hat{\beta}_m$	1.411*** (22.08)	1.645*** (13.67)	0.005 (0.43)	0.010 (0.38)	0.039 (0.76)	0.304*** (10.45)
$\hat{\gamma}_{SMB}$	0.000 (0.05)	-0.000 (-0.58)	0.000 (0.88)	-0.000 (-0.51)	-0.000 (-0.49)	0.000 (0.61)
$\hat{\gamma}_{HML}$	0.001*** (4.11)	0.000 (1.48)	0.000 (0.24)	0.000* (1.93)	0.000* (1.96)	-0.000 (-0.91)
$\hat{\beta}_0$	-0.000 (-1.42)	0.000 (0.11)	-0.000 (-0.72)	-0.000 (-0.68)	0.000 (0.43)	-0.000 (-0.94)
N	1,591	1,523	1,523	1,591	1,591	1,591
R^2	78.18%	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.

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

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:

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

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.⁸

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

⁸ 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.

C. Results from seemingly unrelated regressions

In this subsection, we assess the importance of portfolio holdings of sovereign debt as well as MMF exposure in explaining our factor loadings more formally in a one-step regression framework using Zellner's (1968) seemingly unrelated regression (SUR) technique.⁹ The pooled time series cross-sectional approach is well suited in our setting because there might be substantially more variation in the bond portfolios across banks as there is variation over time for a single bank given the limited portfolio data that is available to us. Regression model (1) is estimated as a system of equations consisting of N (i.e., the number of banks) time series equations and is estimated using GLS.

In Panel A of Table IV.2, $\hat{\beta}_{GIPSI}$ takes the form $\alpha_0 + \alpha_1 \frac{Holdings_{GIPSI,i,t-1}}{Assets_{i,t-1}}$ and $\hat{\beta}_{Germany}$ takes the form $\alpha_2 + \alpha_3 \frac{Holdings_{Germany,i,t}}{Assets_{i,t-1}}$. The coefficients are point estimates and constrained to be constant across all banks. We thus can interpret these coefficients as average factor loadings of our sample banks. We expect the value of $\hat{\alpha}_1$ and $\hat{\alpha}_3$ to be positive.

[Table IV.2]

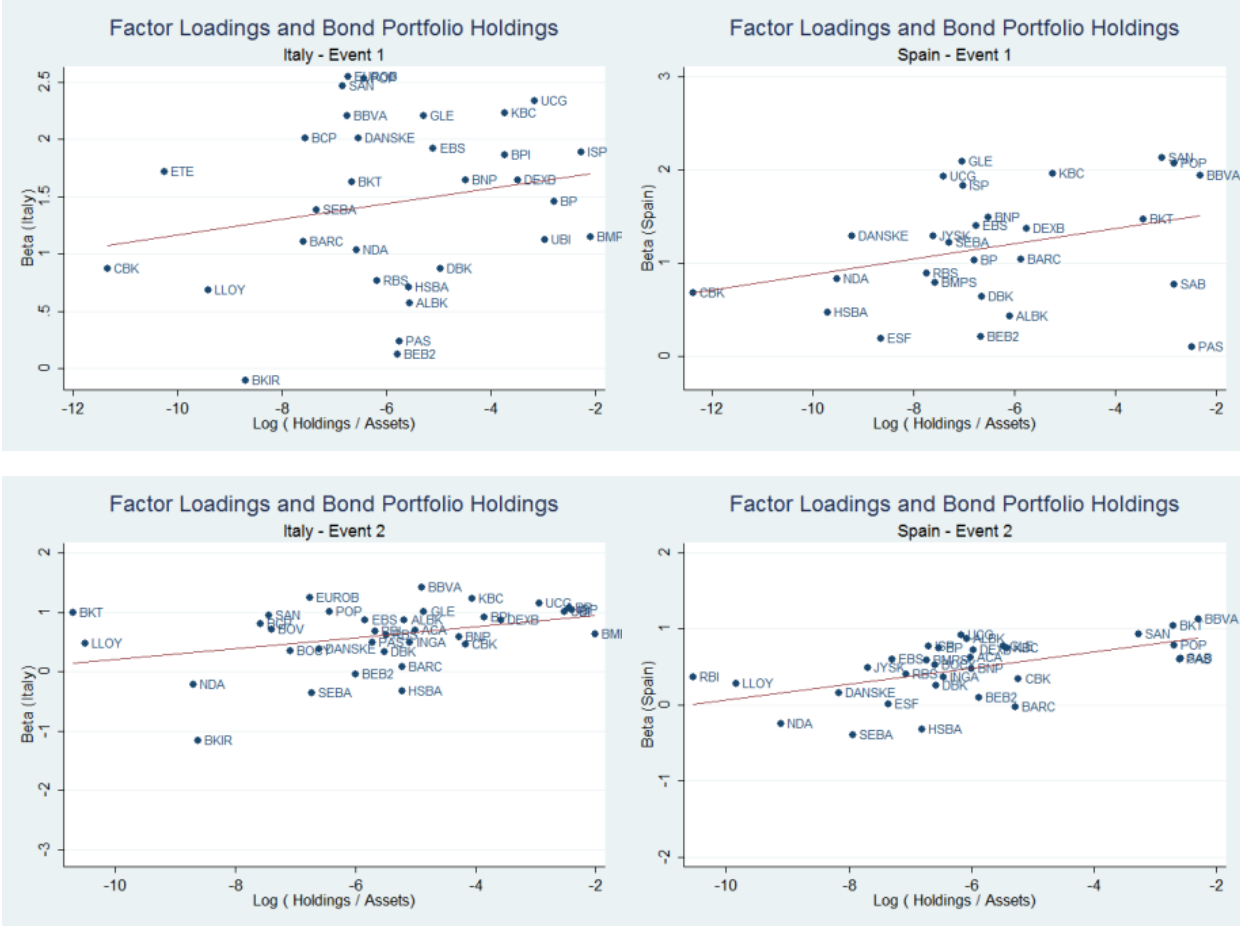
We report the results using banks overall GIPSI as well as Italian and Spanish bond holdings. $\hat{\alpha}_1$ and $\hat{\alpha}_3$ are positive, which indicates that banks benefit from higher bond returns if they own bonds from the periphery or Germany. In Panel B of Table IV.2, $\hat{\beta}_{Germany}$ takes the form $\alpha_2 + \alpha_3 \frac{\Delta MMF_{i,t}}{Assets_{i,t-1}}$. ΔMMF are monthly money market withdrawals denominated in million euros. We re-estimate our systems of equations and find that $\hat{\alpha}_3$ is negative and highly

⁹ This approach has also been used, for example, in French et al. (1983) to estimate the effects of nominal contracting on stock returns.

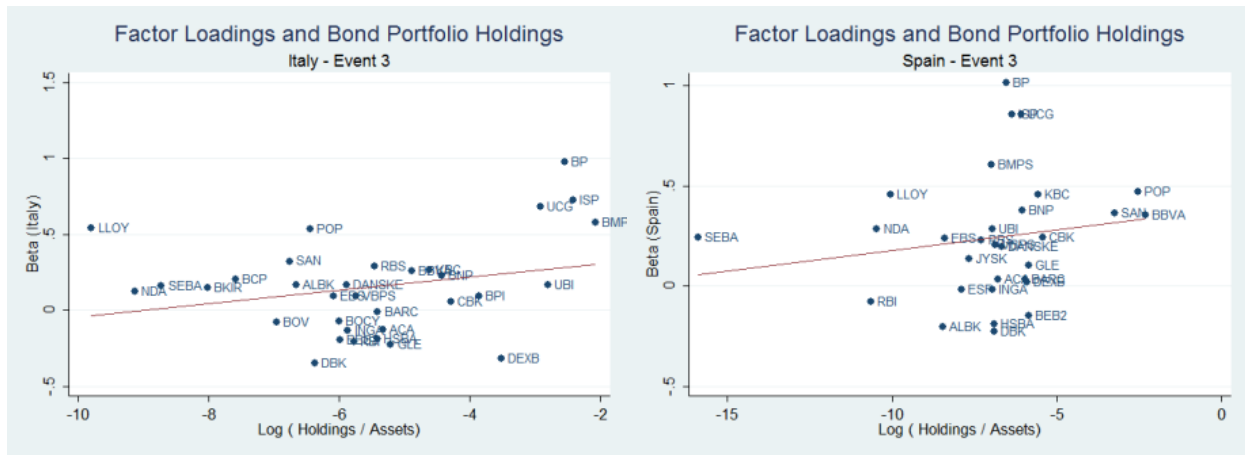
significant. Banks with larger withdrawals from MMFs experience more short-term funding pressure. $\hat{\alpha}_2$ is also negative and significant, which indicates that even if banks do not have exposure to U.S. MMFs, they are still subject to short-term funding risk.¹⁰

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.



¹⁰ In unreported tests, we also analyze the effect of other measures of liquidity risk on banks’ sensitivity to German bunds, which have been used widely in the literature. There are: short-term debt over total debt and repurchase agreements with other banks or the ECB over total assets. As expected, banks with more short-term debt (relative to total debt) or more repo funding have more negative factor loadings on German bunds.



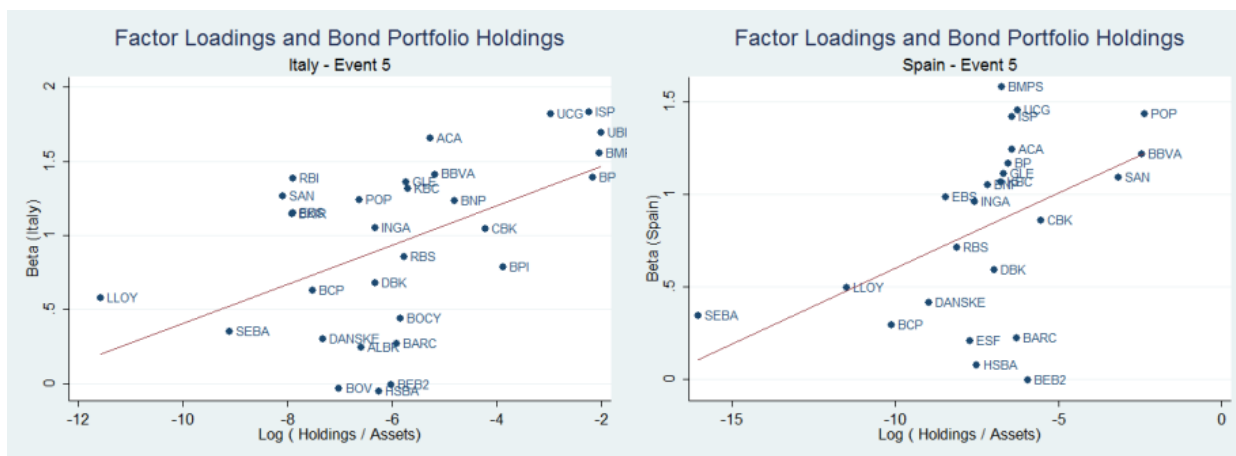
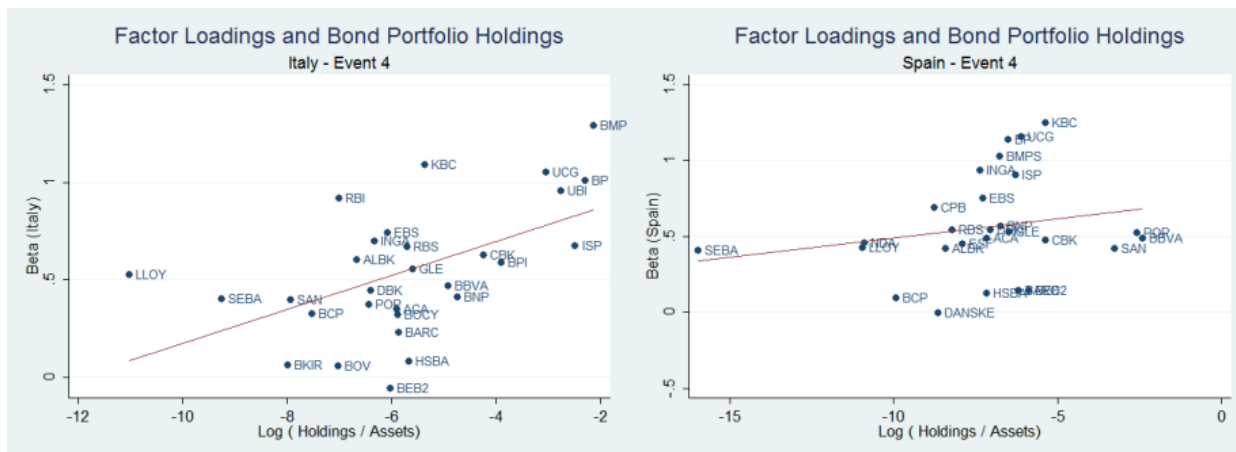


Figure IV.2. Dexia S.A. – Time Varying Betas and MMF Exposure

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.

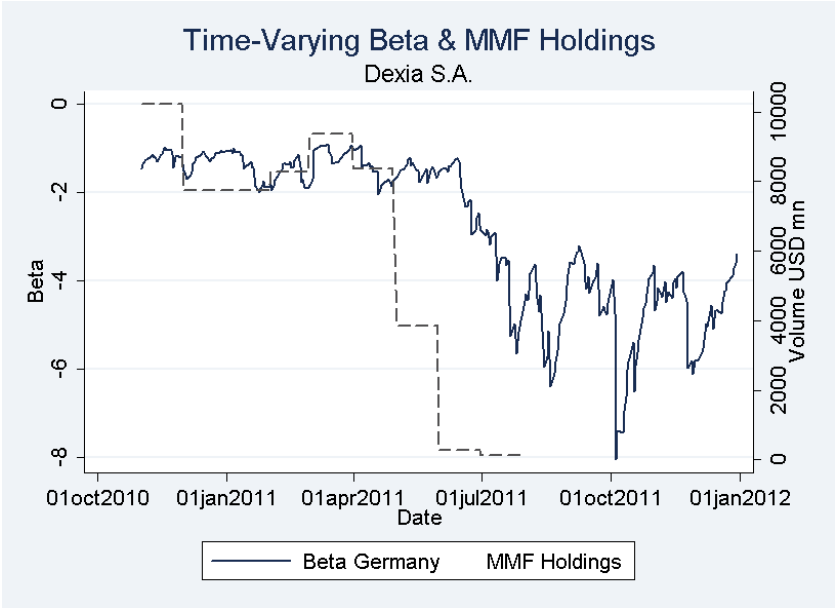


Table IV.1**Factor Loadings, Portfolio Holdings and Funding Risk**

This table contains the results regressing factor loadings ($\hat{\beta}_{Italy}$, $\hat{\beta}_{Spain}$, $\hat{\beta}_{Greece}$) 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

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

GIIPS	N	$\hat{\alpha}_0$	$\hat{\alpha}_1$	R^2
<i>Scaled by Total Assets</i>				
Italy	194	0.756*** (11.10)	7.845*** (5.26)	7.41%
Spain	194	0.653*** (13.10)	6.161*** (2.70)	4.31%
<i>Scaled by Book Value of Equity</i>				
Italy	194	0.753*** (10.91)	0.468*** (4.46)	6.53%
Spain	194	0.650*** (12.96)	0.372*** (2.66)	4.18%

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.

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

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

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

This table reports the results from cross-sectional regressions of factor loadings ($\hat{\beta}_{Italy}$, $\hat{\beta}_{Spain}$) 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.

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

	$\hat{\beta}_{Italy}$				$\hat{\beta}_{Spain}$			
	All (1)	All (2)	All (3)	Non-Italian (4)	All (5)	All (6)	All (7)	Non-Spanish (8)
$\hat{\alpha}_1$	1.148*** (4.09)		-0.602 (-0.63)	4.990 (0.73)	0.657** (2.66)		-0.808 (-1.41)	-3.556 (-0.81)
$\hat{\alpha}_2$		8.565*** (2.95)	12.091 (1.52)	36.248*** (2.81)		6.847*** (3.53)	13.158*** (3.37)	71.094 (1.39)
$\hat{\alpha}_0$	0.845*** (6.84)	0.807*** (6.38)	0.799*** (6.20)	0.685*** (5.14)	0.691*** (9.53)	0.676*** (9.36)	0.676*** (9.32)	0.625*** (6.56)
N	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)
	$\hat{\beta}_{GIPSI}$			
	All Banks	All Banks	All Banks	Non GIIPS Banks
GIIPS / Assets	2.656*** (2.91)		3.135*** (2.79)	16.897*** (4.39)
Real - GIIPS / Assets		0.178 (0.99)	-0.160 (-0.91)	-2.364*** (-5.94)
$\hat{\beta}_0$	1.023*** (11.17)	1.081*** (11.57)	1.048*** (10.67)	0.908*** (8.27)
N	49	51	49	28
R ²	0.12	0.02	0.13	0.25

Table IV.2. Sub-Periods

This table contains the results regressing factor loadings ($\hat{\beta}_{GIIPS}$) on sovereign bond holdings. $\frac{Holdings_{GIIPS,i,t-1}}{Assets_{i,t-1}}$ are GIIPS 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.

Panel A. GIIPS sovereign bond exposure

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

Table IV.2**Results from Seemingly Unrelated Regressions**

This table reports the results from seemingly unrelated regression (SUR). In Panel A, the sensitivity of equity to GIPSI sovereign bond returns $\hat{\beta}_{GIPSI}$ (measured during the 2010 to 2012 period) takes the form $\alpha_0 + \alpha_1 \frac{Holdings_{GIPSI,i,t-1}}{Assets_{i,t-1}}$. The sensitivity of equity to German bond returns $\hat{\beta}_{Germany}$ takes the form $\alpha_2 + \alpha_3 \frac{Holdings_{Germany,i,t-1}}{Assets_{i,t-1}}$. $\hat{\alpha}_0, \hat{\alpha}_1, \hat{\alpha}_2,$ and $\hat{\alpha}_3$ are point estimates under the constraints: $\alpha_{0,1} = \alpha_{0,2} = \dots = \alpha_0, \alpha_{1,1} = \alpha_{1,2} = \dots = \alpha_1, \alpha_{2,1} = \alpha_{2,2} = \dots = \alpha_2, \alpha_{3,1} = \alpha_{3,2} = \dots = \alpha_3,$ and $\alpha_{4,1} = \alpha_{4,2} = \dots = \alpha_4$. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Panel A. SUR Models including German Bund holdings

$$R_{i,t} = \beta_{0,i} + \alpha_0 R_{GIPSI,t} + \alpha_1 \frac{Holdings_{GIPSI,i,t-1}}{Assets_{i,t-1}} R_{GIPSI,t} + \alpha_2 R_{Germany,t} + \alpha_3 \frac{Holdings_{Germany,i,t-1}}{Assets_{i,t-1}} R_{Germany,t} + \beta_{m,t} R_{m,t} + \varepsilon_{i,t}.$$

GIPSI	α_0	α_1	α_2	α_3	Prob > chi²
GIPSI	0.316*** (8.86)	6.423*** (16.07)	-2.446*** (-37.89)	4.380*** (2.73)	<0.001
Italy	0.365*** (10.87)	9.444*** (13.46)	-2.330*** (-31.37)	3.664** (2.21)	<0.001
Spain	0.381*** (10.42)	5.368*** (12.18)	-2.442*** (-38.00)	3.690** (2.24)	<0.001

Panel B. SUR Models including U.S. MMF Withdrawals

Panel B reports the results from seemingly unrelated regression. The sensitivity of equity to GIPSI sovereign bond returns $\hat{\beta}_{GIPSI}$ (measured during the 2010 to 2012 period) take the form $\alpha_0 + \alpha_1 \frac{Holdings_{GIPSI,i,t-1}}{Assets_{i,t-1}}$. The sensitivity of equity to German bond returns $\hat{\beta}_{Germany}$ takes the form $\alpha_2 + \alpha_3 \frac{\Delta MMF_{i,t}}{Assets_{i,t-1}}$. $\hat{\alpha}_0, \hat{\alpha}_1, \hat{\alpha}_2,$ and $\hat{\alpha}_3$ are point estimates under the constraints: $\alpha_{0,1} = \alpha_{0,2} = \dots = \alpha_0, \alpha_{1,1} = \alpha_{1,2} = \dots = \alpha_1, \alpha_{2,1} = \alpha_{2,2} = \dots = \alpha_2, \alpha_{3,1} = \alpha_{3,2} = \dots = \alpha_3,$ and $\alpha_{4,1} = \alpha_{4,2} = \dots = \alpha_4$.

$$R_{i,t} = \beta_{0,t} + \alpha_0 R_{GIPSI,t} + \alpha_1 \frac{Holdings_{GIPSI,i,t-1}}{Assets_{i,t-1}} R_{GIPSI,t} + \alpha_2 R_{Germany,t} + \alpha_3 \frac{\Delta MMF_{i,t}}{Assets_{i,t-1}} R_{Germany,t} + \beta_{m,t} R_{m,t} + \varepsilon_{i,t}.$$

GIPSI	α_0	α_1	α_2	α_3	Prob > chi²
GIPSI	0.310*** (6.48)	6.709*** (12.28)	-2.324*** (-31.75)	-11.595*** (-3.82)	<0.001
Italy	0.296*** (7.2)	11.203*** (10.53)	-2.210*** (-25.47)	-8.091*** (-2.58)	<0.001
Spain	0.399*** (8.29)	4.736*** (8.9)	-2.32*** (-32.48)	-10.389*** (-3.45)	<0.001

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 GIIPS and non-GIIPS 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. Column (5) reports the results for the full sample and columns (6) and (7) for sub-samples of GIIPS and non-GIIPS 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*, *1mEuribor*, Δ *ESI*, Δ *IndProd*, Δ *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.

Panel A

	Exposure to Italian Sovereign Debt				Exposure to Spanish Sovereign Debt			
	(1) All Banks	(2) GIIPS Banks	(3) Non GIIPS Banks	(4) German/French banks	(5) All Banks	(6) GIIPS Banks	(7) Non GIIPS Banks	(8) German/French banks
$\hat{\beta}_{GIIPS}$	-0.479 (-0.99)	1.095 (1.62)	-1.025*** (-3.59)	-4.395*** (-3.26)	-0.723 (-1.33)	0.104 (0.15)	-1.081*** (-2.91)	-2.737*** (-3.88)
$\hat{\beta}_{GIIPS \times \text{Log-Assets}}$	0.052** (2.06)	-0.036 (-0.90)	0.079*** (6.51)	0.488*** (3.35)	0.063*** (2.71)	0.016 (0.44)	0.073*** (4.90)	0.257** (2.40)
$\hat{\beta}_{GIIPS \times \text{ST-LVG}}$	0.809*** (2.93)	1.808*** (6.43)	0.370** (2.40)	-2.117* (-1.77)	0.691** (2.18)	1.624*** (7.33)	-0.041 (-0.22)	0.179 (0.18)
$\hat{\beta}_{GIIPS \times \text{RWA/Assets}}$	0.552** (2.54)	-0.609 (-1.61)	0.704*** (4.00)	2.222*** (3.70)	0.624*** (3.37)	0.088 (0.21)	0.593*** (2.97)	1.532*** (3.66)
$\hat{\beta}_{GIIPS \times \text{Tier 1}}$	-0.034*** (-2.88)	-0.045** (-2.53)	-0.008 (-0.33)	-0.169** (-2.29)	-0.024 (-0.95)	-0.047 (-1.52)	0.018 (0.89)	-0.083 (-1.26)
$\hat{\beta}_{Germany}$	0.639 (0.43)	-2.116 (-1.21)	0.944 (1.03)	16.006*** (7.10)	0.662 (0.45)	-2.223 (-1.21)	1.067 (1.27)	15.777*** (7.03)
$\hat{\beta}_{Germany \times \text{Log-Assets}}$	-0.137** (-2.08)	-0.006 (-0.06)	-0.171*** (-4.93)	-1.230*** (-5.36)	-0.141** (-2.12)	-0.008 (-0.08)	-0.172*** (-4.83)	-1.141*** (-5.07)
$\hat{\beta}_{Germany \times \text{ST-LVG}}$	-0.859* (-1.65)	-2.633*** (-5.42)	-0.202 (-0.63)	-2.247 (-1.26)	-0.910* (-1.77)	-2.821*** (-6.37)	-0.020 (-0.08)	-3.440* (-1.96)
$\hat{\beta}_{Germany \times \text{RWA/Assets}}$	-0.582 (-0.67)	2.536** (2.76)	-1.387*** (-3.85)	-9.076*** (-5.45)	-0.629 (-0.73)	2.522** (2.42)	-1.409*** (-4.10)	-8.888*** (-5.58)
$\hat{\beta}_{Germany \times \text{Tier 1}}$	-0.079* (-1.83)	-0.122* (-2.01)	-0.044 (-1.00)	0.165 (1.22)	-0.076* (-1.86)	-0.104** (-2.10)	-0.059 (-1.54)	0.102 (0.75)
$\hat{\beta}_m$	1.372*** (16.09)	1.477*** (21.05)	1.252*** (22.22)	1.011*** (7.84)	1.375*** (16.12)	1.479*** (20.77)	1.257*** (22.18)	1.024*** (7.92)
$\hat{\beta}_0$	-0.010** (-2.48)	-0.012** (-2.44)	-0.006 (-1.26)	0.003 (0.56)	-0.009** (-1.97)	-0.009 (-1.49)	-0.005 (-1.11)	0.004 (0.65)
<i>N</i>	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							
	(1)	(2)	(3)	(4)	March - Dec 2010	Jan - Dec 2011	Jan - June 2012
					(5)	(6)	(7)
$\hat{\beta}_{Tier\ 1}$	-0.310*** (-4.42)		-0.317*** (-4.14)	-0.270*** (-3.14)	-0.361** (-2.22)	-0.267* (-1.98)	-0.016 (-0.28)
$\hat{\beta}_{RWA/Assets}$		0.031*** (3.19)	0.005 (0.49)	0.021 (1.36)	0.012 (0.53)	0.031 (1.24)	0.006 (0.33)
$\hat{\beta}_{Log-Assets}$				0.003* (1.74)	0.003 (1.30)	0.003 (1.28)	-0.000 (-0.01)
$\hat{\beta}_0$	0.049*** (5.06)	0.000 (0.10)	0.049*** (4.05)	0.004 (0.11)	0.010 (0.22)	-0.002 (-0.05)	0.004 (0.13)
<i>N</i>	180	195	171	171	78	73	20
<i>R</i> ²	0.12	0.03	0.13	0.14	0.15	0.14	0.04

Dependent Variable: Spain / Assets							
	(1)	(2)	(3)	(4)	March - Dec 2010	Jan - Dec 2011	Jan - June 2012
					(5)	(6)	(7)
$\hat{\beta}_{Tier\ 1}$	-0.179*** (-4.08)		-0.087** (-2.26)	-0.031 (-0.60)	-0.075 (-0.84)	0.025 (0.45)	0.202 (0.88)
$\hat{\beta}_{RWA/Assets}$		0.036*** (3.87)	0.034*** (3.19)	0.054*** (3.14)	0.042* (1.75)	0.052** (2.15)	0.222** (2.63)
$\hat{\beta}_{Log-Assets}$				0.003* (1.81)	0.000 (0.13)	0.004** (2.25)	0.016** (2.34)
$\hat{\beta}_0$	0.030*** (4.47)	-0.008*** (-2.78)	0.004 (0.62)	-0.049 (-1.59)	-0.005 (-0.10)	-0.076** (-2.10)	-0.305** (-2.18)
<i>N</i>	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*, Δ *ESI*, Δ *IndProd*, Δ *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)
	GIIPS		Non-GIIPS	
$\hat{\beta}_{Greece}$	0.039** (2.66)	0.013 (1.05)	0.003 (1.17)	-0.004 (-1.00)
$\hat{\beta}_{Italy}$	0.260*** (4.73)	0.259** (2.46)	0.201*** (5.71)	0.078 (1.21)
$\hat{\beta}_{Portugal}$	-0.003 (-0.12)	0.011 (0.41)	0.018** (2.48)	-0.004 (-0.52)
$\hat{\beta}_{Spain}$	-0.035 (-0.64)	0.069 (0.85)	0.017 (0.84)	0.002 (0.08)
$\hat{\beta}_{Ireland}$	0.150*** (3.62)	0.077** (2.28)	0.109*** (6.44)	0.082*** (5.85)
$\hat{\beta}_{Germany}$	-2.315*** (-17.46)	-2.321*** (-17.80)	-2.271*** (-17.40)	-2.230*** (-16.97)
$\hat{\beta}_{Intervened}$	-0.002** (-2.37)	-0.002** (-2.36)	-0.001** (-2.14)	-0.001** (-2.19)
$\hat{\beta}_{Intervened \times Greece}$		0.116* (1.89)		0.053* (1.76)
$\hat{\beta}_{Intervened \times Italy}$		-0.000 (-0.00)		0.231** (2.62)
$\hat{\beta}_{Intervened \times Portugal}$		0.040 (1.68)		0.012* (1.81)
$\hat{\beta}_{Intervened \times Spain}$		-0.159 (-1.50)		0.027 (0.74)
$\hat{\beta}_{Intervened \times Ireland}$		-0.023 (-0.56)		0.038*** (3.29)
<i>N</i>	34,457	34,457	41,710	41,710
<i>R</i> ²	0.39	0.39	0.44	0.44

Appendix VI. Did sovereign debt purchases crowd out lending?

Our results suggest that under-capitalized banks and banks with high risk-weighted assets increased their sovereign bond holdings. Particularly under-capitalized GIIPS banks had high exposures and this home bias increased since December 2011 when the ECB started a very accommodative monetary policy flooding the market with liquidity. Worse, because of their lack of capital, banks might not have been able to provide loans to the corporate sector preventing a broad recovery of their economies.

To investigate whether weak banks increase their securities holdings while simultaneously reducing their real sector lending, we collect monthly data from the ECB about Italian and Spanish banks' investments in government securities and lending to non-financial corporations since January 2008. The ECB publishes data aggregated at the country level for activities within the euro area.¹¹

[Figure VI]

Figure VI.A displays the time-series of domestic corporate lending and government securities holdings relative to Spanish banks' total assets since January 2008. We find that corporate lending declined by about 0.5%, on average, each month. Lending by Italian banks decreased by 0.2% per month, on average, as Figure VI.B suggests. At the same time, investment in domestic government securities increased by 1% (Italian banks) and 1.7% (Spanish banks), on average, per month. The cross-correlation between both time series is -0.97.

¹¹ The countries in our analysis include Austria, Belgium, France, Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Portugal and Spain. Non-EU countries, Sweden and the UK, and Norway, which are officially outside of the EU, are excluded from the analysis as they only provide information about their banks' investments within their home country.

Overall, we observe a substantial decline in credit to corporations in Italy and Spain from domestic banks. This is particularly worrisome given the continued lack of growth in both economies. Our results suggest that a re-capitalization of the banking sector is necessary to avoid this crowding out of corporate lending and to facilitate growth in the Eurozone.

Figure VI.A Government Securities vs. Corporate Lending (Spain)

This graph shows domestic lending to firms of Spanish banks (left y-axis) and investment in domestic government securities (right y-axis) relative to total assets over the January 2008 to March 2014 period. Data are on a monthly basis and downloaded from the ECB website.

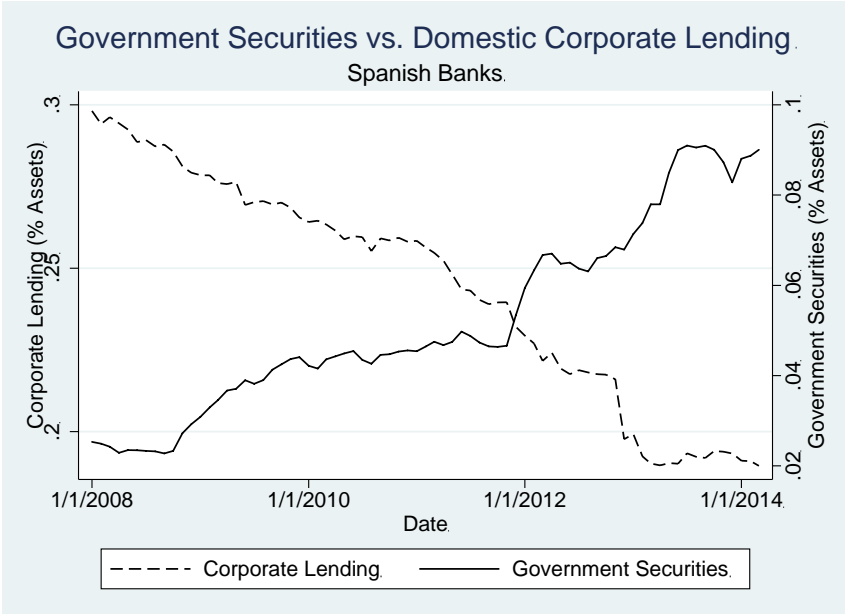
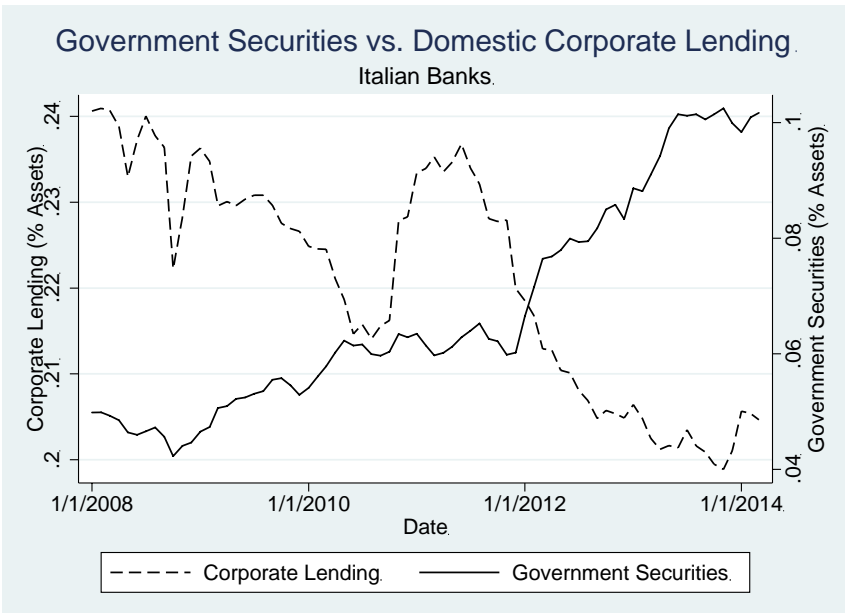


Figure VI.B Government Securities vs. Corporate Lending (Italy)

This graph shows domestic lending to firms of Italian banks (left y-axis) and investment in domestic government securities (right y-axis) relative to total assets over the January 2008 to March 2014 period. Data are on a monthly basis and downloaded from the ECB website.



Appendix VII 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.	C	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 Bancorp	FITB	94,714	11,117
M&T Bank Corporation	MTB	64,618	10,371
Northern Trust Corporation	NTRS	72,690	10,172
Regions Financial Corporation	RF	93,416	9,021
KeyCorp	KEY	69,601	7,161
Comerica Incorporated	CMA	50,630	5,233
New York Community Bancorp, Inc.	NYCB	34,732	4,930
Huntington Bancshares Incorporated	HBAN	43,740	4,817
First Republic Bank	FRC	27,375	3,957
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	UMBF	12,255	1,550
CapitalSource Inc.	CSE	6,619	1,468
EverBank Financial Corp	EVER	14,285	1,465
Washington Federal, Inc.	WAFD	10,234	1,432
FirstMerit Corporation	FMER	11,917	1,415
Capitol Federal Financial, Inc.	CFFN	7,330	1,404
First Citizens BancShares, Inc.	FCNCA	16,660	1,370
F.N.B. Corporation	FNB	9,362	1,324
Trustmark Corporation	TRMK	9,247	1,309
Texas Capital Bancshares, Inc.	TCBI	7,819	1,285
Cathay General Bancorp	CATY	8,209	1,236
Bank of the Ozarks, Inc.	OZRK	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.	VPPG	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